TECHNOLOGY: BIOFUEL
COMPANY: **SINO-US BIO-FUEL TECHNOLOGY JOINT RESEARCH CENTRE OF TSINGHUA UNIVERSITY**

Institution Company Supplier	Details
Sino-US Bio-Fuel Technology Joint Research Centre of Tsinghua University	**Renewable Energy Technology Achievement Declaration**

QR code			
Technical provision unit	Sino-US Bio-Fuel Technology Joint Research Centre of Tsinghua University	Submission date	June 28, 2016
Contact person	Zhang Lei	Technical type	Biomass energy utilization technology
Tel.	13661099951	E-mail	Leizhangxny@tsinghua.edu.cn
Technical name	Technology and equipment of Advanced Solid State Fermentation (ASSF) generation of sweet sorghum stalk ethyl alcohol		
Technical provider	Sino-US Bio-Fuel Technology Joint Research Centre of Tsinghua University		
Scope of application	Biological energy source field, suitable for countries from tropic to temperate zone		
Brief description of technology	For technical bottleneck blocking the development of bio-fuel ethanol, Tsinghua University has developed technology and equipment of Advanced Solid State Fermentation (ASSF) generation of sweet sorghum stalk ethyl alcohol and ruminant feeds. Tsinghua University has developed the largest continuous solid biological reactor with 555m^3 in the world at present. It has firstly realized continuous and automatic production of sweet sorghum stalk ethyl alcohol in the world without waste water being produced, which has remarkable environmental and economic benefits.		
Technical information	Annual production of absolute ethyl alcohol of the production line is 1,500t, power consumption per ton 433kwh, steam 6.2t Main equipment: Pulverizer 5t/h, 30kW Fermentation tank 555m^3, Total weight of 141t Crude distillation tower 52m^3, The total weight of 27 tons.		
Business application situation	In the early 2014, Tsinghua University and Dongying Hongli Biotechnology Co., Ltd. jointly built the A SSF sweet sorghum ethanol plant with the output of 10,000tons, which was equipped with the world's largest continuous solid biological reactor of 555m3. It is running now.		
Service conditions	Shandong Dongying Hongli Bioenergy Technology Co., Ltd. Zhou Huandong 18678630111, 1777696@qq.com		

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	Contact person of business application unit /Tel,/E-mail	Tsinghua University patent equipment is adopted for the main process, and the super gravity patent equipment from Zhejiang University of Technology is adopted for rectification and dehydration. Main equipment: Rotary fermentation tank with the drive power of 30kW, the drive motor of crude distillation tower with 7.5kW, and rectification equipment with the power of 120kW .Operating time 300days per year. Train operators Normal equipment maintenance and repair shall be carried out annually.
	Investment on equipment	The plant with an annual output of ten thousand tons, RMB sixty million as one-time investment, including RMB 30 million for equipment investment (including the installation of subsidiary pipelines and utilities equipment and installation), and RMB 30 million for plant and civil construction costs.
	Expense of operation maintenance	16 tons of sweet sorghum with the sugar content of 14% is consumed for one ton of fuel ethanol, a-Diastase 2L, Glucoamylase 1.2L, Corn meal 85kg, Sterile air 107m^3, Cooling circulating water 264t, Primary water 0t, Power Investment 433kW, Steam 6.2t. Labor cost RMB 200, Equipment depreciation RMB 278.86, Repair expenses RMB 55
	Investment payback period	Payback period of investment for project 5.8 years before income tax, 6.7 years after the income tax (including the construction period of 2 years)
	Other earnings	Sorghum stalk can be used to produce fuel ethanol, and the main method is liquid state method and solid state method. Compared with the liquid state method, both methods can produce the byproduct of lees feed. For the lees feed produced by means of the solid state, through fermentation and high temperature distillation process, distiller's grains are rich in nutrients with fermented aroma. It is easy to digest and the nutrient composition is equivalent to silage corn. It can be used as coarse fodder for cattle and sheep. The sugar content of sorghum residue squeezed by means of the liquid state is high. If fed to cattle and sheep for a long term, it can easily cause acidosis. And the feed value is far lower than the byproduct distiller's grains produced by means of the solid state. 13.8 tons of distiller's grains feed as byproduct can be produced from per ton of finished fuel ethanol by means of solid state, and the feed per ton is between RMB 190 and 210. In Africa or Southeast Asia Islands where the power shortage is severe, distiller's grains left after ethanol is produced by solid fermentation can generate electricity. The problem of electricity can be solved through the distributed power grid of small-scale. Especially for more than 90% of rural Africa without access to electricity, it is more suitable to use the sweet sorghum-ethanol power mode, and the ethanol factory with output of 10,000tons can match 2.5MW biomass power plant for power generation.
	Technical occupancy	At present, the domestic ethanol production is mostly grain ethanol, non-grain ethanol market has not yet been formed due to technical bottlenecks. ASSF sweet sorghum ethanol technology, as the most competitive non-grain ethanol technology, has great potential for development.

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	Market potential of the Technical	Bio fuel is the only alternative fuel to replace oil in large scale, and the market prospect is broad. Bio-fuels are in the first place in renewable energy, accounting for 3% of the world. At present, bio fuels that are used are mainly fuel ethanol and bio diesel, of which the fuel ethanol accounts for more than 80%. The Organization for Economic Cooperation and Development (OECD) and Food and Agriculture Organization of the United Nations (FAO) expect that the global ethanol production will be 125.6 million tons in 2023 and biodiesels will be 34 million tons, which will provide a broad space for future development of bio-fuels. China implements the preferential policies of exempting product consumption tax and return after collection of value-added tax for the fuel ethanol industry; However, the fiscal subsidy of grain ethanol was stopped in 2015, but the development of non-grain ethanol has still been encouraged. National finance gives the subsidy of RMB 200 per mu for planting sweet sorghum and other energy crops on the uncultivated land. At the same time, it gives the non-grain fuel ethanol plant the interest subsidies during the construction period and the reward of 20-40% of the total investment after the completion. On April 26, 2016, Xinhua News Agency issued the *Opinions on the Overall Revitalization of Northeast China and Other Old Industrial Bases by Central Committee of the Communist Party of China and State Council*. The fuel ethanol will expand the scale of production and research the layout of the new production base. The new pilot program will undoubtedly play a role in promoting the development of new technology research and market development of enterprises. In this context, ASSF technology takes low energy consumption and no waste water as the concept of technology development, and strives to build green substitution industries of renewable fossil energy. It vigorously promotes the recycling energy agriculture and the bio based industry cluster development with the biomass energy as the core.
	Technical advancement	ASSF sweet sorghum ethanol technology has no squeezing process in the traditional liquid fermentation, which directly ferments the crushed sweet sorghum grain. It significantly reduces the energy consumption for squeezing juice and there is no problem like waste disposal. Through amplification of a series of engineering, the technology solves the theory and engineering problems in the production process of sweet sorghum ethanol. It shows characteristics that are obviously better than those of liquid fermentation and reaches the international advanced level (J.ZI [JQ P2015] No. 003), which realizes the industrialization of sweet sorghum ethanol for the first time. Economic and technical indexes 1. During the solid fermentation process, the residence time for the material in the tank is 20-24 hours. It doubles the efficiency of corn ethanol. 2. Ethanol yield; 91%; 3. In the production process of ethanol, no waste water is discharged (6 tons of wastewater is produced for per corn ethanol); 4. Distillers' grains are used as the boiler fuel, with no foreign fossil fuels being used. The input-output ratio of energy is 1:2.72 (corn ethanol is 1:1.3 at best). 5. 1 ton of ethanol can be produced from 16 tons of sweet sorghum stalk (the content of sugar is14.1%), and the distiller's grains, except as the boiler fuel, can be used to feed one cattle. 6. Ethanol costs about RMB 4,257.7 / ton (calculated on the base that the

		price of sweet sorghum is RMB 250 / ton and the price of distillers' grains is RMB 200 /ton). 7. If the alcohol and power cogeneration mode is used, the distiller's grains that produces 1 ton of ethanol can produce 2,500kWh power. Besides for own use, it can be used to surf the Internet for 1500 KWh. Ethanol costs about RMB 4,558.4 / ton (calculated on the base that the price of sweet sorghum stalk is RMB 250 / ton, the price of power is RMB 0.75 / kWh and the cost is RMB 0.4 / kWh).
	Technical maturity	Through 10 years, the technique of ASSF sweet sorghum ethanol is gradually enlarged and improved to be mature by Tsinghua University. It started with the flask experiments on the laboratory level, through 10 liters, 50 liters, 250 liters, 5 cubic meters, 40 cubic meters, 127 cubic meters up to the world's largest continuous solid biological reactor of 555m^3. And the theory and engineering problems in the production process of sweet sorghum ethanol have been solved. The inherent shortcomings in the biological solid reaction process have been overcome as far as possible, and characteristics that are significantly better than those of liquid fermentation are shown in the production of sweet sorghum ethanol. During the engineering enlargement, the low carbon agro-industrial chain whose core is ASSF sweet sorghum ethanol has gradually formed. It has integrated with the bio-energy, agricultural planting, equipment manufacturing and cultivation. It forms the relatively complete equipment manufacturing system and industry alliance with the capacity of the complete technique and equipment output. Such development pattern plays an obviously promoting role on the economic development, national stability and people's living standard especially for the underdeveloped area such as Africa.
	Technical applicability	After 10 years of optimization of the SSSF sweet sorghum ethanol technique, its main process and equipment have been greatly improved, and the steady industry alliance in the fields of breeding, agricultural machinery, equipment manufacturing and universal equipment has been established initially. On the other hand, the sweet sorghum is native to Africa, which has a strong stress resistance to the salt and alkali, drought and heavy metal contaminated soils and can be planted in the marginal and contaminated soils which are not suitable for cultivation. Its growth cycle is short (it can be planted for more than 3 times each year in most countries in Africa. According to the report issued by Food and Agriculture Organization of the United Nations FA0, there are 69.49million hectares of land suitable for sweet sorghum in Tanzania, while that suitable for planting sugarcane is only 0.9million hectares) with high biomass. It can grow in the most areas from the tropic to the temperate belt, thus accepted as the most competitive non-grain raw ethanol material. In addition, the sweet sorghum has excellent economic characteristics. It is the best poverty alleviation method to plant barren-resistance sweet sorghum. The peasants' income is more than double compared with other crops such as corn, wheat, cotton and sugarcane. Therefore, it can bring about more benefits to the peasants in comparison with other crops, which can guarantee the stable supply of sweet sorghum. In general, ASSF sweet sorghum ethanol technique is the new bio-fuel technique that can be promoted worldwide.

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	Technical stability	ASSF technique has gone through the 500ml shake flask, 10L solid fermentation tank, 50L tank, 250L tank experiments and 5m^3 tank, 127 m^3 tank middle tests in the lab, until operated in the 555m^3 industrial device for 2 years. It constantly improves the production equipment centering on the ethanol production from sweet sorghum stalks and formulates relevant process document, which makes the equipment stable during the engineering operation and become resistant to the environmental and technical parameters and other interference factors.
	Technical safety	The supporting agricultural machinery remains to be developed, and the industry needs the seeds with better regional adaptability. Currently, the fuel ethanol market is affected by international oil price and is in the valley phase yet. Although the sweet sorghum ethanol produced with the ASSF technique can compete with the $50 oil price, it still requires the government's policy support and the constantly improved technique to achieve cost reduction and further improvement of enterprise's economic benefits.
	Obstacle in achievement transformation and promotion	According to the provisions in *Notice of Fuel Ethanol Subsidy Policy of the Ministry of Finance*, the losses happened to the manufacturing enterprise on the denatured fuel ethanol production and denatured fuel ethanol allocation and sales are to be subsidized at some ration by the national finance. In 2012, the Generation 1 grain ethanol and Generation 1.5 fuel ethanol are respectively subsidized at RMB 500/t and RMB 750/t. In 2015, the nation lowers down the fuel ethanol subsidy to RMB 300/t and RMB 500/t respectively, which increases the pressure of ethanol industry.
	Transfer of intellectual property	The technique owns the domestic and international intellectual property rights and can be cooperated through technology license manner.

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	Photo caption	

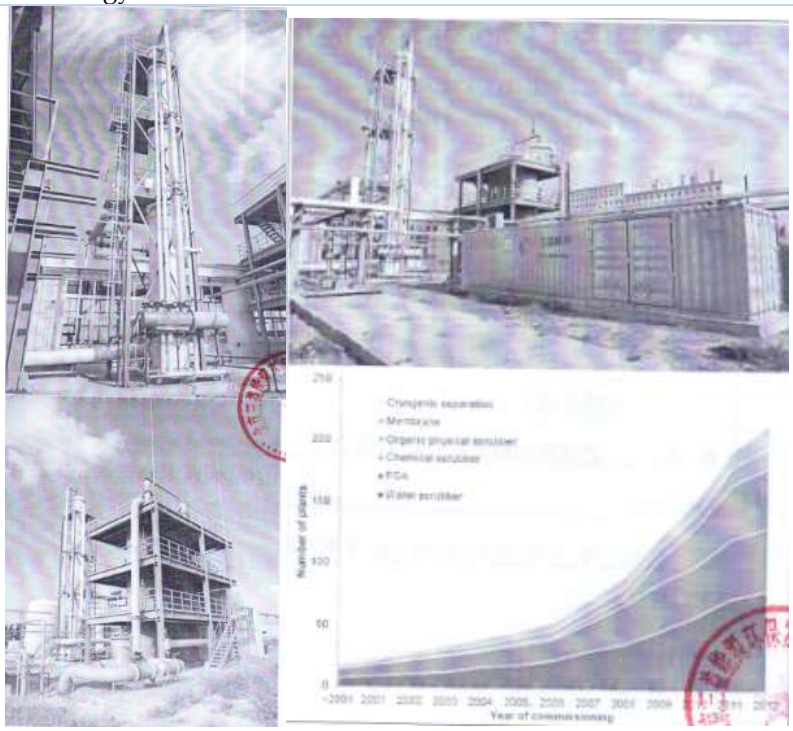
TECHNOLOGY: BIOGAS
COMPANY: **BEIJING SANYI ENERGY ENVIRONMENTAL PROTECTION DEVELOPMENT CO., LTD**

Beijing Sanyi Energy Environmental Protection Development Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Beijing Sanyi Energy Environmental Protection Development Co., Ltd.	Submission date	June 29, 2016
	Contact person	Li Hang	Technology type	Biomass energy utilization technology
	Tel.	13901346797	E-mail	lihang@syge.com.cn
	Technology name	Biogas membrane purification technology		
	Technology provider	Beijing Sanyi Energy Environmental Protection Development Co., Ltd.		
	Scope of application	Beijing Sanyi Energy Environmental Protection Development Co., Ltd.		
	Brief description of technology	Membrane separation Biogas is the use of different gas components in different solubility and diffusion rate of permeation polymer membrane when the compressed biogas flows along the lumen of the hollow fiber tubes of different gases in the high-side and low-side music hollow tube filaments formed by the points under pressure differential solubility and diffusivity of the gas permeation rate is large relative priority being to achieve the purpose of the separation barrier through the fiber membrane wall remaining gas		
	Technical information	Membrane module arrangement ways are primary, secondary and third membrane system, a required minimum number of membrane modules for primary system, secondary methane recovery rate can reach 97%, third methane recovery rate of over 99%, the methane content of exhaust gas is less than 1%		
	Business application situation	Weifang Yingxuan Industrial biogas purification project is RMB 150,000 m^3/day, Lianyungang Jinchanglin biogas purification project is RMB 80,000 m^3/day, Shandong Luwei pharmaceutical biogas purification project is RMB 20,000 m^3/day.		
	Service conditions	Weifang Yingxuan Industrial biogas purification project Zhang Haitao 18919676622, Lianyungang Jinchanglin biogas purification project Zheng Guo 18614034565, Shandong Luwei pharmaceutical biogas purification project Liu Bin 15550021122		
	Contact person of business application	For daily amount of biogas of five thousand m^3, it is possible to use mobile energetic purification equipment, which is marketable. 5,000 to 30,000 m^3 of biogas amount shall take local investment and construction mode. Biogas purification membrane technology at home and abroad have been widespread, and technology is mature and reliable, simple to use training to operate, easy to install, repair and maintenance costs of 30,000 m^3only RMB 331,200 per year		

	unit /Tel. /E-mail	
	Investment on equipment	For example: Shandong Weifang project: Weifang Yingxuan biomass nature gas project (30,000 m^3 for phase I); Project investment: Total investment: RMB 18,118,200 (Including civil engineering and gas desulfurization); Main contents and scale of Shandong Weifang Project: Processing capacity 10,950,000 m^3/a Specification of equipment 30,000 m^3/d Gas production 6,396,990 m^3/a Exhaust output 4,553,010 m^3/a Total installed power 593.29 kw The entire project covers an area of 9,973m^2. Operating rooms, offices set above the ground outside the ground 600mm, each equipment basic settings above ground 200mm. Various types of circulating pumps, pipeline pumps, compressors, chillers and other large equipment to produce noise and vibration are arranged on the shop floor for the purpose of damping and fixing Various pipelines for transporting materials fail to pass through air or underground of the places for labor staying, rest area and control rooms. Shandong Weifang major equipment projects: Desulfurization process: Circulating pumps, measuring pumps, sludge pump sulfur, nutrient pumps, dosing pumps, air blowers along, plate and frame filter press, fans Decarburization engineering: Gas compressors, co_2 separation membranes, nature gas compressors, biogas cold and dry Utilities: Air compressors, circulating pumps, cooling towers, micro-oil screw compressor, fire facilities
	Expense of operation maintenance	Expense of operation maintenance for Shandong Weifang project: 1. Expenses for purchasing materials: RMB 5,475,000 2. Power fees and water fees: RMB 1,946, 900 3. Expenses of consumables: RMB 792,500 4. Depreciation of fixed assets: RMB 1,457,800 5. Salary and welfare expenses RMB 761,000 6. Office fees: RMB 228,300 7. Maintenance and repair fees: RMB 331,200 Overall costs and expenses of the project (including depreciation): RMB 11, 016,800 Overall costs and expenses of the project (not including depreciation): RMB 9,559,000
	Investment payback period	The project's total investment is RMB 18,118,200, the annual operating costs (including depreciation of RMB 11,016,800, project's annual sales revenue is RMB 19,191,000. Internal rate of return is 33.77%, investment payback period is 2.96 years.

	Other earnings	1. To promote environmental protection and circular economy industry. This project is the supporting project of light industry enterprise, is the by-product biogas industry chain extension, increasing the income of the environmental protection facilities, and promoting sustainable development of environmental protection and circular economy industry construction and building beautiful home. 2. Renewable energy utilization reduces the consumption of fossil energy. Biogas is a kind of renewable energy, and biogas utilization slows down the consumption of fossil energy in our country to ensure the stable and sustainable development of the economy in our country. 3. It relieves contradiction between supply and demand caused by far distance from nature gas transportation and high cost. Natural gas market is in short supply in our country, especially contradiction between supply and demand becomes more obvious in the winter, biogas purification and preparation as nature gas can relieve contradiction between supply and demand of natural gas in Nanning 4. Investment projects contribute to energy conservation and emissions reduction, and at the same time promote the good image of environmental protection.
	Technical occupancy	Commonly used biogas purification technologies include high pressure water washing, variable pressure adsorption, chemical absorption, physical absorption, membrane method, cryogenic separation. Among them pressure variable pressure adsorption method, pressure water washing method, chemical absorption and membrane separation are widely applied in terms of biogas purification. According to early estimates (IEA), by 2012, 229 biogas purification works had been built in the world, with all kinds of technical market occupancy as illustrated
	Market potential of the technology	In the face of the increasingly serious energy resources and the environment, must take effective measures to cope with the situation, development and utilization of biological gas such as renewable energy, protecting the ecological environment, is the inexorable selection of achieving sustainable development. Biogas utilization at present is mainly used in cooking, heating and power generation, etc., in this use of for the purpose of burning gas, a large amount of carbon dioxide (30%-40%) have fire retardant effect, the combustion would reduce the utilization of heat of combustion, reduce the utilization rate of flame temperature, reduce the volume of the combustion chamber, and rise in the cost of combustion heat release process, this way of biogas utilization has low energy efficiency, economic benefit is poor. Biogas purification refining production into biomass fuel gas is a way with a higher value. After biogas purification into biomass fuel gas, methane content up to 97% above can realize strong firepower and higher energy grade and higher utilization ratio after it is burnt, in addition, the biomass gas after purification has less discharge of pollutants, flexible and wide application for industry and civil, automotive use), and with the advantages of replace fossil natural gas and other. Therefore, biogas purification into biomass gas can realize efficient utilization of biogas, which is one of the most promising usage method
	Technical advancement	Membrane separation used for biogas purification biological methane is a hot spot in recent research at home and abroad, being considered as an important development direction for the process of using high value of biogas. Membrane separation is the method of using a polymer thin film materials, relying on different gas on

		the affinity of membrane differences resulting in selective diffusion phenomenon, and achieving the purpose of separation by generally selecting & klquo; filtering & rdquo feed gas component. The research shows that, membrane filtration method to biogas calorific value up to the gas quality grade is feasible. Compared with more traditional separation methods such as variable pressure adsorption, chemical absorption, high pressure water washing, membrane separation method has high separation efficiency, small volume, low energy consumption investment, convenient operation and maintenance, and many other advantages. Purified biogas using membrane technology has carried out some fruitful research, including two stage and multistage membrane series purification technology, and estimates the use of membrane filtration method each cubic for production & klquo; biological gas & rdquo; In about 0.3 kWh of energy consumption, the energy consumption is low, and a very promising biogas purification technology.
	Technical maturity	The technology at home and abroad has construction of multiple projects, daily capacity from 1,000 m^3 to 3,000 m^3, and technology maturity is higher.
	Technical applicability	Biogas purification and refining is a way of using high value of biogas containing gas such as CH_4,CO_2, H_2S, H_2O, biogas purification process for the purification of the main tasks include: Removal of CO_2, H_2S and water improves the relative amounts of methane and increases the heat of combustion. The purified biomass gas obtained by purification usually contains 95%-97% methane and 1%-3% carbon dioxide, which can be used as an alternative to natural gas to be consolidated into gas pipeline network or to be pressurized as fuel gas for automobiles. Main components of low-quality natural gas, landfill gas, coal bed gas are similar to the biogas, membrane purification technology is also applicable to low-quality natural gas, landfill gas, coal bed gas purification.
	Technical stability	There are a number of projects at home and abroad under the stable operation.
	Technical safety	The technology has security safeguards in key links, including safety valves, emergency relief and other facilities. In addition, the membrane purification technology does not use chemicals, the purification process will not cause harm to the environment and human body.
	Obstacle in achievement transformation and promotion	The achievement transformation is a high risk, high investment, high-yield work, a longer cycle, requiring having a strong capital base, and there are some obstacles in the promotion of the transformation of the capital.
	Transfer of intellectual property	The company has its own intellectual property rights, patents of invention, *Purified Membrane Biogas Heating System*, patent number ZL201410112064.0. This technology provides a membrane biogas purification heating temperature control system, including a compressor heat recovery circulating system, external heat source system, heat exchange system and control regulation system; The circulating system of compressor heat recovery recovers heat generated during compressor compression through the thermal storage tank; External heat source system shall be compensated in case of insufficient heat recovered from the compressor; Heat

		exchange system shall be heat exchanging site for hot water for recovering heat by biogas and compressor; Control and regulation systems are connected to described compressor heat recovery circulating system, external heat source system and a heat exchange system to make more energy consumed for existing heating technology, especially the case that heat production and the system cannot be used sufficiently, be reused by subsequent biogas heating compressed gas generated by heat recovery to the subsequent methane gas heating, thereby reducing energy of system and making the system energy efficiency can be improved with less energy waste.
	Photo caption	

TECHNOLOGY: BIOGAS
COMPANY: **HENAN TIANGUAN GROUP CO., LTD**

Henan Tianguan Group Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Henan Tianguan Group Co., Ltd.	Submission date	June 30, 2016
	Contact person	Ma Ming	Technology type	Biomass energy utilization technology
	Tel.	13838906959	E-mail	tgmaming@163.com
	Technology name	Cassava fuel ethyl alcohol project with annual output of 100-300 thousand tons		
	Technology provider	Henan Tianguan Group Co., Ltd.		
	Scope of application	Henan Tianguan Group Co., Ltd.		
	Brief description of technology	With raw material pretreatment, liquefying-saccharification, in fermentation, distillation dehydration and other processes, the project realizes conversion from raw material of cassava to absolute ethyl alcohol, has support of professional technology and patent technology, and is able to effectively utilize resources, save resources and reduce consumption.		
	Technical information	Refer to GB18350-2013 *Denatured Fuel Ethyl Alcohol* for product standard		
	Business application situation	The technology has realized industrialization, and has been applied in Henan Tianguan Fuel Ethyl Alcohol Co., Ltd. and Henan Tianguan Biological Engineering Co., Ltd., and the operation is currently in good condition.		
	Service conditions	Ma Ming 0377-61606339 tgmaming@163.com		
	Contact person of business application unit /Tel,/E-mail	It is applicable to areas with abundant cassava resources and poor fossil energy.		
	Investment on equipment	RMB 0.65 billion		
	Expense of operation maintenance	It is under normal operation with current market price, absolute ethyl alcohol consumption in ton: Consumption of raw material of RMB 5,622.71, machine material and auxiliary material of RMB 90.23, water of RMB 80.14, electricity of RMB 88.64, steam of RMB 180.79, labor cost of RMB 35.06, equipment		

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		depreciation of RMB 133.94, maintenance cost of 54.7, other management cost of 102.88, total of RMB 6,389.09.
	Investment payback period	8 years
	Other earnings	Application of this product not only obtains fuel ethyl alcohol product, but also optimizes energy structure and improves air quality.
	Technology occupancy	Henan Tianguan Group Co., Ltd. is entitled with proprietary intellectual property rights of this technology.
	Market potential of the technology	
	Technical advancement	Aiming at features of cassava raw materials, the technology has researched and developed a package of advanced technology of unloading, purification, dedusting, transmission, screening of liquid saccharification, fermentation and distillation, which belongs to advanced technology in our country.
	Technical maturity	The technology belongs to absolutely mature technology, which has realized industrialization and prepares absolute ethyl alcohol through the processes such as raw material pretreatment, grinding, liquid saccharification, fermentation and distillation; the technology has complete equipment and special integration system to realize automatic control, and has complete maintenance mechanism.
	Technical applicability	The technology is mainly applicable to cassava raw material, and meanwhile, it is available to apply corn, wheat and other raw materials for production, which requires supporting facilities such as electricity and steam.
	Technical stability	The technology realizes stable operation during operation and suffers little interference from outside.
	Technical safety	The technology has complete supporting facilities, has much market acceptability, and there is no obstruction factors
	Obstacle in achievement transformation and promotion	The achievement of the technology is mainly realized by independent research and development, and technical problem has been totally solved; it mainly suffers from market influence, while the influence of capital and cultivation of talents is little
	Transfer of intellectual property	It has 36 authorized patents, including 7 patents for invention, with proprietary intellectual property rights. The technology is owned by Henan Tianguan Group Co., Ltd.. This technology enjoys higher localization degree and technology transfer intention.
	Photo caption	

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COMPANY: **HENAN TIANGUAN GROUP CO., LTD**

Renewable Energy Technology Achievement Declaration			
QR code			
Technology provision unit	Henan Tianguan Group Co., Ltd.	Submission date	June 30, 2016
Contact person	Ma Ming	Technology type	Biomass energy utilization technology
Tel.	13838906959	E-mail	tgmaming@163.com
Technology name	Straw biogas project with daily output of 5000-20000m3		
Technology provider:	Henan Tianguan Group Co., Ltd.		
Scope of application	Henan Tianguan Group Co., Ltd.		
Brief description of technology	With the two-phase process fermentation technology, convert all kinds of organic waste substance; into biogas, and produce organic biogas residue at the same time. It not only produces renewable energy, but also solves the problem of environmental and soil pollution. The main technical characteristics include high fermentation efficiency, high concentration of methane, high level of automation and raw material wide adaptability.		
Technical information	Biogas, concentration of methane 5%; biogas residue Solid Matters 5%, organic matter 70%, nitrogen phosphorus and potassium 3.5%;		
Business application situation	The technology has been successfully applied in Henan Nanyang Wolong Agricultural Science and Technology Park, with daily output of biogas of 6000m3, and the project is in good operation currently.		
Service conditions	Ma Ming 0377-61606339 tgmaming@163.com		
Contact person of business application unit /Tel./E-mail	Suitable for areas with rich agricultural straw resource and poor natural gas resource.		

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	Investment on equipment	RMB 25 million
	Expense of operation maintenance	RMB 470,000
	Investment payback period	8.37 years
	Other earnings	In electric power, a part of electric energy from the generator is used for the own production, and another part is incorporated into the state grid; In organic fertilizer, the biogas residues separated by solid liquid separator are made into organic fertilizer after subsequent processing, and used in organic farming.
	Technology occupancy	Henan Tianguan Group Co., Ltd. is entitled with proprietary intellectual property rights of this technology.
	Market potential of the technology	With intensification of modern agriculture, Scale and industrialization development, and the increasing number of agricultural products, agricultural production waste emission is increased. The improper use of agricultural waste will not only cause a waste of resources, but also bring the atmosphere, soil and other environmental pollution problems. This project converts renewable biomass waste into biogas and electric power, at the same time produces organic fertilizer beneficial to agriculture, with mature and reliable technology, and broad prospects.
	Technical advancement	With two-phase biomass biogas fermentation technology, the biogas production rate reaches 2m3/m3 volume. Adopting unattended automation control, it is in a leading level at home and abroad.
	Technical maturity	Raw materials are hydrolyzed in hydrolysis tank after removing impurity by grinding, and then fermented. Biogas dedicated equipment is adopted for all equipment, which is reliable and mature and has passed long-term production test. The automatic remote monitoring technology is adopted for the whole system, which can realize the unattended automatic operation, with high reliability.
	Technical applicability	This technology is mainly applied to distributed renewable energy, with certain requirement for number of crop straw; It has corresponding requirements for the straw collecting conditions; Biogas residue and biogas slurry can be returned to farmland and used as organic fertilizer; Electric products can be transmitted into the nearby grid; It is better that there are biogas users near the project field, including industrial and residential users.
	Technical stability	This technology is mature and stable. In addition to certain requirements for the quantity of straw materials, it has no demand for energy, and can run independently; The project has very small water consumption, and can be satisfied by the daily water consumption; Electricity is provided by its own generator; It has no any pollution to the environment, and does not produce any waste water and residue.

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	Technical safety	The technology promotion needs to ensure the stability of the raw materials; Biogas slurry and residue can be returned to farmland; Power and biogas products enjoy certain subsidy and support policy.
	Obstacle in achievement transformation and promotion	Raw material collection is difficult. The biogas slurry returning to farmland needs appropriate propaganda, and the initial operation of the project needs appropriate government subsidies.
	Transfer of intellectual property	It has 5 authorized patents, including 2 patents for invention, with proprietary intellectual property rights. The technology is owned by Henan Tianguan Group Co., Ltd.. This technology enjoys higher localization degree and technology transfer intention.
	Photo caption	

TECHNOLOGY: BIOGAS

COMPANY: **LIUYANG JIAN°ØAN RENEWABLE ENERGY SERVICE CO., LTD**

Liuyang Jian°Øan Renewable Energy Service Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Liuyang Jian'an Renewable Energy Service Co., Ltd.	Submission date	June 27, 2016
	Contact person	Song Changgeng	Technology type	Biomass energy utilization technology
	Tel.	15388043581	E-mail	67643022@qq.com
	Technology name	A process device for pollutants of livestock breeding industry		
	Technology provider	Liuyang Jian'an Renewable Energy Service Co., Ltd.		
	Scope of application	Liuyang Jian'an Renewable Energy Service Co., Ltd.		
	Brief description of technology	Biogas anaerobic reaction tank-biogas storage vault- desulfurization process device - central gas supply-biogas internal combustion engine generator unit-organic fertilizer production from biogas residue - biogas slurry transported to rice field, fruit tree and vegetables. Self-heating catalytic reaction in the biogas digester solves the big problem of no biogas production at low temperature		
	Technical information	2 1000 cubic meter biogas fermentation pools, 1 500 cubic meter biogas storage vault, 180KW biogas generator unit, separator for biogas slurry and biogas residue		
	Business application situation	The large biogas digester with biogas slurry heating automatically started to be built in Liuyang Hongtouling Pig Farm in August 2013 and is currently under normal operation recycles all excrement and urine from the farm, which solves big problem of the direct discharge of sewage, and effectively utilizes the renewable energy.		
	Service conditions	Hongtouling Pig Farm in Liuyang City, Hunan Province Deng Xiaoyu Tel.: 13349606888 Jinpenshan Pig Breeding Farm in Liuyang City, Hunan Province Zhu Huatang Tel.: 13487319795		
	Contact person of business application unit /Tel./E-mail	The device is constructed for the local use with operation personnel trained, which has good effect, environmental protection and safety, and the cost for four personnel carrying out maintenance and operation is about RMB 14,000 per month.		
	Investment on equipment	Four 1000 cubic meter biogas fermentation pool, cost of RMB 720,000 for each Subtotal amount RMB 2,880,000 Two 500 cubic meter biogas storage vaults, cost of RMB 690,000 for each Subtotal amount: RMB 1,380,000		

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		One 180KW biogas generator unit, cost of RMB 520,000, one 150KW biogas generator unit, cost of RMB 490,000 Subtotal amount: RMB 1,010,000 Two sets of heater for biogas fermentation pool, cost of RMB 135,000 for each Subtotal amount: RMB 270,000 Amount in total: RMB 5,540,000
	Expense of operation maintenance	The electricity consumption of the two sets of 20KW dry-wet separator is 28000. Annual cost of electricity consumption is RMB 20,000 Salary for the 3 operators and 1 maintenance personnel is RMB 168,000 Equipment maintenance expense RMB 120,000 per year Depreciation expense RMB 180,000 per year
	Investment payback period	The total investment of two sets of equipment is RMB 5,540,000 Total cost for each year is about RMB 500,000 The total cost for the two sets of equipment should be recovered in four years.
	Other earnings	Annual power generation income of two sets of equipment is RMB 1,800,000 Annual income from biogas residue acquisition by organic fertilizer plant is RMB 500,000 Biogas slurry transportation expense is RMB 200,000 per year Total: RMB 2,500,000
	Technology occupancy	No abnormality appears during the last two and a half years usage. It should be widely promoted to be used in large-scale pig farms from 2020. Environmental pollution can be reduced and it effectively utilizes renewable energy
	Technical advancement	At present, the heater inside biogas digester is rare, but with the use of this device, the gas production can be greatly improved, which solves the problem of no biogas production at low temperature.
	Technical maturity	Biogas anaerobic reaction tank-biogas storage vault- desulfurization process device - central gas supply-biogas internal combustion engine generator unit-organic fertilizer production from biogas residue -biogas slurry transported to rice field, fruit tree and vegetables.
	Technical applicability	The device in use thoroughly solves the environmental pollution caused by urine or excrement direct discharge and makes renewable energy effectively used, the toxins in pig excrement eliminated, and the fertilizer effect improved.
	Technical stability	No abnormality appears after almost three years usage of the device, which runs functionally and stably, and it solves the environmental pollution caused by urine or excrement direct discharge and makes renewable energy effectively used, the toxins in pig excrement eliminated, and the fertilizer effect improved, without having any influence on the environment.

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	Technical safety	The success rate of the device operation through repeated experiments is 100%, and it is with good stability and good safety. It is widely praised by users.
	Obstacle in achievement transformation and promotion	There is no negative impact of the device by putting into use. It promotes and supports national policy, the renewable energy is effectively used, its promotion and application should be as soon as possible, and more technical personnel should be trained.
	Transfer of intellectual property	The State Intellectual Property Office issues a patent certificate (Patent No.: ZL2013204554680) to this disposal device of pollutants in the breeding industry in July 2013, and the owner of the technology has agreed to transfer the technology and to train technical personnel.
	Photo caption	

TECHNOLOGY: SOLAR
COMPANY: **CHINESE ACADEMY OF AGRICULTURAL ENGINEERING**

Chinese Academy of Agricultural Engineering

Renewable Energy Technology Achievement Declaration			
QR code			
Technology provision unit	Chinese Academy of Agricultural Engineering	Submission date	June 28, 2016
Contact person	Zhao Lixin	Technology type	Biomass energy utilization technology
Tel.	13501008372	E-mail	Zhaolixin5092@163.com
Technology name	Key CTP and STP high-efficient anaerobic conversion technology		
Technology provider	Chinese Academy of Agricultural Engineering		
Scope of application	Chinese Academy of Agricultural Engineering		
Brief description of technology	According to the phase separation and the coupling mechanism as well as the lightweight characteristic of cellulosic raw materials, integrated two-phase anaerobic fermentation technology (CTP) achieves the purposes of cycle dynamic inoculation and two-phase coupling. According to the development of two-phase match coordinative mechanism, separated two-phase anaerobic digestion technology (STP) takes advantages of quenching and tempering acidified liquid ingredients at different solid-phase fermentation stages to ensure the stability and continuity of liquid-phase feed ingredients.		
Technical information	CTP technology volumetric gas production rate of 1.0-1.5m^3/m^3, solid-phase reactor feed concentration of STP technology of 15-40%, volumetric gas production rate of 0.8-1.2m^3/m^3. Unlimited volume of fermentation tank.		
Business application situation	Biogas Project of Xuanhua County Wofeng Technology LLC., STP Technology, total capacity of fermentation tank of 1500m^3. Hebei Qing County Straw Biogas Project, CTP Technology, total capacity of fermentation tank of 2000m^3.		
Service conditions	Hebei Gengzhong Biomass Energy Development Co., Ltd. 13931783091 Tianjin Deshengyuan Environmental Engineering Co., Ltd. 022-60751318 Hebei Guorun Modern Agriculture Co., Ltd. 15116942967		
Contact person of business application unit /Tel./E-mail	Market transaction. The project researched and developed mature CTP and STP technologies suitable for straw, excrement of livestock, organic waste and other raw materials for fermentation. Work time is longer than 8,000 hours/year. Systematic training is required in the process of project implementation, including equipment operation, routine operation and maintenance and so on.		

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	Investment on equipment	Take biogas project at the scale of 1,000m^3 as an example, major equipment includes fermentation tank with a total volume of 1,000m^3, screw pump, gas storage cabinet, stirrer, warming and thermal insulation systems, positive and negative pressure protector, desulfurization tower, dehydrator, flame arrestor, biogas flow gauge, generator (or other biogas utilization equipment), boiler, emergency burner, biogas slurry and residue pump, solid-liquid separator, etc. with a total investment on equipment of about RMB 2.6 million, civil construction investment (aggregate pool, fermentation tank foundation, biogas slurry pool, boiler room, generator room, office, workshop, roads and greening, etc.) of about RMB 0.9 million, other investment of about RMB 0.5 million and total investment of about RMB 4 million.
	Expense of operation maintenance	Take biogas project at the scale of 1,000m^3 as an example: Raw material cost: The annual consumption of straw is 1,800 tons, RMB 200 per ton, and the annual cost is RMB 360,000 Labor expense: It is required of about RMB 100,000 for 3 persons with an average annual salary of RMB 33,000; Water fee: 7,300tons water required, RMB 2.5 per ton, and the total cost is of RMB 18,300 Electric charge: 43,600 kilowatt hour per year required, RMB 0.6 per kilowatt hour, and the total cost is of RMB 27,700 Depreciation expense of fixed assets is of RMB 200,000; Maintenance expense of RMB 41,000, sales expense of RMB 25,000, administrative expense of RMB 12,000 , and total maintenance cost is of RMB 78,000
	Investment payback period	Static payback time is 6-8 years
	Other earnings	Compared with similar technologies, the technology can improve more than 20% of gas production, take biogas project at the scale of 1000m^3 as an example, it can increase gas production of more than 200m^3 daily, can increase gas production of more than 70000 m^3 yearly, and calculate according to the price of RMB 1.5 per cubic meter biogas, it can increase income of RMB 105,000, can replace 49.98 tons of standard coal with 98.88 tons of carbon dioxide emissions, and can reduce 1027.1 tons of carbon dioxide emitted by the full combustion of methane, with 1125.98 tons of total carbon dioxide emission reduction.
	Technology occupancy	
	Market potential of the technology	Compared with similar technologies and products, in addition to having a wide adaptability of raw materials, high feed concentration, continuous and balanced gas production, and high conversion efficiency, it can increase 4-6 years of operating life than conventional modes, saving 20% of the investment, saving 30% of land, shortening 50% of construction period, greatly enhancing engineering economy and the level of equipment, and realizing strong market competitiveness and broad application prospects.

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	Technical advancement	Based on the hard degradable characteristic of straw, CTP technology uses ensiling method to carry out preliminary treatment of fiber, then collects the leachate, and separates it from raw materials to realize the separation of methane and acid produced. A sprayer is used to evenly arrange the filtrate in the upper layer of materials, and filtrate permeates gradually from the upper layer to the lower layer by action of gravity, which leads to the coupling of methane and acid produced by diffusion process. Regulate and control filtrate spray volume, intensity and frequency to achieve high efficient matching of two phases of fiber materials with acidification rate increased by 20%, solving the hard anaerobic digestion problem of cellulose. Based on the easy acidification characteristic of high concentration organic waste and excrement, STP technology connects multiple anaerobic reactors in parallel, and enables them to be at different stages by activating them in batches, then collects leachate in the reactor, uniformly mixes and then sprays them to achieve two-phase matching and coordination of high solid materials by mixing leachate at different reaction stages. Meanwhile, spraying makes the reactor environment homogeneity, heat and mass transfer and material inoculation uniform, STP and CTP process gas production rate at 1.25m^3/m^3, which reaches the international advanced level.
	Technical maturity	With the help of market forces and corporate's commercial operation mode and fund guarantee, the Company and leading technology companies in the industry, agricultural technology promotion agencies, etc. build a sound promotion network targeting at the government, promote the popularization and application of technology by using the project proposals, planning and feasibility study preparation, engineering design and other consultancy activities, and conduct wide technology promotion in Beijing, Tianjin, Chongqing, Gansu, Henan, Heilongjiang, Hubei, Xinjiang, Yunnan, Hebei, Inner Mongolia, Zhejiang, Shandong and other 28 provinces (municipalities and autonomous regions); By showing the project results through the demonstration project, the demonstration projects are established in Hebei, Tianjin, Shanxi, Shandong and other places; Present new technologies to farmers, grassroots technology extension workers directly through technical manuals, demonstration projects, conferences, trainings and other forms, with a total of nearly 20000 people trained.
	Technical applicability	Expand the raw material from excrement of livestock to over 20 kinds of organic raw materials such as straw to guarantee stability, wide adaptability of raw materials, which are suitable for comprehensive promotion for biogas projects. For difficult charging/discharging and high energy consumption problems of treating expanding solid raw materials by existing biogas process, it proposes anaerobic split-phase regulation mechanism, develops integrated and separated two-phase anaerobic split-phase regulation and high efficient conversion technology, and solves problems of difficult charging/discharging, low efficiency of gas production, large output of biogas slurry, higher risk of secondary pollution, etc. during the digestion process of solid raw materials, greatly improving the anaerobic gas production rate.
	Technical stability	CTP technology is mainly suitable for the biomass materials with high cellulose content, such as straw, STP technology is suitable for excrement of livestock, straw, organic waste and other mixed raw materials,

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		and the two technologies can keep stable during engineering operation, with low sensitivity to environment, technical parameters and other external disturbance, and strong adaptability.
	Technical safety	After many years of development, CTP technology and STP technology have become mature, they have a complete set of key equipment and systems, and can operate stably in many demonstration projects. Promotion throughout the nation has been carried out, and the practice proves that the two technologies have strong practicability, complete supporting facilities, good market acceptance and are almost without any risk.
	Obstacle in achievement transformation and promotion	Currently, for achievement transformation and promotion of this technology, main promotion obstacles possibly come from policy barrier, guarantee of raw materials (resources restriction) and influence of engineering use and operation personnel quality.
	Transfer of intellectual property	It has multiple domestic independent intellectual properties, specifically including: Authentication of scientific and technical achievement by Ministry of Agriculture: Study on integrated two-phase anaerobic fermentation process technology (NKGJ ZI (2009) No. 034); Authentication of scientific and technical achievement by Ministry of Agriculture: Solid material separated two-phase anaerobic digestion process technology (NKGJ ZI (2011) No. 027) Booster-type automatic straw charging/discharging system ZL201120225975.6 Integrated two-phase anaerobic fermentation device for straw ZL200920175524.9 Two-phase inoculation anaerobic dry fermentation device ZL200820133043.7 Solid-liquid two-phase separated anaerobic digestion device ZL201120001463.1 Split mounting type concrete anaerobic digester ZL201120412745.0 A sealed gas storage device for solid fermentation with spraying ZL201120412742.7 A completely mixed anaerobic filter in series suitable for high concentration raw materials Integrated reactor ZL 201220594106.5 An airtight technology and device for hydraulic compensation type solid fermentation ZL 201220578167.2 A kind of internal heating solid garage anaerobic fermentation device ZL 201320531315.x

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	Photo caption	

Renewable Energy Technology Achievement Declaration			
QR code			
Technology provision unit	Chinese Academy of Agricultural Engineering.	Submission date	July 4, 2016
Contact person	Zhao Lixin	Technology type	Biomass energy utilization technology
Tel.	13501008372	E-mail	Zhaolixin5092@qq.com
Technology name	The application of the technology of continuous biomass pyrolysis carbonization and carbon base fertilizer		
Technology provider:	Chinese Academy of Agricultural Engineering.		

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	Scope of application	Chinese Academy of Agricultural Engineering.
	Brief description of technology	The poly-generation technology of biomass pyrolysis carbonization takes the modern biomass carbonization technology as a core, and produces biochar, biomass gas, wood tar and wood vinegar liquid and a variety of products by separation and purification of the pyrolysis gas-liquid, besides the technology has many advantages including high resources utilization rate, diversified products and less secondary pollution, from which can further improve the comprehensive utilization benefit from the development of biomass resources. The key equipment is the continuous biological carbonization equipment and the system of oil and gas purification separation.
	Technical information	Outline dimension Length; Width; Height) 2000; 2000;8000;Matched power /KW14.25
	Business application situation	Bazhou Hongda biomass carbonization demonstration engineering, in Bazhou City, Hebei Province, with annual processing capacity of 1,000 tons straw
	Service conditions	Hebei Bazhou Hongda Hardware Molding Factory, Shang Shuntang, 13803164511
	Contact person of business application unit /Tel./E-mail	Market trade. In this project, the continuous pyrolysis carbonization technology and equipment characterized by technical maturity are researched and developed, which is suitable for crop straws, and the system training needs to be carried out in the process of project implementation, including equipment operation, daily operation and maintenance.
	Investment on equipment	The main equipment includes the vertical inner-heating carbonization pyrolyzing furnace of RMB 400,000, and the pulverizer costs RMB 50,000, and other ancillary equipment cost RMB 100,000. The equipment covers an area of about 300 square meters, 300 square meters for raw materials storage site.
	Expense of operation and maintenance	Take the engineering with annual processing capacity of 1,000 tons straw as an example: Raw materials cost: The annual consumption of 1,000 tons straw, with RMB 200 per ton and the annual demand of RMB 200,000; Labor cost: It is required of about RMB 100,000 for 3 persons with an average annual salary of RMB 33,000; Including equipment depreciation charges, fuel power costs, the production cost of one-ton biomass carbon is about RMB 800.
	Investment payback period	Static investment payback period is 7-9 years
	Other earnings	Comparing to other similar technologies, this technology has a continuity for production; Continuous pyrolysis in segment can produce continuously, to make the products stable.
	Technology occupancy	
	Market potential of technology	With the advantages of high resource utilization ratio, product variety, less secondary pollution etc., the technology can further improve the development utilization and comprehensive benefit of the biomass

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		resources, coincide with the strategy of the crop straw resource sutilization, with good prospect of popularization and application.
	Technology advancement	On the base of the technology of inner-heating straw segment continuous pyrolysis carbonization, breaking through the key technologies of material force variable compaction, material ordered disturbance, gas recycling, high efficiency heat exchanging and other straw pyrolysis carbonization, developing the feeding mechanism combining with active compaction and air shut-off , cross distributed biochar agitation mechanism and gas recycling heating system etc., developing vertically flow inner-heating continuously straw carbonizing equipment, to provide the support equipment for the suitable clean and efficient cogeneration engineering of large-scale straw carbon gas in the natural villages
	Technical maturity	Mature technology, stable and reliable operation.
	Technology applicability	The raw material adaptability of continuous straw pyrolysis carbonization cogeneration system is strong, by using crop straws, corn cobs, peanut shells and various biomass briquettes fuel to produce biochar, with broadly market prospect.
	Technical stability	The technology of continuous straw pyrolysis carbonization divides the entire production process into the preparation of materials, materials drying, oxidation and pyrolysis, insulated carbonization and gas recycling etc., with the advantages of continuous production, stable product and low-energy consumption.
	Technical safety	Practice has proved that the technology is rarely risky with high practicality, perfect supporting facilities, good market acceptance.
	Obstacle in achievements transformation and promotion	At present, the main obstacles to transform and promote the achievements of technology are the guarantee of raw materials (the high cost of purchasing and storage) and biochar promotion and application.
	Transfer of intellectual property	The following contents are relevant patents involved by the technology, which intellectual property rights belonging to Chinese Academy of Agricultural Engineering. 1. The processing method of biomass solid briquettes fuel, as a patent for invention, ZL200910136263.4 2. The inner-heating continuous biochar complete equipment, as a patent for invention, ZL201210516644 3. A kind of active compaction device for biomass carbonization equipment, as a new practical patent, ZL201220682395.4 4. A kind of inner-heating continuous biomass carbonization equipment drying drum, as a new practical patent, L201320245403.3 5. A kind of continuous biomass carbonization equipment perturbator, as a new patent, ZL201220682391.6

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		6. A kind of inner-heating continuous biomass carbonization equipment furnace body, as a new patent, ZL201320245424.5 7. Ring die molding machine for biomass solid fuel, as a new patent, ZL200920153756.4
	Photo captions	

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: **ANHUI XI YANG YANG NEW ENERGY TECHNOLOGY CO., LTD**

Anhui Xi Yang Yang New Energy Technology Co., Ltd	**可再生能源技术成果申报** **Technical achievement declaration of renewable energy**			
	二维码 **two-dimensional barcodes**			
	技术提供单位 **Technology Provider**	**安徽喜阳阳新能源科技有限公司** Anhui Xi Yang Yang New Energy Technology Co., Ltd.	**提交日期** Submission Date	26 July 2016
	联系人 **Contacts**	陈攀 Pan Chen	**技术类型** Technology Type	**生物质能利用技术** Utilization technology of biomass energy
	电话 **Telephone**	15256077876	邮箱 E-mail	xyyxny@sina.com
	技术名称 **Technical name**	**生物质气化燃烧炉在谷物干燥机中的应用** Application of biomass gasification combustion stove in grain dryer		
	技术提供方 **Technology Provider**	**安徽喜阳阳新能源科技有限公司** Anhui Xi Yang Yang New Energy Technology Co., Ltd.		
	适用范围 **Scope of application**	**安徽喜阳阳新能源科技有限公司** Anhui Xi Yang Yang New Energy Technology Co., Ltd.		
	技术简要说明 **Technical brief description**	**原理**：**利用高温**热解气化实现生物质的高效、清洁燃烧，为谷物干燥提供烘干热源。 **特点**：优化气化炉结构，强化放热传热，实现生物质的高温高效气化，提高气化效率和燃气热值，降低焦油，提高干燥效率，污染气体0**排放**。		

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: **ANHUI XI YANG YANG NEW ENERGY TECHNOLOGY CO., LTD**

		关键设备：生物质气化燃烧炉、谷物干燥机 Principle: Efficient and clean combustion of biomass by high temperature pyrolysis and gasification, which provides the drying heat source for grain dryer. Trait: Optimizing the structure of gasifier, intensifying heat transfer, achieving the high temperature and efficient gasification of biomass, improving gasification efficiency and calorific value of gas,reducing tar, Improving drying efficiency, No polluting gas emissions. Key equipment: biomass gasification combustion furnace, grain dryer
	技术信息 **Technical information**	产气率80%，碳转化率近100%、燃气焦油低于10 mg/N m； Gas production rate of 80%,The carbon conversion rate is close to 100%, Gas tar less than 10 mg/N m 气化炉体积（mm）：3000*1500*2250 Volume of gasifier: 3000*1500*2250
	商业应用情况 **Commercial application**	宣城市大冲米厂：45万大卡气化炉两台，谷物干燥机6台。 Xuancheng city Dachong rice mill: Two 450 thousand calories gasifier, Six grain dryers 桐城市龙友种植专业合作社：45万大卡气化炉两台，谷物干燥机6台。 Tongcheng city Longyou Planting professional cooperatives: Two 450 thousand calories gasifier, Six grain dryers
	商业应用单位联系人/电话/邮箱 **Commercial application unit contact/telephone/E-mail**	（1） 安徽省宣城市大冲米厂： 姓名：钟志强；电话：13856312807 Anhui Xuancheng city Dachong rice mill: Name: Zhiqiang Zhong; Telephone: 13856312807 （2） 桐城市龙友种植专业合作社：姓名：吴向连；电话：18909663421 Tongcheng city Longyou Planting professional cooperatives: Name: Xianglian Wu Telephone: 18909663421
	使用条件 **Use conditions**	市场交易，无需设备投建； Market transaction, No equipment required 成熟技术； Mature technology

		在实施中需系统培训，安装成本低（人员工资及差旅费用）。使用成本为每公斤谷物6分钱人民币。基本上处于无维修状态。维护成本每年约为总投资的1%（每套投资约为4万美元）。 System training is needed in the implementation, low cost(Staff salaries and travel expenses). The cost is 6 cents per kilogram of grain. Basic don't need maintenance. Maintenance costs are about 1% of the total investment per year(approximately $40 thousand per set).
	设备投资 **Equipment investment**	采用环保型生物质气化炉和谷物干燥机一套联合设备，按年干燥3000吨谷物计算，购置设备费用约为7万美元，其厂房置办费约为1万美元，附属设备如清杂设备、提升设备等约为1万美元，其一次性投入约为9万美元（这是按照1台20吨干燥机和一台环保型生物质气化炉作为一套计算）。次投入费用不包含出口产品时国外出口费用。 Combined equipment of environmental protection biomass gasifier and grain dryer, drying 3000 tons of grain per year, Purchase of equipment is about $70 thousand, rent a factory cost about $10 thousand, ancillary equipment such as miscellaneous equipment, lifting equipment cost about $10 thousand, One-time investment cost about $90 thousand. Foreign export costs is not included in the export product.
	运行维护费用 **Operating and maintenance costs**	设备在运行过程中，一般单位产品耗费的原材料、水、电、人工设备折旧、管理费用等根据规格的不同分别如下： （1）15吨干燥谷物机（单位：美元）：原材料88；电费11；人工费：68；设备折旧费0.27；管理费用0.14；合计：167.41； （2）20吨干燥谷物机（单位：美元）：原材料128；电费11；人工费：68；设备折旧费0.3；管理费用0.15；合计：207.45； （3）30吨干燥谷物机（单位：美元）：原材料193；电费22；人工费：68；设备折旧费0.48；管理费用0.24；合计：283.72；

		（4）60吨干燥谷物机（单位：美元）：原材料352；电费36；人工费：68；设备折旧费0.86；管理费用0.43；合计：457.11； 以上计算是按照生物质颗粒1.2元/KG,电费按1KW价格1元，人工费按每人150元，共计三人，设备折旧费按设备投资的3%，管理费按设备投资的1.5%，人民币对美元的汇率为1：6.7为参考值。 During the equipment operation, according to the different specifications,unit product cost of raw materials, water, electricity, equipment depreciation, management costs, which are follows: (1) 15 ton grain dryer(Unit : dollar): raw materials 88; electricity 11; labor cost 68; equipment depreciation 0.27; management costs 0.14; Total: 167.41; (2) 20 ton grain dryer(Unit : dollar): raw materials 128; electricity 11; labor cost 68; equipment depreciation 0.3; management costs 0.15; Total: 207.45; (3) 30 ton grain dryer(Unit : dollar): raw materials 193; electricity 22; labor cost 68; equipment depreciation 0.48; management costs 0.24; Total: 283.72; (4) 60 ton grain dryer(Unit : dollar): raw materials 352; electricity 36; labor cost 68; equipment depreciation 0.86; management costs 0.43; Total: 457.11; The above calculation is in accordance with the biomass 1.2 yuan / kg, electricity 1 yuan /kW, labor costs 150 yuan per person, a total of three people, equipment depreciation according to 3% of investment in equipment, management costs according to 1.5% of investment in equipment, the exchange rate of RMB against the U.S. dollar is 1:6.7.
	投资回收期 **Payback period**	若用户购置一套20吨的干燥机和1台环保型生物质气化炉，其总投资为9万美元，则在生产使用过程中每干燥一吨谷物则需用去10.37美元。那么按国内谷物收购和售出比价计算如下： 以水稻为例：当水稻在25%水分时，一般收购价为0.80元/斤，干燥后售价为1.16元/斤，其差价约为0.36元/斤，则干燥前20吨（即20000公斤=40000斤）*0.8元/斤=32000元 干燥后：35200斤*1.16元/斤=40832元 收入为：40832-32000-1389.92=7442.08元，约合1110.75美元

		所以：90000美元/1110.75美元=81次，再乘以20吨得出1620吨 按照以上理论计算，若谷物含水量从25%降到15%时，每天干燥20吨谷物则在81天既可收回设备投资。 If the user to purchase a set of 20 tons of dryer and a environmental protection biomass gasifier, which total investment is $90 thousand, Drying a ton of grain requires 10.37 dollars in the process of production. According to the domestic grain purchase and sale price , calculation is as follows: Taking rice as an example: When the water content of rice is 25%, purchasing price is 0.8 yuan/Jin, when it is drying, sale price is 1.16 yuan /Jin, The difference is 0.36 yuan/Jin. Before drying: 20 ton(20000 kilograms = 40000 Jin)*0.8 yuan/Jin=32000 yuan After drying: 35200 Jin*1.16 yuan/Jin =40832 yuan Income: 40832-32000-1389.92=7442.08 yuan about $ 1110.75 So: $ 90000/$ 1110.75=81; 81*20 ton=1620 ton. Recovery of equipment investment needs 81 days.
	其它收益 **Other proceeds**	环保型生物质炉和谷物干燥机技术结合后， （1） 除去生物质燃料后，其固体残余物可作保温材料增加收入； （2） 由于CO等污染气体零排放，确保了环境的清洁无污染，节省了购置环保过滤设备的费用。 After the combination of the environmental protection biomass stoves and the grain dryer, (1) After removal of biomass fuel, the residual solid can be used as thermal insulation materials to increase revenue (2) Because CO and other polluting gas zero emissions, to ensure that the environment is clean, saving the cost of the environmental protection filter equipment.
	技术占有率 **Technology share**	2015年该项技术和产品处于市场初入阶段，但由于当前市场上谷物干燥热源主要的提供燃料为煤炭、燃油以及无法进行清洁高效燃烧的各种固体废弃物，存在要么污染大，要么燃烧值低等种种问题，当前我国处于能源和产业升级转型期，未来生物质气化燃烧炉必将因其高效清洁的燃烧性能在市场上占据绝对优势份额。 The technology and products is in the early stage of the market in 2015. However, the main heating supply source of grain dryer is coal,fuel, and the residual solid in the current market,

		There is either a big pollution, or low combustion value of all kinds of problems. At present, China is in the transition period of energy and industrial upgrading, the future of biomass gasifier is bound to occupy an absolute advantage in the market due to its high efficiency and clean combustion performance.
	技术市场潜力 **Technology market potential**	**我国粮食作物**产量已经十二年连增，2015**年全年粮食**产量超过1.2**万**亿斤，但全国实际粮食机械化烘干总量约占当年全国粮食总产量的10.13%。**而美国、日本的粮食机械化烘干率均在**95%**以上，我国粮食烘干加工**产业的差距还相当大，仍有相当大的发展空间。而目前国内烘干机设备生产企业达150**余家，市**场销售额超过30亿元，年销售规模近15000**台，年均增幅达**18.9%；**且烘干机的保有量也达到**10**万台。我公司生**产的节能环保型热风炉作为烘干机必备的配套热能设备，具有与目前市场上的常规供热设备不具备的高效、清洁、环保等技术特性，市场前景巨大；以平均3**台烘干机配套一台**热风炉计算，粗略计算每年伴随新增销售的烘干机的热风炉需求量就在5000-6000**台；而目前市**场上已保有的10**万台烘干机**对原热风炉的更换将带来热风炉需求30000**到**40000**台。** Grain crops production has been increased for twelve years in our country. The grain output is more than 1.2 trillion Jin in 2015, but the actual grain drying of the country accounts for about 10.13% of the total grain output. But the United States, Japan, which the grain drying rates are more than 95%, there is still considerable room for development in grain drying processing industry. At present, the domestic drying machine equipment provider is more than 150, the market sales is more than 3 billion yuan, the annual sales is nearly 15000 units, Average annual increase of 18.9%; And the amount of drying machine also reached 100 thousand units. Energy saving and environmental protection hot-blast stove in our company is the necessary equipment for drying machine, with efficient, clean ,environmental protection and other technology characteristics, that has a huge market prospects. The calculation of a hot-blast stove with 3 sets of drying machines, so with the new sales of the drying machine, the demand for hot-blast stove in 5000-6000 every year. And the market has maintained 100 thousand drying machine for the replacement of the original hot-blast stove will bring 30000 to 40000 units of hot-blast stove at present.

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	技术先进性 **Advanced technology**	**本次基数申**报中：谷物干燥机采用六粮道横流式干燥方式，其热源利用环保型生物质炉，其原理的创新如下： （1）**利用超**焓气体燃烧理论，供炉内能达到大于900℃，**利用高温充分裂解焦油，在有效提高生物**质气化效率的同时，降低焦油的产出。 （2）设备具有导热性能的燃气导热流管，可将炉内氧化后的热量导至热解区域，可有效防止氧化区域温度过高，生成氮氧化合物，另一方面可提高热解后的反应强度，避免焦油生成，经安徽省科技情报研究所查新表明，以上创新在国内相关文献及产品中是尚未出现的。 In the declaration of the base: the grain dryer adopt six route for providing foodstuff cross-flow drying methods and the heat source use environmental protection biomass stove, the principle of innovation are as follows: (1) Using the excess enthalpy gas combustion theory, the furnace can reach more than 900℃, and the pyrolysis tar is fully cracked at high temperature, which can effectively improve the efficiency of biomass gasification and reduce the production of tar. (2) The device has a gas thermal flow pipe with heat-conducting property. It can lead to the heat of oxidation in the furnace to the pyrolysis area, which can effectively prevent the oxidation temperature is too high and to prevent the nitrogen oxides generated. On the other hand, it can improve the strength of the reaction after pyrolysis and avoid the formation of tar. By the Anhui provincial science and Technology Information Research Institute survey shows that the above innovation in the domestic literature and products are not yet appeared.
	技术成熟度 **Technology maturity**	环保型生物质气化炉已通过生物质特征及气化特征的实验室试验，在试验过程中主要是寻找焦油裂解段气化室来实现清洁高效气体的实现条件，通过实验室试验的结论进行优化设计，投入生产制作。 **目前已通**过批式制作试验和检测，各项性能指标均达到或超过NY/T1417-2007《**秸秆气化炉**质量评价技术规范》所规定的数值。

		生物质气化燃烧炉主要由：炉体、进料器、焦油裂解段、气化室、排渣装置等组成 **其核心装**备生产工艺流程如下：炉体加工、零部件加工、管材加工、标准件加工-质量检查-**管**线连接、电气安装-**整机装配**-**清**洁涂装-检测-**包装**。 Environmental protection biomass gasifier has been characterized by biomass and gasification characteristics of laboratory tests. In the course of this experiment, it is mainly to find the tar cracking section of the gasification chamber to achieve the clean and efficient gas conditions, through the laboratory experiment to optimize the design and then put it into production. Has passed batch production test and detection, the performance indicators have reached or exceeded the specified value provisions by NY/T1417-2007 "Technical Specification of Quality Evaluation for Straw Gasification Furnace " . Biomass gasifier mainly comprises by furnace body, feeder, tar cracking section, the gasification chamber, discharging device etc. The core equipment manufacturing process is as follows: furnace body processing, parts processing, pipe processing, standard parts processing - quality inspection - pipeline connection, electrical installation - machine assembly - cleaning coating - testing - packaging.
	技术适用性 **Technical applicability**	**目前生物**质气化燃烧炉的试用范围除与谷物干燥机结合作为热能外，还可作为蔬菜大棚保暖工程、农村地区家庭采暖炊事、城镇餐饮、城镇锅炉等的能源供给装置。 **其生**产工艺不受地域、环境等限制，在广大农业地区均可广泛使用，热能输出功率等可根据不同地域的气候和环境条件进行微调。 The biomass gasifier trial range n in combination with grain dryer as heat, but also as a vegetable greenhouse thermal engineering, rural area household heating and cooking, urban catering, urban boiler energy supply device. Its production process is not restricted by region, environment and so on. It can be widely used in agricultural areas, and the output power of heat energy can be adjusted according to the climate and environment conditions in different regions.

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	技术稳定性 **Technical stability**	该技术在工程运行中非常稳定，对于环境等其他外界因素具有强抗干扰性，可根据项目推广地区的实际情况，如气候等，对设备进行运行前的微调，使其适应所在地域的特殊环境，保持各项运行指标不变。 The techniques are very stable in the operation of the project. It has strong anti-jamming for the environment and other external factors. And according to the actual situation for the promotion of the project area, such as climate, the equipment has fine-tuning befor running.In this way, it can adapt to the special environment of the region, and keep the running index unchanged.
	技术安全性 **Technology security**	**就以生物**质气化燃烧炉作为谷物干燥机的热源配套设备此一用途来看，其市场实用性，接受度，相关配套均已成熟；因为谷物干燥机作为目前农业机械化设备的重要一环，经过数年的发展，本身技术和市场运行已经相当成熟，而生物质气化燃烧炉作为其热源设备，仅对目前市场上其他以化石能源或秸秆直燃来产热的谷物干燥机配套设备进行技术替换和升级，对热输出功率和燃烧排放指标进行优化，并没有改变谷物机械干燥本身的原理和市场运作模式，因此技术安全性高。 As biomass gasifier as heat source equipment of grain dryer, the market availability, acceptance, related have been mature; because the grain dryer is an important part at the agricultural mechanization equipment, after several years of development, technology and operation of the market is already quite mature, and biomass gasifier as its heat source equipment, in order to optimize the heat output power and combustion emissions by replacing and upgrading the other equipment of the grain dryer which is produced by the direct combustion of fossil fuels or straw. does not change the grain dryer principle and the operation mode of market, therefore, it has high technology security
	成果转化推广障碍 **Obstacles to the promotion of**	**政策**：**在15年之前的十二五期**间，国家对于生物质综合利用，秸秆综合利用等领域提出了非常多的扶持政策，2016**年作**为国家十三五规划首年，希望给予更多的具有针对性的定向扶持；

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	achievements transformation	资本：作为环保产业，新兴技术要占领市场除了政策扶持和本身技术过硬外，还需要国家和资本市场给予更多的资本倾斜，使新技术在开发前期有足够的资本进行运作和推广； **人才培养**：**希望能有更多机会与相关科研院所以及高校**热能和机械专业广泛接触，引入高科技专业人才。 Policy: During the 12th Five Year Plan, the comprehensive utilization of biomass, straw comprehensive utilization and other areas have been put forward a lot of support policies in our country, The national plan for 13th Five-Year began in 2016, I hope give more targeted support; Capital: As the environmental protection industry, emerging technology to occupy the market not only in addition to policy support and excellent technology, but also need to countries and capital market give more capital tilt, that make the new technology in the development of early enough capital for the operation and promotion; Personnel training: I hope to have more opportunities to make extensive contact with related research institutes and the heat and mechanical professional of universities, I can know more high-tech professionals.
	知识产权转让 **Transfer of intellectual property rights**	**本**项技术具有自主知识产权，已经取得多项相关发明和实**用新型**专利； **技**术拥有方和专利权方均为安徽喜阳阳新能源科技有限公司，性质为企业； **目前**该项技术及相关产品均由技术拥有方安徽喜阳阳新能源科技有限公司自行开发，未对第三方进行授权或转让。 This technology has proprietary intellectual property rights. And it has made a number of related inventions and patent for utility models; The owner of the technology and the patent right shall be the Xi Yang Yang in Anhui new energy technology co., LTD, the nature of the enterprise; At present, the technology and related products are developed by the owner of Xi Yang Yang in Anhui new energy technology co., LTD, not on the third party to authorize or transfer.

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Beijing Shenwu Environment & Energy Technology Corp	**Achievement Declaration for Renewable Resources Technology**			
	Two-dimensional/QR code			
	Company providing the technology	Beijing Shenwu Environment & Energy Technology Corp	Date of submission	2016-7-29
	Contact person	Ms. Zhang Nannan	Type of technology	Biomass energy utilization technology
	Telephone no.	15201560622	Email	zhangnannan@shenwu.com.cn
	Description of technology	No heat carrier regenerative rotating bed biomass pyrolysis new technology		
	Company providing the technology	Beijing Shenwu Environment & Energy Technology Corp		
	Application scope	Beijing Shenwu Environment & Energy Technology Corp		
	Technology brief description	This technology adopts no heat carrier regenerative radiant tube rotating bed pyrolysis device, which is Shenwu's independent intellectual property right, to pyrolyze the biomass under anaerobic condition so that the biomass can be effectively converted to biochar, bio-oil which is easy to store and with high energy density and combustible gas. During process there is no inhalable particle including smoke & dust and PM2.5 etc to be generated and no pollution which achieves successfully bio-oil & bio-gas (electricity) & biochar combined production and with flexible single furnace handling capacity.		
	Technical information	Temperature range 0-1000℃; Furnace chamber pressure range & plusmn: 2000Pa; The CV of the fuel of regenerative radiant tube for heating & ge; 700kcal/m3.; The diameter of equipment is ranged from 11m to 65m.		
	Commercial application situation	200t/d organic solid waste comprehensive pyrolysis treatment project which is located in Bazhou, Hebei province. This project is to carry out resource recovery treatment for organic solid waste and with area of 50 mu. In the first stage the pyrolysis gas can be sold and in the second stage the electricity can be sold. The diameter of pyrolysis equipment is 26m.		
	Contact person/tel/email of commercial reference plant	Hebei Bazhou Changlong New Energy Co.,Ltd Zhanghongda 13752515046 zhhongda@126.com		
	Application condition	Available with market dealing and establishment locally; The technology is mature; Before application of this technology, the system training is necessary. Module installation and maintenance can be realized for pyrolysis device with low maintenance cost.		
	Equipment investment	Taking 500t/d straw biomass pyrolysis project as example, the equipment investment is 134,220,000 Yuan, including two sections. The first section is involved with main equipment investment of 98,880,000 Yuan, comprising of straw pre-treatment unit of 1,161,000 Yuan, pyrolysis unit of 3,340,000 Yuan, oil & gas separation& purification unit of 15,370,000 Yuan		

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		and power generation of 38,500,000 Yuan. The second section is involved with auxiliary equipment investment of 35,340,000 Yuan, comprising of plant common pipe network of 1,596,000 Yuan, air compressed nitrogen station of 6,069,000 Yuan, circulation water plant of 2,723,000 Yuan, sewage treatment station of 2,562,000 Yuan, fire protection of 1,260,000 Yuan, telecommunication of 8,211,000 Yuan, heat exchanging station and plant heating supply of 1,064,000 Yuan, plant pipe gallery of 1,050,000 Yuan, manufacturing management and administration office of 3,836,000 Yuan, analysis & testing of 5,117,000 Yuan.
	Operation & maintenance cost	Taking 500t/d straw biomass pyrolysis project as example, when the system is under normal operation, the operation cost per ton using the technology includes water cost of 5.97 Yuan, waste water treatment of 1.47 Yuan, electricity consumption of 58.66 Yuan, chemical reagent cost of 3.29 Yuan, salary & welfare cost of 24.41 Yuan, maintenance cost of 23.53 Yuan, straw raw material cost of 300 Yuan and depreciation cost of 104.6 Yuan.
	Payback period	The larger the capacity is, the shorter the project payback period is. Under the same process condition, for the project with treatment capacity of 200-400t/d, the payback period is ranged from 3 to 6 years. For the project with treatment of 600-1000t/d, the payback period is ranged from 2 to 4 years.
	Other income	The technology can generate the power and byproducts with high economic added value including biochar, wood vinegar liquid and bio-oil. These by-products can produce profit. The market price of biochar is ranged from 1000 to 3000Yuan/ton, the price of wood vinegar liquid is ranged from 300 to 500 Yuan/ton and the price of bio-oil is ranged from 1000 to 1500 Yuan/ton.
	Technology share ratio	Most of researches in biomass pyrolysis technology is under pilot testing phase in China, while, the technology using no heat carrier regenerative radiant tube rotating bed pyrolysis device can pyrolize the biomass under anoxic condition and realize industrialization promotion which is exclusively owned by Shenwu Group.
	Technology market potential	The total annual output of various crop straw came to 0.6 billion tones in China, however, the utilization ratio only came to 33% and most of the same is not be treated. According to the estimate from the national energy office, annual utilization amount of agricultural and forestry residues came to 75,000,000 tones and annual utilization amount of various energy crop came to 25,000,000 tones, which can replace fossil energy equivalent of 50,000,000 tones standard coal per year. & ldquo; The 12th Five-Year Plan &rdquo stated that the installed capacity of power generation of biomass energy will reach 13,000,000kwa in the future 5 years and the market potential of this technology is huge.

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		Compared with biomass incineration power generation project, the payback period of this technology is shorter. Meanwhile, using this technology there is byproducts including biochar, bio-oil and wood vinegar liquid etc to get high profit. According to the 13th Five-year Plan, the state encourages green circulation agriculture, and request to increase the agriculture soil organic matter by 0.8% and reduce the pesticide usage; meanwhile, soil ten policy says more than 97% of contaminated farmland soil should be recovered and utilized by 2020, which brings opportunity and market for biomass pyrolysis projects with two aspects of advantages. One is that the biochar can improve and recover soil and two is that the wood vinegar liquid can replace some of pesticide as nature insecticide and antiseptic. This technology can realize high efficiency resource utilization. At present, this technology has been strongly promoted and demonstrated in organic solid waste area. The reference plant located in Bahou has been putting into continuous production nearly 8000 hours with well operation condition. 300t/d waste pyrolysis treatment project located in Yangling, Shanxi province has been started in 2016. As execution of various projects, the commercial industry application of this technology has been mature.
	Progressiveness of technology	The retorting device adopted for this technology is non-heat carrier regenerative rotary bed biomass retorting device and passed technical elevaluation organized by NEA (National Energy Administration) in 2012, the conclusion is international advanced level. In this technology, the regenerative radiant tube heating technology is applied, it can use low calorific fuel gas, fuel gas with calorific value 700Kcal/m3 will be sufficient. The appilicability of raw material is wide for this technology. The product (oil & gas quaity) is good and calorific value is high. The treatment capacity is flexible, from 50 to 1500t/d is feasible.
	Maturity of technology	The non-heat carrier regenerative rotary bed biomass retorting new technology of Beijing Shenwu Group, the system is mainly consist of biomass pretreatment system, retorting system, oil & gas seperation system, power generation system, wewage treatment system etc, which can covert the biomass into charcoal, biomass gas, biomass tar and pyroligneous four kinds of products in one production line, the utilization through biomass retorting is high. The aplication of this technology has achieved significant result. As a global first and international leading technology, this patent technology has been highly recognized by Beijing Municipal Science & Technology Commission. At present, a 200 t/d organic solid waste retorting resoucelization demonstration project has been built in Shengfang Town, Bazhou city, Hebei Provice (Bazhou Changlong New Energy Co., Ltd), which has been continuously operated for 8000 hours in good running condition, besides, as a Beijing-

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		Tianjin-Hebei callaborative innovation major science & technoology demonstration project, it has been accepted by Beijing Municipal Science & Technology Commission, this technology is advanced and stable. All the equipments of this technology are domestically made and supplied, among which, rotary bed technology, regenerative (radiant tube) high efficnency combustion technology ect are proprietary technologies developed by Beijing Shenwu Group, which has been applied in mutiple industrial devices in domestic and abroad, both the technology and equipments are mature and reliable. The biomass pretreatment equipment in this technology has went through years of development & industrial practice of domestic production industry and has becoming mature and without risk. The power generation unit of this project such as boiler, steam turbine, electric generator etc the main equioments all belong to regular, mature and systematic euqipments.
	Applicability of technology	This Technology can be applied into organic riched all kinds of organic wastes in agriculture and forestry, breeding industry. The biomass matreials souces is wide but scattered, the key issues lies how to collect the argriculture and forestry waste such as straw in farmers' land etc. Threrefore, the biomass retorting treatment project shall be built in the area with abundant biomass resources which is also easy for colletion.
	Technical stablility	With the biomass retorting technology developed by Beijing Shenwu Group, the company has built 24t/d pilot test facility which realized multiple continuous and stable operation, the technology is mature. At present, a 200t/day organic solid waste pyrolysis resource recycling demostration project(Bazhou Changlong New Energy Co.,Ltd) was bulit in Shengfang town, Bazhou, Hebei Porvice, it has been continuously operated around 8000 hours in good condition. All the equipments of this project are locally supplied, among which, rotary bed technology, regenerative (radiant tube) high efficiency combustion technology etc are proprietary technology developed by Shenwu Group and have been applied into several industrial devices in domestci and overseas. Both the technology and equipments are mature and reliable, the technical requirement is not subject to the influence of other factor. The the raw materials of this project, i.e. biomass has a seasonal change, thus most of the agricultural biomass are owned by farmers and may have a price fluctuation problem, however, the influnence of which can be under control by proper raw material stock and purchasing.
	Technolgy safety	(1) Technology practicability The total annual production of various crop straw in China is around 600million tons, but the utlization rate is only 33%, most of which have never been processed, therefore this technology has an huge potential. Compared with other biomass treament technology, this

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: **BEIJING SHENWU ENVIRONMENT & ENERGY TECHNOLOGY CORP**

		technology can not only convert the biomass into energy to generate electricity but also turned into resources to ultilize as by-product such charcoal, bio-oil as well as pyroligneous which may bring higher earnings, so this technology is more practical. (2) Auxliary facility condition Beijing Shenwu Group's non-heat carrier regenerative rotary bed biomass retorting new technology can be used to bulit complete set of devices in different scales, pyrolysis oil and gas can be digested inside the project and product can be converted into electricity. According to the related national policy, the electricity can be connected with electrical power grid and obtaine proce subsidy, power network should be safe. Charcoal as fertilizer, is a type of technology strongly promoted by the country. Pyroligneous has been used as bactericide and pesticide in agriculture, thoese by-product has been accepted by market, it enables the project to realize commercial operation. Besides, the axulilairy public utilities only need basic condtion required by common construction project. (3) Acceptability by public society The project adopt domestic advanced biomass treatment technology and cause less environmental polution. In particular, it can avoid the problem of inhalable particle such as smoke dust and PM2.5 etc produced by conventional incineration method and contribute to neighbouring residents' health and social harmony, so it is more commonly accepted by the bublic.
	Obstacles in achievement transformation & promotion	During the process of technological achievements transformation and promotion, as a mature technology, the country has supportive national policy and also the capital market has given strong support. However, the main obstacle comes from biomass raw materials's garthering, due to most of the biomass materials is scattered, seasonal and mainly owned by farmers, there are certain risks and difficulty to collect timely as needed.
	Assignment of interllectual property	This technology has domestic independent interllectual property rights, it has applied for 27 patents, obtained 16 authorized patents, among which, thre are 2 inventive patent, equipment localization are 100%.
	Illustration	Pcitures

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: **CHANGZHOU ZHENGYI**

Changzhou Zhengyi	**Market potential of technology**	**The biomass particle burner and its matching products (boiler) will be a kind of updated products replacing primary energy resource in the future, and with the exhaustion of primary energy resource, a considerable portion of civilian energy will be biomass energy. Today's solar energy will replace the solar energy of yesterday. It is estimated that the primary energy resource products used in China and sold every year (mainly coal) is about 10 million sets, and annual market demand is over a million sets (in recent years, sales volume in coal-boiler market is over 2 million sets every year). Now, annual market demand of biomass particle fuel boiler could be more than ten thousand sets; With the maturity of products and matching of fuel production, annual demands will also continuously increase. The original air heating furnace market is huge, mainly taking coal, firewood, natural gas and electricity as energy to process tea and grain, and coal and firewood cannot control the temperature; The cost of natural gas and electricity is higher, with potential safety hazard, and electricity utilization is restricted by power grid; Biomass energy is a kind of green clean energy, taking forestry and agricultural residues as raw materials, both environmentally friendly and renewable. It has wide sources, with the title of green coal. The air heating furnace taking biomass particle as fuel is not common. Though biomass particle fuel has been brought to the forefront, it is still a new project, with broad market.**
	Technical advancement	The biomass particle air heating furnace possesses domestic advanced level of originality. The social benefit of popularization and application of biomass energy is obvious. 1. Adjust industrial structure to develop manufacturing industry of fuel moulding equipment, fuel processing industry and manufacturing industry of combustion equipment to increase the employment; 2. Relieve the shortage of coal, oil, gas, electricity and other energy resources supply, expand the use of renewable energy resources, save primary energy resources. 3. Reduce discharge of CO_2 to reduce pollution to the air. Currently, in domestic market, there is the similar boiler but in small quantity.
	Technical maturity	The comparative advantage of technical characteristic of the product is: (1) High combustion efficiency and thermal efficiency: The product combustion efficiency of the competitor is about 80%, thermal efficiency about 80%. The product combustion efficiency of this project is about 90%. Boiler efficiency (service efficiency) about 80%, the overall energy efficiency is higher than the competitor's (2) Dust content in flue gas: The product adopts efficient numerical control combustion technology and underfeed type clean combustion technology, which save fuels and reduce pollution to the air, and the concentration of sulfur dioxide is <3mg/Nm; (Industrial standard is 1,200mg/Nm), the dust concentration is 2mg/m; (Industrial standard is 10mg/m). Namely, environmental protection index is better than the competitor's. (3) Combustion stability is better than the competitor's.

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	Technical applicability	The use of biomass particle air heating furnace is very wide, used to replace traditional fire coal and electric heating furnace, used to dry, supply heat, etc.. Main industries involved are: • Industrial aspect. Heat supply for grain drying, greenhouse, fruitwood and floriculture greenhouse, modern rooms for raising chickens or pigs and other facility agriculture. • Industrial aspect. Heat supply for plant, spraying plastics to the surface of metal products, baking finish, electroplating drying, drying of other materials, etc.. • Forestry aspect. Drying of tea, medicinal materials, timber, wood flour, etc.. Livelihood aspect. Warm air heating, clothes drying, etc.. It is qualified approved by Jiangsu Test and Evaluation Station of Agricultural Machinery.
	Technical stability	Use stably, safely and reliably, with low failure rate.
	Technical safety	For electric appliance, use small capacity control power supply, without pressure or dust, and specify specific sites for combustion.
	Obstacle in achievement transformation and promotion	New energy application is an emerging market, not mature, with high cost, low user acceptability, and it is better to be popularized by the government.
	Transfer of intellectual property	1 patent for invention (technology of Beijing Suyang Pellet Burner Ltd. originally), 2 patents for utility models 29 products for five series have been developed in matching, and popularized and applied in Eastern China, with broad development prospect. Patent for invention: Rotational hydro cooling spray combustion type biomass particle burner: (Patent No. ZL201210055967.0); Patent for utility models: New type biomass particle high temperature hot-air furnace: (Patent No. ZL201420646274.3); Patent for utility models: A kind of biomass particle fuel low temperature hot-air furnace: (Patent No. ZL201520409753.8)
	Photo caption	

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: **DEZHOU DAHE BIOFUEL MACHINERY CO., LTD**

Dezhou Dahe Biofuel Machinery Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Dezhou Dahe Biofuel Machinery Co., Ltd.	Submission date	July 15, 2016
	Contact person	Xiao Anxun	Technology type	Biomass energy utilization technology
	Tel.	13605349182	E-mail	879180105@qq.com
	Technology name	Biomass compression technology		
	Technology provider	Dezhou Dahe Biofuel Machinery Co., Ltd.		
	Scope of application	Dezhou Dahe Biofuel Machinery Co., Ltd.		
	Brief description of technology	One biomass curing forming machine, mainly composed of the body, the crankshaft connecting rods, piston stamping and other mechanisms attached to the body. The feed silo is installed above the body, and discharge mode of discharge hole is installed in the body When used, the biomass feedstocks are fed into the hopper and vertically and freely access to the machine body. Motor drives the crankshaft connecting rod rotation so that the piston rod reciprocating punching motion will squeeze biomass feedstocks out of the discharge mode of discharge hole in order to complete the biomass curing forming.		
	Technical information	Technical parameters: Power: 55KW, Yield: 1,500kg/h, Energy consumption: 35kwh/t Equipment size 3,300*1,500*1,460(7.5t)		
	Business application situation	1. Jiangsu Yangzhou Biomass Energy Co., Ltd.: Wooden furniture factory dust, sawdust and waste, curing and forming into fuel briquettes. 2. Taicang Xinrui Energy-saving Equipment Company: Agricultural and forestry waste and straws are cured and formed into fuels.		
	Service conditions	1. Jiangsu Yangzhou Biomass Energy Co., Ltd.: Gu gang 13817127588 2. Taicang Xinrui Energy-saving Equipment Company: Wang Jianxin 13862275077		
	Contact person of business	It can be traded in the market, and it can also be invested on construction in the local place; The technology is mature, so the installation and debugging process needs training for customers. With low installation cost, power consumption is less than 40% of the ring mold machine, lubricating oil		

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	application unit /Tel./E-mail	consumption may not be taken into account, machine failure rate is very low, tooling and maintenance cost is low. The total power is about 250KW.
	Investment on equipment	The technical production processes: Biomass feedstocks Smash; Drying (dry in the sun); Molding and ex-factory Using this new technology, daily production of 50 tons of equipment necessary for the project: 1 pulverizer, 1 drying machine, 2 molding machine and the conveyor In total: RMB 900,000
	Expense of operation maintenance	4 persons are required to follow 2 production line of curing and forming machines with 40 tons for calculation daily Press molding machine energy consumption per ton: Electricity of 35kwh, lubricating oil RMB 1.5; Labor cost of RMB 15, tooling costs of RMB 7 and other maintenance costs of RMB 3, total about RMB 60.
	Investment payback period	Payback period of 4-6 months
	Other earnings	Biomass curing forming ring mold machines currently on the market: Large quantity, large electricity consumption, large lubricating oil consumption, high failure rate, high equipment depreciation and maintenance costs. The power consumption of our ram-type biomass curing forming machine is less than 40% of the ring mold machine, lubricating oil consumption may not be taken into account, machine failure rate is very low, tooling and maintenance cost is low.
	Technology occupancy	Ram-type biomass curing machine is a new curing forming technology, with total market share of products accounting for about 10% during promotion process.
	Market potential of technology	Due to the traditional ring mold forming machines, strong market reaction in high failure rate, high energy consumption, and low yield, then the expected type machine emerges Ram-type forming machine solves the above problems of ring mold forming machine; With huge market potential, it is estimated that by 2020 the total market share will be around 60%.
	Technical advancement	The advanced technology in the domestic and foreign similar technology is in a leading position.
	Technical maturity	The technical production processes: Biomass thick material; Smash; Drying (dry in the sun); Curing forming; Finished products. Pulverizer, dryer, curing and forming machine integration is complete.
	Technical applicability	The promotion scope of the technology transferring and promotion is wide: Agriculture, forestry waste, furniture, wood company, and household waste disposal. It is not limited by geographical restrictions, size, environment, energy resources and other factors.
	Technical stability	This technology can keep stable in the production operation, with lower sensitivity to interference of environment, technical parameters, etc..
	Technical safety	During the transformation and industrialization of outcomes, practicality, facilities are complete, without risk in market acceptance.
	Obstacle in achievement	Policy barriers. 1. Take more efforts on environmental protection, ban on coal; 2. Promotion of biomass renewable energy, there is policy support.

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	transformation and promotion	
	Transfer of intellectual property	The product of our company has realized a number of utility patents, patent owner of Dezhou Dahe biofuels Machinery Co. Ltd.. All devices are complete such as localization and technology transfer will, without understanding mechanism, policy and approach of the technology and ownership transfer.
	Photo Captions	

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: **HANGZHOU OIL BURNING BOILER CO., LTD**

Hangzhou Oil Burning Boiler Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Hangzhou Oil Burning Boiler Co., Ltd.	Submission date	June 29, 2016
	Contact person	Wu Juan	Technology type	Biomass energy utilization technology
	Tel.	13777864906	E-mail	juneng@vip.163.com
	Technology name	Circulating fluidized bed biomass gasifier		
	Technology provider	Hangzhou Oil Burning Boiler Co., Ltd. Guodian Changyuan Hubei Biomass Gasification Science & Technology Co., Ltd.		
	Scope of application	Hangzhou Oil Burning Boiler Co., Ltd.		
	Brief description of technology	Adopting design guidelines of circulating fluidized bed, there is a hot sand bed in the lower part of hearth of gasifier, and the combustion and gasifying take place on hot sand bed. Under the function of gasifying agent blown in, biomass materials, bed materials and gasifying agent are fully contacted to generate reduction reaction under high temperature oxidation environment within the furnace and produce carbon monoxide, hydrogen, methane and other combustible gases, with characteristics of rapid reaction speed, high gas generation rate, low abrasion, high operational reliability, rapid start, etc..		
	Technical information	The design output of the project is 10.8MW, and consumption of biomass fuel is 8t/h, input thermal power: 31.49MW;Biomass carbon conversion rate 96%;Thermal efficiency 85%; Gas production 18,105Nm^3/h		
	Business application situation	10.8MW biomass gasification and fuel coal power generator coupling power generation demonstration project of Guodian Changyuan Jingmen Power Generation Co., Ltd. is located in Guodian Changyuan Jingmen Power Generation Co., Ltd., Jiangshan Village, Pailou Town, Duodao District, Jingmen City, Hubei Province, and the gasification equipment operates in stable condition currently.		
	Service conditions	Guodian Changyuan Hubei Biomass Gasification Science & Technology Co., Ltd. /General Manager of He Peihong A5826523758/heph@cydlcom.cn		
	Contact person of business application unit /Tel. /E-mail	The project applies coupling of 10.8MW biomass gasification equipment and 640MW fuel coal unit, invested and constructed by Guodian Changyuan Power Co., Ltd. and operated and managed by Guodian Changyuan Hubei Biomass Gasification Science & Technology Co., Ltd.; the project realizes		

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		utilization of 17558 hours, networking power amount of 179450 KWH, and comprehensive utilization of straw resources of 123481 tons.
	Investment on equipment	The project applies power generation by coupling of 10.8MW straw gasification and 640MW fuel coal unit, with total construction investment of RMB 40 million and utilization of land of fuel coal thermal power plant; there is no need to levy new land, and the project can be completed for power generation in one year. Steam system for factory use, water cooling system, air compression system and power for factory use can be supplied by thermal power plant; especially for the fuel gas after straw gasification sent to boiler of fuel coal unit for co-firing with braize, there is no need to otherwise match corresponding boiler, steam turbine, generator and power distribution equipment, which is the key for substantial reduction of project cost while saving investment and land occupation, and substantial shortening of construction period.
	Expense of operation maintenance	1. Fuel consumption per unit time: 8.00t/h 2. Number of utilization hours 17,558.00h 3. Design of the fuel: straw 4. Unit price of biomass raw materials: RMB 400.00/t 5. Heat efficiency of gasification furnace 86.11% 6. Carbon conversion rate: 96.72% 7. Gasification efficiency 73.41% 8. Gas volume per unit time 17,500 Nm^3/h 9. Annual gas volume: 105,138,500 Nm^3 10. Consumption of raw materials per unit time: 8.00 t/h 11. Fuel gas and fuel cost per unit: RMB 0.18 /Nm^3 12. Comprehensive unit price of water supply (Including water treatment cost, agent cost, etc.) RMB 0.33 /t 13. Gas consumption per unit of water cost: RMB 0.000094 /Nm^3 14. Electricity consumption per unit time 600.00 KWH 15. Gas consumption per unit of electricity cost: RMB 0.02 /Nm^3 16. Gas unit of labor cost: RMB 0.03 /Nm^3 17. Maintenance cost of unit fuel gas: RMB 0.01/Nm^3 18. Equipment depreciation period: Ten years 19. Residual value ratio of fixed asset: 5.00% 20. Shared depreciation cost of each unit of fuel gas of investment on equipment and installation: RMB 0.03/Nm^3
	Investment payback period	The project has a stable production and operation after putting into operation, and the company realized a accumulated net profit of RMB 5.34 million in book value in 2013-2015. If taking the income

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		of renewable energy electricity rate subsidy of RMB 7.92 million (including tax, the subsidy was in place in March 2016) in 2013 into account, and it realized total profit of RMB 14.64 million and net profit of RMB 10.98 million in 2013-2015, and annual return rate of investment in 2013, 2014 and 2015 was 12.04%, 12.32% and 14.86% respectively. Investment payback period is 6-7 years.
	Other earnings	The tar generated in gasification has no influence on power station boiler furnace and consequent equipment, and is burned timely during 1,200-1,300℃ in boiler furnace; Solid waste generated is biomass dust after fuel gas dedusting with an annual output of 5,000 tons, and it is sent to silo by application of pneumatic transmission for reutilization by the society. The project belongs to energy conservation and environmental protection project, as it reduces coal combustion quantity of the unit after implementation, the existing discharge of smoke, sulfur dioxide and nitric oxide of power plant can be decreased in a certain degree, and it has an positive effect on improvement of air environment quality in the area of factory address. Meanwhile, carbon sink index and green electricity index can be obtained.
	Technology occupancy	With authentication by famous experts such as Zhang Qisheng, an academician of the Chinese Academy of Engineering, the project technology is the first one in our country; our company and Guodian Changyuan Hubei Biomass Gasification Science & Technology Co., Ltd. entered into patent implementation permission contract in January 2016, and our company owns right of use, manufacture right and promoting right via exclusive authorization of 9 pieces patent technologies of Guodian Changyuan Hubei Biomass Gasification Science & Technology Co., Ltd. such as biomass gasification, coupling power generation of gasification and power plant, and any third party shall not use it without consent of both parties; Hence, current market occupancy is 100%
	Market potential of the technology	Biomass energy conversion technology has been widely recognized as a renewable energy utilization technology with long-term development prospect, the significance of its existence and development is not only confined to one point of provision of liquid fuel with high utilization value, and as this process enables high level utilization of renewable resource, slight pollution of ecological environment and sustainable supply of green energy have been organically combined together, which realizes effective unity of resource, energy and environment. As the state growingly pays attention to utilization of energy and strengthens environmental protection awareness, utilization of biomass gas for power generation not only saves energy, but also utilizes waste, reduces pollution, and has an optimistic market prospect. Our country has abundant biomass resource, the straw output of agricultural products only reaches over 0.6 billion ton, and residue resource of forestry is of 0.12 ton. To improve the comprehensive utilization rate of biomass with this technology, not only generates power and provides gas, hot, cool and industrial gas, but also improves the environment and increases the income of the farmer. Our country has a huge potential in development and utilization of biomass energy resource.

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	Technical advancement	Biomass gasification equipment of the project applies high-speed circulating fluidized bed biomass gasification process, which realizes large-scale industrial utilization of biomass; it can process 8 tons of biomass each hour, and it is the largest biomass gasification equipment in our country. Compared with biomass bubbling bed and fixed bed for gasification, it has a higher gasification efficiency, higher gasification strength and more economic unit investment. The high-temperature gas state tar accompanying fuel gas is totally burned, sensible heat in high-temperature fuel gas brought into power generation boiler realizes sufficient utilization, only a small amount of fly ash is discharged, average carbon content is low, and incomplete mechanic heat loss is few. Through joint power generation with high-parameter large-volume thermal power unit, it improves biomass energy utilization efficiency to more than 34%, which is much higher than that of biomass direct-fired power plant. In July 2013, China Electricity Council organizes Zhang Qisheng, academician of the Chinese Academy of Engineering, and Qin Shiping, researcher of National Development and Reform Commission Energy Research Institute, and other famous experts in total of 11 to constitute authentication committee, and has conducted project achievement authentication. With verification of authentication committee, project technology is the first one in our country which ranks in international advanced level, and meanwhile, it is recommended to relevant national department to offer policy support to facilitate promotion and application of the achievement.
	Technical maturity	Process flow of biomass gasification coupling power generation project: After simple pretreatment, the biomass completes effective gasification in high-speed circulating fluidized bed gasification furnace, the fuel gas generated is directly sent into large-scale power station boiler for co-firing with braize in the form of hot fuel gas after dedusting in clarification system, and it utilizes original power generation system to realize effective power generation. Through in-depth research of biomass straw utilization technology, biomass gasification coupling power generation technology currently obtains breakthrough in many aspects, and biomass gasification demonstration project of Guodian Changyuan Jingmen Power Generation Co., Ltd. has been successfully constructed and operated; currently, the project has a high operation efficiency, its scale has been the maximum in similar kinds in Asia, processing technology is advanced, simple and effective, the complete equipment has a high reliability, commercial operation period has been four years with stable, safe and reliable operation and no occurrence of furnace shut down due to failure, and the project has obtained good benefit so far; successful operation of the project has opened up a shining path for effective utilization of China's biomass. In the production course of the entire project, it has many advantages such as high heat conversion efficiency, little loss, zero discharge of carbon dioxide and no generation of pollutant and waste.
	Technical stability	1. As of March 31, 2016, the project has had a continuous safe production for 1,339 days, realized utilization of 17,558 hours in accumulation, networking power amount of 17,945 KWH, and comprehensive utilization of straw resources of 123,481 tons.

		2. Matching of fuel gas supply parameters and boiler parameters: Compared with 600MW large-scale supercritical power generation fuel coal boiler, biomass fuel gas only accounts for less than 2%, and the parameter of fuel gas entering boiler has slight influence on boiler parameters, which will not has negative influence on the boiler, according to *Test Report of Optimization and Adjustment After Blending Combustion of Material and Fuel Gas in No. 7 Boiler of Guodian Changyuan Jingmen Power Generation Co., Ltd.* completed by Xi'an Thermal Engineering Institute under invitation of Jingmen Power Plant: Through collection and analysis of large amount of testing data, optimum operation way has obtained after coupling of boiler and biomass fuel gas. The test result indicates that: a) After coupling of No. 7 boiler and biomass fuel gas, fly ash combustible has decreased. b) CO at outlet of air pre-heater has significantly decreased, which has great benefit in mitigation of high temperature corrosion on water wall; c) Smoke discharge temperature after coupling with biomass fuel gas has little change; Heat efficiency of the boiler after coupling with biomass fuel gas is of 92.57%, which has increase with 0.26% compared with that prior to coupling; d) NOx at inlet of SCR has decreased with about 10% after coupling with biomass fuel gas.
	Technical safety	Set evacuation of fuel gas and rapid cut-off valve group, and relate with MFT of power station boiler. For example, disappearance of power supply of disperse control system, communication interruption, function failure of all operator station and the emergency situation such as loss of control and protective function of important control station, the operations have been constantly perfected an optimized; currently, it has passed the examination in operation practices of three-year' business operation in demonstration project, it has been proved that various safety protection measures with equipment and chain protection setting and operational specification applied in appropriate, and they can exert effect properly in case of emergency to protect equipment, system and personal safety. Meanwhile, our company carefully implements the policy of safety first and prevention first, adheres the principle of people's interests first, absorbs lessons of relevant domestic accidents, strengthens management in safe production, actually puts various safety measures in to practice, ensures people's life and property safety and equipment safety, and combines the experience of 4-year's commercial operation; in the whole course of project approval of biomass gasification coupling power generation project to putting into commercial operation, achieve safety management, conduct various works especially aiming at key points of fire and explosion precautions, and ensure perfect safety of safety work.
	Obstacle in achievement transformation and promotion	It is recommended that the state puts more efforts in promotion of technology application, and gives play to the advantage of effectiveness, green and low-carbon and environment protection of the technology.

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		1. Specify in the level of national policy that biomass gasification coupling power generation project implements the same networking power price and relevant preferential tax policy with biomass direct-firing power generation project. 2. When the state makes relevant industrialized planning of biomass energy utilization, include biomass gasification-re-combustion power generation technology (also referred to as fuel coal and biomass coupling power generation technology) into one direction for promotion. 3. Regarding the project has no individual installed capacity, for biomass gasification and re-combustion power generation project to obtain local approval or handle filing, and other approvals such as power rate reply and permission of power business, there exist different opinions and divergence. It is recommended to specify in a level of national policy the project as an individual biomass coupling power generation project (different from direct-firing power generation) to declare and perform filing procedure, which is convenient for approval of relevant formalities; meanwhile, declare the capacity of the project 10.8MW to replace coal power according to biomass power generation capacity and make statistics in the same way, while generating capacity of large unit for coupling shall not be decreased. 4. The solution to the problem of collection and storage of biomass is the key for successful operation of the project; it requires the government to issue relevant collection and storage policy, establish an organization to collect and store biomass and assist the project to build biomass collection and storage system.
	Transfer of intellectual property	The project belongs to independent research and development, obtains nine pieces of patents in total, wherein, efficient combination power generation method of biomass gasification and fuel coal power generation boiler obtaining one invention patent and biomass high-speed circulating fluidized bed gasification boiler and other achievement of eight in total obtaining utility model patent. Our company and Guodian Changyuan Hubei Biomass Gasification Science & Technology Co., Ltd. entered into patent implementation permission contract in January 2016, and our company owns right of use, manufacture right and promoting right via exclusive authorization of 9 pieces patent technologies of Guodian Changyuan Hubei Biomass Gasification Science & Technology Co., Ltd. such as biomass gasification, coupling power generation of gasification and power plant, and any third party shall not use it without consent of both parties;
	Photo caption	

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: HENAN JUFENG BIOENERGY DEVELOPMENT CO., LTD

Henan Jufeng Bioenergy Development Co., Ltd	**Renewable Energy Technical Achievement Declaration**			
	QR code			
	Technical provision unit	Henan Jufeng Bioenergy Development Co., Ltd.		
	Contact person	Guan Yongwei	Submission date	June 15, 2016
	Technical type	Biomass energy utilization technical	Specific technical	Biomass Energy-saving Stove
	Tel.	18539305501	E-mail	Guanlil618@163.com
	Technical name	Biomass Granular Cauldron Stove		
	Technical provider	Henan Jufeng Bioenergy Development Co., Ltd.		
	Scope of application	Apply to the catering industry, urban and rural residents, farmhouse, restaurants and canteens of enterprises and institutions, etc.		
	Brief description of technology	Apply to Φ6mm-8mm wooden-pellet fuel, with the sealed combustion design, thoroughly fuel combustion and good gasification, having a device for automatic ignition, feeding, and the device of multi-air supply and oxygen addition, achieving the environmental effect of having no smoke, dust and smell. Be complete with steaming, boiling, stewing and frying, thick stainless steel for stove panel, the design of side bunker fully uses space, powder injection treatment to the overall stove, and the liner has adopted the technology of compression moulding using special refractory materials		
	Technical information	Heat rating 3.1-11KW Fuel consumption 0.7-2.5kg/h Appearance 1065×740×720mm Net weight of product 115kg		
	Business application situation	Beijing North Locomotive Technology Co., Ltd. - No. 799, Chuangyigu Street, Jingdong Yanjiao Development Zone, Beijing - 10 units - For 1,000 persons/meal		
	Service conditions	The product owns mature technology, automatic design, easy operation and adopts market transaction. No need of system training with the attached detailed Instructions,; High reliability, and lower installation, use and maintenance costs		
	Contact person of business application unit /Tel./E-mail /Tel. /E-mail	Beijing North Locomotive Technology Co., Ltd./ Tang Zhaogang/13370175828		

	Investment on equipment	The equipment, whose price is RMB 5,000, can be directly used with no need of other accessory equipment.
	Expense of operation and maintenance	Electric charge: The power of the equipment motor is 70W; If calculated at operating 5 hours per day and 300 days per year, and electricty price is RMB 1/kwh: 0.07*5*300*1=RMB 105 fuel cost The fuel consumption of the equipment is 0.7-2.5kg/h, and average price of biomass granular fuel in China is RMB 700/ton: 0.7-2.5kg/h*5*300*0.7=RMB 735-2,625; Total annual maintenance cost is: RMB 840-2,730
	Investment payback period	One equipment can supply 100 persons/meal. Meal fee of 1 person/day is calculated at RMB 20, raw material is calculated at RMB 10/day, annual profit: 100*3*20*300=RMB 1,800,000, cost: 100*3*10*300+2730=RMB 902,730; It is shown that the investment can be taken back in the same year.
	Other earnings	Except for small amount of electricity, main fuel of the equipment is biomass granule; Environmental benefits: Energy saving and emission reduction, promote low-carbon economic development. The project products are for the development and utilization of biomass, great at digesting crop straws, saving coal, petroleum, electricity and other energy sources for the purpose of energy conservation and emission reduction, eco-environment protection, promotion of sustainable living process and development of low carbon economy. By the designed productivity, the biomass molding equipment is available to digest biomass fuel of about 3,000t, substitute standard coal of 1,500t, and reduce emission per year in CO_2 of about 3,900t, SO_2 of about 12t, and NOX of about 11t to protect the ecological environment. Good social benefit With the corn stalks, cotton straws, bean straws, wheat bran, rice straws, millet straws, peanut vines (shells), alfalfas, furfural residues, ginger residues, barks and other agriculture and forestry residues of primary processing and part of industrial residues as the production materials, the normal production of products needs to purchase biomass materials from the surrounding farmers, through which, income of native farmers can be increased and the local economic development and new rural construction can benefit from this.
	Technical share	Domestic market share in 2015 was 2%, which ranked forefront in the same trade.
	Potential of Technical market	In the National *Middle and Long-term Development Planning of Renewable Energy Sources*, it indicates that: According to the current needs of economic and social development as well as biomass energy utilization technology in China, the biomass energy utilization focuses on biomass power generation, methane, biomass solid molding fuel and biomass fluid fuel. Wherein, biomass solid molding fuel refers to the fuel, that is the compression molding of biomass by special device for the purpose of storage, transportation and use convenience, clean and environmentally friendly characteristics and high combustion efficiency, which can be used as cooking and heating fuels for rural residents, as well as the fuels for decentralized heat supply in cities. The plan proposes development goal and key points of construction of biomass solid fuels By 2020, the biomass solid molding fuel will become a superior fuel widely used. The annual consumption of biomass solid

		molding fuel in China will be 50,000,000 tons. It means that the utilization amount of biomass granular fuel will increase over 3 million tons annually in average in the next 15 years, which will provide great space for the development of biomass energy molding equipment and biomass energy stoves. Meanwhile, the equipment may replace rural firewood stove, and it can also be used in happy farmhouses, restaurants, canteens of enterprise and public institutions. It can meet supply of hot water or steam while cooking, and it has a wide market space.
	Technical advancement	The equipment is of simplicity and applicability, achieves automatic feeding during usage, and is convenient to make movement, with even fire behavior and little ash, high heat efficiency and no smoke or dust; it has fully utilized the one time recycling of waste heat energy and conversion heating technology, and has significantly reduced fuel cost. Combustion chamber inside the furnace is optimized and designed with whole sealing combustion, and combustion of fuel is complete and gasification is good. It has automatic ignition, automatic feeding and multiple air distribution and oxygen-adding equipment, and via configuration of bottom air inlet and adjustment and coordination of air volume between secondary air distribution outlet and fuel air inlet, it has effectively increase effective combustion efficiency of internal biomass fuel. It is equipped with heat insulation and fire-resistance materials outside the furnace core, which has effectively improved safe configuration of labor and extended service life of the equipment, and further enhanced safety performance of large cooking range during operation. The cooking stove realizes automatic control and feeding through electronic control operating panel and packing dragon feeding mechanism, and it has effectively reduced labor intensity of the worker, increased economic benefits of the enterprise, and realized overall automatic safe production process.
	Technical maturity	Large biomass granule cooking range includes frame body, and a furnace stage is equipped with on the upper end of frame body 1. It is equipped with pot body on the furnace stage, and it is equipped with core at the bottom of the pot body. It is connected with secondary oxygen-adding system at bottom of the core, and fireproofing material is equipped with in the outside of secondary oxygen-adding system. It is also connected with secondary air distribution outlet at the bottom of secondary oxygenation system, and it is respectively equipped with fuel air inlet and bottom air inlet at right and left side of secondary air distribution outlet. It is respectively equipped with igniter and grate board in the upside of bottom air inlet, and it is equipped with air blower at left side of frame body. Air blower is connected with the bottom of frame body via air inlet channel, and it is equipped with heat insulation material in the periphery of core. It is equipped with heat insulation board in the connecting part between heat insulation material and core and frame body, electronic control operating panel is equipped with on air blower, and the left side of frame body is equipped with packing dragon feeding equipment. The equipment system is mature and reliable, and there is no need of supporting equipment and can be used independently

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	Technical applicability	The equipment technology is mature and reliable, and oral surface diameter of the product is about 600mm. It is integrated with the functions of frying, steaming and boiling. This product is one of the best sellers in companies and institutions, canteens and restaurants and can supply hot water or steam at the same time when the user is cooking. That is: Boiling soup or frying dishes on one hand, and steaming rice or steaming dishes on the other hand. During supply of hot water, similarly, on one hand, boiling soup or frying dishes is available, and on the other hand, supply of hot water showering is available. 3. Usage Target of product Urban and rural residents, happy farmhouse, restaurant, enterprise and institution canteen, etc. One oven can meet the use of a canteen with about 100 people.
	Technical stability	It is integrated with advanced automatic control technology and biomass fuel combustion technology, and intelligent electronic system operation is adopted; it realizes intelligent adjustment of fire, random control of firepower size, automatic feeding, convenient movement, large volume of kitchen work, even fire behavior and little ash, high heat efficiency and no smoke or dust. It has fully utilized the one time recycling and conversion heating technology of waste heat energy, and has significantly reduced fuel cost. Apply to Φ6mm-8mm wooden-pellet fuel, with the sealed combustion design, thoroughly fuel combustion and good gasification, having a device for automatic ignition, feeding, and multi-air supply and oxygen addition, having the environmental effect of no smoke, dust and smell. The functions of steaming, boiling, stewing and frying are complete, panel of cooking range applies thickened stainless steel material with high temperature resistance and corrosion protection, and the design of side bunker fully utilizes the space. Long-term usage of the spraying powder part of overall cooking range will cause no black coating, and it is easy to be cleaned and it is clean and sanitary. The material of liner directly determines service life of cooking range. Liner adopts compression molding of special fireproofing material, and service life is several times of that of traditional cooking range.
	Technical safety	The safety of control system is in multiple protection, which ensures the quality and service life of the product. The appearance design is bright and fashionable. It is equipped with stainless water tank at the upside. It can heat the cold water in the bucket by utilization of waste heat in cooking. The temperature of hot water can reach to about 90℃ at maximum, and it can be used for making soup, soup dishes, washing dishes and washings, etc. It gets flamed in 1- 2 minutes and saves energy of about 30-40% compared with natural gas, the maximum firepower is faster than natural gas about 50%, and it has the function of low carbon and energy conservation, economy and environmental protection.
	Obstacles in achievement transformation and promotion	Supporting motor of the equipment applies 220V alternating voltage, and it uses biomass granular fuel as fuel.

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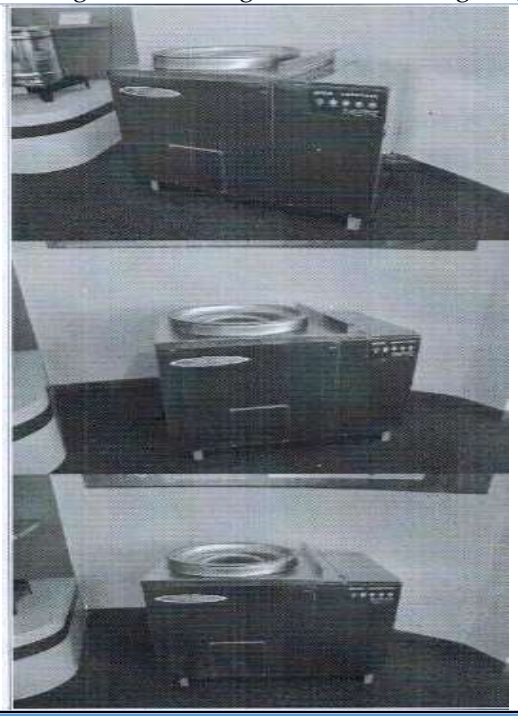
	Transfer of intellectual property	The equipment technology provider possesses intact domestic proprietary intellectual property, and the provider is a domestic private enterprise and can offer technology transfer. Intellectual properties hold; Application for domestic invention patents to be authorized: A kind of large biomass granule cooking range, Application No.: 2015 1 0887U2.8. Authorized domestic patents. A large biomass granule cooking range, Application No.: ZL2015 2 1001002.9; An automatic feeding equipment of large biomass cooking range, Authorization No.: 2L 2015 2 1000641.3; An automatic feeding device of large biomass cooking range, Authorization No.: ZL 2015 2 1001063.5.
	Photo captions	
	Renewable Energy Technical Achievement Declaration	
	QR code	
	Technical provision unit	Henan Jufeng Bioenergy Development Co., Ltd.

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Contact person	Guan Yongwei	Submission date	June 15, 2016
Technical type	Biomass energy utilization technical	Specific technical	Biomass Compression and Carbonization Technologies
Tel.	18539305501	E-mail	guan li1618@163.com
Technical name	Biomass solid fuel Densifying equipment		
Technical provider	Henan Jufeng Bioenergy Development Co., Ltd.		
Scope of application	Comprehensive utilization of rural agricultural and forestry residues		
Brief description of technical	It makes agricultural and forestry residues and other biomass materials to be pressed cut or rub with the length of 30mm below and moisture content in 15-25%, of which, being feed into conveyor, forcibly squeezed out in block or granule from the hole of model through the rotation of spindle to power the compression roller and through the automatic rotation of compression roller, falling down from the outlet and being packed into the bags after cooling off.		
Technical information	Productivity 1200-1800kg/h, Dimension (L × W × H) 2600 × 2200 × 1800mm, Weight 3000kg		
Business application situation	Huzhuang Biomass Fuel Production Base –Huangcun West Road, Huzhuang Township, No.106 National Highway, Puyang County, Henan, with the annual comprehensive utilization capacity of 6000 tons and annual comprehensive utilization value of RMB 3,570,000		
Service conditions	With mature technical, the product uses market transaction, with detailed operation instruction attached along with the product and the system training provided at the same time; High reliability, and lower installation, use and maintenance costs		
Contact person of business application unit/Tel./E-mail	Puyang Lvtan Huinong Technical Co., Ltd./Han Haoyi/13525645999		
Investment on equipment	One set of equipment with the annual output of biomass solid fuel of 3,600 tons。 It requires a set of biomass solid fuel densifying equipment (including feeding machine) of RMB 120,000, a pulverizer of RMB 10,000, a receiving machine of RMB 5,000, a grass grasper of RMB 30,000, and a transformer of RMB 50,000, in total of RMB 215,000.		

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	Expense of operation maintenance	1. Labor cost: 3 persons * RMB 60/d * 300d = RMB 54,000; 2. Electric charge: Electric charge is by the integral electricity price of RMB 1/kWh and working hours per day of 8h, ① pulverizer: 1*25*8*300=RMB 60,000; ②briquetting machine: 1*55*8*300=RMB 132,000; 3. Oil consumption to grab grass and raw materials: RMB 100 for 8h/d oil consumption of grass grasper vehicle, 300*100=RMB 30,000; 4. Cost of raw materials: RMB 300 per ton in the average of straw materials, 300*3600=RMB 1,080,000; 5. Depreciation cost of the equipment The designed service life of biomass solid fuel densifying equipment of 10 years, other equipment of 5 years, 12/10+(1+5000+30000+50000)/5=RMB 31,000; Total annual maintenance cost is: 54,000+60,000+132,000+30,000+1,080,000+31,000=RMB 1,387,000
	Investment payback period	By the designed productivity, the biomass solid fuel densifying equipment is annually averaged of 3600 tons, which is calculated by multiplying of 1.5t each hour, 8 work hours each day, and 300 days each year, for biomass densifying fuel. At present, the densifying fuel is RMB 700/t in the market price and RMB 2.52m per year in the economic income. Each set of equipment is RMB 1,387,000 in the maintenance per year and RMB 215,000 in the investment cost, thus the investment outlay recouped in the year can be clear.
	Other earnings	Environmental benefit; Energy saving and emission reduction promotes low-carbon economic development. The project products are for the development and utilization of biomass, great at digesting crop straw, saving coal, petroleum, electricity and other energy sources for the purpose of energy conservation and emission reduction, eco-environment protection, promotion of process in green living and of development in low carbon economy. By the designed productivity, the biomass solid fuel densifying equipment is available to digest biomass fuel of 3600 tons, fungible to standard coal of 1800t, to emission reduction per year in CO2 of c. 4680t, SO2 of c. 15t, and NOX of c. 13t to protect the ecological environment. Good social benefit With the corn straws, cotton straws, bean straws, wheat bran, rice straws, millet straws, peanut vines (shells), alfalfas, furfural residues, ginger residues, barks and other agriculture and forestry residues for primary processing and part of industrial residues as the production materials, the normal production of products is needed to purchase biomass materials from the surrounding farmers, of which, increasing their income thus benefiting the local economic development and new rural construction.
	Technical occupancy	Domestic market occupancy of 1% in 2015, ranking the forefront of the same industry.

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	Market potential of the technical	For the purpose of national *Middle and Long-term Development Planning of Renewable Energy Sources,* it indicates that: According to the current needs of economic and social development as well as biomass energy utilization technical in China, the biomass energy utilization focus on biomass power generation, methane, biomass densifying solid fuel and biomass fluid fuel. Where, biomass solid densifying fuel shall refer to the fuel for compression molding of biomass by special device with storage, transportation and use convenience, clean and environmentally friendly characteristics and high combustion efficiently, which can be used as cooking and heating fuels for residents in rural area, as well as the fuels for decentralized heat supply in cities. The plan proposes development goal and key points of construction of biomass solid densifying fuel By 2020, the biomass solid densifying fuel will become a superior fuel widely used. The annual consumption of biomass densifying solid fuel in China is 50 million tons. It means that the utilization amount of biomass granular fuel will be averaged to annually increase over 3 million tons in the next 15 years, benefiting the development of biomass energy densifying equipment and biomass energy stoves. By 2020, it will need 11,000-18,000 biomass solid fuel densifying equipment with its productivity of 1.2-1.8t/h under the prediction of the annual consumption of biomass densifying solid fuel of 50 million tons in China. Thus, there is a large space in the application market of biomass fuel densifying equipment.
	Technical advancement	The special innovative design of equipment is characterized by raw materials with higher lignin and larger compression density, changing the vertical into horizontal mode production and using multi-seal design to avoid the dust into lubrication part of bearing. In the principal of its rotating centrifugal force, the biomass solid fuel densifying equipment makes the materials uniformly dispatched into all the densifying molds for the avoidance of the boring due to excess concentration of local materials. The unique mold densifying angle makes the discharge smooth and production efficiency higher under the premise in 100% desifying rate, remaining its excellent performance highlighting out of other types of machines. (1) It uses the dual-roller synchronous symmetrical mechanics design, making the productivity higher and stability increased, equipment failure rate reduced. (2) The improvement of design mold synchronizes with the roller abrasion to facilitate the gap adjustment, effectively extend the service life of core components, and meet the demands of long-time continuous production, significantly reducing the maintenance cost. (3) Simple structure is convenient to maintenance; The maintenance support is designed in center to facilitate the maintenance of complete machine. (4) Increasing the effective balance weight makes the operation stable, safe, anti-boring and noiseless. (5) There is a full improvement in the core components of this machine, strengthening the load intensity, especially having a more safety to the efficiency of materials to produce

		cotton straws and branches and other materials with higher hard lignin. (6) For the core components, they are forged and formed using the special materials with high abrasion proof,intensity and tenacity, and in a special treatment process, it is of longer service life, lower maintenance cost, be repeatedly used upon repair in no need of replacement.
	Technical maturity	1. Its fundamental is to smash and transport the agricultural and forestry residues and other biomass materials to the biomass solid fuel densifying equipment, squeeze them into blocky and granular biomass fuel by rotation as the biomass boiler fuel replacing coal. 2. It makes agricultural and forestry residues and other biomass materials to be pressed cut or rub with the length of 30mm below and moisture content in 15-25%, of which, being feed into conveyor, forcibly squeezed out in block or granule from the hole of model through the rotation of spindle to power the compression roller and through the automatic rotation of compression roller, falling down from the outlet and being packed into the bags. The integration of system of the equipment is mature and perfect.
	Technical applicability	The processing scope of biomass solid fuel densifying equipment: Corn straws, cotton straws, bean straws, wheat bran, rice straws, millet straws, peanut vines (shells), alfalfas, furfural residues, ginger residues, barks, agriculture and forestry residues for primary processing, etc. Especially, it is heavier to the materials themselves, for example: more prominent role in the productivity of cotton straws, peanut shells, furfural residues, etc. The equipment is of mature and reliable technical but needs to be equipped with a transformer and corresponding voltage source as designed to apply AC voltage of 380V.
	Technical stability	(1) The roller of biomass solid fuel densifying equipment can be vortically installed on the roller shaft to make the roller automatically rotated, thus reducing the roller edge abrasion, extending the service life, increasing the briquetting density, improving the smoothness of briquetting surface; Furthermore, a roller body is set between the roller and its shaft, and connection of the body and roller is by welding, improving the roller load capacity, extending its service life and increasing its working reliability. (2) The roller shaft of the equipment is of eccentric shaft, and the gap between roller and module can be adjusted according to the processing requirements, which can be readjusted by the adjustment of position of roller shaft after increasing the gap through a uniform abrasion of roller circumference, thus reusing it in no need of replacing the roller, increasing the working reliability of biomass solid fuel densifying equipment, reducing the times of maintenance and replacement and production cost. (3) The feed divider of biomass solid fuel densifying equipment makes the materials uniformly spread in the module opening, benefiting roller formation, increasing the briquetting density and densifying rate, improving the smoothness of briquetting surface while making the materials not huddled, blocked or bored. (4) The heating unit of biomass solid fuel densifying equipment can

		heat the module, thus raising the temperature of materials with a certain humidity to increase its viscosity and softness in order to easily form, save energy consumption, and reduce production cost.
	Technical safety	(1) The dual-class screw press dehydrator for the equipment contains a feed plug and its fastener. When the materials in the high-pressure compression bin reaches a certain dryness and the pressure of materials is greater than that of fastener, it can control the materials processing dryness, increase the effect to squeeze and dehydration, easy to use and operate. (2) With the rational structure and easy operation, the equipment is to power the spindle and roller by a motor, cut or crush the materials in the operation of roller to avoid the module opening to be blocked by the bulk biomass. It is available to add lubricant oil to the oil filler hole on the spindle of biomass solid fuel densifying equipment. As the welding structure of roller and its body, the roller shaft can be rotated to adjust the gap between roller and module, making work efficiency higher, service life longer and operation reliable
	Obstacle in achievement transformation and promotion	The equipment is of mature and reliable technical and easy to operate but needs to be equipped with a transformer and corresponding voltage source as designed to apply AC voltage of 380V.
	Transfer of intellectual property	Technical provider: Henan Jufeng Bioenergy Development Co., Ltd. is a private enterprise, with all domestic proprietary intellectual property of the equipment, so it can provide technical transfer. Authorized country Application for domestic invention patents to be authorized: Biomass Briquetting Machine, Publication Patent No.: CN 10-1085127A; Biomass Fuel for High-efficiency Combustion and its Preparation Methods, Publication Patent No.: CN 104119978 A;Environmental Biomass Fuel Substituting for Coal and its Preparation Methods, Publication Patent No.: CN 104119978A; other authorized domestic patents: Autofeed Device of Biomass Briquetting, Patent No.: ZL 201020187702.2;Biomass Solid Densifying Shear Briquetting Machine, Patent No.: ZL 201020666148.6:;Heating Device for Cut-type Biomass Briquetting Machine, Patent No.: ZL 201420331516.X;Heating Device for Shear-type Biomass Briquetting Machine, Patent No.: ZL 201420331261.7; Adjustable Eccentric Biomass Briquetting Machine Roller Component, Patent No.: ZL 201420331097.X; Combined Densifying Module of Biomass Shear-type Biomass Briquetting Machine, Patent ZL 201420330899.9; A Sealing Device for Granulator Extrusion Wheel, Patent No.: ZL 201520529778.1。

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: HENAN JUFENG BIOENERGY DEVELOPMENT CO., LTD

	Photo caption			

TECHNOLOGY: BIOMASS COOKER -ICS AND OTHERS
COMPANY: XUNDA SCIENCE & TECHNOLOGY GROUP CO., LTD

Xunda Science & Technology Group Co., Ltd

Annex 2 Central Africa Renewable Energy Technology Achievement Declaration Table

Technology provision unit: Xunda Science & Technology Group Co., Ltd. Submission date: June 29, 2016

Xunda Science & Technology Group Co., Ltd. (sealed)

Contact person: Wen Feng Tel.: 0731-55188811 E-mail: fay@xundaco.com

Technical type selected: D. Biomass energy utilization technology

A. Hydropower technology B. Solar energy utilization technology C. Wind energy utilization technology D. Biomass energy utilization technology

Item			Specific description	Filling instruction
(I) Brief introduction of technical introduction	1	Name of technology or product	Biomass clean combustion technology	The name that can be specifically and directly to be promoted with outstanding features.
	2	Provider of technology or product	Xunda Science & Technology Group Co., Ltd.	Please offer the full name of specific unit that has intellectual property rights or possesses the ability for engineering design and construction
	3	Whether it has foreign cooperation experience	Biomass cooking furnace project for aiding Myanmar	Whether it has experience of overseas marketing and application in terms of this technology, and please gives a brief introduction of main contents.
	4	The situation of technical intellectual property rights	With completely independent intellectual property rights, possess multiple biomass stove patents.	In case the intellectual property rights are in inconformity with that of technology provider, please list the full name of owner of intellectual property rights.
	5	Scope of application	Renewable energy, biomass fuel clean combustion, use of forestry and agricultural residues, rural energy	Restrictions in respective industry and technology application (within 20 words)
	6	Brief introduction of technology or product	According to combustion characteristics including low heat value of biomass fuel, rapid volatile component release, apply segmented combustion-supporting air supply in designed and manufactured	Principle, function, technical features and key equipment (within 500 words).

				furnace, and optimize the burner to make biomass fuel burn abundantly by reasonable mixing device of the primary and secondary air, according to different structures configuration, to reach the effects of high efficiency, low discharge and clean combustion. The produced stove can adapt the needs of cooking energy in rural area and resolve abundant forestry and agricultural residues fuels, with characteristics of high thermal efficiency, low emission, good adaptability to fuel, etc., be helpful to energy conservation and emission reduction in rural area, improve living and health level of farmers and health level of kitchen staff.	
		7	Main technical indicator	The produced stoves are mainly for cooking with series of products, cooking power is mainly divided into 1.5kW and 2.0kW, the furnace adopts ventilation patterns of natural ventilation and forced ventilation, and small stoves mainly focus on natural ventilation, the volume generally is 300mmX 300mm X400mm, the power is 1.5kW, cooking thermal efficiency is more than 30%, the weight is lower than 10kg; The volume of large-scale stoves is about 350mmX 450mmX700mm, the power of 2.0kW, cooking thermal efficiency is not less than 35%, the weight is bout 22kg.	Specification, power, service parameters of technology or product, volume and weight of equipment, etc. (within 500 words)
		8	Business application situation	National Development and Reform Commission and Environmental Protection and Forestry Department of Union of Myanmar entered into an	Describe application content and provide the name, location, engineering scale and operation

				agreement regarding the project of climate change materials presentation in November 2014, and National Development and Reform Commission would present a batch of cleaning stoves to Environmental Protection and Forestry Department of Union Of Myanmar, to assist Union Of Myanmar to enhance its ability of handling climate change in its country.	situation of 1-4 demonstration engineering (within 500 words)
		9	Contact person/phone number/mail box of business application unit	Contact number: 010-68781496 Contact person: Hou Fang	Provide contact information of 1-4 application units to verify the data
	(II) Index data of technology quantification (for a certain specific demonstration project)	10	Basic information of the project	National Development and Reform Commission and Environmental Protection and Forestry Department of Union Of Myanmar entered into an agreement regarding the project of climate change materials presentation in November 2014, and National Development and Reform Commission would present a batch of cleaning stoves to Environmental Protection and Forestry Department of Union Of Myanmar, to assist Union Of Myanmar to enhance its ability of handling climate change in its country. Conduct domestic open tendering to the project and Xunda Science & Technology Group Co., Ltd. is selected as implementation unit of the project.	Describe the background of project (selection of technology and product), is the investment a market transaction or investment and construction locally? Main equipment, power, quantity and working time, etc. applied. Whether the systematic training is required in the process of implementation? The situation of installation, use and maintenance costs? (100 words)
		11	Investment on equipment	Input assembly line, bending cutting machine, oil press, shaking cutting machine, punching machine, intelligent	Describe the amount of one-off investment for necessary main equipment and other auxiliary

				electric welding machine, etc., of products	equipment in new engineering in application of the technology, or investment of other newly-added equipment and other auxiliary equipment necessary for transformation of existing engineering. Engineering scale is required to be described.
		12	Expense of operation and maintenance	Collect raw materials, water and electricity costs and other fees according to output quota	Describe the costs of raw materials, water and electricity consumed by the unit product during normal operation of system, and the labor cost (salary), equipment depreciation cost, repair expense, management fee and other maintenance costs consumed.
		13	Investment payback period	2 years	Describe static investment payback period of the project which refers to the period required for accumulated economic benefits being equivalent with initial investment cost under the condition without considering time value of funds.
		14	Other earnings	Derive other similar new energy products, and increase total output value of the company, etc.	Describe the additional economic benefits (such as increase of output value, benefit of by-product, carbon benefit) that occur when this technology is compared with similar technology or after this technology is applied.
	(III) Qualitative indicator	15	Technology advancement	The combustion technology adopted is at advanced level in the industry with characteristics of high efficiency and low emission, and related products pass	Describe innovation of the technology, the position and level in similarly international and domestic technology.

				through new products and new techniques sci-tech achievements appraisement organized by Rural Energy Industry Association. The technical level is in advanced level of domestic similar products, called as the global cleanest stoves by Global Alliance for Clean Cookstoves Aprovecho Test Center.	
		16	Technical maturity	IS09001 international quality management system certification, IS014001 international environment management system and SA8000 social responsibility management system certification, with perfect production management system and production equipment, it has formed scale production.	Describe the technology route and completion degree of equipment and system integration.
		17	Technical applicability	The products promoted can adapt to most forestry and agricultural residues, including fuel wood, tree branch and straw, wide geographical adaptability to the region, without other restricted conditions.	Describe the applicable range of the technology during transformation and promotion, the matching degree with upstream and downstream process and technology and the restrictions of region, scale, environment, resources and energy and other factors.
		18	Technical stability	With good technical stability of the product, users can increase or decrease fuel accordingly, with simple and easy operation according to their own requirements on cooking power	Describe whether the technology can keep stable during engineering operation and the sensitivity to interference of environment, technical parameters, etc.
		19	Technical safety	The technology is safe and reliable, simple and efficient without special training.	Describe the system risks of practicability, whether supporting facilities are complete and market acceptability that the technology is

				faced with during transformation and industrialization of achievement.
	20	Obstacle in achievement transformation and promotion	Less centralized procurement projects of government	Describe the barriers scale of the restricted conditions, such as the technical problems needing to be solved during achievement transformation and promotion, policy barriers, resource or capital restrictions, talent cultivation and others.
	21	Transfer of intellectual property	It has complete independent intellectual property rights, with multiple patents for invention and utility model patents.	Whether it has domestic proprietary intellectual property right, whether it has obtained patent, and nature (enterprise, university, individual, etc.) of the owner of the technology; Localization of key links of technology, process and equipment introduced: Transfer intention of the owner of the technology, transfer mechanism of technology property rights, whether policy pathway is smooth, etc.

Note: Symbols and units of measurement should be normatively written, and English abbreviation shall be noted with the full name.

7-19-2009	**200910043963.9**	**Biomass direct-fired furnace**	**5-30-2012**	**Patent for invention**
7-19-2009	200910043965.8	Secondary air distributor of biomass direct-fired furnace	4-18-2012	Patent for invention
7-19-2009	200920065360.4	Rotary air valve	9-22-2010	Utility model
10-3-2009	200910044515.0	Direct-fired furnace combustion efficiency device	11-9-2011	Patent for invention
5-18-2010	201020194013.4	Water supply and drainage device of the water heater	12-22-2010	Utility model
6-22-2010	201020240490.X	Heater piping system	5-4-2011	Utility model

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	6-22-2010	201020240480.6	Biomass fuel furnace with drinking hot water	1-19-2011	Utility model
	6-30-2010	201020242024.5	Biomass cooking furnace	1-19-2011	Utility model
	3-13-2012	201220092415.2	Secondary air distribution system of biomass furnace	10-3-2012	Utility model
	4-13-2012	201220155849.2	Biomass furnace burners	11-14-2012	Utility model
	4-17-2012	201220161486.3	Biomass cooker air distribution valve	12-19-2012	Utility model
	10-20-2012	201210400109.5	Civil cooking and heating furnace with solid fuel	3-25-2015	Patent for invention
	10-20-2012	201220537550.3	Civil cooking and heating stove with solid fuel	5-8-2013	Utility model
	11-17-2012	201210463328.8	Biomass portable cooking furnace	2-11-2015	Patent for invention
	12-9-2013	201320801041.1	One type bioenergy oven	6-4-2014	Utility model
	12-17-2013	201320832170.7	Normal pressure hot water boiler for biomass semi-gasification combustion	6-4-2014	Utility model
	12-17-2013	201320832169.4	Intake system for biomass semi-gasification boiler	6-4-2014	Utility model
	12-17-2013	201320832141.0	The cooling system to prevent overheating of normal pressure hot water boiler	6-4-2014	Utility model
	10-28-2014	201420629004.1	Biomass stoves	3-25-2015	Utility model

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: BEIJING PIONEER ENERGY SCIENCE AND TECHNOLOGY DEVELOPMENT CO.,LTD

Beijing Pioneer Energy Science and Technology Development Co.,Ltd

可再生能源技术成果 (已申请)			
技术提供单位：	BeiJing Pioneer Energy Science and Technology Development Co.,Ltd		
联系人：	Zhanghonghong	提交日期：	July 27, 2016
技术类型：	other	具体技术：	other
电话：	13811793606	邮箱：	qnkj@qinengkeji.com
技术名称：	The central air-conditioning energy saving control system		
技术提供方：	BeiJing Pioneer Energy Science and Technology Development Co.,Ltd		
适用范围：	Used in public buildings, industrial park, transportation hub energy monitoring and control of energy conservation		
技术简要说明：	Energy saving control system dynamic simulation by using DeST simulation means of central air conditioning working conditions and performance of each part, join energy consumption monitoring data acquisition + via the Internet and cloud computing technology, to realize central air conditioning system energy saving. Key equipment: the energy management of the central control platform, cold standing intelligence group control system, intelligent control system intelligent control system of pump, air conditioning, cooling tower fan intelligent control system.		
技术信息：	voltage: 220 V Current:10 A frequency :50HZ equipment specification: 800 mm * 600 mm * 2000 mm		
商业应用情况：	Guangdong jiangmen palace international hotel, covers an area of 65000㎡, energy-saving 23.3%； Hebei langfang shengfang furniture expo city, covers an area of 220000㎡, energy-saving 38.5%； Shijiazhuang, hebei hotel, covers an area of 89000㎡, energy-saving 25%		
使用条件：	Local dwellings or by rev can science and technology investment and is responsible for the diagnosis of energy saving, custom development, construction project design, system installation, debugging and whole life cycle of energy saving index verification, technical training, the remote on-line service and after-sale service work.Both sides project acceptance or third appraisal to achieve energy saving effect of the contract, the energy-saving benefit created by the customer to pay the cost of energy-saving renovation project or share.		

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	商业应用单位联系人/电话/邮箱：	Shengfang furniture expo city： FengTao 18631680008 Jiangmen palace international hotel：LaiZhaobo 0750-8233388 Hebei hotel： MengXiangrui 13910330149
	设备投资：	Major equipment: energy management of the central control platform, cold standing intelligence group control system, intelligent control system intelligent control system of pump, air conditioning, cooling tower fan intelligent control system, intelligent electric meter data acquisition system, environment of intelligent data collection system； Accessories: frequency converter, sensors, electric meter. Engineering scale in more than 3 square meters, equipment investment 10-35 yuan/square meters, the specific investment according to project actual situation.
	运行维护费用：	And the full cost to energy-saving reform of the science and technology investment clients. Through with the customer on a regular basis to share project after the implementation of energy-saving benefit back your investment.Energy-saving equipment ownership to the customer after the project contract, after the energy saving benefits all belong to the customer.
	投资回收期：	The static payback period of 1.8 to 2.5 years
	其它收益：	According to my company for all kinds of building the central air conditioning system of the sorting of data statistics, for building energy costs RMB 5 million per year, set the price for 1 yuan/KWH。Can use rev energy-saving control system of building energy consumption situation of science and technology as shown below： Medical institutions: power consumption is 5 million yuan, saving electricity is about RMB 1.5 million per year, saving BiaoMei, 606 tons of CO2 emissions of 1509 tons, energy-saving rate of 20% to 40%. Government offices: power consumption is 5 million yuan, saving electricity is about RMB 1.075 million per year, saving BiaoMei, 434 tons of CO2 emissions of 1081 tons, energy-saving rate of 18% to 25%； Mall shopping centers: power consumption is 5 million yuan, the annual power savings of about 1.75 million yuan, save BiaoMei, 707 tons of CO2 emissions of 1760 tons, energy-saving rate of 20% to 50%； Hotel and conference center: power consumption is 5 million yuan, saving electricity is about RMB 1.15 million per year, saving BiaoMei, 465 tons of CO2 emissions of 1157 tons, energy-saving rate of 18% to 28%；Industrial park: the annual consumption of 5 million yuan, saving electricity is about RMB 1.375 million per year, saving BiaoMei, 556 tons of CO2 emissions of 1383 tons, energy-saving rate of 20% to 35%； Transport hub, annual power consumption of 5 million yuan, saving electricity is about RMB 1.45 million per year, saving BiaoMei, 585 tons of CO2 emissions of 1459 tons, energy-saving rate of 18% to 40%.
	技术占有率：	2% - 4%.
	技术市场潜力：	At present, the construction industry accounts for the proportion of energy consumption by 30%, according to the forecast analysis, to 2020, the building energy consumption in China will account for 35% of the energy consumption of the whole society, will become the first big energy consumption beyond industrial fields。The central air conditioning system accounts for 50% -70% of building

		energy consumption, thus reduce building energy consumption of central air conditioning system, will greatly reduce building energy consumption。According to statistics, China's large public buildings power consumption alone for 90 billion KWH each year, the total area of about 500 million square meters, is the power consumption per unit area was 180 KWH per year, the control system even save 1 KWH/m2, can save a year 500 million KWH。The technology is expected to invest 25 billion yuan to 2020, can form the energy saving of 8 million tce and 18.75 million metric tons of CO2 emission reduction ability.
	技术先进性：	Technology innovation points: the device is based on the load forecasting of frozen water flow dynamic energy-saving control system and the traditional constant voltage or constant temperature control，Its innovation points: 1. The constant pressure difference control and temperature difference control is "fixed value control", setting a constant constants as control target. Load forecasting control is "dynamic control", have no fixed value and dynamic prediction as control target, and real-time correction adjustment, therefore, can achieve the best energy-saving effect.2. The constant pressure difference control and temperature difference control belong to "follow" control, only when the differential pressure or temperature deviation signal, the control system will have a control signal output。Control and load forecasting is a kind of "control" in advance, to predict the load of air conditioning system "in the future time" (cold) and adjust the chilled water flow in advance, effectively solves the large delay, large inertia system control lag issues, eliminate the cold quantity difference between supply and demand and the amount of time, the realization energy output and demand matching.
	技术成熟度：	System consists of monitoring cloud services platform, controls the cloud service platform, terminal acquisition system and PC (or APP).Terminal acquisition system is installed in the client on various equipment, central air conditioning equipment room including central air conditioning host, frozen water pump, cooling water pump, cooling tower fan and so on with various measurement devices, for operation of all equipments, especially the energy consumption situation, and through the remote transmission and software, transmitted to the monitoring of cloud services platform, realize the real-time display on the computer or mobile phone client.By monitoring service platform can fully understand and grasp the air conditioning room operation of all equipments and the energy consumption situation, at the same time can through these data, the energy consumption of central air conditioning system of the whole energy consumption in a comprehensive and objective analysis and understanding.Controls the cloud service platform based on the monitoring platform of data simulation, combined with the expert opinion, formulate corresponding operation strategy, realize the energy saving of central air-conditioning control.
	技术适用性：	Technology is applicable to: international and domestic chain enterprises (such as shopping malls, star hotel), large and medium-sized public buildings, industrial park, transportation hub and other individual or group of buildings energy consumption monitoring, statistics, analysis, and system

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		control. This technique is applied to construction, central air conditioning equipment room is not subject to regional and environmental restrictions. Construction scale in more than 3 square meters.
	技术稳定性：	This technical system for hardware equipment and system for independence, strong anti-interference ability. Main system through professional detection at the same time, has the very high stability.
	技术安全性：	The technology has realized industrialization, and enter the product promotion period. Products with high practicability and form a complete set of equipment is perfect, high market acceptance. Through multiple projects running situation analysis, no customer feedback for technology and equipment.
	成果转化推广障碍：	Obstacles technology popularization and Suggestions: after the reform and opening to the outside countries taking economic construction as the center, about energy consumption can cause can use the customer value. Now as the world in the face of climate change calls for the state on energy conservation and environmental protection policies of stage, and all levels of government attaches great importance to the energy-using enterprises have gradually realize the importance of energy saving and the proportion of energy consumption in the operation and production cost, the importance of the obstacles in improving step by step. Suggestion: standard industry standards and behavior
	知识产权转让：	The central air-conditioning energy saving control system of Pioneer Energy Science and Technology can get five science and technology energy-saving control technology has been the patent for utility model with six technology with software copyright nature: enterprise key technology, process, equipment, implement localization; The introduction of international famous brand components

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	图片说明：	

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: BEIJING KINGTECH CO., LTD

Beijing Kingtech Co., Ltd	**Renewable Energy Technology Achievement (Applied already)**			
	Technical provision unit:	Beijing Kingtech Co., Ltd.	Submission date:	July 29, 2016
	Contact person:	Liu Xinyue	Technical type:	Others
	Tel.:	18001170851	E-mail:	liuxy@ktcn.com.cn
	Technical name:	Energy saving service solution		
	Technical provider:	Beijing Kingtech Co., Ltd.		
	Scope of application:	Environmental protection industry, suitable for high energy-consumption enterprise and energy-scarcity area		
	Brief description of technical:	Overall energy saving reformation design for the enterprise (area) through analyzing present situation of energy consumption. Achieve high energy saving rate as possible while keeping capability		
	Technical information:	Distributed energy resource of natural gas, photovoltaic distributed generation, biochar-based fertilizer poly-generation by biomass gasification power generation, energy saving of motor system, comprehensive utilization of waste heat and pressure, transformation of architectural lighting, transformation of energy saving for street lamp and management and comprehensive utilization of carbon assets		
	Business application situation:	Distributed photovoltaic power generation: Jiangsu 3.3MW Plant Roofing Power Generation Project Carbon assets management and comprehensive utilization: Carbon Assets Project of Jilin Changbai Mountain Forest Industry Group Architectural lighting energy saving transformation Energy Saving Transformation of Tianyi Shopping Mall		
	Service conditions:	Local investment and construction and mature technology.		
	Contact person of business application unit /Tel./E-mail:	Wei Xing 18001321896		
	Investment on equipment:	Our company will invest the whole earlier stage, as the case may be		
	Expense of operation maintenance:	Employees of our company will maintain for free during the contract period		
	Investment payback period:	8-10 years		
	Other earnings:	Reduce corporate energy consumption, improve corporate image and realize clean development		

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Technical occupancy:	Ranked the country's leading level, at top 10%.
Market potential of the Technical:	With the reducing of fossil energy, new energy-using mechanism and energy situation will replace the original non-renewable fossil energy gradually. New renewable and clean energy will become a mainstream gradually.
Technical advancement:	International energy structure transition is an irresistible trend, and its technology and technique takes the leading position in new energy field by unceasing improvement
Technical maturity:	Able to realize engineering approach, practical utilization and stable project operating.
Technical applicability:	Environmental protection industry, suitable for high energy-consumption enterprise and energy-scarcity area
Technical stability:	Technology in related field is mature and advances steadily
Technical safety:	At present, all projects are operating stably, and no accident has occurred
Obstacle in achievement transformation and promotion:	Change of local polity and corporate financial condition
Transfer of intellectual property:	
Photo caption:	  Tianyi Shopping Mall

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Chengdu Sanwayao Thermal Power Co., Ltd.

Photos after retransformation

Comparison between high pressure sodium lamp and LED lamp in a same road

After transformation Before transformation

Installed capacity: 800KW
Theoretical electric energy production for 25 years: 20,210,000 KWh
Theoretical standard coals saved for 25 years: 8,075t
Theoretical carbon emission reductions for 25 years: 21,000t

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Installed capacity: 1.2MW
Theoretical electric energy production for 25 years: 26,842,000KWh
Theoretical standard coals saved for 25 years: 10,700t
Theoretical carbon emission reductions for 25 years: 26,800t

Installed capacity: 3.3MW
Theoretical electric energy production for 25 years: 70,724,300 KWh
Theoretical standard coals saved for 25 years: 28,200t
Theoretical carbon emission reductions for 25 years: 70,500t

Installed capacity: 200KW
Theoretical electric energy production for 25 years: 5,050,000KWh
Theoretical standard coals saved for 25 years: 2,260t
Theoretical carbon emission reductions for 25 years: 5,633t

Renewable Energy Technology Achievement (Applied already)			
Technical provision unit:	Beijing Kingtech Co., Ltd.	Submission date:	July 28, 2016
Contact person:	Liu Xinyue	Technical type:	Solar energy utilization technology
Tel.:	18001170851	E-mail:	liuxy@ktcn.com.cn
Technical name:	Distributed photovoltaic power generation		
Technical provider:	Beijing Kingtech Co., Ltd.		
Scope of application:	Industrial enterprise, transportation field, communication field, petroleum, ocean, meteorological field, photovoltaic power station		

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	Brief description of technical:	Solar photovoltaic power generation is to convert luminous energy into electric energy by using solar cell module and electronic characteristic of semiconductor materials
	Technical information:	It is composed of three major parts of solar panel (components), controller and inverter, and the major components are constituted by electronic parts and components.
	Business application situation:	Jiangsu 3.3MW Plant Roofing Photovoltaic Power Generation Project, Jiangsu Jiurong 200KW Roofing Photovoltaic Power Generation Project, Beijing Chaoyang Chuji Ceramic Market 800KW Roofing Photovoltaic Power Generation Project, Huizhou 1.2MW Plant Roofing Photovoltaic Power Generation Project
	Service conditions:	Kingtech distributed photovoltaic power generation system adopts energy management contract model ,that is, the photovoltaic power generation project will be invested, established and maintained in local after the field investigation, calculation and design by technicists of our company, and benefits will be paid back by stage after the project goes into operation. The technology has matured at present, and has demonstration projects all over the country.
	Contact person of business application unit /Tel,/E-mail:	Wei Xing Contact information: 18001321896
	Investment on equipment:	About RMB 9 /W at home (including equipment and construction cost, etc.)
	Expense of operation maintenance:	Maintenance for free within contract period (excluding waterproof construction of Party A)
	Investment payback period:	8-10 years
	Other earnings:	Reduce corporate energy consumption and discharge capacity, and improve corporate image
	Technical occupancy:	The largest photoelectricity market in China is still the communication field whose market share is about 50%, including microwave relay station, satellite communication ground station, satellite TV receiving transposer system, spc telephone exchange, troop communication station, etc. Through endeavor during the ninth Five-Year plan and with the demonstration and promotion of various cooperative projects at home and abroad, the application field of photovoltaic power generation in remote and border areas has been enlarged further. Including photovoltaic power stations and photovoltaic power systems, its market share has been increased from about 20% to 30% and above.
	Market potential of the Technical:	Photovoltaic power generation belongs to the clean renewable energy, so that the development and wide application of photovoltaic technology plays an important part in alleviating shortage of conventional energy and reducing environmental population. Considering either from energy or environment, photovoltaic power generation will enter into electricity market as the alternative energy finally. Once the cost of photovoltaic power generation reduces below $2/W, it will be applied in larger scale and commercial demand of grid-connected power generation will come true.

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	Technical advancement:	Electric-generation principle of photovoltaic power generation is to convert light into electron directly, with no middle process and mechanical motion, which means that there will be no combustion and population in the process, and it is simple to generate electricity. From this view, generating efficiency of this technology is very high.
	Technical maturity:	The relatively mature markets in China include communication field, some industrial fields, rural electrification and commercialized power supply in remote and border areas. By the end of 2000, the annual output of solar battery in China has reached up to 3MWp, and accumulated utilization to 19MWp. In the future 10 years, it will be developed greatly. It is estimated that by 2010, the annual output of solar battery in China will reach up to 30MWp, and accumulated utilization to 200MWp. The potential markets of photovoltaic power generation include roofing grid-connected generation system, large hybrid power generation system, electric car charging system, solar photovoltaic hydrogen generating system, and some special commercialized power supply.
	Technical applicability:	The application scale of distributed photovoltaic power generation: It can be built in rural area, pasturing area, mountainous area, developing cities in small, medium and large size, or nearby commercial district, to resolve the electricity demand of local users. It is unlimited by the resource distribution area, and can take advantage of building roof; for example, areas without electricity and areas with complex topography
	Technical stability:	Solar energy resource in China is very rich, and its theoretical reserve is equal to 1.7 trillion tons of standard coal annually. Development and utilization of solar energy resource has a very vast potential. Photovoltaic power generation industry of China started form 1,970s, and entered into stable development period in 1,990s. The output of solar battery and component increases steadily year by year. Through 30-year endeavors, it has ushered in a new stage of rapid development. Driven by the national programs like the pilot projects of Brightness Program, Township Electrification Program and world photovoltaic market, the photovoltaic power generation industry of China has developed rapidly.
	Technical safety:	① Without exhaustion risk ② Safety and reliable, without noise, pollutant discharge, and public nuisance ③ It is unlimited by the resource distribution area, and can take advantage of building roof, for example, areas without electricity and areas with complex topography ④ Generate and supply power without fuel consumption and electric transmission line; ⑤ High quality of energy;
	Obstacle in achievement transformation and promotion:	Problem with profit model of photovoltaic power generation, problem with electricity price subsidies differentiation of photovoltaic power generation, problem with grid connection of photovoltaic power generation
	Transfer of intellectual property:	
	Photo caption:	

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		 Installed capacity: 1.2MW Theoretical electric energy production for 25 years: 26,842,000 KWh Theoretical standard coals saved for 25 years: 1.07t Theoretical carbon emission reductions for 25 years: 26,800t  	Installed capacity: 800KW Theoretical electric energy production for 25 years: 20,210,000 KWh Theoretical standard coals saved for 25 years: 8,075t Theoretical carbon emission reductions for 25 years: 21,000t  Installed capacity: 3.3MW Theoretical electric energy production for 25 years: 70,724,300 KWh Theoretical standard coals saved for 25 years: 28,200t Theoretical carbon emission reductions for 25 years: 70,500t Installed capacity: 200KW Theoretical electric energy production for 25 years: 5.05million KWh Theoretical standard coals saved for 25 years: 2,260t Theoretical carbon emission reductions for 25 years: 5,633t

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: CHINA SHIPBUILDING IT CO., LTD.

China Shipbuilding IT Co., Ltd.	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technical provision unit	China Shipbuilding IT Co., Ltd.	Submission date	July 31, 2016
	Contact person	Liu Yan	Technical type	Wind energy utilization technology
	Tel.	18721508258	E-mail	Liuyan@csit.net.cn
	Technical name	Intelligent building energy comprehensive management and control system		
	Technical provider	China Shipbuilding IT Co., Ltd.		
	Scope of application	China Shipbuilding IT Co., Ltd.		
	Brief description of technical	It mainly aims at the state organ office building and large public building energy consumption monitoring system construction, realizing the separate measurement, real-time monitoring, statistics and dynamic analysis of the public institution energy resource (water, electricity, gas, heat, cool and renewable resource) consumption; Improve informatization and refinement level in terms of energy saving management in public institutions, practically reduce resources consumption, and achieve the comprehensive management goal of cost reduction, efficiency increase, energy saving and emission reduction.		
	Technical information	Energy consumption data collector configuration: CPU 700 MHZ, onboard memory 512M, SD card 8G, 2 USB 2.0 interfaces, 8 COM ports, 10W power, size 270*135*43.6mm		
	Business application situation	Beijing Governmental Affairs Center, Beijing Liuliqiao, water, heating power, gas, electric power, environmental monitoring, intelligent lighting control, collection monitoring for over 500 collecting points		
	Service conditions	Beijing Governmental Affairs Center Du Zhibin 010-83734390		
	Contact person of business application unit /Tel./E-mail	Market trade, it is a mature technology; for newly built building, system installation and commissioning shall be done together with general contractor for light-current system; for reconstructed project, integrated design, construction and installation shall be implemented. Based on B/S structure, easy application, low maintenance cost during later period		
	Investment on equipment	Depending on scale of project investment, newly built building requires instrument, collector, equipment, system software, 485 cables and other cables and installation accessories etc. Scale-based building uses the product investment for about RMB 1 million. Reconstruction of existing equipment investment of building will increase construction reconstruction cost of existing building, and investment scale shall be confirmed based on current condition of building.		

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	Expense of operation maintenance	The information-based system has extremely low consumption; in terms of labor cost, it only requires addition of one system energy administrator with monthly salary of RMB 8,000, which excludes the labor investment such as meter reading and inspection; calculated based on RMB 5,000 per person, it can at least save working cost for 10 persons and in general, it can save labor cost of over RMB 40,000. Information-based system equipment shall be used based on 10-year depreciation, and repair cost as well as administration cost is extremely low.
	Investment payback period	Energy using efficiency of the building can be improved through energy-saving management, building energy consumption can be saved, and investment payback period is about 3-5 years.
	Other earnings	It conducts energy using analysis through energy consumption management and control system. In case of unreasonable energy using equipment, it shall improve equipment using management, monitor equipment, increase refinement management of energy using equipment, adjust energy using structure of building, increase equipment utilization rate, optimize composite structure, and achieve peak shaving and load shifting in respect to energy load.
	Technical occupancy	It has wide using prospect in building industry, especially the shipping industry, for example, Longxue Shipyard, Huangpu Shipyard, Hudong Shipyard. In energy consumption management and management and control system in ship making industry, market share reaches over 80%, and meanwhile, it is also used in public building field (Beijing Governmental Affairs Center).
	Market potential of the Technical	The technique is promoted in industry or filed until 2020, and market scale can reach RMB 100 million; meanwhile, market drives auxiliary solution, and relevant product's market scale can reach RMB 1 billion.
	Technical advancement	For energy consumption management and control system, our advanced energy management and control technique is used so as to manage energy consumption of each equipment inside the building in a centralized manner through information integration treatment; the technique used has applied for multiple national patents and software copyrights, and energy consumption management and control system technology has been among advanced level in China.
	Technical maturity	Various energy metering equipment (metering equipment for water, electricity, gas, cold resource, hot resource or renewable resource), wireless network technology, wired network technology, database technology, industrial control technology and computer software technology. Summarize energy information, calculate, analyze and figure out in scientific mode the energy-saving operation and guidance report. Exploit energy-saving potential in scientific mode; comprehensive energy management and control system will achieve energy in subjective and objective control mode according to analysis data, to finally help enterprise reach energy management, energy saving, emission reduction and reduced cost.
	Technical applicability	The technology considers the universality of building energy consumption, and during system design, modular design is adopted, as well as multiple information integration technology is used; in terms of system use, it is little affected by factors like region, scale, environment and resources, etc.

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	Technical stability	The technology can keep stable during running process, and is little affected, uses domestically advanced server, and meet domestic environmental protection requirements; during its usage, interference is little.
	Technical safety	Building stocks of China are 50-60 billion m2, and quite a number of stocks are high-energy-consumption building; as area of newly built building each year is 2 billion m2, energy consumption of building accounts for nearly 40% of total energy consumption. Energy, as basis of human existence and development, is more and more used as rare resources, along with high-speed development of social economy. As clearly mentioned in *12th Five-Year Building Energy-saving Special Planning*, By the end of 12th Five-year plan, in terms of building energy saving, it can form 116 million tons of standard coal energy-saving capacity. Hence, energy consumption faces unprecedented pressure and challenge in the issue of energy using. So it has great practicability in accordance with national policy, perfect supporting facilities, high acceptability in market and lower risk.
	Obstacle in achievement transformation and promotion	It needs to deal with rapid deployment implemented in site, reduce implement cost, and improve efficiency. No policy barrier, no capital constraint.
	Transfer of intellectual property	With proprietary intellectual property rights in China, distributed real-time data collection and monitoring system own the patent. Technology-owner is enterprise. Equipment made in China with 100% is the enterprise's own technology with diversified flexible access.
	Photo caption	

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: CHINA SHIPBUILDING IT CO., LTD.

	  	

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: CHENGDU TUNGHSU LIGHTING TECHNOLOGY CO., LTD

Chengdu Tunghsu Lighting Technology Co., Ltd	**Project Application of Renewable Energy Technology**			
	Technical Term:	Lighting Technology of Electrodeless Lamp	Company：	Chengdu Tunghsu Lighting Technology Co., Ltd
	Contact:	Mei He	Date：	2016.7.29
	Technology Type:	Energy-saving	Technology：	smart system, high efficiency and energy saving
	Mob:	15982386834	Email:	-
	Patent and capacity of engineering design and construction	32 Patents, and the R&D department has the ability to do research and development, design, production, and installation.		
	Applications	It's suitable for the illumination of major roadway, highway, parking lot, factory, tunnel , construction, office and commercial.		
	Technical Notes：Principle,function,features & key equipment	The electrodeless induction fluorescent lamp, more commonly known as an "induction lamp", is based on Faraday's principle of electromagnetic induction and possesses a structure similar to a transformer.The energy is coupled from the primary coils to the secondary ring formed by plasma, resulting in a high luminous efficient lighting source with a long lifespan.The innovation is that there is no electrode while the energy is coupled to the lamp through a high frequency induction magnetic field.The buffer gas inside the lamp is excited by the magnetic field and turned into plasma.When the excited plasma atoms return to their ground state, they radiate 254nm UV light, which is converted into visible light by a tri-phosphor coating on the inner glass surface, much in the same manner as fluorescent lamps.This new technology solves the problems associated with electrode-aging, resulting in a maintenance free lamp with a long lifespan. Features： 1、Long lifetime: Average lifetime 100,000 hours, maintenance free, suitable for long term usage. 2、Energy-saving and environment protection. 3、High-frequency operating: Comfortable, flickering free lighting for eyesight protection 4、High color rendering index: ≥80		

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		5、High cost performance. Key Equipment：AI PANASERT、AOI、Reflow Soldering Equipment
	Technical Information：technical parameters and equipment volume	Power: from 10w-400w; Product Series: internal induction lamp, external induction lamp, self-ballast;Main Shape: circular, rectangular, olive. All production equipment are in large volume.
	Commercial Applications	Mamaya Project: Guizhou Beipanjiang Electricity Co., Ltd / Contract Amount 1.92 million yuan. The project works well. Sichuan New Energy Car Production Base project: Sichuan Fulin Industrial Group Co., Ltd - Commodity Trade Branch / Contract Amount 2.6 million yuan. The project works well.
	Brief Outline for Service	Market transactions; Mature technology; Training-free; Easy installation, convenient use, low maintenance cost.
	Customers:	Enya Mao/085189218953/18911072159@163.com Duoshu Wen/ 0816-2537900/jt@fulingroup.cn
	Equipment Investment	Phase 1 project has been finished with 550 million yuan investment, built 7 production lines with annual capacity of 100 million sets induction lamps.
	Maintenance Cost	Energy Consumption Analysis：Material cost 600 yuan / pc; water and electricity cost 30 yuan / pc, wages and welfare cost 100 yuan / pc; depreciation, amortization, and manufacturing expense 60 yuan / pc. Unit cost 790 yuan. Management and repair cost 10 yuan / pc.
	Payback Period	It will take 6 years to repay the original investment by the net income produced with the technology of inductively coupled electrodeless fluorescent lighting from year 2011.

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: CHENGDU TUNGHSU LIGHTING TECHNOLOGY CO., LTD

	Extra Income	As far as conventional lighting is concerned, induction lamps have incomparable advantages on performance and price. At present, the induction lamps are mainly used in engineering lighting area, which can completely replace conventional mercury lamps, sodium lamps, and metal halide lamps. Using a 150W induction lamp (system power watt: 150W) to replace a 250W high pressure sodium lamp (system power watt: 300W), and lighting for 10 hours per day, the electricity can be saved by 50%. With life span of 60000 hours, each induction lamp can save 9000 KWhs,RMB 7200 yuan (base on 0.8 yuan / KWh). If we promote 30 million pcs induction lamps per year, we can save electricity 16.4 billion KWhs and reduce emission of carbon dioxide 16.4 million tons, sulphur dioxide 164000 tons.
	Technology Occupancy	In year 2010, there were 63 million metal halide lamps, 54.41 million high pressure sodium lamps, and 56.24 million high pressure mercury lamps. It's total about 1.7365 trillion pcs of high pressure gas discharge lamps in domestic market. Even if 20% institute, 30 million pcs induction lamps will be needed. The market will finally become occupied by only three lamps, the hight pressure discharge lamps, LED lamps and induction lamps. Actually, by the end of year 2012, the production of induction lamps has been reached 10 million pcs in domestic market, in which, 45% has been exported overseas, saving electricity 5.4 billion KWhs, reducing emissions of carbon dioxide 5.4 million tons, sulfur dioxide 54 thousand tons. If estimated by annual growth rate of 40%, the production of induction lamps will be 27 million pcs in domestic market in year 2015, which will save electricity 14.8 billion KWhs, reduce emissions of carbon dioxide 14.8 million tons, sulfur dioxide 148 thousand tons.

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: CHENGDU TUNGHSU LIGHTING TECHNOLOGY CO., LTD

	Market Potential	In year 2011, China's general lighting market was about 81.4 billion yuan, accounted for about 17.5% of global market. By year 2016, the market will reach about 127.4 billion yuan, account for 20.8% of global market. The compound growth rate from year 2010 to 2016 was 13%. China's general lighting market covers various categories. According to date, fluorescent lamp shared 42%, energy-saving lamp shared 18%, and high pressure gas discharge lamp shared 17%, the rest was filled by LED lamps, halogen lamps, incandescent lamps, induction lamps and etc. Currently, the lighting accounts for 19% of global electricity consumption, and 13% of China's electricity consumption, so it's quite possible to achieve the goal of energy conservation and emissions reduction. In year 2012, China consumed total 4.9591 trillion KWhs of electricity, in which, 644.7 billion KWhs was consumed by lighting, exceeded the total power generation of 7 times of the Three Gorges Hydropower Station, equal to standard coal of 225.645 billion tons, carbon emissions of 169.233 billion tons.
	Technology Advantages	1、Long lifespan due to the lack of electrodes 2、The induction light is a gas discharge lamp in which the power required to generate light is transferred from outside the lamp envelope to the gas inside via an electric or magnetic field, in contrast with a typical gas discharge lamp that uses internal electrodes connected to the power supply by conductors that pass through the lamp envelope. More energy-saving 3、Very high energy conversion efficiency of between 62 and 90 Lumens/Watt [higher power lamps are more energy efficient]; 4、No EMI 5、No EMC, can meet GB17743——2007.
	Technical Maturity	The Induction lighting technology takes the lead in the world, with with mature product structure and process and stable product quality. A sound knowledge of induction lamp technology and manufacturing process is mandatory. All production equipment are maed in China. And the we can source all raw material in China.The induction lighting technolgy got the world wild recognition. Induction lamps are accepted by the world.

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: CHENGDU TUNGHSU LIGHTING TECHNOLOGY CO., LTD

	Technology Security	1. According to the the working principle of induction lamp, the basic condition of light generation was to stimulate mercury atomic to energy level transition by resonance. If high voltage start design was not good, induction lamp may not work in abnormal or bad working environment. We use one frequency scan technology to find the best resonance to motivate high enough voltage by one or more times, so as to sovle the problem of lighting start failure. 2. Induction lamp can not be 0-100% linear dimming, because the luminance and power are depend on the frequency and voltage caused by resonant circuit. But we could do linear dimming at a certain brightness by intermittent PWM mode, and the depth of dimmer can reach 50%. It has a large prospect in applications of high bay, road, tunnel, landscape, and etc. 3. The R&D of induction lamp involves a very wide range of fields, such as electronic power, magnetism, plasma science, microelectronics, optical, etc that requires the corresponding experts to join together to complete. Our comany has sufficient technological resources, and invests a lot of human resources to do deeply research, and we also combine Electronic Science and Technology University to sign Production-Study-Research cooperation agreement to make induction lamps more and more energy efficient.
	IPR	1.We already got 32 patents for induction lamp。 2.Baoshi Group lightened the first induction lamp in China, in 1998. Tunghsu Group acquired Baoshi Group and kept the induction lamp production. Tunghs group improve and deveop the induction technology, and right now we already have been a large-scale and multiple high-tech industry group which has proprietary intellectual property rights and core technology.
	Pictures/Project	
	Attachments	TUV、CCC

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: SICHUAN ZHONGBAOLI SCIENCE & TECHNOLOGY CO., LTD

Sichuan Zhongbaoli Science & Technology Co., Ltd	**Renewable Energy Technology Achievement (Applied already)**			
	Technology provision unit	Sichuan Zhongbaoli Science & Technology Co., Ltd.		
	Contact person	Tian Huaihui	Submission date:	July 29, 2016
	Technology type	Others	Specific technology:	Others
	Tel.	13688011519	E-mail	1060941999@qq.com
	Technology name	Zhongbaoli energy-efficient LED lamp (the latest)		
	Technology provider:	Sichuan Zhongbaoli Science & Technology Co., Ltd.		
	Scope of application	The transformation of the traditional sodium-vapor streetlamps, residential lighting, industrial lighting		
	Brief description of technology	The integrating application of the many patents of fluid circuit heating dissipation, ensure that the LED products achieve 75% - 85% of high efficiency and energy saving, more than 10 years of service life, the dissipation materials only equivalent to about 30% of other similar LED lamps, hence a lot of material are saved for the country, pushing to promote energy-saving emission reduction.		
	Technical infomation	1,000 hours luminous decay is less than 0.1%, and the luminous efficiency has reached up to 160LM/W		
	Business application situation	1. For the energy-saving transformation of 80 sodium-vapor lamps on Jiudu Road, Renhuai City, Guizhou, replace traditional sodium-vapor lamp (400W) with Zhongbaoli LED lamp (170W) and traditional sodium - vapor lamp (250W) with Zhongbaoli LED lamp (120W), by which the energy-saving rate has reached up to 76%.		
	Service conditions	With the capital, technology, package installation and maintenance from our company, the technology is mature.		
	Contact person of business application unit /Tel./E-mail	Renhuai Urban Administrative Bureau, contact person: Bureau Head Li, Tel.: 13985649193 Dongshan Hongfan Photoelectric Technology Co., Ltd, Kunming Changshui International Airport Project, contact person Li Changxing, Tel.: 15922926788		
	Investment on equipment	The amount of investment for ten thousand streetlamps is RMB 100 million.		
	Expense of operation and maintenance	Expense of operation and maintenance only accounts for 5%-10% of the annual electricity consumption.		
	Investment payback period	The investment payback period of 12-year contract energy management is 3-5 years.		
	Other earnings	Reduce the power consumption, thereby reduce carbon dioxide emissions, as well as the use of coal, the weight of the streetlamp is light, and the use of aluminum is saved.		
	Technology occupancy	There is almost no other LED streetlamps with the same power abroad that can achieve light efficiency, light weight, temperature rise and life as the products of the company, but due to local		

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: SICHUAN ZHONGBAOLI SCIENCE & TECHNOLOGY CO., LTD

		protection in the past in different regions, xenophobia, good and bad mix of products of so-called 'big enterprises" and other reasons, they failed to achieve 50% of the expected China's market share, but this goal will gradually be realized.
	Market potential of technology	Because the product is in the leading position at home and abroad, the market potential will be close to 50%.
	Technical advancement	One of the problems of LED application is heat dissipation and ensure that the operating temperature of the chip is below 75℃, due to the company's patente technology, the fluid circuits on the surface of the radiator, so that the operating temperature of the chip is lower than 65℃; And at the same time, we use the power supply with efficiency up to 95%, safe voltage differential, unique technology system of differential lightning, and division of power supply and electric control, so that the products can achieve high luminous efficiency of 160LM/W, a long life for 10 - 15 years, ultralight (the consumption of aluminum per W is only 20g-30g) and ultralow operating temperature (temperature rise is less than 18℃).
	Technical maturity	100%
	Technical applicability	Be widely used in public lighting, industrial lighting and civil lighting.
	Technical stability	100%
	Technical safety	100%
	Obstacle in achievement transformation and promotion	Local protection, good and bad mix of products of "big enterprises" in the market
	Transfer of intellectual property	Li Changxing, chief engineer of the shareholders has more than 100 patents, of which the technologies of two practical patents have been put in the company.

TECHNOLOGY: ENERGY EFFICIENCY
COMPANY: SICHUAN ZHONGBAOLI SCIENCE & TECHNOLOGY CO., LTD

	Photo captions	
		

TECHNOLOGY: GASIFICATION
COMPANY: HEFEI DEBO BIOENERGY SCIENCE & TECHNOLOGY CO., LTD

Hefei Debo Bioenergy Science & Technology Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Hefei Debo Bioenergy Science & Technology Co., Ltd.	Submission date	June 17, 2016
	Contact person	Wu Yinlong	Technology type	Biomass energy utilization technology
	Tel.	15856905896	E-mail	Zhaolixin5092@qq.com
	Technology name	Biomass gasification power generation		
	Technology provider	Hefei Debo Bioenergy Science & Technology Co., Ltd.		
	Scope of application	Hefei Debo Bioenergy Science & Technology Co., Ltd.		
	Brief description of technology	Biomass generates gas in the gasification furnace, and gas goes into the internal combustion engine to generate power after purification. Use a variety of biomasses, including rice husk, straw, wood chips, wood, and shell. Key equipment is: The raw material pretreatment equipment, gasification furnace, purification equipment, internal combustion engine generating unit.		
	Technical information	1.2kg biomass raw material is needed for each KWh, and 1,000kW unit takes up the area of 500m^2.		
	Business application situation	Gasification power generation of 1MW rice husk (2011 Burma) Gasification power generation of Guodian Changyuan 10MW biomass (2011 Jingmen, Hubei) Gasification power generation of 2MW rice husk (2009 Shanggao, Jiangxi)		
	Service conditions	Debo Company assists the demand party for contacting, contact person Zhao Chengwu, tel. 18656157987.		
	Contact person of business application unit /Tel./E-mail	Market trade: Mature technology, more than 80 sets have been domestically and internationally run; The operation training shall be conducted at the initial stage of use, accompanied by a complete operating procedures for study; 1,000kW equipment costs RMB 6.5 million, and the domestic installation costs; 10% of equipment price, annual use and maintenance costs; 8% of equipment price;		
	Investment on equipment	1,000kW gasification power generation system (from the stokehole silo to the outlet cabinet of the generator), the investment of the equipment is RMB 6.5 million.		
	Expense of operation and maintenance	1,000kW rice husk gasification power generation project Numerical values of projects in the following serial numbers Remarks 1 Raw materials cost RMB 2 million /a Integrated price of furnace entry RMB 200 /t		

TECHNOLOGY: GASIFICATION
COMPANY: HEFEI DEBO BIOENERGY SCIENCE & TECHNOLOGY CO., LTD

		2 Water charge RMB 30,000 /a 3 Labor cost RMB ten thousand / Per capita wage RMB 3,500 / month 4 Depreciation and maintenance cost RMB ten thousand /a60 6 Management fee RMB 200,000 /a 7 Electricity revenue RMB 6.3 million /a Power for personal use is deducted 8 Extracting solution income RMB 300,000 /a 9 Biomass carbon income RMB 200,000 /a 9 Total earnings RMB 3.55 million /a
	Investment payback period	Investment payback period: 24 months
	Other earnings	Through the gasification power generation technology, the additional hot water, steam, biomass carbon, extracting solution and so on can be obtained; Hot water of RMB 20 / ton, steam of RMB 120 / ton, biomass carbon of RMB 1,200 & 3,500 / ton and extracting solution of RMB 500 / ton.
	Technical occupancy	Gasification power generation occupies 30% of the market share of domestic gasification power generation.
	Market potential of technology	With the demand on energy from social development, the use of biomass energy is gradually increased, and biomass gasification power generation will double based on the original base in 2020.
	Technical advancement	Gasification furnace designed and produced by Debo Company: Be suitable for a variety of biomasses, including rice husk, straw, wood chips, wood, and shell. The water content of the biomass is required to be low, and the water content of the biomass can reach up to 35%; The gasification process is environmentally friendly, and no waste is produced. Design and produce the largest biomass gasification hybrid power generation equipment in Asia, which belongs to the leading level in the international and domestic field of gasification power generation.
	Technical maturity	Raw materials enters into the gasification furnace through the feed system to undergo pyrolysis and gasification reaction to generate biomass gas, and after purification, the gas goes into internal combustion generator for generating electricity; Equipment model shall be determined according to the process and equipment selection calculation; The gasification and power generation system is controlled by PLC or DCS, with high integration and improvement.
	Technical applicability	Technology promotion requires rich biomass resources; The demand for the market of gasification furnace products (electricity, biomass carbon, extracting solution, hot water, steam) is large, which is convenient for sales; Technology is not limited by region, scale and environment.
	Technical stability	Technology in the engineering runs stably, and there are more than 80 sets of projects running at home and abroad; The water content of biomass has a great influence on the quality of the gas, and the unit capacity needs more biomass with high water content.
	Technical safety	Gasification power generation: Power is used for autonomous power supply of the factory or grid connection; Perfect supporting facilities (gasification equipment, purification equipment, power

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		generation equipment, and power grid equipment); With the requirements of the energy policy and environmental policy, gasification power generation is rapidly being accepted by the market.
	Obstacle in achievement transformation and promotion	Debo Company solves the problems encountered in gasification power generation technology; National policy supports biomass gasification power generation, and advocates the use of renewable energy; The running of this project is based on rich biomass resources; Compared with other power generation equipment, there is less capital investment and shorter recovery cycle; The integration of gasification power generation equipment is high, the operation is simple, maintenance is convenient and the cultivation of talent is very fast.
	Transfer of intellectual property	Debo Company has more than 50 patents, more than 10 patents for invention (those that have been available and have been substantively reviewed) and more than 40 new practical patents; Technology is owned by Hefei Debo Bioenergy Co., Ltd.; Gasification furnace equipment is completely made in China, and supporting valves, motors, electrical components and other parts are imported. Technology is owned by the company which can authorize for use and the authorized channel is smooth.

TECHNOLOGY: GASIFICATION
COMPANY: HEFEI DEBO BIOENERGY SCIENCE & TECHNOLOGY CO., LTD

	Photo captions	 

TECHNOLOGY: GASIFICATION
COMPANY: LIAONING INSTITUTE OF ENERGY RESOURCES

Liaoning Institute of Energy Resources	**Renewable energy technology achievement declaration**			
	QR code			
	Technology providers	Liaoning Institute of Energy Resources	Submission date	2016-06-23
	Contact	Jiankun Liu	Technology type	Biomass energy utilization technology
	Telephone	18804176616	E-mail	nmgljk@163.com
	Technical name	Distributed biomass gasification power generation technology		
	Technology provider	Liaoning Institute of Energy Resources		
	Applicable scope	Liaoning Institute of Energy Resources		
	Technology brief description	The processed biomass (natural drying, truncation) produced crude gas by gasification reactions in the gasifier. Remove the tar, particulate matter, dust and water of the crude gas in the purification system. After purification the gas was gone into the gas tank by the Roots blower. The gas which was in the gas tank was sent to the gas generator to generate electricity.		
	Technical information	Raw material consumption: 50kg/h-1500kg/h; Generating capacity: 100kWe-1000kWe; Produced gas tar and ash content: >20mg/Nm^3; Equipment size: 6m*6m*12m.		
	Business applications	A 300kWe biomass gasification power generation projects is normal operation in the Shichang group in Phnom Penh, Cambodia.		
	Business applications company the contact/Tel/E-mail	Shichang Group Cambodia Development Co., Ltd. Changwu Yang; Tel: 012496563		
	Conditions of Use	Construction can be built locally, and also can be market transactions. Technology and equipment have reached the international advanced level and technology is mature. The project managers and operator need to be trained when using it. System installation, use and maintenance costs account for 10% of the total project cost.		
	Equipment investment	The generating capacity of biomass gasification power generation project is 500kWe as an example. Major equipment includes a truncated equipment, gas equipment (Including gasification, gas purification equipment), gas tank, generator sets, and pipeline and auxiliary attachments which is needed by the operation of the project. The total investment is about 4 million.		
	Operation and maintenance costs	During normal operation, raw materials, water, electricity and other costs per unit of product consumed and the cost of labor charges (wage) required to calculate the actual local situation. Equipment maintenance costs, including depreciation, repairs, management fees, etc. accounts for about 10% of total equipment investment, under normal circumstances.		
	Payback period	Payback period is generally about 8 years.		

TECHNOLOGY: GASIFICATION
COMPANY: LIAONING INSTITUTE OF ENERGY RESOURCES

	Other income	With this technology, the biomass was translated into clean bio-gas for power generation. And the tar can be recycled.
	Technology share	Biomass gasification power generation technology research started late at home. It compared with foreign countries is still lagging behind. Present biomass power generation is mainly direct combustion and large-scale. On the whole, domestic biomass power generation field, distributed biomass gasification power generation system developed by my company accounted for 30% of the total market share.
	Technology market potential	As the fossil energy shortages and environmental problems highlight, to seek and use of clean renewable energy resources is a global issue of common concern. Biomass resources as the only renewable carbon resources, more and more attention has been paid. Distributed biomass gasification power generation technology has some features, as small, flexible, and mature technology. And it can be not restricted by the power grid, and can be produced for own use. Especially in the area where the biomass resources are rich and the electricity is lack, its market potential is huge.
	Technology advancement	The technology was developed cooperatively by the China and Italy international cooperation project which our company undertook during "the ninth five-year". After years of market applications and testing, it has formed a biomass gasification power generation technology and key equipment, which is suitable for China's raw materials and regional characteristics and has independent intellectual property rights. As one of the company, which carries out the biomass energy utilization technology firstly at home, we have been committed to the research and promotion and development work in this field over the years. Through years of technological improvements and product optimization, the technology and key equipment has reached the international level of similar technology and has been the leading position in the domestic similar technology.
	Technology maturity	The processed raw material (natural drying, truncation) is fed into the downdraft gasifier by the lift bucket feeder and transformed into crude gas by gasification reactions. Firstly, remove the large particles of dust from this crude gas in the cyclone. Secondly, remove tar and fine ash from gas and make gas temperature drop below 35 ℃ in the dual role of spray washing and indirect cooling in the spray purifier. Thirdly, further remove the residual tar and water through the biomass filter. After purification, the tar and ash content of the gas is less than 20mg/Nm^3, and the heat value is about 5000 kJ/Nm^3. Finally, the gas is passed through the blower into the storage tank. Through Regular feeding and continuous ash removal system to ensure continuous operation. Biomass gasification gas has a certain fluctuation. Balancing role of gas storage tank ensures the consistency and uniformity of the gas inlet side of the gas generator. At the same time, gas cabinet's constant counterweight ensures constant air sending pressure and gas generator inlet pressure. The stable gas composition and pressure ensures gas generator stable and reliable operation.
	The suitability of technical	Distributed biomass gasification power generation technology with a wide range of application, it can be applied to countries and regions which has adequate feed stocks and it also can be used to replace the

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COMPANY: LIAONING INSTITUTE OF ENERGY RESOURCES

		use of fossil fuels and use with a large power grid. The use of this technology can be mitigated to a large extent to environmental problems from fossil fuels and it also can be used to remote countries and areas of resource-poor for power. We can through the situation of distributed power generation to solve the problem that the use of electricity for residents for and production .The technology is not influenced by region and environmental, but we decide the size of its construction must be based on the local resources of biomass.
	The stability of technical	The most important parts of this technology is manufacturing gas, purification and the production of power. The gasification technology of fixed bed has a long time and the technology is mature. The gas from air gasification has calorific value basic around 5000kJ/Nm^3, when the gas through the system of cyclone dust, water washing and filtering, the tar and ash in gas less than 20mg/Nm^3, that will be satisfied with the demand of feed gas for gas generator. It is mature for the production technology of generator both in foreign and domestic and it can be fully guaranteed the normal and stable operation of system.
	The security of technology	The power generation technology of distributed biomass gasification is mature, especially practical in the countries and regions of resource-rich and power scarcity; through the development and improvement in dozens of years for the field of biomass, facilities have been gradually improved and even mature. The use of biomass utilization has zero pollution to the environment, and it also can be used to replace the use of fossil energy, years of experience can prove that the market has been accepted and we can vigorously promote the development of biomass energy technology in the future.
	The obstacles of achievements promotion	The application and promotion of the power generation technology of distributed biomass gasification has been improved in technical level. The main problem is the affecting of material properties, collection, transport, storage and so on. This is the reason why relatively high production is cost, so it needs the support of some policy and financial from government.
	The transfer of intellectual property rights	The technology with independent intellectual property rights, and obtain one relevant patents and two practical new type patents, the owner of this technology is state-owned enterprise: The key link, process and equipment of this technique has been realized the localization of completely. Technology has side and demand side has been able to transfer of technology through rational negotiation.
	The picture shows	

TECHNOLOGY: GASIFICATION
COMPANY: SHENGLI OILFIELD SHENGLI POWER MACHINERY GROUP CO., LTD.

Shengli Oilfield Shengli Power Machinery Group Co., Ltd.

Annex 2 Central Africa Renewable Energy Technology Achievement Declaration Table

Technology provision unit: Shengli Oilfield Shengli Power Machinery Group Co., Ltd. Submission date: June 20, 2016

Contact person: Xing Kai Tel.: 15105462769 E-mail: 15105462769@163.com

Selection of technology type: D. Biomass energy utilization technology

A. Hydropower technology B. Solar energy utilization technology C. Wind energy utilization technology D. Biomass energy utilization technology

Item			Specific description	Filling Instruction
(I) Brief introduction of technology achievement	1	Name of technology or product	Biomass dry distillation gasification engineering	The name can be specifically and directly to be promoted with outstanding features.
	2	Provider of technology or product	Shengli Oilfield Shengli Power Machinery Group Co., Ltd.	Please offer the name of specific unit that has intellectual property or possesses the ability for engineering design and construction
	3	Whether of foreign cooperation experience		Whether this technology is of experience of overseas marketing and application, and please gives a brief introduction of main content.
	4	The situation of technical intellectual property	Shengli Oilfield Shengli Power Machinery Group Co., Ltd.	In case the technology intellectual property is in inconformity with technology provider, please list the whole name of owner of intellectual property.
	5	Scope of application	Utilization of waste from agriculture, forestry and animal husbandry meeting requirement of certain water content and granularity	Restrictions in respective industry and technology application (within 20 words)
	6	Brief introduction of technology or product	Biomass gasification and power generation technology of Shengdong Group applies fold-back rotational gasification process and equipment via independent research and development of	Principle, function, technology features and key equipment (within 500 words).

TECHNOLOGY: GASIFICATION
COMPANY: SHENGLI OILFIELD SHENGLI POWER MACHINERY GROUP CO., LTD.

					the company. It is designed to convert rice hull, wood chip, nutshell, methane residue, animal dung and other waste biomass from agriculture, forestry and animal husbandry meeting requirement of certain water content and granularity into clean flammable biomass gas without tar and power energy The process applies dry distillation first and gasification later. The introduction of specific process is as follows: 1) The stage of dry distillation: The material enters dry distiller, the tar and volatile substance generated in dry distillation have been totally burned, the heat energy released from complete combustion can absolutely meet the consumption required in dry distillation, and there is no need of provision of additional heat energy from outside, which realizes the maximum effective utilization of energy. 2) The gasification stage The material after dry distillation enters fold-back rotational gasifier for gasification, the tar is completely separated out in distillation stage, and there will be no tar in the gasified gas. It is available to utilize waste value in the process to produce mixture of water vapour and air as gasifying agent to increase heat value of gasified gas. 3) Purification process As the high temperature gasified gas generated in the process contains no tar, so it can form clean flammable gas energy	

TECHNOLOGY: GASIFICATION
COMPANY: SHENGLI OILFIELD SHENGLI POWER MACHINERY GROUP CO., LTD.

				for civil use or entering the consequent fuel gas power generation system after dedusting, cooling and further fine filtration.	
		7	Main technical index	Heat value of gasified gas: ≥5.5MJ/m Power generation rate: Biomass of 1.5kg is required for generation of 1kW h Specification and model: 200kW, 60 kW, 1MW	Specification, power, service parameters of technology or product, volume and weight of equipment, etc. (within 500 words)
		8	Business application situation	1. A set of 200kW biomass power generation system is under operation 2. It has entered into business cooperation contract with 3 domestic customers.	Describe application content and provide the name, location, engineering scale and operation situation of 1-4 demonstration engineering (within 500 words)
		9	Contact person of business application unit / Tel. / E-mail	Liu Ruigang: 13406145715	Provide contact information of 1-4 application units to verify the data
	(II) Index data of technology quantification (for a certain specific demonstration project)	10	Basic information	Main equipment: Shengdong biomass dry distillation gasification process and equipment, Shengdong gas engine, power is optional according to project scale.	Describe the background of project (selection of technology and product) is the investment a market transaction or investment and construction by locality? Main equipment, power, quantity and working time, etc. applied. Whether is systematic training required in the process of implementation? The cost of installation, use and maintenance. (a hundred words)
		11	Investment on equipment	The cost of equipment per kW h is RMB 8,000. (Domestic price, excluding biomass pretreatment equipment).	Describe the amount of one-off investment for necessary main equipment and other auxiliary equipment in new construction in application of the technology, or investment of other newly added

					equipment and other auxiliary equipment in transformation of existing works. Engineering scale is required to be described.
		12	Expense of operation maintenance	1. Gasification equipment will have an annual operation period of 7500h, and it will be overhauled once in each year with servicing period of about 20d; 2. Normal overhaul cost and cost for accessories change of each time is about RMB 30,000- 50,000. 3. Normal service life of the equipment is over 10 years; 4. Consumption of softened water Consumption of biomass each ton: 50kg-70kg	Describe the costs of raw materials, water and electricity consumed by a unit of product during normal operation of system, and the labor cost (salary), equipment depreciation, repair expense, management fee and other maintenance costs.
		13	Investment payback period	Projects in different scales have different investment payback periods, the larger of the scale is, the shorter of the payback period is, and 0.2-5MW power generation project is generally suitable.	Describe static investment payback period of the project which refers to the period required for accumulated economic benefits being equivalent with initial investment cost under the condition without considering time value of the fund.
		14	Other earnings	By-product of gasification is plant ash: Ash output accounts 15% of biomass treatment quantity (mass percentage)	Describe the additional economic benefits (such as increase of output value, benefit of by-product, carbon benefit) that occur meanwhile when this technology is compared with similar technology or after this technology is applied.
	(III) Description of qualitative index	15	Technical advancement	Compared with normal straw gasification, the process and equipment have the following advantages: 1) Gasification without tar: The course of normal pyrolysis and gasification will inevitably generates large	Describe innovation of the technology, the position and level in similarly international and domestic technology.

					quantity of tar, which is a big problem in application of gas, as tar deposits on the pipe, valve, instrument and stove after condensation, which will seriously affect normal operation of the system. There are many ways to remove tar, but it is not solved perfectly. Removal of tar not only wastes the energy contained in the tar, but also brings secondary pollution. The biomass of process applies dry distillation first and gasification later. The dry distillation stage completely burns the tar separated out in the process of biomass pyrolysis when it is still not cooling-off and in gaseous state, recovers and utilized the energy contained in the tar, biomass after dry distillation is then gasified, and there will no generation of tar during gasification. 2) Energy saving and environmental protection The technology doesn't study how to clear away tar in gasifies gas, but innovatively study how to avoid tar in gasification process, and tar generated during dry distillation process and volatile substance are burned in high temperature to recycle heat utilization. Therefore, the whole set of technology doesn't discharge any tar, sewage, phenolic water or harmful gas, both energy conservation and environmental protection. 3) High heat value of gas When use waste heat in the technology to generate water vapor, mixing with the air as gasifying agent, not only increase	

				gasification reaction temperature and reaction rate, but also reduce the content of N2 in gasified gas in general gasifier, increase the content of H2 in gasified gas and increase the heat value of gasified gas, with heat value over 5.5MJ/m3, due to partial water gas reaction by accession of stream gasifying agent within fold-back rotation gasifier. 4) Wide adaptability of raw materials Because complete combustion of dry distillation gas generated at stage of dry distillations and concomitant tar may generate a lot of heat, and it can conduct dry distillation of biomass with water content within 15% by heat from self-burning without heat supplied by the outside. So the adaptability of gasification process to various biomass materials is wide, large operational flexibility.	
		16	Technical maturity	Conduct site operation verification, and the process technology is mature	Describe the technology process route and completion degree of equipment and system integration.
		17	Technical applicability	Biomass gasification and power generation technology of Shengdong Group applies fold-back rotational gasification process and equipment via independent research and development of the company. It is suitable for rice hull, wood chip, nutshell, biogas residue, animal dung, etc., all agriculture, forestry and animal husbandry wastes satisfying certain water content and granularity requirements. Not affected by region, environment and resource factors. But the	Describe the applicable range of the technology during transformation and promotion, the matching degree with upstream and downstream process and technology and the restrictions of region, scale, environment, resources and energy and other factors.

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				scale shall not exceed 5 (within 5 power of crops zone radius)	
		18	Technical stability	No secondary pollution to the environment.	Whether the technology can keep stable in the operation of engineering, the sensitivity to interference of environment, technical parameters, etc..
		19	Technical safety	Safety problems of supporting facility are basically considered, possessing perfect safe operation regulations.	Describe the system risk of practicability, whether supporting facilities are complete and market acceptability that the technology is faced with during transformation and industrialization of achievement.
		20	Obstacle in achievement transformation and promotion	Temporarily, there is no popularization obstacles through investigation and communication at the earlier stage	Describe the obstacles that need to be solved in the process of achievement transformation and promotion process of the technology, such as technical issues, policy barriers, resource or capital restrictions, talent training and other restricted conditions.
		21	Transfer of intellectual property	Gasification process and device of biomass two-segment dry distillation, China, patent for invention, patent No.: ZL201510098185, date: March 6, 2015 Applicant (Patentee): Shengli Oilfield Shengli Power Machinery Group Co., Ltd.	Whether it has domestic proprietary intellectual property, whether it has obtained patent, and nature (enterprise, college, individual, etc.) of the owner of the technology Localization of key links of technology, process and equipment introduced: Transfer intention of the owner of the technology, transfer mechanism of technology property, whether policy pathway is smooth, etc.

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Tianjin University

Renewable Energy Technology Achievement Declaration			
QR code			
Technology provider	Tianjin University	Submission date	July 31, 2016
Contact person	Ma Wenchao	Technology type	Biomass energy utilization technology
Tel.	18202268127	E-mail	mawc0916@tji.edu.cn
Technology name	Energy processing technology from household garbage solid waste under high temperature environment		
Technology provider	Tianjin University		
Scope of application	Tianjin University		
Brief description of technology	Schematic diagram of pyrolysis gasifier is shown in Diagram 1. Functions: Treatment of flammable solid waste. Technical features: Emission up to standard. Secondary pollution is strictly controlled; No need of addition of auxiliary fuel; Integrated design, compact and small-size, convenient for installation and operation; Intensive range of medium and small scale treatment, low operation cost. The fuel gas and heating power produced can meet the requirement for cooking and hot water. Benefit is significant.		
Technical information	Treatment capacity of 10t/d, power consumption less than 135kwh/day, water consumption of $10m^3$/day, RMB 1000 in total, labor of 1-2/shift, quantity of heating production of 4t/h calculated by hot water at 70℃, and equipment land occupation of $1700m^2$.		
Business application situation	Tianjin Taida Environmental Protection Co., Ltd., located in No. 1 Taixin Road, Jinnan District, Tianjin, project scale of 10t/d, converts solid waste to treasure, realizes economic benefit of RMB 5 million/year.		
Service conditions	Contact person: Lv Yuan Tel.: 18622407096 E-mail: 18622407096@ 163.com		
Contact person of business application	Local investment and construction and mature technology. Simple training is required before operation of equipment, and compact equipment is convenient for installation and operation with low maintenance cost.		

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	unit/Tel./E-mail	
	Investment on equipment	Project scale is of 10t/d, and investment amount is RMB 3 million. Main equipment: (1) Pretreatment device. It is constituted of crusher and magnetic separator. The crusher breaks the bag of the garbage, disperses and smashes it, makes the garbage better dried in inclined drum-type pre-drying equipment, and reduces the possibility of plugging by garbage feeding; Magnetic separator picks up ferrous metal for recovery and utilization. (2) Feed mechanism. It is comprised of belt conveyor and feed box, and it realizes automatic control or manual control over charging rate and time through mechanical operation. (3) Inclined drum-type pre-drying equipment. It is comprised of smoke jacket, drying cylinder and drive mechanism, preheats and preliminarily dries the garbage into the furnace by utilizing heat of smoke of waste heat boiler and so increases heat value of garbage into the furnace. (4) Pyrolysis gasifier body. It adopts new two-section combustion chamber structure, which is mainly constituted by the vertical cylinder combustion chamber one and unique combustion chamber two with multiple-cavity. (5) Ventilation System. It is comprised of primary air fan, induced draft fan and corresponding air and flue gas duct and valve and meter and other accessories. (6) Deslagging equipment It includes rotational fire grate and transmission structure. The material and unique structure adopted in this equipment realizes mechanical deslagging and continuous operation of incinerator; (7) Heat recovery boiler It includes water jacket covered externally on smoke pipe and horizontal water tank (or steam separator), and the water in the boiler performs natural circulation relying on density contrast. (8) Electrical and automatic control system It includes electric control cabinet and industrial controller and other equipment. Operation condition and relevant process parameters of the entire system can be displayed on computer screen for timely control.
	Expense of operation maintenance	Operation consumption and cost of pyrolysis gasification technology is low, and equipment structure is compact, and maintenance quantity is small, and therefore, maintenance cost is low. First ignition of the equipment requires the help of auxiliary fuel, and there is no need of any auxiliary fuel after stable operation, so the cost of auxiliary fuel can be ignored; Power consumption per day is calculated at 35 kwh, and power generation of operation for a year is 12,250 kwh, power price is calculated at RMB 0.8, and power charge of operation for a year is RMB 9,800; The labor is calculated as 3 shifts per day, 2 persons per shift, 6 persons in total and salary of RMB 3000/month each person, and annual salary is RMB 216,000; Service life of the equipment are 20 years, and depreciation cost is RMB 100,000/year; Maintenance cost and management cost is RMB 80,000/year. In conclusion, operation maintenance cost of the system under normal operation is RMB 405,800/year.
	Investment payback period	Without consideration of time value of money, static investment payback period of the project are 2 years. Method to calculate is shown as follows: Project scale is 10t/d, and quantity of heating production is 4t/h calculated by hot water at 70℃ or saturated vapor at 0.1MPa. Specific heat capacity of water is 4.2, the heat required for 1L water from 20℃ to

		70℃ is 210, so electric quantity consumed for 1L water from 20℃ to 70℃ is of 0.058kW, and the heat quantity generated in the project per day is equivalent to the electric quantity of 5,568kW. Calculated at power price of RMB 0.6, the benefit of one day is RMB 3,340, it operates for 350 days a year, and annual benefit is RMB 1.17 million. Without consideration of time value of money, static investment payback period of the project is 2.56 years.
	Other earnings	Household garbage treatment belongs to environmental project and public welfare project.Charging of garbage treatment cost is required, and in addition, there is still other environmental benefit and carbon emission benefit, which can be converted into a benefit of RMB 0.5 million /year.
	Technology share	As shown in current market investigation, the market share of pyrolysis gasification technology in solid waste processing field is less than 5%. However in several future years, that application of the pyrolysis gasification technology in the treatment of medium and small scale garbage of county, town and village will increase rapidly.
	Market potential of the technology	By statistics, urban household garbage is mainly treated by landfill, incineration and compost in our country. Landfill is the main treatment method currently, which accounts for nearly a half; incineration accounts for about 12%, compost accounts for less than 10%, and there is still 30% of household garbage failing to be processed. Especially processing rate of urban and rural garbage is extremely low, and large amount of garbage surrounds the city, which has resulted in serious environment pollution. Pyrolysis gasification technology is mature, has good environmental protection performance, and is easy to realize automatic control. Its operation consumption and cost is low, and has little land occupation, low investment and significant economic benefit and other features. Currently, there has been the example of applying pyrolysis gasification technology processing village garbage, which opens up the precedent of china's garbage processing equipment being exported overseas: The city of Teheran of Iran constructs 2 vertical-rotation pyrolysis gasification incinerators of 100t/d, and the project has successfully been connected to the grid and generates electricy in February 2015. Therefore, aiming at our national conditions and the current situation of solid waste generation, pyrolysis gasification technology will have tremendous development potential in solid waste processing field by 2020, especially the small-size, distributed pyrolysis gasification technology in the treatment of village household garbage. Large amount of solid waste such as garbage of small cities and villages and forestry and agricultural residues in Africa is required to be processed in urgent need, so market prospect of this technology is huge.
	Technical advancement	The technology is advanced. The advancement of the technology embodies in environmental protection performance. The fundamental distinction between this technology and direct incineration technology of garbage lies in, under the condition of small investment cost, pyrolysis gasification technology solves smoke pollution problem without secondary pollution, and the smoke can be discharged while meeting the standard. Especially, it has significant effect in inhibition of Dioxin generation. As direct incineration in grate is a course of strong oxidation, large amount of SO 2, HC1 and NOX will be generated during

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		incineration; meanwhile, as grate fails to stand high temperature higher than 1000℃, it makes operation temperature of incineration restricted, while incineration temperature lower than 1000℃ is hard to completely resolve Dioxin. Meanwhile, pyrolysis gasification technology can reduce the emission of NOX and SO2, which is because anoxycausis in combustion chamber one belongs to reducing atmosphere, N and S are rarely oxidized to remain in the slag. While unique design of combustion chamber two can ensure smoke forming turbulence and fully blending with oxygen in the air, the degree of air excess required is low, and it correspondingly reduces the N source from the air and realizes emission reduction of NOx. Furthermore, three is research showing that, after pyrolysis gasification reaction, the vast majority of chlorine element contained in the garbage has been transferred into solid phase product (bottom slag), which makes H C1 content in smoke far less than standard limits of conventional household garbage incinerator. Pyrolysis gasification technology has good environmental protection performance, is easy to realize automatic control, operation consumption and cost is low, and it has little land occupation, low investment and significant economic benefit and other features.
	Technical maturity	The technology is mature. The complete pyrolysis gasification equipment is comprised of pretreatment equipment, feeding equipment, inclined drum-type pre-drying equipment, combustion chamber one, combustion chamber two, rotational grate, waste heat boiler, induced draft fan, chimney, automatic control system, etc. After smashing and magnetic separation, the garbage is transmitted to feed inlet of inclined drum-type pre-drying equipment through belt conveyor, and combustion course of the pyrolysis gasification furnace is divided into two phases. The first phase is pyrolysis gasification and combustion without oxygen, which is made in combustion chamber one. Operation temperature is controlled at around 750℃, which makes non-volatile combustibles in the garbage totally burned, while flammable volatile gas enters combustion chamber two; The second phase is oxygen-excess combustion made inside combustion chamber two. Operation temperature is controlled at 900-1100℃, which makes flammable gas from combustion chamber one fully blended with sufficient high temperature air and turbulence is formed. Sufficient combustion generates high temperature smoke which goes through multiple baffling and enters into Class 1 and Class 2 settling chamber for dedusting, and then it is sent to waste heat boiler to recover its heat quantity for heat supply, and its process is shown as Diagram 2.
	Technical applicability	Pyrolysis gasification equipment has strong applicability and intensive application range, which can process not only garbage with high heat value but also garbage with low heat value. It's applicable not only for pyrolysis gasification processing of urban (especially villages and towns) household garbage, but also pyrolysis gasification processing of medical garbage and forestry and agricultural residues and other solid waste. Except that the first ignition requires the help of external energy, there is no need to add any auxiliary fuel in processing course and continuous and stable operation can be made. Low power consumption, low operation cost and no consumption of water. Processing scale is determined by processing quantity of solid waste, the scale in villages and towns is in accordance with 1- 10t/d in variety, and scale in counties or cities is in accordance with 10- 100t/d in variety.

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	Technical stability	The technology has good stability. Pyrolysis gasification equipment has a relatively stable operation condition, feeding and discharging can be controlled, automatic control is easily to be realized, and it has low operation consumption and cost. There is no need of pretreatment for the materials, as the garbage is crushed and broken during feeding. Compact furnace type, strong heat intensity and layered furnace temperature is in favor of combustion; The adaptability of fuel is good. Stable combustion and the temperature control are easy to achieve. The overall unit is divided into primary chamber and secondary chamber, with compact structure, small amount of equipment maintenance, and it needs to equip waste heat boiler additionally. Combination of layer combustion and chamber combustion, graded combustion, reasonably allocate the release of chemical energy through control of air amount and control of furnace combustion conditions to achieve more superior combustion status. The rubbish almost doesn't need to preheat. The pyrolysis temperature in primary chamber is under 700℃. The temperature in secondary combustion chamber is over 850℃. And the combustible components decompose completely. Sufficient fuel. Ash ignition reduction of 3%. No disturbance of furnace charge, low dust discharge, the content of incinerator outlet is 3500m g/m3. Realize graded combustion, easy to reach the standard. 850℃ in primary chamber, over 850℃ in secondary combustion chamber, toxic substances decompose completely, with full combustion, the retention time of exhaust gas in secondary combustion chamber exceeds private incinerator outlet, and the discharge of dioxin is nearly zero. The ash content in exhaust gas is little, and the heavy metal is very little.
	Technical safety	The pyrolysis gasification technology has good practicability in achievement transformation and industrialization process, with complete supporting facility, and the unit needs electricity in operation process.So the continuous supply and safety of electricity shall be ensured to ensure normal operation of the unit.
	Obstacle in achievement transformation and promotion	With the appearance of garbage-surrounded city, garbage-surrounded village and other phenomena, each country is actively seeking for different, more efficient way and technique to dispose solid wastes. Currently, domestic waste treatment modes mainly are landfill, incineration and compost. But there are restrictions for landfill, incineration and compost respectively: For landfill, the disadvantages are waste of land resources, more hazards generated, high cost of leachate treatment in landfill area, long subsequent management time, etc.; For incineration, the disadvantages are large investment scale, high operation cost, production of heavy metal pollution and dioxin-like pollutants, etc.; For compost, the disadvantages are high requirements of garbage classification, leakage of aerobic decomposition and gas contamination, outlet of compost products, etc.. Compared to incineration technology, the pyrolysis gasification technology, with compact equipment and low investment, is convenient for installation and operation, and meanwhile with low operation cost, it has significant effects on inhibition of generation of dioxin. Therefore, there is no barrier in technical issues, resources or capital as well as personel training aspects.

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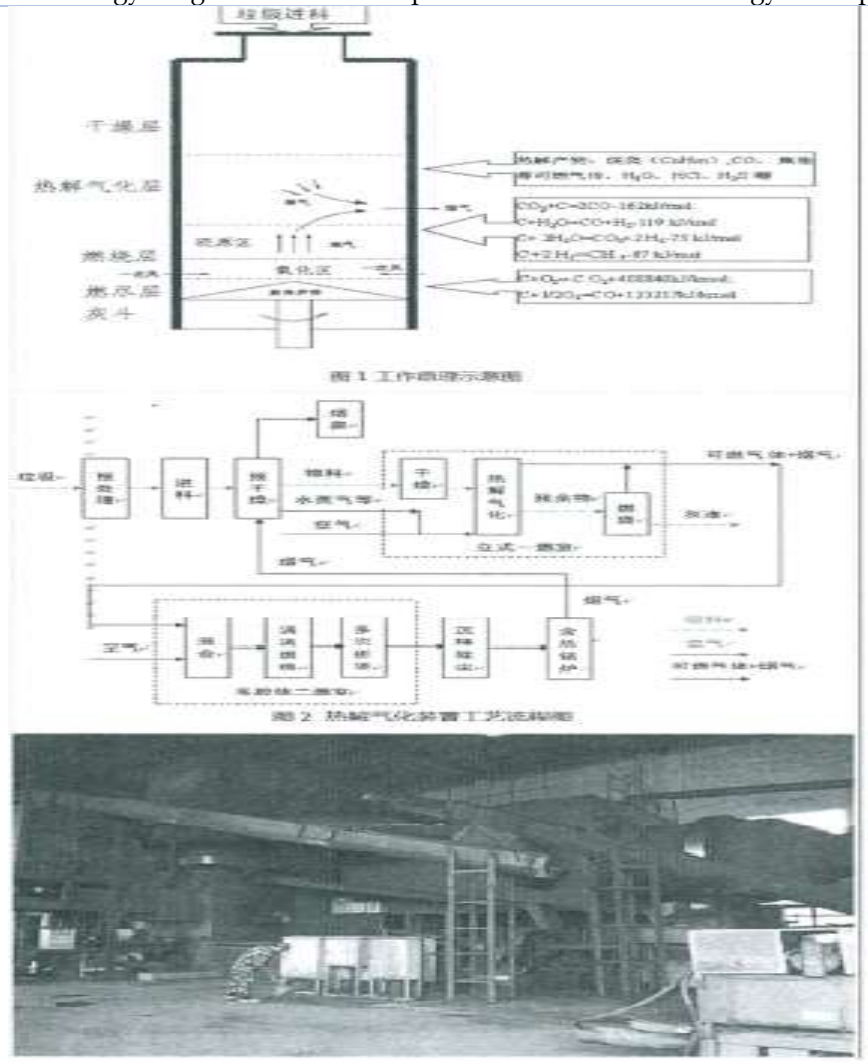
	Transfer of intellectual property	This technique possesses domestic independent intellectual property right. The owner are colleges and universities and obtains related patents and the first and the second prize of Provincial Science and Technology Progress Award. Complete localization of technology and equipment.
	Photo Caption	

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	Name of technology: Technologies of gas, power and fertilizer production by gasification of agricultural and forestry residues **Technology provider: Tianjin University** **Contacts: Guanyi Chen** **Type of technology: Biomass energy** **Specific technology: Gasification** **Cell-phone: 13512208049** **E-mall: chen@tju.edu.cn** √**Technology provider** Tianjin University √**Application scope** This technology belongs to the field of renewable energy and environmental protection. There are no limitation for this technology application, as long as the area is abundant with agricultural and forestry residues. √**Brief introduction of technology** Basic theory: Biomass reduction reaction which utilized the exothermic effect of partial oxidation is employed to produce syngas, char-based fertilizer as well as power generation. Function: Agricultural and forestry residue are converted into energy following the principle of minimization and resources. Syngas as well as char-based fertilizer are produced, and they could meet the requirement of electricity, energy, and agricultural ecological fertilizer. Features of technology: Clean and efficient, polygeneration. Key equipment: Gasifier; Tar-clean device. √**Information of the technology** Gasification and pyrolysis technologies are employed to convert agricultural and forestry residue into high/moderate heat value syngas. Necessary equipment is listed below: feeding equipment, gasifier (700-900℃, normal pressure), tar clean device, flexible tank, other equipment such as motor, pump, fan, and pipeline. Equipment occupies 5 acres approximately. √**Commercial applications** Some technology demonstration projects have been put into set up and operating in China. One of the projects of biomass gasification and pyrolysis for gas, heating and power supply has been built in Jinghai District, Tianjin. 3 tons raw biomass materials are treated per day, and it provides gas and heating for kindergarten, primary school, middle school and other 500 families in the country. The equipment runs well so far. √**Service conditions**

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	As a result of the abundant agricultural and forestry biomass resource in Africa, biomass gasification and pyrolysis process has easy approach to get raw material. The technology is economic and efficient, and it is perfectly suitable for the actual situation in Africa. Besides, this technology is relatively mature, and some demonstration projects have already applied in China. People only need short time for training to ensure the security of personnel and equipments. The installation cost of this process is 150 000 RMB, and use and maintenance cost is 100 000 RMB per year. √**Contact person of commercial application company** Yanbo Li, 137-5253-0279、lmswzn@163.com √**Equipment investment** A biomass gasifier (500 Nm^3/h), a flexible tank, a tar clean device, and some other equipment (such as motor, pump, fan, and pipeline) are needed for this process. Initial investment amount is about 4 000 000 ~ 5 000 000 RMB. Biomass residue treatment amount is set at 10 t per day, and it is enough to provide energy for a natural village (500~800 people) to coke, heat water, power generation, as well as ecological fertilizer production. √**Cost of running and maintenance** Normally, the amount of biomass consumption is 10 t per day, that is 3 650 t per year. The price of raw biomass material is about 300 RMB per ton, so the annual consumption of raw biomass material costs 1 000 000 RMB. Power consumption is 250 000 kW/h per year, and it costs 125 000 RMB (the unit price of power is 0.5 RMB per kW/h). Tap water consumption is 3822 tons per year, and it costs 30 000 RMB per year (the unit price of tap water is 7.85 RMB per ton). Salary and welfare of the staff is 4080 RMB per month per person, and it costs 560 000 RMB per year (10 staff in total). The maintenance costs of equipment is 780 000 per year, and other cost is 530 000 RMB per year. Totally the cost of running and maintenance is about 2 320 000 per year. √**Investment recovery period** The static investment recovery period of this technology is about 4 years, regardless of time value of fund. √**Other benefit** The consumption of raw biomass material is 3650 tons per year, and it equates to 1825 tons standard coal. That is to say, it can obtain 4544 tons reduction of CO_2 emission per year, 1241 tons reduction of smoke dust emission per year, 137 tons reduction of SO_2 emission per year, and 68.5 tons reduction of NOx emission per year. √**Rate of technology share** According to the results of market research, this technology occupied 20% domestic market in 2015. √**Market potential of the technology**

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	There are some shortcomings in current biomass gasification station, such as low efficiency of gasifier, unstable quality of combustible gas, low heating value of the products, problems of gas cleaning technology, high content of tar in gaseous product and bad economic effect. However this technology could overcome these obstacles mentioned above. It can obtain much higher heating value gas and low tar emission through innovative design of gasifier and new cleaning technology. Besides it can operate stable and consecutive with auto control system for production of gas, power and fertilizer. It is expected that in 2020 the technology in the field occupying the market potential can reach 30%. √**Advancement of the technology** The innovations of this technology are listed below. Firstly, a catalytic plate is set inside the gasifier. As a result, the online catalytic upgrade of syngas can be achieved. Secondly, PID system is used for controlling the temperature of gasifier. In order to achieve the optimal condition of gasification, programmed temperature technology is employed to adjust temperature. Thirdly, a gas-liquid separator and cryogenic condensation system are employed to get a rapid condensation process. Fourthly, an independent designed online monitoring device is used for measurement of tar content in syngas, and this device is portable, efficient, accurate and in-situ detection. All the technology mentioned above are advanced in the world. √**Technology readiness level** A comprehensive pyrolysis and gasification process has already applied. First, the agricultural and forestry residue is grounded into fine particles. Then they are put into the gasifier from the feed port. Raw materials get through multivariate classification of the reaction chamber, and the primary, middle and senior tar removal process are completed at char-based nickel catalytic device. Syngas is piped into the storage compartment, and finally pass through the pressure controller. Syngas can be used for heating supply and power generation. This technology has already achieved successful utilization in Jinghai District, Tianjin. It has provided cooking gas for villagers(500-800 person) for two years. Besides, all the data of the gas-combustion generator such as load and emission are meet the National standard and the current power can afford for station self-use. Therefore, no matter in the aspect of process route, equipment, and application of syngas, this technology is mature and integrated. √**Applicability of the technology** This technology is more suitable for area where agricultural and forestry residue can be collected easily, especially somewhere traditional energy (such as oil, coal, natural gas) is relatively scarce, and it can also achieve efficient use of waste resources. Since the tar yield of this technology is relatively low, in addition tar online monitoring device is used for detection of tar, so it can guarantee clean gas product would not block downstream equipment. The produced syngas can be stored in the flexible tanks. Through the pressure controller, syngas can achieve full and efficient use depending on the flexible requirement by local residents. Meanwhile, this technology has full of strong flexibility and adaptability, because boilers can be added to this process to produce hot water and meet residents' requirement. In addition, the remaining residue can produce eco-fertilizer, and this is very helpful for the urban and rural agricultural work. √**Stability of the technology**

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Pyrolysis gasification reactions of this technology mainly take place in the gasifier, so it is good technical stability and environment friendly. According to operating situation of demonstration project in Tianjin, China, this technology can maintain long-term stability in the operation.

√**Requirement of the technology**
This process has a demand for electricity, thus the transformation and industrialization of process requests guarantee of continuous supply of electricity, in order to ensure the normal operation.

√**Obstacle of achievement transformation and extension**
Nowadays, renewable energy technology has become more and more sophisticated. Agriculture and forestry residue gasification and pyrolysis technology prepared for syngas and power received strong support from many countries and regions, so it has great potential for further popularization in industry. As for raw material supply, agricultural residue is very abundant, so there is no resource risk, especially in Africa.

√**Assignment of intellectual property**
Tianjin University as technology provider has got a number of related patents with independent intellectual property rights: a new type of equipment for biomass pyrolysis, a method of biomass pyrolysis prepared for bio-oil, an equipment of biomass gasification produced for syngas, a method and equipment for preparation of bio-syngas, and fast measurement method and instrument of biomass gasification tar. Besides, we won the National Science and Technology Progress Award, and other provincial and ministerial level scientific and technological progress awards. We are willing to transfer technology to Africa. And hopefully policies of transferring technology between university and industry are supportive.

Application of renewable energy technology			
QR Code			
Institutes	Tianjin University	Date	2016-07-31
Contacts	Beibei Yan	Technology Type	Biomass energy utilization technology
Telephone	13902190625	E-mail	yanbeibei@tju.edu.cn
Technology name	The efficient and clean production technology of biodiesel and high-value products		
Provider	Tianjin university		
Scope of application	The efficient and clean production technology of biodiesel and high-value products		
Concise description of technology	Prior to transesterification, the impurities and odors should be separated from waste oil via centrifugation; the free fatty acids should be removed from esterification tank. Then the crude		

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		biodiesel produced by transesterification reaction should be esterified, separated, condensed and rectified to obtain the wanted biodiesel and high-value products. Besides, the recovery system was used for excess methanol collection.
	Information of technology	Major equipment includes oil storage tanks (200m^3), esterification reactor (20m^3), neutralization tank (20m^3), methanol storage tank (200m^3), rectification tower, pumps, etc.
	Commercial application	The 1,0000ton/y demonstration project of biodiesel production based on waste oil was built in dagang of Tianjin, which could be run continuously and environmental with the minimum biodiesel yield of 90%.
	Service conditions	The technology is applicable to the local investment and construction. Operation trainings should be launched before the application of this mature technology. And the installation cost, annual operating cost and annual maintenance cost of this technology are about 50,000 CNY, 100,000 CNY/y and 100,000 CNY/y, respectively.
	Contacts of Commercial application company	Contact of demonstration project: Yan Li; Telephone: 18622407060; E-mail: 2009liyan-2009@163.com.
	Equipment investment	Take the 1,0000ton/y biodiesel production demonstration project for example: 1) Storage facilities: Material oil storage tanks (20× 200m^3): 400,000 CNY; Methanol storage tanks (10× 200m^3): 600,000 CNY; Gas product storage tanks (20× 100m^3): 900,000 CNY; Process storage tanks (10× 20m^3): 200,000 CNY; Pumps to/from storage tanks (22): 90,000 CNY; Total cost: 2190,000 CNY. 2) Process units: Oil transesterification unit: 2800,000 CNY; Pumps (36): 160,000 CNY; Total cost: 2960,000 CNY. 3) Utility equipment (Pipelines, Vacuum system, etc.): 2000,000 CNY. 4) Other costs (Road Construction, Workshop construction, etc.): 1000,000 CNY. Total fixed capital cost: 8050,000 CNY.
	Operating cost	At normal runtime, the conversion ratios of esterification and transesterification were 95% and 90%, respectively. The total annual materials cost was approximately 2500,000 CNY, which included waste oil cost, methanol cost, catalysts cost, etc. The annual operation cost of electricity was approximately 259,000 CNY with 2.88GWh power consumption. The annual operation cost of cooling water was approximately 1,000 CNY with 150m^3 water consumption. The above total operating cost added up to approximately 2760,000 CNY. Besides, the annual labor cost was 500,000 CNY, the annual depreciation cost was 520,000 CNY with a depreciation life of 15 years, the annual repair cost was 10,000 CNY, and the annual management cost was 50,000 CNY. The above total maintenance costs added up to approximately 3930,000 CNY.

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	Payback period of investment	According to the calculation, the annual cumulative economic income was 50,000,000 CNY, the annual net benefit was 4,720,000 CNY, and the annual fixed capital cost was 8,050,000 CNY. So the payback period is about 1.2 years.
	Other benefits	If the benefit from 700t/y glycerol byproduct of 1,360,000 CNY was considered, the extra total net benefit was 1,360,000 CNY. Combined with environmental benefits and carbon reduction benefits, the annual total net benefits would up to 2,080,000 CNY.
	Technology share	The annual animal oil and vegetable oil consumption were about 25 million tons in China. At present, in the process of biodiesel production catalyzed by acid and alkali chemicals, the largest production line based on waste oil could be reached an annual output of 200,000 tons. In the domestic industry, the market share of similar technology was higher than 70%.
	Market potential of technology	Currently, the homogeneous acid catalytic technique has been basically mature, which occupies large amount of market share. This technology was carried out using sulfuric acid as esterification pretreatment reaction catalyst and using waste solid bases as transesterification catalyst, which significantly reduced the production cost and improved the technical and economic feasibility. Furthermore, it was estimated that the annual animal oil and vegetable oil consumption were about 25,000,000 tons in China with a growing trend. And the annual amount of waste edible oil was about 375,000,000~625,000,000 tons. Therefore, the biodiesel production technology, which based on waste oil with the chemical catalysis method, has a tremendous market potential. It is estimated that the market share is expected to reach 90% in 2020. Besides, Africa is rich in oil resources, there are a large number of undeveloped mountains and marginal land, suitable for oil crops plantation. So this technology has a great market share potential in Africa.
	Advance of technology	1) There are large amounts of free fatty acids contained in waste oil, which led to higher acid value of 150mg KOH/g. In order to ensure the reaction conducted smoothly, the acid value of waste oil must be decreased by esterification at the present of sulfur acids. Then the transesterification reaction occurs to obtain the crude product. 2) The obtained crude product is further esterified. The obtained crude product is further esterified at the present of solid basic catalyst under the reaction conditions of 68^{o}C~72^{o}C at 2h. 3) Methanol reflux. The obtained product not only contains biodiesel, but also accompanied with a large number of by-products like glycerol and methanol. So the methanol reflux device could greatly save the consumption of methanol. 4) Variety of novel solid base catalyst such as K_2CO_3/RHA, rice husk ash supported egg shell and CaO-SiO_2 synthesized by biomimetic silicification were prepared for biodiesel and high-value products production. The whole preparation stage is in line with the environmental friendly characteristics. Therefore, this biodiesel production technique is advanced and innovative both in China and abroad.

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	Maturity of technology	The technical route including five processes: Waste oil pre-treatment (deimpurity, dehydration, degumming and bleaching) process: to remove the mechanical impurities and odors of waste oil; Esterification reaction process: to remove the free fatty acids of waste oil; Transesterification reaction process: to obtain product of biodiesel and byproduct of glycerol; Further esterification process: to obtain desired biodiesel conformed to the national standard; Neutralization reaction process: to neutralize acid and base in the neutralization tank; Methanol distillation process: to recycle methanol through exploitation mechanics of different boiling point distillation. The main equipment includes oil tank, esterification reactor, neutralization tank, condensing unit, methanol storage tank, distillation tower and pumps. The whole equipment and systems was integrated and consecutive.
	Applicability of technology	Although the initial raw material of the technology is waste oil, it also applies to animal oil and vegetable oil which the main components is triglycerides. African is rich in animal and plant resources, there are more than 40,000 kinds of plant species, and even the forest-covering area accounted for 21% of the total area of Africa. Furthermore, palm as the main plant of Africa, has a great output, which fully satisfied with the requirement of material. Besides, the pretreatment process could be omitted based on vegetable oil, thus simplified the whole process. Combined with the vast undeveloped territory of Africa, the scale of this technology can be expanded to plant oil crops. Therefore, this technology has a potential market share to facilitate the promotion and application for biodiesel production in Africa.
	Stability of technology	At present, the 1,0000ton/y demonstration project of biodiesel production has been built and run normally, which indicated that the operation process is stable and consecutive.
	Security of technology	The technology has been granted 3 invention patents in the field of biodiesel production. Oil storage tanks, high-pressure reactor, neutralization tank, distillation tower, pumps, control box and other technical supporting facilities are relatively integrated, which can be accepted by the market.
	Obstacles of technology promotion	Acid catalysts have a corrosive effect on equipment, lead to reduction of service lifetime. So further development of new materials and equipment were required for energy loss reduction; Further reduction of material cost was necessary via increasing national policy supporting; Operation talent training for biodiesel and high-value products manufacture is still under development.
	Assignment of Intellectual Property	Tianjin University, as the technology owner, has obtained a number of independent intellectual property rights related patents and provincial-level Science and Technology Progress Award. Technology provider has the intention of transferring supported by sound mechanism of the technology industry in Colleges and powerful national policy.

TECHNOLOGY: GASIFICATION
COMPANY: TIANJIN UNIVERSITY

	Captions	   

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

Wuhan Wushui Electric Technology Co., Ltd	Technological achievements declaration of renewable energy sources			
	Two-dimension code			
	Technology providing unit	Wuhan Wushui Electric Technology Co., Ltd. WUHAN WUSHUI ELECTRICAL TECHNOLOGY CO, LTD (seal)		
	Contact	Sima Pingping	Submission date	2016-08-04
	Technology types	Small hydropower technology	Specific technology	And other technologies related to small hydropower
	Telephone	**13807196853**	E-mail	sn ppll26@ 126.com
	Technology name	Intelligent control device with low pressure generator set		
	Technology provider	Wuhan Wushui Electric Technology Co., Ltd.		
	Scope of application	Automatic control of medium and small hydropower stations		
	Technology briefing	Intelligent control device with low pressure generator set,integrated the speed governing, excitation control, protection, temperature measurement and automatic quasi-synchronization of the water - wheel generator set with low pressure as a whole, realize the one click starting/ closing function. Key components :Electric control cabinet, main switch of electric generator, etc.		
	Technical Information	Voltage-regulating precision <0.5%;Range 10 - 125%; 5% phase step index; Overshooting <30%; Vibration <3; Accommodation time < 5s; Volume 2200 X 800 X 800mm		
	Business application conditions	Xionghe power station, Xiangfan, Hubei; Dongshan power station, Yichang, Hebei; Jinqiao power station, Yidu Hubei; Huang Jia Ju power station, Hubei Dangyang		
	Service conditions	Mature technology; Require training; Simple installation, easy to use, low maintenance costs.		
	Business application unit contact/telephone/E-mail	Contact information: Xionghe power station: 18062239328; Dongshan power station: 13872664448; Jinqiao power station: 13872684992; HUANGJIAJU power station: 1599580983		

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

	Equipment investment	According to the technology and equipment provided in the implementation of the new project, it would be the best for the users to be equipped with the following tools and equipments: 1. Example of electrical tools: Multimeter, screwdriver, wrench, pliers, electric iron, etc.. 2. Three phase voltage regulator (preferably 10KVA) 3. Micromputer-based relay protection testing device(0 ~ 10A three-phase alternating current, 0 ~ 150V three-phase voltage) 4. Two load resistance ZX9~8/800 (7.396Ω24A) Estimated the total cost is no more than 25 thousand Yuan, if the user want further maintenance, inspection equipment. Or commissioning and maintenance of other devices, this is also useful.
	Operation and maintenance fees	Cost of equipment required for the operation of the device at constant pressure: Except for the electric energy (output from the generator) required for the generator excitation output, the power consumption of the apparatus < 100W;There aren't other consumed raw materials for the apparatus. The service life of the devices is above 10 years Statistics of repair cost: Suggested the user purchases part of the device in my company's recommendation to prepare for maintenance and replacement in advance, this will greatly reduce maintenance costs. The cost is about 10% of the total cost of the equipment. The original power station is not required for adding new staff for these devices in maintenance and management, so there will be no additional wage cost.
	Payback period of investment	To recover the cost in two months.
	Other benefits	By using this technology, the higher additional economic benefits can be produced at the same time.
	Technology share	In 2015, in the domestic industry with the similar technology (including the case did not use any technology) production or processing, it accounted for about 20% of the total market share.
	Technology market potential	By 2020, the market potential of this technology which can be developed and promoted is over 50% in this industry or field
	Technology advancement	Highly Integrated equipment and highly centralized control provide the widespread possibility for the unattended water - wheel generator set with low pressure and full automatic operation and management of the few personnel on duty. Unified electric generator could remedy the various "gaps" and disharmonious "fold" occurred in the original devices effectively.
	Technology maturity	The technology has completely reached maturity.
	Technology applicability	Automatic control of small and medium sized hydropower station
	Technology stability	Each component of the operating parameter of microcomputer excitation, microcomputer governor and low voltage unit integrated intelligent control of the device has sufficient margin. All the electronic components use industrial grade even military products, and all have the electrical aging screening of over 72 hours; Design and installation for secondary circuit, and the anti-

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

		electromagnetic interference measures fulfilling GB/T3797, GB14285, G B/T 14598.9 and G B/T4064 with the standard and specifications, can exclude the interference of the general environment and technical parameter. Serving as the microprocessor-based product, the above control apparatus are suitable for the control parameter setting of various water-turbine generator sets with convenient and wide method and means, therefore the control water-turbine generator set can constantly operates stably, safely and reliably.
	Technology security	Reliably
	Obstacles of results transformation and promotion	There isn't any obstacle for this technology in the process of the result conversion and promotion
	Intellectual property transfer	The enterprise possesses this technology which has the national proprietary intellectual property rights
	Picture description WUHAN WUSHUI ELECTRICAL TECHNOLOGY CO, LTD (seal)	

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

Technological achievements declaration of renewable energy sources			
Two-dimension code	  WUHAN WUSHUI ELECTRICAL TECHNOLOGY CO, LTD (seal)		
Technology providing unit	Wuhan Wushui Electric Technology Co., Ltd.		
Contact	Sima Pingping	Submission date	2016-08-04
Technology types	Small hydropower technology	Specific technology	And other technologies related to small hydropower
Telephone	**13807196853**	E-mail	sn ppll26@ 126.com
Technology name	Microcomputer excitation device		
Technology provider	Wuhan Wushui Electric Technology Co., Ltd.		
Scope of application	Automatic control of medium and small hydropower stations		
Technology briefing	Closed-loop control of PID which is conducted by the current feedback quantity is outputted by the output voltage or reactive or excitation device of the electric generator. Critical components have microcomputer excitation controller, exciting transformer, power rectifier and deexcitation formation.		
Technical Information	Voltage-regulating precision <0.5%; Range 10 - 125%; 5% phase step index; Overshooting <30%; Accommodation time < 5s; Volume: 2200 X 800 X 800mm		
Business application conditions	Xionghe power station, Xiangfan, Hubei; Dongshan power station, Yichang, Hebei; Jinqiao power station, Yidu Hubei; Huang Jia Ju power station, Hubei Dangyang		
Service conditions	Mature technology; Require training; Simple installation, easy to use, low maintenance costs.		
Business application unit contact/telephone/E-mail	Contact information: Xionghe power station: 18062239328; Dongshan power station: 13872664448; Jinqiao power station: 13872684992; HUANGJIAJU power station: 1599580983		

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

	Equipment investment	According to the technology and equipment provided in the implementation of the new project, it would be the best for the users to be equipped with the following tools and equipments: 1. Example of electrical tools: Multimeter, screwdriver, wrench, pliers, electric iron, etc.. 2. Three phase voltage regulator (preferably 10KVA) 3. Micromputer-based relay protection testing device(0 ~ 10A three-phase alternating current, 0 ~ 150V three-phase voltage) 4. Two load resistance ZX9~8/800 (7.396Ω24A) Estimated the total cost is no more than 25 thousand Yuan, if the user want further maintenance, inspection equipment. Or commissioning and maintenance of other devices, this is also useful.
	Operation and maintenance fees	Cost of equipment required for the operation of the device at constant pressure: Computer excitation adjusting mechanism except for the electric energy (output from the the generator) required for the generator excitation output, the power consumption of the apparatus < 100W; There aren't other consumed raw materials for the apparatus. Statistics of repair cost: Suggest the user purchases part of the device in my company's recommendation to prepare for maintenance and replacement in advance, this will greatly reduce maintenance costs. The cost is about 10% of the total cost of the equipment. The original power station is not required for adding new staff for these devices in maintenance and management, so there will be no additional wage cost.
	Payback period of investment	To recover the cost in two months.
	Other benefits	By using this technology, the higher additional economic benefits can be produced at the same time.
	Technology share	In 2015, in the domestic industry with the similar technology (including the case did not use any technology) production or processing, it accounted for about 20% of the total market share.
	Technology market potential	By 2020, the market potential of this technology which can be developed and promoted is over 50% in this industry or field
	Technology advancement	Adopt binary channels double-chick operating mode with the STD bus structure; And the software and hardware adopt modular design. Complete functions and liable to extend; Adopt preset tracing technology, the fault operating status of the electric generator which caused by the wrong tracing of the main equipment control carbine during switching would not occur in the double-chick operion. Such devices of the Company have been experienced the operating certificate for over two decade years, and have advanced technology, reliable craft with great influence in the period of excitation in foreign and domestic.
	Technology maturity	The technology has completely reached maturity.
	Technology applicability	Automatic control of small and medium sized hydropower station

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

	Technology stability	Each component of the operating parameter of microcomputer excitation, microcomputer governor and low voltage unit integrated intelligent control of the device has sufficient margin. All the electronic components use industrial grade even military products, and all have the electrical aging screening of over 72 hours; Design and installation for secondary circuit, and the anti-electromagnetic interference measures fulfilling GB/T3797, GB14285, G B/T 14598.9 and G B/T4064 with the standard and specifications, can exclude the interference of the general environment and technical parameter. Serving as the microprocessor-based product, the above control apparatus are suitable for the control parameter setting of various water-turbine generator sets with convenient and wide methods and means, therefore the control water-turbine generator set can constantly operates stably, safely and reliably.
	Technology security	Reliably
	Obstacles of results transformation and promotion	There isn't any obstacle for this technology in the process of the result conversion and promotion
	Intellectual property transfer	The enterprise possesses this technology which has the national proprietary intellectual property rights

Technological achievements declaration of renewable energy sources			
Two-dimensional code			
Technology providing unit	Wuhan Wushui Electric Technology Co., Ltd. WUHAN WUSHUI ELECTRICAL TECHNOLOGY CO, LTD (seal)		
Contact	Sima Pingping	Submission date	2016-08-04
Technology types	Small hydropower technology	Specific technology	And other technologies related to small hydropower
Telephone	**13807196853**	E-mail	sn ppll26@ 126.com
Technology name	Microcomputer turbine speed control device		
Technology provider	Wuhan Wushui Electric Technology Co., Ltd.		
Scope of application	Automatic control of medium and small hydropower stations		

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

	Technology briefing	Conduct PID closed-loop control with the turbine speed or active output or guide vane opening as the amount of feedback, in order to achieve optimal dynamic and static operation of water turbine. Key components include the electric control cabinet, mechanical hydraulic servo system, etc. with PLC as the main body.
	Technical Information	Speed dead band ≤0.08%; permanent difference coefficient bp = 0 ~ 10%;100% load shedding, overshoot 3% wave does not exceed twice; Approximate volume: 700X 600 X 1700mm
	Business application situation	Xionghe power station, Xiangfan, Hubei; Dongshan power station, Yichang, Hebei; Jinqiao power station, Yidu Hubei; Huang Jia Ju power station, Hubei Dangyang
	Service conditions	Mature technology; Require training; Simple installation, easy to use, low maintenance cost.
	Business application unit contact/telephone/E-mail	Contact information: Xionghe power station: 18062239328; Dongshan power station: 13872664448; Jinqiao power station: 13872684992: Huangjiaju power station: 1599580983
	Equipment investment	According to the technology and equipment provided in the implementation of the new project, it would be the best for the users to be equipped with the following tools and equipment: 1. Example of electrical tools: Multimeter, screwdriver, wrench, pliers, electric iron, etc.. 2. Three phase voltage regulator (preferably 10KVA) 3. Micromputer-based relay protection testing device(0 ~ 10A three-phase alternating current, 0 ~ 150V three-phase voltage) 4. Two load resistance ZX9~8/800 (7.396Ω 24A) Estimated the total cost is no more than 25 thousand Yuan, if the user want further maintenance, inspection equipment. Or commissioning and maintenance of other devices, this is also useful.
	Operation and maintenance fees	Cost of equipment required for the operation of the device at constant pressure: Its consumption in electricity < 100W: Statistics of repair cost: Suggest the user purchases part of the device in my company's recommendation to prepare for maintenance and replacement in advance, this will greatly reduce maintenance cost. The cost is about 10% of the total cost of the equipment. The original power station is not required for adding new staff for these devices in maintenance and management, so there will be no additional wage cost.
	Payback period of investment	To recover the cost in two months.
	Other benefits	By using this technology, the higher additional economic benefits can be produced at the same time.

TECHNOLOGY: GASIFICATION
COMPANY: WUHAN WUSHUI ELECTRIC TECHNOLOGY CO., LTD

	Technology share	In 2015, in the domestic industry with the similar technology (including the case did not use any technology) production or processing, it accounted for about 20% of the total market share.
	Technology market potential	The technology will be promoted within the industry or field in 2020, which can explore the market potential of more than 50%
	Technology advancement	The advanced digital technology and modern hydraulic technology are adopted, the original conventional oil pressure is replaced with high oil pressure, making the structure of whole speed controller more concise; Mechanical hydraulic system is constitute of standard industrial hydraulic components with high reliability, strong standard and more convenience for maintenance.
	Technology maturity	The technology has completely reached maturity.
	Technology applicability	Automatic control of small and medium sized hydropower station
	Technology stability	Each component of the operating parameter of microcomputer excitation, microcomputer governor and low voltage unit integrated intelligent control of the device has sufficient margin. All the electronic components use industrial grade even military products, and all have the electrical aging screening of over 72 hours; Design and installation for secondary circuit, and the anti-electromagnetic interference measures fulfilling GB/T3797, GB14285, G B/T 14598.9 and G B/T4064 with the standard and specifications, can exclude the interference of the general environment and technical parameter. Serving as the microprocessor-based product, the above control apparatus are suitable for the control parameter setting of various water-turbine generator sets with convenient and wide method and means, therefore the control water-turbine generator set can constantly operates stably, safely and reliably.
	Technology security	Reliably
	Obstacles of results transformation and promotion	There isn't any obstacle for this technology in the process of the result conversion and promotion
	Intellectual property transfer	The enterprise possesses this technology which has the national proprietary intellectual property rights

TECHNOLOGY: GASIFICATION
COMPANY: GUANGZHOU INSTITUTE OF ENERGY CONVERSION, CHINESE ACADEMY OF SCIENCES

Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences

Technological achievements declaration of renewable energy sources

Technology supplier	Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences		Date of submission	2016-06-29	
Contacts	Xiuli Yin		Technology type	Biomass Energy	
Telephone	86-20-87057737		E-mail	xlyin@ms.giec.ac.cn	
Technology	Biomass gasification and power generation				
Scope of application	Renewable electricity with scales of 200-6000 kW.				
Brief introduction	1. Biomass gasification and power generation system mainly consists of feeding device, gasifier, gas cleaning, generator sets, recirculating cooling water system and electric control device. 2. Either fixed-bed gasifier or fluidized-bed gasifier can be used, depending on client's requirement. 3. The fuel gas after cleaning has a tar content of 5-10 mg/Nm^3, which can meet the needs of internal-combustion gas engine. 4. The output of a gas engine generator set is in the range of 200-500 kW, which is specifically designed for low-heating-value fuel gas.				
Major technical parameters			Units	2 MW	6 MW
	Gasification efficiency		%	75	78
	Electricity for self-consumption		%	10	10
	Electric efficiency		%	18	28
	Annual operation time		hour/yr	6000	6500
	Biomass consumption		kg(dry)/kWh	1.35	1.10
Status of commercial utilization	Location	Year	Scale	Technology	
	Laos	2002	200 kW	Fixed-bed gasification.	
	Thailand	2003	1200 kW	Circulating fluidized-bed.	
	Hainan, China	1998	1200 kW	Circulating fluidized-bed.	
	Jiangsu, China	2005	5500 kW	Circulating fluidized-bed.	
Contacts for more details	Zibo Diesel Engine Parent Company, Jiehui Liang, 86-13573365268				

	about commercial projects				
	Capital investment (RMB 10^4 Yuan)	**2MW biomass gasification and power generation system**			
		Items		Price	
		1. Major device (gasifier, generator, etc.)		610	
		2. Material and fixings for installation		30	
		3. Infrastructure		120	
		4. Installation and test operation		75	
		5. Auxiliary		65	
		6. Unpredictables		100	
		7. Total investment		1000	
		8. Capital cost (Yuan/kW)		5000	
	Operation costs	**Items**	**Units**	**2 MW**	**6 MW**
		Electric output	10^4 kWh/yr	1080	3510
		Depreciation	10^4 Yuan/yr	56.67	221
		Maintenance	10^4 Yuan/yr	17	66.3
		Labour	10^4 Yuan/yr	85.96	184.2
		Management	10^4 Yuan/yr	12	24
		Distribution	10^4 Yuan/yr	12	18
		Wastewater treatment	10^4 Yuan/yr	6	19.5
		Auxiliary material	10^4 Yuan/yr	24	78
		Biomass feedstock	10^4 Yuan/yr	324	858
		Total	10^4 Yuan/yr	513.63	1488.5
		Notes: The annual consumption of biomass is 16200 t and 42900 t for 2MW and 6 MW, respectively.			
	Payback period	About 6-8 year.			
	Other profit	Profit may be made from carbon emission trading.			
	Technical share in market	No data available.			

TECHNOLOGY: GASIFICATION
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Potential market	This application of technology depends strongly on feedstock price, access to grid and market acceptance.
Technical advantages	The technology of small- and medium-scale biomass gasification and power generation can be ranked in the first class all over the world.
Technical maturity	This technology has been utilization commercially.
Technical feasility	This technology is suitable for electricity supply for small- and medium-sized enterprises or off-grid areas.
Technical stability	The annual operation time is larger than 6000 hours in existed projects.
Technical safty	High.
Technical transformation and promotion	No barrier for technical transformation and promotion.
Intellectual property rights	We have independent intellectual property rights, which makes various forms of cooperation possible.
Figures	 a. power plant

TECHNOLOGY: GASIFICATION
COMPANY: GUANGZHOU INSTITUTE OF ENERGY CONVERSION, CHINESE ACADEMY OF SCIENCES


b. control room


c. generator sets

Technological achievements declaration of renewable energy sources			
Technology supplier	Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences	Date of submission	2016-06-29
Contacts	Xiuli Yin	Technology type	Biomass Energy
Telephone	86-20-87057737	E-mail	xlyin@ms.giec.ac.cn
Technology	Production and application of fuel gas from biomass gaisfication		
Scope of application	Fuel gas derived from biomass gasification is used as a substitute of fossil fuels such as coal, heavy oil and natural gas.		
Brief introduction	1. Novel mixed-current fixed-bed gasifier, which combines advantages of updraft and downdraft gasifier. 2. Hot gas filtration for dust removal. 3. High-efficiency combustion of low-heating-value fuel gas, with limited air pollutant emission. 4. Systematic combination of biomass gasification and industrial kiln.		
Major technical parameters	1. Capacity of gasifier: 0.5-3.0 tons biomass/h; 2. Lower heating value of fuel gas: 1350 kcal/ Nm^3. 3. Content of impurity in fuel gas: ≤ 50 mg/Nm^3; 4. Hot gas efficiency: ≥ 85%.		
Status of commercial utilization	This technology has been used in many industries, including steel rolling, metal smelting, pharmacy, food processing and clothing industry. 1. Project of Foshan Jinlan aluminium profile plant. The annual consumption of biomass for aluminium melting is 540,000 tons. The heavy oil being replaced is equivalent to 210,000 tons tce. The capital investment is about 20 million RMB Yuan while the payback period is 2.6 year. A total of 50,000 tons CO_2 emission can be avoided. 2. Project of Livzon New North River Pharmaceutical Co.,Ltd		

TECHNOLOGY: GASIFICATION
COMPANY: GUANGZHOU INSTITUTE OF ENERGY CONVERSION, CHINESE ACADEMY OF SCIENCES

	The annual consumption of biomass for steam production is 10,000 tons. The heavy oil being replaced is equivalent to 7,000 tons tce. The capital investment is about 5 million RMB Yuan while the payback period is 1.5 year.				
Contacts for more details about commercial projects	1. Yangshan Carbon Neutral Biofuels Development Co.,Ltd, Guifeng Liu, 86-15602338420 2. Guangdong Zhengpeng Biomass Energy Technology Co., Ltd, Jiaping Zhang, 86-13783789065				
Capital investment (RMB 10^4 Yuan)	**Items**	**6 t/h**	**10 t/h**	**15 t/h**	
	Construction	20	50	75	
	Storage and feeding	50	70	120	
	Gasifier	100	150	180	
	Auxiliary	10	20	30	
	Electric control	10	10	15	
	Installation	30	45	60	
	Boiler	80	100	150	
	Total	300	445	630	
Operation costs	**Items**	**Units**	**6 t/h**	**10 t/h**	**15 t/h**
	Steam production	10^4 t/yr	3	5	8
	Biomass consumption	10^4 t/yr	0.72	1.2	1.92
	Number of gasifiers		1	2	3
	Total investment	10^4 Yuan	300	445	630
	Purchase price of fuel	Yuan/t	750	750	750
	Cost of fuel	10^4 Yuan/yr	540	900	1440
	Cost of labour	10^4 Yuan/yr	75	100	125
	Cost of maintenance	10^4 Yuan/yr	15	22.25	31.5
	Depreciation of equipment	10^4 Yuan/yr	37.5	55.63	78.75
	Water and power	10^4 Yuan/yr	60	100	160
	Others	10^4 Yuan/yr	18	27	36
	Total operation cost	10^4 Yuan/yr	745.5	1204.88	1871.25

TECHNOLOGY: GASIFICATION
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		Selling price of steam	Yuan/t	310	300	290
		Gross income	10^4 Yuan/yr	930	1500	2320
		Gross profit	10^4 Yuan/yr	184.5	295.13	448.75
		Tax	10^4 Yuan/yr	46.5	75	116
		Notes: The above data is estimated based on full load of boiler, with an annual operation time of 7920 h. The cost of steam will increase by 25-30 Yuan/t when the purchase price of biomass fuel increase by 100 Yuan/t.				
	Payback period	About 1.5 year				
	Other profit	1. The cost of fuel will decrease by 25%, 32% and 15% when replacing natural gas, diesel and heavy oil with biomass. 2. The reduction of C emission is estimated to be in the range of 6500-18000 t, which can make profit from carbon emission trading.				
	Technical share in market	About 40%.				
	Potential market	Annual consumption of biomass fuel gas may reach 50 billion m^3, which can replace 10 billion m^3natural gas. Annual consumption of biomass pellet may reach 50 million tons, which can replace 30 million coal.				
	Technical advantages	The novel mixed-current fixed-bed gasifier, which combines advantages of updraft and downdraft gasifier, is an advanced technology. With the specific design of gasifier structure, high gasification efficiency, low content of tar/dust in fuel gas, high fuel flexibility, simple operation and long-term stable operation can be guaranteed.				
	Technical maturity	This technology has been utilization commercially.				
	Technical feasility	This technology is suitable for heat supply for small- and medium-sized enterprises.				
	Technical stability	The annual operation time is larger than 6000 hours in existed projects.				
	Technical safty	High				
	Technical transformation and promotion	No barrier for technical transformation and promotion.				
	Intellectual property rights	We have independent intellectual property rights, which makes various forms of cooperation possible.				

TECHNOLOGY: GASIFICATION
COMPANY: GUANGZHOU INSTITUTE OF ENERGY CONVERSION, CHINESE ACADEMY OF SCIENCES

	Figures	 a. steel rolling  b. aluminum melting  c. aluminum melting  d. steam boiler

TECHNOLOGY: HYDRO
COMPANY: FUZHOU FANGYUAN ELECTRIC MACHINERY CO., LTD

Fuzhou Fangyuan Electric Machinery Co., Ltd	Annex 2 Central Africa Renewable Energy Technology Achievement Declaration Table Technology provision unit: Fuzhou Fangyuan Electric Machinery Co., Ltd. Submission date: August 5, 2016 Contact person: Chen Junyuan Tel.: 15859087576 E-mail: paladincjy@fangyuanelectric.com Technical type selected: A hydropower technology Brief introduction of technical achievements: 1. Name of technology or product: Assembled vertical-axis impulse type water-turbine generator set 2. Technical or product provider: Fuzhou Fangyuan Electric Machinery Co., Ltd. 3. Whether it has the foreign cooperation experience: It has the foreign cooperation experience, France trading company declared that there are three power stations in France using this type of unit. 4. Technical intellectual property situation: The technical intellectual property of such type of product is owned by Fuzhou Fangyuan Electrical Machinery Co., Ltd. for declaration of national patents. 5. Applicable scope: It is suitable for the hydropower station with high water head (over 90m and less than 400m) and low flow and belongs to hydropower electromechanical equipment product. 6. Brief description of technology or product; The unit converts the pressure potential energy of water flow to free jet flow with kinetic energy and transfers the hydroenergy to the turning wheel and rotor taking advantage of nozzle for generating the electric energy.. It is suitable for the unit characterized by high water head, small flow, excellent hydraulic performance, compact structure and easy installation. Water turbine adopts DC effuser and improves about 2% of efficiency compared to the conventional elbow effuser. The generator is installed on the casing of water turbine to greatly reduce the axial length of horizontal unit, improve the rigidity of principal axis and increase the stability of the unit. The unit is installed vertically with the multi-nozzle structure to improve the specific speed of the water turbine, reduce the diameter of turning wheel, improve the rotate speed of the unit and reduce the investment costs of power station. Because the distribution pipe and casing of unit are buried in the concrete, the unit has the low noise and the plant is beautiful. The unit has an assembled structure with easy installation for

power station and is free of horizontal and upright adjustment for the horizontal unit. The key equipment is streamline distribution pipe with DC effuser which can effectively reduce the bydropower loss and improve the efficiency of unit.

7. Main technical indicators:
   a) For the specification of the product, the diameters of the turning wheel are t60, 70, 80, 890, 100cm respectively
   b) Number of nozzles: One, two or four
   c) Power range: ≤2000kW
   d) Working water head: 80-400m
   e) Size of the product: 1600×1600×2600 mm, 1800×1800×2800 mm, 2000×2000×3000 mm, 2200×2200×3200 mm, 2400×2400×3400 mm
8. Business application situation:
   a) Minqing Antai power station: It is located at the side of Minqing County, Fuzhou, Fujian and is installed with one double-nozzle water-turbine generator set with the model of CJA475-L-62/2×6, the capacity of generator is 630KW, operation situation is better and it has been put into operation for power generation for three years.
   b) Liuwuhe Power Station, Yangbi County, Dali, Yunnan: It is located at Yangbi County, Dali, Yunnan and is installed with three sets of four-nozzle water-turbine generator sets with model of CJA475-L-86/4X8.6, the capacity of generator is 1,700KW, total installed capacity is 5,100KW, the operation situation is better at present and it has been put into operation for power generation for half a year.
9. Contact person of business application unit /Tel. /E-mail
   a) Minqing Antai Power Station: Lin Ling, 15559581861
   b) Liuwuhe Power Station, Yangbi County, Dali, Yunnan: Lei Chuntao, 13887210168
10. Basic information of the project
   a) Minqing Antai Power Station: The power station is transformed by the old units, original unit is 400KW horizontal impulse-type water-turbine generator set with single-nozzle structure, upon repeated measurement and calculation of experts of our company, the capacity of original unit can be increased by 630KW without changing

	the channel and pressure pipeline and the assembled vertical-axis double-nozzle impulse type water-turbine generator set with compact and reasonable structure is adopted. The power station is personal power station locally, the model of water turbine is CJA475-L-62/2x6, the generator is a vertical water-turbine generator with 630KW, the quantity of one and operation period of more than three years. b) Liuwuhe Power Station, Yangbi County, Dali, Yunnan: The power station is a newly-built one, upon field investigation and analysis, the professional technicians of our company decide to adopt assembled four-nozzle vertical-axis impulse water-turbine generator set. Due to the four-nozzle vertical-axis structure adopted, the size of its turning wheel and comprehensive efficiency are superior to those of the conventional horizontal double-nozzle structure, thus, such type of unit is adopted. The model of the water turbine is CJA475-L-86/4X8.6, the generators are three sets of low-voltage units of 1,700KW, the voltage grade is 690V and the operation period is half a year. 11. Investment on equipment: The investment on hydropower has great differences in different regions due to scale size, advantages and disadvantages of resources, local labor costs, materials price, and generally it is RMB (7,000-12,000) /kW at home. The host equipment generally is RMB (800-1,000) /kW at home, and the main influence factors are advantages and disadvantages of resources. 12. Operation and maintenance costs: For operation and maintenance costs, generally each power station involves 1-2 persons labor cost and 1-2 persons water and electricity costs, after improve the automation investment, it can realize unattended operation. The equipment overhauling usually is conducted every 5-6 years, and the equipment amortization and maintenance costs usually are RMB (20-25) /kW per year. 13. Investment payback period At home, according to advantages and disadvantages of resources, total investment is generally withdrawn in 8-10 years. 14. Other earnings: For the assembled structure of the equipment, convenient installation, simple plant, little investment, compared to same type of equipment, one-time investment is reduced at least 12%.

TECHNOLOGY: HYDRO
COMPANY: FUZHOU FANGYUAN ELECTRIC MACHINERY CO., LTD

	15. Technical advancement: The innovation is mainly reflected on vertical axis and assembly. The unit is installed by vertical axis, helpful to the spatial arrangement of bearing, distribution pipe and effuser to improve unit efficiency and reduce noise; It is convenient to set multi-nozzle to improve discharge capacity, increase unit capacity and reduce power station investment cost. The unit adopts assembly type and more compact structure, to increase rigidity of the unit, be convenient for beautiful arrangement, installation and maintenance of the plant. The product is pioneered at home, achieving to international advanced level 16. Technical maturity: All components and parts are refined within plant, qualified in preassembly, debugging and inspection, assembled into a whole to be delivered, and the unit is highly integrated. 17. Technology applicability: It is suitable for hydropower station characterized by small flow with medium and high water heads, especially suitable for power station with too high rotation speed among mixed-flow type water-turbine generator set and power station with water flow in dry season. 18. Technology stability: The complete unit is preassembled within the plant, and dynamic balance test shall be conducted for the rotatable parts within the plant, which greatly improve the stability of the unit, since the distribution pipe and enclosure are embedded in concrete, so the unit has low noise with high stability, no effect on the surrounding environment. 19. Technology safety: The equipment with assembled structure, safe and reliable technology, has been used for multiple power stations, and some stations have operated safely for many years, with support equipment of inlet valve, speed controller, all belonging to conventional products. The investors generally accept and satisfy them. 20. Obstacle in achievement transformation and promotion: The key technology in the design of this equipment is compact structure, difficult to manufacture. Currently, the recognition degree of the market to this equipment is low, ignoring development. It may need to go abroad. 21. Transfer of intellectual property: Our company has obtained the national patent on such achievement, and the patent belongs to Fuzhou Fangyuan Electric Machinery Co., Ltd. Fuzhou Fangyuan Electric Machinery Co., Ltd. (sealed)

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

Zhejiang Jinlun Electromechanic Co., Ltd	Renewable Energy Technology Achievement Declaration			
	QR code			
	Technology provision unit	Zhejiang Jinlun Electromechanic Co., Ltd.		
	Contact person	Zhang Liansheng	Submission date	August 4, 2016
	Technology type	Small hydropower technology	Specific technology	Design, manufacture, installation and maintenance technologies of small hydropower station main engine and auxiliary engine
	Tel.	13957960510	E-mail	hslt@126.com
	Technology name	Axial flow water turbine		
	Technology provider	Provider: Zhejiang Jinlun Electromechanic Co., Ltd. is a professional enterprise for production of hydropower equipment, which is also an international small hydropower center and hydropower equipment manufacture base of UN, national high-tech enterprise, key high-tech enterprise of National Torch Plan and provincial patent demonstration enterprise, and the company owns provincial research and development center and provincial technology center. “Jinlun Brand” water turbine has won “China Machinery Industry Famous-brand Product”, “Zhejiang Famous Brand”, “Zhejiang Famous Trademark”, “Zhejiang Famous Export Brand”, “China Electrical Appliance Industry Quality Trustable Product” and other titles. The company passed international quality standard certification of ISO9001 in 1998, environmental system certification of ISO14001 in 2008 and occupational health and safety system certification of O H SA S18001 in 2010. The company owns qualification for contracting international project, has implemented enterprise resource planning (ERP) management system and has effective and complete quality assurance system. At present, it owns 1 national invention patent and 30 national utility model patents.		
	Scope of application	It belongs to manufacturing industry with applicative water head of 2-30 meters.		
	Brief description of technology	The model is a vertical shaft device with open-channel, pressured open-channel and closed channel (that is, concrete volute), in total of three forms. Runner structure is generally fixed runner blade (or manually adjustable blade). There are two types of tail pipe, which are direct push pipe and elbow pipe. Runner with diameter of less than 1000 mm is direct push pipe. The model applies to the power station with small change in water head and load.		
	Technical information			
	Business application situation			

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

	Service conditions	The company can provide power station site investigation, analysis of hydrogeology materials, overall planning and design of power station, irrigation works of power station, electromechanical equipment design and package of service. Water turbine technology has been standing in the leading position in the country. In the ranking of national small hydropower equipment manufacture industry statement, its comprehensive index has been No.1 for more than ten consecutive years.
	Contact person of business application unit / Tel. / E-mail	
	Investment on equipment	
	Expense of operation maintenance	
	Investment payback period	
	Other earnings	
	Technology occupancy	
	Market potential of technology	
	Technical advancement	The dominant product of water turbine has enjoyed a higher reputation and awareness in the same industry in the country, "Jinlun" brand water turbine is one of two enterprises nationwide in water turbine industry with the title of "China Machinery Industry Famous-brand Product", and it has won the titles of "Zhejiang Famous Brand" and Zhejiang "Famous Trademark" in 2005 and 2007 respectively. It won the titles of "Zhejiang Famous Export Brand" and China Electrical Appliance Industry "Quality Trustable Product" in 2009. The company has abilities for independent R&D and self-dependent innovation, adopts computer aided design and analysis, namely CAD, CAM and CAE, and adopts CFE and FE software to design, research and develop hydropower equipment with self-dependent intellectual property, and its hydropower equipment reaches domestic and international advanced technical level. At present, the company has designed, researched and developed hundreds of various types of new machines, among which more than 30 types have obtained the national patent technologies.
	Renewable Energy Technology Achievement Declaration	
	QR code	

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

Technology provision unit	Zhejiang Jinlun Electromechanic Co., Ltd.			
Contact person	Zhang Liansheng	Submission date	August 4, 2016	
Technology type	Small hydropower technology	Specific technology	Design, manufacture, installation and maintenance technologies of small hydropower station main engine and auxiliary engine	
Tel.	13957960510	E-mail	hslt@126.com	
Technology name	Impulse water turbine			
Technology provider	Provider: Zhejiang Jinlun Electromechanic Co., Ltd. is a professional enterprise for production of hydropower equipment, which is also an international small hydropower center and hydropower equipment manufacture base of UN, national high-tech enterprise, key high-tech enterprise of National Torch Plan and provincial patent demonstration enterprise, and the company owns provincial research and development center and provincial technology center. “Jinlun Brand” water turbine has won “China Machinery Industry Famous-brand Product”, “Zhejiang Famous Brand”, “Zhejiang Famous Trademark”, “Zhejiang Famous Export Brand”, “China Electrical Appliance Industry Quality Trustable Product” and other titles. The company passed international quality standard certification of ISO9001 in 1998, environmental system certification of ISO14001 in 2008 and occupational health and safety system certification of O H SA S18001 in 2010. The company owns qualification for contracting international project has implemented enterprise resource planning (ERP) management system and has effective and complete quality assurance system. At present, it owns 1 national invention patent and 30 national utility model patents.			
Scope of application	It belongs to manufacturing industry with applicative water head of 100-1,000 meters.			
Brief description of technology	Water forms jet flow from penstock through nozzle to force the turbine runner to rotate for work Impulse water turbine has compact structure, stable operation, easy operation and other characteristics It is applicable to water head and hydropower station with small flow.			
Technical information				
Business application situation				
Service conditions	The company can provide power station site investigation, analysis of hydrogeology materials, overall planning and design of power station, irrigation works of power station, electromechanical equipment design and package of service. Water turbine technology has been standing in the leading position in the country. In the ranking of national small hydropower equipment manufacture industry statement, its comprehensive index has been No.1 for more than ten consecutive years.			

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

	Contact person of business application unit / Tel. / E-mail			
	Investment on equipment			
	Expense of operation maintenance			
	Investment payback period			
	Other earnings			
	Technology occupancy			
	Market potential of the technology			
	Technical advancement	The dominant product of water turbine has enjoyed a higher reputation and awareness in the same industry in the country, "Jinlun" brand water turbine is one of two enterprises nationwide in water turbine industry with the title of "China Machinery Industry Famous-brand Product", and it has won the titles of "Zhejiang Famous Brand" and Zhejiang "Famous Trademark" in 2005 and 2007 respectively. It won the titles of "Zhejiang Famous Export Brand" and China Electrical Appliance Industry "Quality Trustable Product" in 2009. The company has abilities for independent R&D and self-dependent innovation, adopts computer aided design and analysis, namely CAD, CAM and CAE, and adopts CFE and FE software to design, research and develop hydropower equipment with self-dependent intellectual property, and its hydropower equipment reaches domestic and international advanced technical level. At present, the company has designed, researched and developed hundreds of various types of new machines, among which more than 30 types have obtained the national patent technologies.		
	Renewable Energy Technology Achievement Declaration			
	QR code			
	Technology provision unit	Zhejiang Jinlun Electromechanic Co., Ltd.		
	Contact person	Zhang Liansheng	Submission date	August 4, 2016
	Technology type	Small hydropower technology	Specific technology	Design, manufacture, installation and maintenance technologies of small

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

				hydropower station main engine and auxiliary engine
	Tel.	13957960510	E-mail	hslt@126.com
	Technology name	Mixed flow water turbine		
	Technology provider	Provider: Zhejiang Jinlun Electromechanic Co., Ltd. is a professional enterprise for production of hydropower equipment, which is also an international small hydropower center and hydropower equipment manufacture base of UN, national high-tech enterprise, key high-tech enterprise of National Torch Plan and provincial patent demonstration enterprise, and the company owns provincial research and development center and provincial technology center. “Jinlun Brand” water turbine has won “China Machinery Industry Famous-brand Product”, “Zhejiang Famous Brand”, “Zhejiang Famous Trademark”, “Zhejiang Famous Export Brand”, “China Electrical Appliance Industry Quality Trustable Product” and other titles. The company passed international quality standard certification of ISO9001 in 1998, environmental system certification of ISO14001 in 2008 and occupational health and safety system certification of O H SA S18001 in 2010. The company owns qualification for contracting international project, has implemented enterprise resource planning (ERP) management system and has effective and complete quality assurance system. At present, it owns 1 national invention patent and 30 national utility model patents.		
	Scope of application	It belongs to manufacturing industry with applicative water head of 20-300 meters.		
	Brief description of technology	The model has a volute device to make water flow move in the volute in good flow state. It is with high efficiency, simple structure, reliable operation, and is suitable for medium and high water head and larger hydropower station.		
	Technical information			
	Business application situation			
	Service conditions	The company can provide power station site investigation, analysis of hydrogeology materials, overall planning and design of power station, irrigation works of power station, electromechanical equipment design and package of service. Water turbine technology has been standing in the leading position in the country. In the ranking of national small hydropower equipment manufacture industry statement, its comprehensive index has been No.1 for more than ten consecutive years.		
	Contact person of business application unit / Tel. / E-mail			
	Investment on equipment			

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

	Expense of operation maintenance	
	Investment payback period	
	Other earnings	
	Technology occupancy	
	Market potential of the technology	
	Technical advancement	The dominant product of water turbine has enjoyed a higher reputation and awareness in the same industry in the country, "Jinlun" brand water turbine is one of two enterprises nationwide in water turbine industry with the title of "China Machinery Industry Famous-brand Product", and it has won the titles of "Zhejiang Famous Brand" and Zhejiang "Famous Trademark" in 2005 and 2007 respectively. It won the titles of "Zhejiang Famous Export Brand" and China Electrical Appliance Industry "Quality Trustable Product" in 2009. The company has abilities for independent R&D and self-dependent innovation, adopts computer aided design and analysis, namely CAD, CAM and CAE, and adopts CFE and FE software to design, research and develop hydropower equipment with self-dependent intellectual property, and its hydropower equipment reaches domestic and international advanced technical level. At present, the company has designed, researched and developed hundreds of various types of new machines, among which more than 30 types have obtained the national patent technologies.

Renewable Energy Technology Achievement Declaration			
QR code			
Technology provision unit	Zhejiang Jinlun Electromechanic Co., Ltd.		
Contact person	Zhang Liansheng	Submission date	August 4, 2016
Technology type	Small hydropower technology	Specific technology	Design, manufacture, installation and maintenance technologies of small hydropower station main engine and auxiliary engine
Tel.	13957960510	E-mail	hslt@126.com
Technology name	Through-flow turbine		
Technology provider	Provider: Zhejiang Jinlun Electromechanic Co., Ltd. is a professional enterprise for production of hydropower equipment, which is also an international small hydropower center and hydropower equipment manufacture base of UN, national high-tech enterprise, key high-tech enterprise of National		

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

		Torch Plan and provincial patent demonstration enterprise, and the company owns provincial research and development center and provincial technology center. “Jinlun Brand” water turbine has won “China Machinery Industry Famous-brand Product”, “Zhejiang Famous Brand”, “Zhejiang Famous Trademark”, “Zhejiang Famous Export Brand”, “China Electrical Appliance Industry Quality Trustable Product” and other titles. The company passed international quality standard certification of ISO9001 in 1998, environmental system certification of ISO14001 in 2008 and occupational health and safety system certification of O H SA S18001 in 2010. The company owns qualification for contracting international project, has implemented enterprise resource planning (ERP) management system and has effective and complete quality assurance system. At present, it owns 1 national invention patent and 30 national utility model patents.
	Scope of application	It belongs to manufacturing industry with applicative water head of 2-30 meters.
	Brief description of technology	Rotary blade is fixed or manually adjustable, with large discharge flow, high specific speed, large discharge capacity, good flow characteristic, high efficiency and other characteristics, which is a good model for the development of power station with low water head and high flow.
	Technical information	
	Business application situation	
	Service conditions	The company can provide power station site investigation, analysis of hydrogeology materials, overall planning and design of power station, irrigation works of power station, electromechanical equipment design and package of service. Water turbine technology has been standing in the leading position in the country. In the ranking of national small hydropower equipment manufacture industry statement, its comprehensive index has been No.1 for more than ten consecutive years.
	Contact person of business application unit / Tel. / E-mail	
	Investment on equipment	
	Expense of operation maintenance	
	Investment payback period	
	Other earnings	

TECHNOLOGY: HYDRO
COMPANY: ZHEJIANG JINLUN ELECTROMECHANIC CO., LTD

	Technology occupancy	
	Market potential of the technology	
	Technical advancement	The dominant product of water turbine has enjoyed a higher reputation and awareness in the same industry in the country, "Jinlun" brand water turbine is one of two enterprises nationwide in water turbine industry with the title of "China Machinery Industry Famous-brand Product", and it has won the titles of "Zhejiang Famous Brand" and Zhejiang "Famous Trademark" in 2005 and 2007 respectively. It won the titles of "Zhejiang Famous Export Brand" and China Electrical Appliance Industry "Quality Trustable Product" in 2009. The company has abilities for independent R&D and self-dependent innovation, adopts computer aided design and analysis, namely CAD, CAM and CAE, and adopts CFE and FE software to design, research and develop hydropower equipment with self-dependent intellectual property, and its hydropower equipment reaches domestic and international advanced technical level. At present, the company has designed, researched and developed hundreds of various types of new machines, among which more than 30 types have obtained the national patent technologies.

TECHNOLOGY: HYDRO
COMPANY: HANGZHOU GUOWANG TECHNICAL CO., LTD

Hangzhou Guowang Technical Co., Ltd	**Renewable Energy Technical Achievement Declaration**			
	QR code			
	Technical provision unit	Hangzhou Guowang Technical Co., Ltd.		
	Contact person	Sun Li	Submission date	August 11, 2016
	Technical type	The technical of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
	Tel.	13605712310	E-mail	13605712310@163.com
	Technical name	NDK-2001 Intelligent Control System for L.V. Generator Set		
	Technical provider:	Hangzhou Guowang Technical Co., Ltd.		
	Scope of application	Anhui Qiguang Energy Science & Technical Research Institute Co., Ltd.		
	Brief description of technical	NDK-2001 Intelligent Control System for L.V. Generator Set applies to L.V. water-turbine generator set with the generator outlet voltage of 400V Intelligent Control System for L.V. Generator Set is centered by industrial grade microprocessor, using various artificial intelligence technologies (AIT) for automatic control, frequency adjustment, synchronization parallel grid connection, measurement and generator protection, etc. for the set. Human-computer interface is LCD touch screen		
	Technical information	Automatic power on and shutdown, emergency shutdown, automatic frequency modulation, etc.. Control cabinet size for 2260mm(H) × 1200mm(W) × 800mm(D)		
	Business application situation	SHIWANG' ANDU Hydroelectric Station, Zambia, 2×500kW, good. Shenfan Grade I Hydroelectric Station, Jinhua, Zhejiang, 3×400kW, good.		
	Service conditions	NDK-2001 Intelligent Control System for L.V. Generator Set has mature technologies, over 14 years to put into operation first, with the constant improvement and perfect of technologies. Operators can apply the control equipment only after a simple training as it is used in the Hydroelectric Station, which has a high integration and is combined in a control cabinet with one-off switchgear of generator, easy to install and with lower cost of use and maintenance.		
	Contact person of business application unit/ Tel. / E-mail	Contact person of SHIWANG' ANDU Hydroelectric Station: Mr. Mwape, Tel.: +260 974378130 Contact person of Shenfan Grade I Hydroelectric Station: Liu Weixing, Tel.: 13757986933		
	Investment on equipment	The cost of single combined control cabinet per set is generally c. RMB 150,000, and others such as speed governor and excitation system can be complete with the control system for a certain		

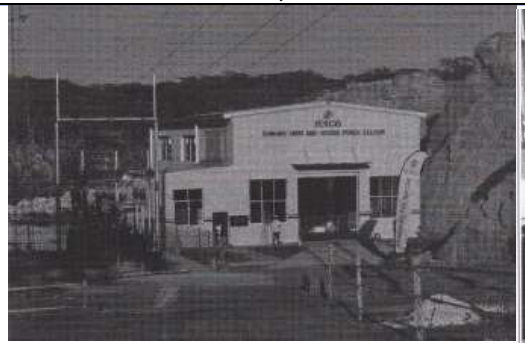
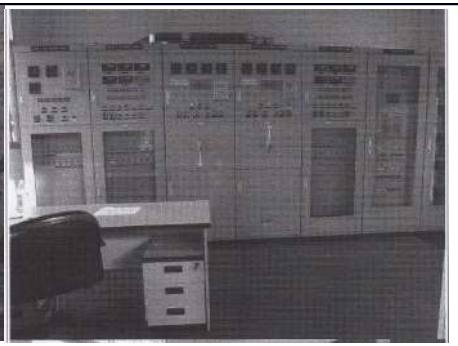
TECHNOLOGY: HYDRO
COMPANY: HANGZHOU GUOWANG TECHNICAL CO., LTD

		corresponding adjustment according to different sets. It can be used only with the generator voltage of 400V, and the generator breaker in the control cabinet needs to be changed in case of different set capacity.
	Expense of operation and maintenance	Equipment in normal operation has a very small power consumption itself, with the overall system of c. 300-400W, ignoring when used in the Hydroelectric Station, without consumption for other materials and water and in no need of special person to watch and under the management of its watchkeeper. With the lower expense of maintenance and management, most of devices operating for several years are in no need of replacing their accessories.
	Investment payback period	The application in the Hydroelectric Station of NDK-2001 Intelligent Control System for L.V. Generator Set is able to reduce the operators on duty and even to be non-attended upon the increase of mobile remote control. After 2-3 years, the cost to reduce the operators can cover that in equipment investment.
	Other earnings	The application of intelligent control system increases the reliability and safety in the operation of Hydroelectric Station and reduces its downtime, and the Hydroelectric Station can achieve the functions such as operation optimization according to water level of forebay, increasing generating capacity and its economic benefit.
	Technical occupancyy	Domestic and foreign hydroelectric stations for L.V. generator sets are subjected to the manual control but automatic control has not yet been widely used.
	Market potential of technical	The technologies of NDK-2001 Intelligent Control System for L.V. Generator Set are currently in full maturity, and the small hydroelectric stations for L.V. generator sets in villages have the operators for the most of over 50-year-old rural rear personnel due to remoteness. Above 80% rural hydroelectric stations in China are the L.V. generator sets with the generator voltage of 400V in urgent need of automatic control technologies for non-attended. As there will thus be a large demand by 2020, small hydroelectric stations are also the superior renewable energy resources in the global energy markets, of which, their construction having a small effect on the environment, great significance to reduce carbon emission, and importance to solve the lack of and no electricity in Africa regions.
	Technical advancement	Small as the automatic control systems of L.V. generator sets in rural hydroelectric stations, they are complete and request much technical with its difficulty even higher than that of H.V. generator set. Few as the products suitable for L.V. generator sets, they are in poor functions, lower reliability although similar ones in China while the foreign products have higher price and fail to fully meet the L.V. generator sets in technical performance, unacclimatization, not timely in aftersales, and higher cost. Based on the above, our Company has developed NDK-2001 Intelligent Control System for L.V. Generator Set suitable for L.V. generator sets..
	Technical maturity	NDK-2001 Intelligent Control System for L.V. Generator Set is centered by industrial grade microprocessor, using various artificial intelligence technologies (AIT) for automatic control,

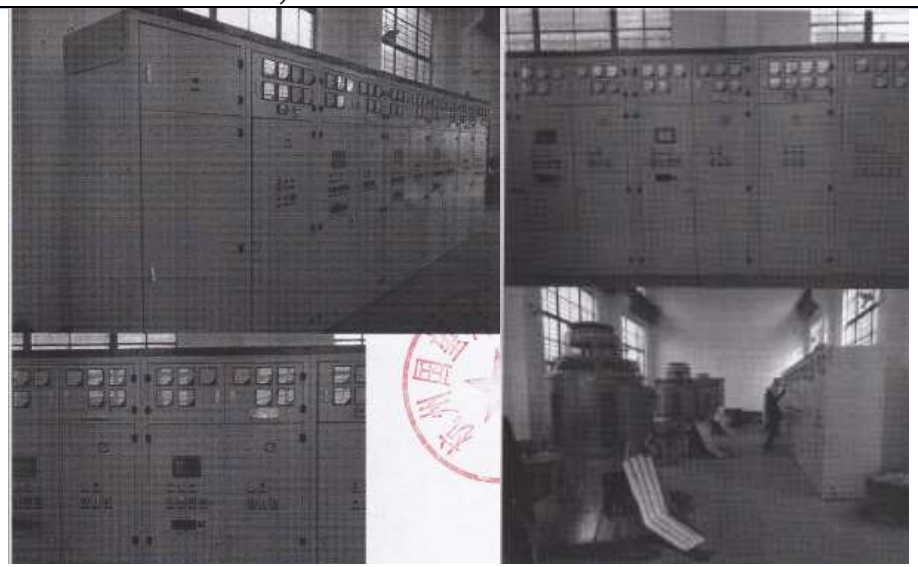
TECHNOLOGY: HYDRO
COMPANY: HANGZHOU GUOWANG TECHNICAL CO., LTD

		frequency adjustment, synchronization parallel grid connection, measurement and generator protection, etc. for the set. Human-computer interface is LCD touch screen It can be available to connect with the upper set by communication interface. The control system is characterized by mature technical.
	Technical applicability	NDK-2001 Intelligent Control System for L.V. Generator Set applies to the control of L.V. generator set with the generator voltage of 400V, matching in technical with upstream and downstream altitudes without the restrictions of territory, scale, environment, resource and energy.
	Technical stability	NDK-2001 Intelligent Control System Equipment for L.V. Generator Set is stable and reliable, with the longest operating time for over 14 years, and has strong adaptive capacity to environment and resistance to interference.
	Technical safety	NDK-2001 Intelligent Control System for L.V. Generator Set has higher technical safety and perfect corresponding supporting facilities in the course of technological achievement transformation and industrialization, higher market recognition to transfer to Africa. It is available to set up assembly plant therein (such as Zambia) for local assembly and realization of localization production, of which, not only increasing the local technical level and manufacturing capacity, but solving the product marketing and promotion, installation, commissioning, aftersales, etc..
	Obstacle in achievements transformation and promotion	In the course of achievement transformation, the places receiving transformation are required for assembly site, equipment, personnel and funding, wherein the last two are the key. Our Company is available to provide the core components and train the personnel of receiving country. In the course of achievement transformation and promotion, it is required to obtain the support from the policy and finance at the level of Technical exporting and receiving countries and their government.
	Transfer of intellectual property	For NDK-2001 Intelligent Control System for L.V. Generator Set, our Company has all the independent intellectual property rights, obtaining multiple patent certificates and software copyright certificates, and is willing to transfer the technical to African counties such as Zambia, without barrier to that inside the Company.

TECHNOLOGY: HYDRO
COMPANY: HANGZHOU GUOWANG TECHNICAL CO., LTD

	Photo captions	    

TECHNOLOGY: HYDRO
COMPANY: HANGZHOU GUOWANG TECHNICAL CO., LTD



TECHNOLOGY: HYDRO
COMPANY: HANGZHOU GUOWANG TECHNICAL CO., LTD

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

NARI Group Corporation	Renewable Energy Technical Achievement Declaration			
	QR code			
	Technical provision unit	NARI Group Corporation		
	Contact person	Pan Meiting	Submission date	August 17, 2016
	Technical type	The technical of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower station.
	Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
	Technical name	Analytic system of condition monitoring for SI-9000 hydroelectric generating set.		
	Technical provider	NARI Group Corporation		
	Scope of application	Condition monitoring and analysis for hydroelectric generating set.		
	Brief description of technical	By gathering vibration, throw, macroaxis displacement, air gap, magnetic flux, generator's partial discharge and other sensor of hydroelectric generating set, the system has realized the condition monitoring and fault diagnosis for hydroelectric generating set with characteristics of high integration, standardization and modularity, and includes computer, local LCU, monitoring sensor and other key equipment.		
	Technical information	Cabinet: 2260×800×800; The largest fast analog quantity count is 84, and the largest slow analog quantity count is 112. Sample in a timing and regular term, the highest sampling rate of single channel reaches 10Hz/s.		
	Business application situation	Huanggou pumped storage hydropower station (1200MW), Xiaowan hydroelectric station (4200MW), Ethiopia Jibu Ⅲ hydroelectric station (1870MW) Zambia Itezhi hydropower station (120MW)		
	Service conditions	The supplying party should invest and construct at local with mature techniques, and needs systematical training so that users can use and maintain it automatically.		
	Contact person of business application unit/Tel./E-mail	Three Gorges Hydropower Plant, Li Youping,15997651833; Zambia Itezhi Hydropower Station: Hou Changqing, 13523053085		
	Investment on equipment	Units below 50MW, RMB 200,000 per unit Units between 50MW-300MW, RMB 500,000 per unit Units between 300MW-1000MW, RMB 1,000,000 per unit		

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Expense of operation maintenance	If the system operation rating is below 1kw, it needs some labor maintenance costs. It has a depreciation period of 10 years, and needs operation maintenance cost is about RMB 20,000-50,000 a year.
	Investment payback period	2-3 years
	Other earnings	Optimize repair schedule, increase the hour amount in a year of unit, maintenance security of equipment operation in power plant, decrease operation and maintenance staffs.
	Technical occupancy	25%
	Market potential of the technical	It is predicted that the market standard are 150 sets by 2020, market occupancy is 55% with a production value of RMB 50,000,000.
	Technical advancement	Realize visualization for operation state of hydroelectric generating set, and become the leading place in similar technical.
	Technical maturity	Products reach in high integration with high completion.
	Technical applicability	Applied in large and medium hydroelectric generating set and pump storage unit without the limit of geographical location.
	Technical stability	Ambient temperature requirements: -40℃-70℃ Main technical parameters: The largest slow analog quantity count is 84, and the largest slow analog quantity count is 112. Fault-free time MTBF: >50,000h Levels of anti-electromagnetic interference Grade 3
	Technical safety	In maintenance-free mold, The product is simple and easy to handle with high reliability, maintenance and change in convenience, complete function, and lower cost effectively.
	Obstacle in achievement transformation and promotion	None
	Transfer of intellectual property	Owning proprietary intellectual property rights, Copyright No.: 02457Q7, Type Examination Certificate DBA15008, etc..
	Photo caption	
	Renewable Energy Technical Achievement Declaration	
	QR code	

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

Technical provision unit	Nanjing Nari Group Corporation			
Contact person	Pan Meiting	Submission date	August 17, 2016	
Technical type	The technical of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies	
Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn	
Technical name	Automatic system of water regimen and water dispatching. (Finally)			
Technical provider	Nari Group Corporation			
Scope of application	Be suitable for power rigid, hydroelectric station, centralized control in drainage basin and prevention and control of flood.			
Brief description of technical	Based on advanced data sensor, network communication, hydrological and hydraulic theory, the system has realized the information management, analysis and prediction trend towards hydrology, weather and reservoir operation, provided hydrological forecast and reservoir regulation policy to support model. With the characteristics of intense integration, layering, standardization and modularization. Including the functions of collection and analysis for water and rainfall information, auto calculation for water affairs, timing alarm, mobile browse, duty management, flood prediction, power generation dispatching, and so on.			
Technical information	Operate steadily and reliably in long term, response with fast speed and good security. With wide openness and flexible connect type, the system has access to various congruence angle system from the third party. Can be accessed into 2,000 remote control stations, 8,000 data points.			
Business application situation	Laos Nam Lik 1-2 Hydroelectric Station (100MW), Sudan national dispatching center Gradin Chengdu area of Jinsha River downstream dispatching center (65000MW), Yalong River Drainage Basin centralized control center. (26258MW)			
Service conditions	For the supplier's local investment and construction, with mature technologies, users can use and maintain on their own through simple system training.			
Contact person of business application unit / Tel. / E-mail	Centralized control center of Yalong River Drainage Basin He Guochun,028-82907333;Changheba Hydroelectric Station Wang Guohua,0836-8903692			
Investment on equipment	The investment of one-unit plant system is RMB 2,000,000-5,000,000 per unit. (as per the practical application demand).			
Expense of operation and maintenance	The service life of system is over 8 years, and the operation maintenance expense is RMB 50,000-80,000 per year. (adjust according to practical scale of system)			
Investment payback period	2-3 years			

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Other earnings	Water saving for generation, utilization of floodwater, decrease of loss in flood. Realize the automation of monitoring condition for water and rainfall and reduce operation and maintenance staff.
	Technical occupancy	80%
	Market potential of technical	It is predicted that the market scale are 150 sets by 2020, market share is 90% with a production value of RMB 1.6 billion.
	Technical advancement	With the intelligent functions of hydrologic forecasting, power generation dispatching, flood dispatching, business process recommendations, etc., a leader in the world.
	Technical maturity	The product technologies use originally mature technologies to integrate and realize high integration, with higher extent of perfection.
	Technical applicability	Apply to the power grid, centralized drainage basin control, hydroelectric station, water rainfall regimen monitoring and reservoir dispatching for water conservancy flood prevention, not restricted by geographic locations.
	Technical stability	Service life≥8 years; Annual available rate≥99.5%; Database available rate≥99.5%; Mean time between failures≥1 year; Response time of real time picture≤3s; Response time of non-real-time picture≤30s; Normal operation rate for monthly communication≥95%; On-time rate for monthly data≥90%; Percent of pass for monthly data≥98%;
	Technical safety	Products for high reliability and easy to use, load balancing, automatic backup, perfect authority management, easy to maintain, complete function, and lower cost effectively.
	Obstacle in achievements transformation and promotion	None
	Transfer of intellectual property	Having domestic independent intellectual property right, Software product registration certificate No. SDGY-2015-A0640, Copyright registration No. 2010SR026695 etc.
	Photo captions	

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

Renewable Energy Technical Achievement Declaration			
QR code			
Technical provision unit	NARI Group Corporation		
Contact person	Pan Meiting	Submission date	August 17, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
Technical name	Computer monitoring system of SSI-3000 hydropower plant V1.0		
Technical provider	NARI Group Corporation		
Scope of application	Hydropower plant, watershed centralized control center, pumped storage power station, photovoltaic power station		
Brief description of technical	System uses multi-level design including power plant local LCU, central control room and superior dispatching management department, achieves functions of equipment operation monitor and control adjustment in conventional hydropower plants of different sizes, pumped storage power station, PV power station and cascade hydropower station centralized control center, with characteristics of highly reliable, and its partial failure does not affect the normal operation of site equipment, mainly including host system, local control unit LCU and other key equipment.		
Technical information	Cabinet body: 2260×800×800 standard equipment cabinet The utilization rate of final acceptance is not less than 99.99%; MTTR<0.5h; MTBF>30000h;		
Business application situation	Zambia Kariba hydropower station (360MW), Sichuan Yalong River centralized control center. (The total capacity of cascade 26258MW), Liaoning Pushi River pumped storage power station (1,200MW), Qinghai Longyangxia water-light complementary (531MW)		
Service conditions	For the supplier's local investment and construction, with mature technologies, users can use and maintain on their own through simple system training.		
Contact person of business application unit /Tel./E-mail / Tel. / E-mail	Kariba, Zambia, Li Shunqi 0371-86019195; Yalongjiang Drainage Basin centralized control center of, Zhang Junbo 13888358002; Pushi River pumped storage power station, Dong Xingshun,18741507119; Qinghai Longyangxia water-light complementary, Zhu Xiangjia 18997078281		

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Investment on equipment	The units below 100MW, 1,500,000/per unit 100MW-300MW units, 2,000,000/per unit The units above 300MW, 2,500,000 /per unit
	Expense of operation maintenance	It needs a little labor maintenance cost. It has depreciation period of 10 years, its operation maintenance cost is about 20,000-100,000 a year.
	Investment payback period	2-3 years
	Other earnings	If increasing the hour amount in a year of unit, no one needs to be on duty, and operation maintenance staff can be decreased.
	Technical occupancy	70%
	Market potential of the technical	It is predicted that the market standard are 300 sets by 2020, market occupancy is 70% with a production value of RMB 500,000,000.
	Technical advancement	System configuration and equipment selection follows the advanced product in the computer field, and the system reaches the international advanced level. It is designed according to the principle of "None on duty" (few people on duty), and carry out the overall design and configuration in accordance with the guiding ideology of achieving monitor and control at all levels including power plant local LCU, central control room of power plant and superior dispatching management departments.
	Technical maturity	Products have been widely applied into a great amount of engineering at home and abroad, with a high degree of maturity.
	Technical applicability	IEEE802.3 standard design for compute monitoring system; It is a fully distributed and open system, not only convenient for the expansion of the function and hardware, but also can fully protect the application resources and investment, the distributed database and software modular, structured design allow the system to adapt to the increase of function and the expansion of scale, and has self-diagnostic capability. This series of products are mainly applicable to plant operation monitoring and control regulation and the operation and management automation and dispatching control of cascade hydropower stations, the dispatch center of large, medium and small hydropower plants, pumped storage power stations, and photovoltaic power stations.
	Technical stability	Based on more than 20 years of development of hydropower plant computer monitoring system of NARI Group Corporation, the technical fully absorbs the latest technical in the field of the international computer science, can effectively meet the needs of monitoring and management of production process in the water conservancy and hydroelectric power, photovoltaic field, has been widely applied in more than 700 large and medium-sized projects, and it is a very mature technical products.
	Technical safety	In maintenance-free mold, The product is simple and easy to handle with high reliability, maintenance and change in convenience, complete function, and lower cost effectively.

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

Obstacle in achievement transformation and promotion	None	
Transfer of intellectual property	Has the domestic proprietary intellectual property rights, and the registration number of the computer software copyright is: 2001SR1776	
Photo caption		

Renewable Energy Technical Achievement Declaration

QR code			
Technical provision unit	NARI Group Corporation		
Contact person	Pan Meiting	Submission date	August 17, 2016
Technical type	The technical of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
Technical name	Hydrogovernor (Final version)		
Technical provider	NARI Group Corporation		
Scope of application	Be appropriate for single unit of water-turbine generator set between 100,000kw-1,000,000kw.		
Brief description of technical	By gathering auto control, electric-hydraulic conversion and hydraulic manifold technical, the system has realized automatic function of rotate speed and active power of water turbine with characteristics of high reliability, standardization and integration. It includes electric control cabinet, hydraumatic operation cabinet, main control valve, oil pressure installation, as well as control equipment, emergency distributing valve, subsection and closed installation and mechanical plastic protection installation.		
Technical information	Size of main control valve, emergency distributing valve, etc.. DN50-DN250, pressure rating 2.5MPa-16MPa, oil pressure installation $0.6m^3$-$60m^3$		
Business application situation	Yunnan Xiaowan hydroelectric station (700MW), Anhui Xiangshuijian hydropower station (250MW), The north costal of Zambia Kariba expanding units (360MW), The south coast of Kariba in Zimbabwe (150MW)		
Service conditions	The supplying party should invest and construct at local with mature techniques, and needs systematical training so that users can use and maintain it automatically.		

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Contact person of business application unit/Tel./E-mail	Xiaowan hydropower station, Ji Zhengtang, 18987247538 Xiangshuijian hydropower station, Xing Hongchao, 15255380893; Kariba, Zambia: Hou Changqing, 13523053058
	Investment on equipment	Units below 10MW, RMB 300,000 per unit; Units between 10MW-300MW, RMB 1,000,000 per unit Units between 300MW-1000MW, RMB 2,000,000 per unit
	Expense of operation maintenance	It needs some labor maintenance costs. It has a depreciation period of 10 years, and needs operation maintenance cost is about RMB 10,000-100,000 a year.
	Investment payback period	2-3 years
	Other earnings	If increasing the hour amount in a year of unit, no one needs to be on duty, and operation and maintenance staff can be decreased.
	Technical occupancy	20%-30%
	Market potential of the technical	It is predicted that the market standard are 1,000 sets by 2020, market occupancy is 25%-35% with a production value of RMB 300,000,000.
	Technical advancement	The technical standard of NARI hydrogovernor is international advanced level and in leading place in china.
	Technical maturity	Hydrogovernor is a highly mature technical product. NARI has more than 30-year experience in governor production, debug, and commission.
	Technical applicability	Hydrogovernor can be applied in various water-turbine generator set.
	Technical stability	Ambient temperature requirements: 0℃-40℃ Main technical parameters: Proportional gain KP: 0.01-20; Integral gain KI: 0-20 l/s; Differential gain KD: 0-20s; The eternal slip ratio Bp: 0-10%, Adjustment range of artificial dead zone: 0-0.75Hz Fault-free time MTBF: 63,782 hours Levels of anti-electromagnetic interference: IEC61000 Grade 3 m^3
	Technical safety	This product has high security of technique which guarantees the safe and stable operation of hydroelectric generating set.
	Obstacle in achievement transformation and promotion	None
	Transfer of intellectual property	Owning proprietary intellectual property rights, Patent No.: ZL200810243848.1, ZL200820215291.6, ZL200910184028.4, ZL200920282821.3, ZL200920282820.9, ZL201020156584.9, ZL201010566574.7, ZL201110437743.1 Copyright No.: RZD ZI No. 0274778

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

		Type Examination Certificate: DZ142192, DZ142192-EMC, DZ150022, DZ150022-EMC, DZ150021, DZ150021-EMC		
	Photo caption			

Renewable Energy Technical Achievement Declaration			
QR code			
Technology provision unit	NARI Group Corporation		
Contact person	Pan Meiting	Submission date	August 17, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
Technical name	IMS2000 intelligent agricultural water saving irrigation integrated management and control system (Finally)		
Technical provider	NARI Group Corporation		
Scope of application	Water saving irrigation of the reservoir, canal system and field of agricultural water conservancy		
Brief description of technical	System integrates functions of sluice pump station, water level and flow, soil moisture, video surveillance, water-saving irrigation and wells control, realizes the water dispatching, wisdom agricultural irrigation, automatic monitoring of sluice pump station and others, with characteristics of high integration, standardization and modularization, mainly consists of small PLC, water-saving irrigation electromagnetic valve, network transmission, water level flow M collection, soil moisture collection, meteorological data collection, integration platform and other key equipment.		
Technical information	Field water-saving irrigation, electromagnetic valve: ZIGBEE wireless automatic control; The soil moisture monitoring and control: Wireless automatic monitoring. The integration irrigation of water and fertilizer; Water and fertilizer automatic ratio intelligent irrigation		
Business application situation	Water source of Yanqi County, Xinjiang, Ten thousand acres of walnut forest of Yuncheng, Shanxi, Irrigation district of Yumen, Gansu, Trunk canal in Kuta, Xinjiang		
Service conditions	For the supplier's local investment and construction, with mature technologies, users can use and maintain on their own through simple systematic training.		
Contact person of business application unit / Tel. / E-mail	Automatic monitoring of water source in Yanqi, Xinjiang, Liu Guojun, 13565060698, 297395425@qq.com		

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Investment on equipment	Make a budget estimate according to the agricultural irrigation area, and about RMB 400,000 is invested for every 1,000 acres of basic hardware equipment. The basic investment in software and data center is RMB 2,000,000-5,000,000.
	Expense of operation and maintenance	If the system operating power is 30-75Kw, it needs some manual maintenance costs. It has a depreciation period of 10 years, and needs operation and maintenance expense is about RMB 5,000 a year.
	Investment payback period	2-3 years
	Other earnings	Save irrigation water and save labor cost.
	Technical occupancy	5%
	Market potential of Technical	It is predicted that the market standard are 12,000 sets by 2020, market share is 5% with production value of RMB 30,000,000.
	Technical advancement	Integration of computer technical, modern communication technical, automatic control Technical, sensor technical, automatic irrigation Technical, artificial intelligence technical, database technical, carry out automatic collection, transmission and processing of information about water resource in the irrigation area, and realize the integration of measuring, monitoring, management and control.
	Technical maturity	The product technologies use originally mature technologies to integrate and realize high integration, with higher extent of perfection.
	Technical applicability	Water saving irrigation of the reservoir, canal system and field of agricultural water conservancy.
	Technical stability	Ambient temperature requirements -20-50℃ Main technical parameters: MTBF>8760h; Alarm time for the occurrence of failure <10 minutes; WEBGIS response speed: <5 seconds; Complex report response speed: <5 seconds; General query response speed: <3 seconds.
	Technical safety	In maintenance-free mold, The product is simple and easy to handle with high reliability, maintenance and change in convenience, complete function, and lower cost effectively.
	Obstacle in achievements transformation and promotion	None
	Transfer of intellectual property	Having domestic independent intellectual property, Patent number: 201521072098.8, Copyright No.: 2015SR217855, Certificate of inspection report 151222134, Software product certificate: S-RC-2016-A0271 etc.
	Photo captions	

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

Renewable Energy Technical Achievement Declaration			
QR code			
Technical provision unit	NARI Group Corporation		
Contact person	Pan Meiting	Submission date	August 17, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
Technical name	Integration control technical of low pressure units at small hydropower station s		
Technical provider	NARI Group Corporation		
Scope of application	Applicable for low pressure water turbine generating unit with single unit of 1000kW or less than 1000kW		
Brief description of technical	The system has integrated low pressure unit intelligent controller (generator circuit breaker, excitation major loop, instruments and operation button, etc. The primary and secondary equipment of water-turbine generator set shall be configured in one screen cabinet by optimization; It has realized automatic startingup and shutdown with one button, excitation and building pressure, synchronization and disaggregation, generator protection, remote control and other functions, and it has the features of high integration, standardization and modularization.		
Technical information	Cabinet body 2260×800×800; Input precision of temperature range 5%;Analog quantity input precision 3‰;Pressure adjustment precision of excitation parameter <0.5%;		
Business application situation	Zhejiang Zhengtao Hydropower Station (2×160kW) \ Fujian Xiaoneng Hydropower Station (2×400kW), Ventanas Hydropower Station in COSTA RICA (11MW)		
Service conditions	For the investment and construction in the supplier's local place, the technical is mature. Only simple system training is needed and users can use and maintain by themselves.		
Contact person of business application unit /Tel./E-mail / Tel. / E-mail	Zhejiang Zhengtao Hydropower Station, Zhou Xiaojun,15869038398		

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Investment on equipment	Unit less than 1000kW, RMB80,000/single unit
	Expense of operation maintenance	If the system service rating is below 2kw, it needs some maintenance costs. It has a depreciation period of 10 years and needs about RMB 2,000-5,000/ year as operation maintenance cost.
	Investment payback period	2-3 years
	Other earnings	Add power generation hours of units for the year, with possibility of no man on duty, reducing quantity of operation and maintenance personnel
	Technical occupancy	10%
	Market potential of the technical	It is predicted that the market size are 150 sets by 2020. Market share of our company is 10% with a production value of RMB 16,000,000
	Technical advancement	Primary and secondary function of high integration hydropower low pressure unit has achieved integrated control of hydropower unit, which is in leading position in similar technical.
	Technical maturity	The product technical adopts original mature technical for fusion to achieve high integration of the product with high perfection.
	Technical applicability	It is applicable for new construction of small hydropower plant or transformation of small hydropower with weak foundation in automatic control, without limitation of geographical location.
	Technical stability	Ambient temperature requirements -10℃-+50℃, The average temperature within 24h does not exceed 35℃ Rated AC current; 5A. Rated AC voltage, Un 57.74V or 220V Rated frequency: 50Hz Working power supply: DC/AC220V, Allowable change range: 80%-110%。 Level of anti-electromagnetic interference In accordance with the regulation of the International GB/T14598.9
	Technical safety	In maintenance-free mold, The product is simple and easy to handle with high reliability, maintenance and change in convenience, complete function, and lower cost effectively.
	Obstacle in achievement transformation and promotion	None
	Transfer of intellectual property	Possession of domestic proprietary intellectual property
	Photo caption	

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

Renewable Energy Technical Achievement Declaration			
QR code			
Technical provision unit	Nanjing Nanrui Group		
Contact person	Pan Meiting	Submission date	August 17, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower station.
Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
Technical name	Intelligent distributed project safe monitoring automatic system (Final)		
Technical provider	NARI Group Corporation		
Scope of application	Reservoir dam, underground plant, tunnel, channel, high slope, wind power plant and other projects		
Brief description of technical	The system applies advanced sensor, network communication and computer technical to complete automatic monitoring and off-line analysis function on transformation, porous flow, osmotic pressure, temperature, stress-stain, water level and other items of building and rock project with technical features such as reliable structure, flexible system configuration and high operation efficiency. It mainly includes modular structure data collection unit, monitoring host, management computer, etc.		
Technical information	Interviewee capacitance-type sensor, resistance-type sensor, vibrating wire type sensor, potentiometer-type sensor and other sensors; In addition, it is also available to collect sensor with transmitter and output of current and voltage, etc.		
Business application situation	Imboulou hydropower station, Congo (The Republic of Congo) (120MW), Guinea Kaleta Hydropower Station (240MW), Guizhou Sanbanxi Hydropower Station (100MW), Jiangsu Yixing Pumped Storage Power Station (1,000MW)		
Service conditions	The supplier should construct and commission at local with mature techniques, and it needs simple systematical training so that users can use and maintain it by themselves.		
Contact person of business application unit / Tel. / E-mail	Kaleta, Wang Yourui, 18709218852; Jinping Project I and II, Luo Hao,13882479799; Sanbanxi Zhou Xiaolu, 18692219287; Yixing Pumped Storage, Zhang Lei, 0510-80763702		

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Investment on equipment	According to the scale of the project from RMB 500,000 to RMB 5,000,000, determine by depending on the number of monitoring points.
	Expense of operation and maintenance	It needs a little artificial maintenance cost. It's depreciation period is 10 years, operation maintenance cost is about RMB 100,000 /year.
	Investment payback period	2-3 years
	Other earnings	The on-line data collection of safety monitoring data of reservoir dam is realized, which provides data support for analysis of safety and stability of dam.
	Technical occupancy	40%
	Market potential of Technical	Market size is expected to reach 200 units in 2020, the market share of the products of our company will account for 50%, and the output value will be RMB 100,000,000.
	Technical advancement	System combines with the latest achievements of modern microelectronic technical and network communication technical with more reliable system structure, more flexible system configuration and more efficient operation, so it is a distributed system with intelligence analysis capabilities, reached the international advanced level of technical, and fully meeting all real requirements of users.
	Technical maturity	The system has been applied in more than 100 hydropower station projects in China, including the Three Gorges, Xiaowan, Jinping and other mega projects, and mostly the system has continuously operated more than three years, with high mature technical.
	Technical applicability	The system is designed, manufactured according to the requirements of China "technical specification for automation of dam safety monitoring", it is of distributed modular design, flexible system configuration, flexible expansion, and it can well adapt to various small and medium-sized hydropower stations, reservoirs, wind farms, pumping storage and other engineering.
	Technical stability	The system is a professional product oriented to application in the hydropower industry, the application environment of hydropower industry has been fully considered for design and manufacture, it can be deployed in the dam corridor, crest, slope, tunnel, F room and slope surface area. The application results of a plurality of projects show that the operation of system is stable and reliable.
	Technical safety	The system is a mature and reliable product, adopting distributed and modularized design, so that fault of single equipment does not affect the running of the whole system; it has been widely applied in the market, the facilities of system is highly perfect, accessories are complete, maintenance is convenient, and the success rate of system construction is high.
	Obstacle in achievements transformation and promotion	None

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

Transfer of intellectual property	Possession of domestic proprietary intellectual property	
Caption		

Renewable Energy Technical Achievement Declaration

QR code			
Technical provision unit	NARI Group Corporation		
Contact person	Pan Meiting	Submission date	August 17, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
Technical name	MB80 series PLC		
Technical provider	NARI Group Corporation		
Scope of application	Hydroelectric station, photovoltaic, wind power station, thermal power plant, railway transportation, sluice and pump station and sewage treatment plant		
Brief description of technical	MB80 series PLC applies the most advanced design idea, elements and processing craft in the industry, realizes the function of measurement control, network communication, four remote controls, process control and information alarm at industrial control site, possesses the features such as attractive appearance, convenience and utility, dust prevention, moistureproof, quakeproof and against electromagnetic interference protection, and mainly includes CPU controller, I/O module and other key equipment.		
Technical information	Switch quantity signal DC24V, Resolution 1ms; Analog signal 0-20mA/0-5V, Measurement/output precision <2‰; Ethernet communication interface 10M/100M self-adaptation		
Business application situation	Democratic Republic of the Congo ZONGO2 Hydropower Station (150MW), Laos Houay Lamphan Gnai Hydropower Station (88MW), Liaoning Pushihe Pumped Storage Power Station (1200MW), Burqin Shankou Hydropower Station (220MW).		
Service conditions	For the supplier's local investment and construction, with mature technologies, uses can use and maintain on their own through simple system training.		
Contact person of business application unit /Tel. /E-mail	Democratic Republic of the Congo ZONGO2, Li Shunqi 0371-86019195;Laos Houay Lamphan Gnai Hydropower Station, Liu Tiepei, 15196666312;Pushihe Pumped Storage Power Station, Dong Xingshun, 1874150711; Burqin Shankou Hydropower Station, Li Xiaobing, 15999107228		

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Investment on equipment	The units below 100MW, 1.5 million/single unit 100MW-300MW units, 2 million/single unit The units above 300MW, 2.5 million/single unit
	Expense of operation and maintenance	It needs a little artificial maintenance cost. Its depreciation period is 10 years, its operation and maintenance cost is about RMB500, 000 a year.
	Investment payback period	2-3 years
	Other earnings	Improve control safety, increase adjustment speed and precision, no-man on duty is available, and reduces operation and maintenance personnel.
	Technical occupancy	As it still applies imported PLC in domestic large and medium hydroelectric station automatic control field, market share of NARI MB series PLC is about 10%, and it takes about 60% in utilization of domestic PLC.
	Market potential of technical	It is predicted that the market standard are 500 sets by 2020, market share is 55% with a production value of RMB 250,000,000.
	Technical advancement	MB series intelligent PLC is specially designed for safe and stable operation under complex and severe environment in hydroelectric plant, it has passed various electromagnetic compatibility test certifications of the national highest class, EU CE certification and China classification society certification, etc., and it can operate under stable condition in dusty workshop of hydroelectric plant with highfield and strong vibration.
	Technical maturity	MB series intelligent PLC is an product of high performance and high reliability with independent intellectual property, developed by NARI Group on the basis of systematic automatic research and development and project application for several decades, absorbing previous successful experience, fully blending advantages of DCS and PLC in other brands, aiming at current latest development direction of PLC, applying the technologies such as site bus technical, embedded technical and intelligence and combined with the latest technical in industrial control field. Since it has been placed on the market, research and development team analyzes and summarizes plentiful project cases, concludes control features in hydroelectric monitoring field, aiming at industrial requirement, persistently updates and optimizes configuration of software and hardware, constantly makes improvement and intensification, and conducts customized development according to the user's requirement and fully meets different demands of the customer. According to statistics, failure rate of MB series PLC products has constantly been kept under 0.2%, which is far less than PLC product of imported brand.
	Technical applicability	It possesses Modbus/TCP and other open and standard communication interface, it can be effectively integrated with various automatic components and automatic measurement control equipment of international mainstream manufactures, and forms complete plant computer monitoring system.

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

	Technical stability	Electromagnetic compatibility design of MB80 series PLC runs through the overall process from principle design, circuit board design and system structure design, and it has passed various electromagnetic compatibility test certifications of the national highest class; it is of high reliability and strong capacity of resisting disturbance, which is higher than foreign high-end PLC index. ■ Surge immunity: 4kV (Common mode) /2kV (Differential mode), Level 4 (IEC61000-4-5) ■ Damped oscillation noise immunity: 2.5kV (Common mode) /1kV (Differential mode), Level 3 (IEC61000-4-12) ■ Fast transient: ±4kV (power supply) /±2kV (I/O), Level 4 (IEC61000-4-4) ■ Electrostatic discharge: ±15kV (air) /±8kV (contact), Level 4 (IEC61000-4-2) ■ Radiated electromagnetic field anti-interference: 10V/m, Frequency 80MHz-1GHz, Level 3 (IEC61000-4-3)		
	Technical safety	MB80PLC has passed standard and strict CE certification and classification society certification with strict environment; It totally possesses certification qualifications for exporting to EU and other countries and regions, in the hydroelectric plant computer monitoring system completed by NARI Group, there are more than 120 power stations that apply MB80 series intelligent PLC as in-place LCU core controller, and it accounts for more than 20% in overall performance.		
	Obstacle in achievements transformation and promotion	None		
	Transfer of intellectual property	Having domestic independent intellectual property, Patent No.: ZL200820038734.9, ZL200910025039.8, ZL200920234197.X, ZL200820038735.3, ZL200820184987.7, ZL20103CL25512.3, Type Test Certificate No. DZ131341, DZ131341-EMC etc.		
	Photo captions			
	Renewable Energy Technical Achievement Declaration			
	QR code			
	Technical provision unit	NARI Group Corporation		
	Contact person	Pan Meiting	Submission date	August 17, 2016
	Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and

TECHNOLOGY: HYDRO
COMPANY: NARI GROUP CORPORATION

				distribution technologies of small hydropower stations
	Tel.	15950566319	E-mail	panmeiting@sgepri.sgcc.com.cn
	Technical name	UF-911 multi-path ultrasonic flowmeter (Finally)		
	Technical provider	Nari Group Corporation		
	Scope of application	It is applicable for mass flow online measurement and unit efficiency monitoring over water conservancy and hydropower, large water supply engineering		
	Brief description of technical	The product applies multi-path ultrasonic time-difference method flow gaging, all control, measurement, display and communication are configured in a wall-hanging cabinet with IP65 protection level, it can realize the measurement over flow velocity and flow of pipe, open channel, square-shaped culvert and many other cross sections via externally connected energy converter, and in addition, it can conduct efficiency monitoring over hydroelectric unit. It has the feature of being moistureproof, dust prevention and strong capacity of rejecting disturbance.		
	Technical information	Measurement over the diameter of the pipeline. 0.5-15m; Measurement over width of channel: 1-100m; Measurement error: Round pipe or square-shaped culvert in pressure: ±0.5%, pipe or open channel without pressure: ±1.0-2%		
	Business application situation	East route of the south-to-north water transfer project (7 pipes *8meters in diameter), Yunnan Manwan Hydropower Plant (300MW), Taishan Nuclear Power Station (4X900MW), Itezhi Hydropower Station of Zambia (130MW)		
	Service conditions	The supplying party should invest and construct at local with mature technologies in no need of training so that users can use and maintain it automatically.		
	Contact person of business application unit / Tel. / E-mail	Itezhi Hydropower Station of Zambia; Hou Changqing,13523053085		
	Investment on equipment	It has nothing to do with unit capacity, and it is calculated according to 1 set of each pipe/channel, with RMB 200,000/single set		
	Expense of operation and maintenance	System operation power is less than 30W, it is required of little manual maintenance cost, and depreciation period of equipment is 10 years		
	Investment payback period	2-3 years		
	Other earnings	It provides decision foundation for optimized distribution of hydroelectric unit load and water conservancy and power generation increase, and provides important basis for assessment of unit transformation effect.		
	Technical occupancy	20%		

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	Market potential of Technical	It is predicted that the market standard are 200 sets by 2020, market share is 20% with a production value of RMB 10,000,000.
	Technical advancement	Mass flow ultrasonic measurement technical is in leading position in similar technical.
	Technical maturity	This kind of technical has been used for more than 30 years with high complete degree.
	Technical applicability	This product is applicable for mass flow measurement and monitoring of hydroelectric station efficiency, and to ensure measurement precision, it is recommended to be used in pipe and open channel with diameter or width of over 1meter.
	Technical stability	Ambient temperature requirements Water temperature: 0-50℃;Host temperature-10℃+56℃ Levels of anti-electromagnetic interference Electrostatic discharge immunity, level 3 Electrical fast transient, level 3; Surge immunity, level 3; Power frequency magnetic field immunity, level 5 Degree of host box protection IP65
	Technical safety	1. In maintenance-free mold, the product is simple and easy to handle with high reliability, maintenance and change in convenience, complete function, and lower cost effectively. 2. Energy converter shall be installed according to specific circumstance, installation being not in place will affect measurement effect or even being unmeasurable, and it is required of professional to direct installation.
	Obstacle in achievements transformation and promotion	None
	Transfer of intellectual property	Having domestic independent intellectual property Patent number: 200910181630.2, 201310256511.5 CE certification: E8N151277437017; N8151277437016.
	Photo captions	

TECHNOLOGY: HYDRO
COMPANY: HNAC TECHNOLOGY CO., LTD

HNAC Technology Co., Ltd	Renewable Energy Technology Achievement Declaration			
	QR code			
	Technical provision unit	HNAC Technology Co., Ltd		
	Contact person	Tan Qin	Submission date	August 24, 2016
	Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
	Tel.	13755182914	E-mail	Overseas@cshnac.com
	Technical name	Excitation system of generator		
	Technical provider	HNAC Technology Co., Ltd		
	Scope of application	Generation set in various types.		
	Brief description of Technical	Excitation regulator of PWL-4A generator has 32 trunks of DSP (Digital Signal Processor) and EDA (CPLD) technologies as the control center, applies redundancy structure of binary channels and multi channels in cordwood system equipped with LCD and touch screen. Based on above hardware and our years of experience in software programming, PWL-4A possesses characteristics of high reliability, simple operation, convenient maintenance, flexible use, etc.		
	Technical information	Parallel operation with direct current and alternating current. Voltage-stabilized power supply The power supply of A kit and B kit are independent from each other. Power dissipation: Below 400W.		
	Business application situation	VERTIENTES Hydropower station(1*9MW)		
	Service conditions	1. Market trade 2. Mature technology 3. Need simple training. 4. Low operation and maintenance costs		
	Contact person of business application unit /Tel./E-mail	ELECTRICAL PUNTILLA S.A, Add: CALLE NUEVA DE LYON072,PISO014 COMUNA DE PROVIDENCIA Santiago, Chile		
	Investment on equipment	As the case may be		
	Expense of operation maintenance	Low operation and maintenance costs		

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	Investment payback period	As the case may be
	Other earnings	As the case may be
	Technical occupancy	High technical occupancy
	Market potential of the Technical	Great market potential
	Technical advancement	Excitation regulator of PWL-4A generator, a microcomputer excitation regulator combining classic and modern control theory with technology of digital signal processor (DSP), is the fourth generation of excitation product of our company. It heritages the whole regulatory, control, limit and protective functions of the previous three-generation microcomputer excitation regulator, meanwhile, gains great progress in aspects of computation speed, anti-electromagnetic interference, reliability and so on, is the ideal excitation regulation equipment for synchronization generator set in small, medium and large. PWL-4A is suitable for silicon controlled excitation in various form, is a excitation regulation equipment with high university.
	Technical maturity	Excitation regulator of PWL-4A generator has 32 trunks of DSP (Digital Signal Processor TMS320F2812) and EDA (CPLD) technologies as the control center, applies redundancy structure of binary channels and multi channels in cordwood system equipped with LCD and touch screen. Based on above hardware and our years of experience in software programming, PWL-4A possesses characteristics of high reliability, simple operation, convenient maintenance, flexible use, etc.
	Technical applicability	1. The altitude shall not exceed 4,000m. 2. The temperature of ambient air is +40C in the highest level, and -20C in the lowest level. 3. The relative air humility and the relative air humility in average of the minimum month is 90%, at the same time, the average lowest temperature of this month is +25C. 4. In clear environment without explosion risk. Not in corrosion metal or damaging insulating air or in conducive dirt, as well as not in shake or jolt place. 5. If any special requirements, it should be conformed through consultation by us and user.
	Technical stability	1. Advanced Surface Mount Technology (SMT) process. Excitation regulator of PWL-4A electric generator applies in advanced surface mounting integrated chip with totally-enclosed mechanical structure without fan forming the triple protection of cabinet, intubation tube and plug-in board of shield earth, improves the reliability of integration of equipment. 2. Advanced measurement method: Within one period (20ms), multi-point AC sampling shall be carried out for three-phase voltage and three-phase stator current, active power, reactive power and stator voltage and valid current value shall be calculated by software in real-time way, so response speed is fast and measurement will not be affected by waveform. 3. Highly integrated interface circuit: With a large-scale programmable device (CPLD) as outside interface circuit, excitation regulator of PWL-4A generator will make pulse form a large-scale programmable device with integration of detection,

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		frequency and phase detection, A/B sleeve switching and other functions. It improves overall reliability of the equipment.
	Technical safety	1. Distributed isolating power supply: Excitation regulator of PWL-4A generator uses distributed isolating power supply. Overall equipment power supply is distributed into host power supply (+5V), analog power supply (+12V and -12V); Pulse power supply, pulse detection power supply, switch quantity output power supply, switch quantity input power supply (2-way), each regulator outputs three pulses, can drive three bridges to automatically realize stream technology. Each part of the mutual isolation. It improves overall reliability of the equipment. 2. Electromagnetic compatibility technology: To strengthen its ability of the electromagnetic compatibility, excitation regulator of PWL-4A generator shall take more measures in general and local design. It is able to withstand ± 2500V transient conduction disturbances, ± 8000V static discharge interference and 10V/M space electromagnetic radiation.
	Obstacle in achievement transformation and promotion	Unknown
	Transfer of intellectual property	With proprietary property rights
	Photo caption	

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Renewable Energy Technology Achievement Declaration			
QR code			
Technical provision unit	HNAC Technology Co., Ltd.		
Contact person	Tan Qin	Submission date	August 23, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Survey and evaluation technologies of hydropower resources
Tel.	13755182914	E-mail	overseas@cshnac.com
Technical name	High and low voltage switchgears of small and medium hydropower stations		
Technical provider	HNAC Technology Co., Ltd.		
Scope of application	Power transmission and distribution of small and medium hydropower stations, substations, residences, factories and mines		
Brief description of Technical	High and low voltage switchgear is mainly used for power control, protection, measurement, conversion and distribution		
Technical information	Taking small and medium hydropower station with 6.3KV typical generator unit as an example, booster station equipment adopts outdoor equipment, and generator switch cabinet adopts KYN28A-12 type, and switch cabinet for house supply adopts HNMNS type.		
Business application situation	Chile Robleria hydropower station		
Service conditions	It has been put into operation in good condition for four years		
Contact person of business application unit /Tel./E-mail	Inversiones Talavera Limitada, Add: Catedral N 4547 Santiago-Chile, Tel: +56229515513		
Investment on equipment	According to primary main electrical connection schemes and wiring scheme for house supply, taking a hydropower station (with 2 generators, 1 main transformer) as an example, the main equipment configurations are as follows: 2 generator-terminal PTs and excitation PT cabinet, 2 generators outgoing cabinet, 1 generator bus PT cabinet, 1 transformer cabinet for house service, 1 main transformer outgoing cabinet, which are all KYN28A-12 type; 1 incoming cabinet for house supply (dual power incoming line, using the ATS switch), 2 feeder cabinet for house supply, which are all HNMNS type; General applications are some parts easy to wear and tear within the above switchgears with configuration of a certain number of spare parts.		

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	Expense of operation maintenance	Low operation maintenance costs
	Investment payback period	Short payback period
	Other earnings	High and low voltage cabinets are electromechanical equipment in hydropower station, and by adopting this program, it can reduce operation maintenance difficulty, improve repairing efficiency, and provide better guarantee for stable operation and grid-connection of units.
	Technical occupancy	Leading position in domestic small and medium hydropower stations
	Market potential of the Technical	Great market potential
	Technical advancement	High voltage switch cabinet adopts metal armored draw-out type with main elements installed in trolley, and is equipped with corresponding transit trolley for examination and maintenance of the equipment. with function cells sealed and separated by metal partition, independent channel for pressure release, as well as simple and reliable mechanical interlock, fully meeting the requirements of "five-prevention". Low voltage switch cabinet uses drawer type, with convenient examination for drawer unit. Steel plates are used to separate horizontal bus room, function unit room and cable room, with all rooms independent with each other. High-strength inflaming retarding engineering plastic components is widely used to strengthen its safety effectively. Standard modular design is used to make good interchangeability between functional units Compared to fixed cabinet used in original hydropower station, these two drawer-out type cabinets can realize main wiring functions of hydropower station, better and more conveniently and more safely.
	Technical maturity	Mature technology
	Technical applicability	High and low voltage equipment adopts drawer-out type, which has appropriate requirements for size and foundation of electricity room that the operation maintenance and examination channel shall be larger than that of fixed cabinet The feed mechanism and operating mechanism for some draw-out components require corresponding professional suppliers.
	Technical stability	High stability
	Technical safety	Every functional cell of high-tension switch cabinet is sealed and separated by metal partitions and equipped with pressure-release channel as well as simple and reliable mechanical interlock, which can meet the requirements of "five-prevention". Steel plates are used to separate horizontal bus room, function unit room and cable room, with all rooms independent with each other. High-strength inflaming retarding engineering plastic components are widely used to effectively strengthen its safety

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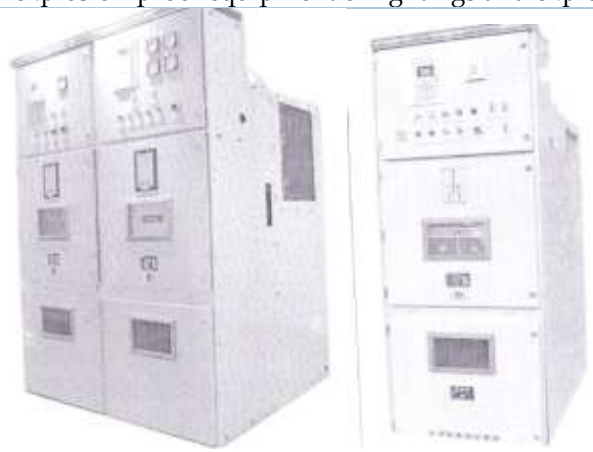
Obstacle in achievement transformation and promotion	Unknown	
Transfer of intellectual property	For the KYN28 cabinet, the company possesses two utility patents on the cabinet structure. Overhaul of explosion-proof equipment of lightings and explosion-proof inspection window	
Photo caption		

Renewable Energy Technology Achievement Declaration			
QR code			
Technical provision unit	HNAC Technology Co., Ltd.		
Contact person	Tan Qin	Submission date	August 23, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
Tel.	13755182914	E-mail	overseas@cshnac.com
Technical name	Hydro-turbine governor		

TECHNOLOGY: HYDRO
COMPANY: HNAC TECHNOLOGY CO., LTD

	Technical provider	HNAC Technology Co., Ltd.
	Scope of application	Hydro-turbine governor and electro-hydraulic governor and oil pressure unit
	Brief description of Technical	Digital microcomputer-based regulator with regulating rule of proportion, integration, differentiation(PID) regulates the guide vane opening (and beater blade angle) and change the water inflow into the water turbine by adopting digital valve, proportional valve, servo motor and other electro-hydraulic conversion devices to receive and convert the electric signal sent by the microcomputer-based regulator into mechanical displacement, and finally controls the rotating speed and output power of water turbine power unit.
	Technical information	1. Governor model: Parallel PID digital regulator; 2. Speed measurement method: Residual pressure, toothed disc;
	Business application situation	Albania Fetterly -1 hydropower project (2*1MW), has been put into operation for 4 years
	Service conditions	1. Market transaction; 2. Reliable and mature technology; 3. Requiring short-answer training; 4. Low cost for operation and maintenance
	Contact person of business application unit /Tel./E-mail	Hydroborsh sh.p.k Add.: Twin Towers, Tower No.2, Fourth Floor, 2A, Tirana, Albania
	Investment on equipment	1. The necessary main equipment: Hydro-turbine governor 2. Other accessory equipment: hydro generator, excitation equipment, integrated automation system, high and low voltage switchgears, transmission / distribution lines, oil, gas, water and other auxiliary equipment.
	Expense of operation maintenance	Operation and maintenance is simple, and the cost is low
	Investment payback period	Short payback period
	Other earnings	1. With 16MPa high oil pressure, the oil pressure device and the control device are integrated into one cabinet, which can not only be conducive to reducing the loss of oil in the pipeline, but also prevent the leakage of the pipeline from polluting the environment; the amount of hydraulic oil needed by the system is greatly reduced, so the use of hydraulic oil is saved; The amount of hydraulic oil needed by the system is greatly reduced, so the volume of the hydraulic component, servomotor and other devices can also be reduced. 2. The use of high oil pressure solves components, rust, corrosion, vibration, air turbidity and other problems in the hydraulic system caused by the mixing of oil / water and the mixing of gas / liquid. 3. Oil pressure device adopts the bladder type accumulator that can not only free the power station from the air-supplying in the operation, also not free the power station form need for high

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		pressure air system and corresponding plant, so that a considerable sum of investment can be saved from the power station construction, at the same time, the management and maintenance of high pressure air system in the future can be eliminated. 4. AC servo motor adopted as the electro hydraulic conversion device, can realize the oil-free conversion, as a result of which, the workload of oil management by the staff can be reduced, and the service life of components and oil is prolonged. 5. The cartridge valve is used as the distributing valve; the static oil consumption is close to zero; the hydraulic oil is saved, the pollution of the oil to the plant is reduced, the starting times for the oil pump motor to pump oil and the loss of the electric energy are also reduced because of reduction of the loss of the pressure oil,
	Technical occupancy	Technical occupancy is above the average
	Market potential of the Technical	Great market potential
	Technical advancement	1. 16MPa high oil pressure is adopted in Kaplan turbine control system, so that the oil consumption and the volume of the system is reduced, and the high-pressure air supplement device of the low oil pressure is canceled; This maturity technology is applied in hydraulic industry, and the system reliability is increased. 2. AC servo motor, which has realized the oil-free conversion to improve the oil resistance of the hydraulic system, is used to control the cartridge valve; The application of the cartridge valve simplifies the system structure, improve the response speed, and static oil consumption of the system is close to zero. 3. For the rotary seal of the existing oil receiver can only accept the pressure oil below 6.3MPa, it is difficult to bear high working pressure. This technology has realized the application of the 16MPa high oil pressure technology to the Kaplan turbine. 4. By controlling pilot valve, it can realize the connection between the AC servo motor and the cartridge valve, thereby controlling the corresponding cartridge valve and realizing the corresponding control function.
	Technical maturity	Technical route 1. 32 bit PLC is selected as the controller to realize the fully digital control; 2. High oil pressure hydraulic components are selected to meet the use of 16MPa oil pressure; 3. Research and development of high oil pressure blade control device; 4. The implementation of electro-hydraulic conversion device with digital valve, proportional valve, servo motor and so on as the core.
	Technical applicability	1. Suitable for regulating small, medium and large mixed-flow, axial-flow (fixed blade or rotary blade) and tubular (fixed blade or rotary blade) turbine;

		2. All the components are standardized components in the international and domestic electrical industry and hydraulic industry, with high standardization and good universal compatibility; 3. Altitude is not more than 4000m, the maximum air temperature is 40℃, and the minimum air temperature is 5℃; The average maximum relative humidity in the most wet month is 90% and the average temperature in this month is 25℃; The oil quality shall be consistent with the provisions of No. 46 steam turbine oil or oil of the same type with similar viscosity in GB11120, and the temperature range for oil use is 10℃-50℃. In order to obtain the high reliability of the hydraulic control system, the cleanliness of the oil shall be ensured, and the filter accuracy should be in accordance with the requirements of the product. (If the above working environment cannot be met, the relevant indexes shall be negotiated by supplier and demander.)
	Technical stability	1. The static characteristic curve should be similar to the night line (<5%); 2. Dead zone of revolving speed: Large adjustment 0.02%, Medium adjustment 0.06%, Small adjustment 0.1%, Extra small adjustment 0.2% 3. The swing value of servomotor: Large adjustment 0.1%, Medium adjustment 0.25%, Small adjustment 0.4%, Extra small adjustment 0.8% 4. For the speed governing system of Kaplan turbine, the inaccuracy is of the blade servo system is not greater than 0.8%. The deviation between the measured combination curve and the theoretical combination curve is not more than 1% of the total stroke of the blade servomotor. 5. Under the steady-state condition, the position deviation of the two spray needles of the multi-nozzle impulse turbine is not more than 1% within the whole range; The deviation between the position of each spray needle and the average value of the position of all spray needles is not more than 0.5%. 6. Stability of the unit under various working conditions and operating modes. The relative value of the revolving speed swing is not more than ±0.15% for large electric speed governors, not more than ± 0.25% for medium and small speed governors, and not more than ±0.3% extra-small governors. 7. Dead time of servomotor: Not more than 0.2S
	Technical safety	1. The latest achievements in programmable technology, modern hydraulic technology and digital technology are adopted. The governor not only has advanced technical indexes, complete functions, but also has a more concise structure more compared with the hydro turbine governor of the conventional oil pressure. The hydraulic mechanical parts are composed of standard industrial hydraulic components, with high reliability and simple maintenance. Because the technology of the governor that is composed of standard hydraulic parts is mature, it is replacing the small and medium-sized hydro turbine governor in the conventional oil pressure series.

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		2. Relevant qualification and quality management system: ① Having design, manufacture, supply and service ability of regulator; ② Have manufacturing equipment, technical strength and production capacity that can match manufacturing qualification, and sufficient design, manufacturing, processing and testing equipment; ③ Having the corresponding equipment, laboratory facilities and manufacturing process; ④ Be equipped with testing equipment that can be used for nondestructive inspection by means of X - ray, ultrasound; ⑤ Be equipped with facilities that can be used for plant testing on various parts / components of contract equipment; ⑥ Having standard quality assurance system of ISO9000 series of to ensure the quality of design, manufacture and installation; ⑦ Be equipped with equipment and instruments required to conduct on-site testing according to technical specifications;
	Obstacle in achievement transformation and promotion	For the power station in the isolated network operation, due to parameters of the capacity of the user load, the variation of the mutational load and the structure of the power grid have no clear uniform standard, it needs to be adjusted according to the actual working conditions.
	Transfer of intellectual property	Having domestic independent intellectual property

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COMPANY: HNAC TECHNOLOGY CO., LTD

	Photo caption	

Renewable Energy Technology Achievement Declaration			
QR code			
Technical provision unit	HNAC technology Co., Ltd.		
Contact person	Tan Qin	Submission date	August 23, 2016
Technical type	The technologies of small hydropower stations	Specific technology	Computer monitoring, power grid automatic scheduling and power

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COMPANY: HNAC TECHNOLOGY CO., LTD

				transmission and distribution technologies of small hydropower stations
	Tel.	13755182914	E-mail	overseas@cshnac.com
	Technical name	Protection, measure and control for power station, substation and distribution station with voltage class of 110kV and below		
	Technical provider	HNAC technology Co., Ltd		
	Scope of application	Protection, measure and control for power station, substation and distribution station		
	Brief description of Technical	High-performance and high-reliability platform, with dual-CPU framework and embedded real time multi-task operation system Anti-interference design, back-plug and unplug composite structure, and completely independent sampling channel for analogy quantity protection and measurement Functional modular design of software and hardware, easy for maintenance Adopt 16-bit high-speed A/D to realize data sampling, and 32-bit DSP to realize calculation protection and other main functions. ● Provide dual-Ethernet and dual-RS-485 communication interface		
	Technical information	Measurement inaccuracy ± 0.2%; Error of fixed value for current and voltage ± 3%;		
	Business application situation	Baiziqiao power station of Sandu in Guizhou situates in river bank of Duliujiang in the form of barrage with 8-kilometer distance of county. The power station is equipped with 2 sets of 5000kW mixed flow vertical units. The operation effect of the power station is good, with high power generation benefits.		
	Service conditions	Market trade, which is configured with equipment depending on the circumstances: Mature technology, which has run in the network for more than 3 years; It needs training in some degree while using with 3-5 days. Low cost of installation and use that the maximum cost is 1% of total cost; Average maintenance cost is 5% of the total cost;		
	Contact person of business application unit/Tel,/E-mail	Jin Xinsheng Tel.: 13765463302		
	Investment on equipment	For relay protection products, new project and reconstruction project need be configured with relay protection tester for the verification and test of protection function, and the equipment investment is about 80,000 to 200,000 (depending on the complexity of the protection function configuration, select appropriate tester) The product can be in installed in group panel mode or on the switch cabinet, requiring to be configured with micro air switch (configured as one to one and controlled by the supply of working power) and corresponding connecting cable (including the cable linking with other equipment of power station)		

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		The product is suitable for the power station and substation and distribution station with voltage class of 110kV and below, unlimited by the project scale
	Expense of operation maintenance	With low power dissipation, the maximum power consumed by a single unit of the product will not exceed 30W per hour; The equipment requires no manual intervention as it is micro-processor based automation equipment; The annual depreciation cost, repair charge and management cost are relatively low as the operating life of the equipment is relatively long;
	Investment payback period	For the power station, investment payback period, from using of the product to generating electricity or producing operation benefit, is less than one year;
	Other earnings	The equipment is designed and transformed to meet the requirements of unattended operation and remote monitoring, which can reduce about 10%-20% human resources cost and management cost
	Technical occupancy	45%
	Market potential of the Technical	Good market prospect
	Technical advancement	Upper and middle level in China
	Technical maturity	Protection function modularization, which can be clipped depending on the demand of practical application, is flexible and easy to configure and highly practical. User can define on line the operating mode for inputs/outputs to satisfy the application in different occasions. Self-checking function of the equipment is perfect The protection function is designed for the objects like electric generator, transformer, circuit, electromotor, with complete function and high integration level
	Technical applicability	● Suitable for protection, measurement and control of power station and substation and distribution station with voltage class of 110kV and below at home and abroad, and components and parts selected for the product are the universal components in international and domestic market, without no special customized components. ● Overload capacity of the product: Current circuit: Two times of the rated current can provide continuous operation Ten times of rated current, 10s is allowable Ten times of rated current, 1s is allowable Voltage circuit: 1.2 times of rated voltage, continuous working ● Limit of working temperature: -10-50℃ Relative humidity: 5%-90%, no condensation of moisture ● Contact rating of tripping output Allowable long-term through-current 5A(8A maximum) Rupturing current 0.3A (DC 220V,V/R 1ms)

			The voltage of working power is defaulted as DC or AC 220V. The other voltage classed need to be specified with order. Nominal parameters of several-day signals: AC 100V, AC 5A, other classes need to be specified with order. Provide 32-channel inputs signal and 16-channel outputs relay
		Technical stability	The algorithm and technology of protection function applied to the product, proved by long-term practice, are reliable and stable, conforming to the requirements of relevant standards of national relay protection industry; Electromagnetic compatibility indexes of the equipment conform to the requirements of national standard. Details are as follows: Radiofrequency electromagnetic filed radiated immunity test conforms to national standard: Provisions of Grade IV test in GB/T 14598.14 – 1998 Standard; Electrical fast transient pulse immunity test conforms to national standards: Provisions of Grade III test in GB/T 14598.9 – 2002 Standard; Radiofrequency electromagnetic field radiated immunity test conforms to the provisions of Grade A (IV) test in GB/T 14598.10-2007 Standard; Pulse interference test conforms to the national standard; Provisions of Grade III test in GB/T 14598.18 – 2007 Standard; Radiofrequency field disturbance test conforms to the national standard; Provisions of Grade III test in GB/T 14598.17 – 2005 Standard; Power frequency magnetic field immunity test conforms to the national standard; Provisions of Grade A test in GB/T 14598.19 – 2007 Standard; Oscillatory wave immunity test conforms to the national standard: Provisions of Grade III test in GB/T 14598.13 – 2008 Standard; Limiting value test of conducted emission conforms to the national standard: Provisions of emission limiting value in GB/T 14598.16-2002 Standard; Limiting value test of radiated emission conforms to the national standard: Provisions of emission limiting value in GB/T 14598.16-2002 Standard;
		Technical safety	• By adopting mature dual-CPU framework and modularized protection function and applying DSP (digital signal processor) as core component, with fast-response protective action, highly reliable operation and interface of humanized design, it is easy to use and maintain Supporting facility or qualification requirement With capability to design, produce and serve on relay protection profession of power industry; With corresponding testing equipment and laboratory facilities for relay protection function, including static and dynamic testing equipment

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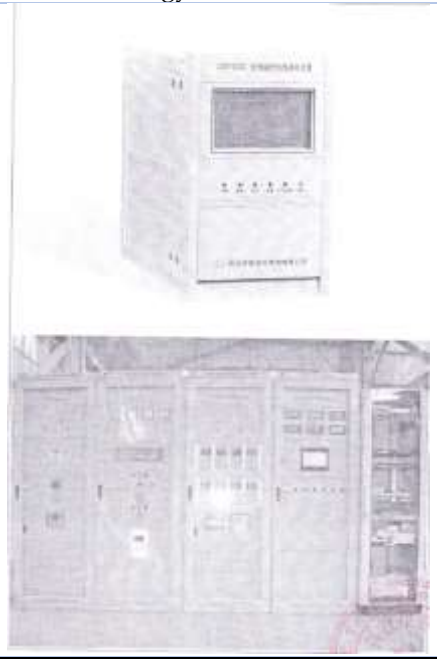
COMPANY: HNAC TECHNOLOGY CO., LTD

		The product has passed the inspection test of national relay protection product standard, and runs on the network for more than 3 years, with stable protection function
	Obstacle in achievement transformation and promotion	Relay protection production conforms to the current national standard in China, While it, in practical application of some area, might exist special technical requirements or other technical standard, which should be treated with discriminatory in concrete execution. Whether the third-party system or equipment communication interface, communication protocol is standard, whether can timely provide corresponding technical support for joint debugging; In policy, whether restrict to have local operational performance, whether require to have the third party certification; While in talent cultivation, it is mainly limited by familiar degree of relevant professional knowledge in application field for user.
	Transfer of intellectual property	The product possesses domestic proprietary intellectual property right; Having obtained 2 patents for invention, which are owned by the technology enterprise; Technology is developed independently instead of introduced or transferred from the third party. Relay protection product as the core product of technology owner, only provide product application and technology transfer.
	Photo caption	

TECHNOLOGY: HYDRO
COMPANY: HNAC TECHNOLOGY CO., LTD

Renewable Energy Technology Achievement Declaration			
QR code			
Technical provision unit	HNAC Technology Co., Ltd.		
Contact person	Tan Qin	Submission date	August 23, 2016
Technical type	The technologies of small hydropower stations	Specific technical	Computer monitoring, power grid automatic scheduling and power transmission and distribution technologies of small hydropower stations
Tel.	13755182914	E-mail	overseas@cshnac.com
Technical name	Small and medium-sized hydropower plant or heat-engine plant with automatically monitored system SCADA.		
Technical provider	HNAC Technology Co., Ltd.		
Scope of application	Small and medium-sized hydropower plant or heat-engine plant with automatic monitoring		
Brief description of Technical	• Apply layered and distributed structure, and divide into data communication, data processing and data application. • Using network middleware technology and multithreading technology and other technologies to support the platform of cross-operating system (windows and linux) to deploy. • Functional modularity of the program; With multi machine and multi configuration with network, it can be deployed easily, operate steadily and dependently and support upgrade of one button publishing. • Provide second development interface, support ActiveX control widget and JavaScript.		
Technical information	Distinguishability of Sequence of Event (SOE) is ≤5ms; Refresh cycle of real-time data is ≤1s; time without failure in average of system is ≥50000h.		
Business application situation	Guizhou Sandu Baiziqiao power station. It situates in river bank of Duliujiang in the form of barrage with 8-kilometer distance of county. The power station is equipped with 2 sets of 5000kW mixed flow vertical units. The operation effect of the power station is good, with high power generation benefits.		
Service conditions	Market trade; Mature technology It needs training in some degree while using with 3-5 days; Low cost of installation and use		

TECHNOLOGY: HYDRO
COMPANY: HNAC TECHNOLOGY CO., LTD

	Contact person of business application unit/Tel,/E-mail	Jin Xinsheng, Tel.: 13765463302
	Investment on equipment	Software product. For new construction, purchasing computer hardware on which software operating depends, operating system software, interchanger, and so on is enough. The investment amount is related to system scale. Engineering scale: Installed gross capability of small and medium-sized hydropower station is below 25MW.
	Expense of operation maintenance	Monitoring products operating on computer equipped with operating system consume mainly resource of electricity. While the system is in normal operation, platform-computer product consumes less than 0.3kW per hour. If consumed electric quantity for maintenance of operating ambient temperature is included in, then the power may reach to 3kw. The concrete cost need to be converted into the local electrovalence. Software product does not refer to depreciation cost, repair charge of equipment or other costs, its cost of labor and administrative fee occupy less than 0.5% of total cost.
	Investment payback period	From putting into use of the product to producing benefits by generating electricity, the investment payback period is less than one year.
	Other earnings	By using HZ3000 monitoring software to upgrade free, no more cost will be charged. Power station monitoring can achieve the aim of unattended on duty, remote monitoring, and reduce about 10% to 20% of human resource cost and administrative cost.
	Technical occupancy	Small and medium-sized hydropower plant in China hold a leading place in application market share.
	Market potential of the Technical	Good market prospect
	Technical advancement	Domestic advanced level
	Technical maturity	Aiming at configuration software developed in water conservancy and hydropower industries, and based on data collection of client/servicer(C/S) setup and monitoring platform, its basic function includes real-time data, monitoring picture, real-time warning, historical data, report query and so on, provide powerful picture or graphic configuration with diversified and flexible second development interface used in cross platform. Under the cooperation of intelligent equipment in power station, the system can automatically power on or power off with one button. Auto trouble removal can help no one on duty in site and remote control. With perfect system function, it can provide high-rank functional application, such as automatic generation control (AGC) and automatic voltage control (AVC), optimize operation and instream flow monitoring and fully satisfy the need of practical application. High openness of

TECHNOLOGY: HYDRO
COMPANY: HNAC TECHNOLOGY CO., LTD

		system and protocol library plug-in interface provided expediently expands the system communication with the third-party equipment, substation or child business.
	Technical applicability	System can be regarded as an independent software product to service all kinds of hydropower plant, heat-engine plant without geographic restrictions and supported by multilingual visions. With high openness of system, use the form of protocol library plug-in to access equipment with the third-party intelligent equipment or system, support serial port, Ethernet, CAN and other communication ways. The system provides data forwarding service, supports several primary stations, business system, and guarantee communication performance and concurrent access performance. Operating environment and resources of system follow the standard of DL/T578.
	Technical stability	Stable and reliable system operation It is in accordance with all relevant national standards. The equipment and facilities that system relies on require suitable operating environment (for example, surrounding environment is between 18-25℃), and ±10% of fluctuation range for power source and correspondence with the standard of DL/T578 for electromagnetic compatibility.
	Technical safety	Monitoring software products should be no special equipment invested in. And supporting facilities should be complete. With high acceptability in home market, it is widely applied in hydropower monitoring filed. Most functions of products are developed according to domestic application, and part of customized functions is applied on specific occasions. Overseas application is mainly limited by different using behavior and focus area. Function need to be modified while practical application. There will be the procedure of cognition and acceptance for special configuration software from China
	Obstacle in achievement transformation and promotion	1) Products follow the current national standard in China, while it's practical application in some area might exists special technical requirements or other technical standard, which should be treated with discriminatory in concrete execution. 2) Whether the third-party system or equipment communication interface, communication protocol is standard, whether can timely provide corresponding technical support for joint debugging; 3) In policy, whether restrict to have local operational performance, whether require to have the third-party certification; 4) The popularization of monitoring software products has no special request over resources or capital. 5) While in talent cultivation, it is mainly limited by software user and knowledge structure of secondary development and familiar degree of relevant professional knowledge in application field.
	Transfer of intellectual property	The product possesses domestic proprietary intellectual property right; Develop technology independently

TECHNOLOGY: HYDRO
COMPANY: HNAC TECHNOLOGY CO., LTD

		As the core product of technology owner, monitoring software provides product application and technology transfer.
	Photo caption	

TECHNOLOGY: MEASURING EQUIPMENT AND OTHERS
COMPANY: BEIJING GAS ENERGY DEVELOPMENT CO., LTD

Beijing Gas Energy Development Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Beijing Gas Energy Development Co., Ltd.	Submission date	July 28, 2016
	Contact person	Liang Chen	Technology type	Others
	Tel.	13581677348	E-mail	Liangchen01@bjgas.com
	Technology name	CCHP technology for gas		
	Technology provider	Beijing Gas Energy Development Co., Ltd.		
	Scope of application	Beijing Gas Energy Development Co., Ltd.		
	Brief description of technology	Combined cooling heating and power supply for gas, a type of distributed energy, is the heat (cold) distributed energy supply system that is arranged in the vicinity of the user, with gas as primary energy for power generation, and use waste heat after generation.		
	Technical information	Use mature equipment: Power generation assembly, waste heat utilization equipment are mature products; Gas power generation, gas cooling, gas heating, electric cooling, cogeneration, power supply and distribution technologies are mature technologies.		
	Business application situation	Innovation base project: National demonstration project Jinyan Hotel Project: Beijing demonstration projects.		
	Service conditions	Contact person of innovation base project: Mou Guang 18101209600		
	Contact person of business application unit /Tel. /E-mail	Built in local place, with mature and reliable technology. Technical training is needed for the operation. Installation and maintenance costs are controllable		
	Investment on equipment	Major equipment are generators, direct gas turbine, boiler, electrical refrigeration and other main equipment, with various pumps, plate heat exchanger, the pressure tank, and cooling towers. The investment amount is less than of routine energy supply means, and it saves energy and increase energy utilization rate.		
	Expense of operation maintenance	The repair of equipment is divided into heavy, medium and minor one, operators conduct maintenance in case of medium and minor repair and the equipment manufacturer conduct maintenance in case of heavy repair. Labor cost of each person per year is of RMB 80,000.		
	Investment payback period	Investment payback period of project is 8-10 years.		

TECHNOLOGY: MEASURING EQUIPMENT AND OTHERS
COMPANY: BEIJING GAS ENERGY DEVELOPMENT CO., LTD

	Other earnings	Energy conservation and emission reduction, it realizes coupling of distributed photovoltaic and biomass and other clean energies. Participate in voluntary emission reduction transaction.
	Technology occupancy	Market share of fuel gas triple generation technology is not high, and it is required of a professional energy company to implement investment, construction and operation. Currently, natural gas distributed market accounts for about 5%.
	Market potential of the technology	Fuel gas triple generation technology is mature and advanced, and the technology is of good economy with energy conservation and emission reduction. As of 2020, natural distributed energy will account for 30% of total energy utilization rate. As requirement for environmental protection is stricter and stricter, natural gas will gradually replace fuel coal, and there is tremendous market prospect in the future.
	Technical advancement	Beijing Gas Energy Development Co., Ltd. is a professional company for investment, construction and operation, and has experience for many years in fuel gas triple generation in Beijing, and it has operated 8 projects. Coupling multiple clean energies and provision of regional function scheme for the user. Relevant technologies are in leading position across the country.
	Technical maturity	Fuel gas triple generation technology has matured, and relevant equipment and facilities are advanced and reliable. Relevant national policies Strongly support the development of relevant industry.
	Technical applicability	Fuel gas triple generation technology is well matched with relevant equipment and integrated with process, automatic control and electrics. Linkage between various systems is made by automatic control convertible component, which realize combination of automatic control and manual control. Land occupation for energy is little and it has little influence on the environment. Conservation of primary energy cost
	Technical stability	Relevant technologies are stable, and it has experience in construction, operation and management for many years. Operators are mature and reliable.

TECHNOLOGY: MEASURING EQUIPMENT AND OTHERS
COMPANY: BEIJING ZHONG RUI WATER TREATMENT ENVIRONMENTAL TECHNOLOGY CO., LTD

Beijing Zhong Rui Water Treatment Environmental Technology Co., LTD

可再生能源技术成果申报

技术提供单位	**北京中睿水研**环保科技有限公司	**提交日期**	**2016-07-26**
联系人	周雷	**技**术类型	**其他**
电话	13641009081	邮箱	zhoulei@chnemc.com
技术名称	**全效**电化学水处理设		
技术提供方	**北京中睿水研**环保科技有限公司（原属于北京中预华腾能源科技有限公司，现已完成技术转让）		
适用范围	**中央空**调、工业等循环冷却水处理		
技术简要说明	**主要原理可分**为电解氧化、电解还原、酸碱中和、离子平衡及极性水分子反应。采用电化学原理，在设备阴极区形成一个碱性环境，使水中的钙、镁离子结晶析出，保持水的硬度平衡，有效防止结垢；在设备阳极区形成一个酸性环境，把水中的氯离子转变成具有杀菌、灭藻作用的余氯，避免了细菌及军团菌的滋生。		
技术信息	**根据工程**规模，可选用不同型号设备。设备长度为3500mm，**高度**2000mm，**根据不同的循**环水量，设备宽度可分为650mm、800mm、900mm。		
商业应用情况	**北京大学第三医院中央空**调冷却水处理项目，安装一台； **秦皇**岛明阳耀华余热发电冷却循环水处理项目，安装四台。 处理效果均满意。		

	使用条件	**采取灵活多**样的合作模式，可做设备销售，也可作EMC**合作。技**术成熟稳定，项目完成后会负责工作人员使用培训等工作。设备运行使用及维护成本较低，可为企业节省大量的运行维护成本。
	商业应用单位联系人/电话/邮箱	**北京大学第三医院**：15611963322　邓超 **秦皇**岛明阳耀华余热发电有限公司：15100918663　**王**艳辉
	设备投资	**以秦皇**岛明阳耀华余热发电项目水处理工程为例，项目分为两个厂区，装机容量分别为4.5MW,5MW。**两个厂区各安装两套**ATCH-1900设备，工程项目的投资主要包括四台全效电化学水处理设备，远传模块，房屋基础及活动板房建设，水泵水表及其他零配件安装。工程总体投资1800000**元人民**币。
	运行维护费用	**根据**设备的技术原理，设备主要能耗为电能。由于设备有显著的除垢作用，可有效去除原有设备管路积存的老垢，减少设备生产运行过程中产生的能耗，可以有效的抵除电化学设备产生的电耗，甚至可节省电能消耗。设备采用全自动智能操作，**无需**专业人员值守，节省人力开支。设备组件使用年限较长，半透膜2**年更**换一次，电极板3-5**年更**换一次即可。
	投资回收期	**由于**设备的技术原理，可节省100%**的**药剂，80%**以上的水**，10%**的能耗**，**且可做到零排**污。因此，项目的投资回收期由企业的药剂费用，补水费用，排污处理费用，能耗费用决定。根据以往的项目经验，项目运行后1-3**年即可收回成本**。

TECHNOLOGY: MEASURING EQUIPMENT AND OTHERS
COMPANY: BEIJING ZHONG RUI WATER TREATMENT ENVIRONMENTAL TECHNOLOGY CO., LTD

Renewable energy technology to declare			
Technology provides the unit	Beijing Zhong rui water treatment environmental technology co., LTD.	**Submission date**	2016-07-26
The contact	Wang Yang	**Technical types**	**other**
The phone	13611277908	Email	wangyang@chnemc.com
Technical name	Circulating cooling water Electrochemical water treatment for full effect		
Technology provider	Beijing Zhong rui water treatment environmental technology co., LTD. (former Beijing Zhongyu hua teng energy technology co., LTD., is now complete technology transfer)		
Scope of application	The central air conditioning, industrial circulating cooling water treatment, etc		
Technology brief description	Main principle can be divided into electrolytic oxidation, reduction, acid and alkali neutralization, ion balance reaction and polarity of water molecules. Using electrochemical principle, the device cathode area form an alkaline environment, make the water crystallization precipitation of calcium and magnesium ions, keep the balance of water hardness, effectively prevent the scale; In equipment anode area form an acidic environment, transform the chloride ions in the water into the residual chlorine, sterilization, algae has avoided and legionella bacteria breeding.		
Technical information	According to the project scale, can choose different type equipment. Equipment length is 3500 mm, 2000 mm, depending on the circulation of water, width of equipment can be divided into 650 mm, 800 mm and 900 mm.		
The commercial application of	Peking University third hospital central air conditioning cooling water treatment project, installing a;		

TECHNOLOGY: MEASURING EQUIPMENT AND OTHERS
COMPANY: BEIJING ZHONG RUI WATER TREATMENT ENVIRONMENTAL TECHNOLOGY CO., LTD

		Qinhuangdao MingYang yao hua waste heat power generation cooling circulating water treatment projects, installation of four. Treatment effects were satisfied.
	Conditions of use	Adopt flexible mode of cooperation, can do equipment sales, also can make EMC cooperation. Technology mature and stable, after the completion of the project will be responsible for staff use training, etc. Used equipment operation and maintenance cost is low, the operation of the save a lot of maintenance costs for the enterprise.
	Commercial application unit contact/phone/email	Peking University third hospital: 15611963322 deng chao Waste heat power generation co., LTD. Qinhuangdao MingYang yao hua: 15100918663 wang
	Investment in equipment	Waste heat power generation project in qinhuangdao MingYang yao hua water treatment project as an example, the project is divided into two factory, the installed capacity of 4.5 MW respectively, 5 MW. Install two copies each of the two factory ATCH - 1900 equipment, the investment of the project mainly includes four full effect electrochemical water treatment equipment, remote transmission module, basis of their houses and prefabricated housing construction, pump water meter installation and other spare parts. The project total investment of 1800000 yuan.
	Run maintenance cost	According to the principle of the equipment technology, equipment, the main energy into electrical energy. Due to equipment descaling effect significantly, can effectively remove the old scale of original equipment line stored up, reduce energy consumption, produced by the equipment in the process of production can be effective against electrochemical device result in power consumption, even can save power consumption. Device using automatic intelligent operation, no need professional, save manpower expenses. Equipment components use fixed number of year is longer, a semipermeable membrane replaced every 2 years, electrical plate can be replaced every 3 to 5 years.

	The payback period of investment	Due to the technological principle of the equipment, can save 100% of potions, more than 80% water, 10% of energy consumption, and can achieve the zero emission. Project investment payback period by the enterprise, therefore, agents fees, cost of filling water, sewage treatment costs, energy costs. Based on past experience in project, the project can recover the cost of 1-3 years after operation.

TECHNOLOGY: MEASURING EQUIPMENT AND OTHERS
COMPANY: SHANGHAI ANJIE ENVIRONMENTAL PROTECTION SCIENCE & TECHNOLOGY CO., LTD

Shanghai Anjie Environmental Protection Science & Technology Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technology provision unit	Shanghai Anjie Environmental Protection Science & Technology Co., Ltd.	Submission date	July 15, 2016
	Contact person	Zeng Xiangli	Technology type	Others
	Tel.	13357726798	E-mail	13357726798@163.com
	Technology name	Gas phase molecular absorption spectrometer for detection and analysis of water quality		
	Technology provider	Shanghai Anjie Environmental Protection Science & Technology Co., Ltd.		
	Scope of application	Shanghai Anjie Environmental Protection Science & Technology Co., Ltd.		
	Brief description of technology	Principle is to quantitatively decompose the measured composition into gas through the chemical reaction, turn the reaction gas into the absorption tube of gas phase by means of the gas-liquid separation device, and determine the amount of the component based on Bill Longbow's law. The instrument has strong anti-interference ability, detection is quick and convenient, and can be used for detecting the ammonia nitrogen, total nitrogen, sulfur and other projects in various water quality, so as to quickly understand the situation of water pollution.		
	Technical information	Instrument can work more than 8 hours in a continuous and stable way, the instrument measurement data display 4 absorbance value after the decimal point in real time, and the determining speed of each item is not more than 2.5 minutes / sample and so on; The size of device is 60cm long * 50cm wide * 22cm high.		
	Business application situation	1. Beijing Center for Physical & Chemical Analysis (Beijing); 2. Detection Center of Institute of Environment and Sustainable Development in Agricultural, CAAS; 3. Zhejiang Academy of Agricultural Sciences; 4. Beijing Municipal Research Institute of Environmental Protection		
	Service conditions	1. Beijing Center for Physical & Chemical Analysis, Wang Yu, 13718436802; 2. Detection Center of Institute of Environment and Sustainable Development in Agriculture, CAAS, Tong Chengfeng, 13611279384		
	Contact person of business application	The instrument technology is very mature, in accordance with the standards of the Ministry of Environmental Protection, and can be delivered in the market, when it is used, the engineer shall carry out detailed training to the customer, it does not need installing, and it can be used after it is opened and debugged. The company		

	unit/Tel./E-mail	shall maintain it for free within 1 year; the maintenance cost is very low for more than 1 year, about RMB one thousand.
	Investment on equipment	The instrument has no auxiliary equipment, and one-time investment is about RMB 300-600 thousand.
	Expense of operation maintenance	When the system is in normal operation, the monthly consumption cost of water and electricity is about RMB 100, the expenses of labor are one employee's wages, equipment depreciation expenses are about RMB 30-60 thousand/year, material fee is about RMB 1000/year, repair fee is about RMB 3000/year, and the management fee is not required.
	Investment payback period	Static investment payback period is about 3-5 years.
	Other earnings	Through the detection and analysis of water quality, the water quality problems of biogas engineering and other projects can be timely found, so as to ensure the smooth progress of the project.
	Technology occupancy	This instrument was awarded the excellent new product award for scientific instrument in instrument industry in 2015; Technology is domestically leading, with about 30% of the segment market share.
	Market potential of the technology	The technology has a high maturity and has been widely used in 33 national and local standards, covering environmental protection, agriculture, water conservancy, ocean, various large enterprises and many other customer groups; there are about 3000 domestic environment monitoring units, 2000 agriculture monitoring units, 10,000 water conservancy monitoring units, 30,000 enterprises and units in various kinds, many colleges and scientific research institutions in various kinds and about 440,000 target customers; the technology will have a market potential of 16 billion or so within industry field as of 2020.
	Technical advancement	It is confirmed in Science and Technology Novelty Search Consultation Report of 2016 issued by Chinese Academy of Sciences Shanghai Science and Technology Novelty Search Consultation Center that: AJ-3000plus gas phase molecules absorption spectrometer produced by Shanghai Anjie Environmental Protection Science & Technology Co., Ltd. is a full automatic gas phase molecules absorption spectrometer, with single built-in ultraviolet source, and all items such as ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, Kjeldahl nitrogen, total nitrogen and sulfide can be accurately measured; it has on-line oxidation system of ammonia nitrogen, ammonia nitrogen can convert to nitrite through auto-oxidation, and there is no need for manual addition of oxidizing agent; It is equipped with built-in air purification carrier gas system with gas supply under ordinary pressure by air, and there is no need to apply high pressure (nitrogen) air source; Sample injector is arranged with homogeneity blowing equipment, and the samples with sediment or muddy matter can be blended during sample injecting, which makes sampling is representative and result measured is reliable; It is equipped with built-in cry drying equipment, dehydration effect is good, and there is no any need to apply desiccant, which saves test cost and decreases interference. It is not seen of coverage that is absolutely same as the project method home and abroad, therefore, the project is of novelty. After analysis, the project comprehensive technology has reached leading level in our country.

TECHNOLOGY: MEASURING EQUIPMENT AND OTHERS
COMPANY: SHANGHAI ANJIE ENVIRONMENTAL PROTECTION SCIENCE & TECHNOLOGY CO., LTD

	Technical maturity	The equipment has single standard calibration function, on-line attenuation function, on-line oxidative system, on-line dehumidification system, air purification carrier gas system, precise constant temperature control system, ammonia nitrogen on-line decomposition module and other functions; the instrument realizes one-button operation, and it realizes convenient operation of obtaining date in 45 seconds without the need of any pretreatment,
	Technical applicability	The technology can be applied in methane engineering detection, agricultural environment monitoring, environment monitoring, hydrologic monitoring, ocean monitoring, aquaculture, food processing, petrochemical engineering and other fields, free of any limitation of time and space.
	Technical stability	The technology can maintain stable operation in the laboratory under normal temperature, stability zero drift of 0.0003A bs, and it can operate for over 8 hours continuously and stably.
	Technical safety	The technology has been widely used in various fields since 2000 and included in standard of national Ministry of Environmental Protection in 2005; with an application accumulation of 16 years, it has been applied in 33 standards and taken as national measurement standard, and it has high market acceptability.
	Obstacle in achievement transformation and promotion	Currently, the technology is still required to solve capital shortages by financing, to further improve instrument technology, enlarge production scale, increase productivity and meet market demand.
	Transfer of intellectual property	The company currently has 2 patents for invention (substantive examination), 14 utility model patents, 27 software copyright registrations, and patents under declaration include 1 patent for invention, 3 utility model patents, and there are 47 patents and software copyrights in total.
	Photo caption	

TECHNOLOGY: WASTE-TO-ENERGY
COMPANY: ZHEJIANG ECO-WASTE TECHNOLOGY CO., LTD

Zhejiang ECO-WASTE Technology Co., Ltd	**可再生能源技术成果申报** Application of Renewable Energy Technological Achievement			
	技术提供单位 **Technology provider**	浙江泰来环保科技有限公司 Zhejiang ECO-WASTE Technology Co.,Ltd.	提交日期 Date Submitted	2016-06-20
	联系人 **Contact**	范婷婷 FAN Tingting	技术类型 Technical type	生物质能利用技术 Biomass energy utilization technology
	电话 **Tel**	18968259188	邮箱 Email	gma@eco-waste.cn
	技术名称 **Technical Name**	固体废弃物立式旋转热解气化技术 Solid Waste Vertical Rotary Gasification Technology		
	技术提供方 **Technology provider**	浙江泰来环保科技有限公司 Zhejiang ECO-WASTE Technology Co.,Ltd.		
	适用范围 **Scope of application**	中小规模生活垃圾、医疗垃圾、危险废弃物 small and medium scale of municipal solid waste, medical waste, and hazardous waste		
	技术简要说明： **Brief description of the technology**	该技术采用热解气化原理对固体废弃物处理，主要由热解气化室和可燃气体燃烧室组成，通过先热解气化、后富氧燃烧的二段式焚烧处理方式，无需任何辅助燃料的条件下，具有“热效率高、一燃室温度高、热灼减率低、飞灰排放量小、二噁英排放浓度低”等技术优势。 The technology applies the principle of gasification to disposal the solid waste. The gasification system mainly consists of the gasification chamber and the combustible gas burning chamber. The two-stage manner first gasifier the solid waste and then burn the syngas. This technology does not need any additional fuel during the operation. It also has technical advantages like “high thermal efficiency, high temperature in first combustion chamber, low loss on ignition, low emission of fly ash & dioxin”.		
	技术信息 **Technical information**	一燃室燃烧层温度：950℃-1050℃，二燃室温度950℃-1100℃、烟气停留时间≥2s，残渣热灼减量≤3%，单炉处理能力5-150t/d。		

TECHNOLOGY: WASTE-TO-ENERGY
COMPANY: ZHEJIANG ECO-WASTE TECHNOLOGY CO., LTD

		Temperature of burning zone in first combustion chamber: 950℃-1050℃; Temperature of secondary combustion chamber: 950℃-1100℃; Flue gas retention time≥2s; Loss on ignition of residue ≤3%; Capacity of each gasifier 5-150t/d.
	商业应用情况 Commercial application	已在国内外十几个城市各类固废处理工程中得到成功应用，如伊朗德黑兰2×100t/d生活垃圾热解气化发电厂、安徽省阜阳市5t/d医疗垃圾处理工程。 The technology has been applied in several cities both in China and abroad. For instance, Iran Tehran 2×100t/d MSW Gasification Power Plant, Anhui Fuyang 5t/d Medical Waste Disposal Project.
	使用条件 Instruction	公司可提供成套热解气化处理线技术装备，需要在当地投建。技术成熟可靠，运行时需系统的培训。由于其结构简单、占地面积小、操作便捷、维护方便、运营能耗低，垃圾处理时无需任何辅助燃料，投资和运行成本较低。 ECO-WASTE can provide complete sets of gasification disposal equipment which need to investe & construct in local area. The technology is mature and reliable. Employees should have a systematic training before the operation. The system has compact structure which requires less room. It also has long service life and easier to carry the operation and maintenance. Therefore, both the investment and cost of the system is rekative low than the other technology.
	商业应用单位联系人/电话/邮箱 Relative Contacts	（1）洪洞县民生垃圾综合处理有限公司，卢为民/18635766600。 （2）伊朗德黑兰2×100t/d生活垃圾焚烧发电厂，Esmaili（伊思马力）/0098-21-88368077-8。 1) Shanxi Hongdong MSW Comprehensive Treatment Co. Ltd. LU Weimin/18635766600 2) Iran Tehran 2×100t/d MSW Gasification Power Plant, Esmaili /0098-21-88368077-8
	设备投资 Equipment Investment	以日处理生活垃圾300吨项目为例，配置两条150t/d热解气化处理线，一台4.5MW汽轮发电机组，主要设备包括：步进式给料机、垃圾抓斗等收储给料系统；立式旋转热解气化炉、二燃室等热解气化焚烧系统；余热锅炉及其附属设备等余热利用系统、除酸塔、布袋除尘器等烟气净化系统；汽轮发电机组及其辅助设备；灰渣处理系统；垃圾渗滤液处理系统；自动控制系统及其他附属设备等。该项目总投资约1.4亿元，其中设备购置及安装费为8660万元。 Take the 300t/d MSW gasification power plant project for example, there will be two 150t/d gasification disposal lines, and one 4.5WM steam turbine-generator set. Main equipments include: the waste feeding system such as step-by-step feeding machine, grab type elevator; the gasification system such as vertical rotary gasifier and secondary combustion chamber; the waste heat utilization system such as the waste heat boiler and its accessory equipment; the flue gas purification system such as

		deacidification tower and bag filter; the steam turbine-generator set and its accessory equipment; slag disposal system; the leachate treatment system; automatic control system and its accessory equipment. Total investmant of this project is about RMB 140 million, which includes equipment purchase and installation costs RMB 86.6 million.
	运行维护费用 Operating and maintenance costs	以日处理生活垃圾300吨发电项目为例，年处理垃圾10.95万吨，除财务成本外，吨垃圾处理成本为131元/吨（含发电成本），其中原材料费用14.81元、水电等燃料及动力费8.84元、人工费46.03元、设备折旧费44.45元、设备维修费7.61元、管理费9.20元。 Take the 300t/d MSW gasification power plant project for example, the project will disposal MSW 109.5 thousand ton each year. Except the financial cost, the waste disposal cost is 131 RMB /t (includes the generation cost). The cost includes raw material cost (RMB 14.81); cost of water, electricity, fuel and energy (RMB 8.84); labour costs (RMB 46.03); depreciation expense of equipment (RMB 44.45); maintenance cost (RMB 7.61); management cost (RMB 9.20).
	投资回收期 Investment recovery period	以日处理生活垃圾300吨项目为例，经营收入包括售电收入和垃圾处理费收入两部分。项目年处理垃圾10.95万吨，垃圾补贴单价按100元/吨算，年垃圾处理费收入1095万元。项目年上网电量2963.07万度，上网电价为0.65元/度，年均上网售电收入1646.15万元。静态投资回收期（含建设期）10.48年。 Take the 300t/d MSW gasification power plant project for example, the operating revenue includes electricity sales revenue and the waste disposal fee revenue. The project will disposal MSW 109.5 thousand ton each year, at waste disposal fee RMB 100 per ton, the waste disposal fee revenue will be RMB 10.95 million. On-grid energy of the project is 29,630,700 KWh, at feed-in tariffs RMB 0.65/KWh, the electricity sales revenue will be RMB 16,461,500. Payback period of static investment (includes construction period) is 10.48 years.
	其它收益 Other income	垃圾通过热解气化焚烧，实现垃圾处理无害化、减量化、资源化目标。以日处理生活垃圾300t/d项目为例，每年可上网电量约3000万度，折合标煤约22172.86t/a，可减少CO2排放8.07万吨，减少SO2排放22.7吨，减少NOX排放45.5吨。另外，焚烧系统采用灰、渣分排系统，热解气化炉产生的炉渣由于不属于危险废弃物，因此可以综合利用，用于铺路或运至制砖厂制砖。除渣系统设有除铁器，由除铁器分离出的废金属打包后装车送到有关物资回收部门，综合利用。 The waste disposal will realize the reducing, recycling and reusing through the gasification technology. Take the 300t/d MSW gasification power plant project for example, on-grid energy of the project is about 29 million KWh, which equals to standard coal 22172.86t/a. This will reduce CO_2 emission 80.7 thousand ton, reduce SO_2 emission 22.7 ton, and reduce NO_x emission 45.5 ton. Besides, the gasification system discharges the ash and slag separately. Slag after gasification does not belong to hazardous waste, so it can make comprehensive utilization such as paving or brick making. Slag

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		removal system also has magnetic separator to remove the waste metals from slag. These waste metals can also be recycled.
	技术占有率 **Technology Share**	目前全国垃圾热解气化焚烧厂中，泰来环保占其中60%以上的比例；同时在全国的医疗垃圾焚烧领域，泰来环保的热解气化焚烧装置市场占省会城市的50%以上。 ECO-WASTE now accounts over 60% of waste gasification plant in China. Meanwhile, in Chinese medical waste gasification filed, ECO-WASTE also accounts over 50% in the market of capital city.
	技术市场潜力 **Market potential of the technology**	中小城市在选择焚烧炉型中最关心两个问题是投资金额和环保，相比较而言，以泰来环保立式旋转热解气化技术建设的焚烧工程建设成本比同吨位目前主流的炉排炉低20-30%左右，其主要成本节省的地方是由于占地面积小，用钢量和土建成本较少，同时热解气化技术运行费用也是三种技术中最低的。在环保问题上，由于立式旋转热解气化技术燃烧充分，在环保排放指标上是三种技术中最低的。因此，对于日处理垃圾吨位较低的中小型城市、县级城市、乡镇、岛屿等地区，该技术的低成本和环保性具有很大的竞争力。 The most two concerns of small-medium cities in choosing the type of incinerator are investment and environmental protection. Project construction investment of ECO-WASTE's "Vertical rotary gasification technology" is 20-30% lower than the investment of grate furnace technology. This is because of the gasification technology requires less room, less steel during the construction, it also requires less costs during the operation. On the environmental protection, ECO-WASTE's technology has great environmental emissions targets. Therefore, the economy and Environmental Protection of the technology has great competitiveness in the field of small-medium citie, town, island area's waste disposal where the waste quantity is relative low. 在2014年11月18日召开的全国农村生活垃圾治理工作电视电话会议上，住房和城乡建设部部长陈政高提出，全面启动农村生活垃圾5年专项治理，即到2020年，使全国90%村庄的生活垃圾得到处理，并形成农村生活垃圾治理的长效机制。因此，公司热解气化焚烧技术将迎来巨大的市场契机。 During the National rural household waste management work meeting on Nov.18, 2014, minister of Ministry of Housing and Urban-Rural Development said the rural household waste 5-year special management will begin overthrough the country. Household waste of 90% rural area will be treated by 2020. Market potential of ECO-WASTE's gasification technology is great.
	技术先进性 **Advantages**	本产品通过中国机械工业联合会科学技术成果鉴定，专家组一致认为：针对我国固体废弃物处置领域突出的环境问题，开发了两段式热解气化焚烧炉。该炉采用分级燃烧、叠片式旋转炉排、固定炉盖、旋转炉体等关键技术和装备，克服了立式炉进料均匀性和连续排渣两大技术难题，使进、出料均匀，保

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			持了运行工况的相对稳定。该技术装备具有处理效率高、运行能耗低、操作便捷、维护方便、使用寿命长、设备占地面积小、造价低等特点；本装备焚烧机理先进，有利于控制焚烧产生的二次污染。工程应用表明运行工况及污染物排放值均符合《生活垃圾焚烧污染控制标准》（GB18485-2014）及《危险废物焚烧控制标准》（GB18484-2001）要求，实现了生活垃圾、医疗垃圾等固体废弃物的无害化、减量化和资源化处理。鉴定委员会认为，该项成果总体达到了国内领先、国际先进水平。 The product has been passed the scientific & technological achievement identification from China Machinery Industry Federation. The gasifier applys some key technology & equipment such as staged combustion, rotating grate, fixed furnace cover, rotating grate furnace. These realize evenly feeding in vertical furnace and continous slag discharging which make the operation condition more stable. The equipment has the advantages of high disposal efficiency, low operation energy consumption, easy operation and maintenance, long service life, small land occupation area and low investment. The system can also control the secondary pollution, and the emission meets national standard "Standard for pollution control on the municipal solid waste incineration" (GB18485-2014) and "Pollution control standard for hazardous wastes incineration" (GB18484-2001). It realize the reducing, recycling and reusing of MSW and medical waste.
	技术成熟度 **Technological maturity**		立式旋转热解气化系统主要由行车抓斗、立式旋转热解气化焚烧炉、出渣机、余热锅炉、烟气除酸塔、布袋除尘器、引风机、烟囱组成。该技术改变了传统的直接焚烧处理工艺，实现垃圾先热解气化，后富氧燃烧的二段式焚烧处理工艺，使垃圾焚烧产生的大气污染物、粉尘、二噁英类物质显著减少；并独创立式旋转设计，巧妙地解决了布料的均匀性和连续排渣的技术难题，填补国内外中小吨位生活垃圾焚烧处理的空白，以满足国内县级城市、乡镇、海岛等地区规模的生活垃圾、医疗垃圾等固体废弃物的无害化、减量化、资源化处理需求。产品本身是自动化水平较高的成套装置，配备有电气自控系统（由DCS自控系统和手动备用操作系统组成）、烟气在线监测系统。 The whole system includes grab-crane, vertical rotary gasifier, slag remover, waste heat boiler, deacidification tower, bag filter, induced draft fan, and chimney. Different from traditional incineration technolody, ECO-WASTE's gasification technology first gasifier the solid waste and then burn the syngas, which significantly reduce the fly ash and dioxin during the combustion. The vertical rotary desigh realize evenly feeding in vertical furnace and continous slag discharging. This technology fills the technological gaps in medium and small size garbage disposal of China. It also meets the processing demand of MSW & medical waste in small-medium citie, town, island area. With electric automatic control system (DCS Control System & manually backup operating system) and CEMS, the system has relative high automatic level.

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	技术适用性 **Technical applicability**	本技术产品主要适用于中小规模生活垃圾、医疗垃圾、危险废弃物焚烧处置及利用水泥窑生产过程协同资源化处理城市及产业废弃物。 This technology is mainly applied in small and medium tonnage of MSW, medical waste, hazardous waste disposal as well as cement MSW coprocessing. 垃圾焚烧处理设备行业是一个由多个行业交叉融合的行业，与上下游存在较高的联动性。上游行业的主要影响体现在企业采购成本的变化上。若上游产品供应趋紧则公司原材料价格上升，可能降低本公司的毛利率；若上游产品供应趋稳，则原材料价格回落，公司垃圾焚烧处理系统设备毛利率可能提高。随着国内上游行业的不断发展和设备国产率的不断提高，垃圾焚烧处理系统所需的大多数原材料都可以从国内得到充足的供应。下游行业对垃圾焚烧处理行业的发展具有较大的牵引和驱动作用，它们的需求变化直接决定了行业未来的发展状况以及行业市场容量、消费需求和消费力。 Industry of waste incineration treatment equipment spans multiple industries. Upstream industry will influence the purchasing costs. When price of raw material increasing, gross margin of the company may be decreased. On the contrary, gross margin may be increased if price of raw material decreased. Now most raw materials of ECO-WASTE's gasification equipments have enough supplies in China. Demand of downstream industry influences the future development, market capacity and consumption of this industry. 垃圾处理设施的建设和普及也受地方经济发展程度的影响，根据《"十二五"全国城镇生活垃圾无害化处理设施建设规划》，到2015年，全国城镇生活垃圾焚烧处理设施能力达到无害化处理总能力35%以上，其中东部地区达到48%以上。因此，前期阶段东部沿海地区会是小吨位垃圾焚烧处理设施建设的主市场。 Construction and popularization of the waste disposal equipments are also influenced by local economic development degree. According to " *Twelve-Five* " *national construction planning of urban household garbage treatment facilities*, capacity of urban household garbage incineration treatment facilities occupy 35% in household garbage treatment in China, and eastern region takes for more than 48%. Therefore, main market of small size waste incineration facilities will be Chinese eastern coastal region in early stage.
	技术稳定性 **Technical stability**	该技术在工程运行过程中受到客户的一致好评，项目运行稳定，操作便捷，维护方便，投资和运行成本较低。 The project operates steady. With easy operation and maintenance as well as low investment and operation costs; this system has won high praise from customers.

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		济南2×100t/d生活垃圾焚烧项目至今已稳定运行近8年，年资源化处理生活垃圾7.2万吨，污染物排放经权威监测机构测试，均低于国家标准排放要求。伊朗德黑兰市200t/d生活垃圾焚烧发电项目已建成投运，伊朗副总统Ebtekar、德黑兰省省长、德黑兰市市长及其他内阁成员一起参加了2015年2月9日的点火落成仪式，在中东地区引起很大反响，该项目稳定运行至今一年多。 Jinan 2×100t/d MSW gasification project runs stably for 8 years, with MSW disposal capacity 72 thousand each year. After testing, all the pollutant emission indexes are better than the national standard. Iran Tehran 200t/d MSW gasification power plant project has successfully launched on Feb. 9th 2015. A number of city and state officials, including Iranian Vice-President, Tehran's Mayor attended the completion ceremony. The project has been stably operating more than one year.
	技术安全性 **Technical Security**	泰来环保是目前国内固体废弃物热解气化焚烧领域规模最大、技术最优的环保公司，公司拥有一支非常完整的产品研发、设计、销售、工程实施、安装调试、运营管理及售后服务的高素质的队伍。同时公司垃圾处理产业链条完整，除涉及垃圾焚烧炉外，还涉足后续布袋除尘、二噁英净化、垃圾渗滤液处理，产品可相互配套，技术可相互支持，服务更加完善齐全，尤其在整体工程方案解决中优势明显；另外，望春工业园区占地50亩的产业基地不仅是焚烧系统设备的加工基地，也是焚烧系统备品备件等的加工、服务基地，可保证售后服务所需物品的及时供应及质量。 ECO-WASTE is the leading environmental protection company with the best technology of solid waste gasification technology in China. The company engaged in core equipment and technologies R&D, engineering design, selling, project implementation, as well as operation & maintenance. ECO-WASTE has complete industrial chain on waste disposal, besides the waste gasifier, it involves the bag filter, dioxin purification, leachate treatment. All the products and technology can mutual support to provide more complete service. The 8.3 acres of R&D center in Ningbo Wangchun Industrial Zone is not only manufacturing base of gasification equipments, but also manufacturing and service base of relative spare parts. These will ensure the after sales service.
	成果转化推广障碍 **Prometing barriers in achievement transformation**	技术实力、资金实力和融资能力是从事垃圾焚烧处理企业迅速抢占市场的制胜关键。在政策层面，政府对环境保护的重视程度不断提升，国家电价政策的发布将有利于保障生活垃圾焚烧行业的长期和健康发展，各地陆续发布的生态环境补偿等举措有望缓解生活垃圾焚烧厂的选址矛盾，因此不存在政策壁垒。国有固废处理企业在地级市的固废处理项目的争夺中，凭借其较强的股东背景和较强的政企合作关系占据有利地位；而对于财力有限的县级市项目，规模相对较小的民营企业凭借其较强的技术实力和成本控制能力“脱颖而出”。泰来环保的立式旋转热解气化技术填补了国内中小规模垃圾焚烧处置的技术空

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		白，由于该技术具有独特的环保优势和经济优势，现已荣获国家环保部科学技术二等奖、中国机械工业科学技术二等奖、国内装备制造业重点领域首台（套）产品、并入选国家工信部、科技部、环保部《国家鼓励发展的重大环保技术装备目录（2014版）》。目前，公司的市场订单已经达到13.5亿元，且已出口海外。因此，该技术现已获得行业、专家和市场的普遍认可，具有国内外广阔的市场空间。 Technology strength, financial strength, and financing capability are three key points for waste incineration disposal company to seize the market. In policy terms, government pays more attention to environmental protection. National electrovalence policies will be helpful to the long-term and healthy development of MSW incineration industry. More regions issue relative policies to ease the contradiction of MSW incineration power plant location selection. For the projects in prefectural-level cities, the company can get favorable position in competition with its long-term accumulated experience and resources. For those projects in county-level city, the company is more competitive because of its technical strength and cost control ability. ECO-WASTE independently researched and developed "Vertical Rotary Thermal Gasification Incineration Technology" of the company fills the technological gaps in medium and small size garbage incineration disposal of China. With environmental and economic advantages, this technology has been awarded several national awards such as the “2nd prize of Science& Technology” by National Ministry of Environmental Protection and “2nd prize of Scientific and Technological Progress” by China Machinery Industry Federation. It has also been endorsed among the three most advanced Chinese equipment & machine list which enjoy the highest recommendation from Chinese government. For now, the order has reached RMB 1350 million, and the products have been exported to overseas. The technology has been widely recognized by the, experts, market and industry. It has a broad market space
	知识产权转让 **Intellectual property rights conveyance**	该技术由浙江泰来环保科技有限公司自主研发，拥有该产品技术的绝对所有权，目前已申请国家专利23项，其中发明专利8项（4项已授权），实用新型专利15项（均已授权）。目前无转让意愿。 This technology is independently R & D and owned by Zhejiang ECO-WASTE Technology Co.,Ltd.. ECO-WASTE has applied 23 national patents, which include 8 invention patents (4 patents have been granted), 15 utility model patents (all of 15 patents have been granted). With no willingness to transfer.

TECHNOLOGY: WIND
COMPANY: SHANGHAI GHREPOWER GREEN ENERGY CO., LTD

Shanghai Ghrepower Green Energy Co., Ltd	**Renewable Energy Technology Achievement Declaration**			
	QR code			
	Technical provision unit	Shanghai Ghrepower Green Energy Co., Ltd.		
	Contact person	Zhang Shichen	Submission date	June 15, 2016
	Technical type	Wind energy utilization technology	Specific technical	Selection of small and medium sized wind power generator units
	Tel.	18721508258	E-mail	zsc@ghrep.com
	Technical name	Permanent magnetic direct-driven wind power generator		
	Technical provider	- Shanghai Ghrepower Green Energy Co., Ltd.		
	Scope of application	- Application of a variety of industries, such as: Communication base station power supply / enterprise business unit power supply, commercial power generation		
	Brief description of Technical	- Principle: Use natural wind to drive the generator to generate electric power - Functions: Solve the problem of power supply in the area without electricity - Technical features: Long service life (20 years), low wind speed start-up, high power capacity and protective measures - Key equipment: Wind power generator, controller, inverter		
	Technical information	- Zhiyuan wind power generator unit product line is 5KW-100KW, and divided into FD5/FD8/FD16/FD21/FD25 - The height of the conventional tower: 9 meters -36 meters		
	Business application situation	-1. Harbin Power Jiangsu Dafeng New Energy Oceanographic Engineering Domestically initial -2. Italy 60kW Business Grid Connected Project (a total of 50) -3. China Mobile Base Station Power Supply Project (a total of 8,000+)		
	Service conditions	- The market transactions and local investment and construction are the current business models - For installation and use, our company will provide the instruction and be responsible for training. - Annual maintenance costs account for 1-3% of the total input, depending on the local labor level		

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	Contact person of business application unit/Tel,/E-mail	- China Mobile Fang Yun 15000395706 - Italy Business Grid Connected Project Wang Hailin 18602112864
	Investment on equipment	- Revenue includes: 1. Equipment funds 2. Project construction funds 3. Land grant and lease funds 4. Interest on bank loans (if any) - As the wind power project has personalized, customized features, the equipment investment funds shall be determined according to the demand of the project and the program.
	Expense of operation maintenance	- Water and electricity is not used while the system is running. - Labor cost, repair cost, management fee shall be calculated in routine maintenance, which has been explained as the above - Depreciation expense
	Investment payback period	-10 5-6 years
	Other earnings	-11 Environmental protection and low pollution income
	Technical occupancy	-12 /
	Market potential of the Technical	-13 /
	Technical advancement	-14 Permanent magnetic direct-drive, gearless box
	Technical maturity	-15 Technology is mature, safe and reliable
	Technical applicability	-16 /
	Technical stability	Shipments in bulk in Japan, Europe and North America
	Technical safety	-18 Get SWCC, IEC, class NK and other certificates
	Obstacle in achievement transformation and promotion	1. The type of the equipment needs to be equipped with national or industry certification. Hence, Shanghai Zhiyuan products have passed a number of certifications from many countries and the industry. 2. The type of equipment requires the import license from local government, and some government requires wind turbine products to be localized.
	Transfer of intellectual property	-19
	Photo caption	

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CSIC Chongqing Haizhuang Windpower Equipment Co., Ltd.	可再生能源技术**成果申**报 1、 **技**术提供方（拥有**知**识产权或具备工程设计建造能力，列出具体单位**全称**） **CSIC （Chongqing） Haizhuang Windpower Equipment Co.,Ltd.** 2、 **适用范**围（**所属行**业、技术适用的限定条件，**限**30**字**） **Renewable Energy, suitable for remote and isolated areas where are rich of renewable energy resource.** 3、 **技**术简要说明（**原理、功能、技**术特点及**关**键设备，**限**150**字**） **HZ(HaiZhuang) Smart Micro-Grid, designed for renewable energy utilization, features in integrated DC-bus structure. The energy supply and storage is taken place in DC-bus side. The HZ Smart Micro-Grid is compatible with most of renewable energies and fossil energies. The structure of this micro-grid provides great stability to the users. The grid remains stable in case of full load cut in and cut out, and it can shift between energy supplies seamlessly. The energy manage controller of HZ Smart Micro-Grid maximizes the utilization of renewable energy and maintains the stability of the system.** 4、 **技**术**信息**（**技**术**参数和**设备体积，**限**60**字**） **The maximum capability of a single unit is 2MW. Multiple units can be grouped parallel. The voltage of DC bus is 560V-750V, and 200V to 400V on AC bus, between 3 phases lines. Frequency 50/60Hz. This Micro-Grid is designed in modularization method and compressed in container. Multiple energy resources provide power simultaneously.** 5、 **商**业应用情况（1~4**家示范工程名称、所在地、工程**规模及效果，**限**60**字**） **The demonstration project of HZ Smart Micro-Grid is located in Yadan international geopark, Dunhuang, Gansu, China, used as an isolated island grid. The user includes the management office of the park, several restaurants, the police office, and an in-building hotel. The total load is about 400kW/500kVA in around 1km distance.** 6、 **使用条件**（**市**场**交易**还是当地投建？是否**成熟技**术？**使用是否需要系**统培训？安装、**使用和**维护成本情况？**限**120**字**） **This micro-grid system is stable and reliable, easy to use. Only the workers on duty need a basic operation and maintenance train. The cost of installation, usage, and maintenance is based on the proportion of different energy sources. We can provide**

	the following services: 1 A whole solution to meet user need; 2 Technology transfer; 3 Devices producing; 4 Investing to building and running a micro-grid. 7、 商业应用单位联系人/电话/邮箱 **Contact：Ye Wang** **Tel：18696661305** **e-mail：wangye_hzfd@aliyun.com** 8、 设备投资 **The main devices of HZ Smart Micro-Grid include power generating devices, power distributing devices and storages. The price of power distributing devices is about $4,000 USD per kW; the price of storage is about $800 USD per kWh; the price of power generation devices is about $2,000 USD per kW for wind turbines and $2,200 USD per kW for PV w/o batteries. All the prices above cover construction costs.** **Take the demonstration project in Yadan as an example. Total load 400 kW, design life 20 years, the system consists of three 200kW wind turbines, 100kW PV, lead-acid battery 1440kWh. The total cost of this system is about $4million USD, of which $1.19m USD for three wind turbines including blades, nacelle and tower, $0.21m USD for PV unit, $1m USD for storage and $1.6m for power distributing devices. Maintain cost is about $0.16m each year. The system generates 1.6 million kWh (which depends on the renewable energy resource) each year. Suppose the power price is $0.43 USD per kWh, it's 7 years to recover the cost.** 9、 运行维护费用 **The maintenance cost for wind turbines is about 4% of the total price of wind turbines. For PV unit excluding batteries, the maintenance cost is mainly consisted of labor cost.** 10、 投资回收期 **The investment payback period depends on the resources of wind and sunlight, construction costs, electricity price, Load saturation level, etc. Stable investment recovery period is about 8 to 10 years.** 11、 其它收益

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	HZ Smart Micro-Grid produces stable and reliable power supply 24 hours by renewable energies controlled by a central monitoring and controlling system, cutting off 50% costs comparing with diesel power generator. 12、 技术占有率（指该技术2015年在国内行业同类技术，包括未采用任何技术的情况，生产的产品或处理规模中所占市场总量份额百分比） **HZ Smart Micro-Grid is the only high-power commercial pure isolated micro-grid system around China, which can fit various harsh environments such as sea island, desert and prairie.** 13、 技术市场潜力（指在结合技术成熟度、市场容量、技术经济性、资源和能源约束条件下，分析该技术到2020年在产业或领域内推广可挖掘的市场潜力，或达到的规模） **It's an important technology to improve the life quality of the inhabitants lived in low grid-cover-rate areas such as sea island and some remote areas in Africa.** 14、 技术先进性（描述技术的创新性，在国际和国内同类技术中所处的地位、水平） **HZ Smart Micro-Grid is the first integrated DC-bus micro grid that is commercially used. The demonstration project in Yadan is the first isolated micro-grid that using wind power as the main power supply. The main feature of this system is stability and compatibility. We have got two patents, and four utility model patents. The innovation points are shown below:** **1 Integrated DC-bus structure; 2 Inverters to separate power generating devices and loads, for safety reason; 3 Storage that connected to DC-bus directly, affording a rapid adjustment to the DC-bus voltage; 4 Inverters that working parallel to provide reliability; 5 Smart Controlling Algorithm that give high priority to renewable energies to reduce pollution; 6 modularized and compatible design, which makes the system easy to expand capability.** 15、 技术成熟度（描述技术工艺路线、设备及系统集成的完善程度） **The demonstration project in Yadan has ran for 2 years stably. The technology is mature.** 16、 技术适用性（描述该技术在转化推广过程的适用范围、与工艺技术上下游匹配程度、受地域、规模、环境、资源能源等因素的限制条件） **1. Haizhuang co. Ltd is a subsidiary company of CSIC. The technical specifications, human resource, manufacturing ability and inspection technology of CSIC is competitive over China. Therefore, the main devices of HZ Smart Micro-grid can be supplied through the stable supply chain in CSIC.**

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	2. HZ Smart Micro-grid can be used in various environment including island and desert. The system configuration is depending on the renewable resources such as wind, sunlight, water, biomass, etc. 17、 **技**术稳定性（**描述**该技术在工程运行过程中能否保持稳定，对环境、技术参数等干扰的敏感程度） **The demonstration project in Yadan has ran for 2 years stably. During this period, the highest temperature reaches 50℃, and the lowest temperature gets to -20℃. The extreme wind velocity is up to 30m/s and more than 20 sand storm days.** 18、 **技**术**安全性**（**描述**该技术在成果转化和产业化过程中**面**临**的**实用性、**配套**设施是否完善、市场接受度等系统风险） **The system fit for various environments and different resource conditions due to compatibility and stability. It has a wide market. The main devices of the system are mature products which can be all supplied by CSIC supply chain. This system is easy to use, improving the life quality of the residents lived in remote areas.** 19、 **成果**转化推广障碍（**描述**该技术在**成果**转化和推广过程中需解决的技术问题、政策壁垒、资源或资本制约、人才培养、其他限制条件等障碍大小等） **The major limitations for Africa usage are short of fund, imperfect law and policy, instable politics.** 20、 知识产权转让（**是否具有国内自主知**识产权，是否取得的专利等，技术拥有方性质；**引**进技术关键环节、工艺、设备的国产化程度；**技**术拥有方的转让意愿、技术产权转让机制、政策途径是否顺畅等） **Haizhuang Co. Ltd reserves independent intellectual property rights of this technology. All the key parts of the system can be manufactured domestically. We have got two patents, and four utility model patents. To support underdevelopment areas, we are willing to transfer the IP right. There's no constrain nor obstacle in policy for transferring.**