Announcement of Changzhou's List of Major Technological Demands for Breakthroughs by Means of "Open Competition Mechanism" in 2023

To support Changzhou's "532" development strategy to become a world-class city for smart manufacturing and a pivotal hub in the Yangtze River Delta and to accelerate the construction of a new energy capital, we further advance the Open Competition Mechanism for joint researches. This will help our industry chains to make breakthroughs in technologies facing a major bottleneck and our enterprises develop core technologies. According to Notice 9 in 2023 issued by the Changzhou Bureau of Science and Technology, the list of requirements for Changzhou's Sci-Tech Projects Up for Bid 2023 are as follows.

I. Projects for Bid

A total of 36 sci-tech projects up for bid (see Attachment 1) have been announced, mainly in new energy and new material sectors. The announcement is valid until 17:00 pm (Beijing Time), May 3, 2023.

II. Bidding Requirements

1. For Domestic Bidders

Bidders should be domestic colleges/universities, research institutes, sci-tech companies, innovation alliances, and other businesses or organizations with R&D capacity, while also meeting the following conditions:

(1) Capable of undertaking the contractor's proposed tasks, with strong R&D capacity, excellent research conditions, and a stable team.

(2) Capable of providing feasible solutions for the proposed major technical requirements, with independent intellectual property rights (IPR).

(3) The bidder and the contractor shall not be each other's sponsor, investor, shareholder, director, executive, creditor, etc.

(4) Have good financial status and standardized management, showing good records of research ethics and business integrity, with no "bad credit" record in the past three years.

2. For Bidders from Overseas/Hong Kong/Macao/Taiwan

Bidders should be colleges/universities, research institutes, sci-tech companies, innovation alliances, and other businesses or organizations with R&D capacity that meet the following conditions:

(1) Have a strong R&D capacity, showing good records of research ethics and business integrity, and capable of providing feasible solutions for the proposed technical requirements.

(2) The bidder and the contractor shall not be related as branches of the same corporation within or outside China nor in a parent-subsidiary relationship, *etc*.

(3) When the bidder and the contractor enter into cooperation, their acts shall abide by the laws and regulations of each other's country or region while acting there.

(4) If the bidder and the contractor sign a cooperation agreement, the agreement shall be standardized and rigorous, specifying the responsibilities and tasks for both sides, with specific provisions on IPR. The agreement shall be signed by authorized representatives from both sides with their names and official seals, or by other people authorized by the representative(s) in a written statement. Each signatory's name, employer, department, and job title shall be specified. An agreement in a foreign language should be submitted with its Chinese version at the same time, with the Chinese version prevailing in case of inconsistency.

III. Bidding Process

1. Filling in documents. Eligible bidders shall submit the *Form for Domestic Bidders and Proposed Solutions* within the validity period. For bidders from overseas/Hong Kong/Macao/Taiwan, they may entrust a partner in China to submit the application documents. A document in a foreign language should be submitted with its Chinese version at the same time, and the Chinese version shall prevail in case of inconsistency.

2. Submitting the documents. The required documents shall be sent in digital form (the Word document together with their scanned PDF copies) to Changzhou Science and Technology Resources Coordination Service Center (E-mail: **czkjpg@126.com**).

3. Communications between tenderees and bidders. Changzhou Science and Technology Bureau, will organize tenderees to communicate fully with bidders on the provided solutions, after which the bidders will further optimize.

4. Announcement on the successful bidders. Within one month from the date on which the announcement expires, tenderees will decide on their proposed bidder by signing a Letter of Intent. The list of bid winners will be released by the Changzhou Science and Technology Bureau on the website of Changzhou Technology Innovation (http://kjj.changzhou.gov.cn/), after which projects with no objection will enter the contract/agreement signing stage.

IV. Contact

The Service Division of Changzhou Science and Technology Resources Coordination Service Center, Contact: Yiwan Teng; Tel.: 0519-88101380; E-mail: czkjpg@126.com.

Changzhou Science and Technology Bureau

March 28, 2023

Attachments:

1. Changzhou's List of Major Technological Demands for Breakthroughs by Means of "Open Competition Mechanism" in 2023
2. Form for Domestic Bidders and Proposed Solutions
3. Form for Overseas/Hong Kong/Macao/Taiwan Bidders and Proposed Solutions

Attachment 1

Changzhou's List of Major Technological Demands for Breakthroughs by Means of "Open Competition Mechanism" in 2023

1. New Energy

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
1	CRRC QISHUYAN CO., LTD.	Research on key technologies of the hydrogen fuel cell hybrid system simulation and test platform	350	Currently, there are a large number of intended hydrogen train orders in the global market, and with the increasing demand in the hydrogen market and further promotion of fuel technology, the hydrogen train market is sure to have a promising prospect. However, in the field of rail transport, a hydrogen fuel cell hybrid system test platform with complete functions and in line with the standards and application characteristics of rail transport is absent, and the testing of related products is currently realized with engineering simulation software. This project intends to develop a hydrogen hybrid power system (with a fuel cell - energy storage power ratio ≥ 60%) simulation and test platform which should realize, among other functions: (1) scheme design and parameter matching; (2) research and optimization of power distribution algorithm; (3) fuel cell system output performance, safety and stability testing; (4) performance testing and matching degree evaluation for core components of fuel cell system; and (5) power battery system performance testing and	(1) High-power fuel cell hybrid power system testing capacity: system power ≥400kW; (2) Efficient thermal management and simulation control technology: heat dissipation ≥300kW; (3) Big-data-based fuzzy control algorithm: execution efficiency≥93%; (4) High voltage class current conversion control technology: with a voltage class of 750-1500V;| (5) Rail transport EMC technology: with an interference immunity higher than Class B.

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				matching. With the above platform, future development, testing and evaluation of engineering prototypes can be realized.	
2	CHANGZHOU ALMADEN CO., LTD.	Research and development of key technologies for the manufacturing of laminated large-size perovskite/crystalline silicon cell modules	200	Crystalline silicon cell, as the mainstream product of photovoltaic market, accounts for 90% of the market share. Perovskite has a favorable characteristic of the adjustable band gap, which, together with crystalline silicon photovoltaic cells, is used to produce laminated perovskite-crystalline silicon cells. Laminated cells provide excellent performance and have become the focus of the industry in recent years. Perovskite can not withstand high temperature due to its poor air stability. Particularly, large-size perovskite solar cell modules face the challenges of poor stability and low efficiency. This project mainly involves the research and development of key technologies for the manufacturing of laminated large-size perovskite/crystalline silicon cell modules, and the main research contents include: (1) perovskite materials with high stability and low defect and the preparation process of	(1) Efficiency of large-size (0.6m*1.2m) single-junction perovskite module ≥15% (2) Power generation efficiency of large-size (0.6m*1.2m) laminated perovskite module ≥27% (3) Stability of single-junction/laminated perovskite modules ≥ DH1000 hours (4) The packing materials shall be featured by water resistance, oxygen resistance and UV resistance, and the modules shall comply with the testing indexes stipulated in IEC 61215:2016.

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				light-absorbing layer; (2) large-scale single-junction perovskite structure and the manufacturing technology; (4) large-scale perovskite/crystalline silicon lamination manufacturing technology; (5) low temperature, high resistance water-oxygen packing materials and packing technology.	
3	JIANGSU POWER EQUIPMENT CO., LTD.	Research and development of spring isolator for turbine generator foundation	500	Turbine generators are the core equipment of large-scale thermal and nuclear power plants. The shaft system of a million-kilowatt class turbine generator is 70 meters long, the rotor weighs thousands of tons, and the vibration shall not exceed 20 microns. During the startup and running process of the generator, resonance with the foundation may occur, which significantly affects the normal running and shorten the service life of the generator, and even endanger structural safety. In recent years, the turbine foundation has developed from the early rigid foundation and flexible foundation to the current independent island-type spring isolator foundation, and the turbine vibration foundation type which is arranged in combination with main powerhouse. This project aims at independently developing spring isolators so as to realize the domestic production of vibration isolators, establishing a product system highly adaptive to the characteristics of electric power engineering in	(1) A final report for each part according to the theoretical analysis and experimental analysis is prepared; (2) Prototypes of vibration isolator are produced; a model selection guideline for product series is prepared; and the product standards for vibration isolators is formulated; (3) The permissible maximum vibration of spring vibration isolation system shall be ≤ 20μm; and the vibration isolation efficiency of spring isolator foundation should be ≥ 95%; (4) Apply for at least 2 invention patents.

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				China, and promoting the application and development of vibration isolators for the foundation of turbine generators and similar key equipment. Planned work includes the following: (1) Design and research of vibration isolator components in the limited space of turbo-generator foundation. (2) Carry out analysis of dynamic response and vibration resistance of turbine vibration isolation foundation: analysis of stress status of vibration isolator under vibration load and earthquake. (3) Provide a fatigue analysis method and damage assessment mechanism for vibration isolators under the extreme conditions of the turbine vibration reduction/seismic foundation. (4) Form a series of products and prepare corresponding product standards through mathematical modeling calculation, product development and sample test. (5) Analyze the vibration mass, stiffness and vibration load of the turbine generation unit: in the mathematical modeling calculation, accurately simulate the influence of the vibration mass and the stiffness of the unit on foundation vibration, simulate the role of unbalanced disturbance of rotor, and select appropriate kinetic parameters such as the disturbance force value, the control frequency range and the damping ratio.	
4	LIUGONG	Research and	350	With the promotion and implementation of the “two	(1) Overall dimension of truck:

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	CHANGZHOU MACHINERY CO., LTD.	development of extended-range DW118AE off-road wide-body dump truck		carbon" strategy and according to the tightened requirements of the state on environmental protection, the development of new and clean energy based products has become an inevitable trend in the construction machinery industry. Pure electric mining trucks, hybrid mining trucks and other new energy vehicles are featured by energy saving, consumption reduction, and environmental-friendly, which are in line with the future development trend, and have a broad market prospect. In the field of mining dump trucks, pure electric power has disadvantages such as high battery price, low energy density and long charging time, and fails to meet the working condition of heavy-loaded climbing. Extended-range power inherits the advantages of pure electric power such as energy saving, environmental friendly and excellent performance while overcoming shortcomings including low battery capacity and short driving mileage. Extended-range electric vehicles can give play to the advantages of drive motor and power battery, while, by configuring with a range extender, overcomes the disadvantages of power battery, and is especially suitable for the working conditions of frequent start and stop and severe load changes for off-road vehicles. This project involves the research and development of extended-range DW118AE off-	9460mm×3670mm×4470mm, load capacity of truck ≥80 t; (2) Maximum vehicle speed ≥40km/h, maximum climbing slope ≥32%; (3) Load ratio ≥2 (4) Compared with fuel-powered vehicles, the fuel consumption rate shall be reduced by 15%.

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				highway wide-body dump trucks, and the research contents are as follows: (1) Vehicle configuration and matching design. Carry out model selection and matching of engines, generators, motors, transmissions, traction batteries, and perform mechanical analysis of key bearing parts such as frame; under the premise of ensuring compact overall dimension, small turning radius and high stability of the truck, conduct configuration design and NVH performance design for fuel engine, generator, motor, transmission, traction battery, fuel tank and cooling system. (2) Study the control strategy of extended-range power system. According to the working conditions of off-highway wide-body dump trucks, select the appropriate control strategy (constant power control, power follow control, constant power + power follow control, intelligent control strategy, etc.), program the control strategy for the controllers (MCU, PDU, VCU), and realize the optimal matching between subsystems.	
5	SUWEN ELECTRIC ENERGY TECHNOLOGY CO., LTD.	Research and development of novel air contactors for new energy use	300	In the field of new energy applications such as new energy vehicles, DC contactors control the connection and disconnection of the traction battery system. During the connecting and disconnecting process of the electric contacts, electric arcs are generated due to electrical discharge, which leads to the delay of the circuit breaking. High arc energy will	(1) Rated voltage: 750VDC; (2) Rated current: 300A; (3) Electrical life: 300 times (300A/450VDC), 200 times (200A/750VDC); (4) Cut-off life: 50 times (600A/450VDC), 30 times (400A/750VDC), 1 time (2000A/450VDC), 1 time (1000A/750VDC); (5) Transient overload

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				burn the electrical contacts and even result in melting of the electrical contacts. Currently, two main types of DC contactors can be found in the market including the epoxy resin seal type and the ceramic brazing seal type, with the inner cavity filled with compressed nitrogen and hydrogen respectively. In the nitrogen or hydrogen atmosphere, DC arc is subject to easy cooldown and extinguishing. However, due to the difference in sealing principle, products with epoxy resin structure are more likely exposed to gas leakage after certain years of use, and both these two high-pressure sealed products are subjected to explosion hazards in case of short-circuit current. This project intends to develop an air atmosphere (non-pressurized design) DC contactor, introduce the non-pressurized design to the epoxy seal type and the ceramic brazing type products, and improve the electrical performance by using the air atmosphere. The main research contents are as follows: (1) Develop a novel unpressurized air DC contactor, and carry out modeling and simulation for structures such as cavity and arc extinguishing chamber. Research and develop high voltage DC arc extinguishing mode as well as the evaluation and test method. (2) Design high-voltage DC arc distinguishing method for different new energy application scenarios (electric	capacity: 2min (600A), 10s(1000A). 1s(2000A), 20ms (6000A);

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				vehicles, DC charging piles, energy storage systems, etc.) according to the specific DC arc extinguishing requirement of each application scenario.	
6	JIANGSU LUOKAI MECHANICAL & ELECTRICAL CO., LTD.	Development of key technologies of energy storage battery pack connector system (integrated cover plate)	200	Along with the trend of size reduction of storage battery packs, the size of the connector system of battery pack should also be reduced. At present, the size of a general component system is about 10mm, which cannot meet the requirement of size reduction of energy storage battery packs. There is a huge demand for battery module systems with a thickness below 5mm in the market. In the battery module size reduction process, problems such as insufficient welding between the integrated cover plate and the cell, large thickness and size of the integrated cover plate, and module separation may be encountered. Based on the above problems, the main research contents of this project are as follows: (1) Develop technologies for solving the technical difficulty of insufficient welding between aluminum bar and cell; (2) Develop modular integration technology for integrated cover plates; (3) Develop size and weight reduction technology for integrated cover plates.	Obtain integrated cover plates that meet the following index requirements: (1) An NTC temperature sensor with a resistance of 10KΩ@25℃ must be used, the resistance from acquisition point to connector pin shall be ≤1Ω, and the integrated cover plate temperature measuring range shall be -40℃~85℃; (2) Withstand voltage class: 2500VDC; (3) Current: interloop current ≤200mA, leakage current ≤1mA; withstand current ≥600A; (4) Thickness ≤5mm.
7	CHANGZHOU NUODE ELECTRONICS CO., LTD.	Research and development of key technologies of CCS-	800	CCS-2P9S acquisition system is an important part of new energy vehicle pack, which currently faces technical challenges including complicated machining process, low manufacturing precision, low module	(1) Build an automatic production and manufacturing intelligent CCS production line which reduces the production cost and improves the stability of CCS modules; and meets vibration resistance and other safety performance

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		2P9S acquisition system for new energy vehicle battery pack		compatibility, and poor welding. This project involves the research and development of key technologies of CCS-2P9S acquisition system for new energy vehicle battery pack, and the main research content includes: (1) Develop an integrated scheme of FPC + vacuum forming/harness + separator/PCBA + riveting to reduce PCBA+ hot pressing time, and improve production efficiency; (2) Integrate connector, FPC, nickel sheet, temperature sensor, aluminum bar, *etc*. into the vacuum forming tray, so as to improve automation level and homogeneity of product, and ensure quality tractability. (3) Integrate cell acquisition and cell temperature sensing functions, monitor cell temperature changes, optimize the acquisition layout, and improve product quality and performance.	of cell modules. (2) Module size accuracy ≤0.02mm, the cost of structural products should be 30% lower than that of manual manufacturing. (3) DC5000V/60S, withstand voltage/leakage current ≤1mA; DC3000V/60S, insulation resistance ≥500MΩ; (4) Apply for at least 2 invention patents.
8	JIANGSU MATCH-WELL ELECTRICAL PRODUCTS CO., LTD.	Research and development of oil-free scroll compressor series for new-energy vehicles and the industrialization	600	Oil-free scroll compressor, as a core component of heat pump, air conditioner and refrigeration equipment, has gradually extended to new energy vehicles, medical equipment, machinery manufacturing and other related fields. Therefore, there is a huge potential market and development space for the research & development and production of oil-free scroll compressors. This project involves the research and development of a series of oil-free scroll compressors for new energy vehicles, and the	(1) Oil scroll air conditioner system; with efficiency increased by 3-6%, realizing the reduction of refrigerant charging amount. Relevant indexes are as follows: Displacement: 34cc/REV; speed range: 1000-8500(rpm); refrigerant: R290; rated voltage: 300 (200~450) (V); maximum refrigeration capacity: 7500(W); COP:2.15. (2) Oil-free scroll air compressor brake system; improve the reliability of the air distribution system, and meet the requirements of new

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		thereof		realization of industrialization thereof. The key research contents are as follows: (1) Development of R290 refrigerant-based oil-free scroll air conditioning compressor and the application thereof in new energy vehicles；(2) Development of oil-free scroll air compressor and the application thereof in new energy vehicle brake system	energy vehicles for air, environment and compressor cleanliness. Relevant indexes are as follows: air displacement: 400L/min; rated discharge pressure: 12.5bar; noise: lower than 70dB (A) under a discharge pressure of 10bar; vibration: lower than 15mm/s at the severe vibration point; working life: more than 20,000 hours (10,000 hours before wear parts replacement); specific power: lower than 8kW/(m3/min). (3) Complete the matching and application of the above two products in new energy vehicles. (4) Apply for at least 2 invention patents.
9	BAIC HEAVY DUTY TRUCKS CO., LTD.	Research and development of electric heavy-duty truck “three electrical systems” performance test platform	350	This project involves a new bench-level electric heavy-duty truck “three electric systems” performance test platform, which, together with the vehicle simulation calculation, calibration, test and verification systems, shall meet the requirement of vehicle performance and core parts development, be able to simulate the real operation of the vehicle, verify the working indicators and reliability of each key part, and realize vehicle-level integrated testing of all aspects of the performance of electric vehicle drive system with the computer system in a laboratory. It is mainly used for the verification, testing and optimization for performance development, as well as reliability and control strategy	(1) Motor test bench: Peak power ≧600kW; Operating voltage 300V~800V; Peak torque ≧4000N.m. (2) Traction battery test platform: Battery pack capacity: ≧500kWh; Working voltage: 300V~800V; Battery pack cooling system temperature: -30 ° C ~100 ° C. (3) Apply for 5 invention patents. (4) Build a “three electrical systems” test bench.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				development of motors, power batteries and controllers. The main functions shall include: (1) Input and output characteristic test (speed, torque, electrical parameters, mechanical power, efficiency MAP, etc.); (2) Temperature rise test of motor and battery; (3) Motor locked-rotor test; (4) Function verification and performance matching test; (5) Maximum speed and over-speed test; (6) Braking regenerative energy feedback test; (7) Motor system reliability test; (8) Torque and speed response test.	
10	SEGWAY TECHNOLOGY CO., LTD.	Development of vehicle control unit (VCU) for hybrid all-terrain vehicles	500	Hybrid power has been widely applied in the automobile industry, but its application in the all-terrain vehicle industry is still in the blank stage at home and abroad. All-terrain vehicles have very high requirements for jumping, acceleration performance and passability, meanwhile, the requirements for comfort, safety, environment protection and emissions shall also be taken into consideration, and all these requirements highly depend on the coordination and control of vehicle control unit (VCU). The project mainly involves the development of software and hardware for vehicle control unit. As the core component of hybrid vehicles, it needs to collect the working status data of the electric drive system, battery and various body systems, collect signals from accelerator pedal, brake pedal and other actuators,	(1) Rated voltage 9-16V; static current ≤2mA; working temperature -40-85℃: working humidity 0-95%; (2) IP67, be able to withstand triaxial frequency sweep vibration, frequency: 10-25Hz, amplitude: 1.2mm, frequency: 25-500Hz, acceleration: 30m/s2, sweep rate: 1oct/min; (3) 32-bit processor, CPU speed ≥64Mhz, with floating point capability, RAM≥60KB, Flash capacity ≥1MB, EEPROM or emulated EEPROM≥4KB; (4) Vehicle torque response time ≤50ms, torque control accuracy ±5%; (5) Realize energy management and distribution, high voltage power-on and power-off, high voltage safety protection, driver intention analysis, charging management, energy recovery, thermal management, vehicle fault

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				sensors and controllers, to make a comprehensive analysis and judgment on driver's driving intention, to give control instructions to each system, and to monitor actions of all part controllers at the lower layer. It is also responsible for power-on and power-off of all-terrain vehicles, drive, energy feedback, energy management of engine and traction battery, network management, fault diagnosis and treatment, vehicle status monitoring and others.	diagnosis, network management and other key functions.
11	JIANGSU SIBEIER HINA ENERGY STORAGE TECHNOLOGY CO., LTD.	Research and development of high-performance energy storage lithium battery management system	200	As the "carbon peaking and carbon neutrality" goal is put forward, the energy storage industry has entered the fast track of development and become an important support for the construction of new power systems. In order to ensure the safe and efficient use of battery energy storage systems, it is important to perform scientific and effective management over lithium-ion batteries, that is, to conduct in-depth research on energy storage battery management system BMS, it is also an important link to achieve the low carbon goal. Research content includes: (1) Introduce an efficient state estimation algorithm or other high-precision state estimation schemes to realize accurate cell state estimation, providing basic support for the charge and discharge control and the voltage and current protection. (2) Provide high-power active equilibrium, remote system	(1) Rated power consumption: 0.5W (slave control), 3W (master control), 1.5W (overall control). (2) Acquisition channel: 6-30 ways. (3) The single voltage acquisition accuracy shall not be less than 0.2% of the single cell, and the sampling period shall not be greater than 100ms. (4) The temperature acquisition accuracy is 0.1 ℃, the measurement error is not greater than 0.5 ℃, and the sampling period is not greater than 1 s. (5) Equalization mode: active equalization (3A), passive equalization (150mA). (6) SOC estimation accuracy: 2.5%. (7) The current sampling error shall not be greater than 0.1%, and the sampling period shall not be greater than 30ms. (8) Insulation resistance acquisition accuracy: above 600K Ω, with an accuracy of

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				monitoring and other advanced functions. Realize active equilibrium between any cell, control the equilibrium current in a reasonable range of 2-3A; and provide passive equilibrium function. (3) Develop an efficient, energy saving and safe equilibrium strategy, improve the overall efficiency to 95%, and use the new system to prolong the battery pack life by 25%.	10%. (9) Insulation resistance collection range: 0-10M Ω.
12	CHANGZHOU LAMBDA ELECTRONIC CO., LTD.	Design of electrode with high activity and long life for solid oxide electrolysis cell (SOEC) and the manufacturing technology thereof	240	In the process of water electrolysis for hydrogen production at high temperature, electrodes, as the core components, whose ionic conductivity, stability and compatibility with electrolytes are the key factors that determine the performance and life of a single battery, and also the basis for the practical application of SOEC technology. The research contents are as follows: (1) Simulation and screening of highly active electrode materials. Carry out high-flux design and screening of materials by computational simulation, and establish the structural model of large electrode surface to predict the material composition and crystal structure with high oxygen precipitation activity. (2) Instantaneous mass synthesis and thermal expansion control strategy of electrode materials. Improve the material screening efficiency, and realize the adjustment and control of thermal expansion coefficient of electrodes.	(1) Effective area of electrode ≥150 cm^2; (2) Polarization impedance of electrode material at 800℃ ≤0.10Ω·cm^2; (3) Electrical conductivity ≥300 S/cm; (4) Attenuation rate ≤1%/kh.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				(3) Construction and in situ analysis and characterization of high-stability electrode/electrolyte interface. Realize the thermomechanical compatibility of oxygen electrode with electrolyte, and increase interface stability. (4) Analysis of electrolysis hydrogen production performance and of structure-function relationship. Study the electrochemical reaction and attenuation mechanism of battery by taking the dynamics of composite materials and a single cell three-dimensional multi-field coupling model into comprehensive consideration.	
13	JIANGSU ZHIXIN JINCHUANG TECHNOLOGY CO., LTD.	Research and development of grid-connected optical storage DC microgrid system	420	Photovoltaic power generation is directly used for capacitive deionization (CDI) water treatment and ionic membrane caustic soda production, which can improve the energy efficiency of the system since the inversion, rectification, transformation and other links are removed. The main research contents of this project include: (1) Build a grid-connected optical storage DC microgrid system for supplying power to CDI water treatment units and other DC loads. (2) Develop a source-grid load storage information exchange and energy control platform, and realize status monitoring and control of system equipment, energy scheduling, and fault alarm and locating. (3) Provide special control software to process the working condition information of each unit of the platform and	(1) Current interfaces of photovoltaic power generation units, energy storage batteries, grid-connected devices and DC loads shall comply with JB/T14260-2021; (2) The micro-grid system shall be able to automatically realize the power supply of mains power, photovoltaic DC power and energy storage battery to DC loads, providing 260V-360V voltage to each DC load module, and with the maximum current not exceeding 75A; (3) Develop an intelligent processing system that can automatically monitor, give feedback and regulate the working state of each part of the unit, and push abnormal working situations to the control center in real time to remind relevant personnel for timely response.

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				intelligently adjust the charging and discharging state of the energy storage battery, and to automatically eliminate working capacity fluctuation of DC loads such as CDI water treatment unit caused by the fluctuation of photovoltaic power generation capacity.	(4) Applied for 3 invention patents.
14	CHANGZHOU JINGCE NEW ENERGY TECHNOLOGY CO., LTD.	Development of technology and equipment for testing high-pressure PEM hydrogen production electrolytic bath	300	An excellent proton-exchange membrane (PEM) electrolytic bath test system is an effective tool to improve the performance and prolong the service life of proton-exchange membrane (PEM) electrolytic bath. This project intends to research and develop the technology and equipment for testing high-pressure PEM hydrogen production electrolytic baths, and the research contents are as follows: (1) Develop a high-precision automatic performance test system for testing the performance and working condition of proton-exchange membrane electrolytic baths under high-pressure operation. (2) Develop high-precision testing technologies for optimizing the operation of PEM water electrolysis and hydrogen production test system. (3) Develop a high-precision electrolysis test power supply suitable for various working conditions of proton-exchange membrane electrolytic bath. (4) Develop rapid and accurate gas leak detection methods and safety protection technologies.	(1) The continuous trouble-free operation time is more than 1000 hours (2) High pressure at both anode and cathode, the pressure is ≥3MPa (3) The pressure control accuracy is higher than 0.5%, and the pressure difference control accuracy is higher than 2% (4) Water temperature at the inlet of electrolytic bath ≥ 80°C@50mL/min (5) Water conductivity at the inlet of electrolytic bath ≤5uS/cm (6) High precision water electrolysis test power supply, with voltage and current control accuracy ≤ 0.05% (7) Detection accuracy of hydrogen in oxygen ≤1%, response time ≤100ms
15	JIANGSU MAYMU	Research and	350	The lithium battery wet recovery process includes	(1) Resistance of univalent selective ion exchange

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	SE ENVIRONMENT PROTECTION TECHNOLOGY CO., LTD.	development of electrochemical membrane separation materials and components for high-efficiency wet recovery of lithium ions of cathode of waste battery		battery pretreatment, cathode active substance leaching, acid leaching solution separation, etc. In the wet recovery process, sulfuric acid is often used to dissolve solid materials into a sulfate solution. this reaction produces a large amount of Li_2SO_4 solution, which is further separated and purified by the electroadsorption method. As the core part of the electroadsorption component, the performance of the univalent selective ion exchange membrane directly determines the separation efficiency and energy consumption of the leaching solution by the electroadsorption component. At present, the univalent ion exchange membrane mainly relies on imports, thus the cost is relatively high. This project, starting from the source design of electrochemical univalent ion exchange membrane materials for wet recovery, and comprehensively considering various structural factors affecting the performance of ion exchange membrane materials, intends to develop a series of high-performance univalent ion exchange membrane materials and separation components for wet recovery of lithium batteries, aiming at greatly improving ion penetrability and selectivity, effectively reducing separation energy consumption, obtaining independent intellectual property rights, and fueling the	membrane material $<3\Omega\cdot cm^2$; (2) Thickness of univalent selective ion exchange membrane material ≥0.1mm, breaking strength ≥0.2Mpa (3) Univalent selective penetration rate of univalent selective ion exchange membrane material ≥93%; (4) Apply for 6 invention patents, obtain 4 invention patents, and obtain independent intellectual property rights.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				rapid development of the lithium battery wet recovery electrochemical membrane separation industry in China.	
16	UNIPOWER HYDROGEN TECHNOLOGY (JIANGSU) CORPORATION	research and development of proton exchange membrane with high performance and durability	200	Proton exchange membranes can be applied in industry, energy storage, transportation and other fields, specifically, in water electrolysis hydrogen production electrolytic baths, all-vanadium redox flow batteries, hydrogen fuel cells, etc. At present, domestic hydrogen proton exchange membranes face the problems of poor performance and durability. The technology for preparing proton exchange membranes with high performance and durability is sure to be a breakthrough technology. The innovation in this research and development is to put forward higher requirements for the chemical-mechanical mixing durability of proton exchange membranes. Key problems to be solved: improve electrical conductivity, chemical mechanical mixing durability, stability of proton membrane, etc.	(1) Conductivity ≥0.1S/cm (2) Swelling rate ≤3% (3) Tensile strength ≥45MPa (4) Hydrogen permeation current ≤2mA/cm² (5) Thickness uniformity ±1μm (6) Chemical mechanical durability cycles ≥20000 times
17	CHANGZHOU HOUDE RENEWABLE RESOURCES TECHNOLOGY CO., LTD.	Key technology of accurate screening and high-value regeneration of	500	At present, lithium-ion batteries are mainly recovered by wet and pyrogenic methods at home and abroad, and mature separation-regeneration technology is absent. This project intends to carry out the following research: (1) Precise and automatic screening of powder materials of waste lithium-ion batteries.	(1) Realize accurate screening of waste lithium-ion batteries, with the recovery rate of shell, copper, aluminum, anode and cathode materials exceeding 98%; (2) Develop a cathode material regeneration technology, of which, the 1C discharge capacity of regenerated lithium iron

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
		recycled lithium-ion battery materials		Develop an automatic precise screening technology for efficient recovery of copper powder, aluminum powder, and anode and cathode materials of current collector; (2) Key technology of high-value regeneration of cathode material - lithium iron phosphate. Based on the failure mechanism of lithium iron phosphate recovery, develop a lithium iron phosphate regeneration technology by adopting trace elements doping, microstructure control and crystal structure reconstruction and other means. (3) Key technology of high-value regeneration of anode material - graphite. Based on the failure principle of anode material - graphite recovery, develop a controlled regeneration and preparation technology of graphite crystals by adopting high-temperature decomposition and detaching of copper, iron, lithium and organic matters. (4) Develop technology for the regeneration of anode and cathode materials of waste lithium iron phosphate batteries, and formulate the technical scheme for the regeneration demonstration line of anode and cathode materials of waste lithium iron phosphate batteries.	phosphate cathode material shall be greater than 130 mAh/g, and the first-round charge-discharge efficiency shall be greater than 95%; (3) Develop an anode material regeneration technology, of which, the purity of the regenerated graphite anode material shall be greater than 99%, the first charge capacity shall be greater than 330 mAh/g, and the Coulomb efficiency shall be greater than 90%; (4) Formulate the design scheme for the regeneration demonstration line of anode and cathode materials of waste lithium iron phosphate batteries.
18	JIANGSU HUAWANG ADVANCED MATERI	Research and Development of ultra-thin compos	530	Copper foil is used as a current collector at the anode of lithium-ion traction battery, whose cost accounts for about 5%-8% of the total battery cost. At present, 8-10μm copper foil is mainly used in the industry.	(1) Develop the technology for producing ultra-thin (thickness less than 8μm) composite foil current collector, of which, the copper plating uniformity is 1μm±0.1μm, the thickness of

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
	ALS CO., LTD.	ite foil current collector for lithium traction batteries		Composite foil current collectors can improve the energy density and safety of the battery, and effectively reduce the cost, it has significant market competitive advantages. There are large differences in physical and chemical properties between organic materials and metals such as copper or aluminum, therefore, how to achieve good interface matching between composites while ensuring good electrical conductivity and surface flatness, and how to solve the problem of hot melting and electrical perforation are technical problems that urgently need to be solved. Research content includes: (1) Research PET-based composite foils production technology. (2) Research key technologies of chemical plating and electroplate, and make a key technical breakthrough for ultra-thin large-size composite foils.	copper-aluminum composite foil is 0.04-0.10mm, and the thickness of single-side copper foil is 0.002mm. (2) The thickness of the composite foil is less than 8μm, the elongation is greater than 3.5%, the tensile strength is greater than 120MPa, and the conductivity is greater than 50% IACS. (3) The roughness of composite foil is 0.01-0.3μm, and the surface density is 40-60g/m^2. (4) Apply for 6 patents, including 3 invention patents, and obtain at least 4 patents.
19	JIANGSU BTR NANO TECHNOLOGY CO., LTD.	High-performance polyanion sodium storage cathode material	300	**Current status at home and abroad**: in the late 1970s, research on sodium-ion batteries began almost at the same time as that on lithium-ion batteries. Due to the limitations of energy density and cycle performance of sodium-ion batteries, no further research is carried out. In recent years, with the exposure of problems of lithium resources such as scarcity，uneven distribution, development and utilization difficulties, sodium-ion batteries start drawing people's attention due to the wide	(1) Compaction density ≥ 1.3g /cm^3; (2) Powder compaction density > 2.0g /cm^3; (3) Half-cell 0.1 C gram capacity ≥135 mAh/g; (4) Voltage platform 3.2V; (5) Working temperature -50°C to 80°C.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				distribution of sodium resources, and looking for low-cost alternative materials has become a concerned topic. **Research content**: In view of the disadvantage of the low energy density of polyanionic compound cathode materials, this project intends to improve the specific capacity of materials through doping of metal ions and carbonization technology. Explore the synthesis parameters and boundary conditions of high-capacity materials through lab scale test, amplify the lab scale test results to kilogram scale, carry out sampling check and verification in consecutive 10 batches, and pass the stability test.	
20	JIANGSU LEMENG PRECISION TECHNOLOGY CO., LTD.	Development of friction stir welding technology for 6061-T6 aluminum alloy medium-thick sheets used in the nuclear energy field	350	6061 aluminum alloy has good corrosion resistance and weldability, and is widely used in the fields of nuclear energy, transportation and aviation. 6061 aluminium alloy has a high requirement for heat input in fusion welding, and has a large specific heat capacity and thermal expansion coefficient. With traditional welding methods such as consumable electrode argon arc welding, defects such as pores and slag inclusion may occur during welding, so it is impossible to obtain welding joints with high strength coefficient, which seriously affects the welding quality and performance of 6061 aluminum alloy. Lemeng Company is developing the technology for welding 6061-T6 aluminum alloy medium-	(1) The technology shall meet the welding requirements of 6061-T6 aluminum alloy cylinder with a thickness of 50 mm, diameter of 2 m and height of 1m; (2) The tensile strength, yield strength, corrosion resistance and other performances of the welding joints should not be lower than those of the base material; (3) Welding joint tensile strength (MPa) : ≥260, yield strength (MPa) : ≥240, elongation (%): ≥9; (4) Weld porosity ≤0.2%; local aggregated or chain porosity ≤0.1%; (5) The length and diameter of circular defects shall be less than 0.1mm, and the number of defects shall be less than 2.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				thick sheets with a thickness above 50 mm into cylinders with a diameter of 2 meters and a height of 1 meter, and experiments have been conducted with argon arc welding, laser composite welding and friction stir welding. Existing technical problems are as follows: the tensile strength, yield strength, elongation and other properties of welding joints only reach 50% of those of the base materials, which fails to meet the requirements of performance of welding joints not lower than that of base materials.	
21	CHANGZHOU RONGXIN COMPOSITE MATERIALS CO., LTD.	Key technology for manufacturing large-capacity plastic liner carbon fiber composite pressure vessels for hydrogen storage and transportation	350	At present, type III and type IV gas cylinders are mainly used abroad, and type I and type II gas cylinders are mainly used in China, accounting for more than 95% of total high-pressure hydrogen storage and transportation vessels, and the hydrogen storage efficiency thereof is low. Therefore, it is of great significance to develop type IV lightweight large-capacity hydrogen storage cylinders. For large-capacity type IV hydrogen storage cylinders, research on the following four aspects should be carried out: (1) Research and development of high-performance carbon fiber composite material system, including research and development of low temperature and fast curing resin system, and properties matching and controlling between resin and carbon fiber;	(1) Curing temperature of resin system ≤90℃, curing time ≤5 h, curing degree ≥90%; application period at 25℃ ≥3 h; interface bonding strength between carbon fiber and resin reaching 85 MPa. (2) The lightweight structure design model of type IV hydrogen storage cylinder shall reduce the weight by 10% and above. (3) The interface bonding strength between composite material and plastic liner shall be increased by 20% and above. (4) The hydrogen storage mass density of hydrogen storage cylinders with a working pressure of 35MPa and a volume ≥500L shall be≥6.8%.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				(2) Lightweight structure design of large-capacity type IV hydrogen storage cylinder, and optimization of structure form at special positions of hydrogen storage cylinders; (3) Research on interface matching and controlling of type IV hydrogen storage cylinder, analyze the interface state during forming process and hydrogen charging and discharging process, and develop a method for controlling interface deformation and coordination between structural layer and liner; (4) Research the winding and forming process of type IV hydrogen storage cylinders, realizing mass production and large-scale application of type IV hydrogen storage cylinders.	
22	JIANGSU KAITE AUTOMOBILE PARTS CO., LTD.	Research and development of lightweight and high strength graphene automotive aluminum hubs for new energy vehicles	380	Aluminum hub is the key component of the drive system of new energy vehicles. At present, most new energy vehicles are configured with aluminum hubs produced with A356.2 materials by casting. In order to ensure driving safety, heavier weight than fuel vehicles impose a great influence on driving mileage. Therefore, the existing aluminum hub materials and technical processes cannot meet the need of the rapid development of new energy vehicles. In recent years, European and American countries enhanced the development of new materials and new technical process of aluminum hubs, and achieved a major breakthrough. Therefore,	(1) Develop a set of technical processes for material preparation, forming, heat treatment and surface treatment of graphene-aluminum hubs. (2) The tensile strength shall be greater than 300MPa, the yield strength shall be greater than 260MPa, and the elongation shall be greater than 9%. (3) The forming defect of 18-24 inch thin-wall aluminum hubs with complex structure shall be less than Grade 1, and the pass rate of hot processing shall be higher than 95%. (4) The product shall pass 1000 hours and above neutral salt spray test, the paint film hardness shall be greater than 2H, and the resistance to

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				developing lightweight and high strength aluminum hubs for new energy vehicles is of great significance to consolidate the industrial advantages of new energy vehicles of China. Centering on the requirements of lightweight and high strength of aluminum hubs for new energy vehicles, this project intends to research the preparation of aluminum-based graphene materials, precision forming of aluminum hubs with a complex structure, new processes for heat treatment and surface treatment of graphene aluminum hubs, lightweight design of light and thin-wall aluminum hubs, series technology for personalized customization of aluminum hubs of new energy vehicles, realization of industrial production of lightweight and high strength aluminum hubs of new energy vehicles.	gravel impact shall reach Grade 1. (5) The material yielding rate of aluminum hubs shall be greater than 70%, and the weight of aluminum hubs of the same size shall reduce by 3-6 kg. (6) Develop 10 series of aluminum hubs for new energy vehicles, free of cracks after 250,000 cycles of bending and fatigue test, and free of cracks after 1,500,000 cycles of radial fatigue test.
23	CHANGZHOU HUITIAN NEW MATERIAL CO., LTD.	Research and development of key technologies of high flame retardant and high weather resistance silicone sealing foam	200	Silicone foam is a lightweight low-density liquid foamed silicone rubber material, featured by excellent sealing performance, shock absorption and buffering, support, protection, heat insulation and flame retardant, and can be used as the sealing material for the shell of new energy batteries. At present, imported silicone foams, such as Rogers HT-800, are mainly selected by domestic traction battery manufacturers. Limited by technical processes, domestic silicone foams face the	The silicone foam developed shall have the following main properties: (1) Thickness: 3.0-5.0mm, density: 380-450kg/m^3, (2) Be able to be bent without breaking after (-40℃)/high and low temperature impact (-40℃-120℃); (3) Flame retardant: UL-94:V0 (4) Systematic test (high-temperature aging, “double 85” aging, high and low-temperature impact, millions of pressure changes) waterproof: IPX8

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
		for traction batteries and the industrialization thereof		problems of insufficient reactivity control, long post-curing time, cannot be produced continuously, and low production efficiency; The foam pores are not fine and dense enough, and the compression performance and water resistance after aging are not comparable to those of imported products. This project mainly involves the research of a formula of silicone foam with high flame retardant and high weather resistance, feasible production equipment selection and technical process shall be provided, meeting the requirements of 24h continuous mass production.	(5) The process and equipment shall meet the requirement of 24h continuous production, with an annual output of 800,000 square meters
24	CHANGZHOU GALAXY CENTURY MICROELECTRONICS CO., LTD.	Research and development of key technologies of SiC MOSFET power devices and modules for new energy vehicles	300	For the application of SiC MOSFET in the field of new energy vehicles, Onsemi has released 900V SiC MOSFET, ROHM has launched 1200V G4 SiC MOSFET. SiC MOSFET single module by STMicroelectronics N.V. has been selected used in Tesla Model3. Domestic enterprises such as BYD, STARPOWER, ACCOPOWER and HESTIAPOWER have successfully designed and manufactured SiC modules, and some have possessed mass production capacity. SAIC, BAIC, GEELY, NIO and XIAOPANG are all planning to launch new models configured with SiC modules in 2023. SiC module has obvious advantages. In the future, more and more electric vehicles will configure a SiC module. 800V	(1) SiC MOSFET discrete device Chip: V_{DS}≥1200V; $R_{DS(ON)}$≤75 mΩ; Encapsulation mode: TO247-3L/4L (2) SiC MOSFET module Chip: V_{DS}≥1200V; $R_{DS(ON)}$ ≤20 mΩ Module: voltage/current: 1200V/600A; parasitic inductance < 20nH; Si_3N_4 AMB ceramic substrate combined with sintered silver solidification process, and Infineon EconoDUAL power module pin-to-pin; Compared with Si IGBT module, the specific efficiency shall be improved by 2~10% and the volume shall be reduced by 30% (3) On-board OBC power supply system: input voltage: 450~800VDC; maximum output current: 450Arms;

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				and above high voltage platform is the general trend. Application in the automotive field will be the largest market force that fuels the growth of SiC modules. This project aims at solving the problems of low inductance of current circuit, current equalization design and reliability of vehicle-grade SiC MOSFET encapsulation devices and modules. The research contents include (1) the structure design of SiC power module. (2) Research and development of encapsulation materials and technical processes for SiC power modules. (3) Research and development of the technical process for industrial production of SiC power modules.	peak output: 450kVA; power density: 35kW/L; output frequency range: 0~1kHz (4) Verified with high temperature reverse bias test HTRB for 1000h, high temperature grid bias test HTGB for 1000h, high temperature and high humidity reverse bias H3TRB for 1000h, temperature cycle TC 500 cycles and other reliability tests.

2. New Materials

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
1	JIANGSU JOTRY ELECTRICAL TECHNOLOGY CO., LTD.	Research and development of NDIR sensitive materials and chips	500	As a new generation of gas detection technology, non-dispersive infrared (NDIR) gas sensor detects gas by detecting the characteristic infrared absorption spectrum of gas molecules, which has the advantages of long life, high sensitivity and good stability. However, the sensitive	**MEMS infrared light source** (1) Radiation rate: > 0.9 (2) Frequency response: >80Hz (3) Service life: > 50,000 hours (4) Maximum chip temperature: >800℃ **Infrared gas detector** (1) Response rate

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
		for multiple gases detection		materials and key technologies of NDIR gas sensors are monopolized by foreign countries, and the core components are heavily dependent on imports, therefore, there is an urgent need for domestic products. Targeting the large demand for SF_6 and O_3 detection in the smart power industry, research and develop a full set of independent technologies related to core components of NDIR infrared gas sensors, from sensitive materials to special infrared chips and precision narrow-band infrared filters, and develop high-performance MEMS infrared light source and gas detectors. Optimize infrared radiation coating to improve the infrared radiation efficiency of MEMS luminous chip. Improve the performance of infrared filters, infrared absorption layer materials and infrared-sensitive elements of gas detectors, and develop an infrared thermal detector that can detect various gases simultaneously.	Rs: >200 V/W (thermo-electric pile); >1000 V/W (pyroelectricity); (2) Detection rate D* : $>3\times10^8$Jones (thermopile); $>1.5\times10^9$ Jones (pyroelectricity); (3) Response time: <15 ms; (4) Detected gas type: > 6, including SF_6 and O_3
2	JIANGSU APPLIED POWER MICROELECTRONICS CO., LTD.	Design of automotive-grade power management chip and research and development of	400	Low dropout regulator (LDO) is one of the core power management chips, which is often used in system chips for handling unstable voltage input, however, LDO faces the problem of low efficiency. Given the characteristics of large onboard electronic voltage fluctuation and wide voltage input, this project aims at researching and developing a series of low dropout regulator (LDO) power management	(1) Comply with automotive-grade standard (2) Input voltage: 5V-30V; output voltage: 3.3V-30V; working temperature: -40℃-150℃; load current: ≥100mA (3) Equipped with a self-protection function that can cut off the circuit under certain conditions. (4) The output voltage is stable, with deviation not exceeding 2% under allowable conditions

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
		key encapsulation technology		chips with wide input, with high reliability and up to automotive-grade standards (ACQ-100). The research contents include: (1) Optimize key parameters such as input range, stability, power supply rejection ratio, static current, startup speed and area (cost) of power chips. (2) Optimize the design of LDO temperature, current protection and other auxiliary circuits to improve reliability and safety. (3) Complete circuit design, circuit simulation and layout design of 8 types of LDO chips, and complete laboratory verification. (4) Complete the encapsulation test for physical LDO chips.	(5) Temperature modulation (no load, supply voltage of 30V, temperature of -40℃-150℃): <100mV; load modulation (load lower than 100mA, supply voltage of 30V, temperature of 25℃): <50mV; input modulation (no load, supply voltage of 6-30V, temperature of 25℃): <20mV; power supply rejection ratio (minimal load): for 0Hz, above 100dB, for 100kHz, above 50dB; power supply rejection ratio (load current of 100mA): for 0Hz, above 100dB, for 100kHz, above 10dB
3	CHANGZHOU ZHONGNAN CHEMICAL CO., LTD.	Preparation and application of coal flue gas CCUS core materials	300	China is one of the largest coal-consuming countries. Coal flue gas carbon capture, utilization and storage (CCUS) is an important approach to realizing the “two carbon” goal. Currently, immature carbon capture technology is the main reason hindering the promotion of CCUS. The adsorption method is a frontier technology for carbon capture, and solid amine sorbent is the core material of the adsorption method, which is the focus of relevant research and development at home and abroad. The composition of coal flue gas is complex, and there is a high requirement for the performance of solid amine sorbents. In view of industrial application, the carbon capture capacity should reach 130mg/g, and certain requirements	(1) The material shall be in solid small spherical particle form, particles with a grain size of 1±0.5mm shall account for more than 90%; (2) The material shall have high adsorption activity relative to carbon dioxide, and the saturated adsorption capacity at room temperature shall reach 150mg/g and above. (3) The material has excellent water resistance, after continuous hydrolysis at 100℃ for 24 hours, carbon dioxide saturated adsorption capacity loss rate shall not exceed 10%; (4) After 20 times of reuse, the carbon dioxide-saturated adsorption capacity shall be not lower than 130mg/g.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				concerning material form, water resistance and durability shall be satisfied. This novel solid amine sorbents required to be developed shall be in the solid small spherical particle form, particles with a grain size of 1±0.5mm shall account for more than 90%, the carbon saturated adsorption capacity shall reach 150mg/g and above, hydrolysis loss at 100℃ for 24 hours shall not exceed 10%, and after 20 times of use, the adsorption capacity shall not be lower than 130mg/g. The material preparation route is reasonable and the preparation technology is perfect.	
4	JIANGSU HAOYUE COATING CO., LTD.	Development of high-precision temperature indication and warning paints and the industrialization thereof	350	Foreign countries, including Japan, the UK, America, Russia, France, Germany, etc. started the development and production of irreversible temperature indication paints early. For example, Japan published research and application reports on temperature indication paints for rail transport wheels as early as the 1990s. China started the development relatively late, mainly focusing on solvent-based paints. Heavy metal salts (chrome red, lead oxide, strontium yellow) and azo compounds are often used in color-change pigments, which can cause environmental pollution in the production and application process. At present, temperature indication paints mainly face the problems of insufficient color-changing accuracy and adhesion degradation at high	**Main technical indexes:** Performance indexes for samples, pilot tests and final products: (1) Supporting adhesion reaches Grade 0, adhesion (pull-off method) ≥5Mpa. (Matching with the materials in GB/T 8601-2021) (2) Weather resistance > 1000h, (GB/T 14522) (3) High-temperature resistance 400℃/1h (paint film not falling off). (4) Color-changing accuracy, there shall be an obvious color change at the temperature range of 250-350℃, and the response time shall be within 3min. (5) Thermocycling resistance (-40℃/12h--60℃/12h): 20 cycles. Note: For the high-temperature warning paints series, index 3 and index 4 are different.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				temperature. Our company intends to develop a series of high-precision water-based temperature indication paints in the project, and the paints developed shall be featured by excellent adhesion, weather resistance, corrosion resistance, chemical resistance, and easy application, and shall be able to be applied in various fields such as rail transport wheels.	**II. Indexes concerning intellectual property rights:** Apply for 3-5 domestic or foreign invention patents, and obtain at least 1 patent before the project conclusion.
5	CHINA RESOURCES CHEMICAL INNOVATIVE MATERIALS CO., LTD.	Differentiated polyester material catalytic technology solution	350	The catalysis problem in the polyester industry has been a "perennial difficulty" in the industry for nearly a century, and no balanced solution has been found through years of effects by academics and the industry. At present, metallic compounds of antimony, titanium, and germanium are mainly used as the catalyst for polyester preparation in the polyester industry, and the disadvantages are as follows: antimony series catalysts have high activity and few side reactions, but they are subjected to the hazard of heavy metal precipitation; Titanium series catalysts have low toxicity, low consumption, but they have many side reactions; Germanium series catalysts have stable activity, few side reactions, but the price is relatively high. With the release of energy conservation and emission reduction policies by various countries, it is a general trend for the global polyester material industry to develop novel catalysts with high efficiency and in line with environmental protection	**Technical indexes of differentiated polyester:** (1) Intrinsic viscosity: 0.75-0.87dL /g (2) Acetaldehyde content: ≤1 mg/kg (3) Comply with food-grade test and certification for PET products according to GB 4806.7 (4) Free of heavy metals, with transmittance reaching optical grade, color value: L ≥85 b ≤ 2.0

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				requirements for polyester production, which is also a move to promote the implementation of national policies. It is planned that the company will invest RMB 20 million in this project, among which, RMB 3.5 million are the bounty of the "Accepting the Bounty and Taking Charge" program. Taking this opportunity, our company is open to solicit heavy metal-free differentiated polyester catalysis solutions, aiming at promoting the high-quality development of the domestic polyester industry.	
6	JIANGSU XINZHANJIANG FIBER TECHNOLOGY CO., LTD.	Technology for preparing long-acting antibacterial stoste coloring bio-base/regenerated flame retardant polyester fibers.	200	(1) Use inorganic and organic pigments with high weather resistance as the main colorant, and add ultraviolet absorbent/shielding agent to improve the surface structure as well as the weather resistance of fibers. It is required that the color fastness to light of polyester filament should be 1200 hours and 1500 hours, above Grade 4.0 according to American standards. (2) Introduce self-crosslinking functional groups into PET molecular chain by melting polycondensation to prepare self-crosslinking copolyester. It is required that the product should be flame retardant and free of molten drops while maintaining the original characteristics of PET. (3) Research the bio-base/regenerated filament synthesis technology, and prepare biobase/regenerated colored polyester filament with excellent performance.	(1) Breaking strength: ≥3.5cN/dt (2) Levelling of dyeing: Grade 4.5-5.0 (3) Color fastness to light: AATCC16.3-2014, color fastness to light: xenon arc test ≥1200 hours /1500 hours, Grade 4.0 (4) Antibacterial rate: GB/T20944.3, with an antibacterial rate ≥99.0% (5) Flame retardant: GB 17591-2006, flame retardant woven fabrics standard test, Grade B2

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				(4) The combination of organic or inorganic antibacterial agents is adopted to improve the antibacterial and deodorizing abilities of produced textiles.	
7	JIANGSU WUJIN STAINLESS STEEL PIPE GROUP CO., LTD.	Modification and coil machining technology of super duplex stainless steel for deep sea umbilical cables	300	The development of marine oil and gas resources has extended to the deep sea. The umbilical cable of new generation deep-sea oil and gas resources exploitation - subsea production system is the key component that connects various subsea systems. The service conditions are extremely harsh, and it is required that stable service ≥20 years and a hydraulic transmission load of 68.9MPa shall be ensured, and it shall be able to withstand seawater erosion by chloride ions, chemical agents and others. Due to the high requirements for performance, corrosion resistance, pressure resistance, strength and toughness and others, the manufacturing of conveying coils is difficult. It is now monopolized by a few enterprises such as Sweden Sandvik Company, and is one of the few high-end iron and steel products that need to be imported in China. Research contents include: (1) Develop a welding technology for S32750 duplex stainless steel ultra-long pipes with high collination and high consistency requirements; (2) Microstructure and performance evolution law and process linkage control in the welding technology and cold	(1) Tensile strength ≥850MPa, yield strength ≥630MPa, elongation ≥25%, hardness ≤32HRC; (2) Ferrite content: 40%-60%; (3) PREN value: 45≥PREN≥42.5; (4) Point corrosion: < 1.0g/m^2 (according to ASTM G48, exposure at 50℃ for 24 hours, free of visible corrosive pitting after 10 times magnification); (5) Coil diameter: 21.3~48.3mm, wall thickness deviation range: + 15% ~ -10%t (wall thickness ≤1.3mm), ±10%t (wall thickness ≥1.3mm).

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				rolling and cold drawing process; (3) Research the structure, performance characteristics and service characteristics of tube-tube welding points; (4) Service performance, function and mechanism of key alloying elements and microstructure of S32750 duplex stainless steel.	
8	JIANGSU LONGCHENG PRECISION FORGING GROUP CO. LTD.	Research and development of key technologies of high strength toughness corrosion-resistant aluminum alloys and forgings for hydrogen fuel cells	500	**Current status at home and abroad:** high-strength aluminum alloy is prone to cracking or brittle failure in a hydrogen environment. The mechanical properties degradation of structural materials caused by hydrogen absorption has become the main concern in many sectors such as aerospace, new energy vehicles, nuclear energy, oil and natural gas. Hydrogen may cause cracking, hydride precipitation, embrittlement, and other harmful effects, and hydrogen embrittlement may lead to hydrogen leakage of fuel cells, resulting in potential safety risks. The risk of hydrogen embrittlement greatly restricts the application of hydrogen energy in new energy automobile, aerospace and other fields. Existing technologies at home and abroad can not meet the market demand. **Research contents:** (1) Composition design and internal microstructure optimization based on grain refinement objective of wrought aluminum alloy; (2) Carry out research on hydrogen embrittlement damage	1. Develop a novel aluminum alloy material with high strength, toughness and corrosion resistance: (1) surface coarse grain zone ≤1mm; (2) in the T6 state, surface hardness ≥105HBW, tensile strength ≥370MPa, yield strength ≥340MPa, elongation ≥10%; (3) the internal structure is free of segregation, cracks, holes, impurities and other defects. 2. Develop at least 3 kinds of forgings for hydrogen fuel cells based on the above novel aluminum alloy materials: (1) in the T6 state, surface hardness ≥95HBW, tensile strength ≥340MPa, yield strength ≥320MPa, and elongation ≥10%; (2) free of corrosion after 672h neutral salt spray test. 3. Provide a wrought aluminium alloy hydrogen failure detection method. 4. Apply for 4 patents, including 2 invention patents.

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
				mechanism and strengthening and toughening mechanism of aluminum alloy; (3) Research the hydrogen failure detection method of wrought aluminum alloy; (4) Prepare high-strength toughness corrosion-resistant aluminum alloy and verify the performance thereof in a hydrogen environment.	
9	JIANGSU DINGYING NEW MATERIALS CO. LTD.	Research and development of metal-organic skeleton nanoparticles that can carry chemotherapy and immunotherapy drugs	330	Chemotherapy is widely applied in cancer treatment, however due to the lack of abilities to accurately deliver the drug to tumor sites and to distinguish between cancer cells and healthy cells, the effectiveness is limited. Immunotherapy, which activates the immune system for cancer treatment, has unique advantages of safety and tolerability, however, it also has shortcomings in terms of positioning delivery, accurate targeting, and controlled release, resulting in poor treatment outcomes and serious immune-related side effects. This project intends to develop an intelligent drug delivery system integrating metal-organic skeleton nanocrystals and injectable hydrogels, realizing the combination of chemotherapy and immunization. This therapy can deliver drugs to the cancer site, accurately target and kill cancer cells and regulate immune cells, thus realizing safe and effective cancer treatment while slowing or preventing cancer metastasis.	(1) Obtain metal-organic skeleton nanocrystals hydrosol formula: nanocrystals shall have uniform form and size, with a surface area larger than 1300 $m^2 g^{-1}$, and have high stability in biological solutions. (2) Improve cancer treatment effect: deliver drugs directly to the tumor site and realize controlled release of drugs inside the tumor, target and kill cancer cells and regulate immune cells; compared with conventional chemotherapy, it shall be able to further reduce gross tumor volume by 30% and above, and shall be able to slow or prevent cancer metastasis; (3) Non-toxic: cell survival rate >90%, without affecting blood, liver, kidney health indicators; (4) Biodegradable: The drug delivery system can be degraded within a certain period (such as 3 months) and excreted through metabolism.
10	VICVAC ELECTRONIC	Development of	200	Alumina ceramic is widely applied in the new energy field, with advantages of	(1) High sealing performance (leakage rate within 1*10E-9/ (mbar*L*s));

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
	TECHNOLOGY (CHANGZHOU) CO., LTD.	joining technology for 95 porcelain and metal materials (oxygen-free copper, Curva alloy)		high strength, high hardness, high-temperature resistance, corrosion resistance, wear resistance and excellent insulation, it is commonly used in battery sealing connection, DC fuse housing, DC relay housing, power battery cover plate and other key products. Due to the inherent brittleness and hardness of ceramics, it is difficult to carry out secondary machining. Ceramics are usually connected with metals for functional complementation, so as to obtain good electrical insulation performance and secondary structure machining ability. However, ceramics and metal materials have different bond types and linear expansion coefficients, therefore connection by fusion welding is difficult or large residual stress will be left. (1) Carry out research and analysis on connecting mechanism between the ceramic substrate and different metals, and develop process conditions and parameters that are suitable for industrial production; (2) Carry out research and analysis on mechanical properties and interface structures of joints between different metals or solder and ceramic substrates. (3) Carry out research and guide the design optimization for joint structural parts in the industry by finite element analysis and other methods.	(2) Metal-ceramic connection interface strength ≥150MPa; (3) Resistance to environmental change: temperature impact -40℃-150℃≥1000 times, high temperature storage: over 3000hrs at 150℃; (4) Provide a set of technology schemes suitable for industrial application.
11	JIANGSU AMB	Research and	350	Composite wave-absorbing paints with high	(1) Electromagnetic shielding efficiency of graphene-based

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
	TONGFENG PAINT CO., LTD.	development of key technologies of graphene-based high shielding and corrosion resistance special coating		shielding performance and corrosion resistance are of great significance to information protection for national defense and military industry and high-tech enterprises. At present, the foreign PPG company has developed Fe3O4-based shielding paint, and CETC 33 of China is engaged in developing a single graphene shielding paint. Most electromagnetic shielding paints depend on single resistance type, dielectric type or magnetic loss type absorbing filler, which can only provide single shielding capacity. No matured technology for producing composite absorbing paints is available. The intended research contents under this project include: (1) Develop functional magnetic carbon-based double-compound dielectric material and amphipathic surface active agent, and develop "lightweight, high strength, broadband" graphene functional composites. (2) Build current field, temperature field and other coupled multi-physics field models, and develop the general mixing process for graphene-based composite water paints. (3) Build an intelligent production line of graphene-based high shielding and corrosion resistant special paints.	special paints ≥35 dB (within 2~18 GHz) (2) Significantly improve the compatibility and dispersibility of graphene-based and functional materials with water-based materials meet the main indexes of oil-based paints. (3) Composite material adding amount ≥10% (mass fraction), for a coating thickness within 1.0~5.5 mm, 2~18 GHz frequency band shielding efficiency shall reach 35 dB and above; (4) Humidity and heat resistance, salt water resistance and salt spray resistance of special paints of 168h, 24h, and 168h shall be improved by 3, 3, and 2 times respectively, and the low-frequency impedance modulus (Z0.01Hz) shall be improved by 10 times. (5) Build an intelligent production line of graphene-based high shielding and corrosion resistant special paints with an annual production of 1000t.
12	CHANGZHOU WASTON MEDICA	Research and development of	240	The number of patients with osteoarticular diseases in China is nearly 40 million, and the number is increasing	(1) For the integrated bone cement two-component mixing device: realizing vacuum mixing, powder-

SN.	Company name	Technology demands	Bounty amount (RMB '0,000)	Technology demands	Key technical indexes to be assessed
	L APPLIANCE CO., LTD.	key technologies of polymethyl methacrylate (PMMA) bone cement		rapidly. Bone cement is used as new bioengineering fills between prostheses and bones. The products manufactured by Heraeus GMBH are mature. China has just started the research, and mainly depends on imports, and foreign products hold the entire market. The production of zirconia - a key component of bone cement, and the development of integrated bone cement two-component mixing devices are still waiting for technical breakthroughs. Research contents under this project include: (1) Develop a unique modified zirconia powder for bone cement use. (2) Develop a unique intraoperative integrated bone cement two-component mixing device.	liquid quick mixing; continuous injection, controllable bone cement delivery amount; simple operation, and simple component structure design. (2) The curing characteristics of the powder-liquid mixture (for syringe use) shall meet the following requirements: curing time 6.5-15min, temperature ≤90℃. (3) The curing characteristics of the powder-liquid mixture (paste state) shall meet the following requirements: curing time 3-15min, temperature ≤90℃. 4. After curing, the performance of bone cement should meet the following requirements: average compressive strength ≥70 MPa, bending modulus ≥1800 MPa, bending strength ≥50 Mpa.

Attachment 2

Form for Domestic Bidders and Proposed Solutions

(Year 2023)

<table>
<tr><td>Company Name
(Seal)</td><td colspan="2"></td><td>Unified Social Credit Code</td><td></td></tr>
<tr><td>Address</td><td colspan="2"></td><td>Post Code</td><td></td></tr>
<tr><td>Company Type</td><td colspan="4">☐College/University ☐Research Institute ☐Other_____</td></tr>
<tr><td>Legal Representative</td><td>Name</td><td></td><td>Tel</td><td></td></tr>
<tr><td rowspan="2">Contact</td><td>Name</td><td></td><td>Position</td><td></td></tr>
<tr><td>Mobile</td><td></td><td>Email</td><td></td></tr>
<tr><td>Bidding for (the project on the list)</td><td colspan="4"></td></tr>
<tr><td>Basic information and R&D capacity</td><td colspan="4">(Including number of R&D personnel, intellectual property rights, scientific research platform ,etc.)</td></tr>
</table>

Solutions	(For technical demands and key technical indicators, additional pages can be attached)

Attachment 3

Form for Overseas/Hong Kong/Macao/Taiwan Bidders and Proposed Solutions

(Year 2023)

Company Name		Nationality	
Address		Contact	
Tel		Email	
Bidding for (the project on the list)			
Basic information and R&D capacity			

Solutions	(For technical demands and key technical indicators, additional pages can be attached)
Other matters needing clarification	

Legal representative or authorized agent (signature):

Company Name (seal):

Date: