



Progress Report No. <5>

Project Title: Integrated adoption of New Energy Vehicles in China
UNIDO Project No. : 150157

Reporting Period: <2020.9-2021.3>



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1. INTRODUCTION

1.1 Overview of the project

The EV-RE project is a Global Environment Facility (GEF) project jointly applied by the Ministry of Industry and Information Technology (MIIT), United Nations Industrial Development Organization (UNIDO) and the China SAE in 2015. As an organization commissioned by MIIT, China SAE is responsible for conduct daily coordination and management as PMO (project management office) of EV-RE Project.

The EV-RE project was officially launched on August 27, 2018 with a period of three years and mainly consists of five components which included policy and technical standard making of EV-RE integration, capacity building and expanding, technology and commercialization demonstration, achievement promotion, and finally evaluation. So far, the city-level demonstration has been implemented in Shanghai and Qingdao. The demonstration mainly includes EV sharing and promotion, smart charging station and piles construction, renewable energy micro grid system building, V2G demo, ICT center construction, and exchange etc.

Project Objective: Facilitation and scale-up of the integrated development of electric vehicles (EVs) with renewable energy (RE) in China.

Outcome 1: Drafted and recommended policies, technical standards, and guidelines that provide regulatory and planning elements, leading to the higher adoption of EV-RE integration schemes by city governments, vehicle manufacturers, and consumers, thus resulting in GHG emission reductions

Outcome 2: Increased institutional capabilities and awareness of policymakers at national and local levels on the use of integrated EV - SG (Smart Grid) - RE systems

Outcome 3: Two city-scale projects piloted, demonstrating the integration of EVs and RE, as well as other foundational work needed to achieve large-scale EV-RE integration

Outcome 4: Increased knowledge and capacity of business and consumer stakeholders, facilitating awareness, research and development, manufacture, operation, and maintenance with regard to EV-RE integration

1.2 Main Output

Output	Status	Completion (%)	Estimated time of completion (based on workplan)
<u>Output 1.1A:</u> Release of National-level roadmap to facilitate effective EV-RE integration and expansions to achieve the targets of stakeholders	Completed	Completed	2020.3.31
<u>Output 1.1B:</u> Suggested policies and framework to promote the balance of grid load with power generated via utilization of EVs, which thus provides a foundation for scale-up of EV-RE integration	In Progress	50%	2021.8.31
<u>Output 1.1C:</u> Proposed national-level policies to regulate and incentivize systems for the charging of EVs with RE, including those integrating either RE micro-grids or grid-based large-scale RE installations	In Progress	80%	2021.8.31
<u>Output 1.1D:</u> Proposed national-level policy instruments to regulate and incentivize use of retired EV batteries, which may play a key role in large-scale EV-RE integration	One policy completed in 2019 and another policy in progress	as Planned	2021.8.30
<u>Output 1.2:</u> Issuance of technical standards and specifications facilitating EV-RE integration and scale up, including those for smart charging systems, vehicle to grid (V2G) systems, mobile charging systems, and use of retired EV batteries	In Progress	90%	2021.8.31
<u>Output 1.3:</u> Recommendations presented to transport sector authorities for incorporation of incentives for EV charging with RE in transport sector national carbon trading policies, including carbon trading rules for EVs powered by RE, to promote greater adoption of RE in the grids supplying electricity to EVs	In Progress	60%	2021.8.31

Output	Status	Completion (%)	Estimated time of completion (based on workplan)
<u>Output 1.4:</u> City-level EV-RE integration and scale up plans, including replication plans for the adoption of best models demonstrated in Shanghai and Yancheng	In Progress	40%	2021.8.31
<u>Output 1.5:</u> Proposed institutional plan to establish responsibilities of and coordination among various government organizations for EV-RE integration	In Progress	80%	2021.8.31
<u>Output 2.1:</u> Training program for 100 city-level policy makers on EV-RE integration policies and demonstration experience	In Progress	85%	2021.8.31
<u>Output 2.2:</u> Four workshops conducted to validate the EV-RE integration policy and planning framework	On going	50%	2021.8.31
<u>Output 2.3:</u> International forums with participants from central government agencies and EV demonstration cities that disseminate international developments and plans for EV-RE integration	On going	60%	2021.8.31
<u>Output 2.4:</u> Written materials on EV-RE integration strategically disseminated to policy makers	Completed	Completed	2020.10.27
<u>Output 3.1:</u> Demonstration of integration of EVs with the power grid, as a basis for EVs eventually to address intermittency issues of large-scale RE power incorporation into the grid	In Progress	85%	2021.8.31
<u>Output 3.2A:</u> Demonstration of integration of EVs into RE micro-grids, including demonstration of micro-grids incorporating wind, PV, use of retired EV batteries as storage, EVs, and buildings and a manufacturing facility	In Progress	90%	2021.8.31

Output	Status	Completion (%)	Estimated time of completion (based on workplan)
<u>Output 3.2B</u> : Demonstration of V2G technologies and pilot commercial systems enabling EVs (or retired EV battery packs) to send power back to the micro-grid at times that it is needed	In Progress	80%	2021.8.31
<u>Output 3.3A</u> : Demonstration of higher density of the EV stationary charging network, which further serves as a basis for scale-up of EV-RE integration	In Progress	100%	2021.8.31
<u>Output 3.3B</u> : Demonstration of alternatives to stationary charging stations, in particular mobile charging station vehicles, to deal with emergency needs for charging, thus increasing the feasibility of EV use and thereby supporting the scale-up of EV-RE integration	In Progress	80%	2021.8.31
<u>Output 3.3C</u> : Demonstration of business models to scale-up the number of EVs, thus laying the ground work to realize the benefits of EV-RE integration on substantial scale	Completed	Completed	2020.8.27
<u>Output 3.4</u> : Demonstration of energy management centers that collect and manage data on dispersed EVs and retired EV battery packs used as storage for the grid so that the charge and discharge of these devices can be managed	In Progress	80%	2021.8.31
<u>Output 3.5A</u> : Detailed monitoring and assessment of project demos of EV integration with the power grid	In Progress	60%	2021.8.31
<u>Output 3.5B</u> : Detailed monitoring and assessment of project demos of RE-EV micro-grids	In Progress	60%	2021.8.31
<u>Output 3.5C</u> : Detailed monitoring and assessment of aspects of project demos related to the use of retired EV batteries, including development of know-how with regard to use of retired EV	In Progress	60%	2021.8.31

Output	Status	Completion (%)	Estimated time of completion (based on workplan)
batteries so that they can be leveraged as tools of EV-RE integration			
<u>Output 3.5D</u> : Detailed monitoring and assessment of aspects of project demos related to scale-up and increased concentration of China's EV fleet and charging infrastructure	In Progress	70%	2021.8.31
<u>Output 4.1A</u> : Forums for industry, including both domestic and international players active in the China market in the vehicle, power, and other related sectors, on EV-RE business models, technology, and demonstration results	In Progress	60%	2021.8
<u>Output 4.1B</u> : Dissemination to industry of project's EV-RE information base	In Progress	90%	2021.8.31
<u>Output 4.1C</u> : Meetings publicizing EV-RE related technical standards, held for vehicle OEMs, charging equipment suppliers, and other related industrial companies	Completed	Completed	2021.8.31
<u>Output 4.1D</u> : Technical operation and maintenance workshops related to EV-RE integration aspects held for relevant industrial organizations	In Progress	80%	2021.7
<u>Output 4.1E</u> : Establishment of industry alliance or association subcommittee for promoting and advancing EV-RE integration and liaising with government on EV-RE integration policy	In Progress	80%	2021.8.31
<u>Output 4.2</u> : Awareness raised among current and future potential car sharing companies of various car sharing business models and integration of EVs with RE in car sharing businesses	In Progress	90%	2021.8.31

Output	Status	Completion (%)	Estimated time of completion (based on workplan)
<u>Output 4.3A</u> : Media promotion of EV-RE integration, raising awareness of the public regarding the need to incorporate RE into EV development to realize the environmental potential of EVs and educating the public on various aspects of EV-RE integration	In Progress	70%	2021.8.31
<u>Output 4.3B</u> : Promotion of EV-RE integration to consumers via social organizations, increasing consumers' understanding of and attraction to the concept and related opportunities	In Progress	60%	2021.8.31
<u>Output 4.3C</u> : Outreach on social media platforms and cooperation with social media companies to carry out promotion of EV-RE integration	In Progress	60%	2021.8.31
<u>Output 4.4</u> : An EV-RE integration demonstration center in Yancheng, created to raise awareness on the topic of EV-RE integration amongst consumers, companies using EVs, and industries related to RE or EV	In Progress	50%	2021.8.31

2. ACTIVITIES EXECUTED DURING REPORTING

PERIOD

2.1 Specific Activities

Activity 1.1C

The National Development and Reform Commission (NDRC) undertook RE micro-grids policy research. As of now, the drafts of framework, policy suggestions in Chinese have been completed. The main frames are as follows:

- Research background consists of strategy context, policy review, and analysis based on the distributed grid intelligence and power battery management system.
- Research on business models of EV-RE, analysis of the scenarios and value-added, policy, market potential of micro-grid and distributed grid-grid.
- EV-RE stimulation policy

Suggestions on organization structure, promotion scheme, infrastructure construction, price scheme of charging-discharging

Market scheme and management where EVs operate in electric system and demonstration on the cooperation of RE generation and EV cross regions

The final report will be completed in the next report period.

Activity 1.2.2

Research on energy management centers, smart charging systems and V2G standards is conducted by State of Grid.

Research on Standard for Management Center for Integration of Electric Vehicles and Power Grid and main progress is as follows

- a. Apply to the China Electric Power Enterprise Federation for the group standard "Management Center for Integration of Electric Vehicles and Power Grid" and complete the first draft of the standard.
- b. Chinese group standard "Management Center for Integration of Electric Vehicles and Power Grid" draft standard, which specifies the basic functions, overall architecture, technical performance, information and communication, safety protection, planning and construction, completion acceptance, operation and maintenance, service process and other requirements of the ENERGY Management center (ICT Center) integrating electric vehicles and power grid.

Activity 1.2.3

Research on the General Technical Requirements Standards for Electric Vehicle Charging and Discharging and min progress is as follows

a. More than 20 experts from electric power companies, charging operators, automobile enterprises are organized to carry out iteration the iteration and complete the exposure draft of the industry standard "Two-way Interaction of Electric Vehicle Charging and Discharging Part 1: General Principles".

b. Chinese industry standard "Electric Vehicle Charging and Discharging Two-way Interaction Part 1: General Principles" exposure draft standard, which specifies charge and discharge facilities, orderly charge and discharge, and other terms related to two-way interaction of electric vehicle charging and discharging, participants and their responsibilities, such as facility operators, electric car users, power grid, system technology framework including the grid layer, system layer, equipment layer, link layer, related equipment and system functional requirements, and V2G, V2B, V2H, V2V, V2L and other different application scenarios and cases.

Activity 1.2.4

Information communication protocol standards for electric vehicles and charging and discharging facilities is one of important specification will be taken into account. Main progress is as follows.

a. According to Chinese national standard GB/T 27930-2015 "Communication Protocol between Electric Vehicle Non-vehicle Conductive Charger and Battery Management System", opinions are solicited from both inside and outside the industry, and draft opinions are formed.

b. The exposure draft of "Communication protocol between electric vehicle non-vehicle conductive charger and battery management system" (GB / T 27930-2015) is completed, in which the following problems are studied. (1) different stages of electric vehicle non-vehicle conductive charger and battery management system, including low voltage auxiliary power and charging and discharging handshake, parameter configuration, charge and discharge, charge and discharge end. (2) discharge process of the two sides, such as discharge shaking hands start, shaking hands recognition, the packet format, definition and model of data information, such as the minimum permissible allowed discharge voltage, and the maximum permissible discharge voltage.(3) The information interaction mode and data model with high reliability, high stability and high compatibility .

Activity 1.2.6-1.27

The report analyzes typical scenarios and current status of fire safety of secondary utilization of EV batteries through desk review.

Overheating and overcharging are one of the top causes of fire and explosion of lithium batteries. Addressing these problems, simulation and many tests are conducted about thermal runaway behavior of individual lithium-ion batteries, ternary polymer lithium battery. Then analysis on study of calorimetric test on lithium battery module and overcharge spread behavior of ternary polymer lithium battery module are conducted to investigate the principles and thermal runaway characteristics, and then find out

detection techniques followed by brief introduction of smoke detector, thermal fire detector, photosensitive detector combustible and gas fire detector. Simulation test apparatus for fire reconstruction of battery system is very helpful for understanding system structure and its thermal runaway patterns and then thorough analysis is also done for follow-up measures taken to minimum the risks of explosion. One of measures is to use fire extinguishing techniques and the report analyzes relevant theoretical of fire extinguishing agent. Draft standards of fire safety for secondary utilization of battery standards are conducted for seeking comments from industry.

Detailed information please see project of Study on Key Technologies of Fire Safety for Secondary Utilization of Power Batteries.

Activity 1.4.1-1.4.3

To further explore the techniques of smart charging and extend its commercial scale, the EV-RE project has been expanded to the research on the following 5 scenarios:

(1) Demonstration of V2G in industry parks: The demonstration will take place in Great Wall Motor's parking lot in Tianjin and Baoding, building 100 V2G charging stations. The research focuses on V2G technology, standard testing, and exploration of its commercial model. State Grid EV Service Co., Ltd and Great Wall Motor Co., Ltd will undertake the demonstration.

(2) Demonstration research on PV energy storage in public areas: the research will take place in Guangming Xinlongxing charging station in Shenzhen, which has online checking system on photovoltaics, storage, and smart charging technology. The research will focus on the PV Energy Storage micro-grid energy management and inspection system, in order to have the inspection, feedback and data analysis of the EV battery system. The Nginx Co., Ltd will undertake the research.

(3) Demonstration of smart charging in urban communities.
The research will take place in Haidian District parking lot in Beijing, which has 54 smart charging stations. The research will focus on smart charging technology and management system. State Grid Beijing Electric Power Company will undertake the demonstration.

(4) Demonstration research on "EV-RE integration". The demonstration will be done in power company in Shanxi Province. By responding to EV requirements, State Grid Shanxi EV Co., Ltd will be responsible to investigate "grid and vehicle" technology and market scheme.

(5) Demonstration on the distributed RE utilization: It will be based on Lianyungang New Energy Micro-grid project, which focuses on the effects of V2G on recycling RE and grid generation. Qingdao TGood Co., Ltd will undertake the demonstration.

(6) The recycling and secondary utilization of power battery (on demand and supply). Beijing ABT Company (battery recycling) and Beijing Tower Company (battery utilization) will conduct the demonstration to investigate the utilization of power battery lifecycle.

The detailed demonstration will be completed in the next report period.

Activity 2.1.1-2.1.2

The training related to “the research on NEV and renewable energy integrated development”

On 27 November 2020, an online training with the theme of "research on NEV and renewable energy integrated development" was held, which focused on the development trend of integration of NEVs and renewable energy at home and abroad, key technologies, demonstration and promotion and commercialization application etc. Total 100 experts and decision makers from local government, domestic and foreign industries and companies were invited to provide online training courses. Through the sharing of case practices, the training helped improve the awareness of urban policy makers, relevant companies, institutions and universities in the industry and the public about the integrated applications of NEVs and renewable energy and offer demonstration experiences for future industry development.

Activity 3.1.1-3.1.3

● Shanghai.

For smart charging demonstration, 75 sites and about 876 smart charging piles were under construction, covering 10 scenarios (business parks, office buildings, shopping malls, high-speed railway stations, airports, hotels, colleges, parks, villages, and manufacturing districts), and the public test platform for EV and charging-discharging facilities of Jiading Energy Center was also being developed. During the report period, 4 new sites and about 54 new charging piles were under construction.

Project owner	Number of site	Number of charging pile	Note
NIO	12 smart charging stations、 1 PV charging station	210 smart charging piles	Construction is complete, some data has been connected
Shanghai University of Electric Power	1 smart charging station	139 charging piles (including AC and DC piles)	Construction is complete, data has not been connected
Shanghai Fangrong Technology Co., Ltd.	1 PV charging station	30 smart charging piles	Construction is complete, data has not been connected
Shanghai Yijiang New Energy Technology Co., Ltd.	1 PV charging station	11 smart charging piles	Construction is complete, some data has been connected

SAST Smart Energy Technology Co., Ltd.	1 PV charging station	14 smart charging piles	Construction is complete, some data has been connected
SAIC Anyo Charging Technology Co., Ltd.	1 PV charging station	71 smart charging piles (68 AC piles, 3 DC piles)	Construction is complete, data has not been connected
SGCC Electric Vehicle Service Co., Ltd.	1 smart charging station	12 smart charging piles	Construction is complete, data has not been connected
Toyota Motor (China) Investment Co., Ltd.	1 smart charging station	3 smart charging piles, 3 smart chargers	Construction is complete, data has not been connected
SIAC New Energy Automotive Operation & Service	50 smart charging stations	~ 300 smart charging piles	Construction is complete, data has not been connected
Shanghai E-drive Auto Service Co., Ltd.	3 smart charging stations	20 smart charging piles	Construction is complete, data has not been connected
Shanghai KBVIP New Energy Technology Co., Ltd.	1 PV charging station	11 smart charging piles	Construction is complete, some data has been connected
Shanghai Electrical Apparatus Research Institute (Group) Co., Ltd.	1 public test platform for EV and charging-discharging facilities	None	Construction of test platform is complete
Shanghai Chisheng Electronic Co., Ltd	1 PV-storage-integrated charging station	21 smart charging piles	Newly constructed project, construction is complete, data has not been connected
Shanghai Ruihua (Group) Co., Ltd	2 PV-storage-integrated charging stations	23 smart charging piles	Newly constructed project, construction is complete, data has not been connected
Shanghai Yuhaitang Ecological Agricultural Technology Co., Ltd	1 PV-storage-integrated charging station	10 smart charging piles	Newly constructed project, construction is

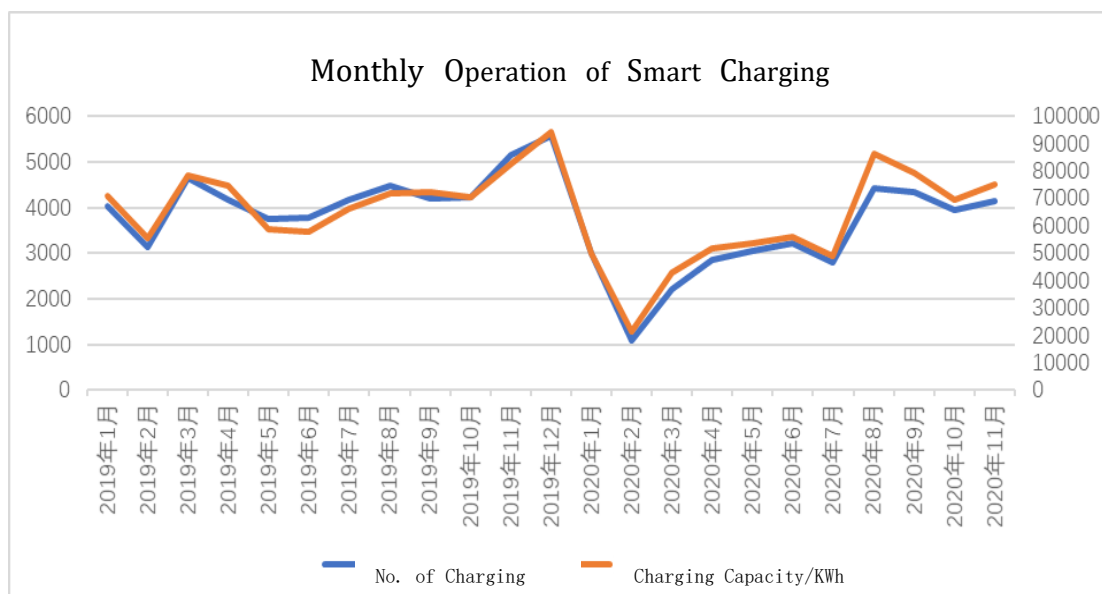
			complete, data has not been connected
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For smart charging demonstration, 75 sites and around 876 charging piles have been built. See the following table for the distribution of sites and details of built charging piles:

N o.	Site	Type of charging pile	No. of charging pile
1	Shanghai Hopson One showroom pile group (NIO)	7kW AC charging pile	1
2	Shanghai Junhao Auto NIO supercharging station (NIO)	7kW AC charging pile	3
3	Shanghai Luojin Road NIO User Service Center (NIO)	7kW AC charging pile	9
4	Shanghai TaikooHui UC charging pile group (NIO)	7kW AC charging pile	8
5	Shanghai The Mixc UC charging pile group (NIO)	7kW AC charging pile	9
6	Shanghai The Mixc showroom charging pile group (NIO)	7kW AC charging pile	1
7	Shanghai NIO Headquarters – Auto Innovation Park NIO charging pile group (in-house) (NIO)	7kW AC charging pile	115
8	Shanghai Yide Automobile Service Co., Ltd. ASC charging pile group (NIO)	7kW AC charging pile	5
9	Shanghai Yiwei Automobile Service Co., Ltd. (ASC) charging pile group (NIO)	7kW AC charging pile	3
10	Shanghai Wisdom Bay NIO Delivery Center CDC charging pile group (NIO)	7kW AC charging pile	43
11	Shanghai Tower UC charging pile group (NIO)	7kW AC charging pile	8
12	Shanghai Tower showroom charging pile group (NIO)	7kW AC charging pile	2
13	Auto Expo Park flexible PV storage-charging station with battery backup (NIO)	60kW DC charging pile	3
14	Shanghai University of Electric Power charging station	7kW AC charging pile	81
		DC charging pile	58
15	HongQiao Capital Venture Harbor PV charging DC micro-grid system	10kW DC charging pile	2
		7kW AC charging pile	9
16	SAST-Fiorentini smart energy micro-grid demonstration	7kW AC charging pile	14
17	SAIC Anyo Building wind-PV storage micro-grid system	3.5kW AC charging pile	29
		7kW AC charging pile	39
		30kW DC charging pile	3
	EV-AI smart energy charging station	7kW AC charging pile	8

1 8		State Grid EV Service charging pile	2
		60kW V2G charging pile	2
1 9	Toyota NEV Time-of-Use charging station	7kW AC charging pile	3
2 0	Shanghai NEV timeshare smart charging station (100 sites)	7kW AC charging pile	~400
2 1	NEV bus-based smart charging station (3 sites)	DC charging pile	20
2 2	Changyang Campus storage-charging-test smart micro-grid demonstration site	120KW DC dual-gun charging pile	4
		120KW DC charging pile	6
		60KW DC charging pile	1
2 3	Shanghai Happy Valley Super PV Charging Station	7kW AC charging pile	12
		60kW DC charging pile	9
2 4	Shanghai Ruihua “PV-Storage-Charging” Integrated Intelligent System Demonstration Station (2 stations)	120kW DC charging pile	14
		60kW DC charging pile	9
2 5	Charging stations at Xin'an Village, Sanxing Town, Chongming, Shanghai	7kW AC charging pile	8
		60kW DC charging pile	2

The 12 charging pile clusters in Shanghai have been in operation for two years, with cumulative charging capacity of 1.489 million kWh and monthly average charging capacity of about 62,000 kWh and with a cumulative number of 86,000 charging times and monthly average number of nearly 3,600 times. The data chart is shown below.



● Qingdao

The main achievements of TELD New Energy Co., Ltd. from August 2020 to February 2021 are provided below:

S/N	Research Task	Achievements from August 2020 to February 2021
1	Business model of integration of electric vehicle and power grid	Two power stations interacting with the power grid have been completed in residential areas. They are located in Chengyang District and Laoshan District of Qingdao respectively. The station in Chengyang District was put into operation in August. So far, the charging amount has reached 210 kWh/D. Within six months after operation, the cost has been recovered by nearly RMB 20,000 yuan. Moreover, the DC charging system data of more than 4,000 hours in residential areas have been collected.
2	Business model of integration of electric vehicle new energy microgrid and distributed renewable energy	The hardware construction and software debugging of more than 20 V2G charging piles, to be put into operation, have been completed.
3	Business model of V2V mobile charging rescue	The product R&D tests have been completed. The product production was started.

At present, a total of 10 intelligent orderly charging terminals and 36 alternating and orderly charging terminals have been built in Qingdao. Currently, operation data of not less than 4,000 hours have been collected, and over 10 real estate developers and 20 enterprises and institutions have expressed their cooperation intention.

● Qingdao

Under the project, 300 smart charging piles (with orderly terminal charging at 7kw/ac) have been developed and constructed in Qingdao. These stations are under demonstration, serving 500 EV and each operating for 500 hours.

Activity 3.2A.1-3.2A.2

● Shanghai

For PV charging micro-grid demonstration, 9 sites have been built covering 8 scenarios: big factory, office building, business park, hotel, university, park, village, and manufacturing district. During the report period, 4 new sites for PV charging micro-grid demonstration have been built.

Project	Project owner	PV capacity	Storage capacity	Charging pile quantity	Note
Shanghai Yangpu Machine Tool Factory PV storage micro-grid power generation	Shanghai Electric Distributed Energy Ltd., Co.	3.4M Wp	1000kWh	0	Construction is complete, data has been connected
PV storage-charging with battery back for EV application	NIO	23.56k Wp	300kW/350kWh	3	Construction is complete, some data has been connected
Technical demonstration of EV integrated with renewable energy micro-grid	Shanghai University of Electric Power	2MWp	200kWh	10-15	Construction is complete, data has not been connected
3.3. Changning District Linkong Industrial Park smart energy management and operation service	Shanghai Fangrong Technology Co., Ltd.	2.35M Wp	24MWh	30	Construction is complete, data has not been connected
HongQiao Capital Venture Harbor PV charging DC micro-grid system and NEV application demonstration	Shanghai Yijiang New Energy Technology Co., Ltd.	250kWp	1MW/ 2.5MWh decommissioned battery AC storage, 100kWh DC	8	Construction is complete, some data has been connected

			micro-grid storage		
Demonstration of EV integrated with SAST-Fiorentini smart energy micro-grid	SAST Smart Energy Technology Co., Ltd.	219kWp	108kWh	14	Construction is complete, some data has been connected
PV storage-charging smart micro-grid system	SAIC Anyo Charging Technology Co., Ltd.	125.06 kW	1MWh	71	Construction is complete, data has not been connected
Demonstration of a storage-charging-test smart micro-grid	Shanghai KBVIP New Energy Technology Co., Ltd.	0	500kWh	11	Construction is complete, some data has been connected
Shanghai Lingang PV Charging Micro-grid and Smart Transportation Project	Shanghai Electric Distributed Energy Ltd., Co.	4MWp	122.88kWh	1	Construction is complete, data has not been connected
Shanghai Happy Valley Super PV Charging Station	Shanghai Chisheng Electronic Co., Ltd	100kWh	60kWh	21	Newly constructed project, construction is complete, data has not been connected
Shanghai Ruihua “PV-Storage-Charging” Integrated Intelligent System Application Demonstration Project	Shanghai Ruihua (Group) Co., Ltd	100kWp	1500kWh	23	Newly constructed project, construction is complete, data has not been connected
NEV and Renewable Energy Integrated Application Commercialization Project based on	Shanghai Yuhaitang Ecological Agricultural	499.5kWp	441kWh	10	Newly constructed project, construction is complete, data has not been connected

Chongming's beautiful countryside	Technology Co., Ltd				
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13 PV charging micro-grid demonstration sites have been built. See the following table for their details:

Project owner	Site	PV capacity	Storage capacity	Charging pile quantity	Note
Shanghai Electric Distributed Energy Co., Ltd	The PV-storage microgrid demonstration station at Shanghai Machine Tool Works Co., Ltd	3.4MWp	1000kWh	0	The demonstration of PV-storage microgrid for power supply in industrial factory buildings
NIO	Flexible PV-storage-integrated charging and battery swapping station at Shanghai Auto Expo Park	23.56kWp	300kW/350kWh	3	The demonstration of PV-storage-integrated charging and battery swapping station for EV energy replenishment
Shanghai University of Electric Power	The site at Shanghai University of Electric Power	300kWp	200kWh	82	The demonstration of PV-storage-integrated charging microgrid in campuses
Shanghai Fangrong Science and Technology Co., Ltd	The site at Linkong Industrial Park in Changning District	638.7Wp	24MWh	20	The demonstration of PV-storage-integrated charging microgrid in Linkong Industrial Park
Shanghai Yijiang New Energy Science and Technology Co., Ltd	The "PV-storage-integrated charging" DC microgrid system at Hongqiao Fund Town	262kWp (252kWp rooftop PV modules)	1MW/6MWh AC-powered retired battery energy storage system and 25kW/200kWh DC	8	The demonstration of DC microgrid energy storage system in business parks

		; 10kwp PV system)	microgrid energy storage system		
Shanghai Aerospace Smart Energy Technology Co., Ltd	The demonstratio of Shanghai Aerospace Feiao Smart Energy Microgrid	219kWp	108kWh	14	The microgrid consisted of multiple energy sources
Shanghai AnYo Energy- Efficiency Technology Co., Ltd	SAIC AnYo's Wind-PV-storage microgrid system for buildings	125.06k W	1MWh	71	The wind-PV- storage microgrid system in downtown industrial parks
Shanghai Kuaibu New Energy Tec hnology Co., Ltd	The site of storage- charging-testing microgrid demonstration at Changyang Valley	0	500kWh	11	The demonstration of storage-charging microgrid with testing functions
Shanghai Electric Distributed Energy Co., Ltd	The site of PV- storage-integrated charging microgrid at Lingang area in Shanghai	4MWp	122.88kWh	1	The demonstration of PV-storage- integrated charging microgrid with the support of autonomous driving in heavy equipment zones
Shanghai Chisheng Electronic Co., Ltd	Shanghai Happy Valley Super PV Charging Station	100kWh	60kWh	21	The demonstration of the application and commercialization of PV-storage- integrated charging microgrids in the amusement park parking lots

Shanghai Ruihua (Group) Co., Ltd	Shanghai Ruihua “PV-storage-charging” integrated intelligent system demonstration station (2 sites)	100kWp	1500kWh	23	The demonstration of retired battery energy storage for microgrids in commercial office buildings in Jinzhong Road and Lianghang Co-creation Industrial Park
Shanghai Yuhaitang Ecological Agricultural Technology Co., Ltd	The site at Xin’an Village, Sanxing Town, Chongming District in Shanghai	499.5kWp	441kWh	10	The demonstration of PV-storage-integrated charging microgrid in a beautiful countryside setting

● Qingdao

The microgrid hardware construction and software debugging have been completed and will be put into operation soon.

Activity 3.2B.1-3.2B.3

● Shanghai

During the report period, 20 sets of V2G charging piles and 31 V2G vehicle (data not yet connected) were completed. The detailed list is as follows:

No.	Project name	Project owner	No. of charging piles	No. of vehicles	Note
1	Ubiquitous IOTIPS Smart Charging and Discharging Demonstration and Pilot Project	SGCC Electric Vehicle Service	4	0	Built, no data access yet
2	EV V2G Micro-grid Demonstration	Mitsubishi Electric (China) Shanghai Branch	1	1	Built, no data access yet
3	State Grid EV-NIO Shanghai Innovation Park Intelligent Public Charging & Discharging Demonstration Station	SGCC Electric Vehicle Service	15	30	Built, no data access yet

● Qingdao

Two V2G stations interacting with the power grid in the residential area have been completed in Qingdao. One power station was put into operation in August, and the charging capacity has reached 210kWh/D up to now.

The V2V emergency equipment has been manufactured with an input voltage of DC200V-DC430V, output voltage of DC200V-DC750V, output power of 21 kw, and output current of 0-42A.

Activity 3.3c.1

● Shanghai

EV time-sharing renting services in Shanghai

By the end of November 2020, a total of 7,661 vehicles were put into operation, 8,105 vehicles had been built and operated, 507 time-sharing renting points and 3,593 charging piles had been built, with a total number of over 2.51 million registered members. The operation data of EV time-sharing renting services provided by EVCARD is shown in the following chart (data source: EVCARD Shanghai).

Month	2016.12	2017.12	2018.12	2019.12	2020.6	2020.12
Number of Shanghai EVCARD online operation points	2042	4013	2452	756	566	507
Number of EVCARD vehicles in operation in Shanghai	5197	6639	7311	7772	7661	8105

Activity 3.3C.2

● Shanghai

Electric bus rental fleets in Shanghai (Shanghai E-drive Company)

By the end of December 2020, the number of vehicles in electric bus rental fleets (E-drive buses) in Shanghai reached 1084 (including 250 electric buses for custom bus businesses), with 64 charging stations in place, more than 170,000 mobile APP users, a total of 35 special lines opened and in operation, and more than 23 cooperative industrial parks. The cumulative number of vehicles in electric bus rental fleets (E-drive buses) that were promoted in 2020 is shown in the following chart (data source: Shanghai E-drive Automotive Service Co., Ltd)

Month	2017.12	2018.12	2020.20
Number of Shanghai E-drive shared buses	400	900	1084

● Rugao

Rugao, one of the first county-level cities in China to promote car-sharing services with new energy vehicles, innovatively rolled out the new “Micro Public

Transportation” model supported by “Microcity” and “All-weather.” The new urban transportation model has significantly increased the utilization rate of vehicles in the city while also alleviating traffic jams and the shortage of parking spaces, thus improving the city’s overall environment and image.

Cars for long-term and short-term renting is acceptable by the city. These cars boast the advantages of extremely low renting costs and highly flexible renting period. Clients can choose from various makes of cars such as the new-energy-fueled four-seat EC180 by Beijing Automotive Group, the two-seat Geely Gleagle K12, and the four-seat EC3 with an excellent battery life also by Beijing Automotive Group.

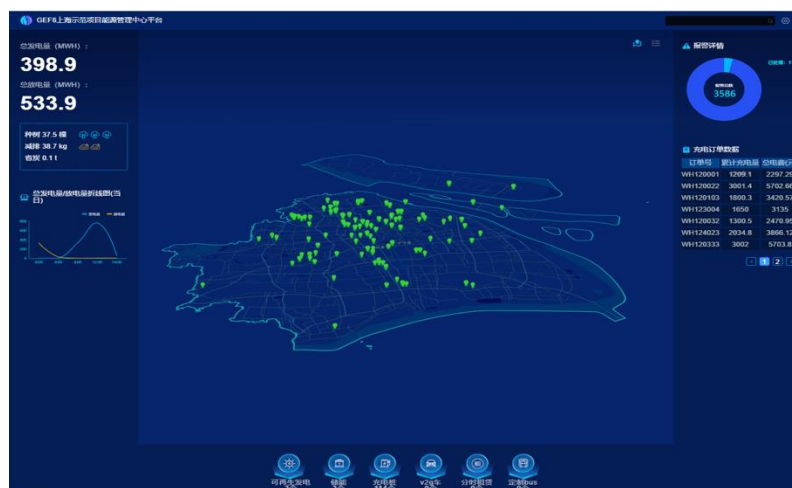
Car-sharing business has been well received in Rugao since it was introduced to the city. However, some problems also emerged in the meantime, such as decreased battery lives and not enough service centers, as well as the predicament of high operating costs with relatively low gains. For this reason, relevant parties have offered suggestions for improvement, which include the following: 1) Phase out cars with short battery lives. This helps reduce the number of times needed to charge up a car and thus improves user experience; 2) Operators should be able to provide entire-tenancy clients with maintenance services once the three-year rental period is up; 3) Further reduce the cost of value-added services; 4) Increase the number service centers.

Activity 3.4.1

● Shanghai

Energy management platform:

The project is committed to creating an energy management platform that can receive, store, monitor and display data and is capable of gathering real-time data from smart charging piles, energy storage station – micro-grid, V2G and other energy systems. The energy management platform will develop specific data collection standards to connect software systems of multiple facility operating organizations simultaneously for data reception and unified management.



The diagram displaying the data connection with the Energy Management Center Platform

An energy management center with the following technical and performance indicators, was built.

Technical specifications:

- The data receiving and storage are processed by distributed structure system
- The data storage can be seamlessly connected with commonly used data analysis system tools
- The system security shall conform to the level 3 requirements of information security level protection 2.0

● **Qingdao**

The preliminary construction of Energy Management Center has been completed and has been put into trial operation in Qingdao.

Activity 4.1B.1-4.1B.2

Qingdao project have done some project dissemination in Qingdao

For residential areas in Qingdao, the research on charging demands and site selection were carried out, and research and communication with many mainstream real estate developers such as Longfor, Haier, Hisense and Vanke were conducted;

For enterprises and institutions in Qingdao, the research on charging demands was carried out. The communication with national government departments (such as Qingdao Municipal Bureau of Industry and Information Technology, Development and Reform Commission, and Qingdao Municipal Bureau of Housing and Urban-Rural Development) and some enterprises was conducted to discuss the possibility of building stations.

According to the platform research results, the strategy of research on C-end customer construction demands was developed.

TELD has communicated with State Grid (Qingdao) to discuss the scheme of power grid synergetic and its feasibility. According to the current stations under operation, the asset recovery period is estimated to be 3~5 years. In addition, a detailed discussion on the profit model, reliability and maintainability of charging network operation was completed.

● **Activity 4.1A.1**

The 2020 NEV and Renewable Energy Integrated Development Forum

On 15 September 2020, the Sub-forum of the 2020 World Autonomous Vehicle Ecosystem Conference "NEV and Renewable Energy Integrated Development Forum"

was held in Shanghai Auto Museum. The Forum was organized by Shanghai International Automobile City (Group) Co., Ltd and attended by Mr. Wang Ju, Deputy Secretary General of China-SAE, Mr. Chen Coke, Deputy Director of Smart Manufacturing Promotion Department of Shanghai Municipal Commission of Economy and Informatization, Ms. Xu Hui, Deputy Secretary of CPC Jiading District Economic Committee and Deputy Director of the Committee, Ms. Guan Qingping, Member of CPC Shanghai International Automobile City (Group) Co., Ltd Committee and representatives from domestic and foreign industry associations, well-known universities and relevant enterprises. The event was hosted by Ms. Liu Huiping, Director of Green Transportation Committee of Shanghai Institute of Traffic Engineering.



Guest speakers



The roundtable forum

The Shanghai Demonstration Project Office relies on Shanghai International Automobile City's existing brands such as "e mini-class", WeChat official accounts and EV-AI Smart Mobility Harbor to launch multi-disciplinary, multi-level and multi-channel publicity activities.

On 15 September 2020, the "NEV and Renewable Energy Integrated Development Forum" was held in Shanghai Auto Exhibition Center and was viewed online by 3,800+ people, which shows that the project has a certain influence.

In terms of recruitment and publicity, the latest activities of the project and industry-related messages are released through the WeChat official accounts. By 31 August 2020, a total of 3 project collection activities had been carried out. The WeChat official accounts of SIAC and the project implementation units released industry-related messages about 5 articles per week.



The third working meeting

In terms of science popularization activities, several smart charging, V2G and PV-storage-integrated EV charging and battery swapping projects have settled down in EV-AI Smart Harbor's Smart Energy Center to introduce the latest technological achievements of the Demonstration Project to visiting people, companies and government groups, which has effectively increased the influence of the project. The number of visitors to the EV-AI Smart Harbor reached 199,200 from January to October 2020.

As for the promotion of activities, through the rich auto company resources of "e mini-class ", the e mini-class licensing and GEF6 Shanghai Demonstration Project Meeting were jointly held to strengthen the coordination between auto companies and the Project and to explore potential project partners. By the end of October, 339 series of "e mini-classes" were held for science popularization and exchanges.



The experience map of “e mini-classes”

Activity 4.1B.1

China SAE has set up Chinese website (<http://gef.sae-china.org/>), which is updated periodically on basic information, news, and latest research. The website has successfully promoted EV-RE integration of the products and service to auto industries, charging station industries and auto organizations.

Activity 4.1B.2

China SAE has completed the design and distribution of project brochures, and is now entering to the promotion stage by printing out paperwork of many international conferences, including WNEVC2021.

Activity 4.1C.

On November 4-5 in 2020, the group standard meeting of “Fire Safety for Secondary Utilization of Power Batteries” and “Power Battery Gas Safety Device” has been held in Hangzhou Province. The standards were made by China SAE and China Fire Safety Association, and was led by Shanghai Fire Safety Research Institute.

Experts from Neo, BAIC Motor, FAW, and many other big auto companies have attended the meeting. After the meeting, the standard editing team will collect and review the suggestions from the members from each company for the standard promotion.



Activity 4.1D

High female participation

The total number of participants involved in Shanghai Demonstration Project is 43, among which 22 are females (51.2%). The proportion of females in the team is quite high and these females were quite active in the whole project implementation process. The need to tap into the role of those women who work on the land of green and intelligent energy development and explore the value and power of women in the field of NEVs and renewable energy are also important inspirations for the project.

Activity 4.3A.1

China SAE has completed the promotional video of GEF6, which is available online. The video introduces the contents of GEF6 from different aspects and shows audience the activities and demonstration in this project since 2018.

Activity 4.3A.2

<http://gef.sae-china.org/>

The project management office has set up its Chinese official website and official account in Wechat to update and disseminate the latest progress.

By the end of September in 2020, with the help of the project management office, more than a hundred media have made report on the achievements of the project within 2 years

Activity 4.3B.1-4.3B.2

Pushed articles of Wechat official accounts

During this reporting period, in addition to relevant pushed articles of WeChat official account of Shanghai International Automobile City related to NEVs and renewable energy, relevant units and media also publicized the projects from time to time.



Screenshots of pushed articles of Wechat official accounts

Output 5

On 25 February 2021, the Second Project Steering Committee Meeting of Global Environment Facility (GEF) for the Integrated Adoption of New Energy Vehicles in China was held at the China Society of Automotive Engineers (China SAE).

The meeting was held by Wang Ju, Deputy Secretary-General of China SAE, and attended by Chen Chunmei, Deputy Division Director of Automotive Division of Equipment Industry Department of Ministry of Industry and Information Technology of the People's Republic of China, Liu Liming from International Organization Office of International Cooperation Department of Ministry of Industry and Information Technology of the People's Republic of China, Representative Tonilyn LIM of the United Nations Industrial Development Organization Regional Office in China, Deputy Representative Ma Jian of United Nations Industrial Development Organization Regional Office in China, Deputy Secretary-General Wang Ju of China Society of Automotive Engineers, and the representatives of Project Offices of four Demo Cities including Shanghai, Rugao, Yancheng and Qingdao; Katarina BARUNICA, (please fill in the department and position) United Nations Industrial Development Organization, Professor Huang Xueliang and Professor Gaoshan from Southeast University participated in the Meeting in an online way.

The conference has agreed upon the progress of project and the follow-up workplans.

Activity 5.3.1

MTR was conducted by UNIDO.

MOF and MIIT has organized Chinese consultant company to check the progress of the project from the aspects of target, achievements, output, activities, testing standards. They are satisfied with the current progress and have made suggestions on the future workplans.

2.2 Project Management

On 25 February 2021, the Second Project Steering Committee Meeting of Global Environment Facility (GEF) for the Integrated Adoption of New Energy Vehicles in China was held at the China Society of Automotive Engineers (China SAE).

The meeting was held by Wang Ju, Deputy Secretary-General of China SAE, and attended by Chen Chunmei, Deputy Division Director of Automotive Division of Equipment Industry Department of Ministry of Industry and Information Technology of the People's Republic of China, Liu Liming from International Organization Office of International Cooperation Department of Ministry of Industry and Information Technology of the People's Republic of China, Representative Tonilyn LIM of the United Nations Industrial Development Organization Regional Office in China, Deputy Representative Ma Jian of United Nations Industrial Development Organization Regional Office in China, Deputy Secretary-General Wang Ju of China Society of Automotive Engineers, and the representatives of Project Offices of four Demo Cities including Shanghai, Rugao, Yancheng and Qingdao; Katarina BARUNICA, (please fill in the department and position) United Nations Industrial Development Organization, Professor Huang Xueliang and Professor Gaoshan from Southeast University participated in the Meeting in an online way.

The participants have made a consensus on the progress of the project. Please see the minutes of the second steering committee meeting.

3. EVALUATION OF CONSULTANTS AND CONTRACTORS

Activity	Name of Contractors	Evaluations and Recommendations from Experts
Activity 1.1D.1-1.1D.3	Project of Retired EV battery Utilization Management and technology of EV Power Battery	<ol style="list-style-type: none"> 1. The project objects on solutions to EV power battery industry problems. It attains the importance and meaning through research on policy and standards of EV battery secondary utilization. The project should include management review, recommendations, construction of recycling service, product identifications, retirement evaluation and safety considerations. 2. The project should develop on a clear, feasible quantified, and reasonable budget.
Activity 3.2A.1-3.2A.2	Yancheng Project of Demonstration and Utilization of Micro-grid EV-RE	<ol style="list-style-type: none"> 1. The plan needs clear objectives, testing standards, deadlines, and result reviews. 2. To support the results, the project should add EV-RE Micro-grid controlling strategies, technology structure, and typical plans. 3. The project should clarify engineering construction interface and research developments (including system, platforms, vehicle engineering) for the preparation of budget instructions. 4. The project should provide agreements and supporting documents with its cooperative companies.
Qingdao Demonstration	Qingdao Demonstration Project	<ol style="list-style-type: none"> 1. The undertaking company should clarify deliverables and the testing standards. 2. The project needs a clear roadmap and the effect of V2G. The detailed budget will be based on various measurements. 3. The undertaking company is responsible to speed up communication with Qingdao State of Grid.
Activity 1.2.6-1.2.7	Fire Safety Research on Power Battery	<ol style="list-style-type: none"> 1. The project focuses on the secondary utilization of power battery in the field of heat uncontrollability and detection. The

	Secondary Utilization	<p>analysis on fire risk has achieved the testing review.</p> <ol style="list-style-type: none"> 2. The task budget and progress are on the right track. 3. The project should focus on the four standards and seek for suggestions.
Activity 1.1B.2-1.1B.4	EV-RE Stimulus Policy Research	<ol style="list-style-type: none"> 1. Expand demonstrations in typical cities to collect data. This will help to investigate in follow-up policy research. 2. Research results is suggested submit to government offices 3. Deliverables should include stimulated national policies of EV-RE output.
Activity 1.2.3	Research of EV Charging and Discharging Standards	<ol style="list-style-type: none"> 1. keep research and fulfill the report on EV charging and discharging technology. 2. Strengthen the communication with management offices in order to improve the review process.
Activity 1.2.2,1.2.4	Promotional Policy Research on EV-RE	<ol style="list-style-type: none"> 1. The project targets on the research of clean energy transformation on the national level. It has the necessity to report suggestions and policies. 2. The plan is feasible and reasonable to conduct, and the undertaking company has the ability to research and promote the policy.
Activity 1.1C.2 Rugao Demonstration	Rugao Commercial Demonstration Project of EV-RE	<ol style="list-style-type: none"> 1. The team needs to focus on construction of PV technology. 2. With the reference of past reports and feedback from experts, the team should speed up the research. 3. The team should make plans and stimulating policies based on the local grid-vehicle-station.

4. NEXT STEPS

The Secondary Committee Meeting has discussed minor adjustments of the project. Most of activities in Yancheng will be moved to Qingdao. The following demonstration and data collection in Shanghai and Qingdao are the key elements of the project. PMO



will frequently set up coordination meetings to promote the demonstration and data analysis. Plus, the project will be promoted by media and official websites to expand dissemination and public education.