Strategy and Practice of Smart Grid in SGCC




State Grid Corporation of China

April, 2013

Profile of SGCC

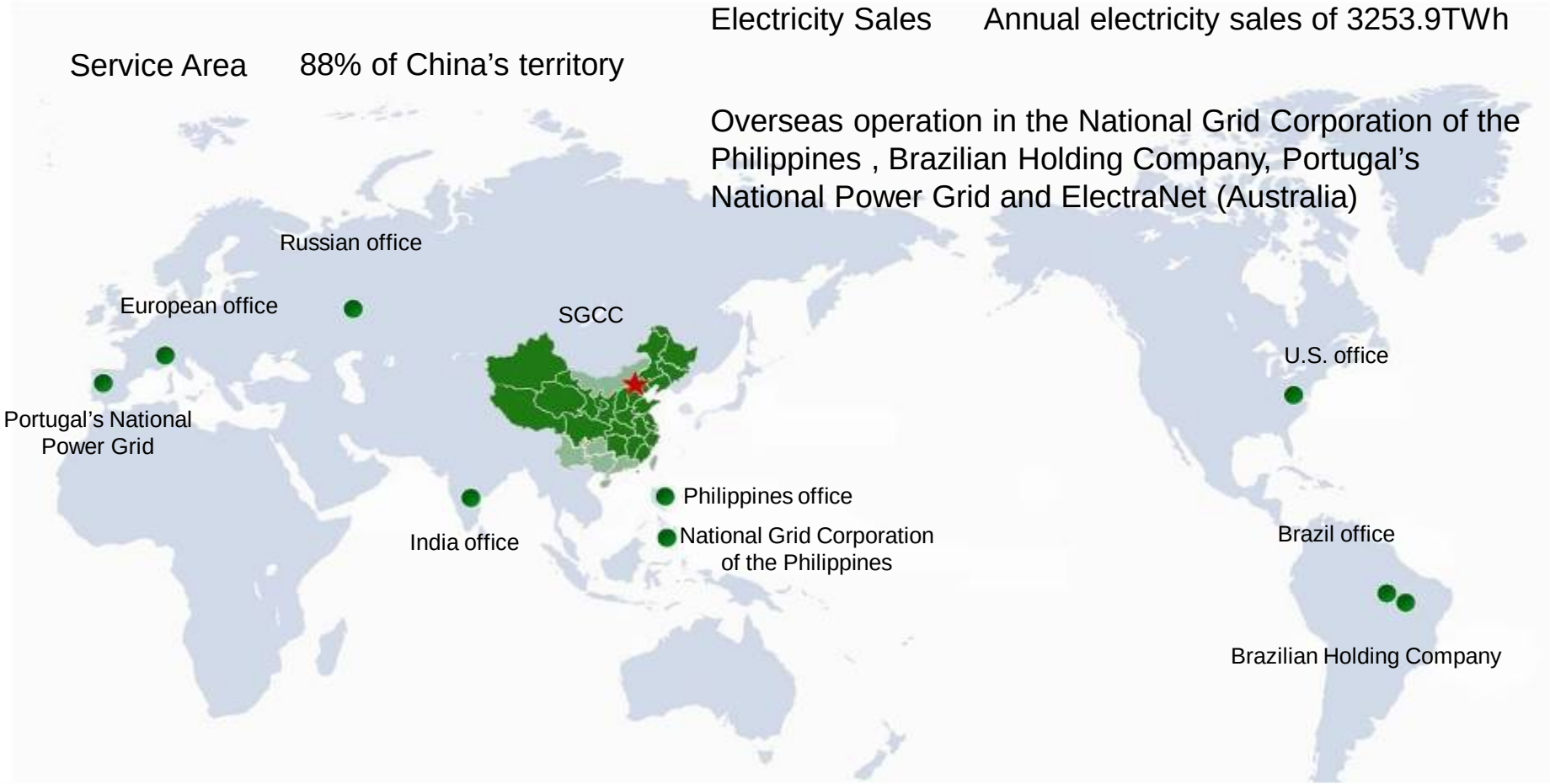
Strategy and practice of Smart Grid

Standardization by SGCC

1. 1 Profile of SGCC

Employees	1.56 million
Total assets	2209.3 billion yuan
Service Area	88% of China's territory
Customers	Serves over 1 billion population
Electricity Sales	Annual electricity sales of 3253.9TWh

Overseas operation in the National Grid Corporation of the Philippines , Brazilian Holding Company, Portugal's National Power Grid and ElectraNet (Australia)



1.1 Profile of SGCC

- 26 provincial electric power companies
- 5 research institutes
- 20 Other institutions

SGCC

- The largest power utility in the world
- Total income of 2012 was over 1885.5 billion Yuan
- Ranked 7th in Fortune Global 500 in 2011

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2. 1 Background of Strong & Smart Grid

The current global energy revolution is on the way to be more clean and diversified. The construction of strong & smart grid plays a significant role.

Developing clean energy

Ensuring power supply

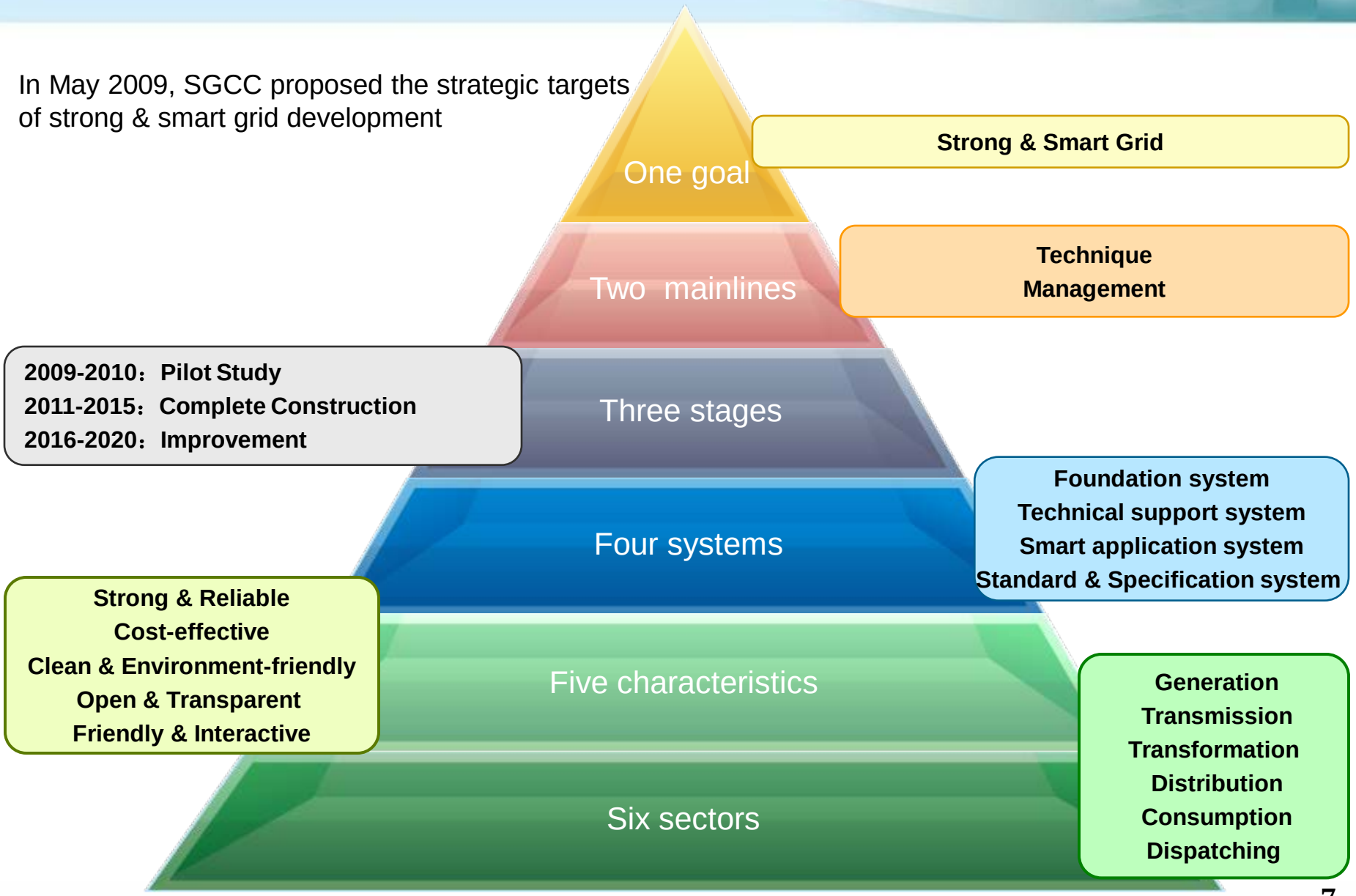
坚强
智能电网
Strong &
Smart grid

Helping address global climate change

Realizing sustainable development

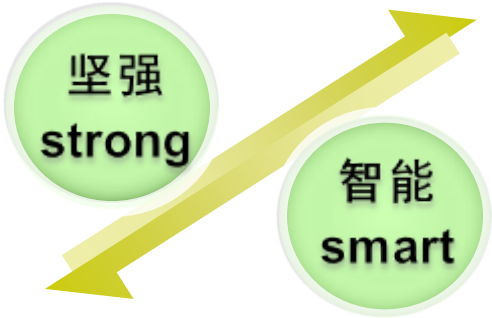
2. 2 Strategic targets to Develop a Strong & Smart Grid

In May 2009, SGCC proposed the strategic targets of strong & smart grid development



2. 3 Systematic concept of Strong & Smart Grid

Creatively integrated the concept of Strong and Smart



Systematic strategy frame

Developed the “SGCC Umbrella Plan on Smart Grid (2009-2020)”

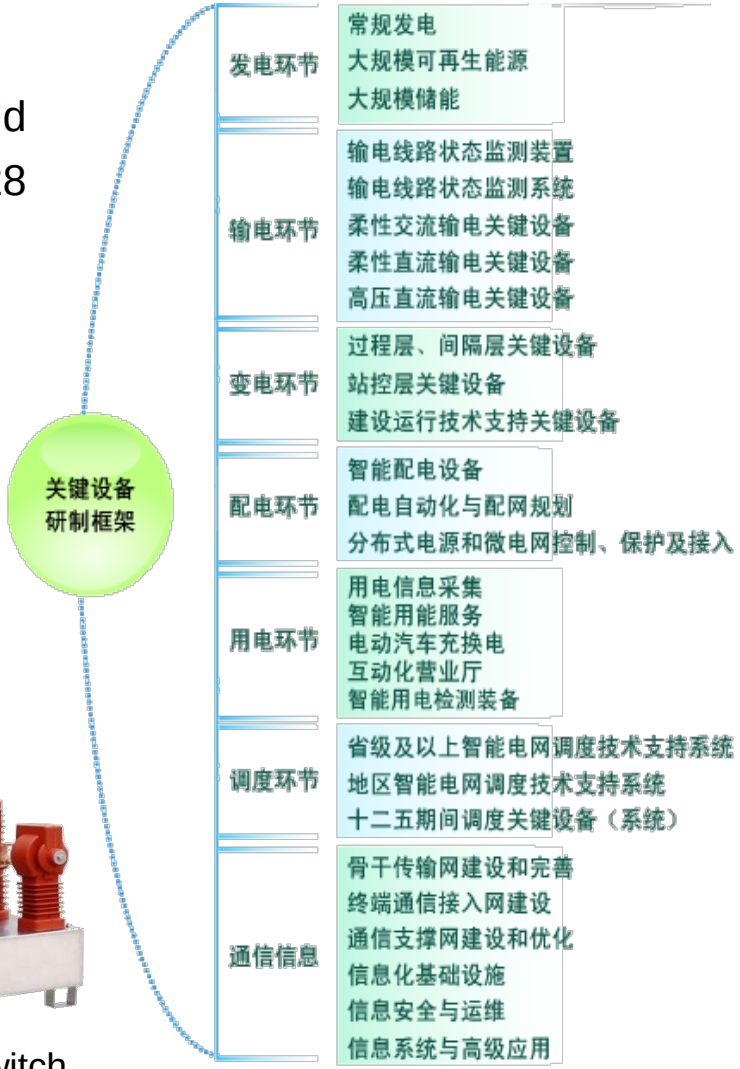
SGCC 12th Five-Year Plan of Smart Grid

Clarified the targets of Smart Grid development

2. 4 R&D on smart equipment

- Released the “R&D Plan for Key Smart Grid Equipment/System” . Including 7 technical areas, 28 specific technical topics and 137 equipments

- Guide stakeholders, especially equipment manufacturers and system providers



Smart GIS

Smart terminal

Smart switch

2. 5 Established Full-scale Testing Capabilities

The cultivation of smart grid overall testing ability

National Energy Large Scale Wind Power Integration Technology R & D Center

Smart transmission technology sub-center

Flexible transmission technology sub-center

Micro-grid technology sub-center

Custom power technology sub-center

National Energy Smart Grid Technology R & D Center

Information security technology sub-center

National Energy Solar Power Technology R & D Center

Energy storage technology sub-center

Smart power consumption technology sub-center

Energy efficiency technology sub-center

2. 6 Established Full-scale Testing Capabilities

World-class UHV test & research system (4 bases, 2 centers)

UHV (AC) test center

UHV (DC) test center

SGCC Simulation center

High-altitude test base

UHV engineering test center

R&D (experiment) center of UHV DC transmission complete design

2. 7 Comprehensive Smart Grid R&D and Practice

- Arranged 287 smart grid pilot projects
- 238 projects have been completed by the end of year 2011

✓ Extensive coverage ✓ Large scale ✓ Fast implementation

2. 7. 1 Breakthroughs in UHV Transmission

- Developed the world's first class UHV AC equipments and DC key equipments

The world's largest 1000kV transformer

The world's first success in UHV DC converter valve

The world's first 6-inch thyristor valves

- 1000kV UHV AC pilot demonstration project started operation in January 6, 2009
- ±800kV UHV DC transmission demonstration project started operation in July 8, 2010

2. 7. 2 Remarkable enhancement in Renewable Energy Integration

- Breakthrough in bulk renewable energy integration
- Success in integration of distributed PV power

National Wind and Solar Power Generation/Energy Storage/ Transmission Demonstration Project

- 100 MW wind power, 40 MW solar power, 14 MW energy storage in Project Phase I. Most advanced comprehensive demonstration project of clean energy with flexible operation and largest scale ever

Large-scale Wind Power Forecast and Operation Control

- 6 pilot projects in operation in North China, Northeast China , Northwest China, Xinjiang, Jilin and Gansu

2. 7. 3 Outstanding achievements in Smart Grid

65 smart substations of 110KV~750KV have been set up.

750kV smart substation in Yan'an

The 500kV smart substation in Yu'shan

220kV smart substation in Xi'jing

Smart distribution system has been built in key zones of 23 cities.

Distribution and Dispatching Hall in Qing'dao

DA management system in Qing'dao

Integrated Terminal

2. 7. 4 Various smart grid services

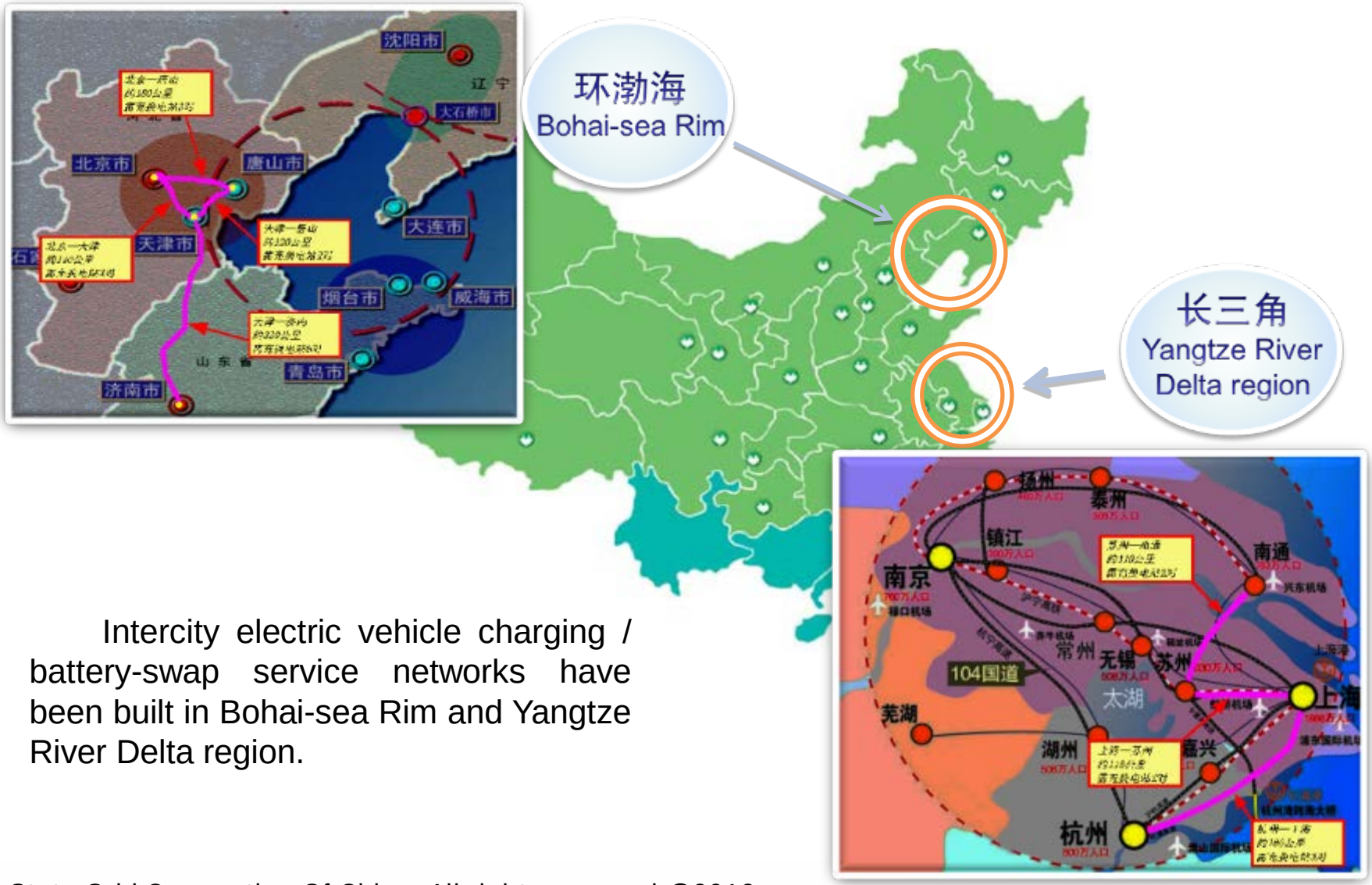
- 28 smart communities constructed in Beijing and Shanghai, serving 251 thousand households

- 243 charging/battery-swap stations and 13, 283 charging spots have been built, covering 26 provinces and municipalities

- EV charging/battery-swap service networks have been set up in Qingdao and Hangzhou.

Xuejia Dao EV Battery-swap Station in Qingdao

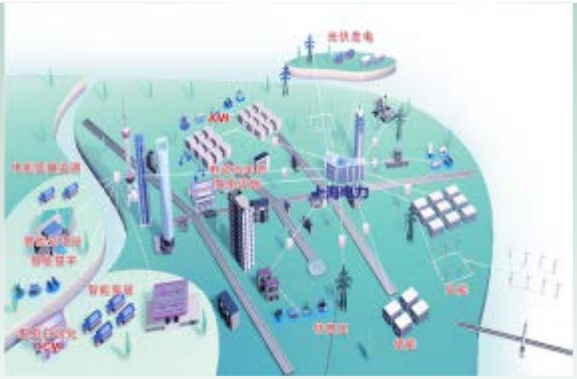
2. 7. 4 Various smart grid services



Intercity electric vehicle charging / battery-swap service networks have been built in Bohai-sea Rim and Yangtze River Delta region.

2. 7. 5 Achievements in Smart Grid Demonstration Project

Shanghai Expo and Sino-Singapore Tianjin eco-city Comprehensive smart grid demonstration project already started operation.



2010 Shanghai EXPO

State Grid Pavilion received 1.61 million audience

Sino-Singapore
Tianjin ECO-CITY

Smart grid comprehensive demonstration projects are under construction in over 20 districts, such as Beijing, Yangzhou, etc.

2. 8 Development Outlook of Smart Grid

By 2015，the Smart & Strong Grid will take shape.

发电环节
Generation

- Able to accommodate **90** GW wind power and **8** GW solar power by 2015

输电环节
Transmission

- Promote status monitoring systems for transmission and transformation devices, VSC-HVDC Transmission System and applications of various smart patrol methods

变电环节
Transformation

- Newly construct 5100 and refurbish 1000 smart substations(above 110(66)kV)

2. 8 Development Outlook of Smart Grid

配电环节 Distribution

- Implement construction of distribution automation system in core areas of major cities.

用电环节 Consumption

- Promoting application of 187 million Smart Meter, as well as a Construction plan of 1140 EV charging stations and EV 153,000 charging poles.

调度环节 Dispatching

- SGOSS construction with a 100% coverage of provincial dispatching and 70% district-level dispatching centers will take form .

通信信息平台 Information platform

- 100% optical fiber for 110kV (and above) core communication networks and a fully construction of SG-ERP.

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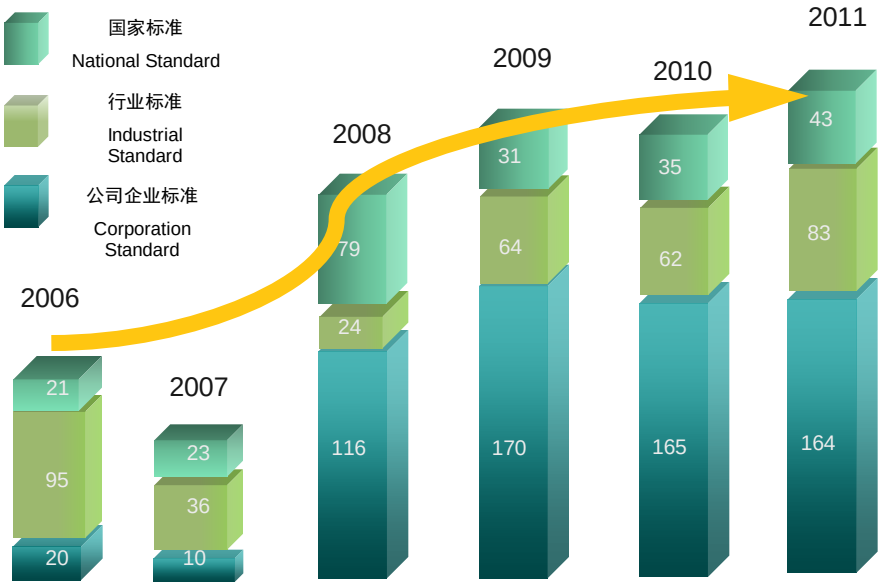
3. 1 A Full-range Technical Standard System

With unremittingly independent innovation, SGCC has carried out a series of scientific research, testing and demonstration projects in UHV and Smart Grid and realized “Created by China” and “Led by China” in the electric power industry

- Established the UHV transmission technology Standard System
- Involved in the formulation and revision of more than 470 national and industry standards;
- Formulated and issued "Planning of standard systems for smart grid technologies”



3. 2. 1 International Cooperation- IEC

➢On January 11, 2013, State Grid's EVP Shu Yinbiao was officially elected as IEC's Vice Chairman.

➢Actively involved in IEC technical committee activities

- currently undertakes three secretariats for IEC technical committees (PC 118, TC 115 and TC 85) and one commitee chairman position (TC 95)
- applying to launch two new technical committees of "UHV AC system" and "large-capacity renewable energy's generation and operation"

➢Since 2009, SGCC has submitted a total of 14 IEC standard proposals and 11 of them have been approved.

3. 2. 2 International Cooperation- IEEE, CIGRE

- In 2012, State Grid was elected as the member of IEEE-SA Corporate Advisory Group, providing strategic direction and recommendations to IEEE-SA corporate members and to the IEEE-SA Board Of Governors

- State Grid has proposed 4 standards related with energy storage integration and UHV technology to IEEE

- State Grid was actively involved in CIGRE's activities.
  - Participated in 15 technical committees
  - experts from State Grid helped drafting CIGRE's study report
  - State Grid also held positions such as B3.29 working group chairman, A3.28 task force leader, D1.50 secretary

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Thank you