China Smart Grid
Development Model and Industry Prospect

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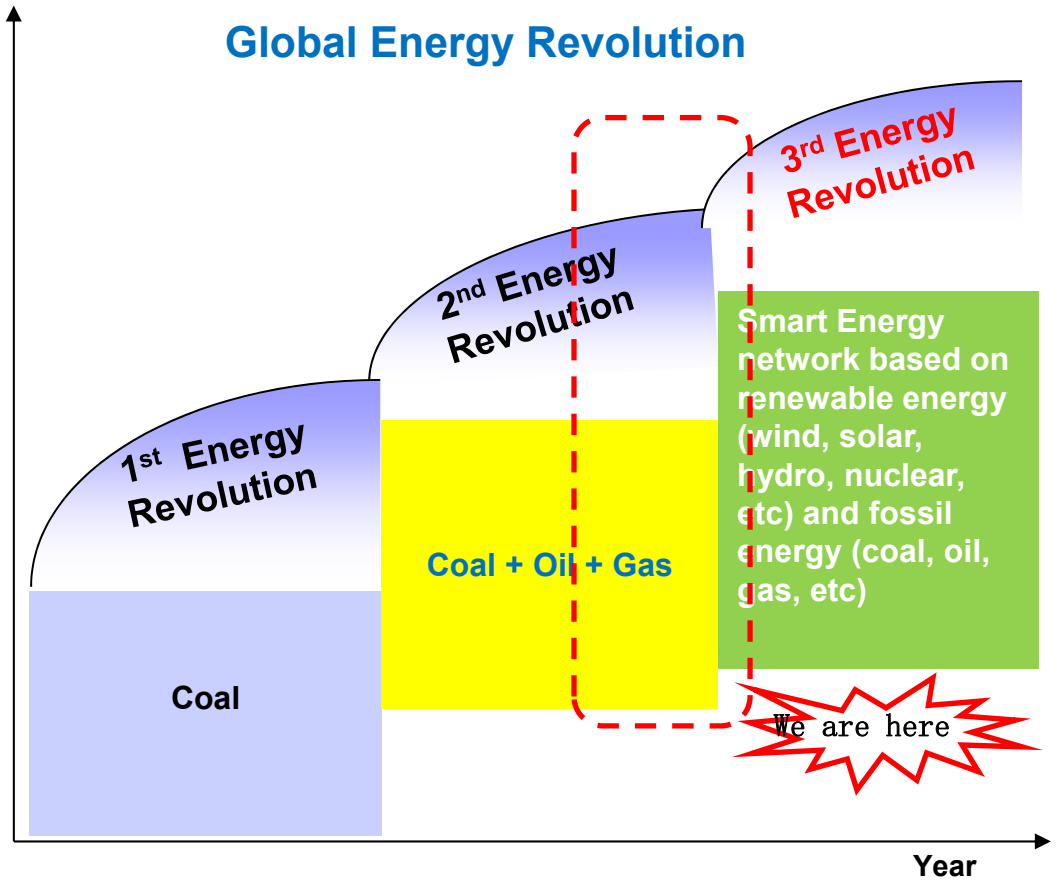
Agenda

- Summary of Smart Energy Grid
- 4 Systems in Smart Energy Network
- 10 Innovations and Application of Smart Energy Network

Global energy industry underwent 3 revolution. The 3rd one, based on smart technology, will bring big reform for industry.



Forecast for 3rd Energy Revolution

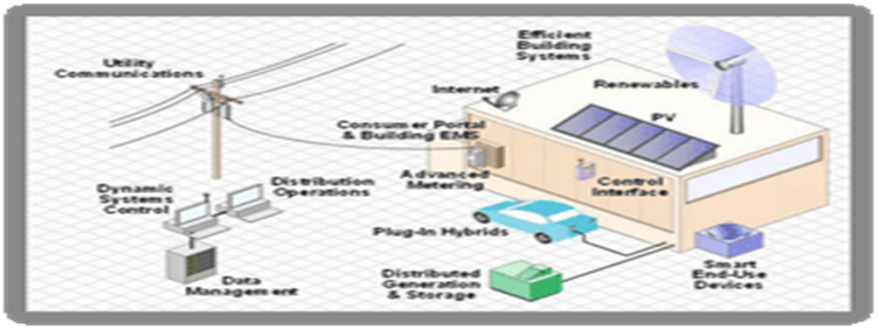
- **Process transformation:** energy flow from uni-directional to bi-directional;
- **Consumption Behavior Transformation**: Users actively participate in energy produce and selling;
- **Energy Management Transformation:** from centralized to both centralized and distributed;
- **Energy portfolio transformation:** smart energy restructure and optimization;
- **Energy market operation model transformation:**

3rd energy revolution will make energy industry infrastructure more smarter and efficiency

As for smart energy infrastructure theory, there are two popular theories, one is single grid theory (or smart grid)

Single grid Theory (Definition of smart grid)

- **the United States Department of Energy**: *"The smart grid use latest sensor, communication and control technology. It is able to heal itself, motivate consumers to actively participate in operations of the grid, resist attack, provide higher quality power that will save money wasted from outages, accommodate all generation and storage options, enable electricity markets to flourish, run more efficiently."*
- **the European Technology Platform SmartGrids***: "the Smart grid incorporate creative tools, products and service to provide generation, transmission and distribution, using advanced sensing, communication and control technology. It realize the bi-direction communication between customers and energy providers, and could provide more information choice, larger energy supply, and high efficiency. "*
- **The Electric Power Research Institute (EPRI):** *"The smart grid is composed by several automatic transmission and distribution systems and operates reliably and efficiently to meet customer (commercial and residential) demand response quickly. A modern smart grid must have self-heal capability in diagnostics and fault repair, and provide reliable and economic power supply/service, using modern communication technology to offer real-time information. "*
- **China State Grid: "***China Smart Grid is strong smart grid based on the ultra-voltage grid infrastructure and multi-level grid develop coordinately. It uses latest sensing, communication, information and control technology to build self creative and international advanced strong smart grid with characteristics in information, automation, and interaction . "*



EPRI Smart grid

Smart Grids

Even for same smart grid, China strong smart grid has some differences from U.S & EU ones.

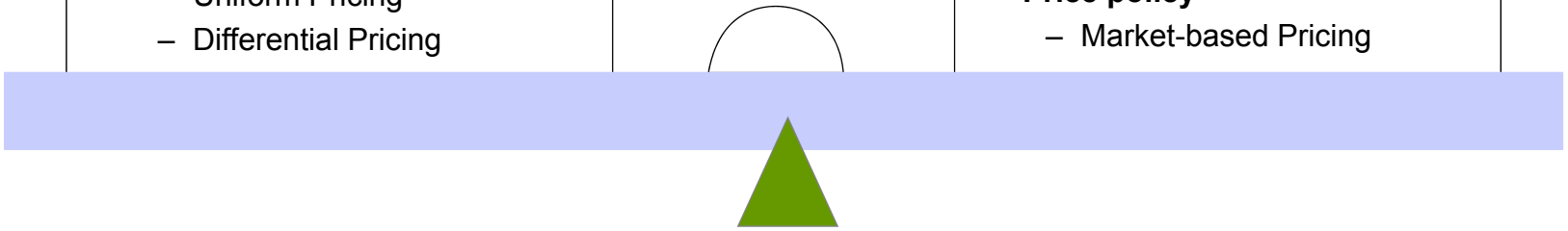
China Strong Smart Grid

- **Power Generation**
  - Big hydro、large coal-based plants
  - Wind、Solar
  - Nuclear, etc.
- **Transmission Technology**
  - Ultra voltage
- **Reliability Management**
  - Unified power flow control
  - Renewable energy connection to grid.
- **Price policy**
  - Uniform Pricing
  - Differential Pricing

Strong smart grid V.S. U.S.& EU Smart grid

U.S & EU Smart Grid

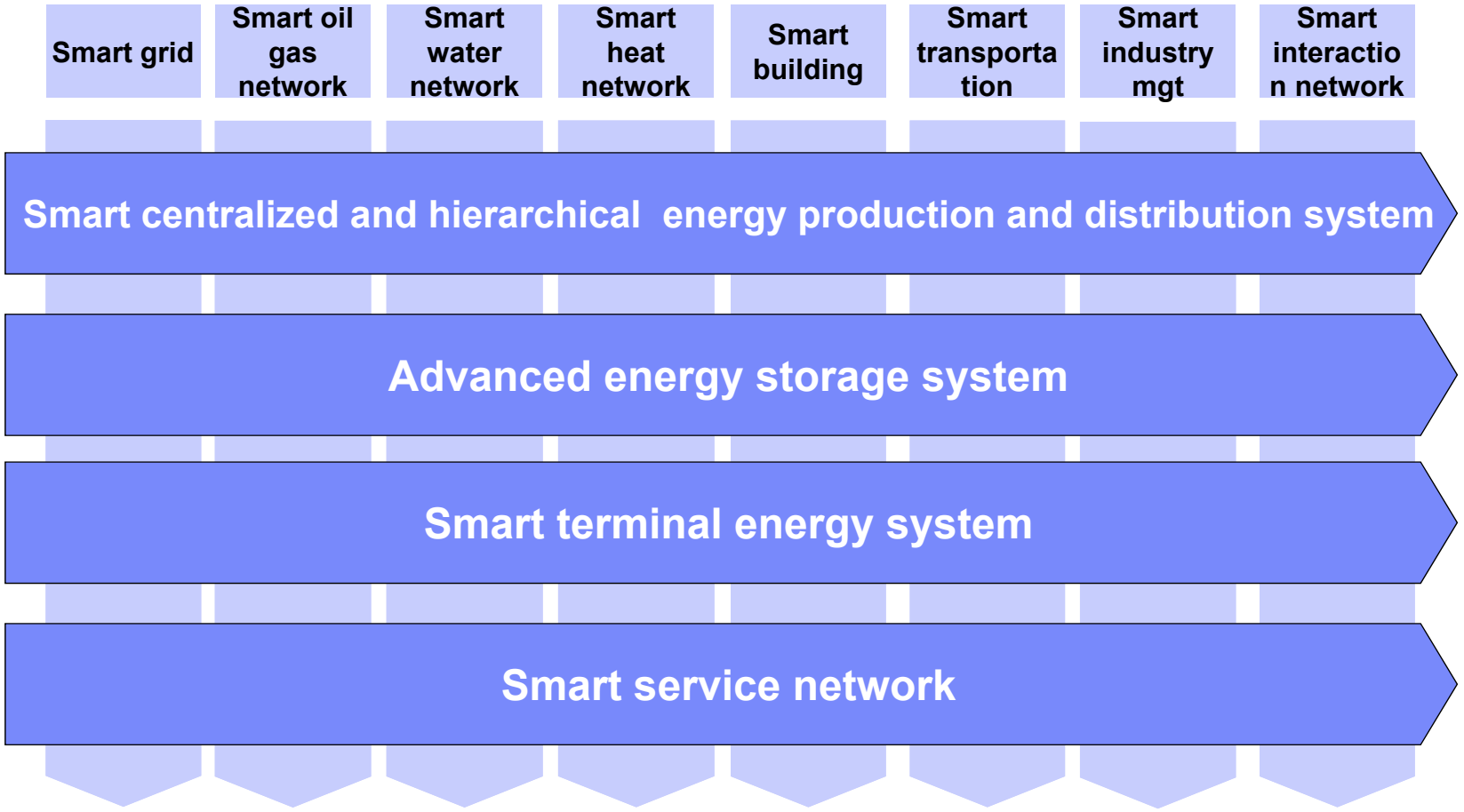
- **Power Generation**
  - Gas & Oil Power, coal-fired Power
  - Wind, solar, nuclear
  - Distributed energy
- **Transmission Technology**
  - FACT (Flexible Alternating Current Transmission)
- **Reliability Management**
  - Smart Interactive
  - Large scale storage technology
- **Price policy**
  - Market-based Pricing



Multi-network theory, i.e. smart energy network

- The purpose is to transform the traditional energy process infrastructure by utilizing advanced communications, sensors, energy storage, data optimization and management, and smart control technologies, to a new interactive energy generation and consumption infrastructure. The energy flow between different energy infrastructure can be allocated and exchanged in a more efficient way. The current one-way energy system will be transformed to an optimized, integrated and interactive process, including the components of generation, transformation, distribution, utilization, market, operation, customers, service, government regulation, low carbon awarding.
- More precisely, smart energy network can be called Intergrid.

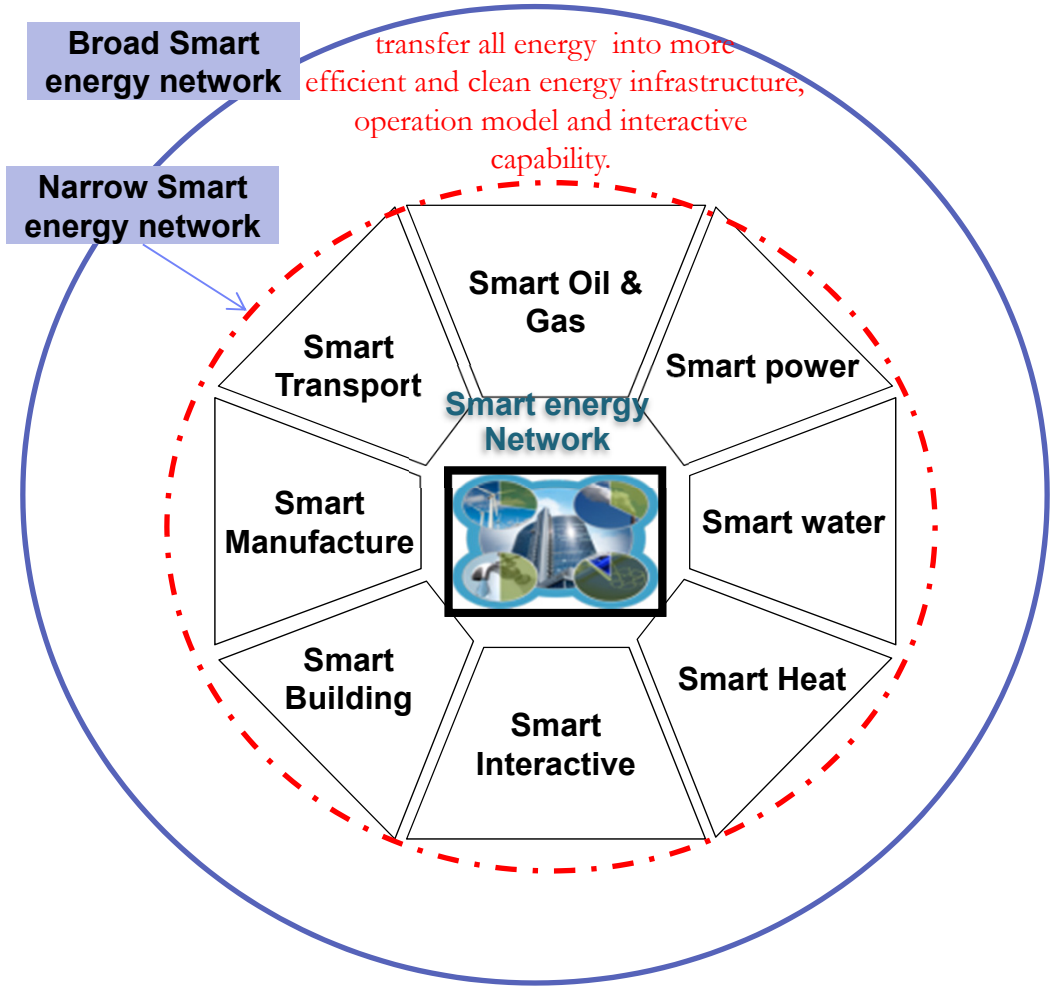
Architecture of smart energy network: 4 systems and 8 sub-networks



Innovation of Smart Energy Network(1): transformation from the hierarchical systems to an interactive networks with multi-energy sources

- According to the definition of smart energy networks, I advocate to transform the existing centralized hierarchical energy structure to four interactive energy systems, namely:
  - intelligent centralized energy production and distribution system
  - Advanced energy storage system
  - Intelligent Terminal energy system
  - Smart energy service system
- Smart Energy Network means the significant transformation of the existing traditional energy systems.
  - From a centralized to a distributed energy system, from centralized top-down hierarchical to distributed electrical power systems, or micro-grid, which is in fact the traditional energy structure
  - The transformation from the traditional energy structure means the changes of different energy mode, its essence is the transformation from the rating system to a interactive network with multi-center and multi-chain.

Innovation of Smart Energy Network(2)：accelerating the transformation from smart grid to smart energy network



Transform

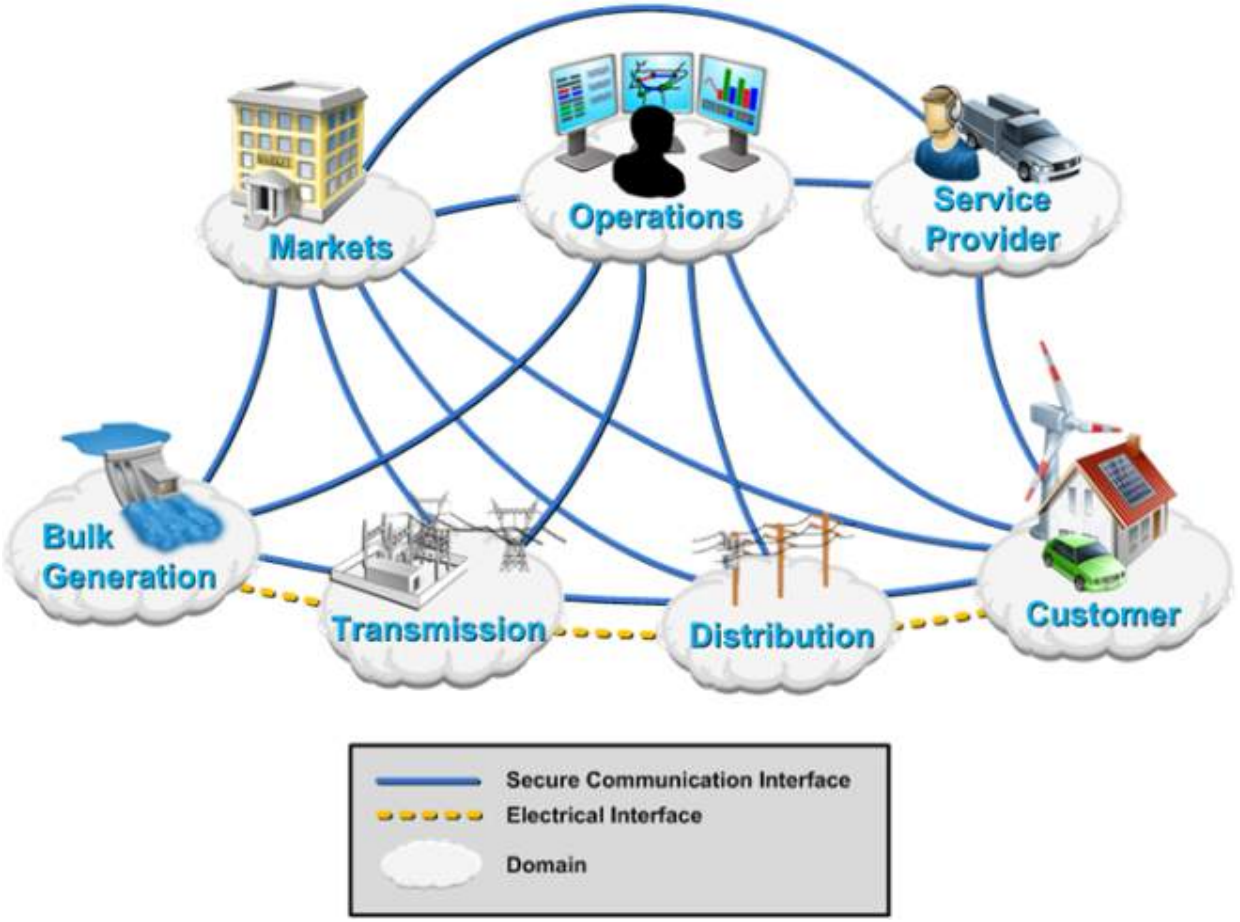
Reform Recommendation

Smart energy network Reform by industry

Multi-smart network interaction. e.g. Gas-power grid interaction

Other industry revolution. E.g. IPv6, micro-grid, sensing, Nanotechnology, etc.

Innovation of Smart Energy Network(2)： Smart grid includes 7 key elements

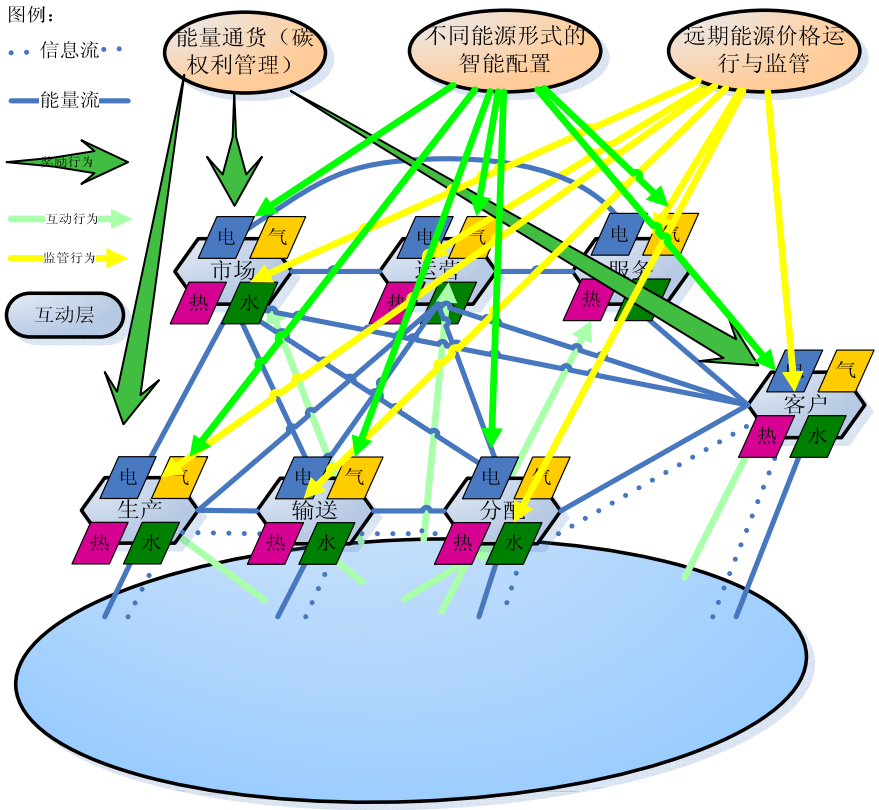


Innovation of Smart Energy Network(3)： Smart energy network includes 10 key elements

Introduction for smart energy network

- Smart energy network include 10 core elements: **product, transmission, distribution, market optimization, operation, service, customers, long-term energy price regulation, carbon credit management, smart allocation among different energy grids.**
- It was first created by Professor Wu Jiandong;
- Compared to INST Conceptual Smart Grid Model (7 elements), Smart energy network has 3 more elements: carbon credit management, long-term energy price regulation, and smart interaction among different energy grids.
- Long-term energy pricing regulation refers to government must build policy and regulation to supervise energy generation, transmission, distribution and consumption, improving the asset value; carbon credit management refers carbon emission costs so that reduce carbon emission;
- Such smart energy will great improve energy using efficiency in the city.

Conceptual diagram of 10 elements



Innovation of Smart Energy Network(3)： Smart energy network advantages over smart grid

Smart energy network has higher strategic view

- Compared INST 7 elements model, smart energy network has high meaning: build interactive model among different energy grid, it could bring new value, profit and improve energy efficiency.
- It will accelerate China energy infrastructure building.

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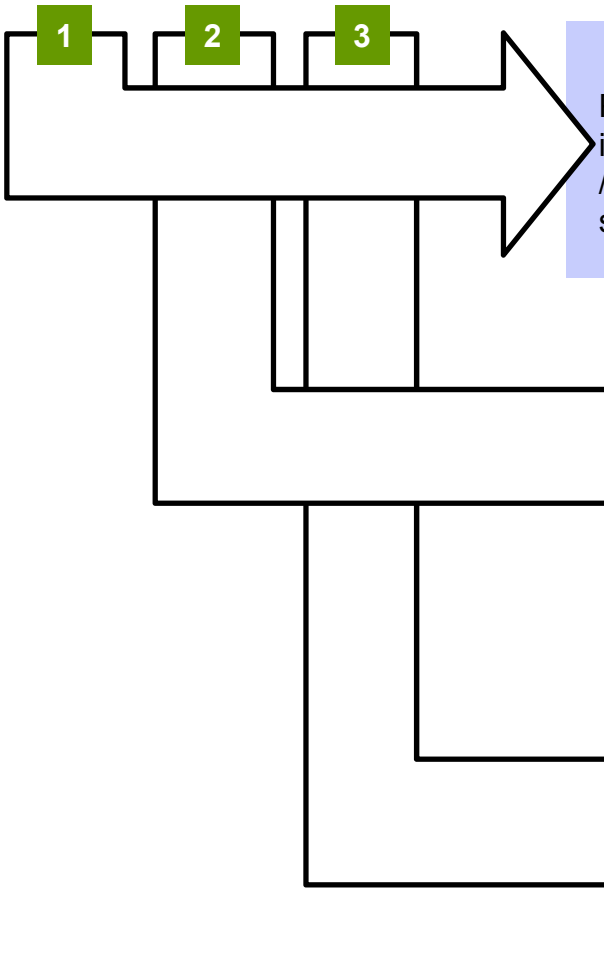
Smart energy network could improve China energy management skills

- The Carbon credit management will push China to improve its energy management, and gain advantages in international Carbon trading system in future
- Build long-tern energy price management and regulation will add China energy assets value in future, it will build strategic platform for China energy reform.

- **The Smart energy network should regard as the business model in China 12th planning. It will help China energy infrastructure into international advanced level**

Innovation of Smart Energy Network(4)： Smart energy network has three transformation models, we recommend to take Hybrid model



Progressive model with multi-stage

Push the transformation through part to part change in the energy industry, follow the principle of integrate the energy industry /system one by one, achieving transform objectives by dividing stage and class, build pilot and find error.

Large system integration model with strategic view

Combine electricity, water, heat, gas, building materials into integrate resource by integrated, market-oriented, information-oriented approach; push energy industry organization management transformation and objective change. This mode is forward-looking, great change cross stage and industry, pushing low-carbon economic achievement in high-speed and integrate means.

Hybrid Model

- Suggest China jump out of the narrow view of just build standards for one specific energy industry, but develop integrated energy which Chinese has advantages and world leading, avoid duplication construction.
- The industry transformation should be promoted to integrate transformation of Chinese economy, and thus bring higher level low-carbon economy roadmap and international technology standards, accelerating China‘s energy industry upgrading.

Innovation of Smart Energy Network(5)： Smart Energy Network architecture and theory model

Smart energy network architecture

- Smart Energy Network architecture define the relationship between the components and includes the principle and requirement which both smart energy network and its application need to compliance with. The architecture is as the framework for the following research.
- Smart energy network is a loose coupling system which is similar with the Internet. It is a very complex integrated architecture which includes many systems and subsystems. Flexibility is important for the implementation of the system as well as building simple interface between systems. It is needed to understand its main components, and their relationships to the analysis and determine the interoperability of standard interfaces, and to develop network security plan.
- Smart Energy Network architecture is a model used to study the characteristics of network elements and their relationship. It should provide the standards and protocols to ensure the interoperability and network security , and also propose a reference for the definition and architecture development of the system and subsystem.

Smart Energy Network

Smart energy network characteristics

- Compatible with traditional and new technologies to support the connection with traditional equipment, effectively use of traditional energy facilities.
- Uniform interface standard, reserved for cross-industry interfaces.
- Unified data model, use advanced modeling tools and techniques to manage complex systems.
- Smart energy network framework is relatively fixed, needs to adapt to technological progress and development.
- Interoperability, open, fully meet the maintenance, expansion and upgrade needs, support the access of third-party equipment and new applications.
- Smart energy network standard is universal which keep the interoperability of key systems and equipment , so that they can work together in the smart energy network. Uniform standards support energy companies to develop new equipment and support equipment, plug-in, reduce system maintenance costs.

Innovation of Smart Energy Network(6)： Smart configuration function of Smart Energy Network

Smart Energy Network significantly improve energy efficiency

- According to the research forTangshan and Shanghai Pudong pilot, during china 12th five years plan, if we can build up an interactive energy network which includes smart gas, smart grid, smart water, smart thermal, smart building, smart transportation,etc. then the energy efficiency can be improved at least 15%
- Based on China's total energy consumption in 2009, smart energy network can save nearly 500 million tons of standard coal, which means significant energy transformation and technology innovation.

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Energy transformation is driven by smart energy network

- If the main global economic organization promote smart energy network construction, based on the global energy consumption in 2009, more than 10 million tons of fuel can be saved, and it also means about 700 billion U.S. dollars can be saved
- thus, a global energy system operating system replacement is driven by china, and this may be the largest energy transformation opportunity since the Industrial Revolution.

- **The core objective of developing smart energy network is to promote the observability, interactivity and controllable of multi-level complex energy network, which can be achieved by integration, information sharing and process transformation between the components and subsystems of smart energy**

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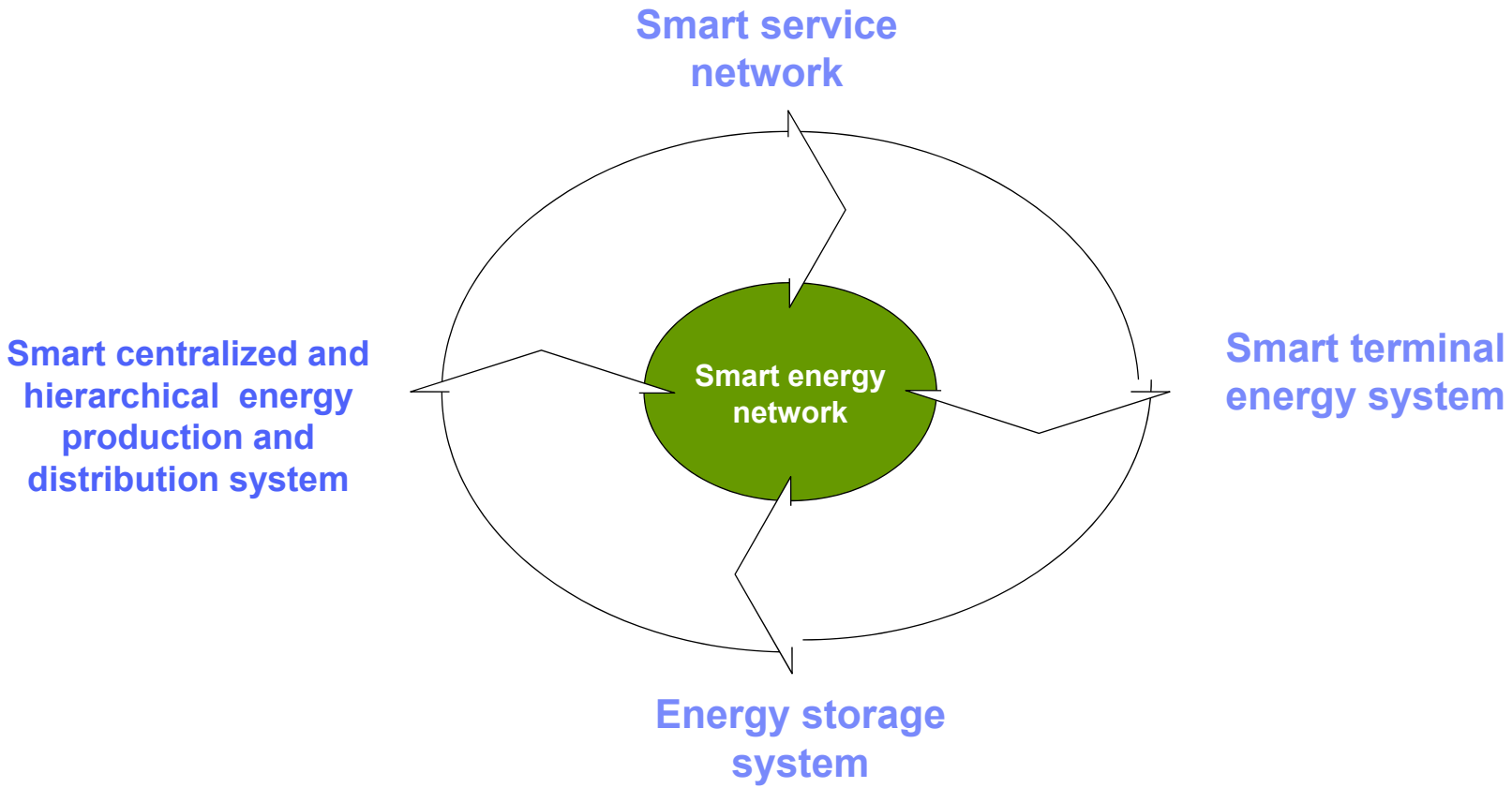
transformation from the hierarchical systems to an interactive networks with multi-energy sources

Four systems in smart energy network



System 1: smart centralized and hierarchical energy production and distribution system

Smart Energy Network promote the centralized and layered energy production and distribution system

- Smart energy network promote the emergence of new industry from the traditional hierarchical structure of energy production and transmission system , which is as the basis of energy usage for the human.It will provide the common model,common standards, common protocols, common network and common data for different energy networks in order to promote the running of various components of hundreds of millions of energy systems.

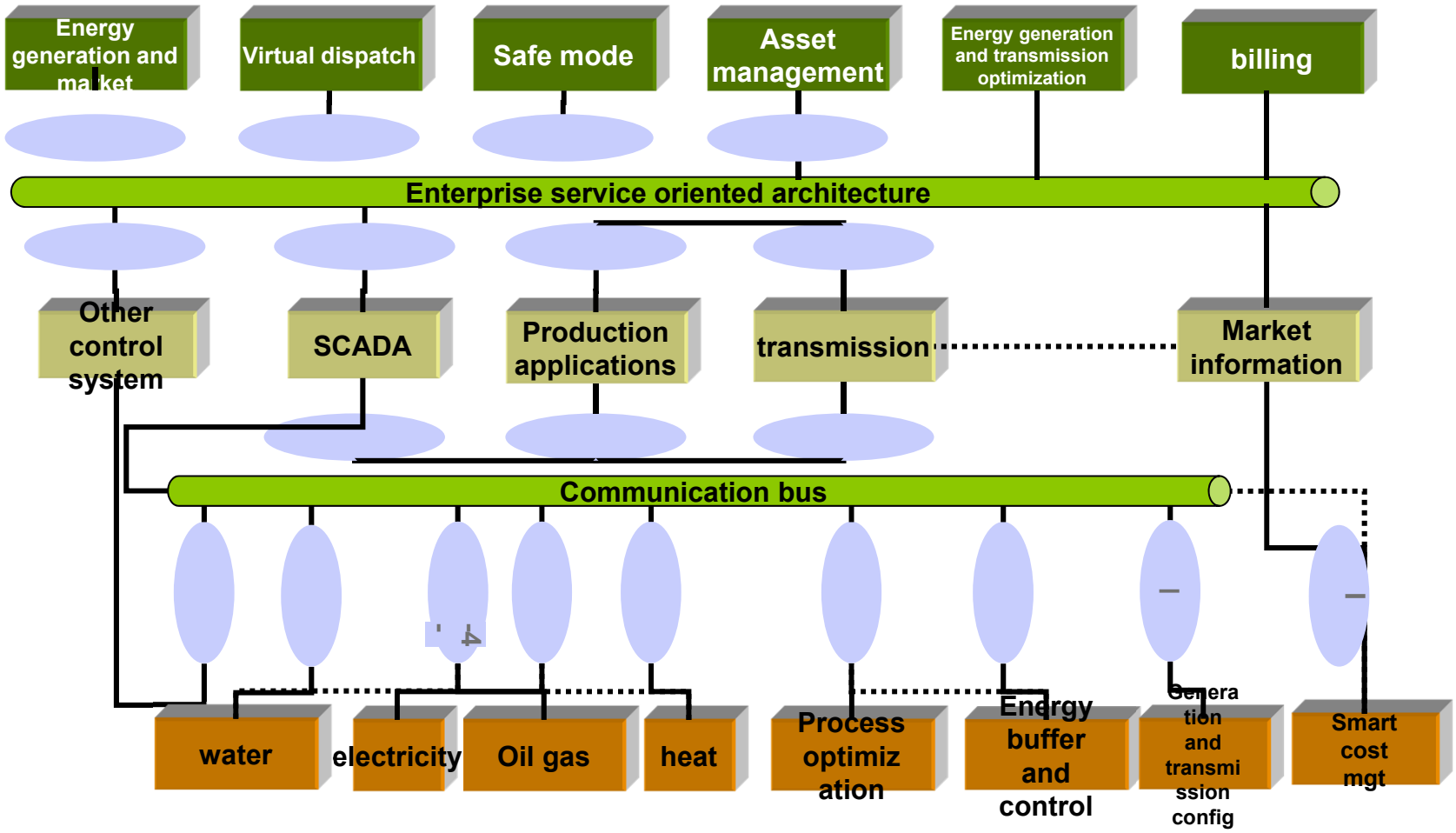
Therefore, the intelligent centralized and hierarchical energy production and distribution system are compatible with a different energy grid, and it is a flexible energy equipment cluster with the characteristics of network, intelligence and ecological.

System 1: the trend of smart centralized and hierarchical energy production and distribution system

- Promote more intelligent configuration among the different energy networks
- Promote the integrated networks operation from from a single network system;
- Promote the energy interactive operations from the energy with hierarchical and top-down approach;
- Promote energy equipment from automation, mechanization to a flexible ecosystem of energy equipment cluster with network, intelligence;
  Promote energy equipment shift from energy-intensive materials to low energy materials;

- Promote energy production and deliver from only on the Earth to compatible with outer space transportation of energy production and microwave and laser energy delivery;
- promote interoperability and security coordination among different energy networks;
- Promote the common model, common standards, common protocols, common network and common data for different energy networks in order to promote the running of various components of hundreds of millions of energy systems.

System 1: Diagram of smart centralized and hierarchical energy production and distribution system



System 2: build advanced energy storage system

Smart energy network boosts the energy storage system

- Smart energy network boosts the energy storage system to be separated from conventional energy system and become a new industry system.
- The energy storage system will become the fundamental repertory in future daily production and life. It is the footstone to stabilize energy systems and fundamental channel t utilize the current energy asset more reasonably. It is also the prerequisite to promote clear energy utilization. Building energy storage system is a revolution which will form the fifth energy value chain besides generation, transmission, distribution and customer service.

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Energy storage system boosts energy network transformation

- The energy storage system in smart energy network is an energy integration system which stores energy directly or indirectly in a controllable, observable and inter-operational way.
- It transforms the energy flow from one-way to two-way and multi-way, it also transforms the energy system from centralized control to flat and decentralized control.

System 2: The strategic direction for energy storage industry

Industry transformation

- transform from decentralized, isolated and supplemental industry to centralized and decentralized combined, networked system and core industry.
- transition from electricity power based small-capacity energy storage to multi-energy type, multi-network configured and large-capacity storage
- transition from battery storage to mechanical energy storage, buffer system storage and centralized industrialized storage

Industry strategy

- The strategic commanding point for energy storage industry is to establish common international standard. Energy storage industry needs to establish common security mode, communication mode to facilitate the interoperability
- The prerequisite for large-scale and revolutionary development of energy storage industry is to boost the development of power market.

Technical direction

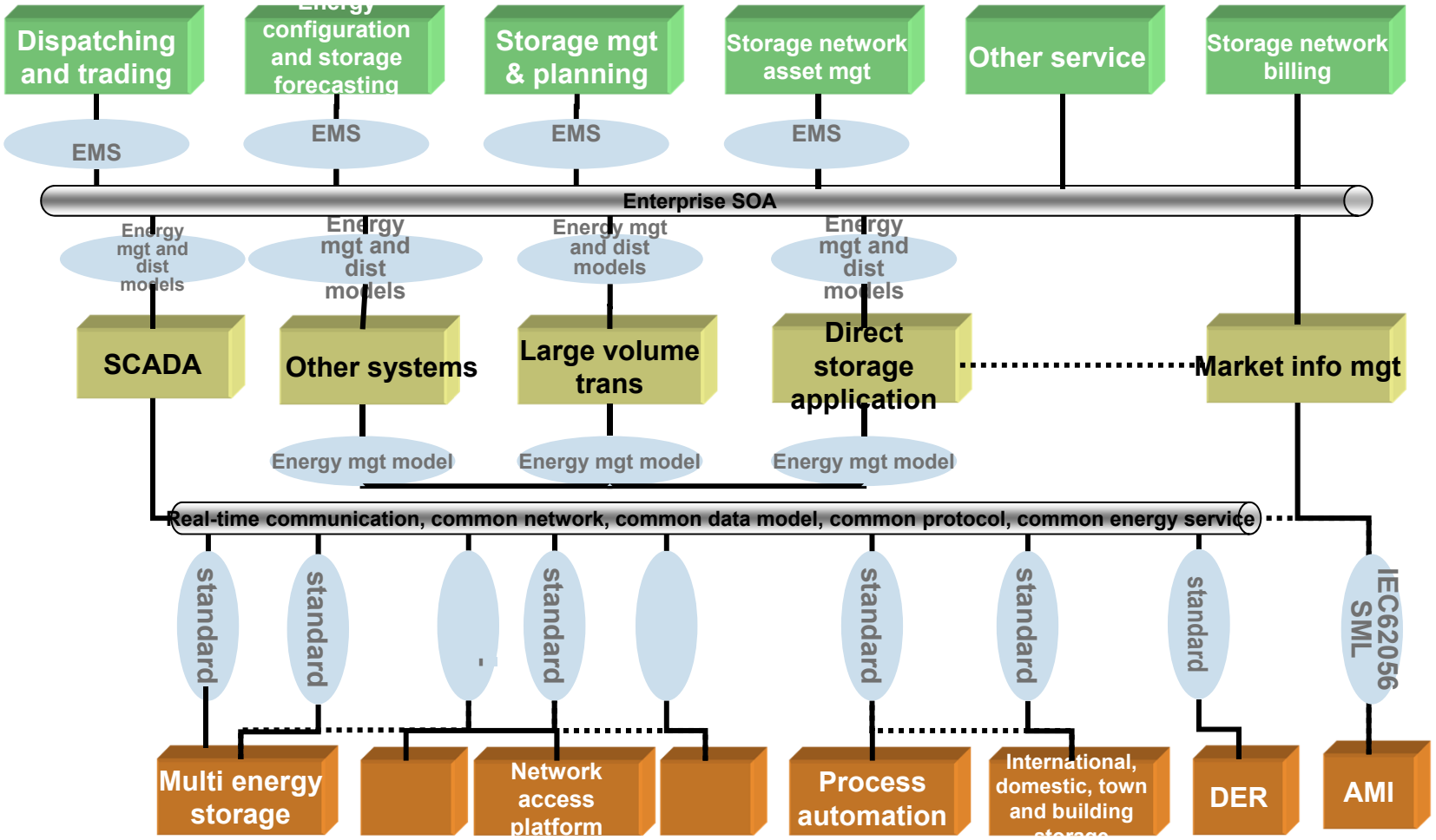
- transition to high technologies, i.e. nanotechnology and superconducting energy storage. Energy storage industry is not only the combination of information technology and storage industry
- realize the multi-level storage for the energy from energy network. It also needs the energy reserve from end energy network. Energy storage itself needs to transform to a higher level smart form.
- integrate the storage control of buffer energy flow, such as gas energy decomposition, nuclear energy generation, heat storage and flywheel energy storage.

Infrastructure support

Energy storage industry needs to realize the high-end networked dispatching optimization.

- Energy storage industry needs to establish common energy data exchange model.
- Energy storage industry needs to build a virtual network infrastructure connected to public network.

System 2: Diagram of energy storage system

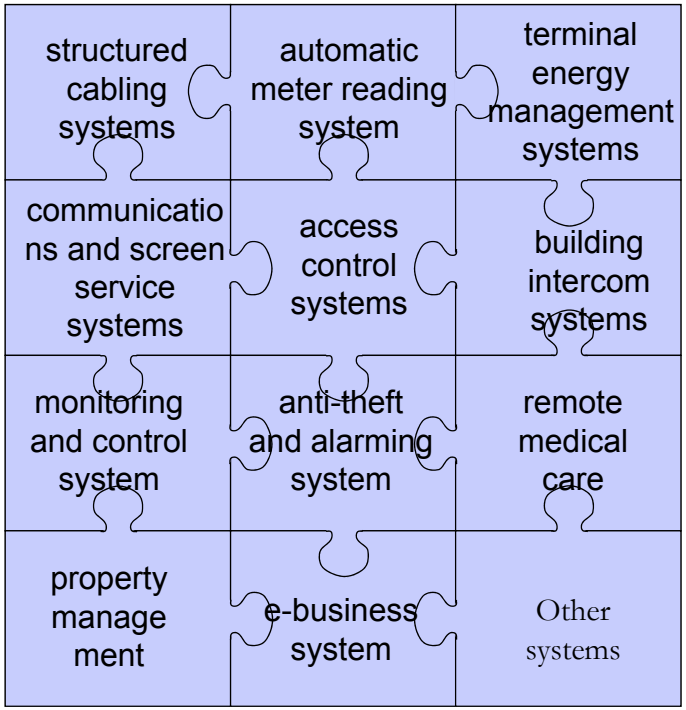


System 3: build an innovative terminal energy system

What is smart terminal energy system?

- use system integration method to promote the combination of communication technology, information technology, construction technology and energy system. ;
- It uses smart devices, structured cabling system, green low-carbon material, specialized end software services, fuel cell, energy storage technology, micro-gas turbines and internal-combustion engine and other advanced technologies to realize the integrated intelligent control of interior lighting, gas, electricity, heating and ventilation, air conditioning, water supply and drainage, prevention, anti-theft devices, in order to achieve the efficient energy management for construction, transportation, industrial facilities.
- It can improve the energy utilization efficiency by combing the electricity, gas and heat and realize the flexible, efficient and convenient “multi network convergence” service

Components of smart terminal energy system



Objectives for building smart terminal energy system

Smart terminal energy system is not an isolated energy system. It is an industry system combining centralized, hierarchical energy generation and transmission network. It can realize the efficient operation by connecting and disconnecting flexibly

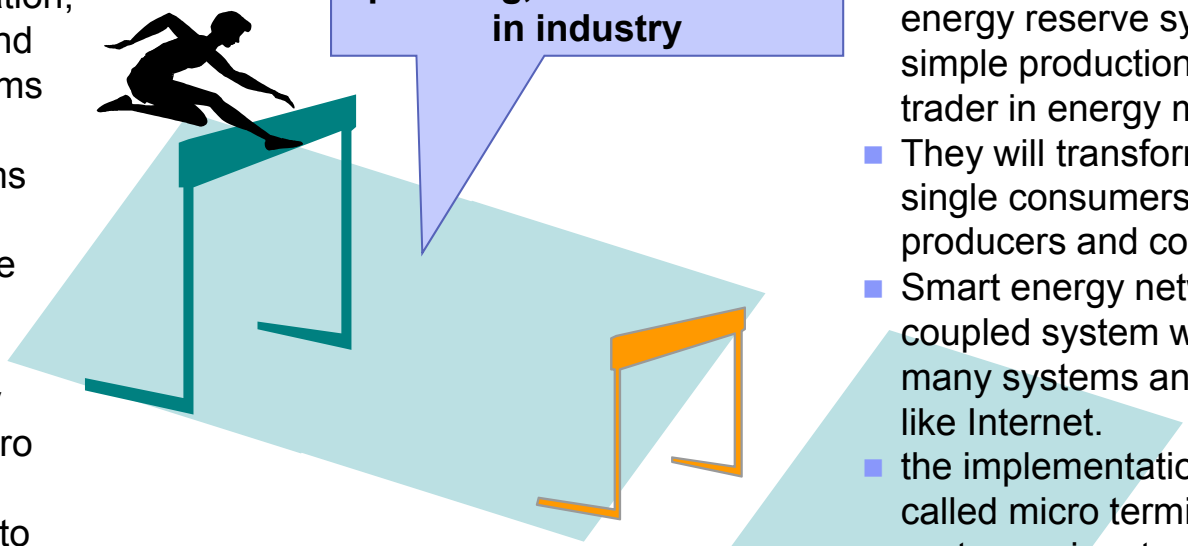
System 3: Transformation mode and road map of smart terminal energy network

This transformation will boost the mobile energy terminals (i.e. vehicles, ships, aircrafts) and immovable energy terminals (i.e. factories, houses and commercial buildings) to form new energy value chain and new industry system. This system will be called terminal energy system. The establishment of this new industry system needs to be accelerated to form new standards, processes, networks, business models and visions.

Conventional energy network

- buildings, transportation, industrial facilities and other terminal systems are mainly energy consumption systems
- Distributed energy, distributed power are only low level components in conventional energy system, and the micro grid is the low end structure compared to bulk power systems

Transformation mode: developing standards and planning, then transform in industry



Smart energy network

- they are not only energy consumption systems, but also energy reserve systems, even simple production system and trader in energy markets.
- They will transform their roles from single consumers to both producers and consumers.
- Smart energy network is a loosely coupled system which aggregates many systems and sub-systems, like Internet.
- the implementation projects are called micro terminal power system, micro terminal heating system, or micro terminal gas system.

System 4: Smart energy service network

Smart energy service network definition

- Smart energy service network is system with common semantics, common syntax, common networks, common standards, common ports, standardized processes, interfaces, it can link the advanced component and technical framework and achieve the simple and convenient information exchange between all system, to achieve real-time data acquirement.
- Smart energy service network achieve the energy efficient, safe and stable operation through interoperability.

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The component of smart energy service network

- Smart energy service network includes energy engine services, meteorological energy services, remote energy control, machine and machine communication protocols, information network based on IPV6 and other new industries.

System 4:
from silo system, automatic operation to flexible energy clusters

- In 1882, Edison established the first power system. Since then, energy systems particularly the power system becomes a system with the characteristics of mandatory , centralized hierarchical, top-down hierarchy, impersonal public services organizations, and the relative efficiency of management procedures, industry predictability. But this structure has disadvantages, such as, un-flexible management, no innovation, more dependent on monopoly, highly energy waste , limited by fossil energy, which need to be transformed.

- Smart energy service network can promote energy facilities from the island system, automatic operation to flexible energy clusters, which is largest industry promotion in the history.

- Smart energy service system will drive all energy facilities from the isolated facilities, specialized systems and industry network to a integrated energy eco-clusters. The architecture of person, machine, network and market will be built up. The global energy is facing an unprecedented transformation and industrial growth.

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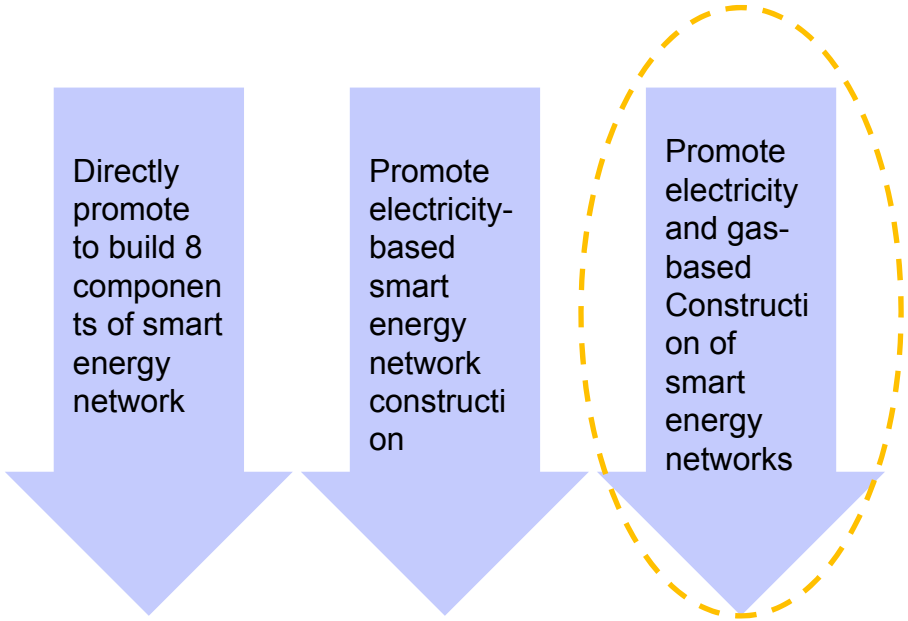
10 Innovations and Application of Smart Energy Network

No. 1 Innovation: Smart electricity and smart oil gas network will be the common engine to develop smart energy network in China

Three major paths for China to promote smart energy network



The core is whether the smart gas network will be built in parallel with smart grid as the main platform for smart energy network

Smart gas network needs to be integrated to other energy systems

- Need to be jointly dispatched together with electricity to realize the interaction of gas and electricity and solve peak shifting issue;
- smart gas network can become the main basis of urban heat supply ;
- Gas network can be used as the main basis of micro-end power and directly address the terminal power supply;
- Gas can be used as an ideal support for new energy vehicles;
- Can be used as the interaction and coordination basis of communications, security, energy management systems, public information model, gas price coordination and management, bus systems, gas networks and power

No. 1 Innovation: Smart city gas network has more advantage

Components of city gas network

City gas network architecture includes high pressure, sub high pressure, medium pressure, low pressure systems

Coke oven gas pipe network includes high pressure, medium pressure, low pressure systems

Sub high pressure and middle pressure adjustment stations, and gas storage facilities

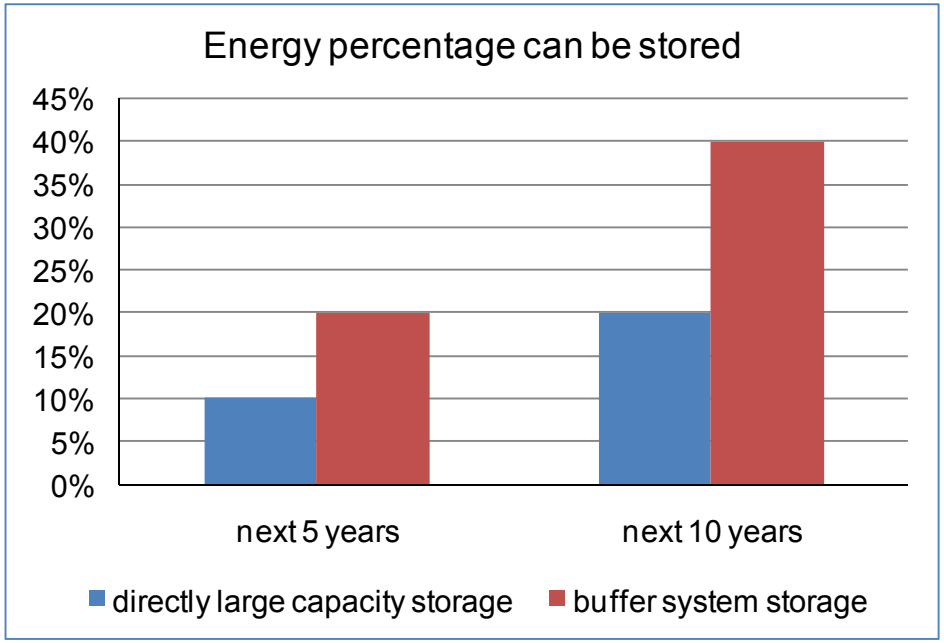
Dispatching systems include dispatching center, sub center and terminal station

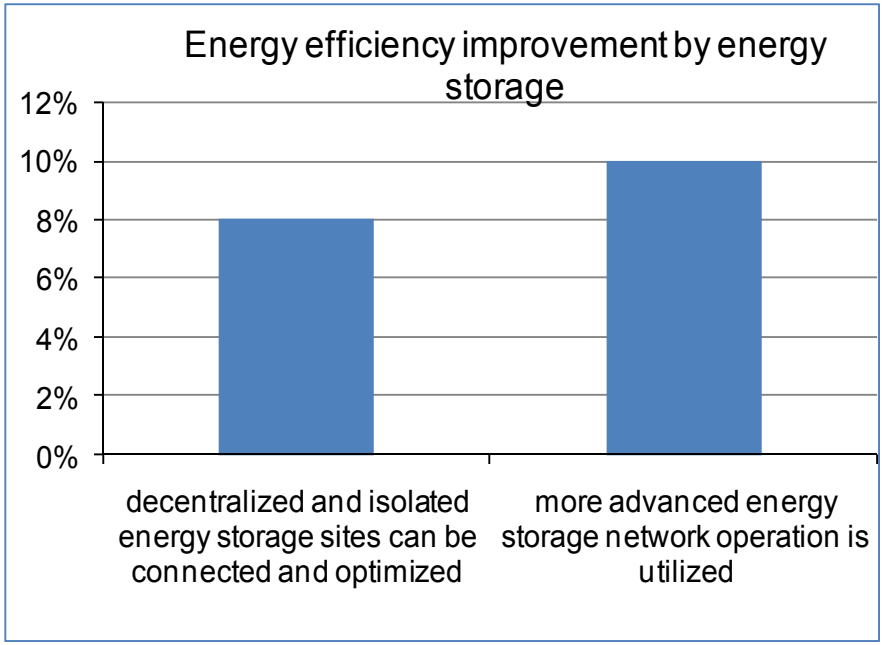
Advantages of gas network compared to grid

- Gas network assets are generally controlled by the local government
- Gas network is the major energy network in cities and it can be basis for interaction with other energies
- City gas network can be a source of micro-end power supply
- Coal-based energy production and consumption system can improve efficiency through gasification
- Smart gas network can improve the effectiveness of integration of local energy assets.

Since both electricity and gas have high, middle and low (voltage/pressure) network, they can become the common engine for smart energy network

No. 2 Innovation: Building energy storage system and improvement of China’s energy efficiency





Components for building energy storage industry in China: direct energy storage; buffer system energy storage; smart configured storage of different energies; public virtual energy storage network infrastructure; city based energy storage system, market based energy storage system.

No. 2 Innovation: Establish new energy storage system: Energy storage will be separated from traditional energy system and become a new industry

If China can establish an integrated and multi level energy storage system, China ‘s energy efficiency can be improved by 10%. It will be a great opportunity for China. So networked operation will be the ideal way to achieve this objective.

Structure

- International energy reserve
- National energy storage
  - Sea water desalination
  - Gas energy
- City energy storage
- Towns and communities energy storage
- Building energy storage
- Micro end energy storage

Process

- Active energy storage
- energy storage in energy mining
  - Coal gasification
  - poly generation
- Energy generation storage
- energy transmission storage
- energy distribution storage
- energy service storage
- user energy generation storage

Format

- direct energy storage
- buffer energy storage
  - Flywheel energy storage
  - / Electric heat transformation storage
- smart configuration
- storage/network convergence
- software control
- mobile energy storage
- fixed energy storage
- Industrialized energy storage
- Virtual operation

Benefit and future

- 30% electricity storable
- 10％ water storable
  - Sea water desalination reserve
  - recycled water energy storage
- 30％heat storable
- 20％ oil gas storable
- 10％buildings storable
- transportation can improve storage efficiency by 10%
- industry can store 5% energy
- agriculture can improve storage efficiency by 10%

Energy storage technologies

- chemical storage, Electrochemical Storage, mechanical storage, Superconducting Magnetic Energy Storage, Compressed Air, heat storage, cool storage, fuel storage, power grid storage, etc.

No. 3 Innovation: China's fresh water, especially one-third of industrial water will come from sea water desalination

Coal changed the resource structure in the19th century; oil gas changed resource distribution in the 20th century; fresh water resources will change the global management in the 21st century

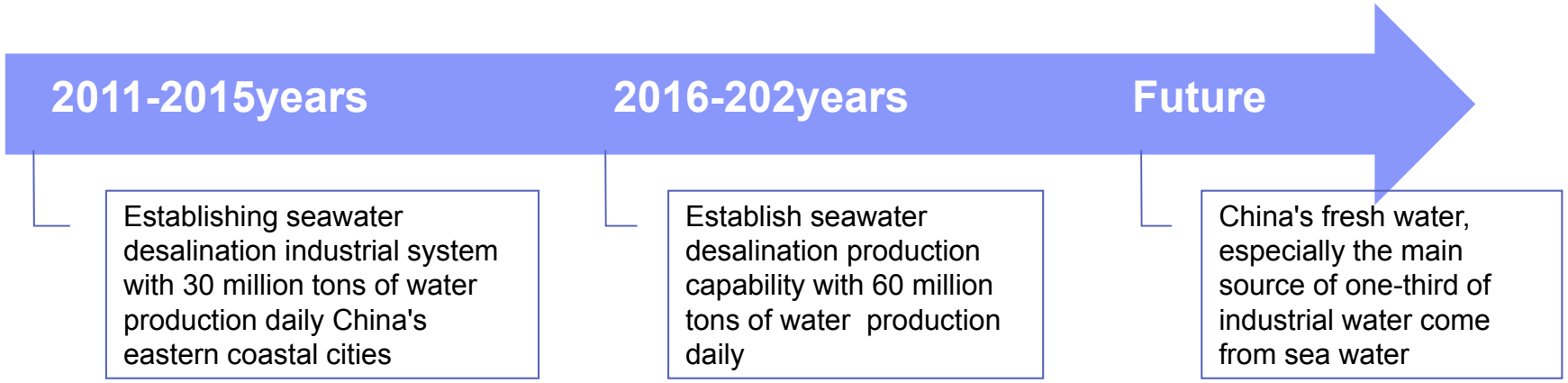
Challenges in China's water resource utilization

- China's total annual water consumption in 2009 is 593.3 billion m^3 of which the total urban water supply about 50 billion m^3, domestic water 24 billion m^3 ;
- Total population supplied in cities is 380 million, daily water consumption is 180L;
- In 2009, China's water resource is 2376.3 billion m^3, 13.4% less than last year; water resource per capita is 1784.9 m^3 , 13.8% less than last year

counter-measures

- From passive adjustment and water transfer projects depending on geography and climate change to commercial production of fresh water
- Smart configuration and energy exchange between power and sea salt water
- Promote the building of China's smart water systems, and promote ploy-generation of electric, water, heat and gas
- Restructure China's domestic water by sea water desalination water especially the main sources of industrial water

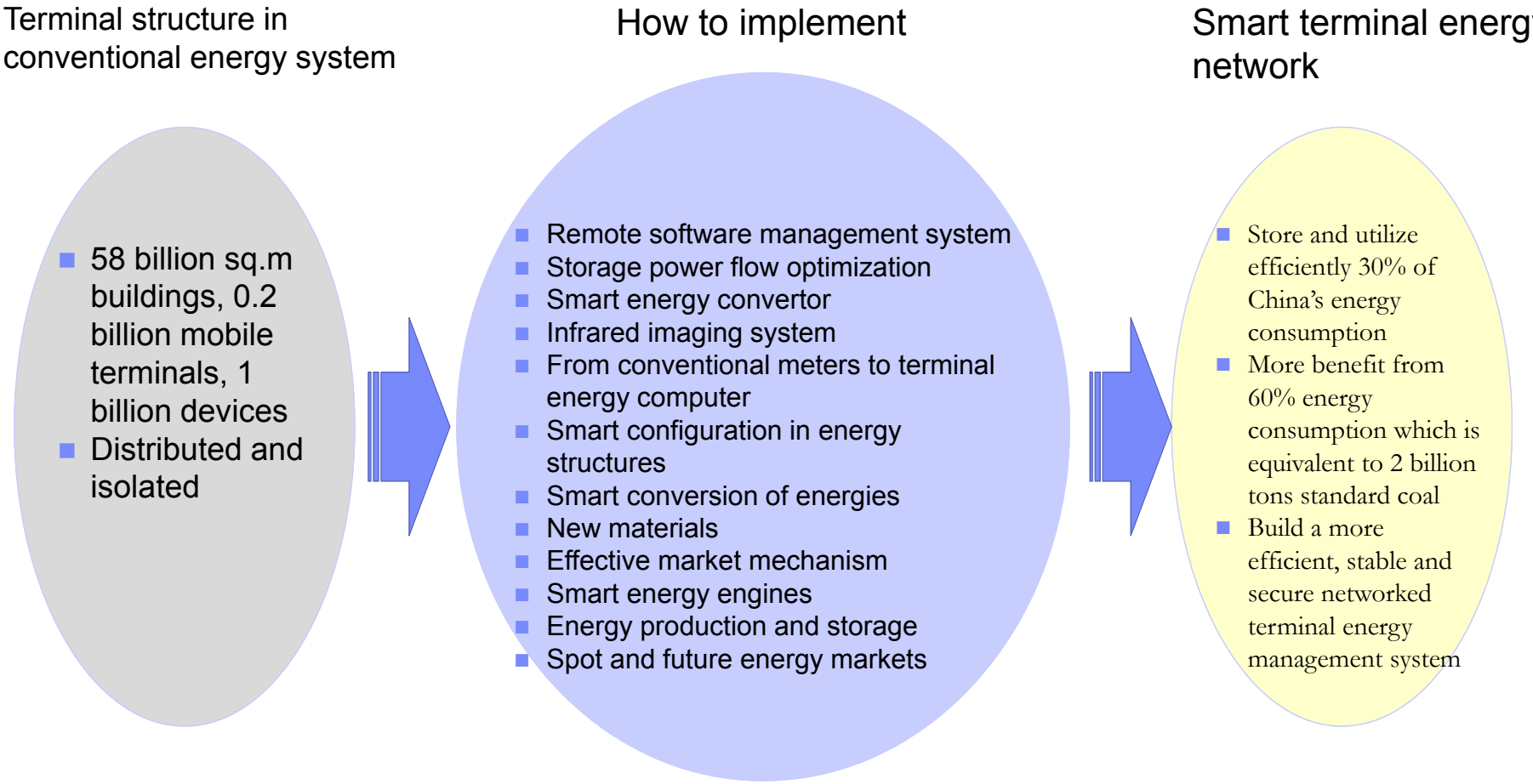
No. 3 Innovation： Sea water desalination and South-to-North water diversion plan， Interactive configuration of water, electricity and heat need to adjust China’s energy objective



- Modify the existing electric power development planning and electricity demand. The current estimation is in 2020 installed capacity of nearly 1.7 billion kilowatts of planning will not be able to meet China's energy needs in the next five to ten years. As a result, we need to promote the smart configuration and industrialization of wind, solar, nuclear, coal and other resources.

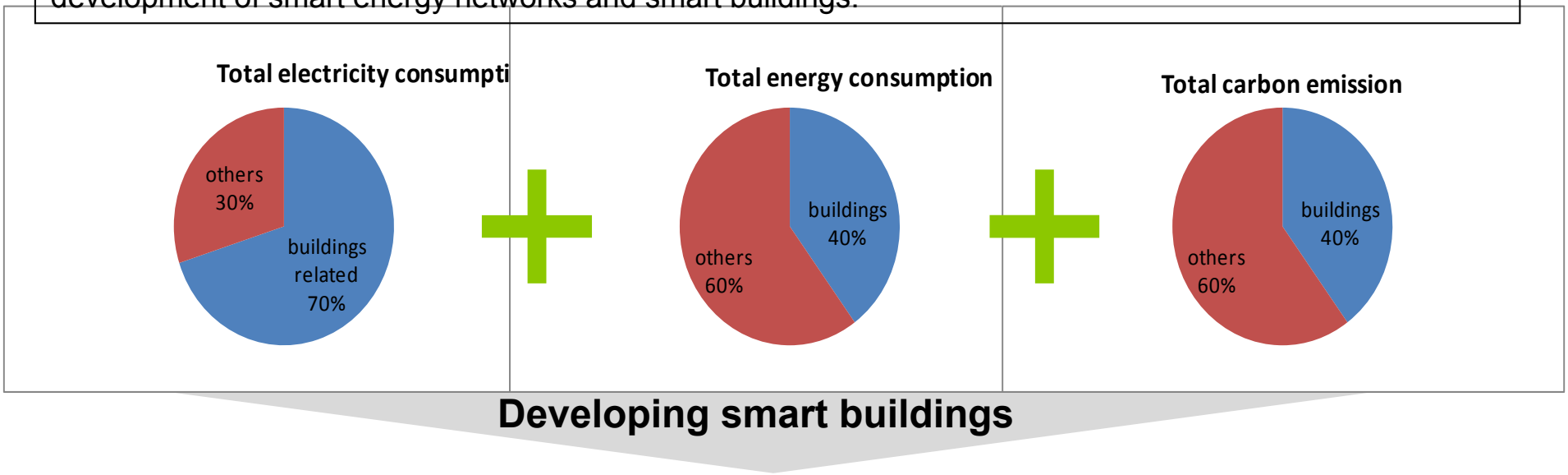
- Effectively adjust the water resources strategy of South-to-North water diversion, re-optimize China's water management system, and establish a new, sustainable model of water resources management

No. 4 Innovation: Strategic visions for developing terminal energy network in China



No. 4 Innovation: Developing smart buildings is the core of smart terminal network

The transformation of traditional domestic architecture can significantly reduce the final energy waste and pollution, can achieve energy savings of scale. The best way to achieve this transformation is through the development of smart energy networks and smart buildings.



- 20k-150k RMB investment/per home, energy saving ;
- If more than 50% buildings can save energy20---40％, it will save 300-600 million tons coal consumption;
- 1-1.5 billion sq.m buildings can be green buildings, it will save 300 million tons coal mining per year;
- In next ten years, China will have more than 10 billion sq.m green buildings requirements. If this requirement is met, it will contribute to Ghina's GDP 1-3%

No. 5 Innovation: City is the breakthrough to build smart energy network

- Electricity and gas can be the breakthrough of smart energy network. In different regions, it can be implemented in different ways, conservatively or aggressively.
- Promoting the integrated reform in more than 600 municipal cites should be the important institutional breakthrough to build smart China, value China and efficiency China. The essence is the redistribution of reform benefit among central authority, local authority and end users.
- The consolidation of new energy integration, allocation of peak load shifting benefit, carbon reduce benefit, cable TV and broadband data serve, communication rental will solve the investment issue of smart energy network and balance the cost issue effectively.

No. 6 Innovation：High prevision energy components and consolidation of networks will promote the upgrade of global information network

The current IPv4 protocol addresses is 32 bits, in theory, it can support 4.3 billion internet users. The IP resource will be exhausted around in 2010 to 2012. But, the interconnection of 10 billion high precision energy components will need more network addresses.

Two technical routes

Option1：IPv4

Continue to use IPv4 system and expand its subnets, it will be a complex process of technical restructuring

Option2：IPv6

Use Pv6 protocol in order to meet future energy facilities and the interconnection of a variety of consumer electronic devices

No. 6 Innovation：The benefit from IPv6 innovation belongs to those who promote smart energy network innovation

Information network supporting smart energy network will be based on IPv6 networks.

- IPv6 will expand the IP address length from 32 bits to 128 bits, so the total number of IPv6 addresses are about 3.4 × 1038, which means there will be 6.5 × 1023 IP addresses in each square meter.
- The IPv6, with the characteristics such as flexible expansion, hierarchical address structure, plug-in,etc, will be as the core of next-generation internet.

more than 1 billion routers to be replaced

more than 100 billion U.S. dollars worth of Internet software and hardware facilities need to be updated,

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Once again, the global information industry brings opportunities to replace the territory. This opportunity should be given to the country who promotes the smart energy network. China should be a leading country.

No. 7 Innovation： Smart Energy will promote revolutionary changes to global human, equipment and grid operation and service organization and structure

- The development of smart energy grid will promote 10 billion or more components of the China energy infrastructure integrate to a networked energy ecosystem group from the professional system and industry networks. The group services for more than 500 million people. This new energy ecosystem group operate on the network based on IP address length of 128, i.e. network with 2^{128}-1 IP address. The organization and structure of global human, equipment and grid will change revolutionary

- To achieve this, base on the general technical systems such as data sensing system and AMI system, contractual and cooperation energy information management should be developed, as well as more advanced energy service engine, whose business value will exceed Google. Terminal energy management system should be developed. There are more than 600 million water, gas and electrical meters in China, whose business value will exceed Apple. Windows system should be developed for energy terminals. The number of energy terminals is more than internet population, whose business value will exceed Microsoft.

The base point for China Smart energy network architecture

China Smart Energy Network Architecture

Object/Goal

- **Build interactive and smart energy infrastructure**
  - Build new energy infrastructure with integrated method across stage and cross industry.
  - Promote China energy users' interactive capabilities, standard, resources and industry chain, accelerating China energy industry upgrade.

Mechanism

- **Push integration reform based on 600 municipal cities as unit**
  - Regulation breakthrough in building smart China, value China and efficiency China
  - Benefit reallocation between central and local governments.
  - Integrate renewable energy connection, allocate benefit of carbon emission reduction, Cable TV, Internet service, communication ease, etc.
  - Solve investment and cost of China smart grid

Go-to-Market Strategy

- **Build energy trading market based on smart energy network**
  - Build energy market system;
  - Build real-time, bi-directional, interactive, energy/utility trading mechanism;
  - Energy trading mechanism benefits DSM reform, reduce capacity and investment
  - Greatly push China users' creative capability if resources are allocated reasonably

Organization Restructure

- **Strategic reform on top and new standard integration**
  - Push reform according the roadmap of : standard—model and planning—Policy and legislation—Administration leading—Pilot-reform.

No. 8 Innovation: From standard to practice, the new strategic view of global energy division

- Common international technical standards is needed for modern multiple interactive energy structure. As the largest smart energy grid market in the future, China should actively participate in international standards development. Standards first is thinking change first. China achieved the success of reform and opening up by participate in international division from low-end 30 years ago. Now China should participate in the international division from high-end, and this will succeed as well.

- We believe that the ideal model of smart energy grid transformation is to develop standards and plan first, then push the industry to transform together.

- There are three ways to accelerate smart energy technical standard construction: fully integrate existing standards, supplement and enhance existing standards, and create new standards. The design of smart energy grid standards should be forward looking so that it can ensure the system interoperability and investment security.

- Communications, security, energy management systems are the core of smart energy grid. General standards such as common network, common information upgrade structure, common data model, common protocol, common energy service need to be established. For example: for the conversion of gas to heat, standards of type, rating, start date, heat storage, thermal charge status, temperature, load history, utilization, manufacturers and other need to be established.

- We suggest China should take this opportunity of international standards development in energy industry transformation, development a set of advanced standards systems of smart energy grid technology and industry with global community, to accelerate China energy transformation.

No. 9 Innovation: The countries that operate energy currency earlier than other counties will get global division initiative

- We recommend add new element of carbon management in 10 elements of smart energy grid. This will promote China energy management level, and more over, to upgrade energy management as second currency system as paper money currency management system. It is important for global to adjust paper money based currency system. The country that operate second currency system earlier than other counties will get global division initiative. Because of this, I suggest to put carbon management into energy management process as soon as possible.

- The specific means of the energy currency management including the incentives for low carbon and punishment for high carbon. Incentives for low carbon is government management costs such as carbon emission constraints should be added into energy price in order to improve energy efficiency and reduce carbon emissions through intelligent information systems and optimization methods in each energy chain of energy production, transmission, distribution, and consumption.

- Excessive use of paper money currency created imbalances in global economic development. Paper money currency system supporting the development of world's most important economic system, but it also created a feature of relatively depreciated currency. Adding new energy currency elements into existing economic system will promote existing paper money currency flow to low carbon economy, and has effect of new international division and wealth transfer.

No. 10 Innovation：No market, no smart energy network

- As the low efficiency of China energy systems, the cost of transformation to smart energy system is even lower than energy savings. This formed a strategic opportunities special for China: the low efficiency energy system in China has a huge prospect of development. the cost of transformation to smart energy system in China to intelligence would equal or even lower than energy saving benefits in next step of production and life. It could be a strategic turning point for us to change the difficult mission of replace or transform the energy system to promote China transit from the export-oriented economy to science and technology based domestic request economy. It is not a burden for China to transform energy system, but a real opportunity, a miracle of turn capital into economy increase. Smart energy grid construction is not only the best way of strategy of improve energy efficiency and reduce greenhouse gas emission, but also a strategic turning point to promote China transit from the export-oriented economy to science and technology based domestic request economy.

- Construction of interactive model of different energy grid, and the result of promote smart configuration of water, electricity, head, building, transportation and industry management, will be the new source of profits, value and efficiency. Construction of interactive model for different energy grid will improve the energy efficiency by 15%, this will be the new source of profit. Customer should not take the cost of smart energy grid transformation. Therefore, taking interaction between different energy grid as the core of promoting smart grid or smart energy grid construction will make China energy system construction has higher strategy advantages.

- There is no real smart energy without market. There is no energy trading and service optimization through network management without market..

Thank you!

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