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China's energy current status and development of clean energy technologies

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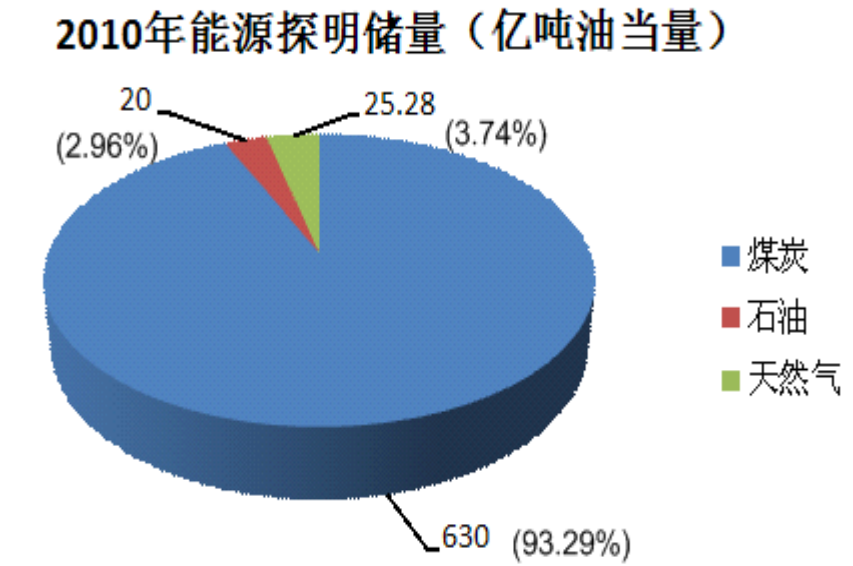
OUTLINE

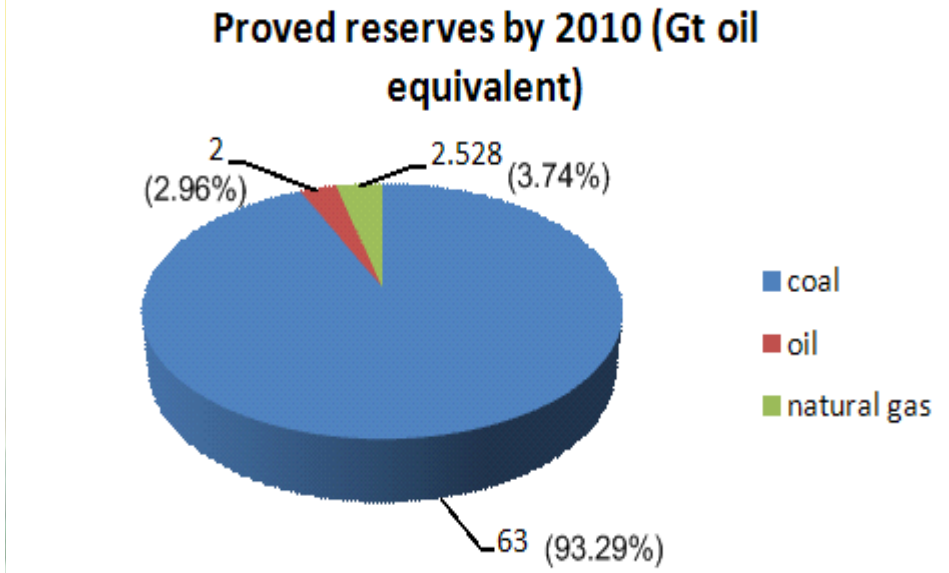
1. Challenges and strategic requirement regarding Chinese energy system
2. Strategic consideration between energy development and climate control countermeasures
3. Energy technology development strategy and key tasks of for 2011-2015
4. Proposal for international cooperation in clean energy technologies

1. Challenges and strategic requirement regarding Chinese energy system

Long-term dependency on coal

- By 2010, proved reserves of China's fossil energy resources as shown in the pies below：of which coal accounts for 93.29%, oil 2.96%, gas 3.74% respectively.



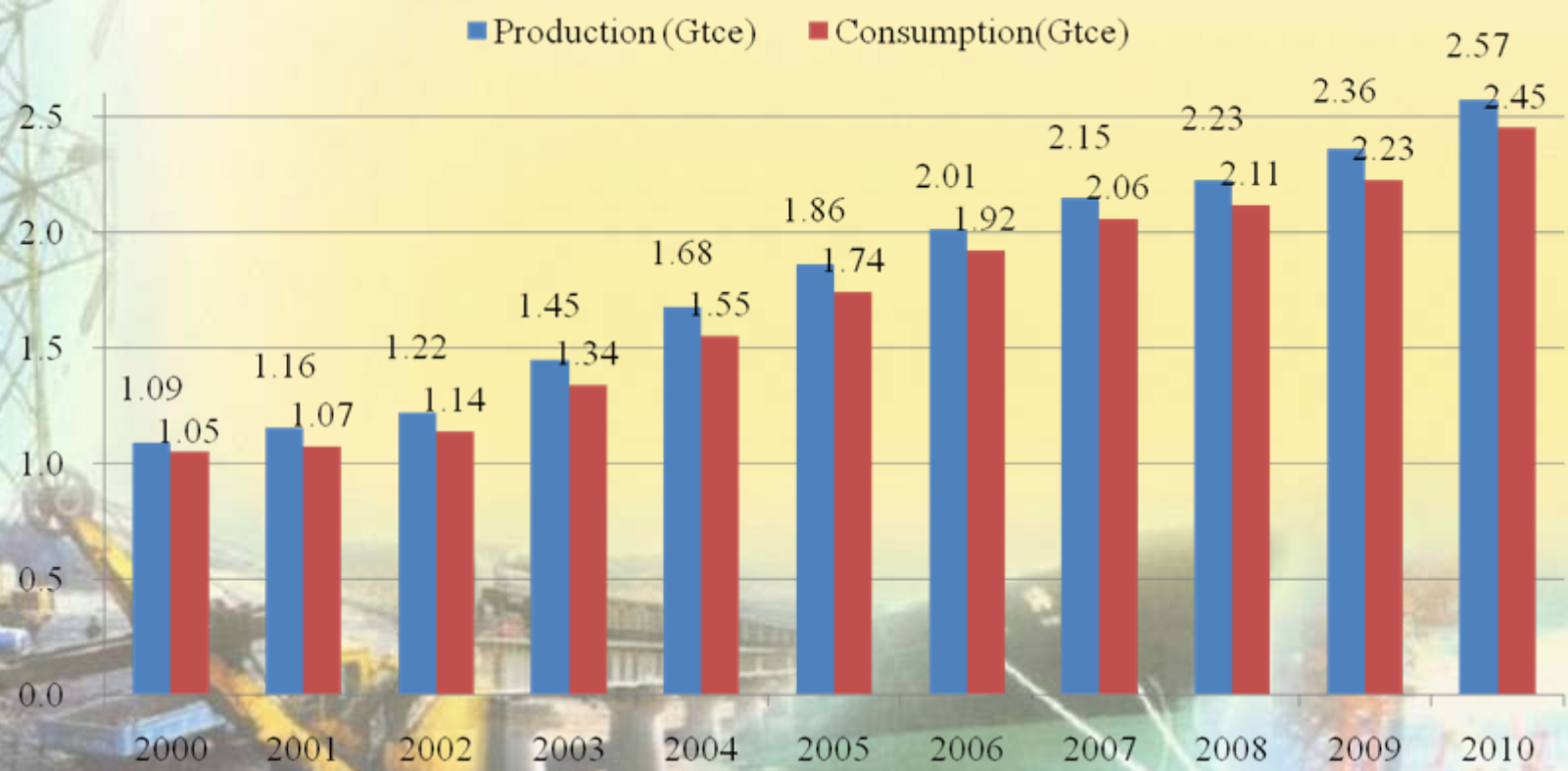


China becomes the largest energy producer and the second energy consumer

China produced 2.8Btce of energy, ranking first in the world; and consumed 3.2Btce, ranking the second, only next to USA。

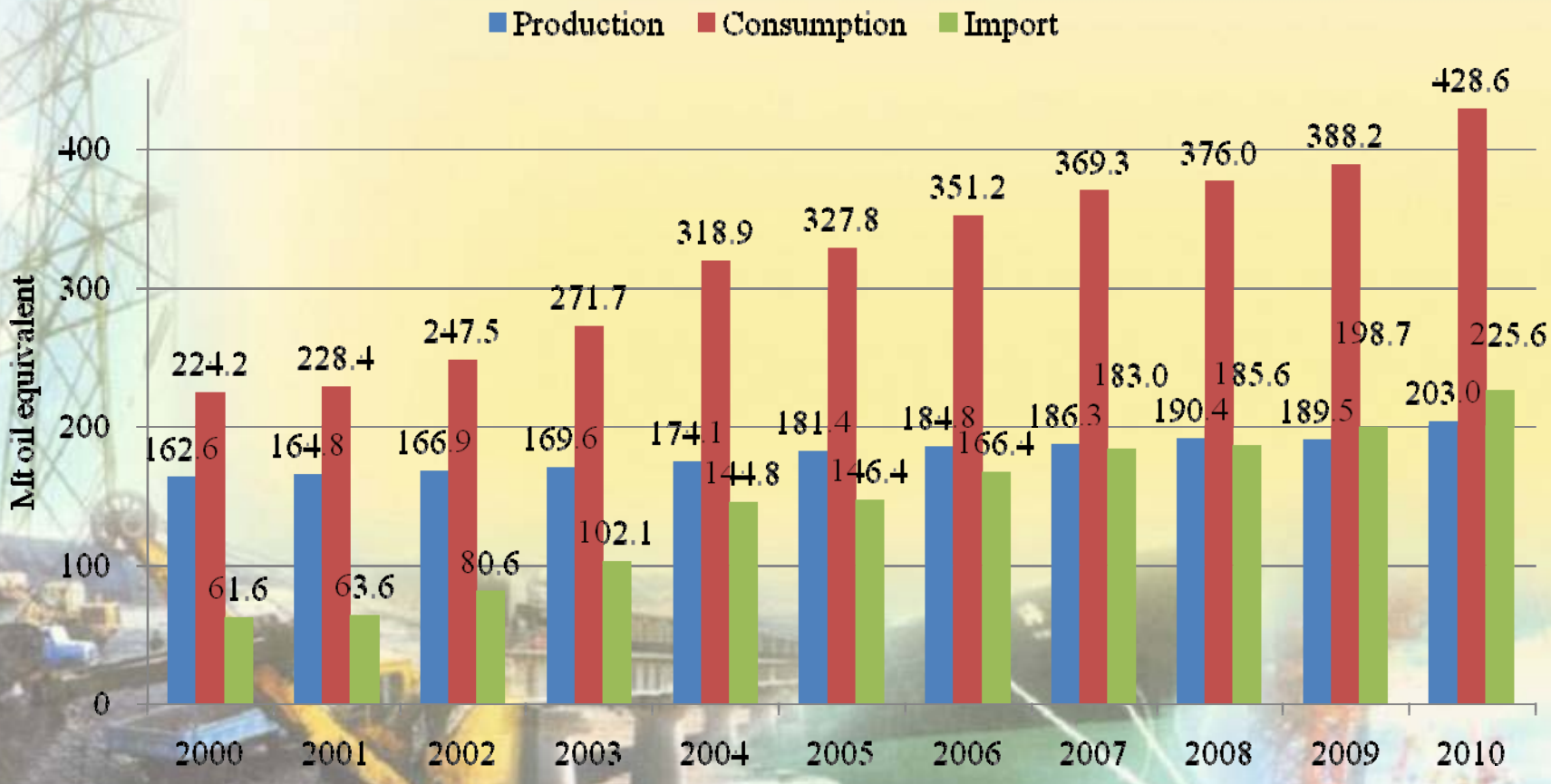
Coal provided important support for fast economy development in China

- The consumption of coal kept growing since 2000
- Coal consumption accounted for 70.28% of the primary total in 2010.
- Coal consumption in China accounted for 48.2% of the global coal consumption in 2010.



Oil consumption kept growing

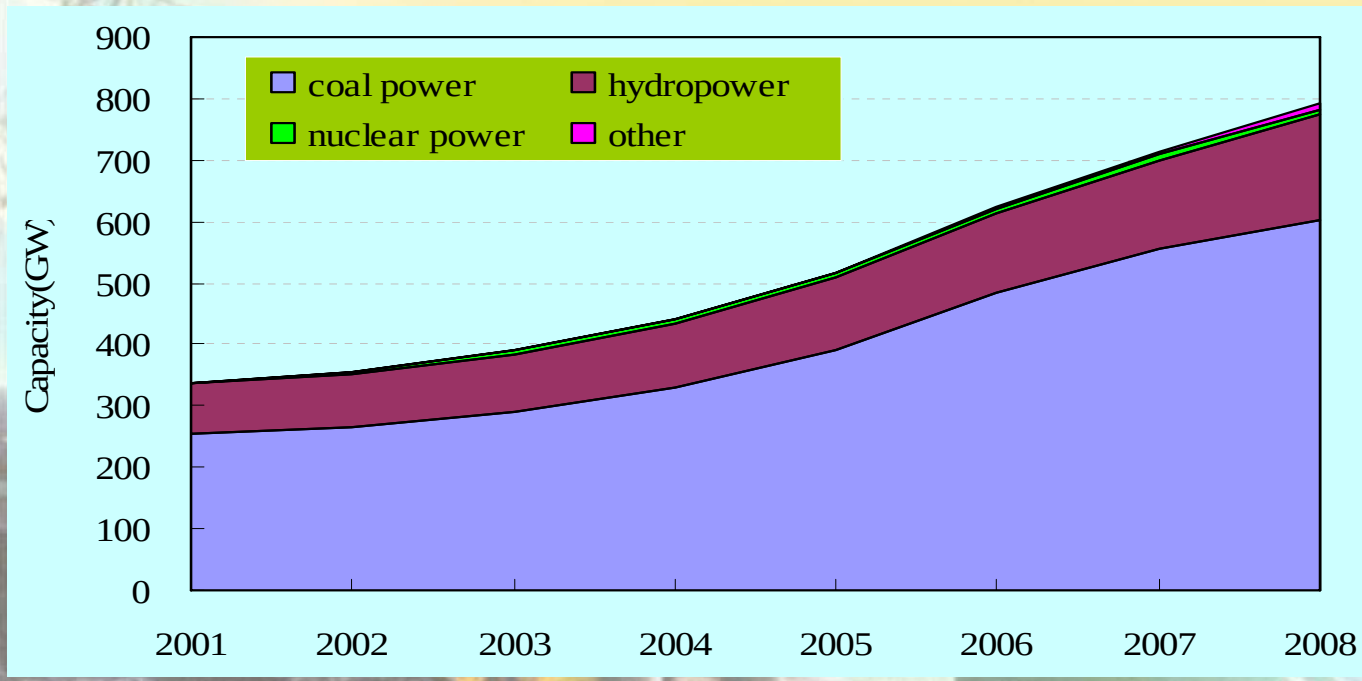
- The oil consumption reached 428.6 Mton, with 225.6Mton imported, with overseas dependency of 52.64%.
- China has become the world second oil consumer and the third oil importer.

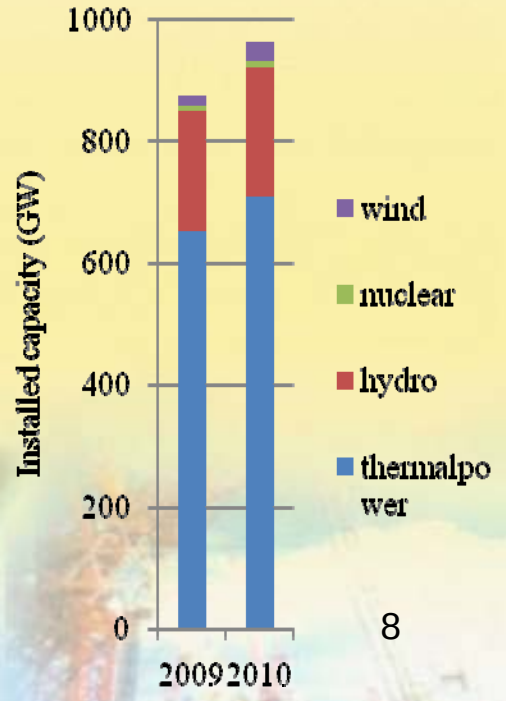


Power capacity grew rapidly

The total power generation capacity surpassed1000GW, ranking second around the world.

- **Coal fired capacity 765GW.**
- **Hydropower capacity 230GW.**
- **Nuclear power 12.5GW in operation, and 36.5GW under construction.**





Renewable energies developed fast

Main renewable energies

type	capacity (by 2010)	capacity (by2015)
Wind power	31GW	100GW
Biomass for power for fuel	5GW 2.3Mton	13GW 4.5Mton
Photovotaic	800MW	10-15GW
Solar heater	168 Million m^2	4 00Million m^2
Solar thermal power	0.0	1GW

Strategic requirement

Strategic requirement

- **First of all "Energy saving and efficiency improvement", second "promoting renewable and nuclear energy", reaching 15% of primary energy consumption by 2020.**

- **The carbon emission per GDP by 2020 reduces 40-45% than that of in 2005， as mandatory carbon and energy intensity reduction targets at the national and provincial levels.。**

2. Strategic consideration between energy development and climate control countermeasures

Mid and long term strategies for China's energy development

- **Energy conservation is a priority**
- **Base on the inl resources and market**
- **Promote multi-component development**
- **Rely on technologi**
- **Protect the environment**
- **Promote mutual corporation and benefit each other**

China's energy industry development should be based on domestic resources and market, and insist in the principle of equality, mutual-beneficial and win-win principle. China will enhance corporation with other countries in energy sector with a frank and practical attitude, improve the cooperation mechanism, broaden the fields for corporation, and ensure the security and stability of international energy market.

preparation on energy for future development

The background and basis for the strategies for China's energy technologies

Policies and Laws by Chinese government to promote energy development

- In 2006, *Mid and Long Term Outline for China's technologies Development Plan* (2006~2020)
- In 2006, *Mid and Long Term Outline for China's Energy Industry Development Plan* (2006~2020)
- In 2006, *Law of the China's renewable energy*
- In 2007, *Mid and Long Term Outline for China's Renewable Energy Development*
- In 2008, *Mid and Long Term Special Plan for Energy conservation*

The background and basis for the strategies for China's energy technologies

Policies and actions by Chinese government to cope with global climate change

- In 1992, Chinese government signed *the UN Framework Convention on Climate Change*
- In 1998, Chinese government signed *the Kyoto Protocol*
- In 2004, MOST published *China's Scientific and Technological Actions on Climate Change*
- In 2007, Chinese State Council published *China's National Climate Change Program*

3. Energy technology development strategy and key tasks from 2011 to 2015

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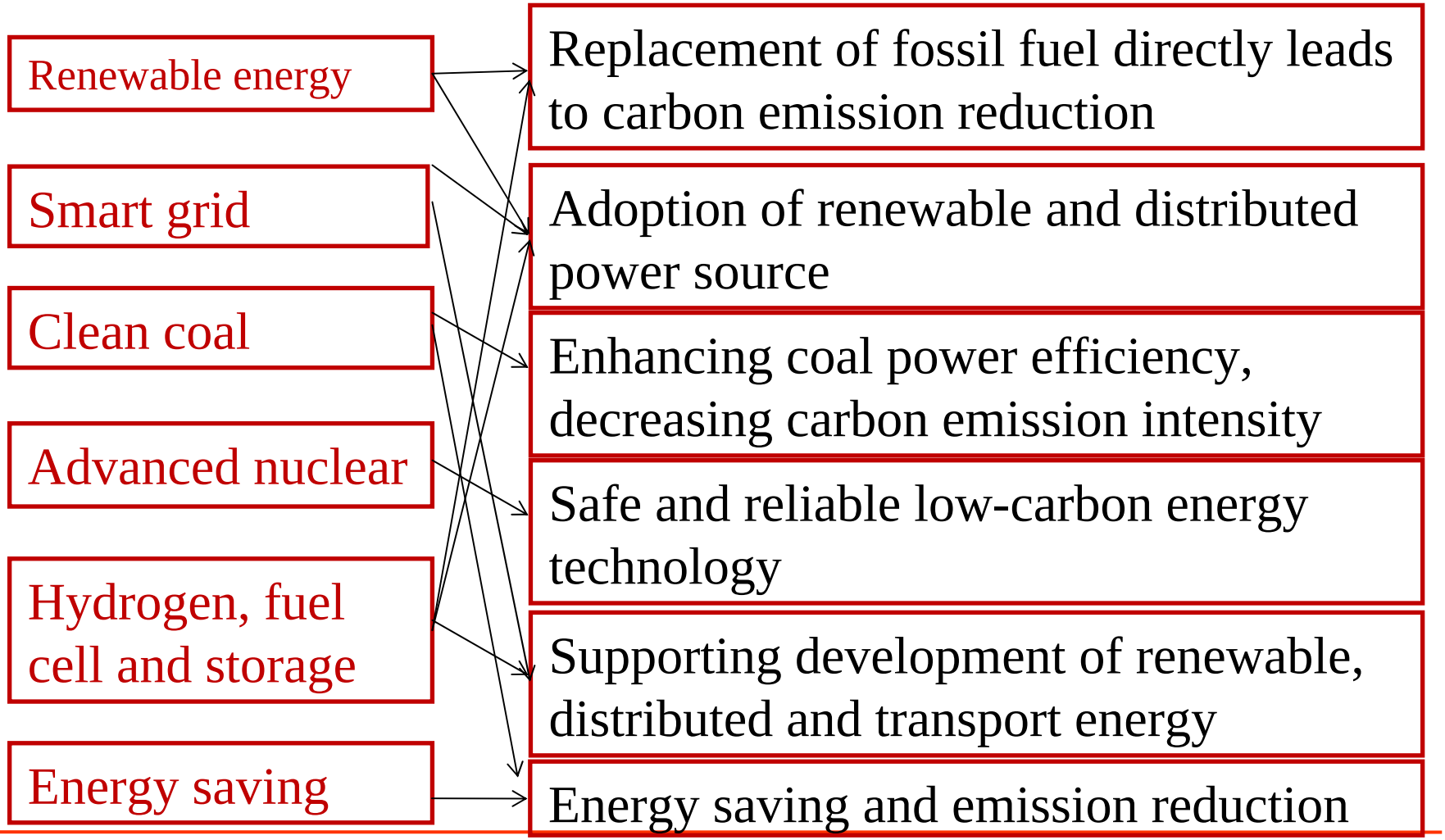
Development strategy



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Four priority projects

- Smart grid
- Clean coal
- Solar technology
- Wind power

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Priority project – smart grid

1. Grid connection for large-scale renewable and distributed power sources
2. Electric vehicles application's impacts on the grid
3. Large-scale energy storage technology and system
4. Smart dispatching technology, intelligent operation and control of large grid
5. Demonstrations of integrated smart grid

Priority project – clean coal

1. Promoting large-scale coal-based multi-generation demonstration plant for gasfication, liquefaction and chemical products.
2. Development in key technologies and equipment for USC, IGCC and CFB.
3. Demonstration on pollutant control, CCUS for coal-fired plants.

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Priority project – solar energy

1. Development of technologies, processes and equipment for manufacturing of solar materials, components and system
2. Development of key technologies and equipments for large-scale solar power generation system
3. The standards for verification and monitoring of solar technology and products
4. Efficiency of crystal silicon cell above 20%, the thin film silicon solar cell above 10%, the cost of investment for per kW less than RMB 12000-13000 yuan, on-grid power price for per kWh less than RMB 0.8 yuan.

Priority project – wind power

1. Industrialization of technology for overall unit and key parts of 3-5MW wind turbine
2. Development of prototype for large scale (10MW) wind turbine
3. Eestablishment of large-scale common test and verification platform
4. Design, construction, operation and maitenance technologies for off-shore wind farm
5. Technologies for access to the power grid

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Four key tasks

- Geothermal, ocean and biomass energies
- Advanced nuclear technology
- Hydrogen, fuel cell and distributed CHP system
- Energy saving and storage

Key task – geothermal, ocean and biomass energy

Geothermal

- Mid-low-temperature power generation
- Comprehensive use of from hot dry rocks

Ocean energy

- Tidal power generation
- Current and wave power generation

Biomass

- Direct combustion, co-fire with coal and gasification for power generation or co-generation
- Biomass to clean fuels

Key task – advanced nuclear

Nuclear safety

- Safety technology for power plant in operation
- Emergency technology for accidents
- Safety equipment development

Advanced reactor and fuel cycle

- Ultra-high-temperature gas-cooled reactor
- Advanced fuel cycle

Key task – hydrogen, fuel cell and distributed energy

Advanced hydrogen storage technology

- Hydrogen production from renewable or fossil fuel
- Hydrogen storage and hydrogen station

Fuel cell

- Application of fuel cell
- Integration of hydrogen production and fuel cell

Distributed CHP system

- Hydrogen-based CHP multi-generation demonstration
- Micro-gas turtine CHP integration and demonstration

Key task – energy reservation and storage

Energy reservation

- Energy reservation and residue heat recovery from industrial process
- High-efficiency building energy reservation

Energy storage

- Chemical energy storage
- Physical energy storage

4. Proposal for international cooperation in clean energy

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- **We have a lot of common interests**
  - Ensuring information exchange and share
  - Reducing CO_2 emissions and mitigate climate change
  - R&D on clean energy technologies
  - Looking for commercial cooperatioin in energy sector

- **All stakeholders should be involved in the cooperation**
  - Research institutes
  - Universities
  - Industry
  - Governmental organizations

Thanks for your attention!