CAETS 2021
ARGENTINA
Engineering a Better World
THE FUTURE OF ENERGY

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# Nuclear Energy and National Strategy of Carbon Neutrality

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中国工程院
CHINESE ACADEMY OF ENGINEERING

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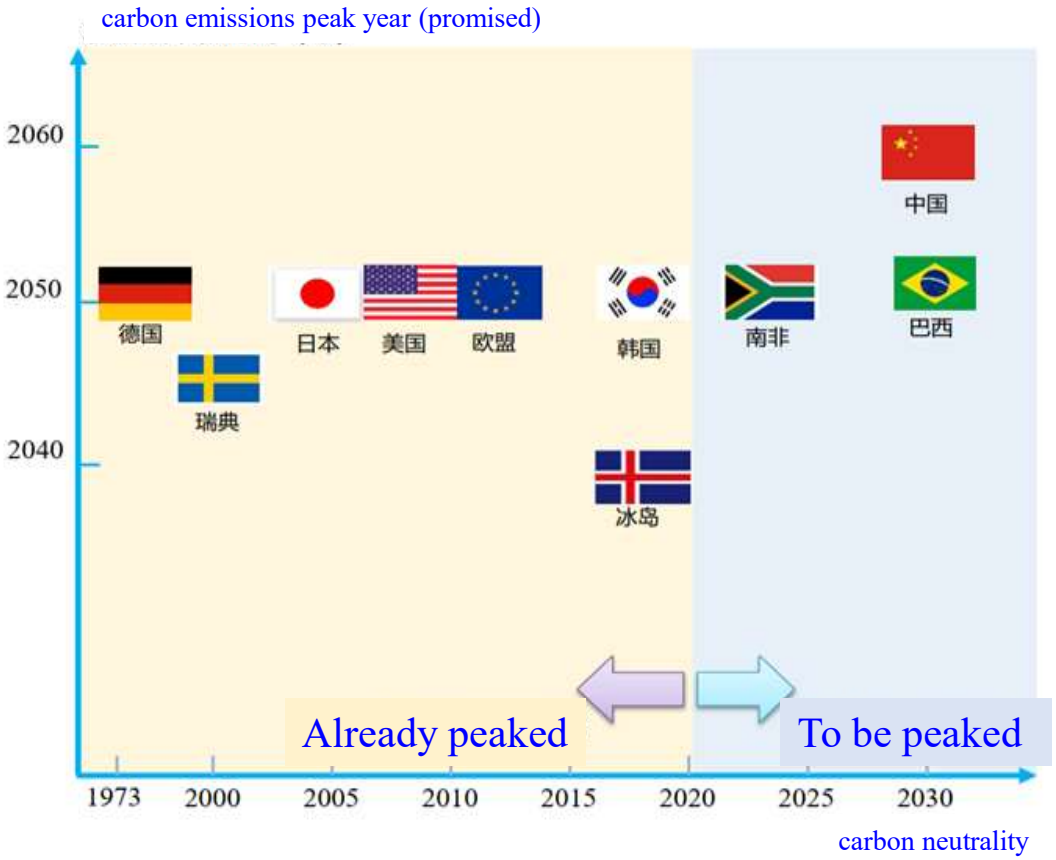
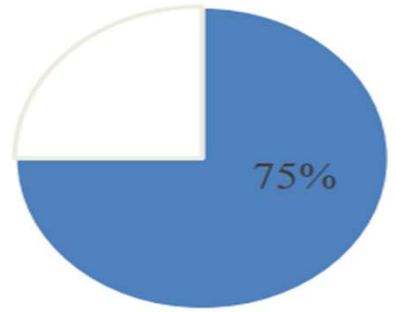
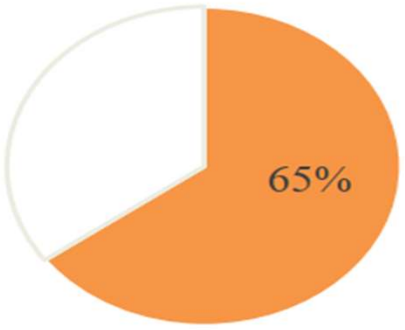



**131 countries with >75% of the global total GDP**




**Over 65% of the global total greenhouse gas (GHG) emissions**

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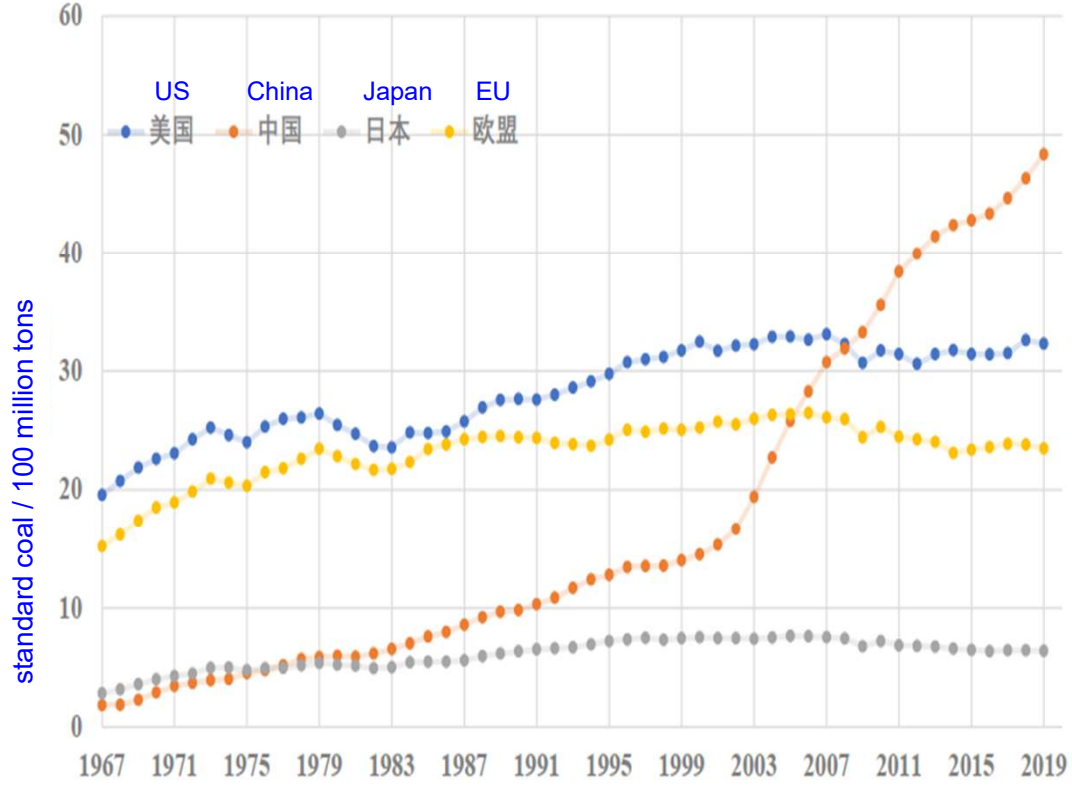
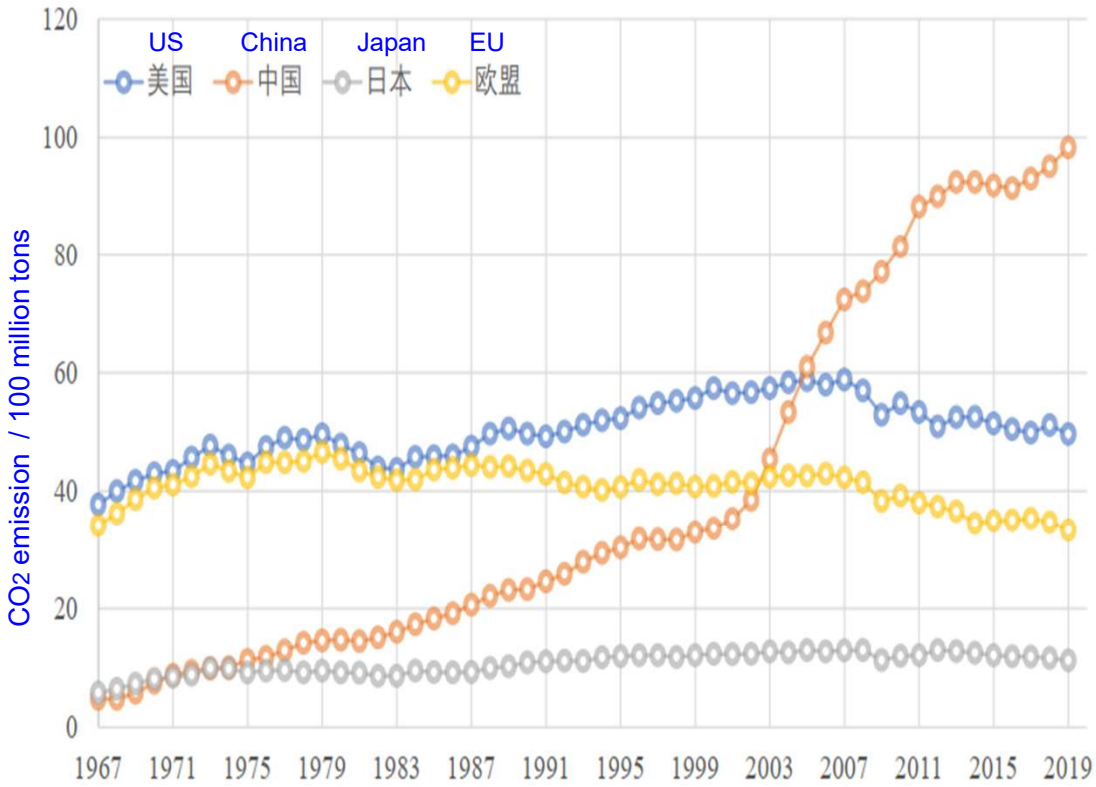
# 1. National goals of carbon emissions peak and carbon neutrality

## 1.1 21st Century – "the Century of Carbon Neutrality"



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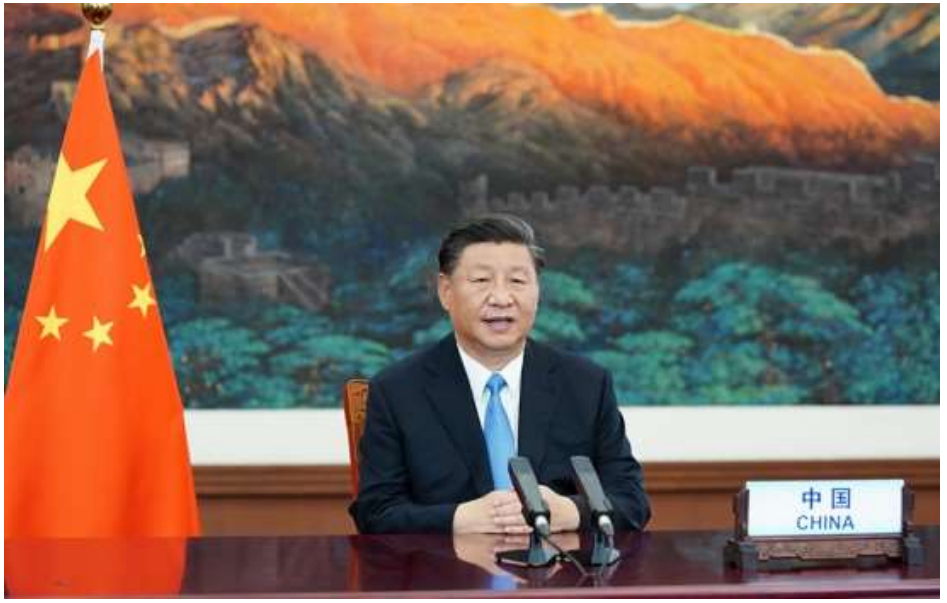
# 1. National goals of carbon emissions peak and carbon neutrality

## 1.2 "Solemn statement of a responsible major country"

**" China will scale up its Intended Nationally Determined Contributions by adopting more vigorous policies and measures. We aim to have $CO_2$ emissions peak before 2030 and achieve carbon neutrality before 2060."**




**-- China's President Xi Jinping at the 75th Session of the United Nations General Assembly**

**September 22, 2020**

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# 2. Actions for carbon emissions peak and carbon neutrality

## 2.1 Major plans of Chinese government


能源生产和消费革命战略

（2016—2030）

（公开发布稿）

2016 年 12 月

**"Goals and requirements: In 2021-2030, the use of renewable energy, natural gas and nuclear power will continue growth, while the use of high-carbon fossil fuels will significantly reduce."**

**"China must 'establish a clean & low-carbon and secure & efficient energy system', and implement the national energy strategy of 'Four Revolutions and One Cooperation'."**

**"China will accelerate the establishment of an energy supply system that features complementary and coordinated development of coal, oil, gas, nuclear energy, new energy and renewable energy."**

- **Energy Production and Consumption Revolution Strategy (2016-2030) issued by NDRC and NEA, 2017**

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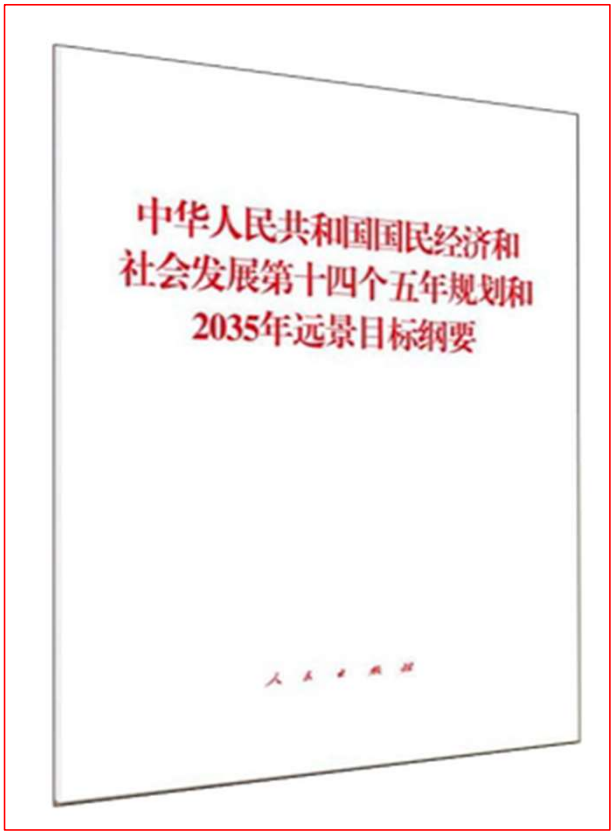
# 2. Actions for carbon emissions peak and carbon neutrality

## 2.1 Major plans of Chinese government




**"China will implement its 2030 INDCs to combat climate change and develop the action plan for carbon emissions peak by 2030; improve the control system of total energy consumption and energy intensity, and focus on the control of fossil energy consumption; … promote clean & low-carbon and secure & efficient energy utilization…; and anchor efforts to achieve carbon neutrality by 2060, and take more powerful policies and measures."**

- **The Outline of the 14th Five-Year Plan (2021-2025) and the Long-Range Objectives Through the Year 2035**
  **NPC, March 2021**

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# 2. Actions for carbon emissions peak and carbon neutrality

## 2.1 Major plans of Chinese government

**China needs to "plan the implementation paths of carbon emissions peak and carbon neutrality in such key aspects as industrial restructuring, energy development and power allocation, and research specific measures for carbon emission reduction by taking the actual development conditions of industry, buildings, transportation and other fields into consideration."**

- Industrial restructuring
- Energy development
- Power allocation
- Industry
- Buildings
- Transportation

- **The Outline of the 14th Five-Year Plan (2021-2025) and the Long-Range Objectives Through the Year 2035**
  **NPC, March 2021**

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# 2. Actions for carbon emissions peak and carbon neutrality

## 2.2 Carbon Emissions Trading Scheme

| | |
|---|---|
| 标　题：碳排放权交易管理办法（试行） | 发文机关：生态环境部 |
| 发文字号：生态环境部令 第19号 | 来　源：生态环境部网站 |
| 主题分类：城乡建设、环境保护\其他 | 公文种类：命令（令） |
| 成文日期：2020年12月31日 | 发布日期：2021年 |

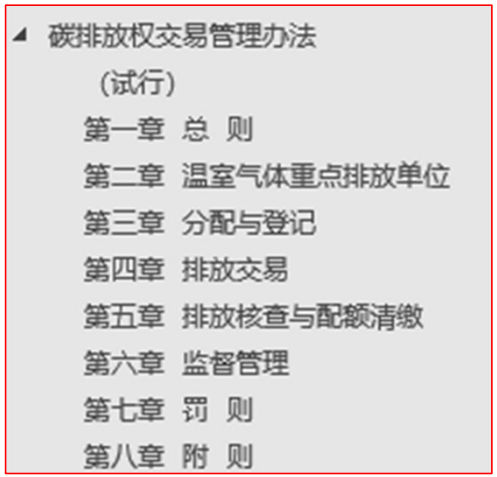
碳排放权交易管理办法（试行）

部令 第19号

《碳排放权交易管理办法（试行）》已于2020年12月25日由生态环境部部务会议审议通过，现予公布，自2021年2月1日起施行。

生态环境部部长 黄润秋

2020年12月31日



碳排放权交易管理办法

（试行）

第一章 总 则

第二章 温室气体重点排放单位

第三章 分配与登记

第四章 排放交易

第五章 排放核查与配额清缴

第六章 监督管理

第七章 罚 则

第八章 附 则

**The Regulation on Carbon Emissions Trading has come into effect on February 1, 2021.**

- **Aims at regulating carbon emissions trading and related activities across the country.**
- **Pilot carbon emissions trading markets since 2011**
  - **~3,000 key carbon emitters in over 20 sectors,**
  - **Trading volume ~430 million tons $CO_2$ equivalent**
  - **Transaction value ~ USD 1.5 billion**
- **In the first fulfillment cycle, the power generation sector will be the first to see country-wide carbon emissions trading.**

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# 2. Actions for carbon emissions peak and carbon neutrality

## 2.2 Carbon Emissions Trading Scheme


- **2021 is the first fulfillment cycle of the National Carbon Emissions Trading Market:**
  - **2,162 key carbon emitters in the power generation sector**
  - **~ 4.5 billion tons of CO2 emissions**
  - **The world's largest carbon trading market**

- **Vice Premier Han Zheng launched the Online Platform for China's National Carbon Emissions Trading Market**
**July 16, 2021**

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# 2. Actions for carbon emissions peak and carbon neutrality

## 2.3 Actions of SOEs for "carbon emissions peak and carbon neutrality"

**All SOEs are playing their part in realizing the goals of carbon emissions peak and carbon neutrality by developing and implementing their green development plan.**

- **(1) Accelerating the promotion of transition to green and low-carbon development and the industrial restructuring.**
- **(2) Speeding up the optimization of energy mix and proactively participating in the of carbon emissions trading market.**
- **(3) Improving the energy and resource utilization efficiency, and continuously enhancing the control of total energy consumption and energy intensity.**
- **(4) Advancing breakthroughs and expediting deployment of green and low-carbon technologies.**

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# 2. Actions for carbon emissions peak and carbon neutrality

## 2.4 Suggestions on carbon emissions peak and carbon neutrality from high-level think tanks

**"It is a significant national strategic decision to achieve carbon neutrality by 2060, which will have extensive and profound economic and social changes in a systematic way. In view of this, China needs to make in-depth researches on the path for how to achieve the goal of building a modern country and the goals of "carbon emissions peak and carbon neutrality" in a coordinated way.**

**Energy transition is the main path to carbon neutrality.**

**In the face of the daunting challenge of putting equal focus on development and carbon emission reduction, China needs to accelerate the establishment and improvement of relevant systems, mechanisms and legal systems, accurately identify the main directions of scientific and technological innovation, and blaze a path to carbon neutrality that is adapted to China's development conditions."**

**- CAE, as an *Engineering Technology Think Tank*, one of the main functions and central work is organizing strategic consulting research and providing support services for national decision-making.**

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# 2. Actions for carbon emissions peak and carbon neutrality

## 2.4 Suggestions on carbon emissions peak and carbon neutrality from high-level think tanks

**Some specific recommendations from CAE's studies:**

- **(1) Improving the carbon markets and establishing a carbon emissions management system.**
- **(2) Giving priority to energy saving and accelerating the replacement of electricity from fossil fuels at end-user side.**
- **(3) Speeding up the development of distributed energy systems and gradually building a new power system and supporting service system adapted to large-scale development of renewable energy.**
- **(4) Adhering to the innovation-driven approach and developing major scientific and technological innovation projects and platforms.**
- **(5) Developing green finance to support the energy transition.**

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# 3. Role of nuclear energy in the national strategy of carbon neutrality

## 3.1 China's position in nuclear energy development

"We will take solid steps toward the goals of achieving carbon emissions peak and carbon neutrality. We will draw up an action plan for peaking carbon emissions by 2030… and take active and well-ordered steps to develop nuclear energy on the basis of ensuring its safe use."

The development and utilization of nuclear energy can effectively promote energy saving and emission reduction, and represent an import means to combat climate change and achieve the goals of carbon emissions peak and carbon neutrality.

- The 2021 Report on the Work of the Government
Premier Li Keqiang, March 5, 2021

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# 3. Role of nuclear energy in the national strategy of carbon neutrality

## 3.2 Status quo of nuclear energy in China

**By December 31, 2020**

- **Nuclear power reactors in operation : 49**
- **Total installed capacity: 51,027 MW**
- **Nuclear power output: 366 billion kWh**
- **% of China's total power output: 4.94%**

- **In 2020, all nuclear power reactors had a very good track record in operation.**
- **Only one Level 1 event under the International Nuclear Event Scale (INES) occurred, and no event at above Level 1 occurred.**

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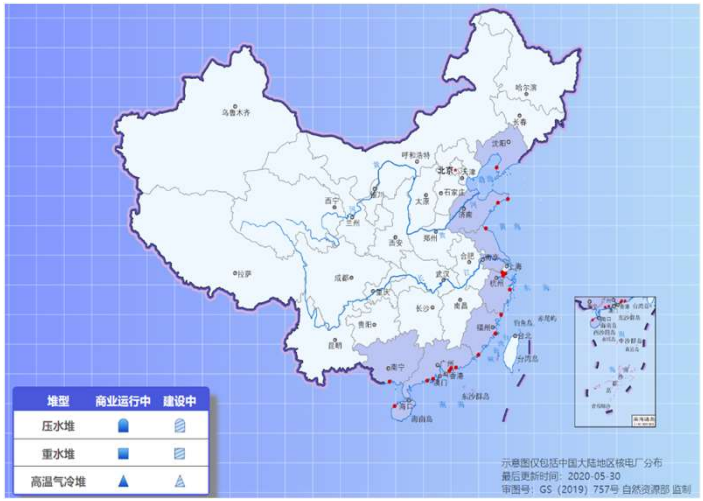
# 3. Role of nuclear energy in the national strategy of carbon neutrality

## 3.3 Prospects of China's nuclear energy

**China's nuclear energy development trends in the "14th Five-Year Plan" period:**

- Safely and reliably promoting the construction of third generation nuclear power plants in coastal areas.
- Promoting the demonstration of small modular reactor, 600MW commercial HTGR, offshore floating nuclear power platform and other advanced reactors.
- Build low and intermediate level radioactive waste disposal plant and spent fuel treatment plant.
- Developing integrated nuclear energy utilization demonstration projects.
- Strict prevention and mitigation of environmental risks.
- The installed capacity in operation will reach 70GW.



# 3. Role of nuclear energy in the national strategy of carbon neutrality

## 3.3 Prospects of China's nuclear energy

**Prospects in the studies of CAE on China's nuclear energy**

- China should accelerate large-scale development of the G-III nuclear energy technology and drive forward the R&D of advanced nuclear power technologies.
- The central China provinces should start nuclear energy development.
- 6~8 nuclear power reactors should be approved for construction annually, and that the subsequent installed capacity of nuclear power should account for at least 10% of China's total and the nuclear power output should make up more than 20% of China's total.
- Other nuclear energy applications such as heating, sea water desalination and hydrogen production should be demonstrated.

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# 3. Role of nuclear energy in the national strategy of carbon neutrality

## 3.4 Introduction of "China-France Nuclear Energy Research" Program – Phase I

- In 2017, the Chinese Academy of Engineering, the National Academy of Technologies of France and the French Academy of Sciences started a joint Program on the nuclear energy future.
- It analysed the development process, safety, challenges and possible solutions of nuclear energy.


Joint recommendations for the nuclear energy future

Released by the three Academies

Chinese Academy of Engineering
National Academy of Technologies of France
French Academy of Sciences

August 31, 2017

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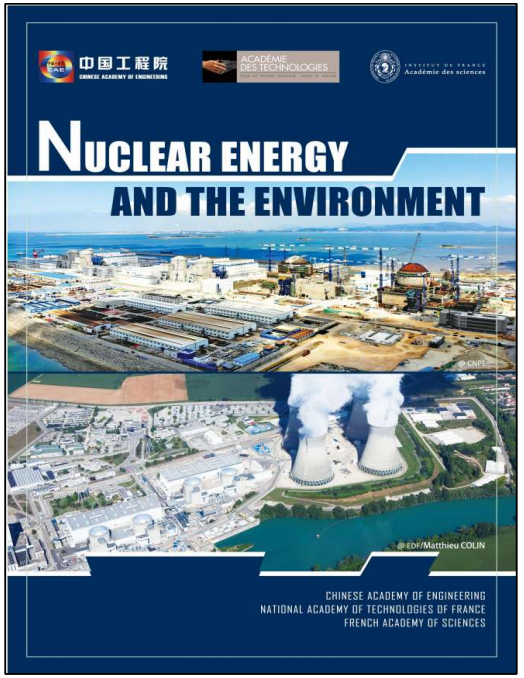
# 3. Role of nuclear energy in the national strategy of carbon neutrality

## 3.4 Introduction of "China-France Nuclear Energy Research" Program – Phase II

- In 2018, the three Academies started Phase-II Program. The topic is Nuclear and Environment.
- The second report deals more specifically with the impacts of the nuclear energy cycle on the environment in response to a strong expectation of society for integrating environmental issues into all human activities.



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# 3. Role of nuclear energy in the national strategy of carbon neutrality

## 3.5 Profile of "China-France Nuclear Energy Research" Program

**The common understandings (conclusions of the program) agreed between three Academies of two countries:**

- **Producing very few GHG emissions, nuclear energy is one of the most effective solutions to combat the global challenge of climate change.**
- **Nuclear energy has small negative impacts on the environment, and even if a severe accident occurs, the environmental impacts are still limited.**
- **The wastes from nuclear energy could be properly disposed of.**
- **The deployment of new technologies can effectively prevent the occurrence of severe accidents.**
- **Nuclear energy is a clean and sustainable energy source.**

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## ☆ Conclusion

**Nuclear energy is an important contributor to China's national security and energy security. As a "clean & low-carbon and secure & efficient" base-load energy form, nuclear energy will play an increasingly important role in supporting China's national strategy of achieving the goals of carbon emissions peak and carbon neutrality.**

**The Chinese people have also realized that the stable and sustained development of nuclear energy is indispensable to the goal of building China into a modern country.**

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# Thank You for Your Attention!

Dr. Zhao Xiangeng