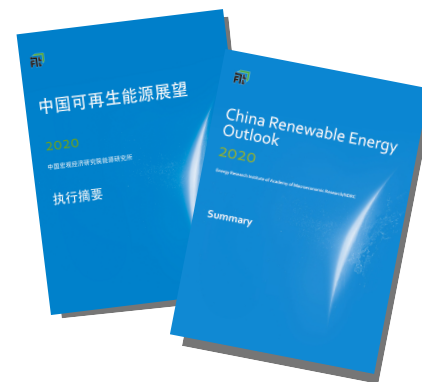


# It is possible to reach the “30-60 carbon targets” – China Renewable Energy Outlook 2020

## CREO will upgrade to CETO from 2021

China Renewable Energy Outlook 2020 (CREO 2020) is the fifth annual outlook from the Energy Research Institute, Development and Reform Commission (ERI of NDRC). The focus of CREO 2020 on a long-term low-carbon vision has become even more topical to achieve the “30-60 carbon targets”. Even though these targets are challenging, our analyses show that it is possible to reach the targets and that a low-carbon strategy is the only feasible way to ensure sustainable economic growth for China in the future. CREO 2020 is the latest outlook that focuses on renewable energy. The [English](#) summary report is ready for download and the Chinese version will be released separately. From 2021, the ERI of NDRC will prepare comprehensive China Energy Transformation Outlooks (CETOs).



## The pathway to carbon neutrality in 2060

The scenarios in CREO 2020 comprise two development pathways. The Stated Policies scenario (SPS) expresses firm implementation of the announced energy sector and related policies. The Below 2 °C scenario (B2D) shows how China can build an energy system for the ecological civilisation. The scenarios show that it is possible to have a CO<sub>2</sub> peak before 2030 for the Chinese energy sector. In the B2D scenario, energy-related CO<sub>2</sub> emissions peak just before 2025, highlighting the importance of significant transformation during the 14th Five-Year-Plan period. The main driver for the B2D scenario is a hard target for energy-related CO<sub>2</sub> emissions reduction implemented by a strategy with **energy efficiency**, **renewable electricity**, **electrification** and **sectoral transformation** at the core.

## Primary energy demand peak in 2030

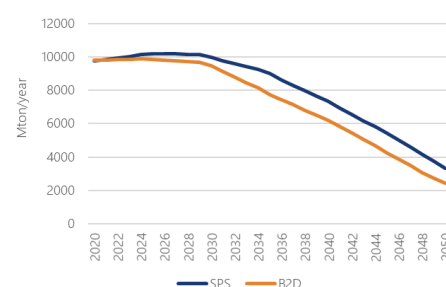
The total primary energy demand will peak in 2030 in both scenarios, with a lower peak and a steeper decrease in the B2D scenario. In both scenarios, non-fossil fuels and natural gas gradually substitute coal from 2020. After 2025, oil consumption starts declining. Natural gas peaks in 2040, with a slight decrease towards 2050. Wind and solar energy play a more prominent role in the B2D scenario.

## The energy consumption control decouples energy demand from economic growth

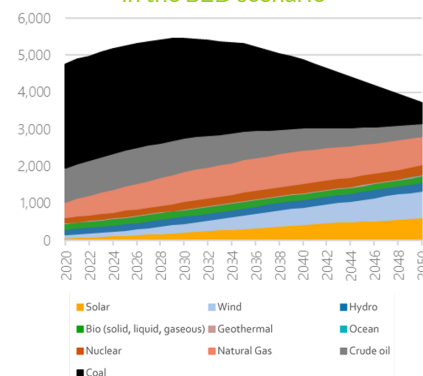
The final energy consumption in the B2D scenario will peak at 3,971 Mtce around 2030, with a very flat peak, then decreasing smoothly. It drops at a rate of 0.4% per year in average from 2020 to 2050, while GDP grows by 4.5% annually. Meanwhile, the final energy consumption structure is changed due to the economic reform process in China. The share of industrial energy consumption drops from 58% in 2020 to 41% in 2050. Several drivers cause the decoupling:

- The economic reform in China will move economic activity from heavy industry towards high tech industry and services that have much lower energy consumption per added value;
- The shift from direct fuel combusting to the use of electricity will increase the energy efficiency in the end-use sectors significantly (see below for details on electrification);
- Focus on energy efficiency and efficiency gains from replacing old with new equipment will lower energy consumption in different sectors, especially in the industry sector.

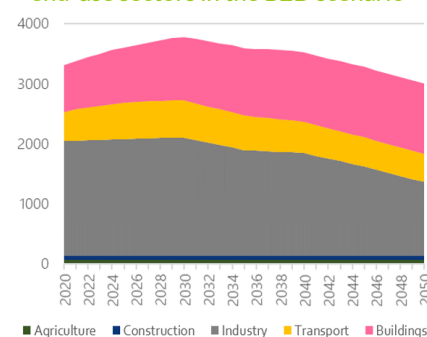
Energy sector CO<sub>2</sub> emissions in the CREO 2020 scenarios



Total primary energy demand (Mtce) in the B2D scenario



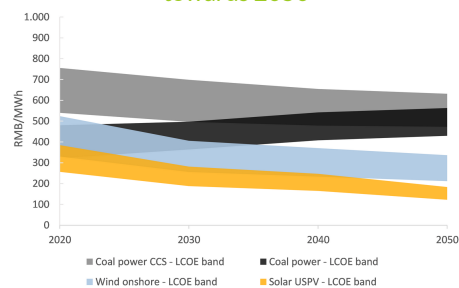
Energy consumption (Mtce) in the end-use sectors in the B2D scenario



## Solar and wind power makes the power sector green and clean

Coal-based power production is gradually phased out and replaced by renewable energy, mainly wind power and solar PV. By 2030, the B2D scenario has 1,860 GW wind and solar power capacity installed, which is higher than the targeted 1,200 GW. This is mainly because wind and solar in China are cost-competitive with fossil generating sources already, and are estimated to be cheaper than coal power in the near future (with and without CCS), even with the most conservative assumptions regarding their annual full-load hours. The share of renewables in power production increases from nearly 30% in 2020 to 88% in 2050 in the B2D scenario.

LCOE by fuel in China from 2015 towards 2050



## Electrification strategy decreases coal and oil usage in end-use sectors

With the deepening of industrial electrification (especially in the iron industry) and the promotion of electric vehicles, electricity consumption will increase substantially. In 2050, the general electrification rate in the end-use sectors reaches 68% in the B2D scenario.



**Industry:** The electrification rate (share of electricity of the total final energy consumption) will increase from around 27% in 2020 to 52% in 2050 in the B2D scenario; the most rapid electrification will happen in the subsectors including ferrous metals, non-ferrous metals, chemicals, machinery manufacturing, food and paper;

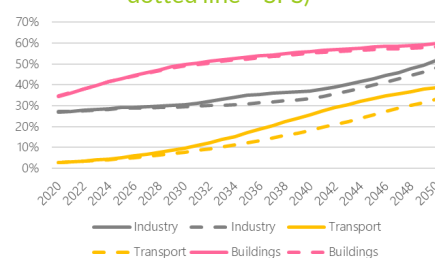


**Transport:** The electrification rate will grow from 3% in 2020 to 39% in 2050 in the B2D scenario; electric vehicles and plug-in hybrid vehicles will be the main route, of which 450 – 490 million EVs (including passenger and freight) are expected on the road by 2050;



**Building:** The electrification rate will grow from 35% in 2020 to 60% in 2050.

Electrification rate development for key end-use sectors (solid line = B2D, dotted line = SPS)



## Regulation and reforms can support the energy transformation

The scenario analyses show that it is technically feasible and beneficial to have a genuine transformation of the Chinese energy sector. However, the energy transformation does not happen by itself. A dedicated policy effort is necessary to encourage change and remove barriers to implementation.

**01 Power markets as the key driver for power system transformation and RE integration.** Establishing efficient, transparent and liquid short-term power markets with clear price signals is fundamental for enhancing flexibility in the power system, easing the integration of VRE.

**02 Lower risk for green investments will boost the deployment of renewables.** Support schemes like feed-in-premium or contracts for differences (CfD) might be necessary for a period for technologies like offshore wind and concentrated solar power (CSP), while power purchase agreements (PPA) would be a risk minimising tool for more mature technologies and these instruments must be developed in line with the power market setup. *In May 2021, the NDRC and NEA jointly issued the policy "Notice to Further Accomplish the Work Relevant to Spot Power Market Construction," reflecting this suggestion. It clearly encourages new renewable energy projects to sign minimum of 20-year long-term contracts with power companies and determine a power price through negotiations.*

**03 Control measures to guide the transformation in the right direction.** At the level of policy design, the Chinese government has continuously formulated plans and regulations focusing on structural energy reform, carbon emission reduction and air pollution control.

- Mandatory renewable power consumption mechanism - to realise that all provinces will bear the responsibility for the development and consumption of renewable power equally by 2030;
- Total coal consumption control - to decrease the share of coal in its overall energy mix and decrease the dominant role of coal in electricity generation;
- Air pollution and control explicit policies - control major air pollutant emissions such as SO<sub>2</sub> and NO<sub>x</sub>, as well as reduce the concentration of PM 2.5 and number of heavily polluted days, especially in key regions.