



2-3. Preliminary Results of APEC Energy Demand and Supply Outlook 9th Edition: Case of China

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Transformation

Energy Supply

Key Findings

Macroeconomic backdrop



- China's population is assumed to follow the UN DESA 'low' projection, with the population falling from the current 1.4 billion to under 1.2 billion by 2060.
- Real GDP is expected to grow steadily and amount to around 60 trillion USD in 2060.
- China's per capita GDP will exceed \$30,000 by 2035, reaching the level of a moderately developed economy. By then, China will have the largest middle-class market in the world and form the largest unified market.



Electrification is the main pathway for the energy transition on the demand side



Total Final Consumption by fuel in REF (PJ)

Total Final Consumption by fuel in TGT (PJ)

- In the reference scenario (REF), energy demand peaks in 2035, with oil peaking in 2032 because of the rising use of EVs.
- Improved efficiency will lead to lower energy demand in 2060 from the reference scenario (REF) to the target scenario (TGT). Coal and oil will contribute the most reduction by fuel switching like coal-gas, coal-electricity, and oil-electricity.
- Hydrogen will play an important role in TGT.

Industry will keep its position as the largest energy consumer in China

Total Final Consumption by sector in TGT (PJ)



Total Final Consumption by sector in REF (PJ)

- In REF, the industrial sector contributes 76% of the energy reduction from peak levels (2035) to 2060 (the buildings sector contributes -15%), and in TGT, this contribution is 62%, both exceeding half of the total reduction.
- In both scenarios, the buildings sector will see a steady increase and be the last one to peak, driven by continuous urbanization and the increase in household appliances.

Industry energy demand in REF, 2000-2060 (PJ)

Fossil fuels are hard to be substituted for 100% within the industry



Industry energy demand in TGT, 2000-2060 (PJ)

- Phasing down energy-intensive industries (such as steel and cement), improving energy efficiency, electrification, digitalization etc. will be the main ways to reduce energy demand.
- The electrification shift is even more prominent in TGT, with electricity accounting for almost 69% of industrial energy demand by 2060 (56% in REF).
- Hydrogen is assumed to apply in steel making and chemical subsectors in both scenarios.

Rising use of EVs and declining personal vehicle usage decreases transport energy demand



Transport energy demand in REF, 2000-2060 (PJ)

- With the rising use of EVs, transport energy demand will peak at 2034 in REF and 2029 in TGT. ٠
- The passenger transport activities' reduction motivated by ride-sharing, telework, and public transportation is ٠ another key to decrease the energy demand.
- BEVs are assumed to reach 100% of passenger vehicle sales by 2040 in REF, and by 2035 in TGT. ٠

Building energy demand in REF, 2000-2060 (PJ)

Urbanization and higher incomes increase buildings energy demand



Building energy demand in TGT, 2000-2060 (PJ)

- The economic transition from industry-driven to service-driven will support the electrification of the building sector through increased demand for appliances and lighting. The fast development of data centers and AI will be a new growth point.
- More stringent building standards, such as a better building envelope, will improve energy efficiency by 20% in REF and 36% in TGT by 2060.
- In northern China, where winters are colder than the south, direct gas heating is more efficient and cost-effective than heat pumps, especially in rural areas.







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Electricity demand is increasingly met with renewable generation

Electricity generation in TGT (TWh)



Electricity generation in REF (TWh)

- Carbon-free fuel (wind, solar, hydro, nuclear) will gradually become the main source of electricity generation (in REF 87% and in TGT 93%).
- Coal use peaks in the 2020s, phased down in REF and phased out in 2050s in TGT.
- Gas plays an important backup role during the peak load and early retirement of coal power plants.
- Ammonia/Hydrogen co-firing and CCUS(Carbon Capture, Utilization, and Storage) were not included in the power sector in the first round of modeling in both scenarios.

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Coal fired-power generation will peak around 2030



Capacity in REF, 2020-2060 (GW)

Capacity in TGT, 2020-2060 (GW)

- In REF, the coal-fired power plant still plays an important role, especially during peak times.
- Battery or other energy storage are expected to make breakthroughs and play a key role in grid balance.
- Wind and solar power capacity have the most increase during the projection(from 2021 to 2060). Wind: 2031 GW(REF)
 2291 GW(TGT)
 Solar: 2693 GW(REF)
 3293 GW(TGT)





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Key Findings

Fossil fuels still play an important role in the total energy supply

Total energy supply in TGT, 2000-2060 (PJ)



Total energy supply in REF, 2000-2060 (PJ)

- Fossil fuels are 55% of the energy supply in REF and 41% in TGT in 2060 (Calorific Value Calculation).
- Share of oil and gas will take about 1/4 share of the energy supply in both scenarios.



The majority of coal will be produced domestically

Coal supply in TGT, 2000-2060 (PJ)



Coal supply in REF, 2000-2060 (PJ)

- Due to the resource endowment, the coal supply is the most secure one for the whole energy system.
- After 2026, the import of coal will keep declining through the projection period in both scenarios.



Energy Supply

The majority of crude oil will be imported

Crude oil supply in TGT, 2000-2060 (PJ)



Crude oil supply in REF, 2000-2060 (PJ)

- Domestic crude oil production will maintain at around 8000 PJ (around 200 million tones/year).
- In TGT, the import of crude oil will occupy 63% in 2060, less than 72% in 2021, but still more than half.



Natural gas supply in REF, 2000-2060 (PJ)

The majority of the natural gas will be supplied domestically



Natural gas supply by sector in TGT, 2000-2060 (PJ)

- Domestic natural gas production will remain stable at over 300 billion cubic meters per year in the long term.
- Import of natural gas will peak at 2034 in REF and 2031 in TGT before decline.
- Most of the natural gas will be supplied domestically.







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Energy Supply



Carbon emissions will peak before 2030



Gross CO₂ emissions in REF, 2000-2060 (million tones)



18

Gross CO₂ emissions in TGT, 2000-2060 (million tones)

- Based on the current policy framework and economic and technological development trends, China will achieve its carbon peak in the energy sector before 2030.
- If carbon neutrality can be successfully achieved, power generation will be the most important area for emission reduction.
- Ammonia/Hydrogen co-firing and CCUS were not included in the power sector in the first round of modeling in both scenarios.

Achieving carbon neutrality is a long pathway in China



CO₂ emissions components in REF, 2000-2060 (million tones)



CO₂ emissions components in TGT, 2000-2060 (million tones)

- Increased individual income is the major driver for emission increment.
- Both energy and emissions intensity reductions are needed.
- Improving energy efficiency, developing renewable energy, and reducing coal use are key initiatives to drive carbon neutrality.





Thank you for your attention

