2. APEC Energy Demand and Supply Outlook 9th edition with focus on China

APERC Workshop

The 71st Meeting of APEC Energy Working Group (EWG71)
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Outline

- Introduction
- Results for the APEC region
- Results for China
- Key takeaways
- Summary

Introduction

About the APEC Energy Demand and Supply Outlook

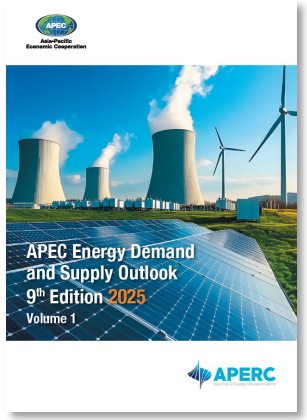
- A priority task under the APEC Energy Action Programme (1995)
- Provides analysis and policy insights on future energy demand and supply in APEC economies
- Volume 1 for APEC region in total and Volume 2 for 21 APEC economies separately
- In the 9th edition, projections extend to 2060.

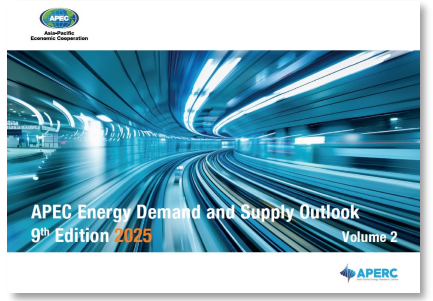
The Reference Scenario (REF)

REF offers economy-specific pathways based on historical trends, recent developments, and APERC's assumptions about the evolution of the energy system within each APEC economy, providing a baseline to compare with TGT projections.

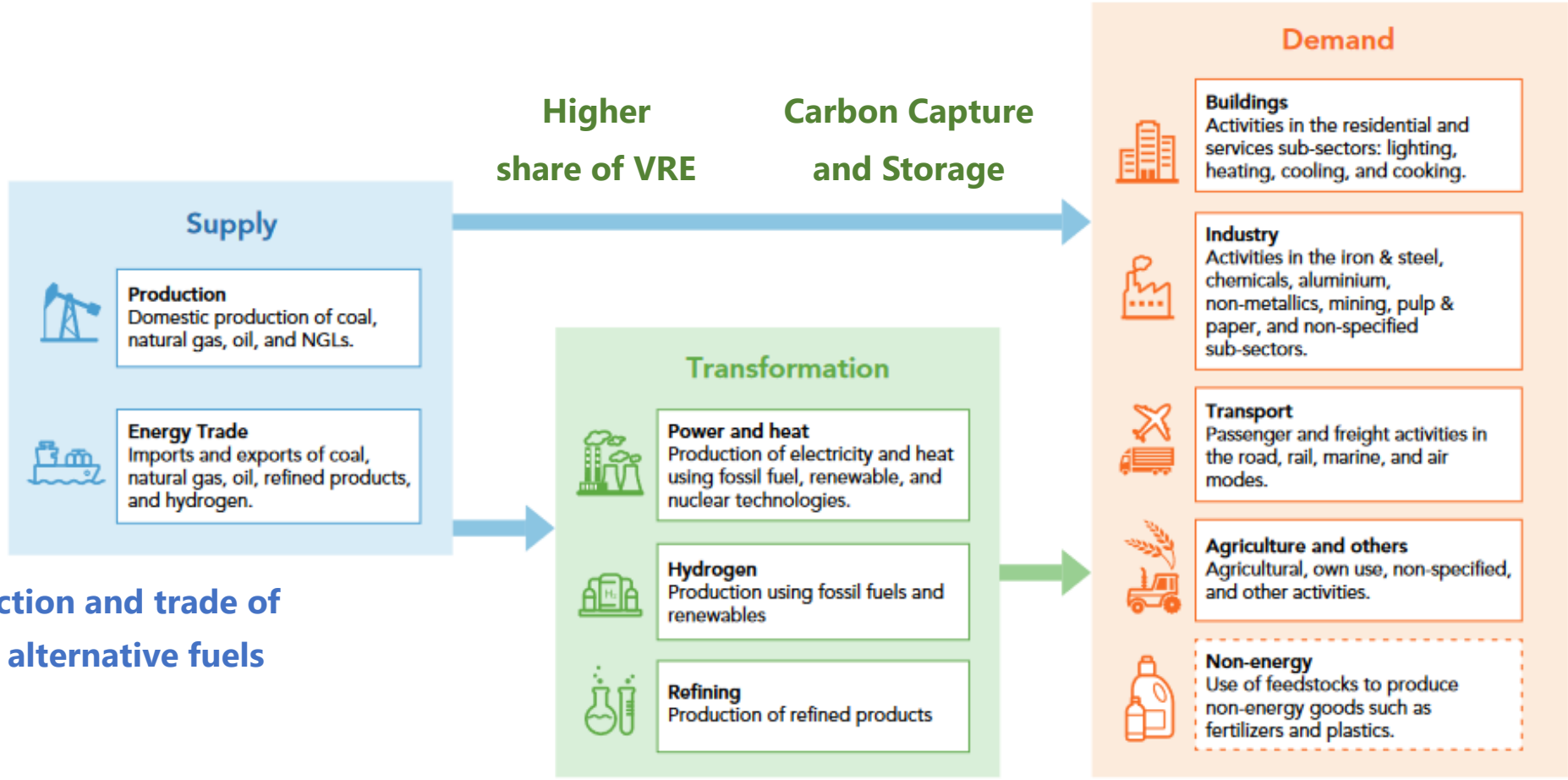
The Target Scenario (TGT)

TGT is a hypothetical pathway where each economy achieves its energy-related policy targets regardless of cost-effectiveness. When implementation details are lacking, assumptions are inferred from the targets themselves or emissions-related goals.





New and renewable energy technologies have implications throughout the energy system



Higher share of VRE

Carbon Capture and Storage

Separate electricity projections for data centres

Electrification and hydrogen

EVs

Synthetic fuels

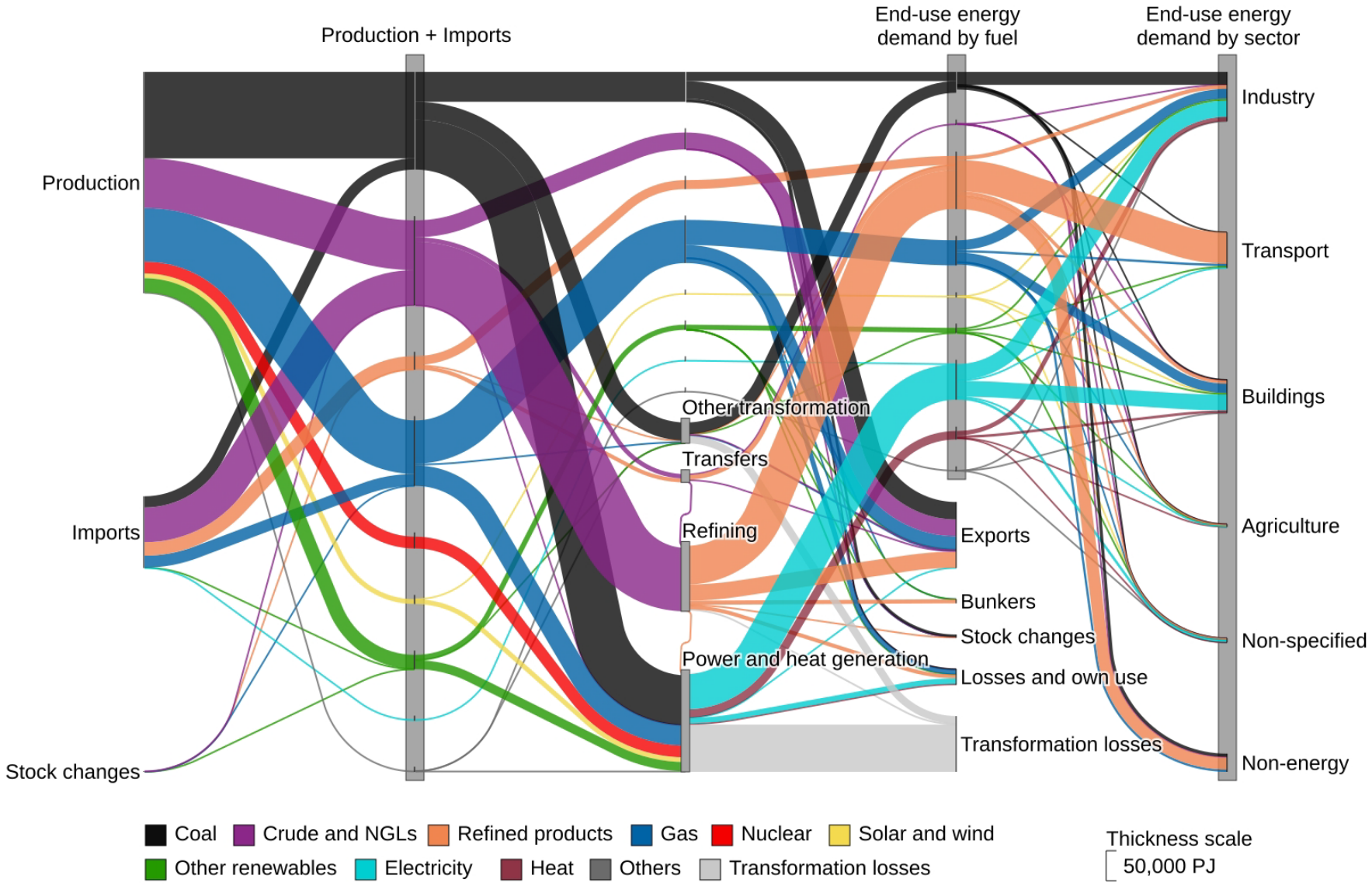
Production and trade of clean alternative fuels

Grid storage technologies

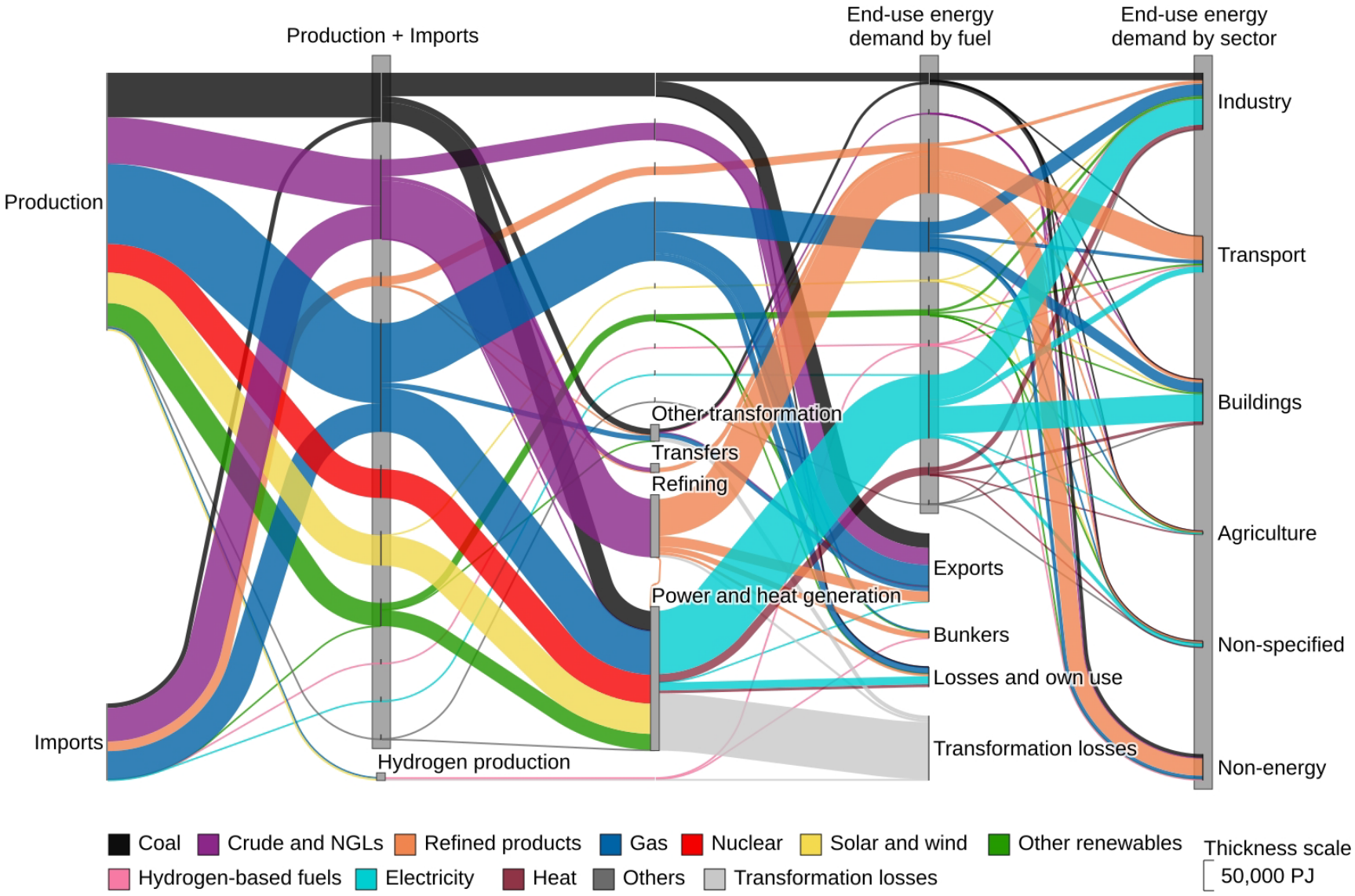
Biomass and biogas

Results for the APEC region

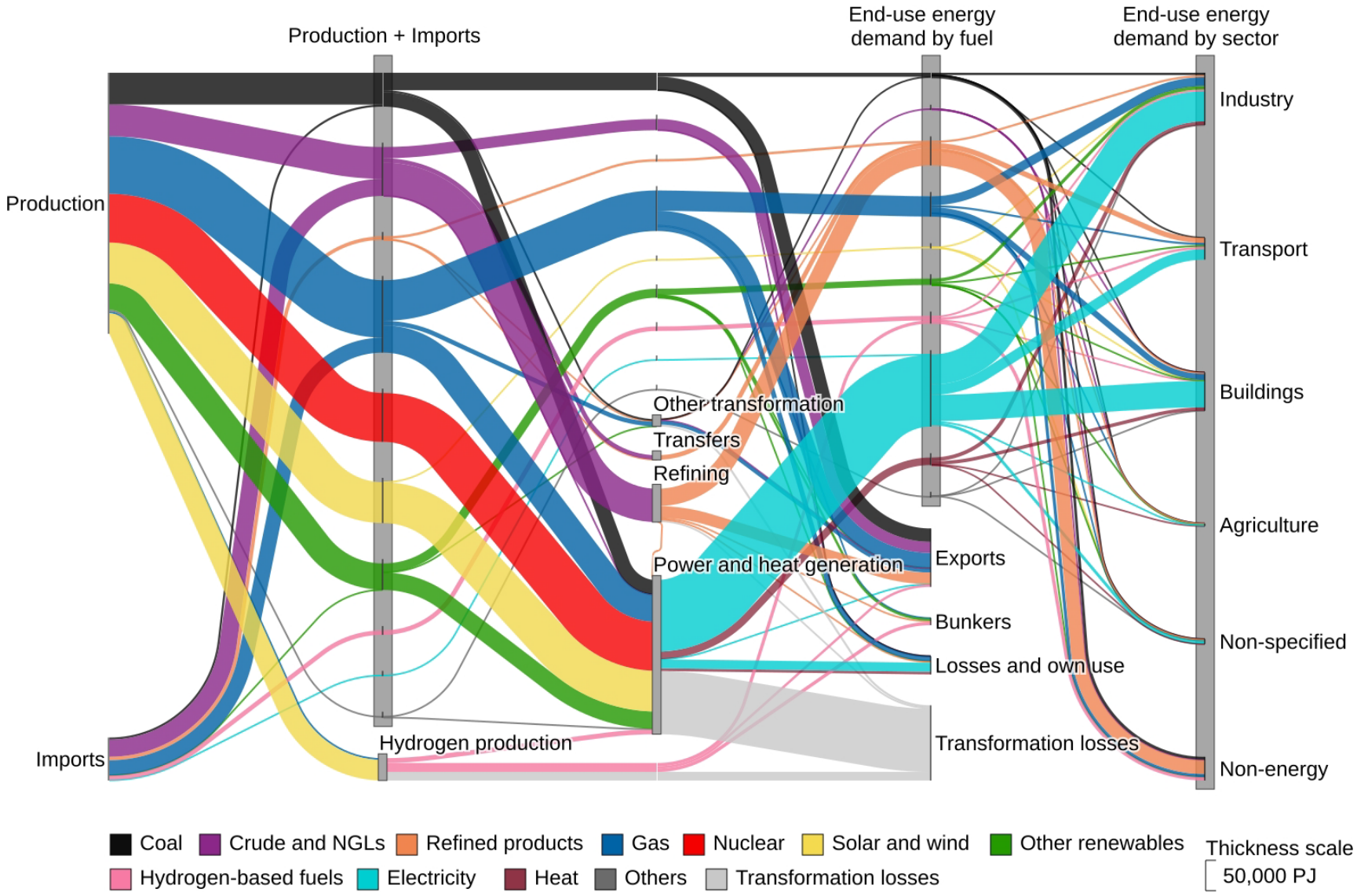
APEC Energy Flows (2022)



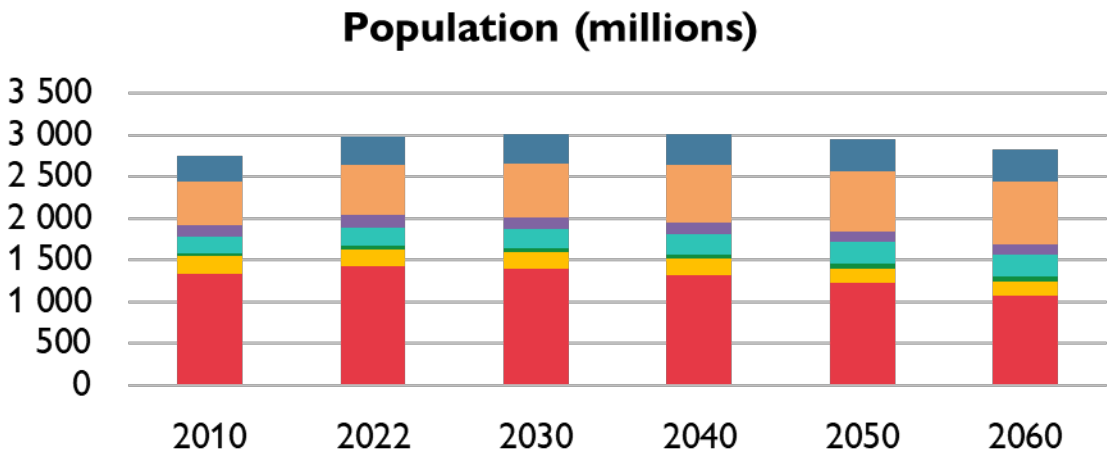
APEC Energy Flows (Reference, 2060)

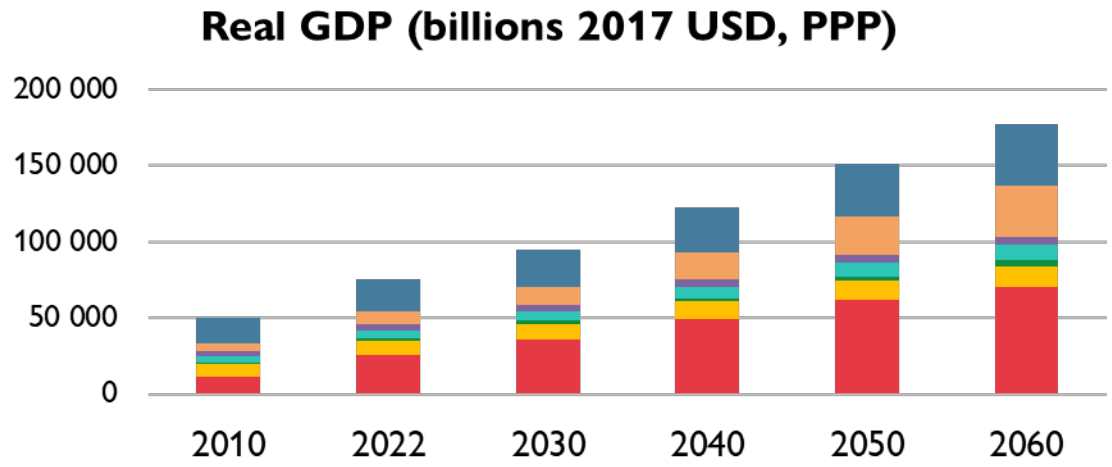


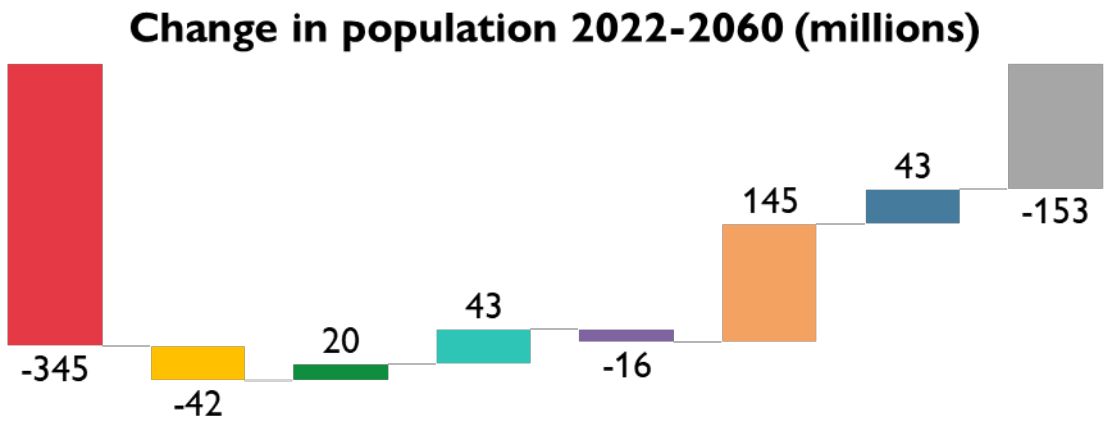
APEC Energy Flows (Target, 2060)

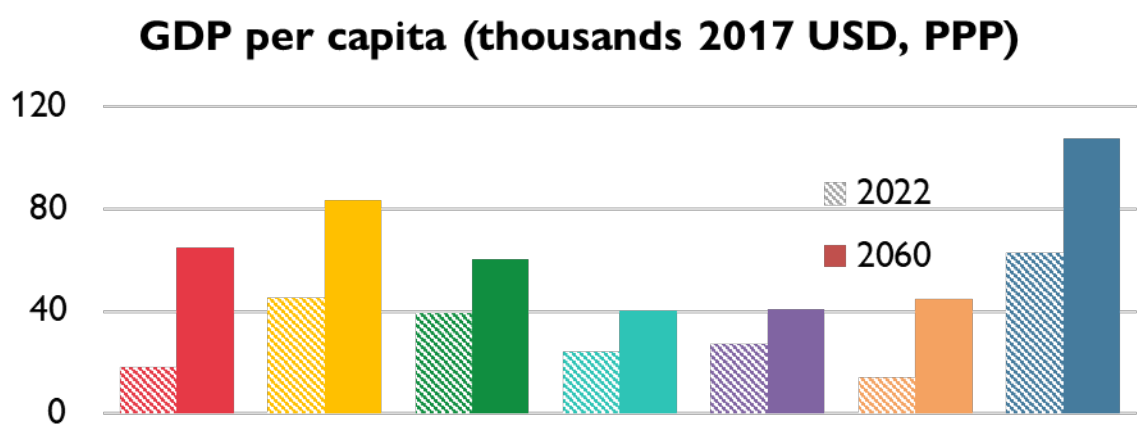


Demographic and Macroeconomic Assumptions



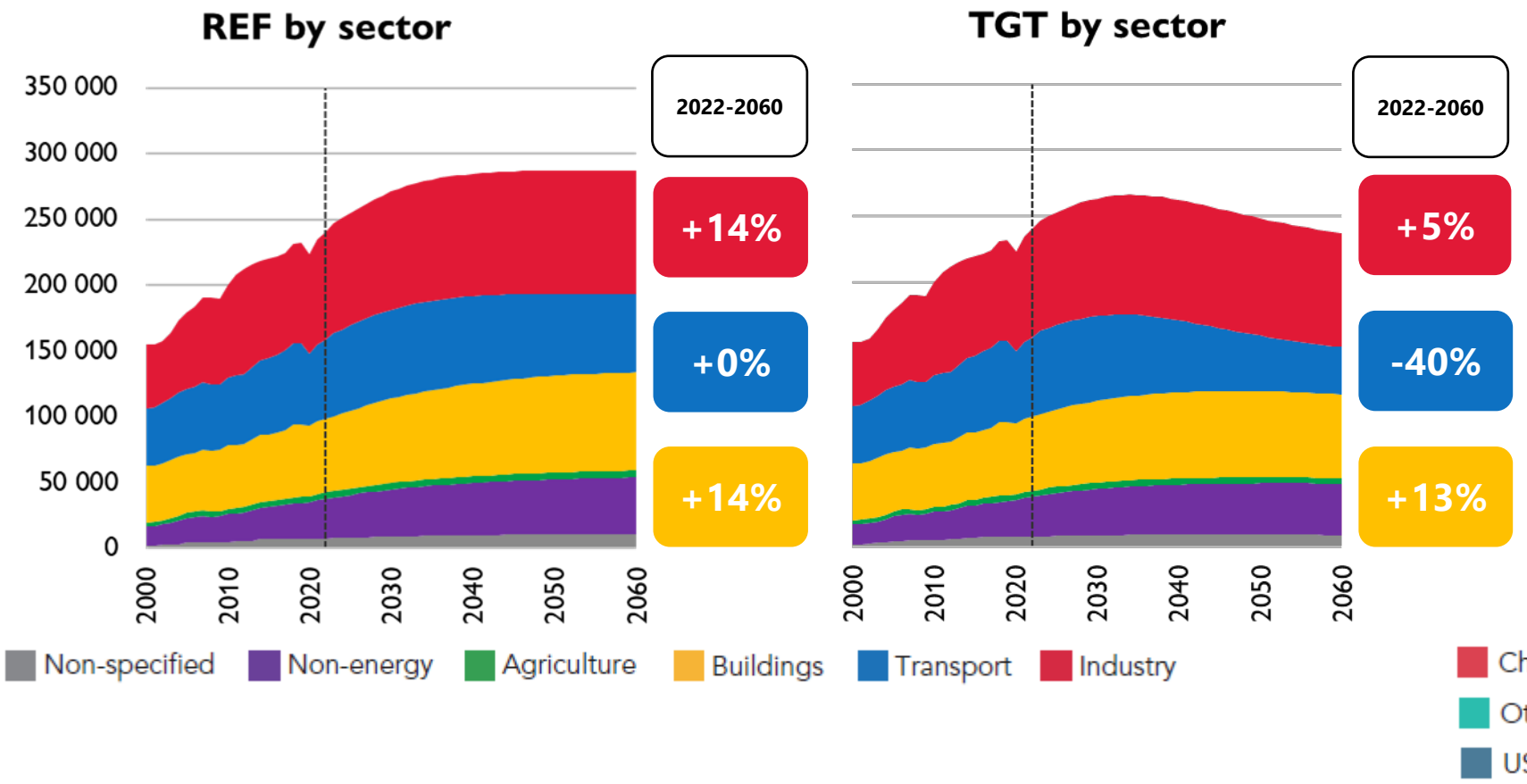


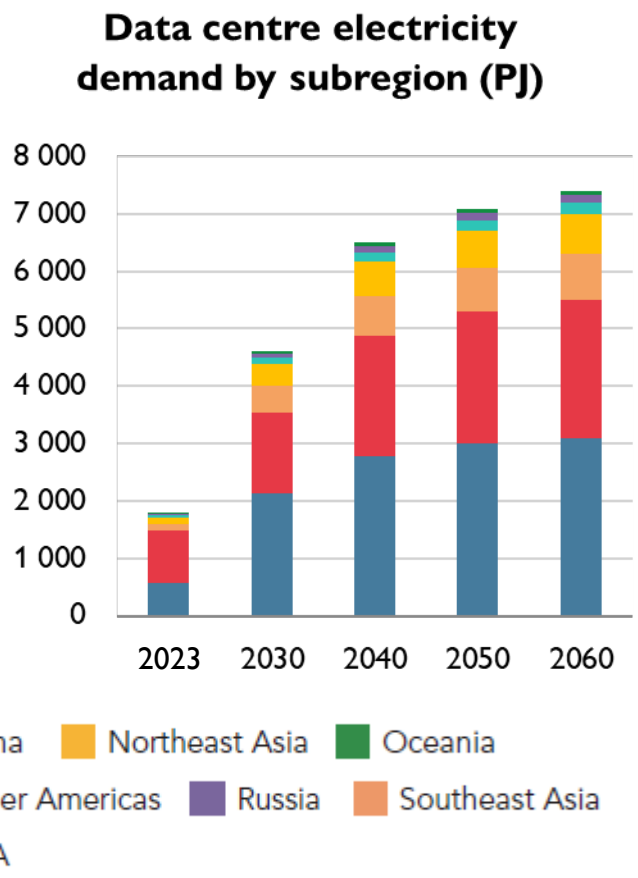




China Northeast Asia Oceania Other Americas Russia Southeast Asia USA

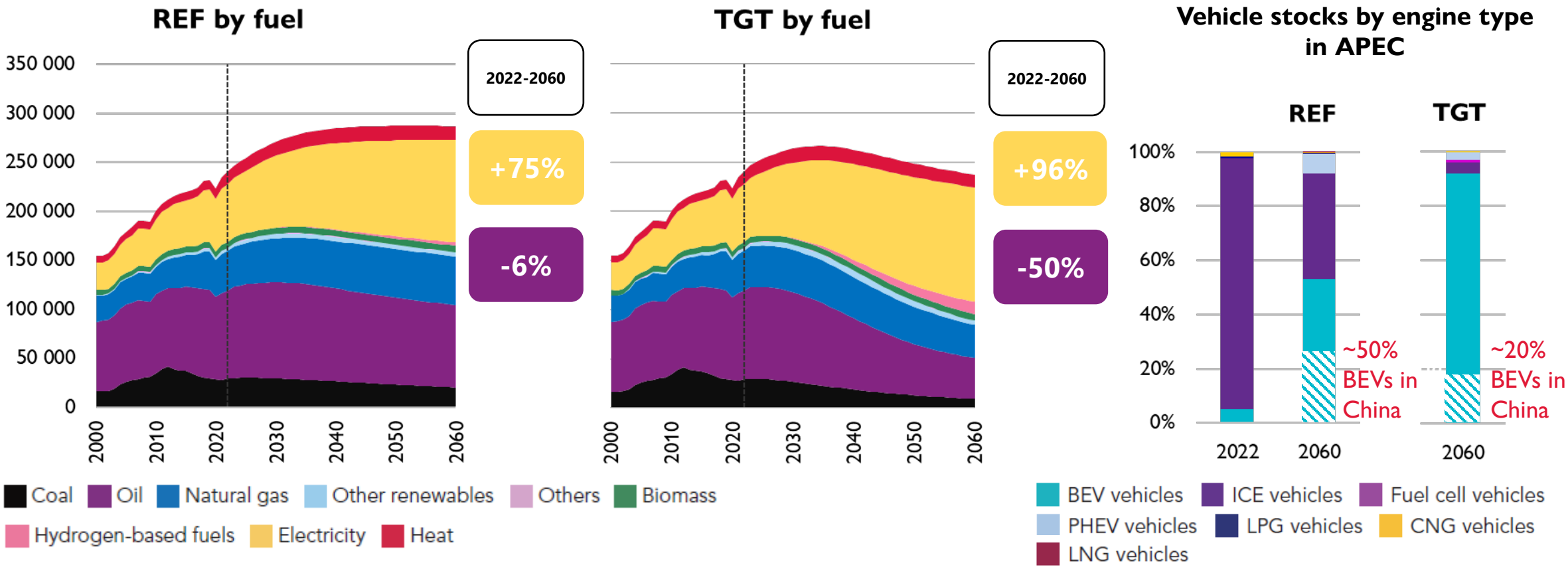
APEC Total Final Consumption (PJ)





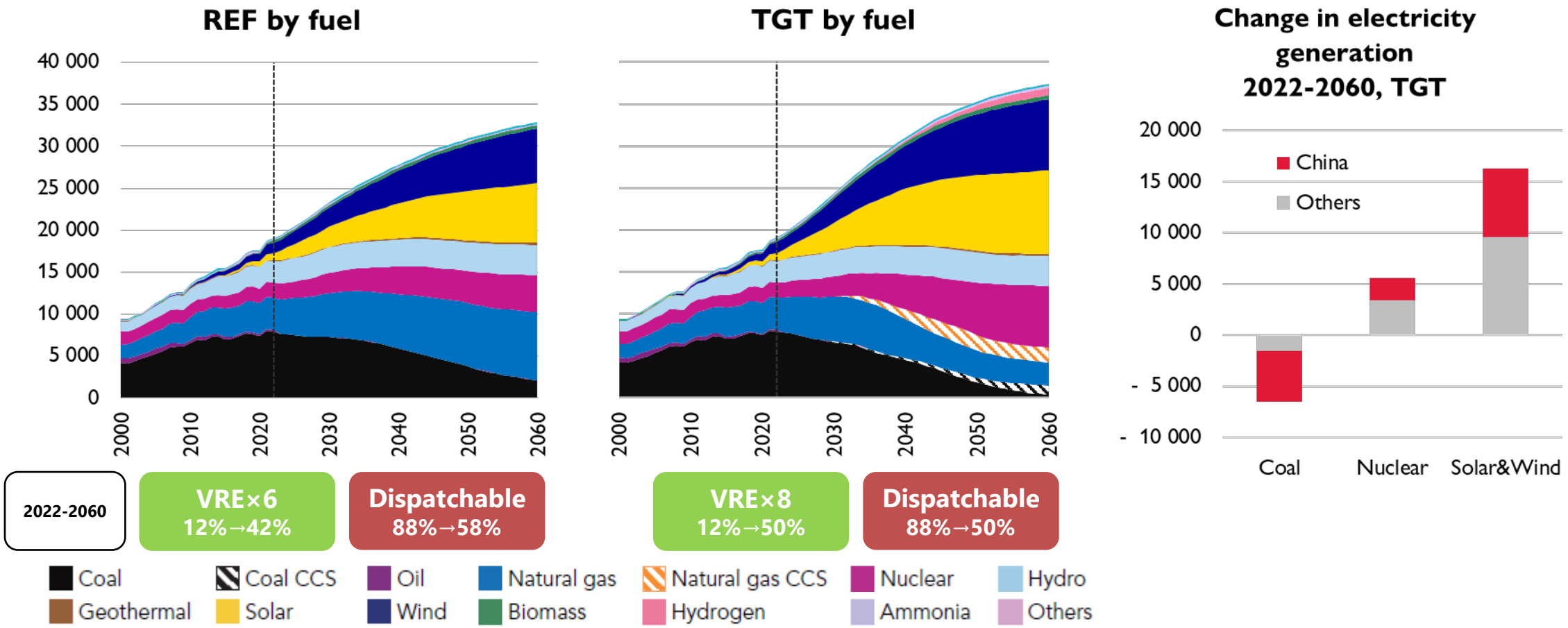
- **Transport** delivers the largest efficiency gains.
- Rapid data centre expansion outpaces efficiency progress in **buildings**.

APEC Total Final Consumption (PJ)



- **Electricity** substitutes for petroleum products and coal, and to a lesser extent, natural gas.
- **Rapid EV adoption** drives the primary decline in transport energy demand and final oil consumption.

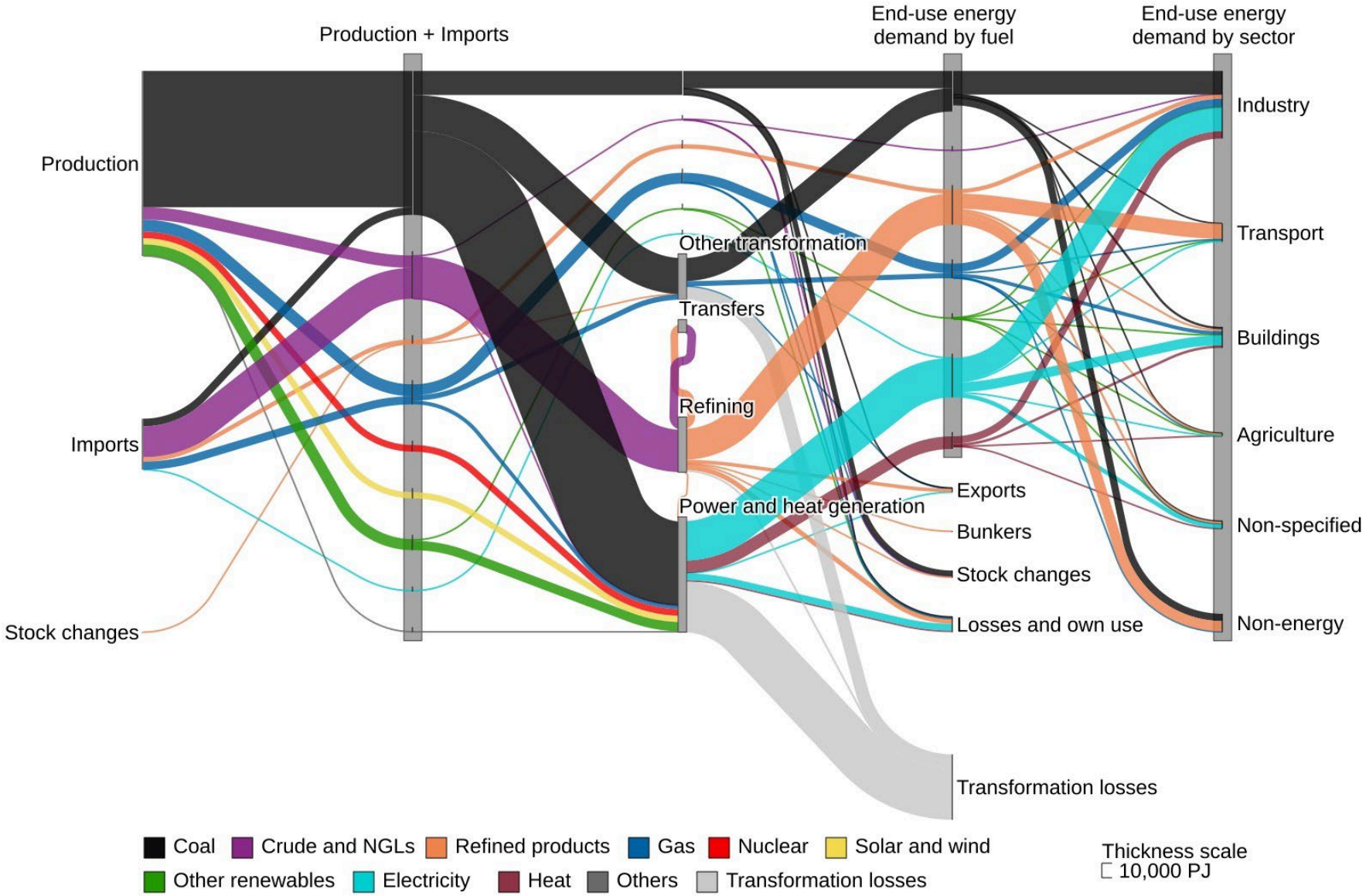
APEC Electricity Generation (TWh)



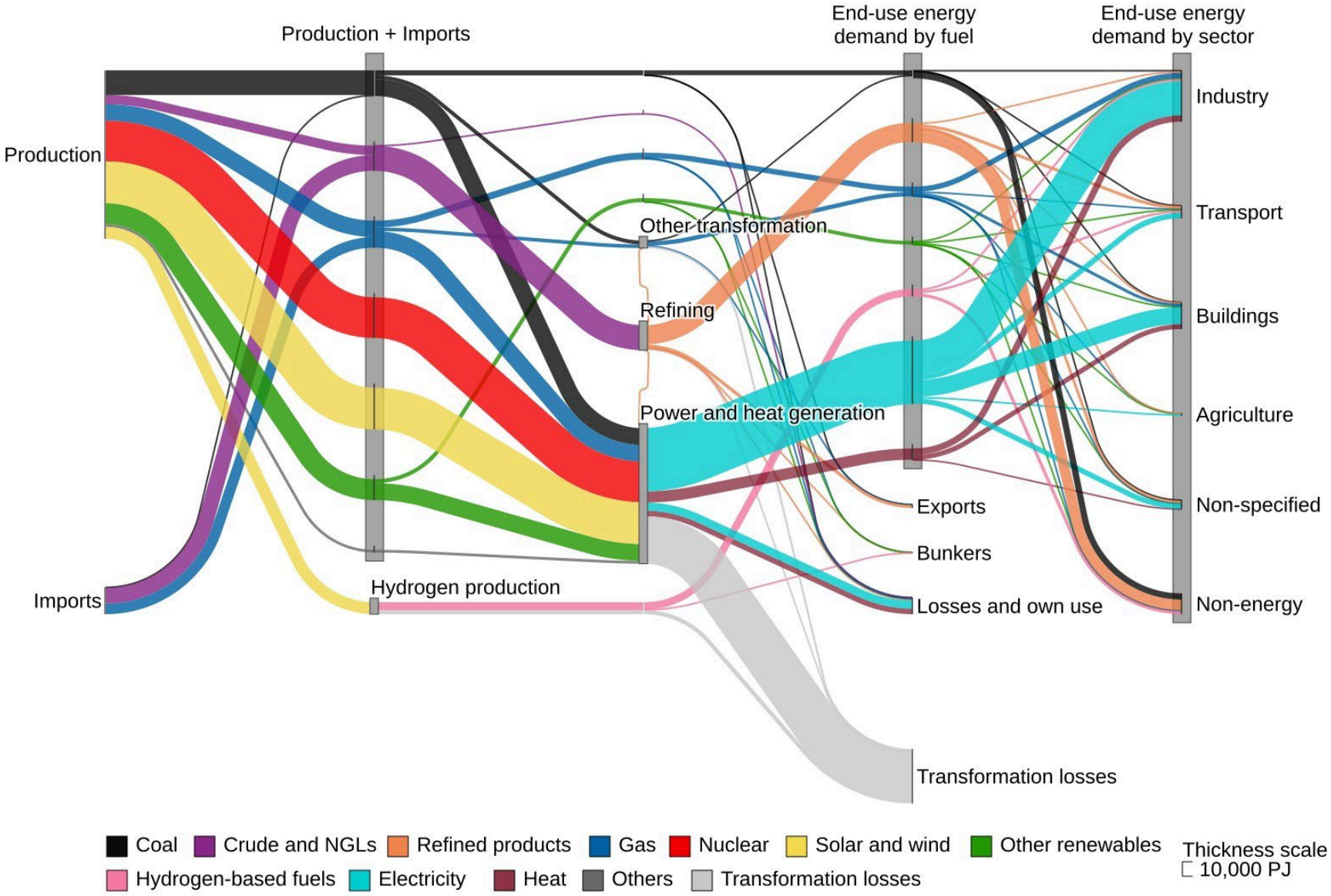
- Rapid **solar and wind** expansion accelerates the decarbonisation of the energy mix.
- **Dispatchable generation** grows slightly, shifting from fossil fuels to zero-carbon sources.

Results for China

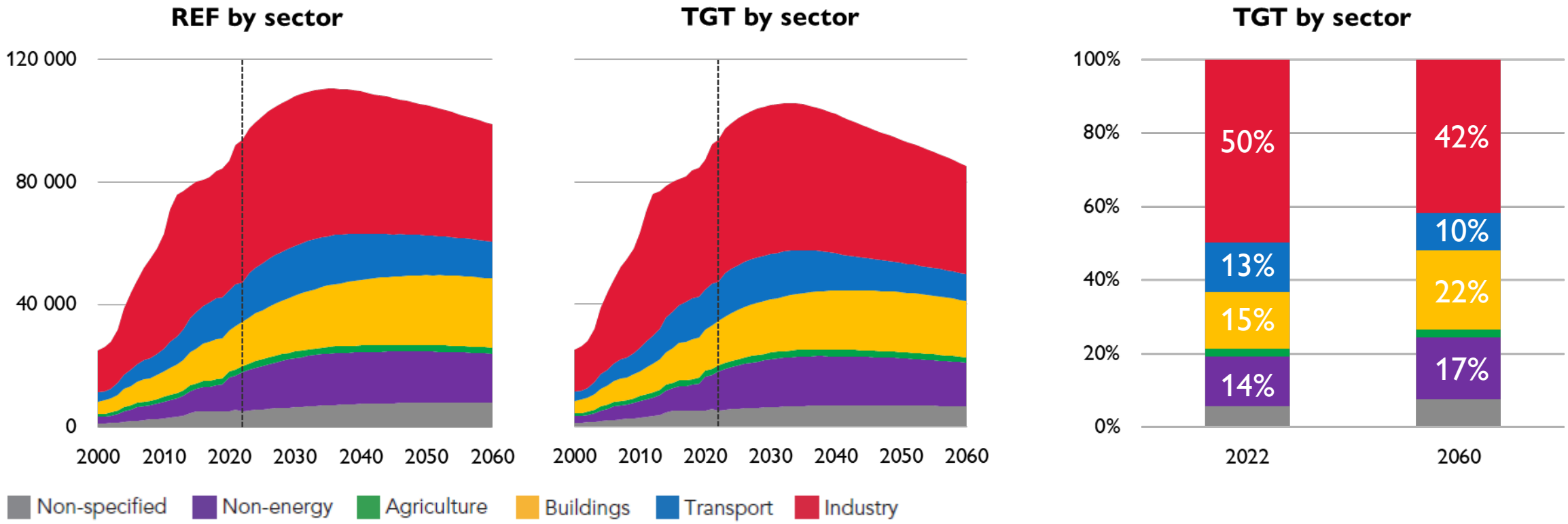
China Energy Flows (2022)



China Energy Flows (Target, 2060)

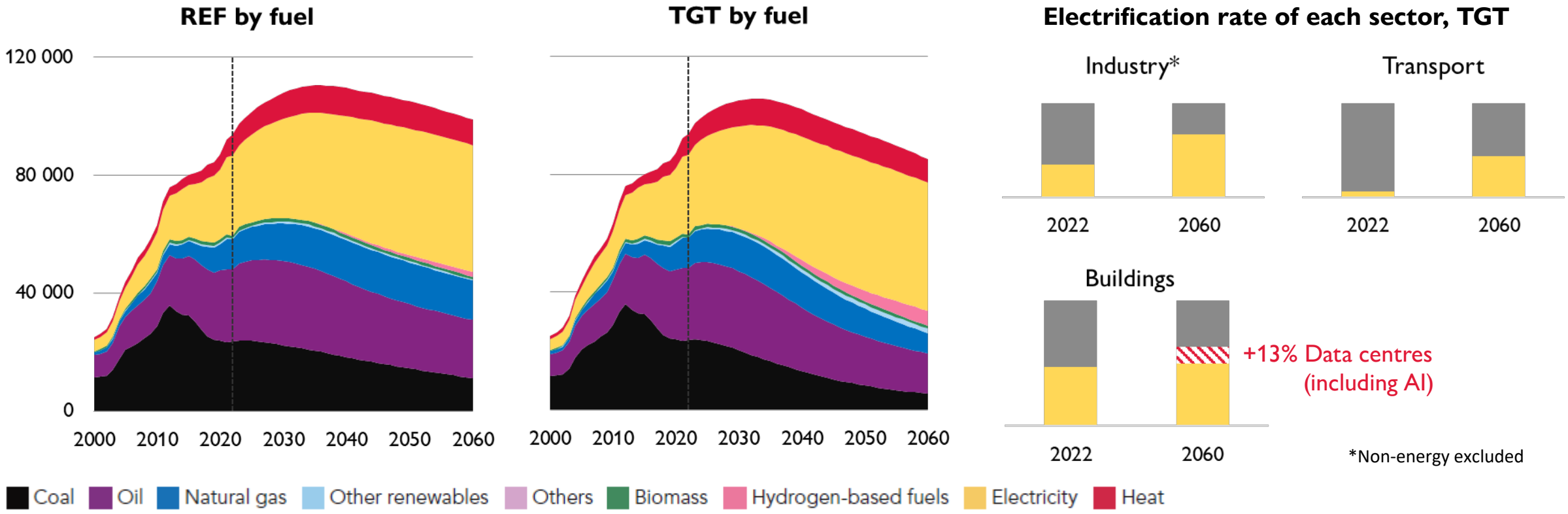


China Total Final Consumption (PJ)



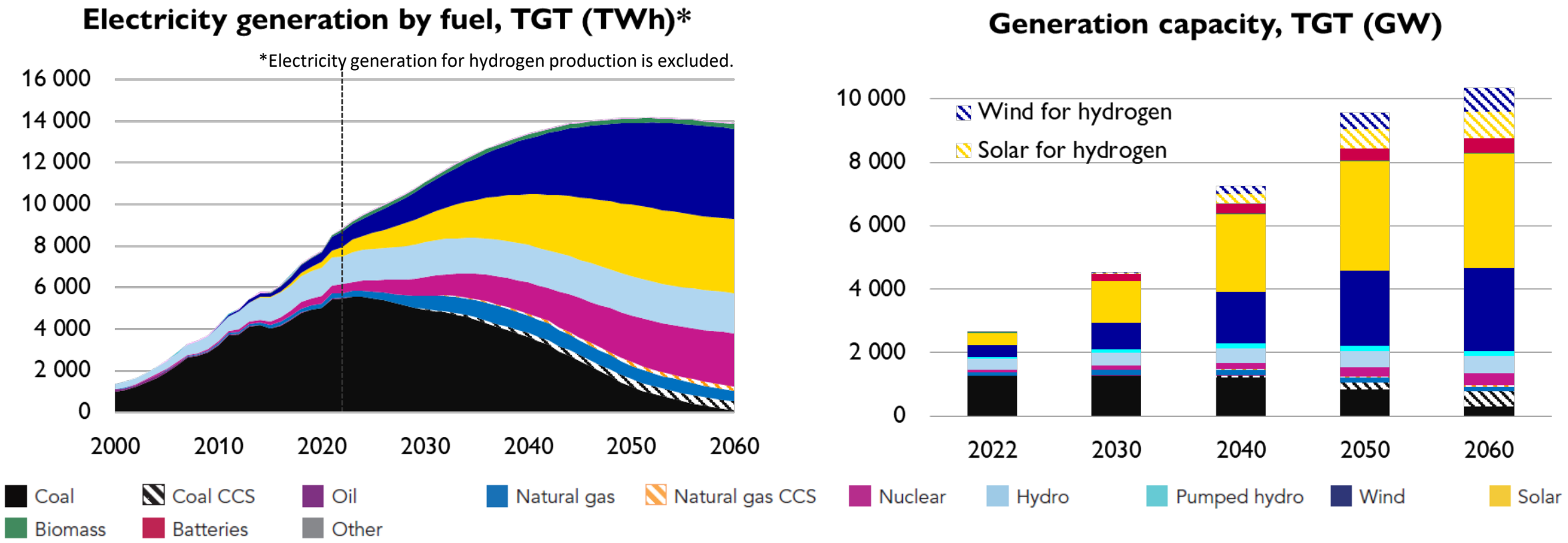
- Total Final Consumption is projected to **peak in the 2030s**.
- **Buildings** become the fastest-growing sector, plateauing later than other end-use sectors.
- **Industry**'s demand share decreases while **non-energy**'s share increases.

China Total Final Consumption (PJ)



- **Electrification of end-use energy consumption** is key for China's energy transition.
- Excluding non-energy, **natural gas** displaces coal as the second-largest end-use source.
- **Data centres** account for 20~30% of the total growth in buildings' electricity consumption.

China Electricity Generation and Capacity

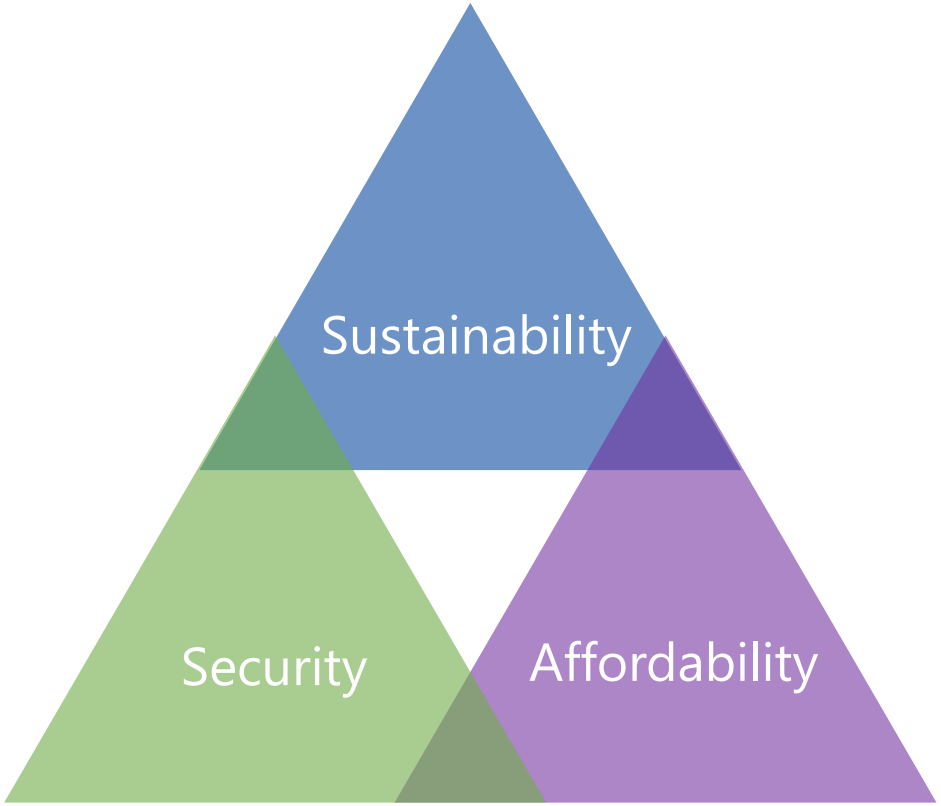


- **Coal** shifts into a supporting power source. **Gas** generation capacity increases by 50%.
- **Wind and solar** lead capacity growth. **Nuclear** construction maintains a steady pace. Diverse **energy storage** technologies play a pivotal role in maintaining grid stability.

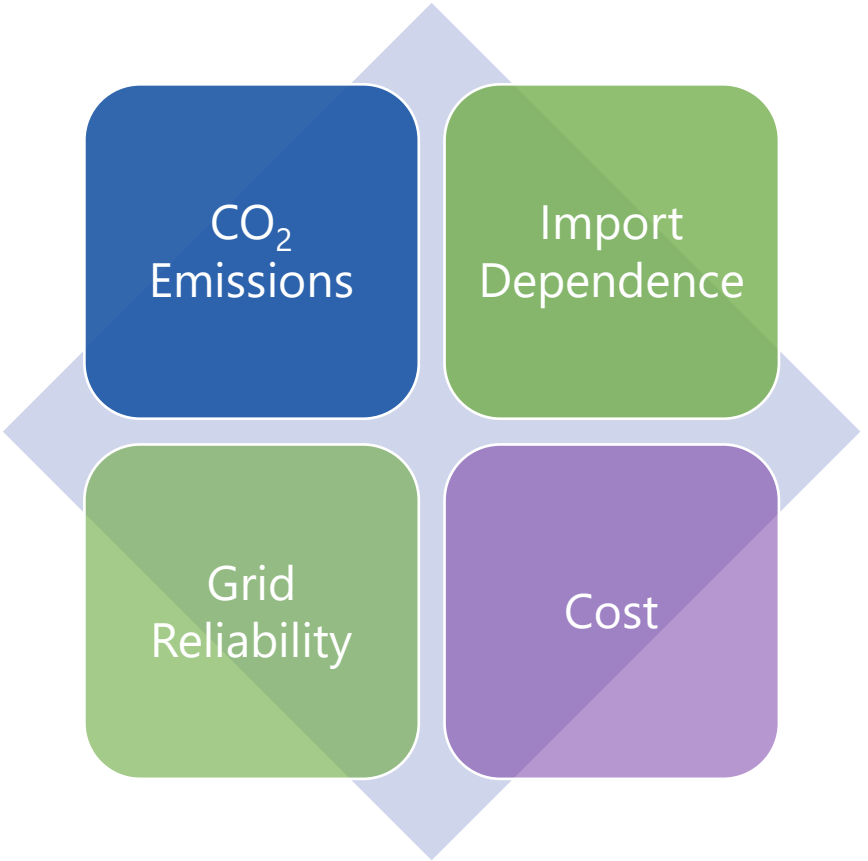
Key Takeaways

Key Takeaways

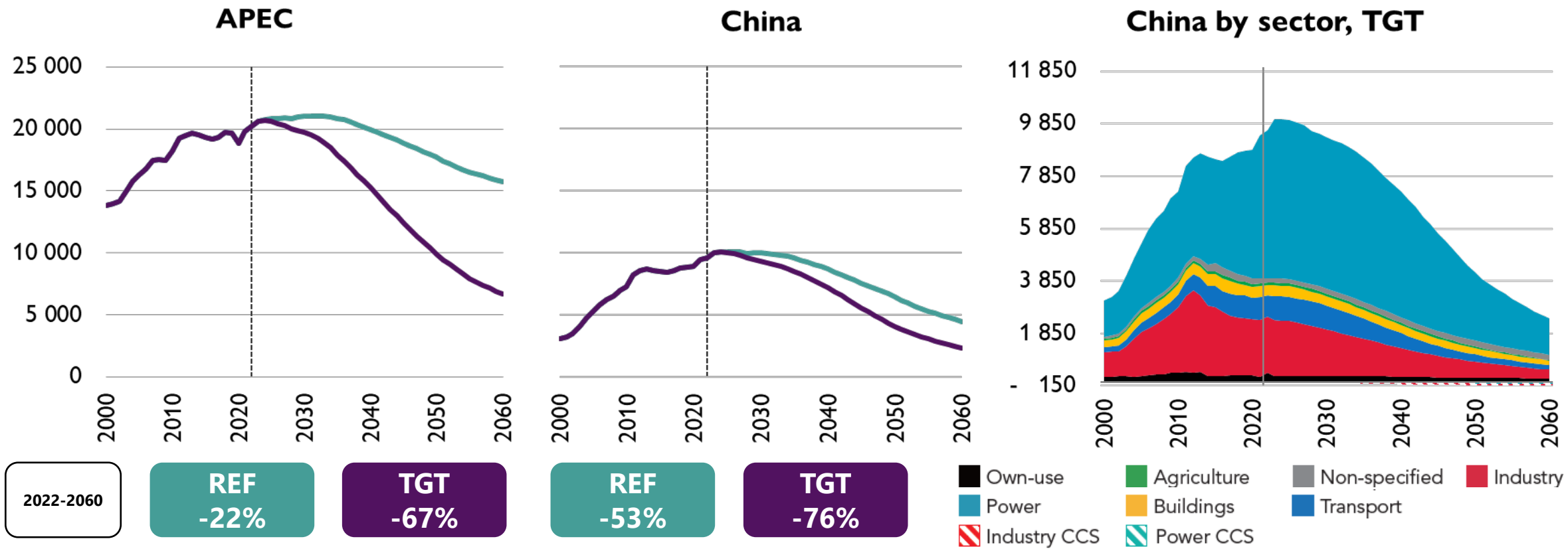
The Energy Trilemma



Key Parameters



CO_2 Emissions (million tons)

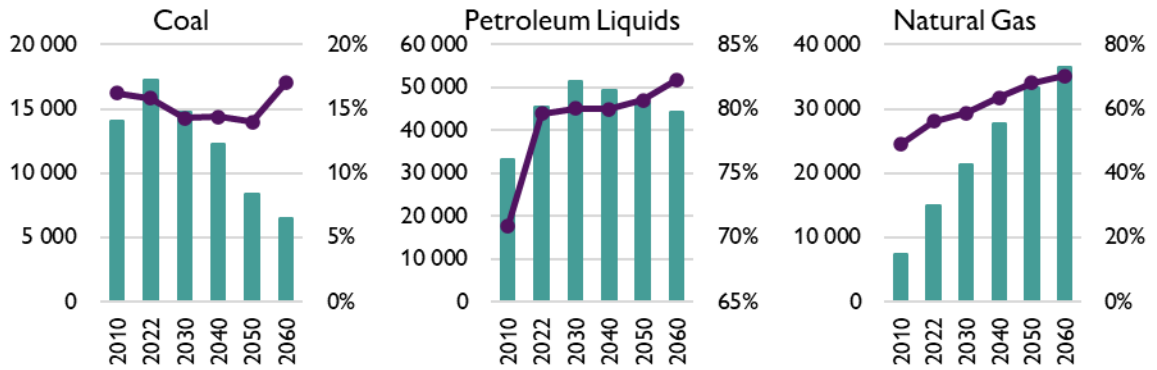


- China's energy sector CO_2 emissions are projected to **peak before 2030**.
- Reaching the 2060 carbon neutrality goal necessitates **expanded carbon sink measures**.

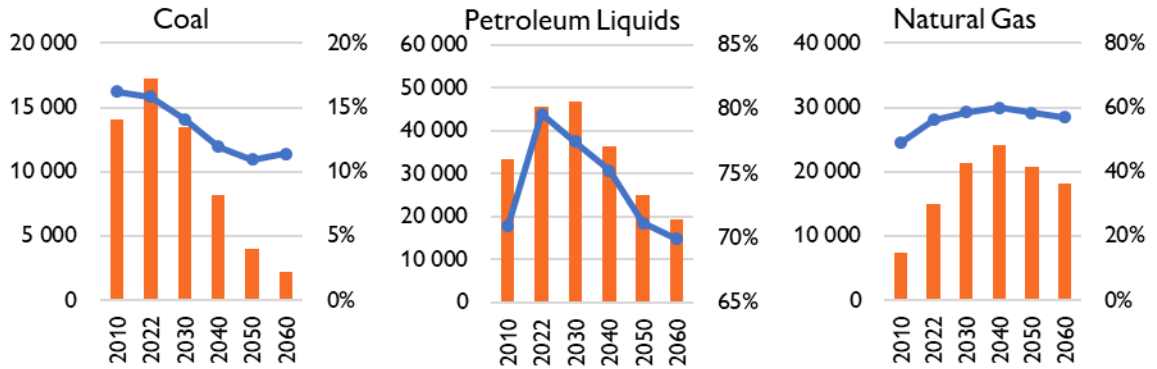
Import Dependence

Net imports (PJ) and import share of Total Primary Energy Supply (%) in APEC importing economies

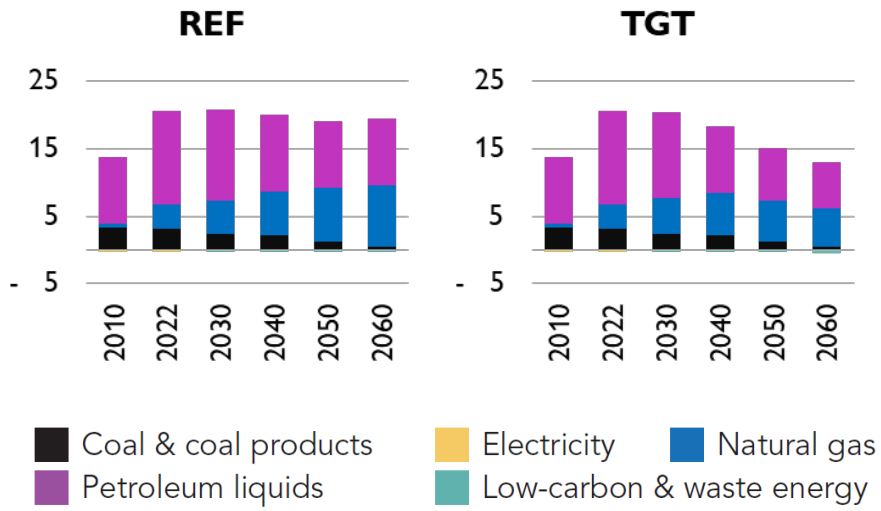
REF
Coal<20%
Oil>80%
Gas>70%



TGT
Coal<15%
Oil>70%
Gas>55%

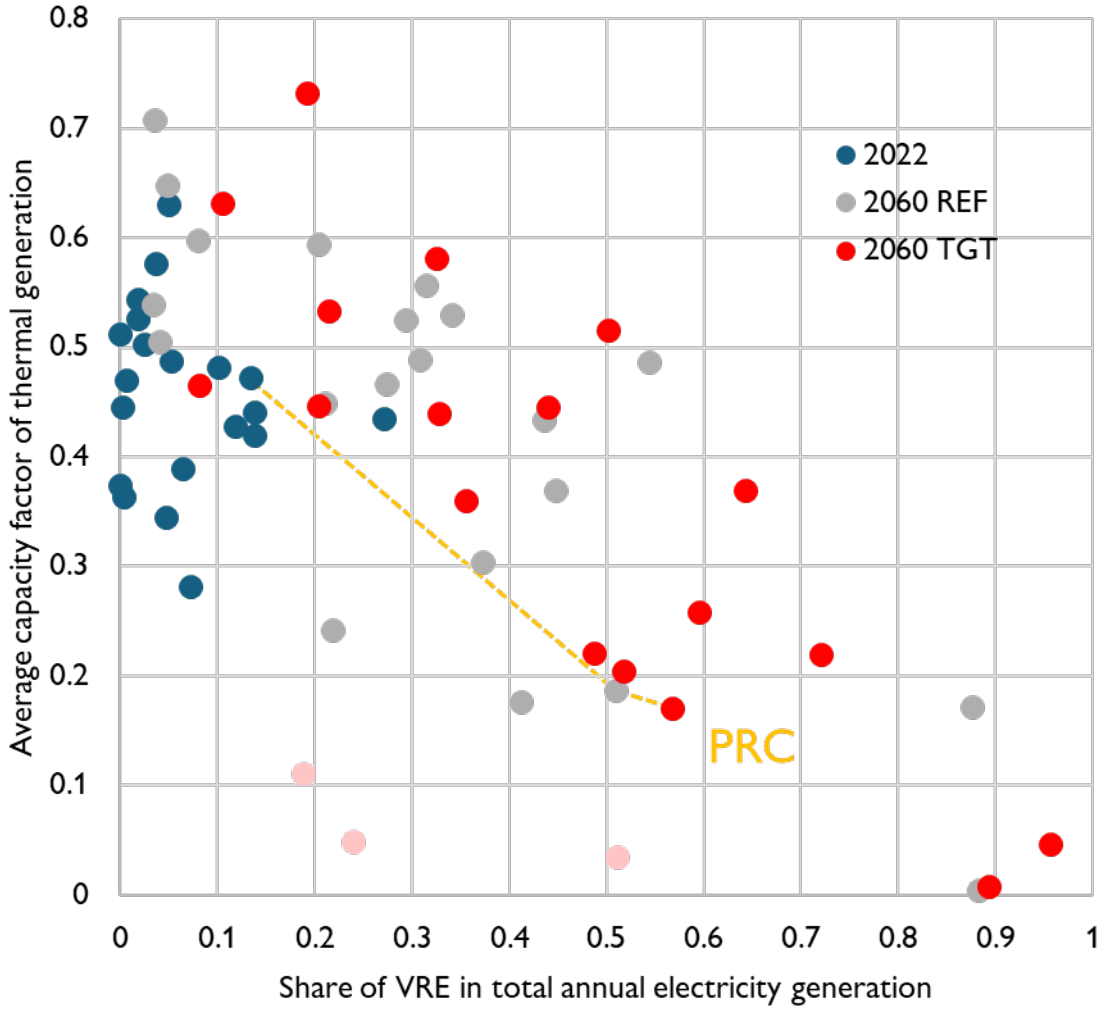


China net imports share of Total Primary Energy Supply (%)

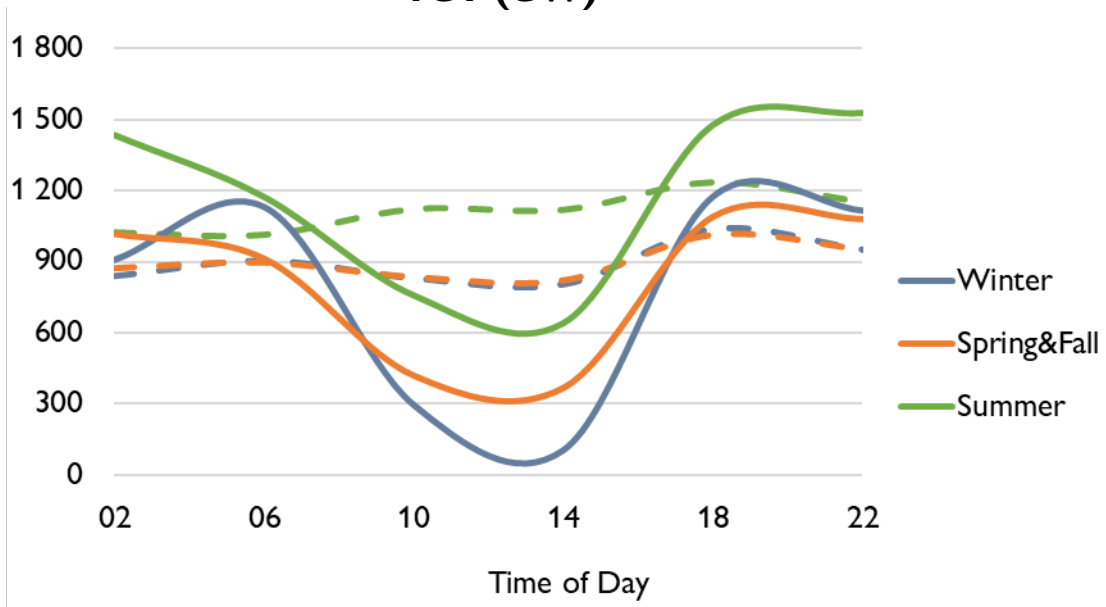


- Importing economies refer to economies that have net imports of a fossil fuel in 2030, including China.
- In TGT, alternative fuels and storage help mitigate China's **natural gas import dependency**.

Grid Reliability

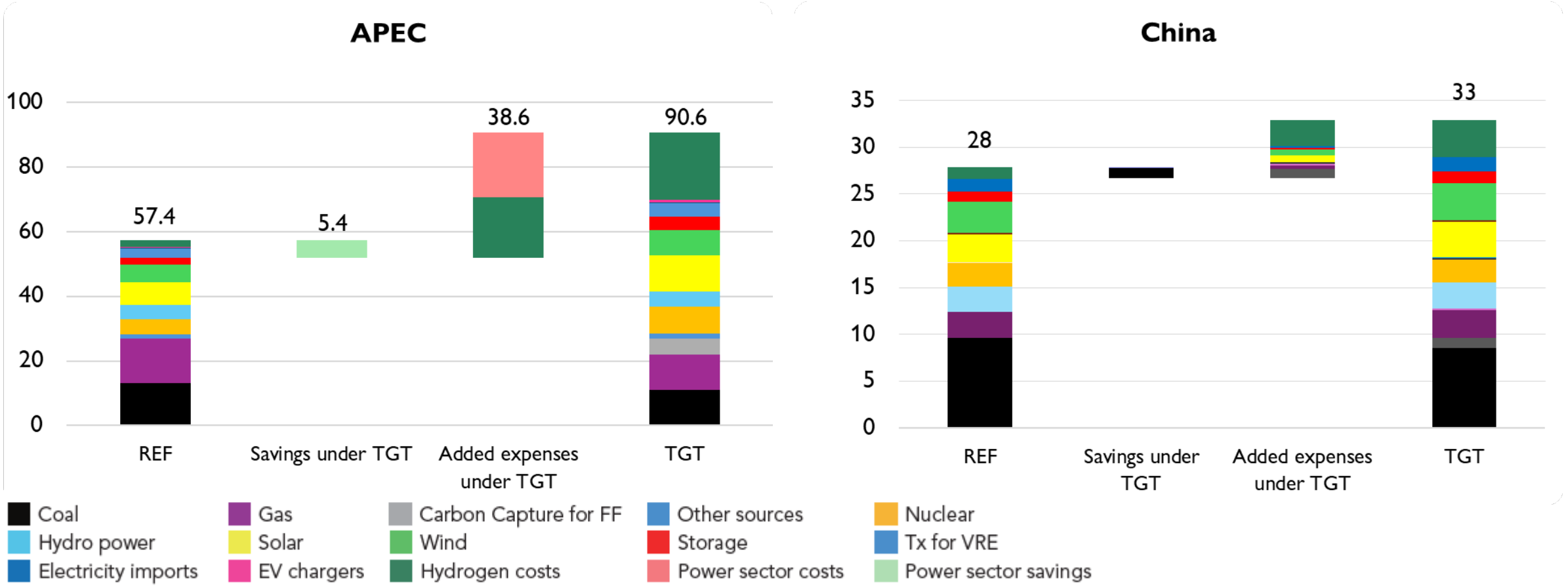


Power from dispatchable sources of China, TGT (GW)



- Dispatchable capacity must provide **increased load-following support** to balance intermittent variable renewable energy (VRE) output.
- Operating thermal plants at **low capacity factors** may escalate electricity costs and compromise grid reliability.

Costs in Power and Hydrogen Sectors (2025-2060, trillion USD)



- **Coal and gas** represent 65% of China's power system **operational costs**. Most of the **capital investment** is directed toward **solar, wind, and transmission**.
- Rapid technological advancement and industrial scaling have significantly **reduced generation costs for Chinese wind and solar PV projects**.

Summary

- In REF, **APEC** final energy demand grows through 2060. In TGT, demand peaks in 2034.
- Increased reliance on low-carbon sources and accelerated EV adoption drive significant **CO_2 emissions** reductions.
- **Fossil fuels** transition to a declining but strategic role, while **natural gas** emerges as the primary fossil fuel.
- High import **dependence for oil and gas** remains a persistent challenge for several economies.
- **Grid flexibility and system integration** are critical challenges, requiring major investment in transmission, storage, and dispatchable capacity.
- As the largest energy consumer, **China** plays a significant role in shaping the APEC energy landscape.
- **Structural transformation** shifts China's final energy demand toward a 2030s peak, fueled by efficiency gains and electrification.
- The share of **domestic production** in China's Total Primary Energy Supply is projected to remain above 78%.
- **Substantial costs** are incurred in the power and hydrogen sectors in both scenarios for China and other APEC economies.

Asia-Pacific
Economic Cooperation

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Asia Pacific Energy Research Centre

Thank you.

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