



International Institute for
Applied Systems Analysis
www.iiasa.ac.at

science for global insight

Draft results: Modelling Carbon Neutrality - SEE

02 June 2021



IIASA, International Institute for Applied Systems Analysis

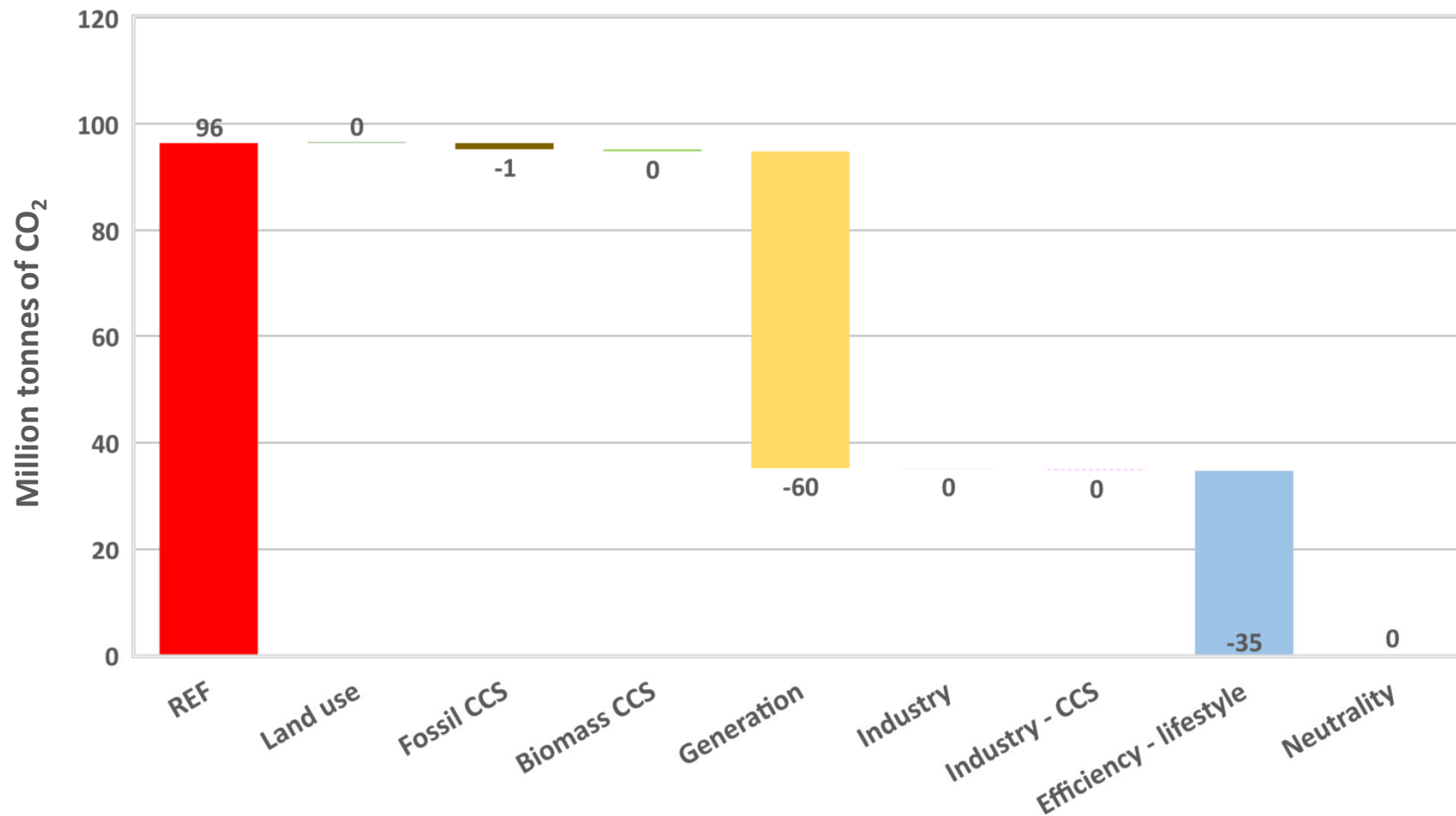
Modeling Results: SEE

The path to carbon neutrality

ENERGY



Cumulative mitigation steps from REF to CN
(as seen by an observer in 2050)



Modeling Results: SEE

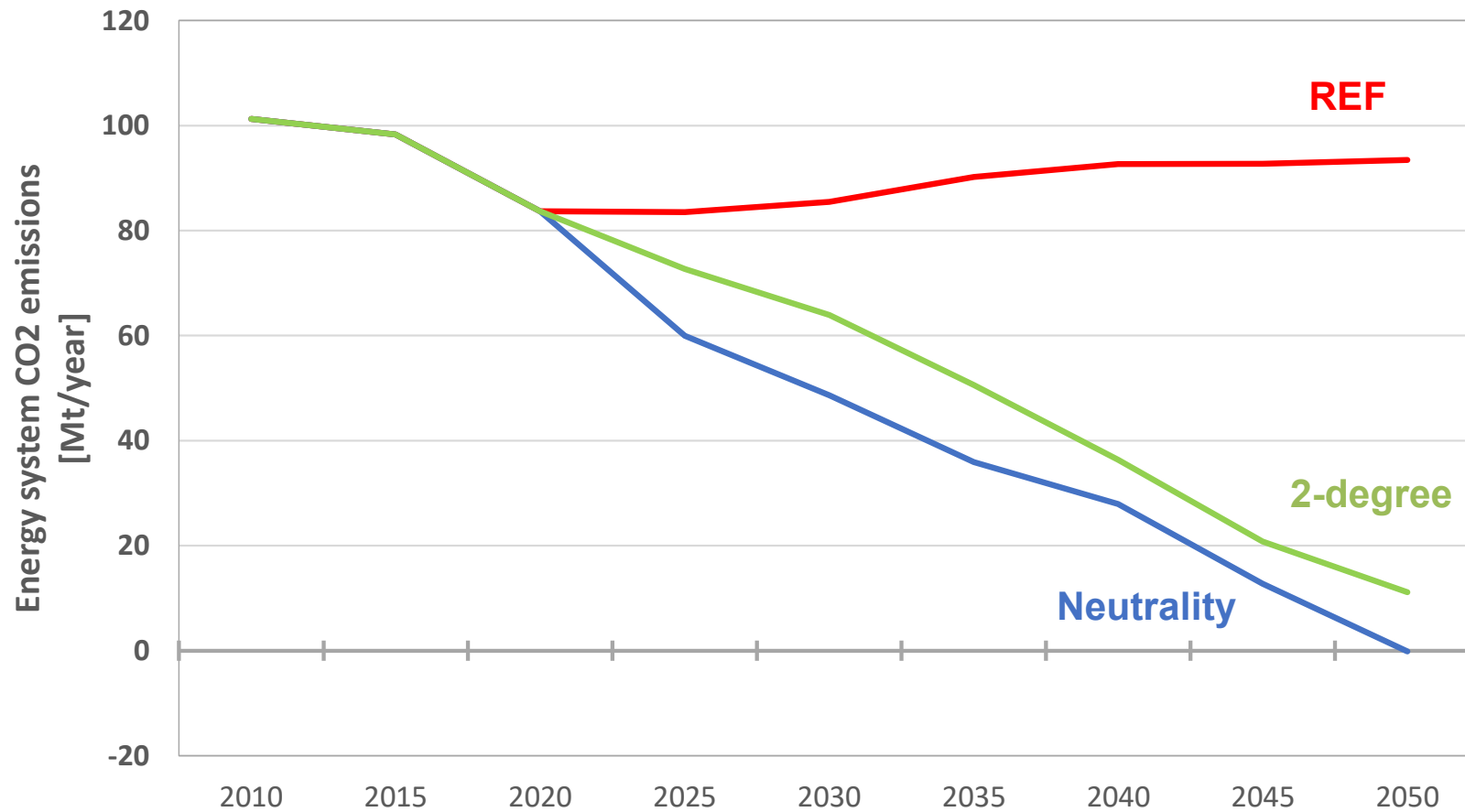
Carbon dioxide emissions

ENERGY



CO₂ emissions by scenario - SEE

[Million tonnes/year]



Modeling Results: SEE

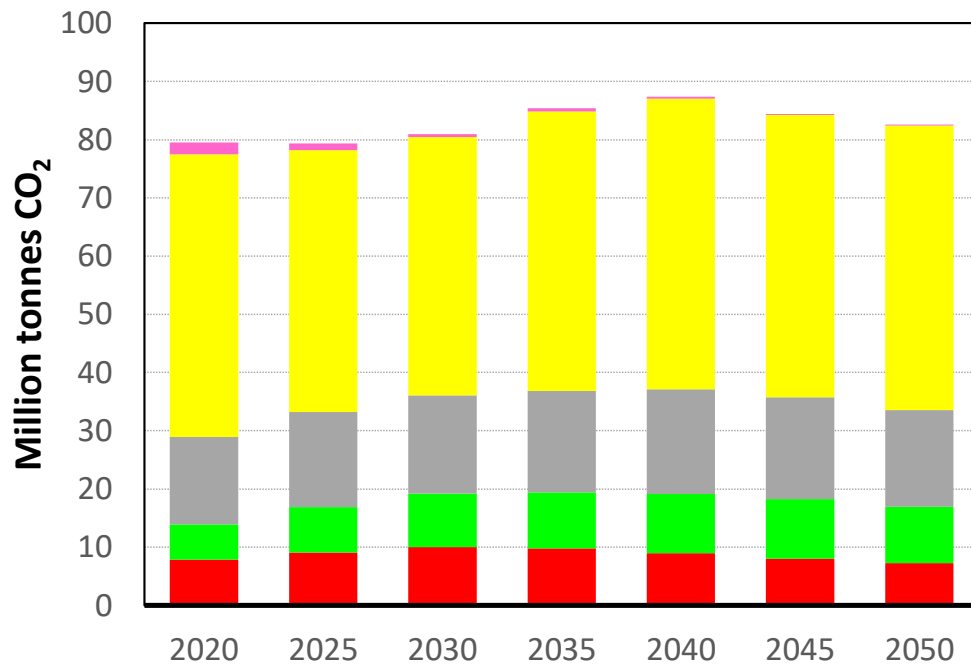
Sector emissions

ENERGY

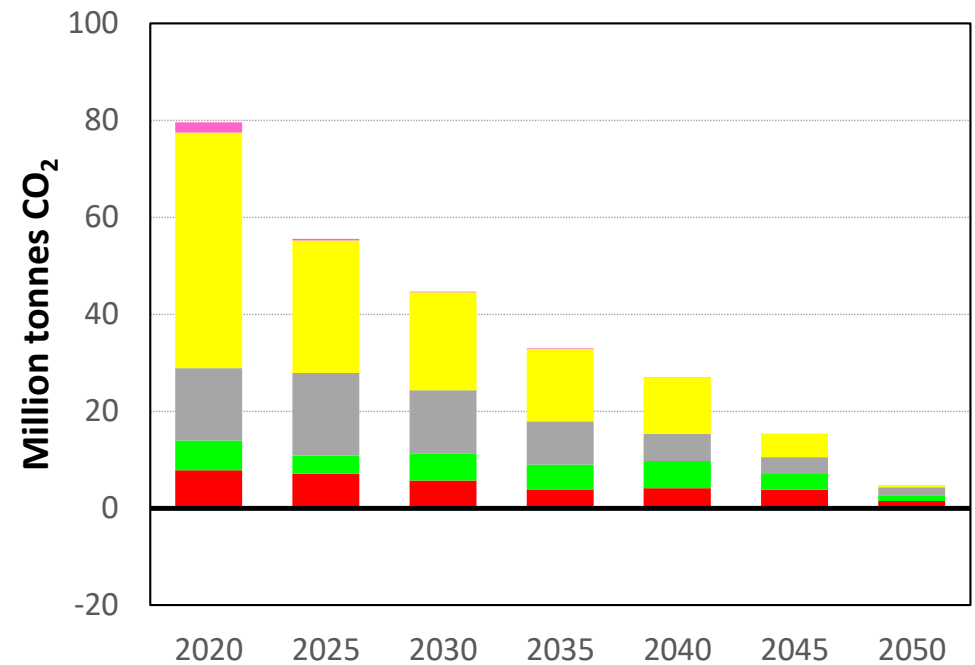


Carbon emissions by sector

Reference (REF)



Neutrality (CN)



- Industry
- Resident/Commercial
- Transportation
- Electricity
- Heat
- Fuel supply

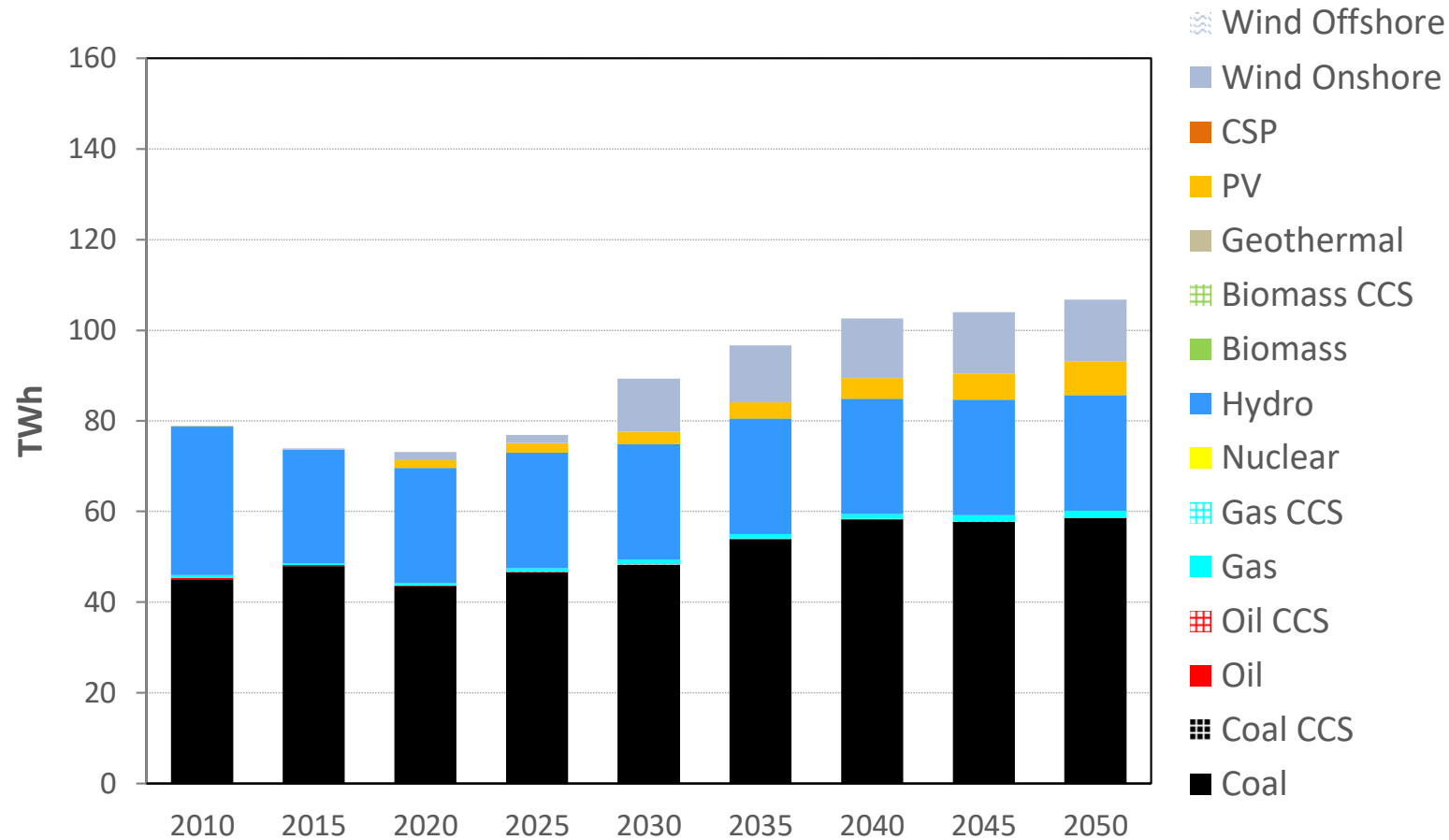
Modeling Results: SEE

Electricity Generation

ENERGY



Electricity generation by technology - SEE REF Scenario



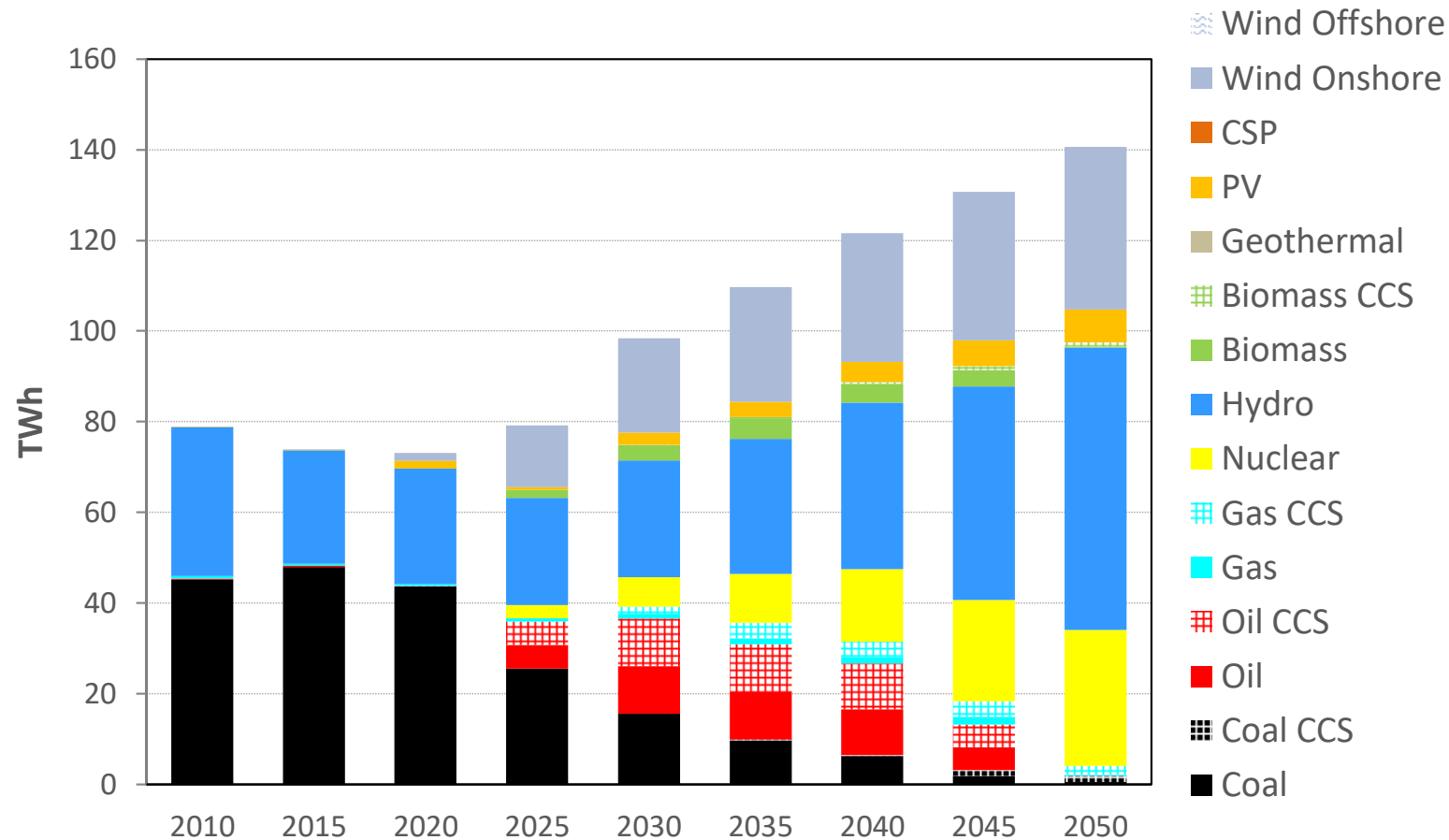
Modeling Results: SEE

Electricity Generation

ENERGY



Electricity generation by technology - SEE CN-UNECE



Modeling Results: SEE

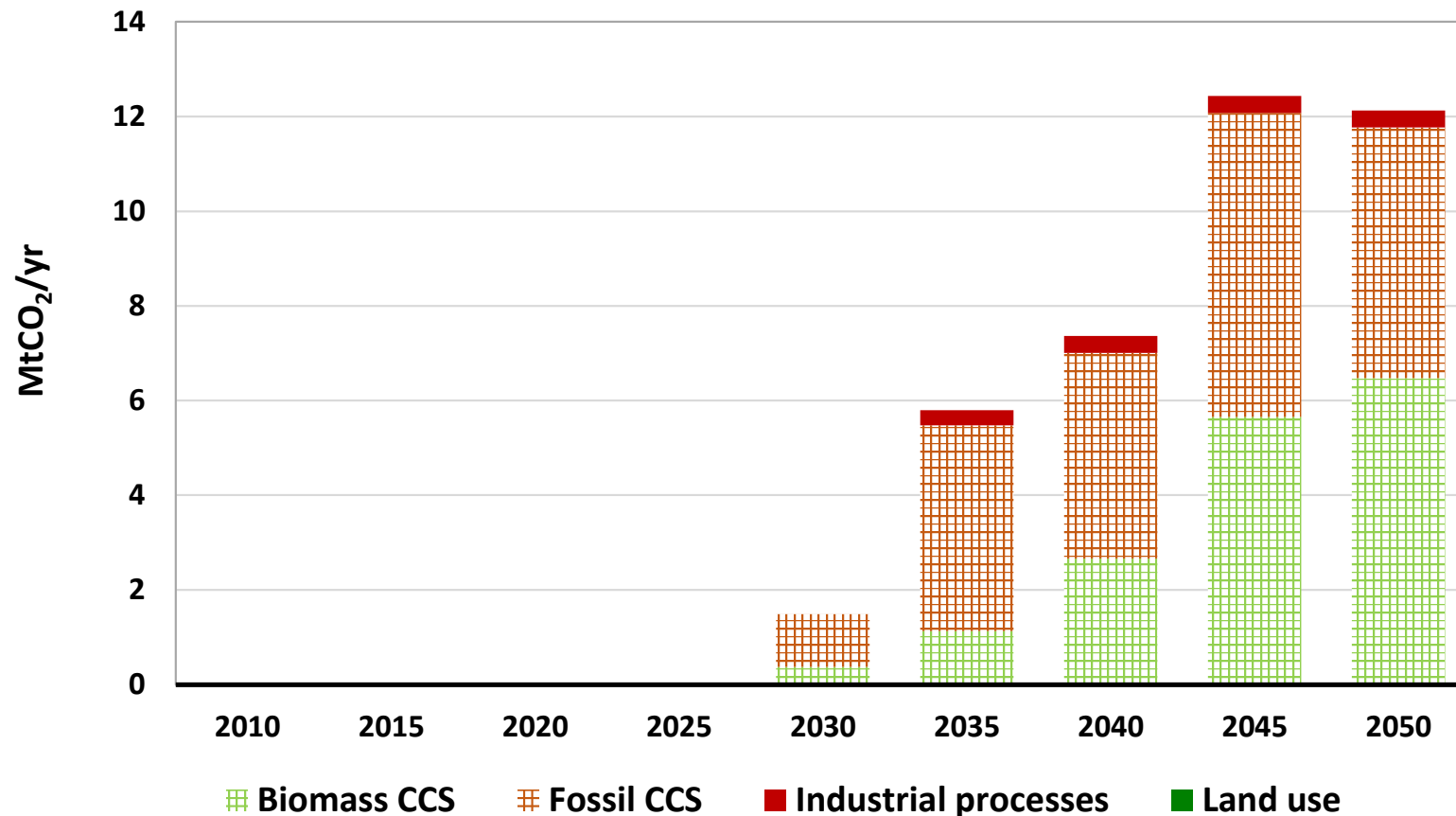
The path to carbon neutrality

ENERGY



Carbon capture, utilization and storage (sequestration)

A mixed set of measures



Modeling Results: SEE

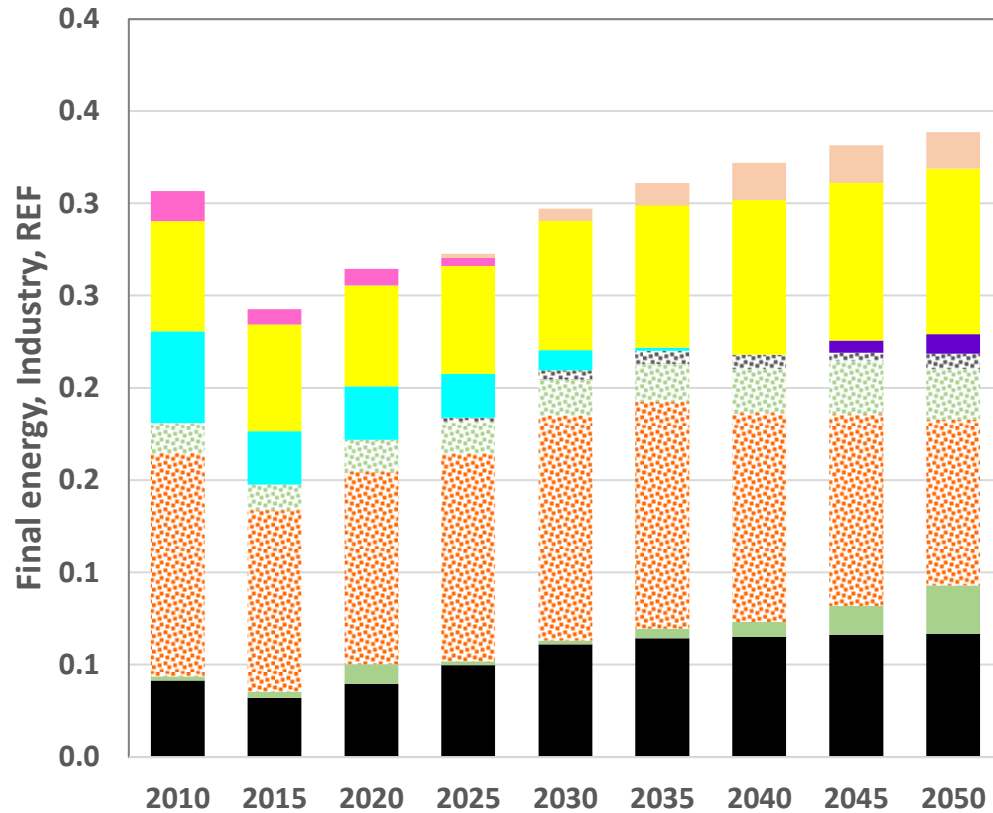
Final Energy

ENERGY

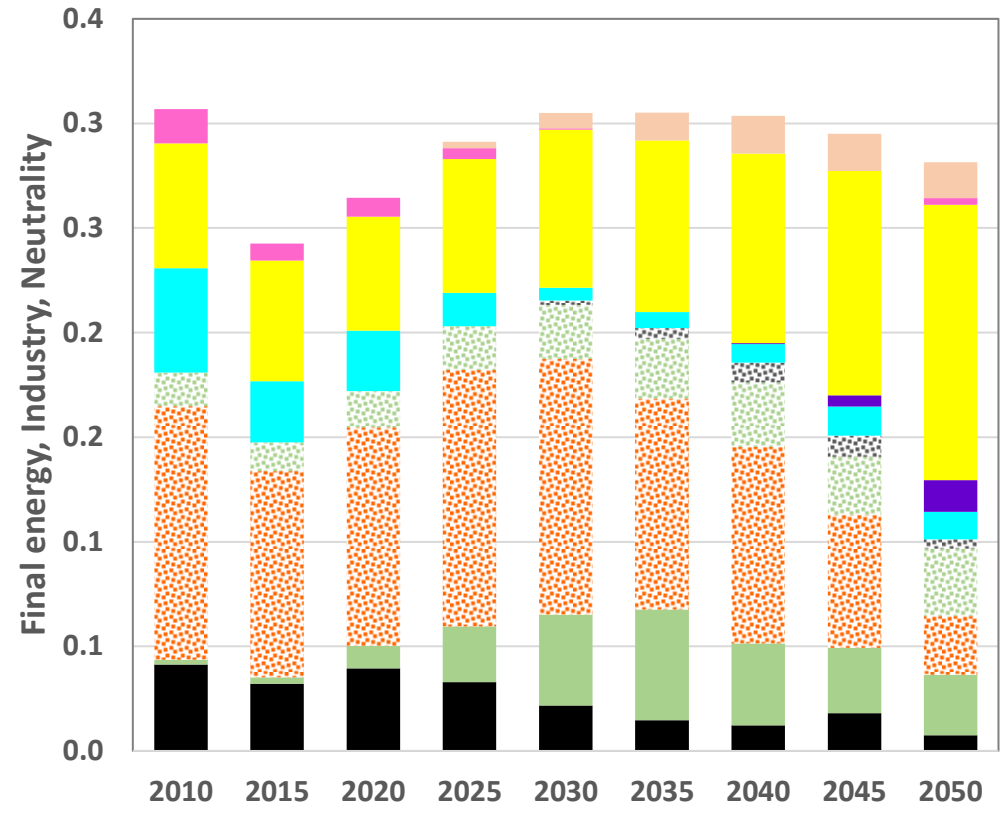


Final energy mix [EJ] - Industry

Reference (REF)



Neutrality (CN)



Legend for energy sources:

- Coal
- Biomass
- Oil-liquids
- Bio-liquids
- Coal-liquids
- Gas-liquids
- Gas
- Hydrogen
- Elec
- Heat
- Sol (el)
- Other

Modeling Results: SEE

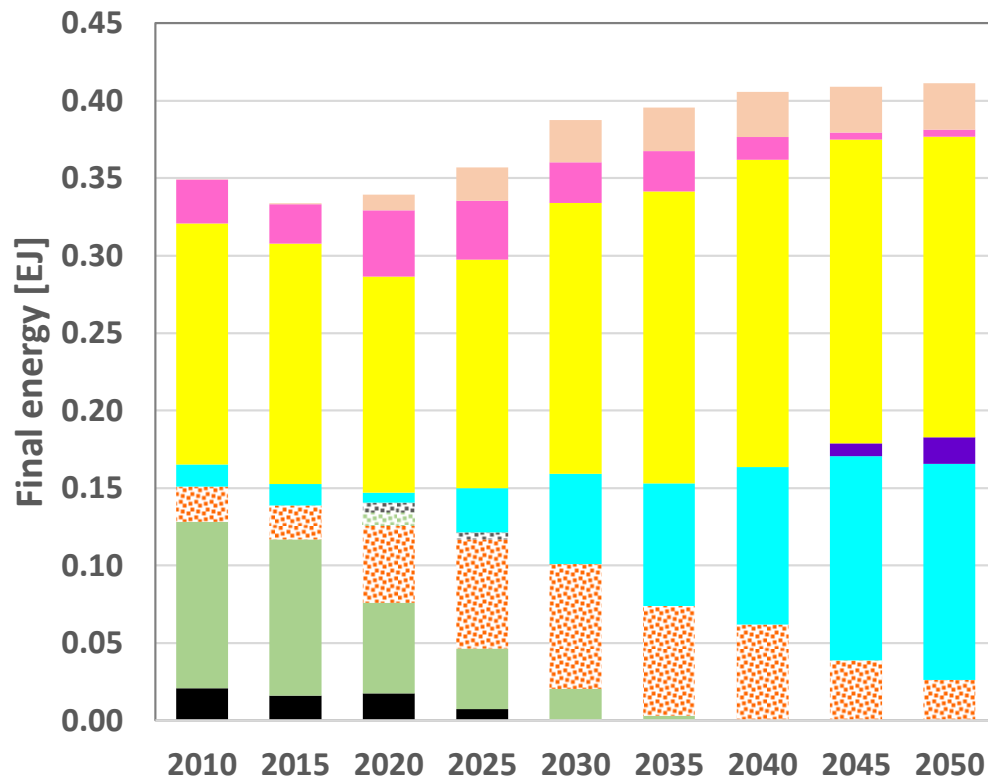
Final Energy

ENERGY

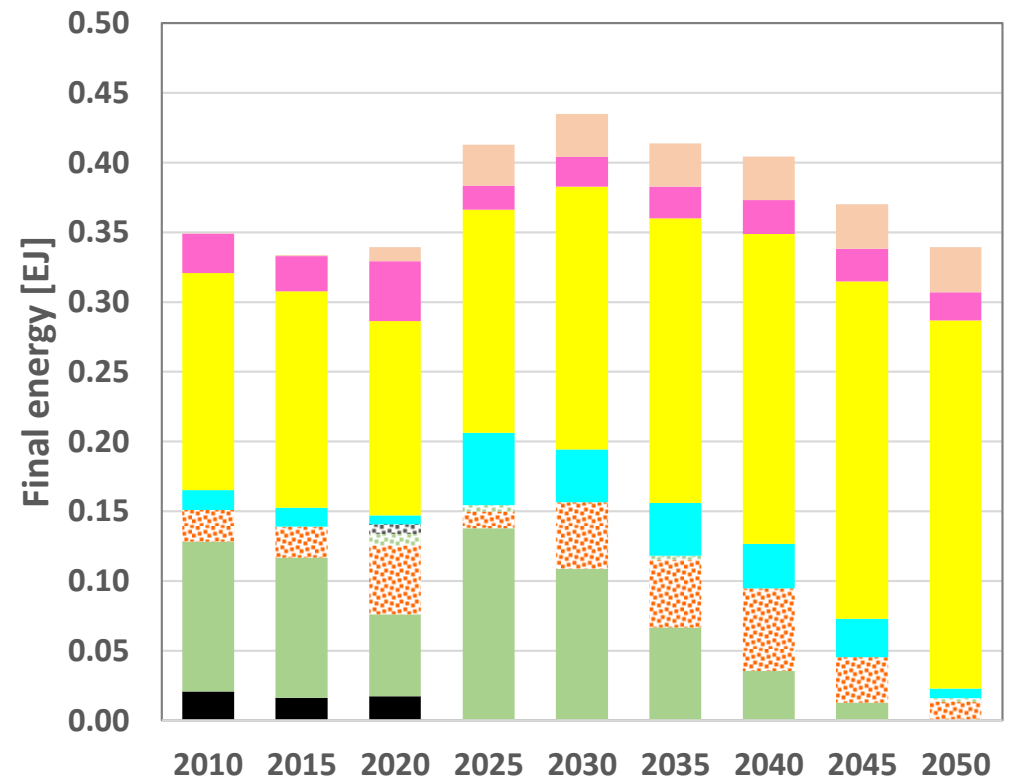


Final energy mix – Residential/Commercial

Reference (REF)



Neutrality (CN)



- Coal
- Biomass
- Oil-liquids
- Bio-liquids
- Coal-liquids
- Gas-liquids
- Gas
- Hydrogen
- Elec
- Heat
- Sol (el)
- Other

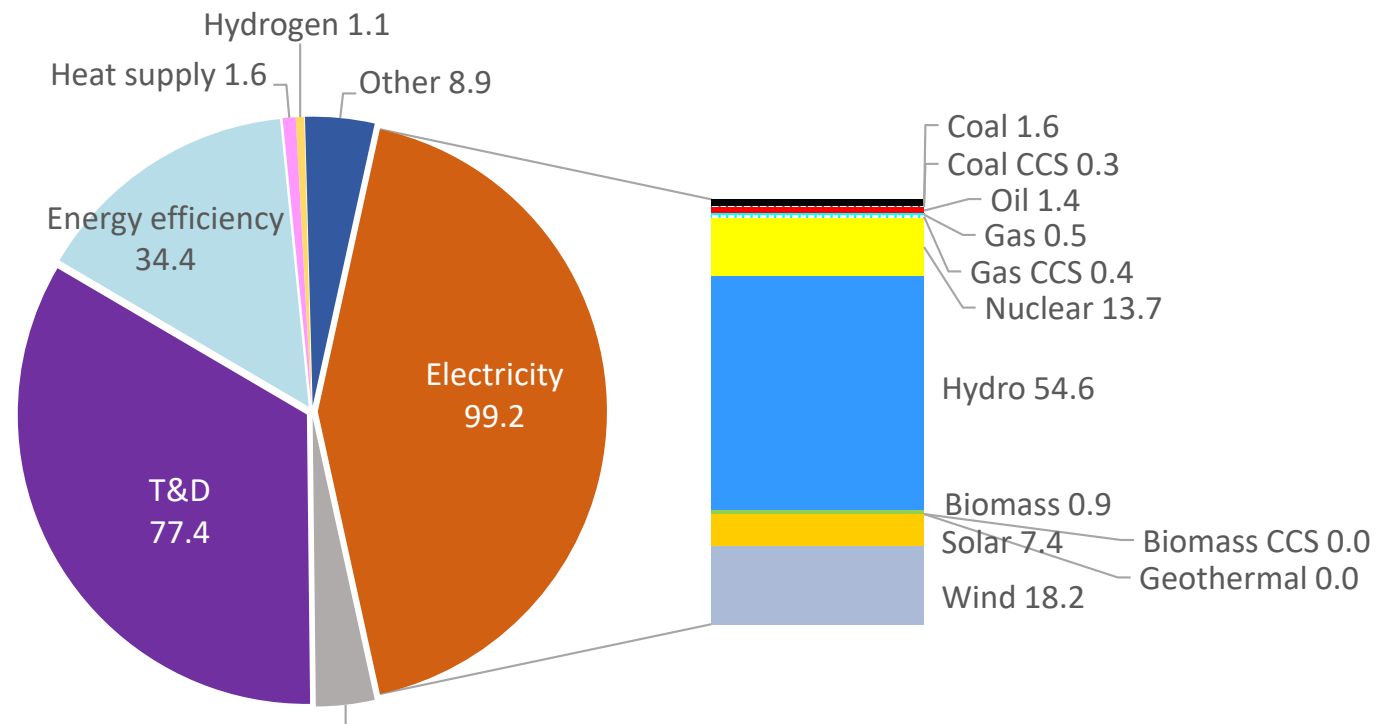
Modeling Results: SEE

Investment needs

ENERGY



Cumulative investments 2020-2050: *129.0 billion US\$₂₀₂₀*
Reference (REF)



- Extraction fossil fuel
- Coal
- Coal CCS
- Oil
- Oil CCS
- Gas
- Gas CCS
- Nuclear
- Hydro
- Biomass
- Biomass CCS
- Geothermal
- Solar
- Wind
- T&D
- Energy efficiency
- Heat supply
- Hydrogen
- Other

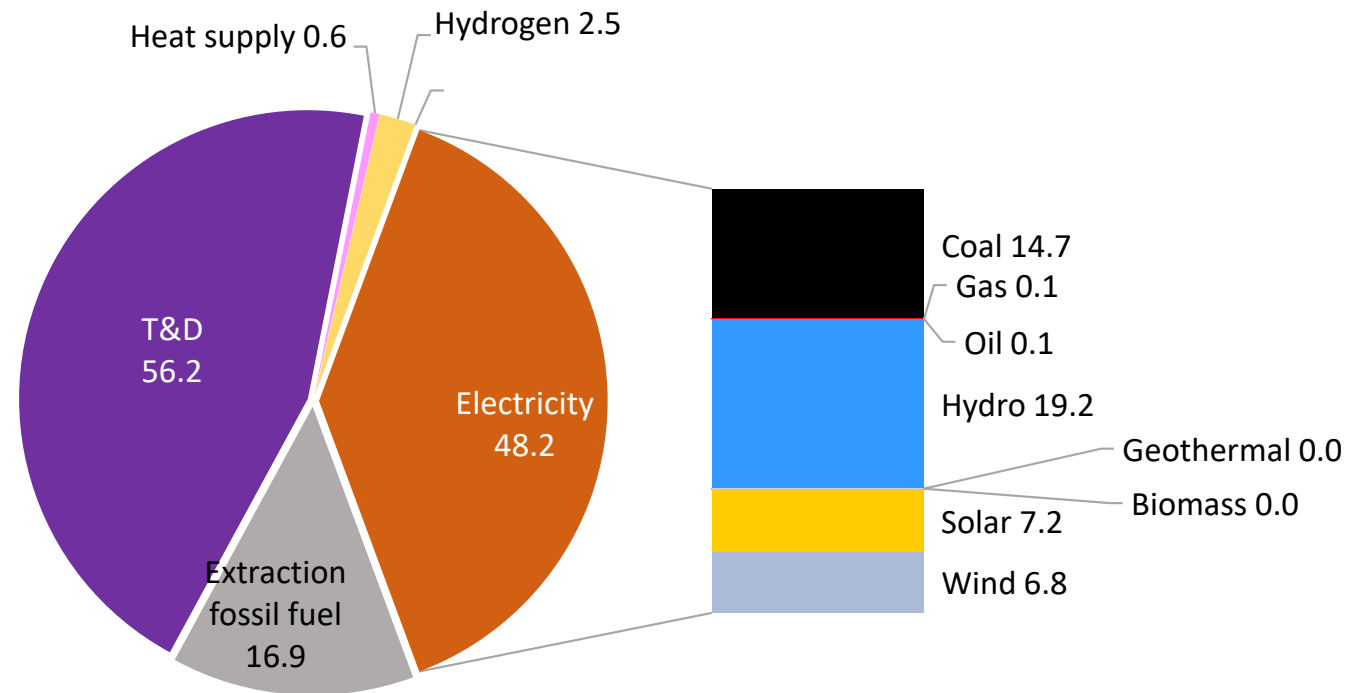
Modeling Results: SEE

Investment needs

ENERGY



Cumulative investments 2020-2050: *230.1 billion US\$₂₀₂₀*
Neutrality (CN)



- Extraction fossil fuel
- ▣ Oil CCS
- Hydro
- Solar
- Heat supply

- Coal
- Gas
- Biomass
- Wind
- Hydrogen

- ▣ Coal CCS
- ▣ Gas CCS
- ▣ Biomass CCS
- T&D
- Other

- Oil
- Nuclear
- Geothermal
- Energy efficiency

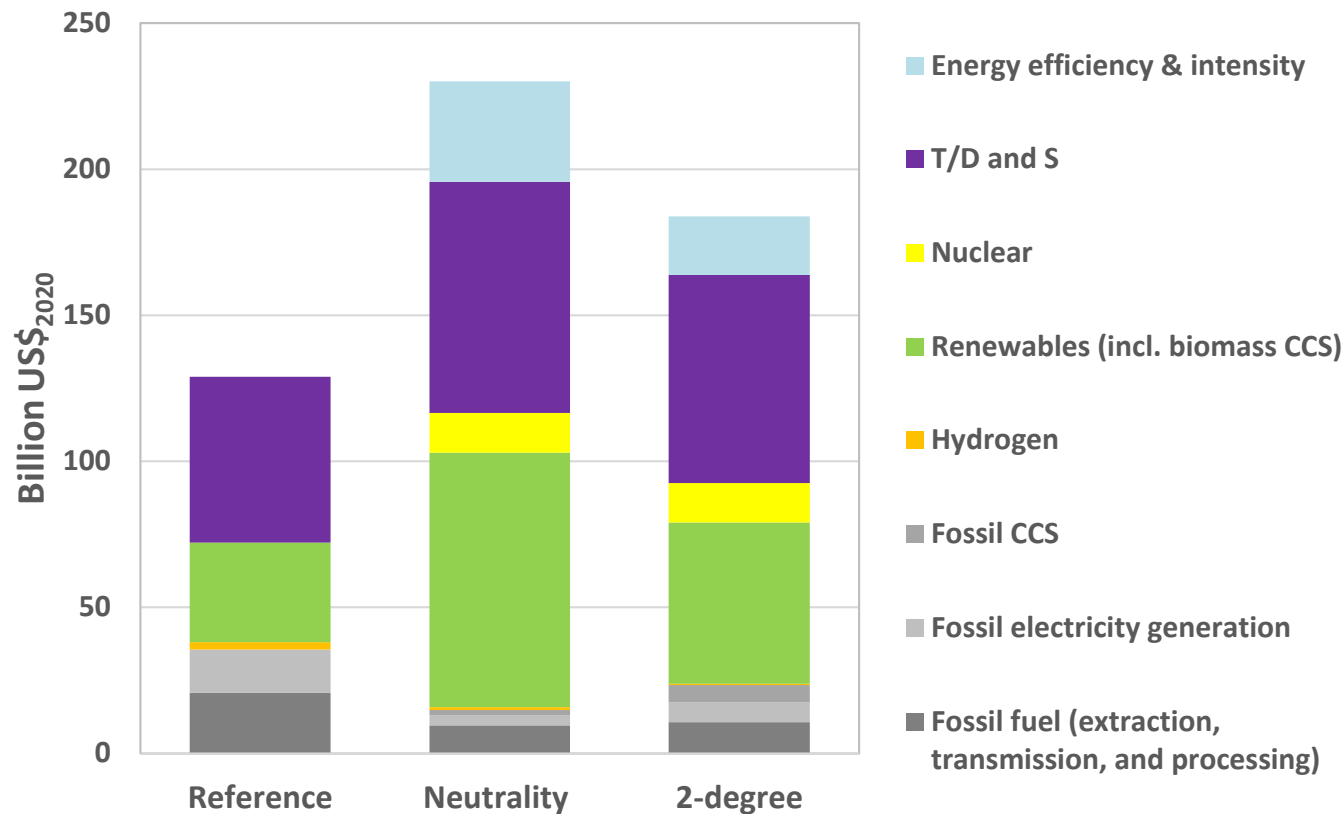
Modeling Results: S&E

Investment needs

ENERGY



Cumulative investment requirements REF, CN and 2-degree



- T/D & S: transmission, distribution and storage of electricity and district heat
- CCS: carbon capture and storage
- BAT: Best available technology

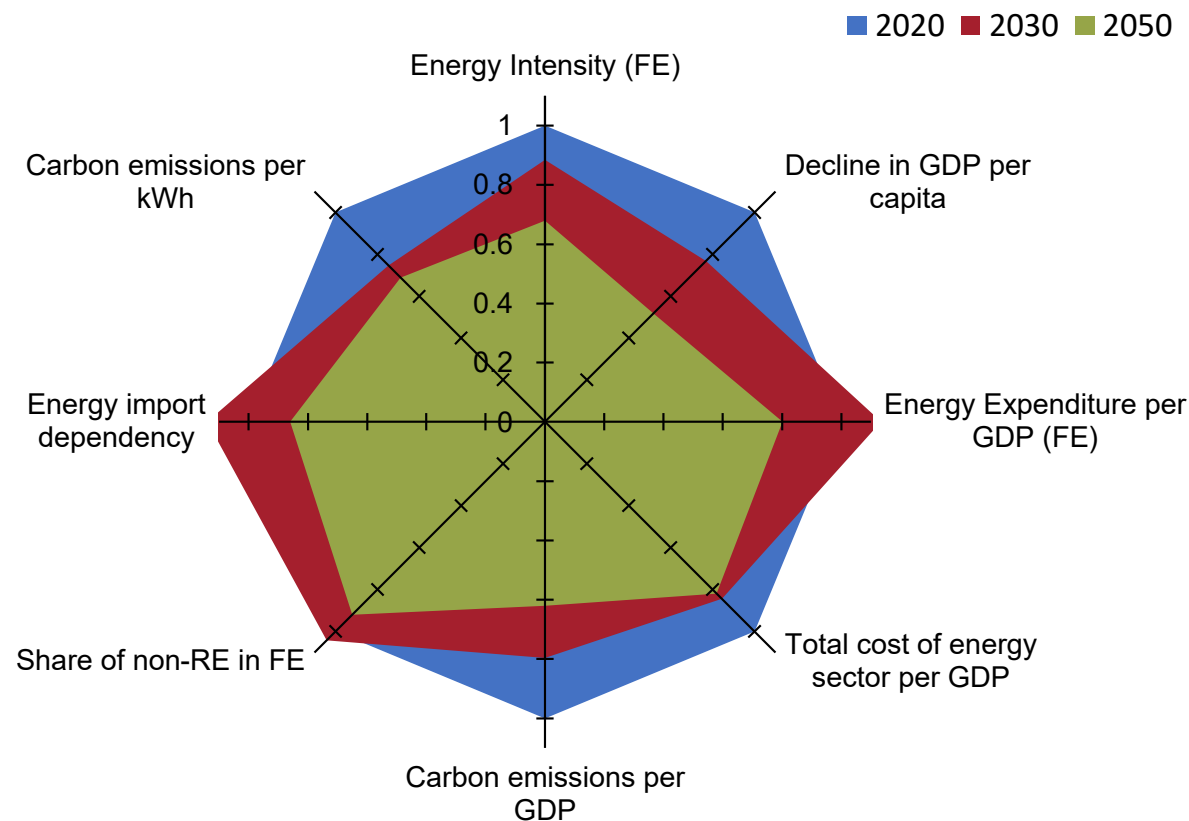
Modeling Results: SEE

Indicators

ENERGY



Comparing different indicators relative to 2020, Reference scenario



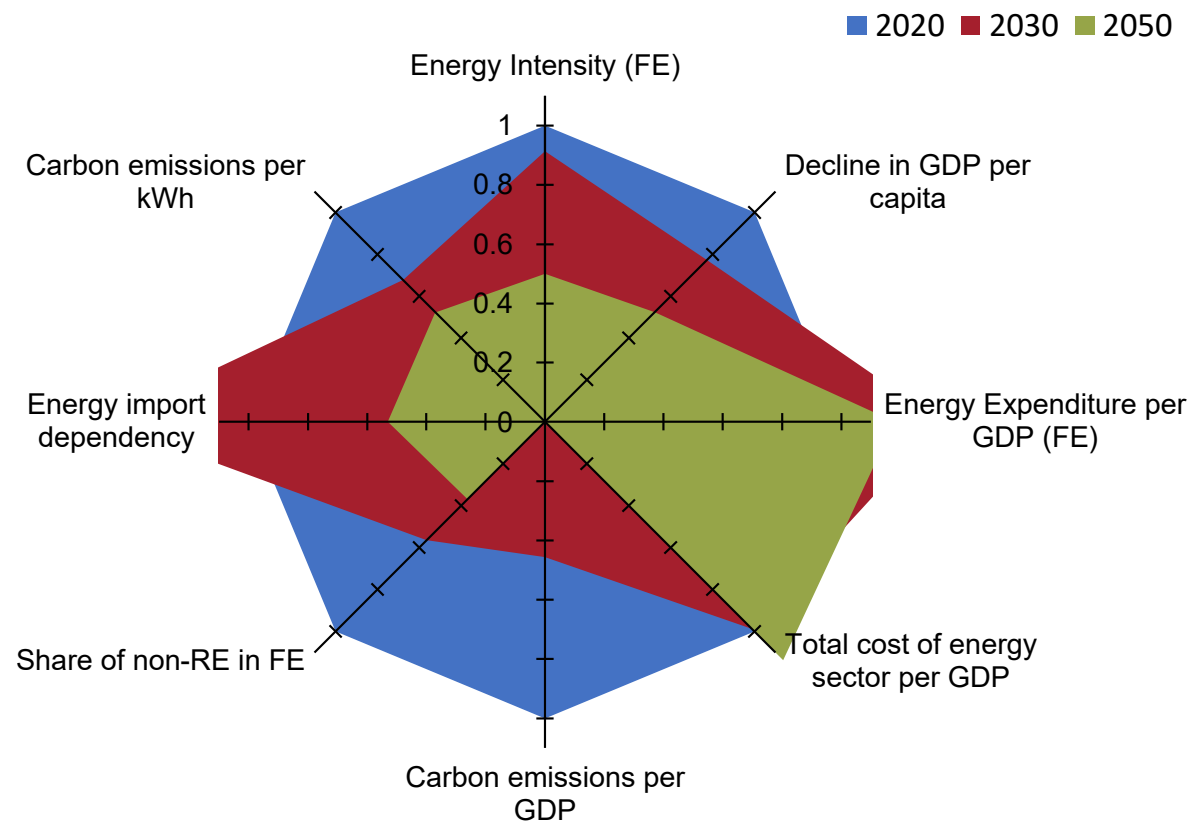
Modeling Results: SEE

Final Energy Mix

ENERGY



Comparing different indicators relative to 2020, Neutrality scenario



Modeling Results: SEE

Impacts of different futures

ENERGY



Indicators across scenarios (averages between 2020 and 2050)

