Japan’s GHG net-zero scenario using AIM/Enduse[1.0]

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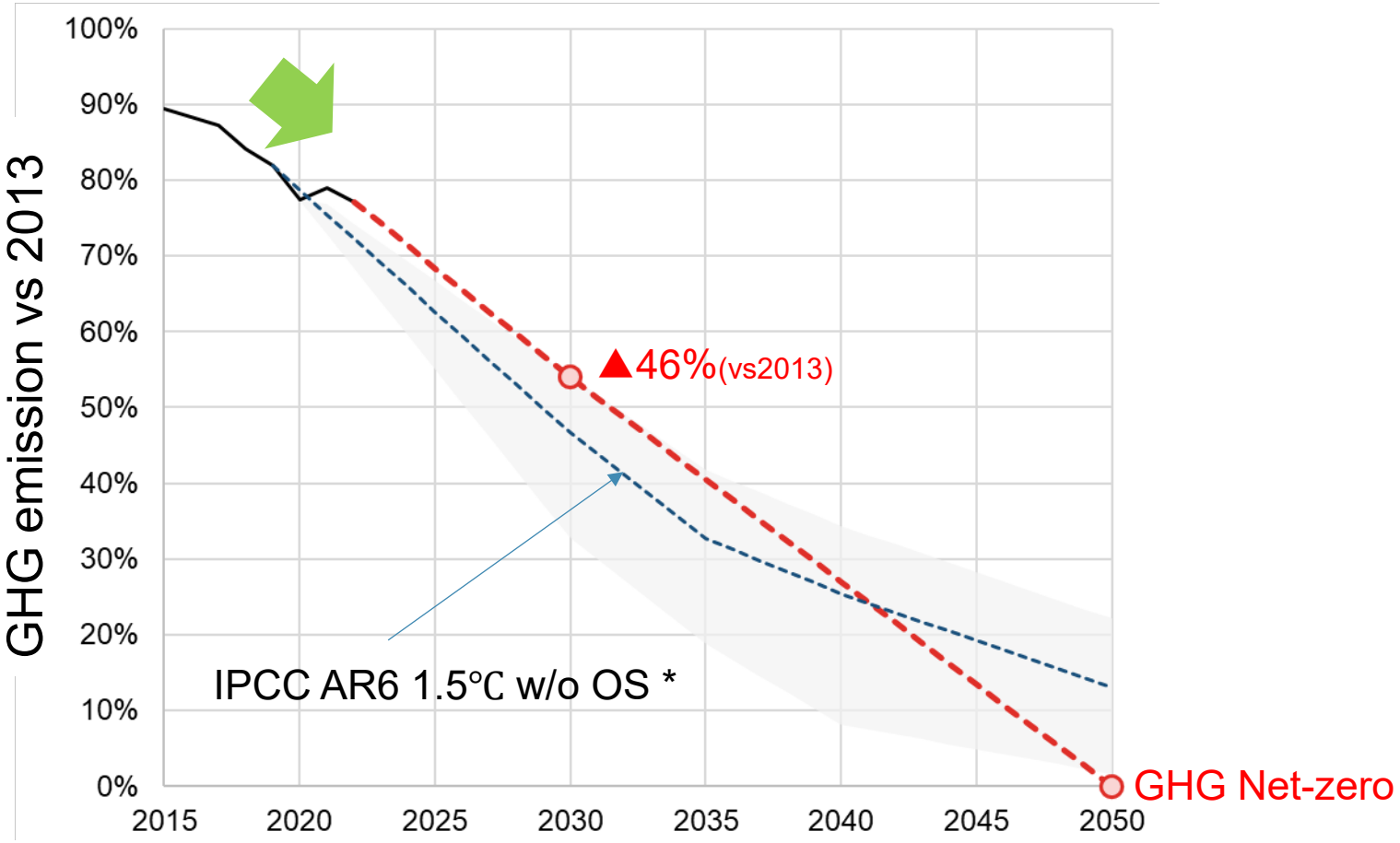
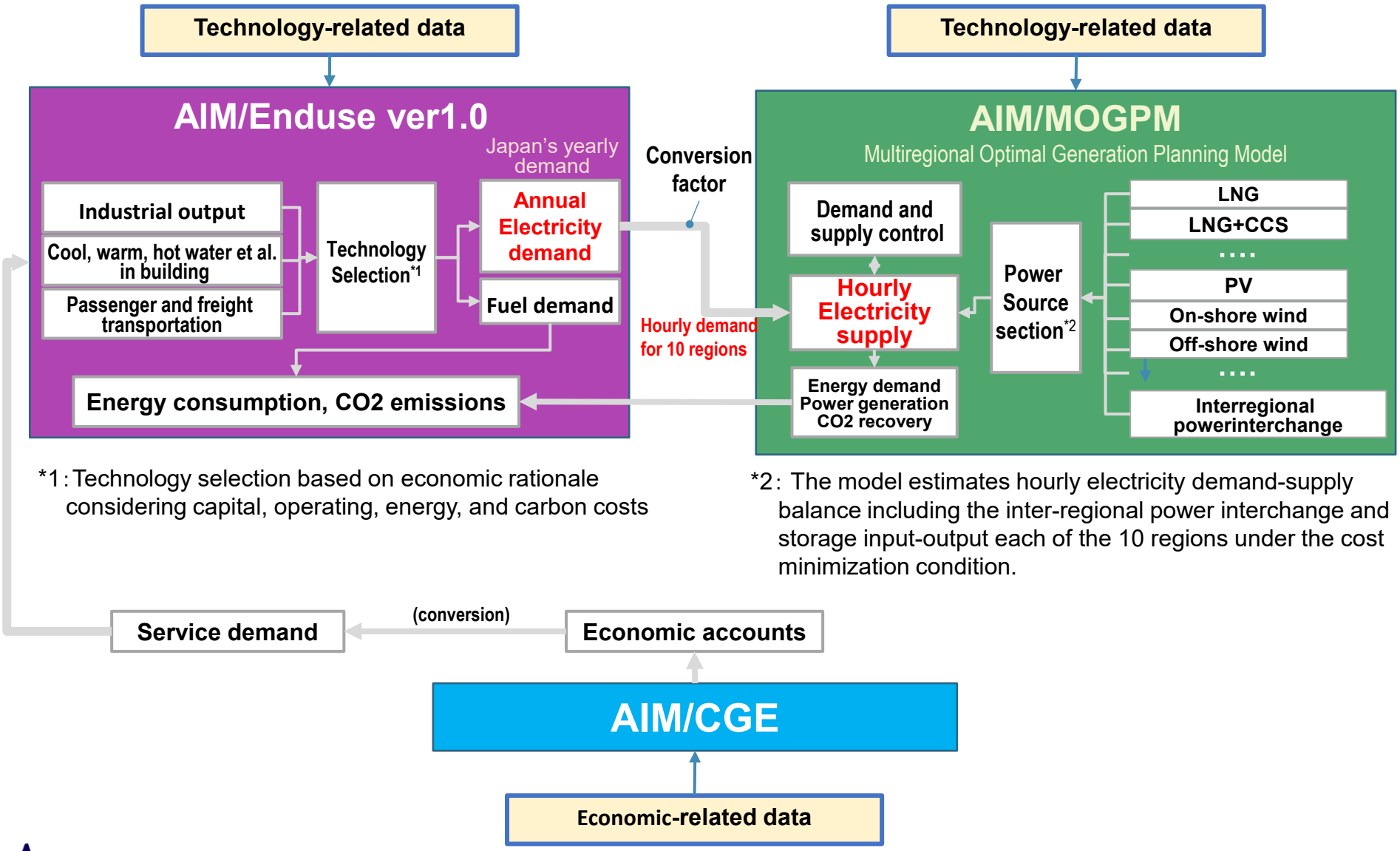
Japan's GHG emission and reduction target

Discussions have started in the government committee to formulate the new target by 2035 and/or 2040.



* IPCC AR6 1.5℃ w/o OS : The reduction rate for the world is applied directly to Japan. The base year is converted from 2019 to 2013.

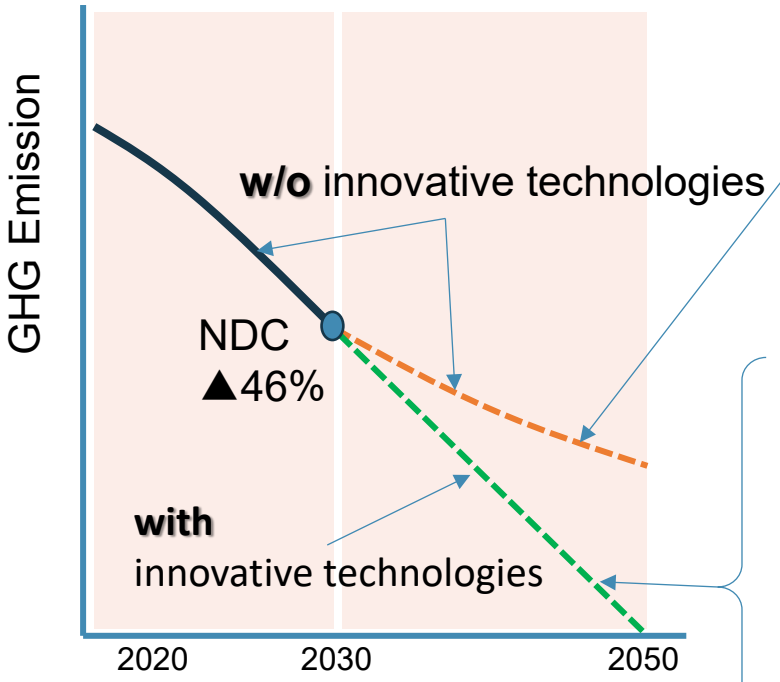
Three AIM models used in the analysis



*1: Technology selection based on economic rationale considering capital, operating, energy, and carbon costs

*2: The model estimates hourly electricity demand-supply balance including the inter-regional power interchange and storage input-output each of the 10 regions under the cost minimization condition.

Scenario and Case | Measures



Technology Progress Scenario

Innovative Technology Scenario

- Hydrogen and H2-based fuel (Synfuel, Ammonia)
- CCUS for power generation and industrial process
- More renewables
- More electrification
- CDR

Social Transformation Scenario

- Circular economy / Dematerialization
- Digitalization

+ above innovative technologies

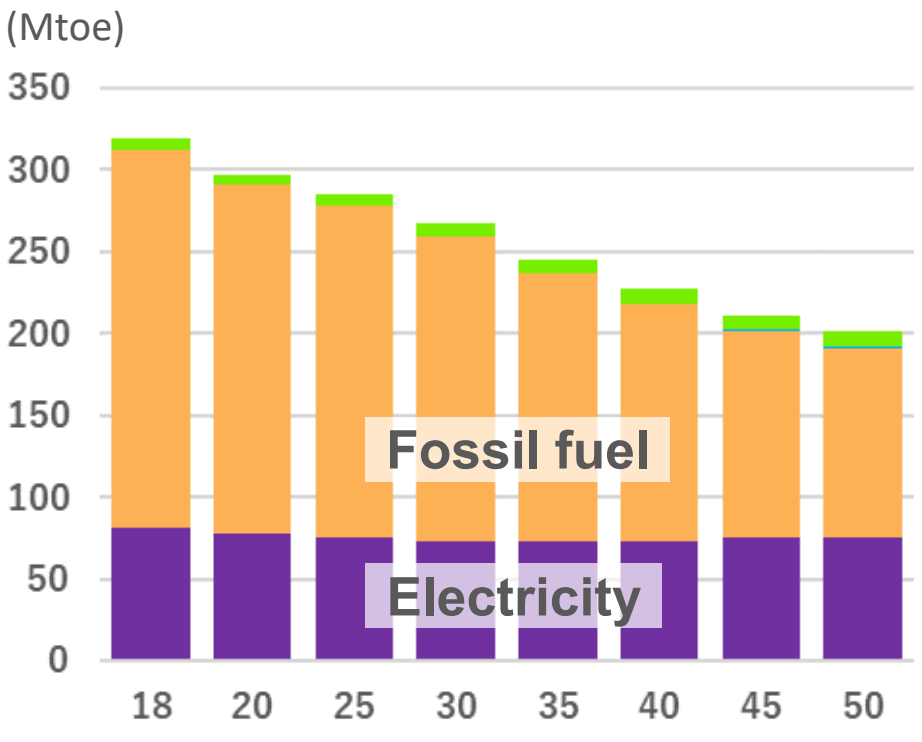
Case study | Renewable electricity and hydrogen-based fuel

	Scenario and case	RE electricity production	H2 & H2-based fuel Self sufficiency	GHG emission in 2050
1	**Technology Progress**	Linear extrapolation of 2020s' trends	about zero demand	
2	**Innovative Technology** RE60 | Domestic H2-based fuel 10	about **60%**	about **10%**	GHG net-**zero**
3	**Innovative Technology** RE75 | Domestic H2-based fuel 25	about **75%**	about **25%**	GHG net-**zero**
4	**Social Transformation** RE75 | Domestic H2-based fuel 25	about **75%**	about **25%**	GHG net-**zero**
5	**Social Transformation** RE75 | Domestic H2-based fuel 45	about **75%**	about **45%**	GHG net-**zero**

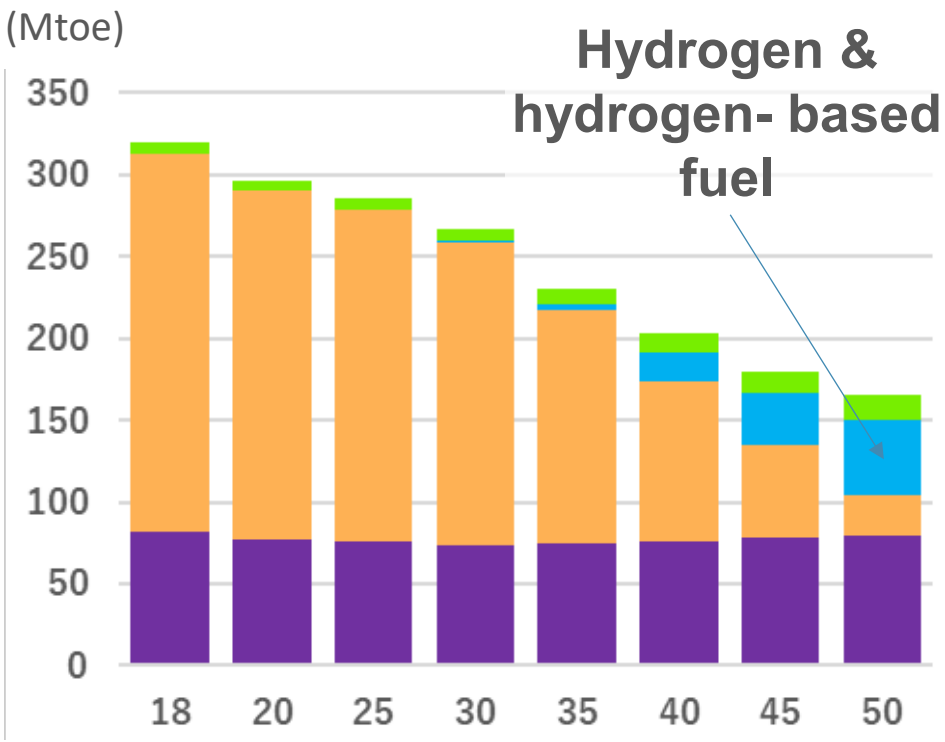
Final Energy Consumption

Technology Progress Scenario

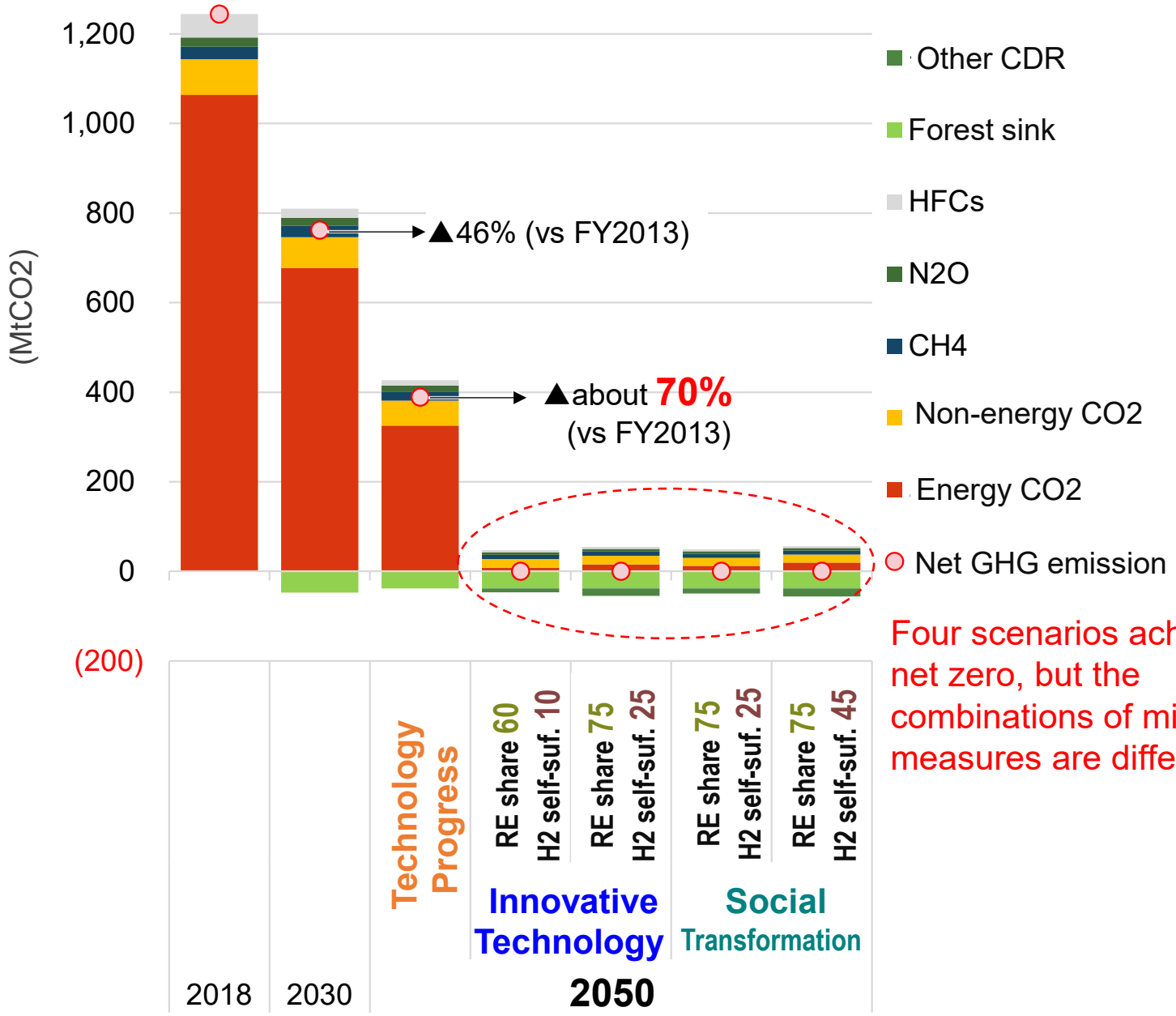
(NDC extension w/o innovative technologies)



Innovative Technology Scenario



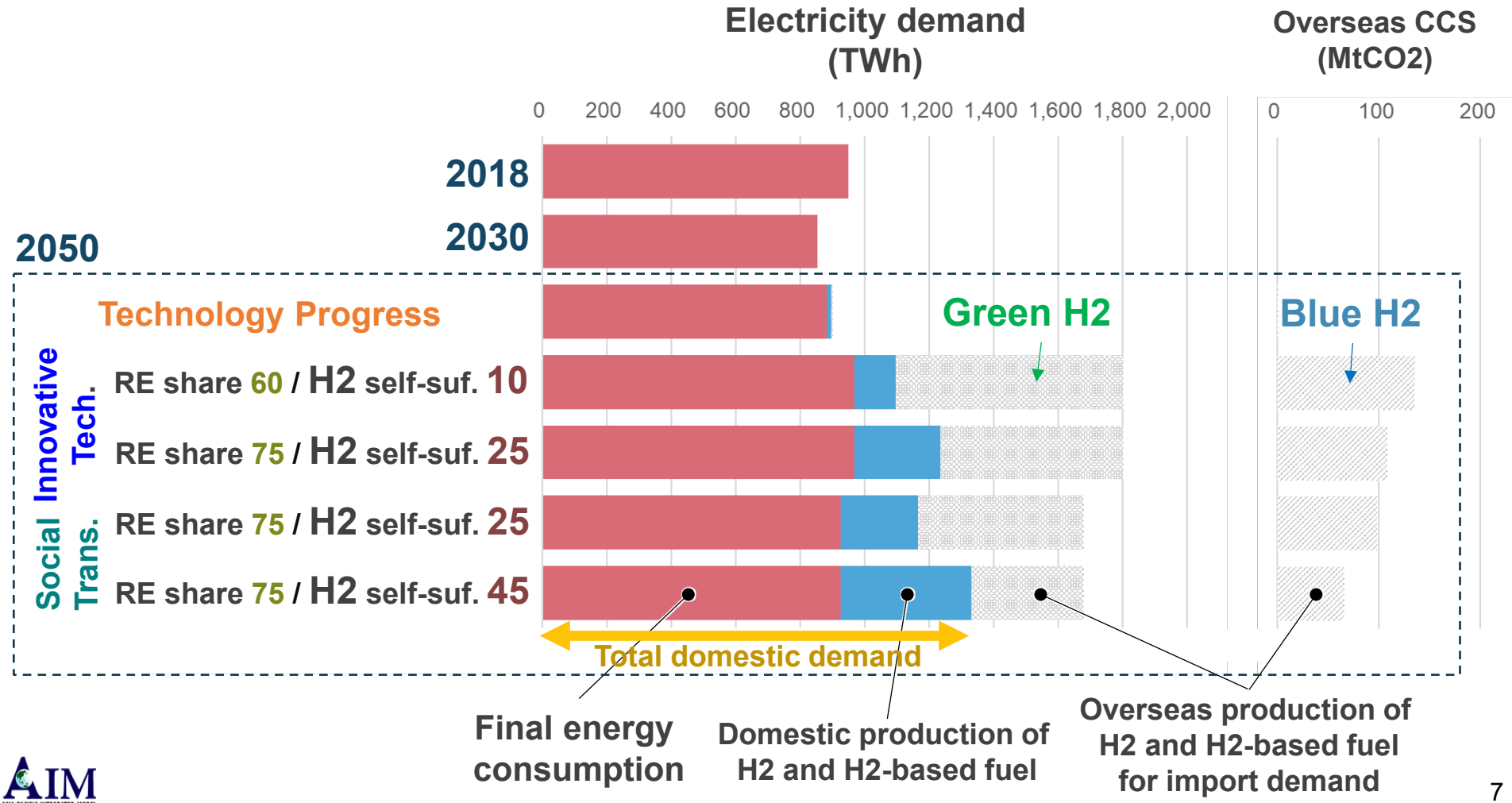
GHG emission in 2050



Four scenarios achieve GHG net zero, but the combinations of mitigation measures are different.

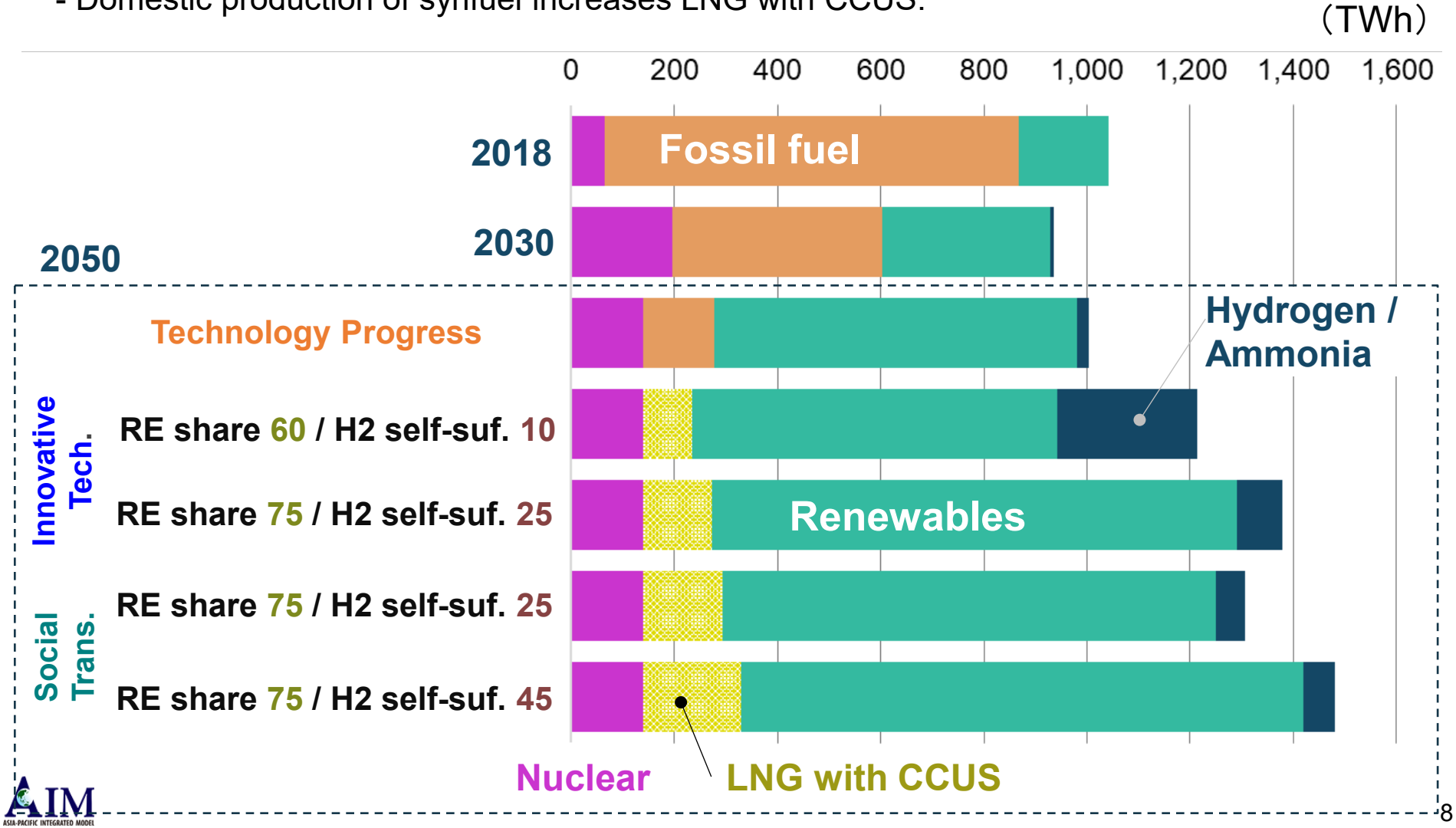
Electricity demand in 2050

- Electricity demand in final energy consumption remains almost same.
- Electricity demand for domestic production of H2 and H2-based fuel is 10-30%.
- Importing H2 and H2-based fuel induces offshore power generation or CCUS.



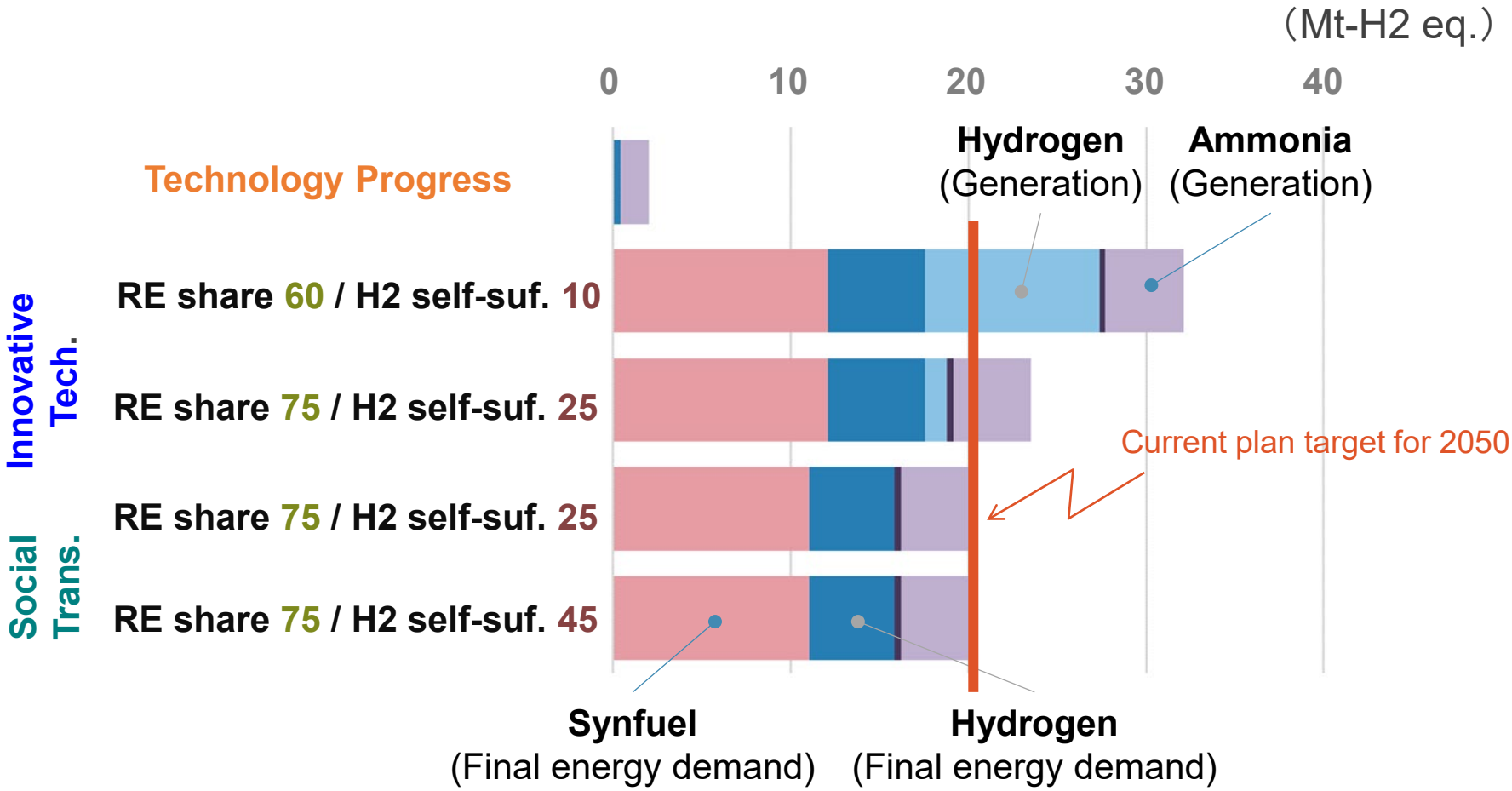
Electricity generation in 2050

- Decarbonized electricity sources share 100% in 2050.
- Low renewables require hydrogen or ammonia power.
- Social transformation reduces renewables and hydrogen/ammonia.
- Domestic production of synfuel increases LNG with CCUS.



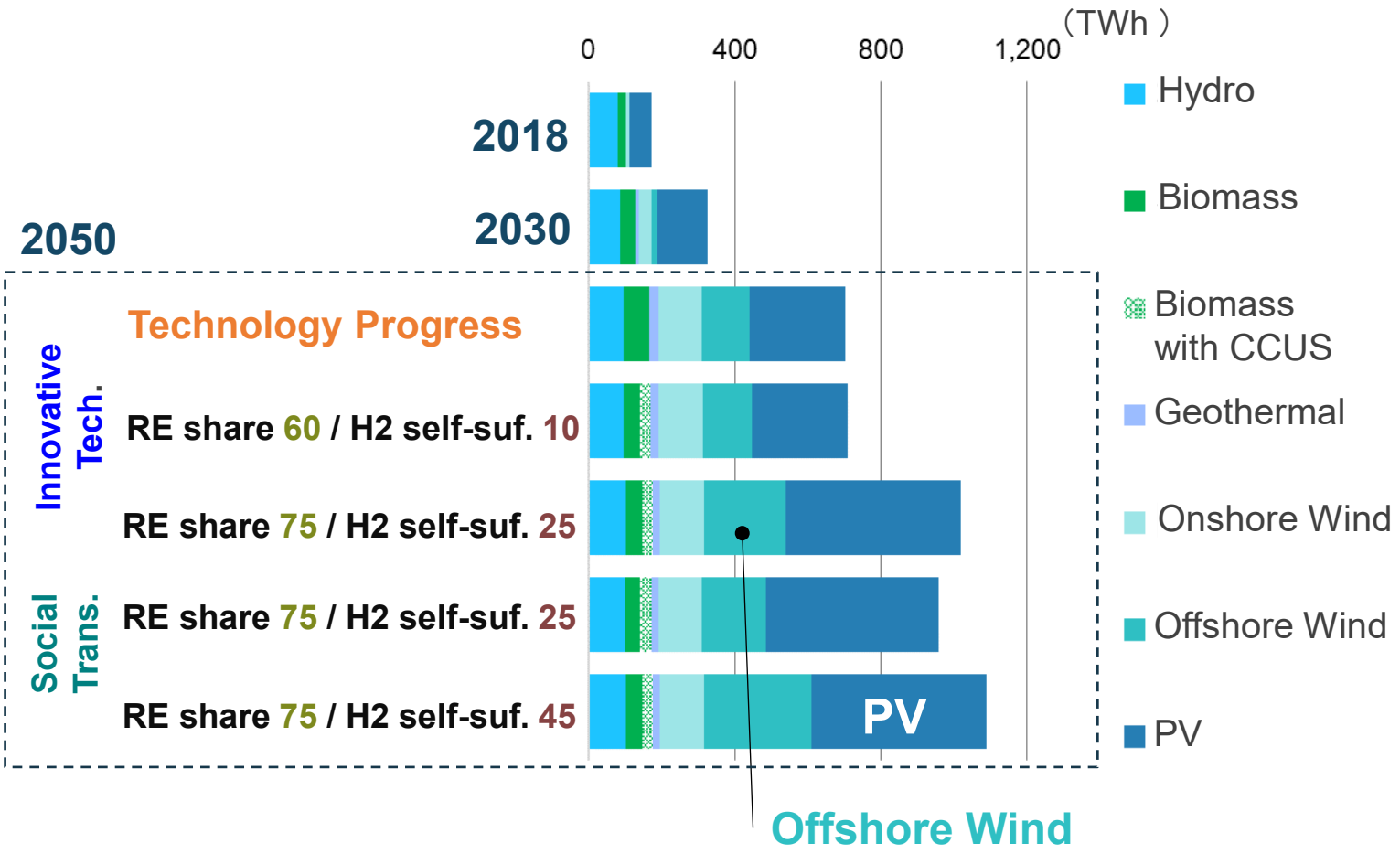
Hydrogen and H2-based fuel demand in 2050

- In case that hydrogen power plant is larger than others, H2 and H2-based fuel demand is over current plant.



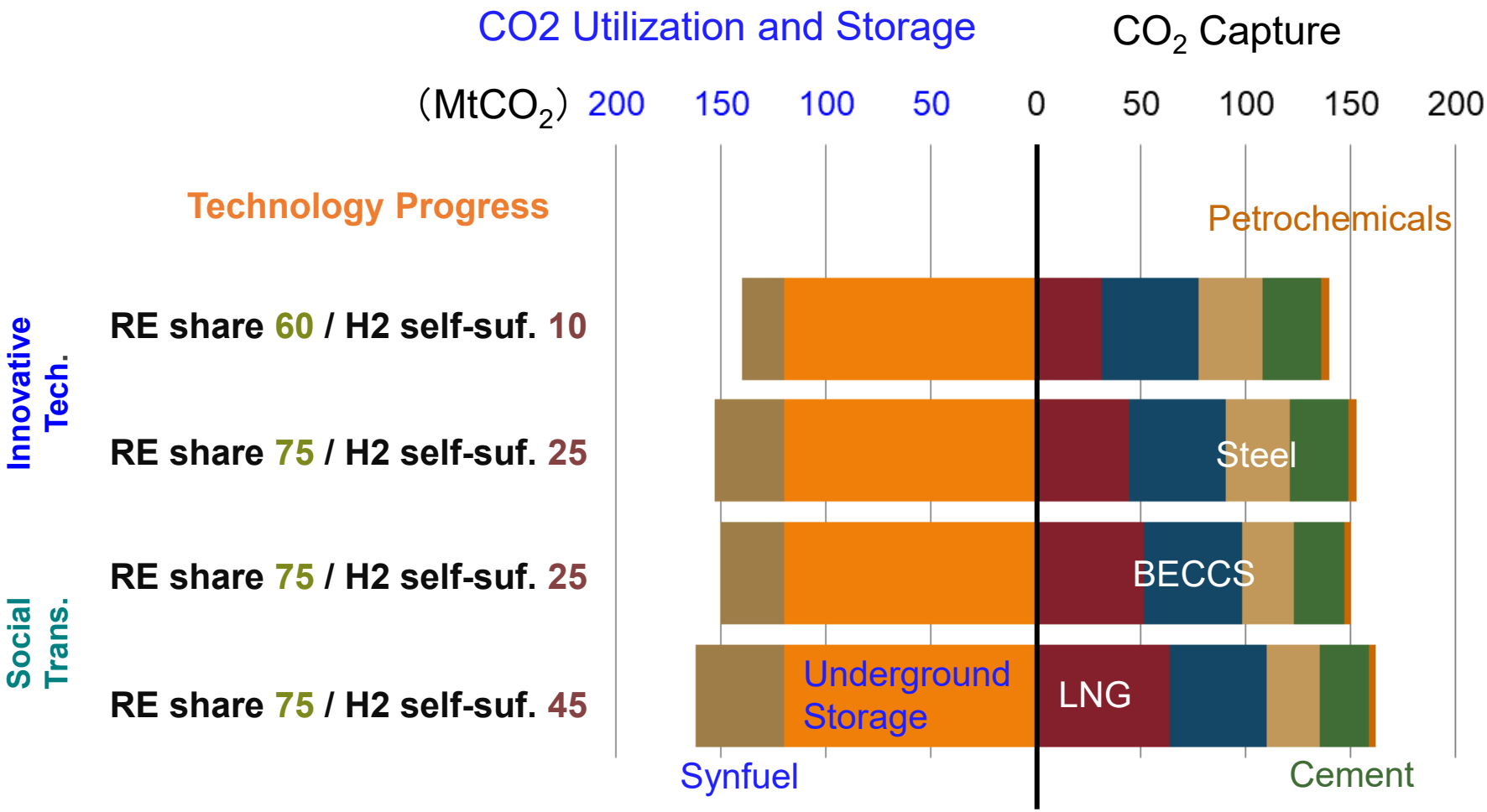
Renewable electricity in 2050

- PV and offshore wind increase largely.
- Japan's renewable condition is not good. R&D of the innovative renewable technologies are underway.



CCUS in 2050

- CO2 storage is assumed 120Mt-CO2 in 2050.

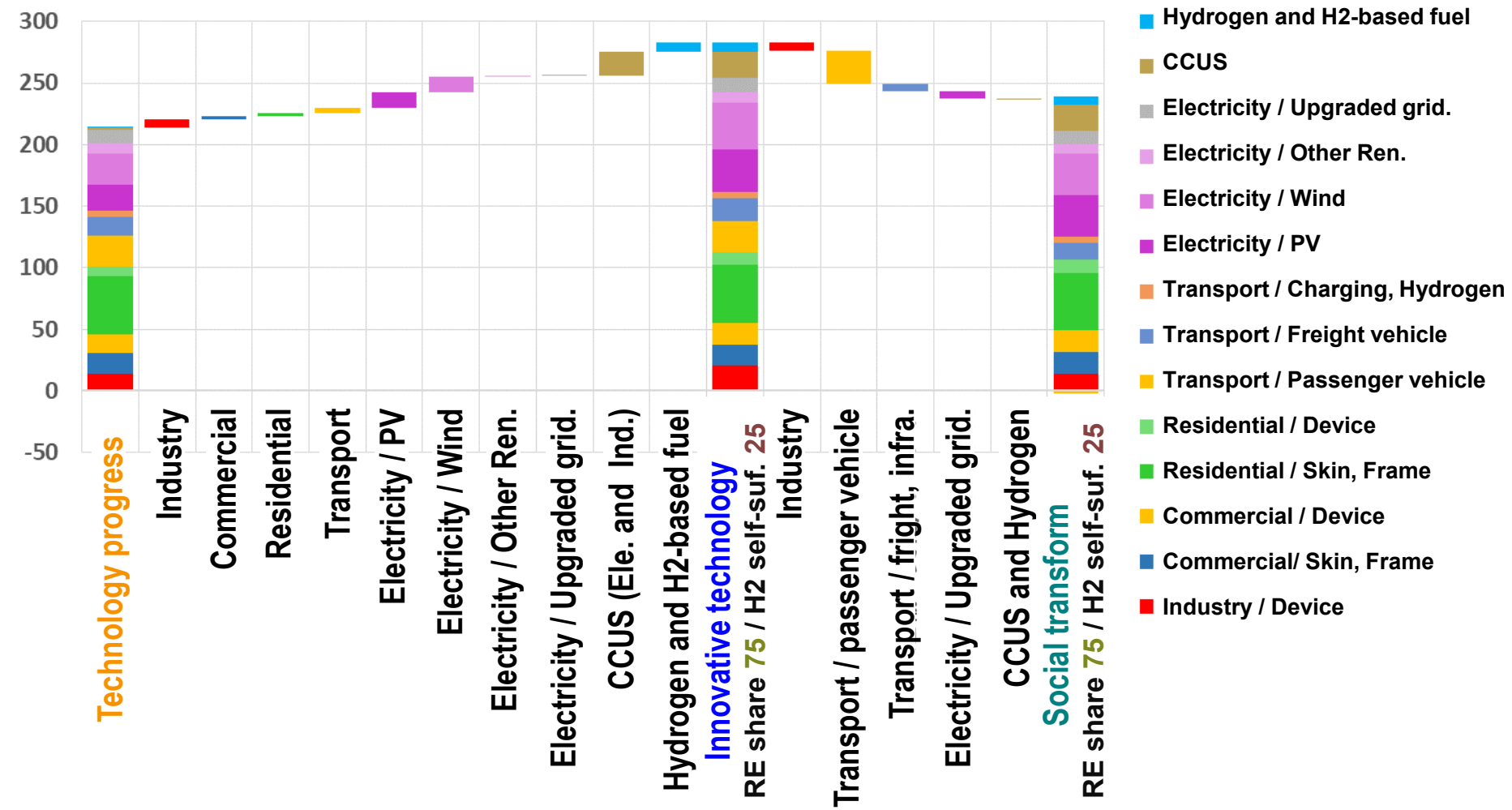


- CCS roadmap by METI : 120~240MtCO2 in 2050
- Cumulative storage by 2022 : 0.3MtCO2

Investment to achieve net-zero emission

- Social transformation decrease total amount of investment.

(Trillion JPY)



Conclusion

To achieve net zero, it is essential that innovative technologies be deployed on a mass scale, which will require further research and development, and strategies to secure decarbonized resources, including from abroad. Social transformation increases the feasibility of net zero.

Discussions have started to formulate the new target by 2035 and/or 2040. We plan to contribute to this discussion by presenting emission pathways and roadmaps.

Achieving a decarbonized society is a difficult change to overcome for any country in Asia. However, each country has advantages and disadvantages regarding decarbonization resources. If we, the AIM family members can promote research activities on the Asian decarbonization society that can be realized by effectively utilizing decarbonization resources across countries, we believe that we can provide helpful information to stakeholders around the world.