

WEBINAR

# 2050 Climate Neutrality Roadmap for Korea 'K-Map' Scenario

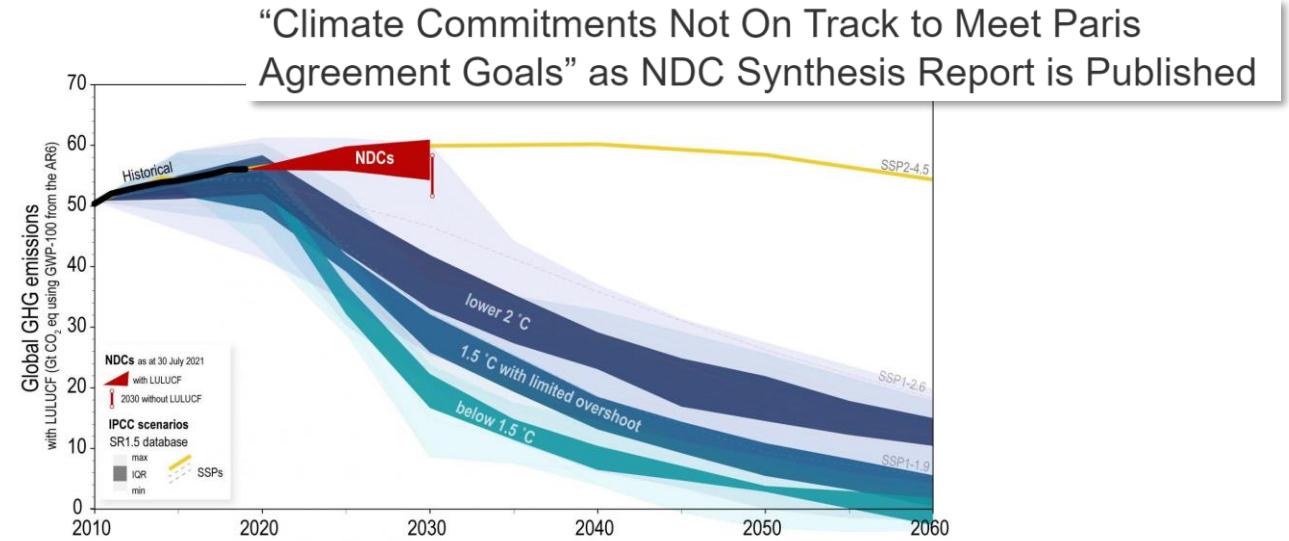
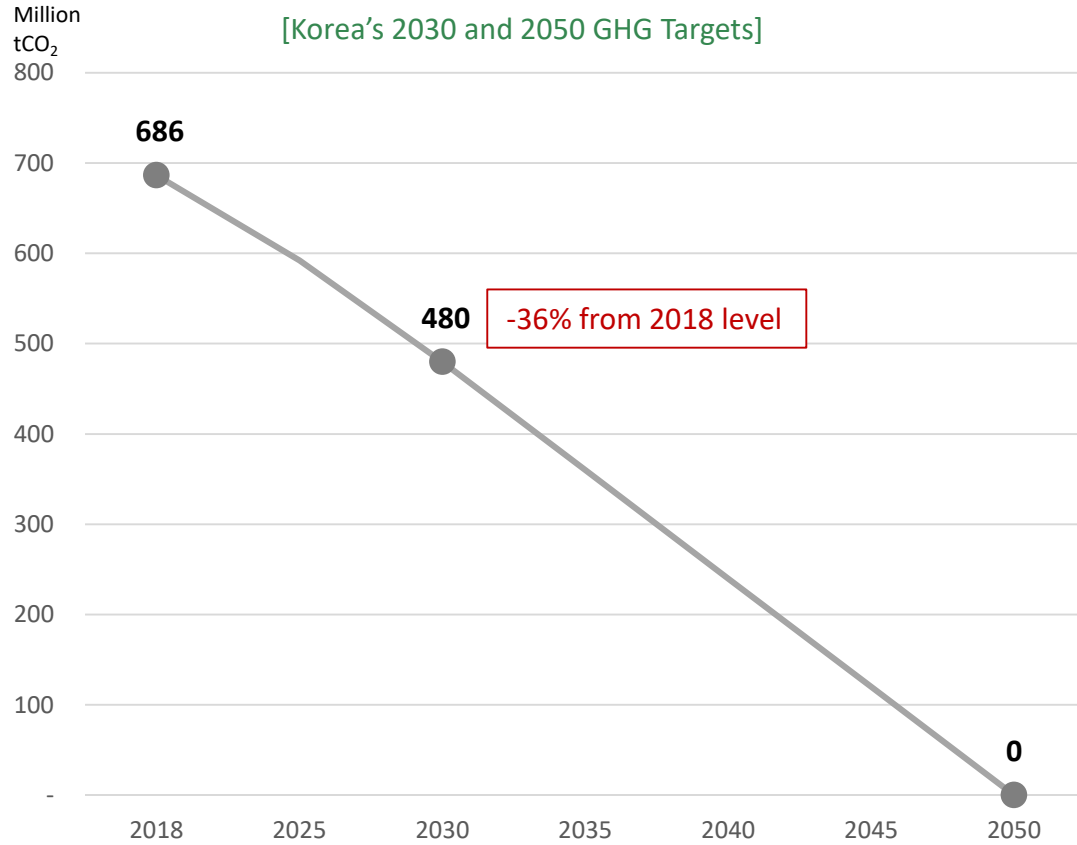
: Emissions Reduction Pathways, Drivers, Costs And Benefits

Feb 17, 2022

Green Energy Strategy Institute (KR)  
Institute for Green Transformation (KR)  
NEXT Group (KR)  
Agora Energiewende (DE)



## Reduction target is not enough to meet Paris Agreement goals.



**SOUTH KOREA OVERALL RATING**  
**HIGHLY INSUFFICIENT**

Source: Climate Action Tracker

1

**A more ambitious reduction target**

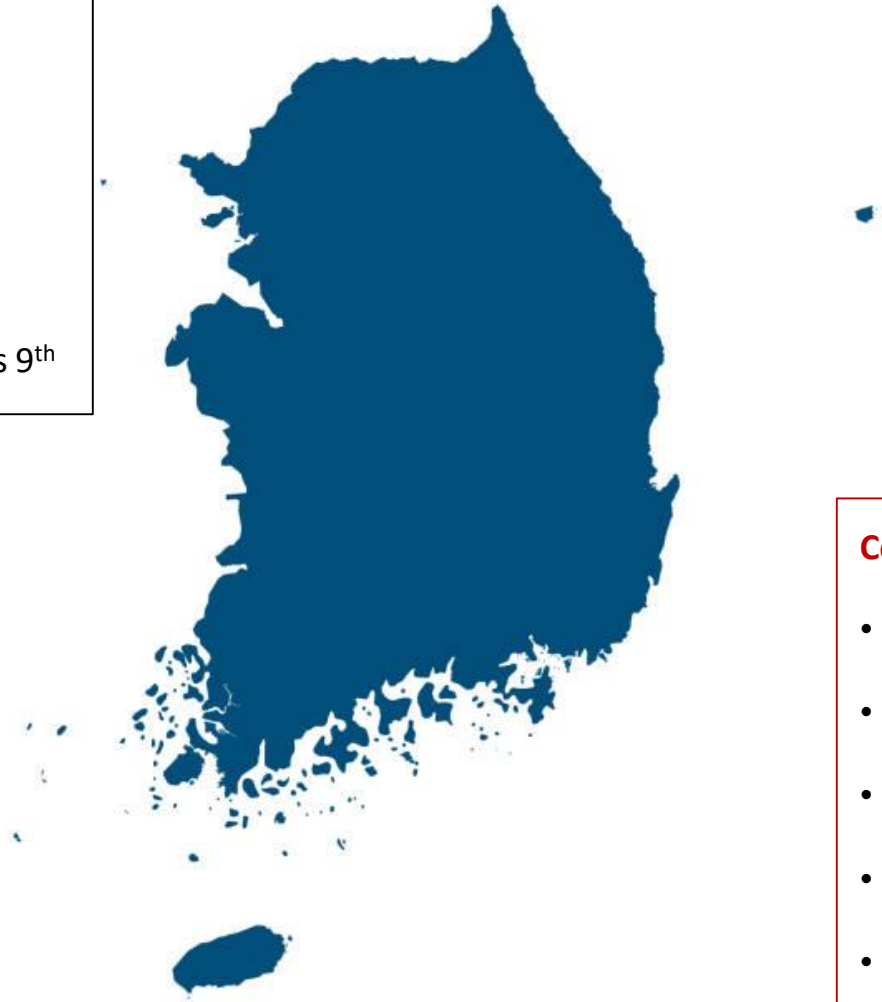
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**Specific reduction measures on timeline**

3

**Cost and benefit analysis**

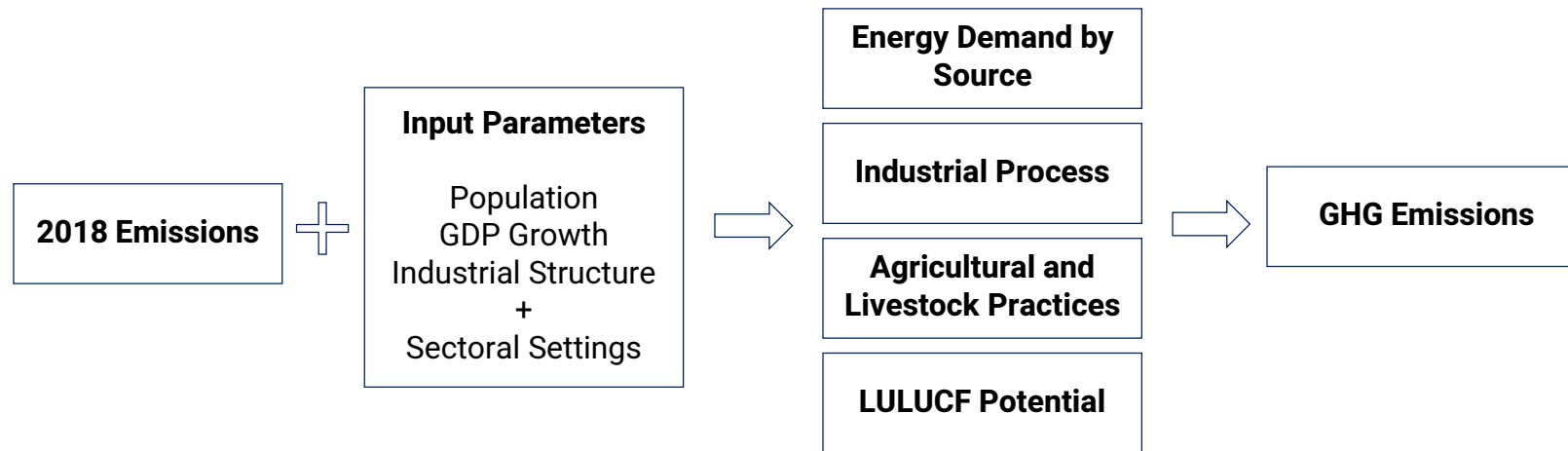
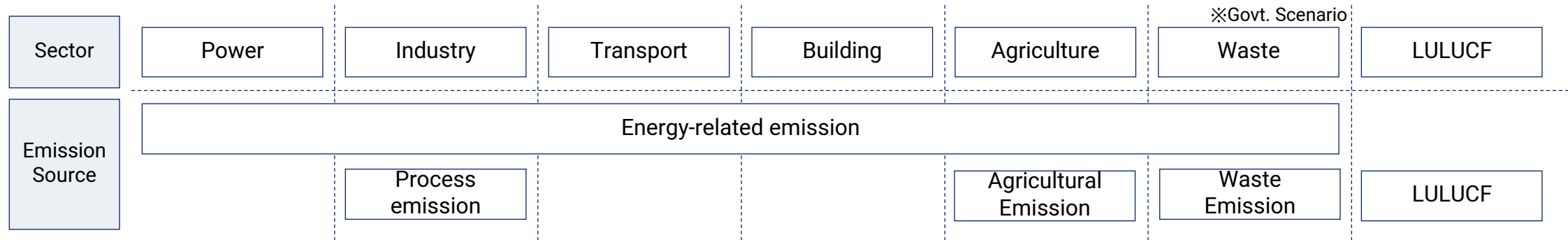
- **Population** : 52 million (2022)
- **Size** : 10 million ha. (one third of Germany)
- **GDP** : 1.6 trillion USD (2020) – world's 12th
- **GDP per capita** : \$29,958 (2020) – world's 31th
- **GHG emissions** : 701 billion tCO<sub>2</sub> (2019) – world's 9<sup>th</sup>



## Constraints in net-zero transition

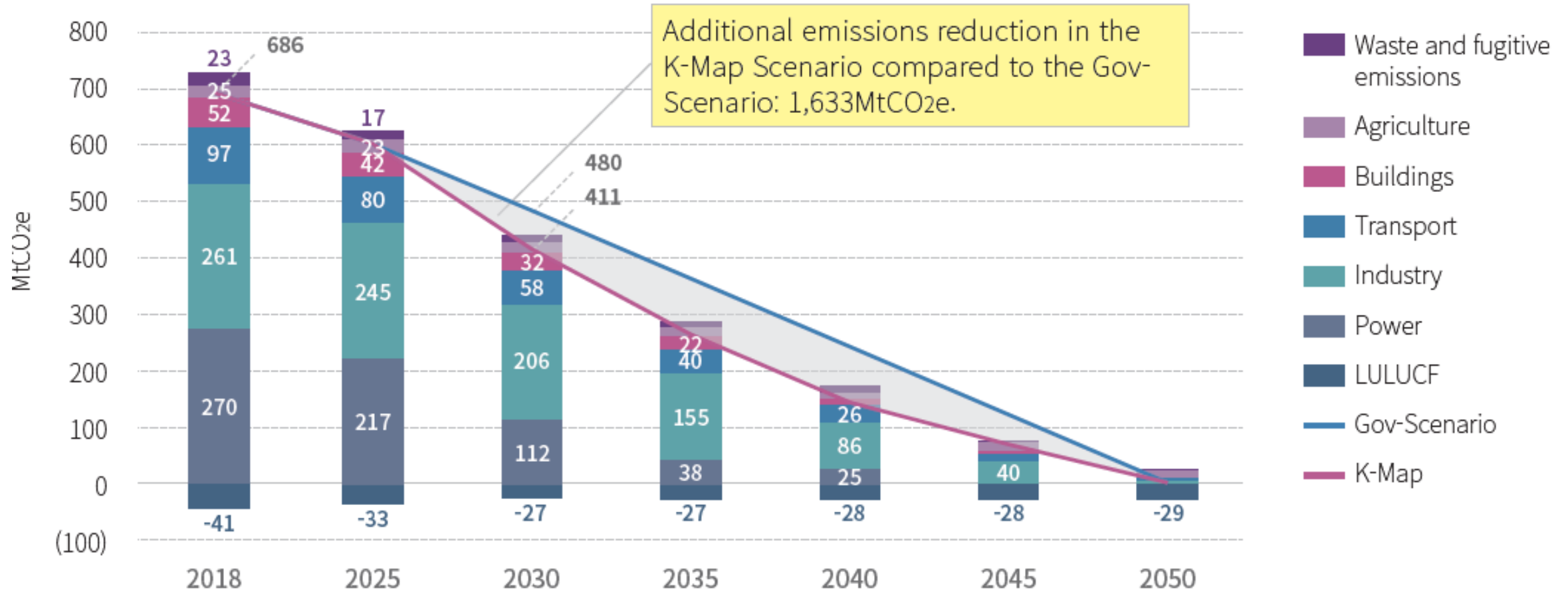
- **Isolated grid**
- **Limited carbon storage space**
- **Manufacturing-oriented economy**
- **Strong resistance from industry**
- **Weak consensus on carbon neutrality**

Based on macro economic parameters of the government scenario, K-Map derived best reduction potential from each sector.



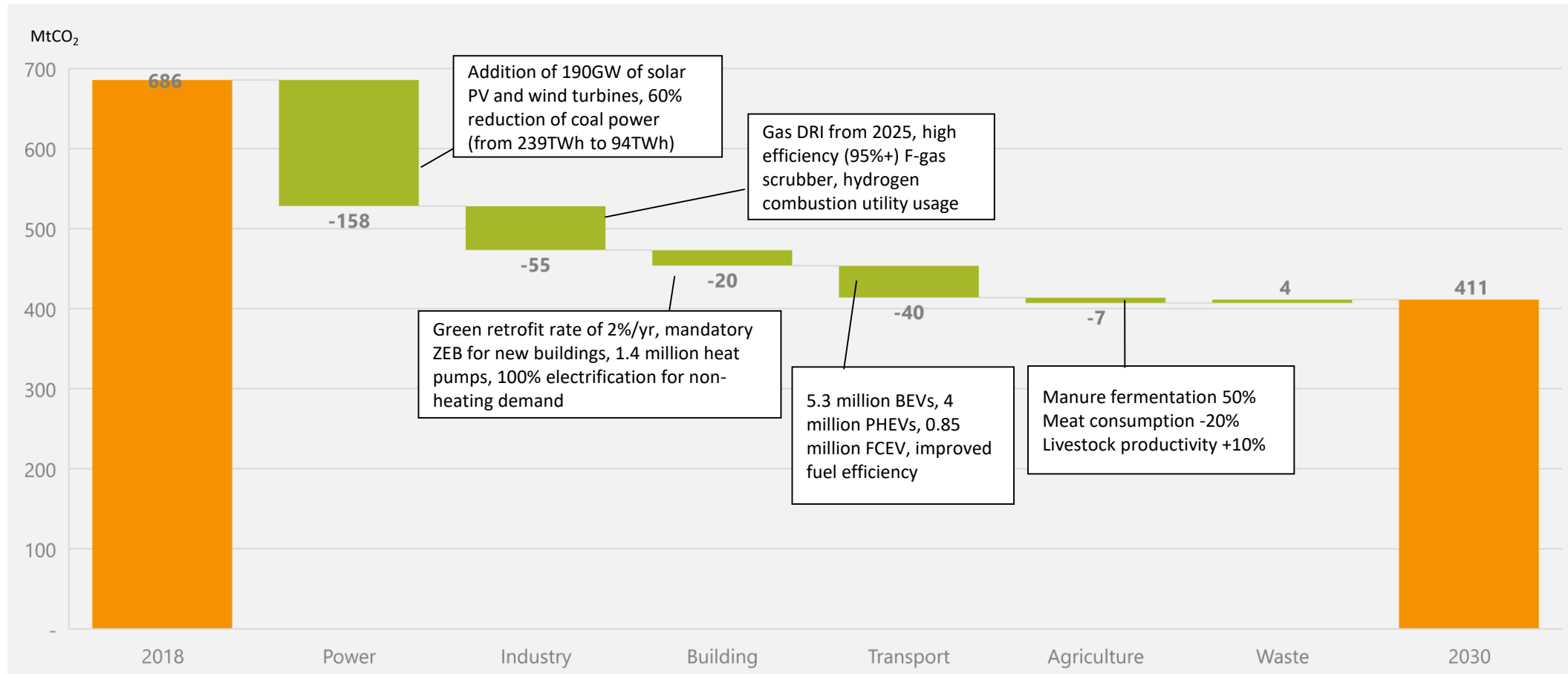
## 40% reduction by 2030, remaining 60% to Net-zero by 2050

- A cumulative 1.6 billion tCO<sub>2</sub> saved compared to the government scenario



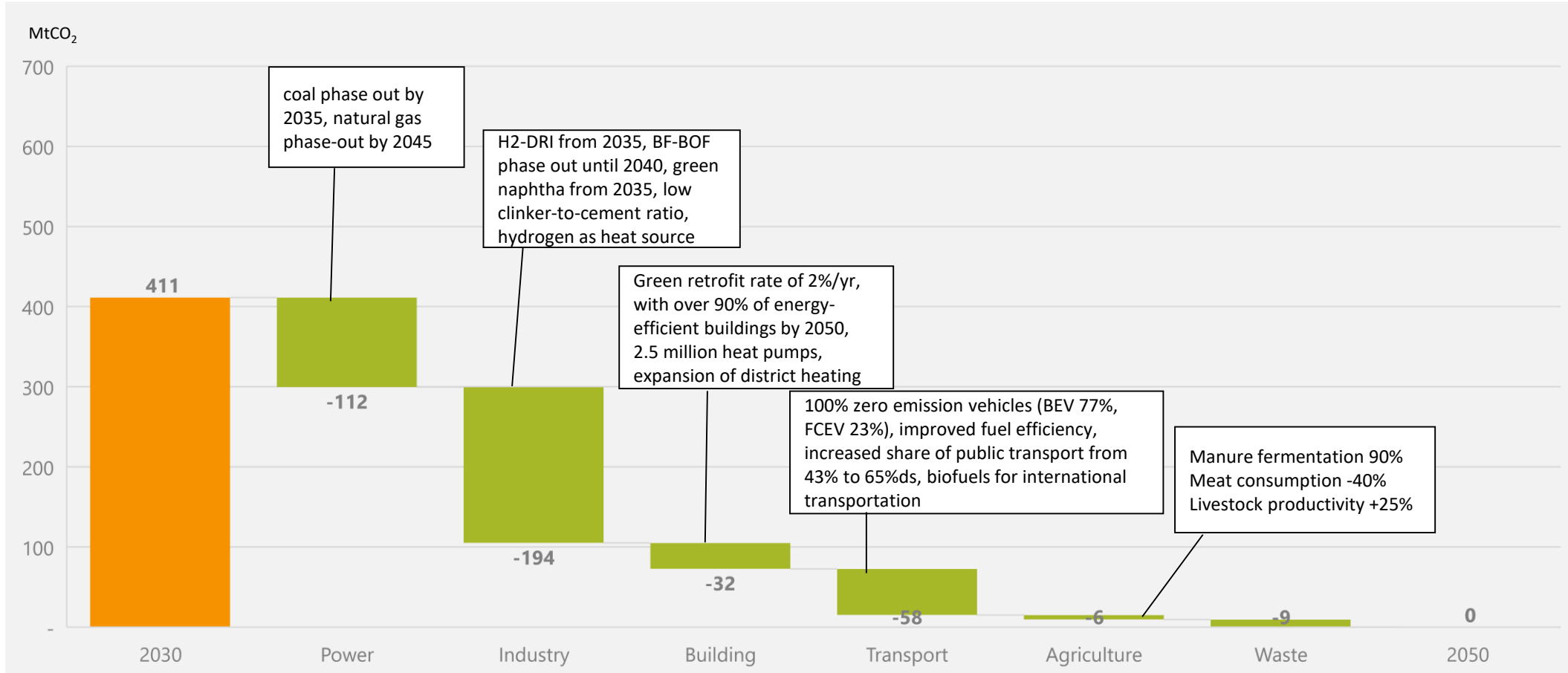
## 40% of domestic reduction is possible, particularly led by the power sector by 2030, without CCUS

- Renewable generation 380TWh in 2030, double of the government RE target
- Natural gas-DRI, higher efficiency of f-gas scrubbers, green retrofit, and a rapid EV deployment



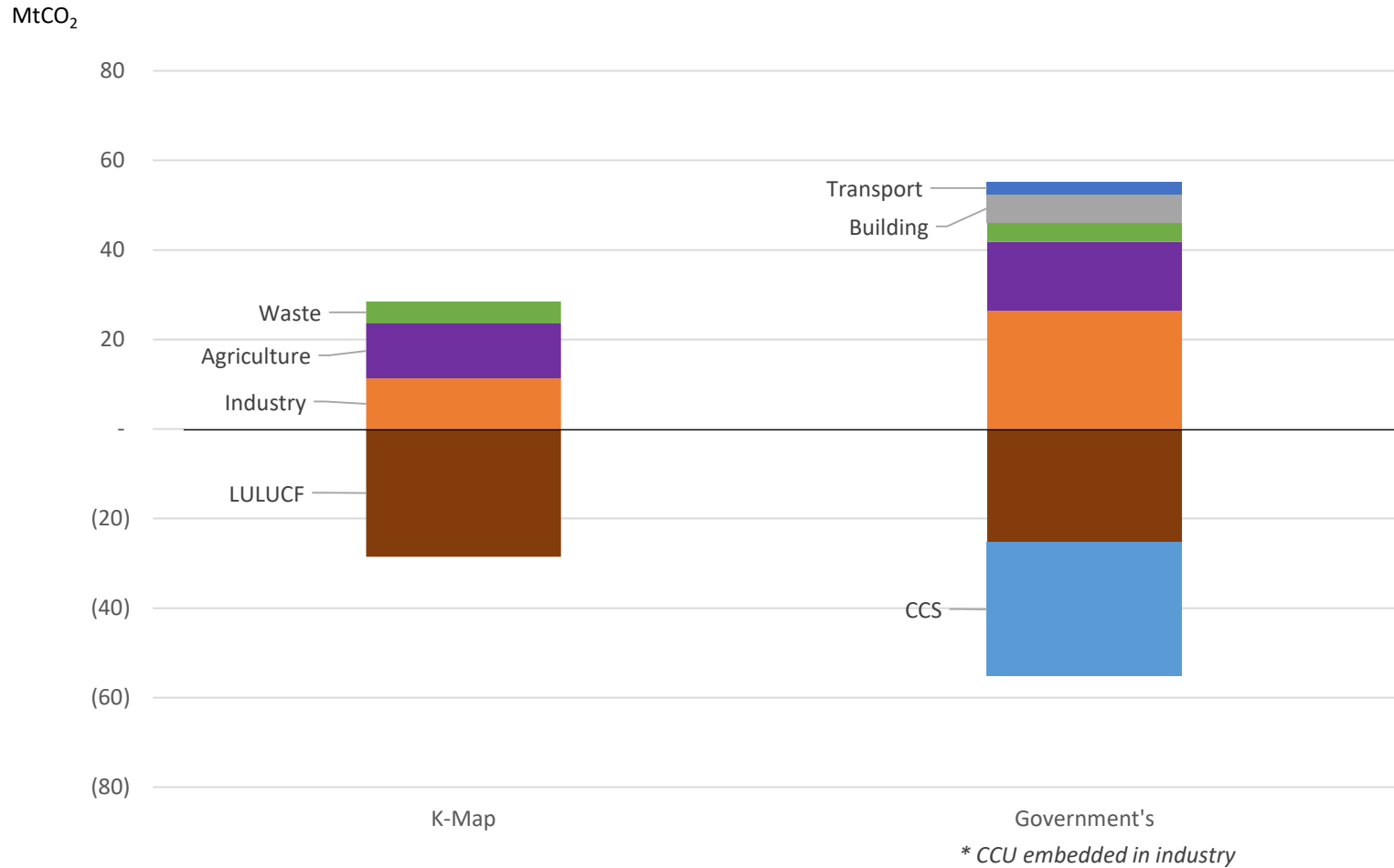
## Industry sector gathers pace, cutting nearly half of the remaining emissions.

- Low-carbon technologies at full length : H<sub>2</sub>-DRI, green naphtha, and alternative supplementary cementitious materials
- Moving from fossil fuel to renewable electricity and hydrogen





## Emissions from waste, agriculture, and industry are completely offset by LULUCF.

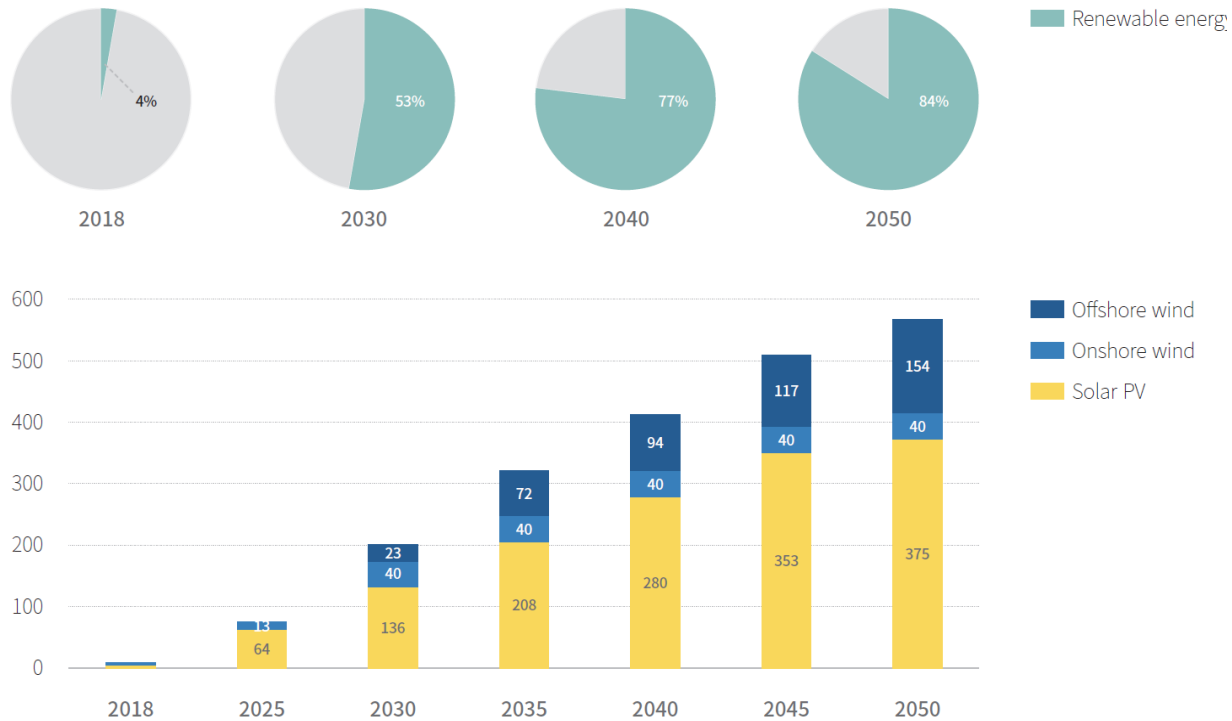


- Compared to the government scenario, K-Map achieves :**
- Carbon neutral transport and building
  - Less than half industrial emissions
  - No CCS included

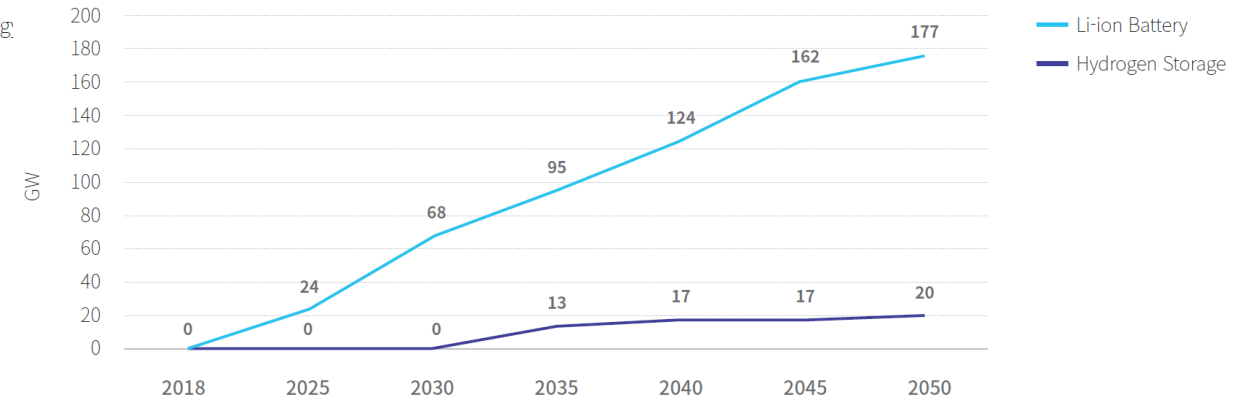
## Accelerating expansion of Renewable energy, especially with a large contribution from offshore wind

- An annual 15-20GW RE addition, to a point where RE takes up 84% in 2050 (onshore WT 10%, offshore WT 37%, solar 38%)
- Installed batteries and hydrogen storage reaching nearly 200GW in 2050

[RE share in generation mix and installed capacity of RE by source]

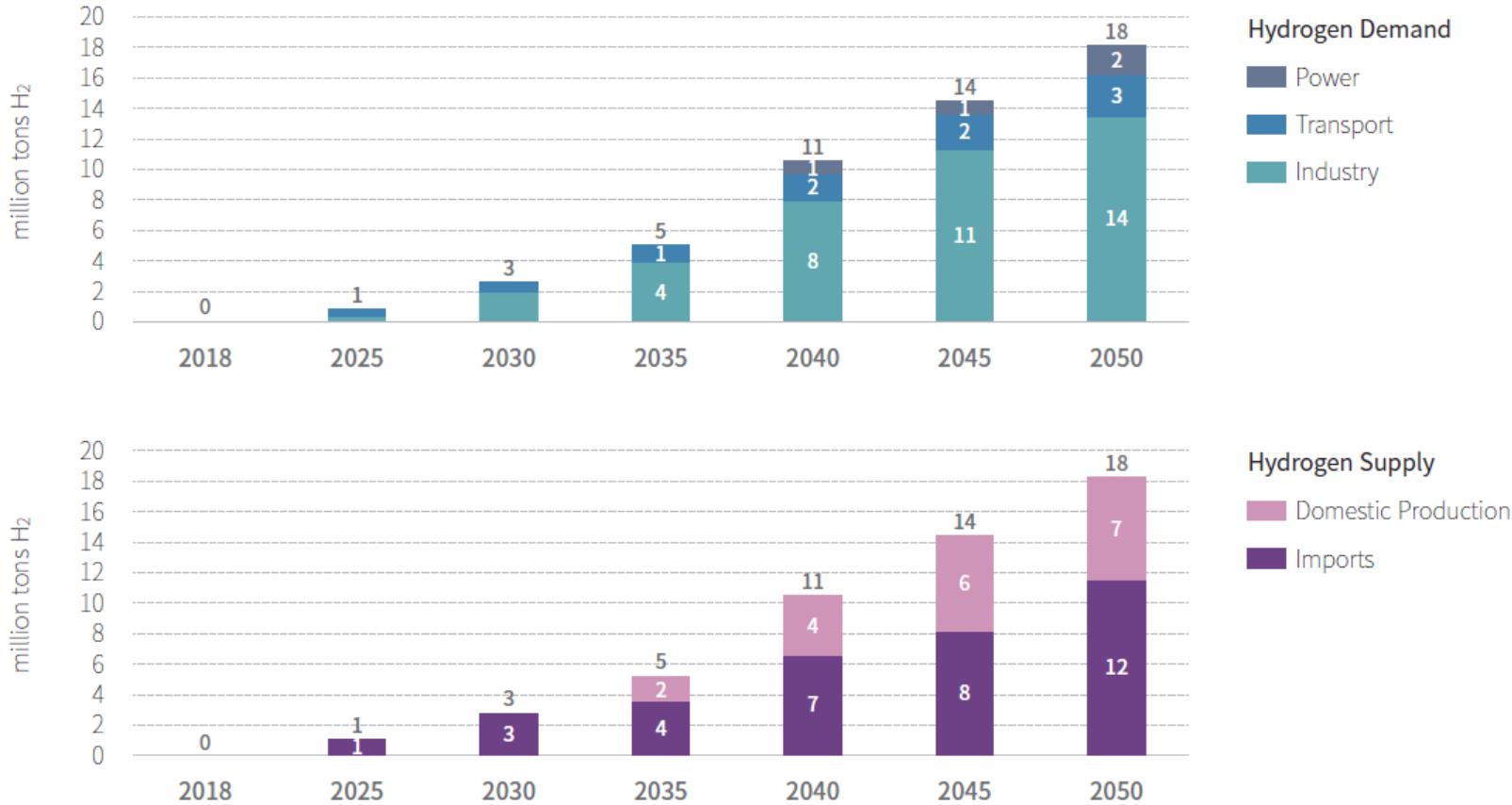


[Installed capacity of storage]



## Industry sector driving national hydrogen demand to 18 million tons

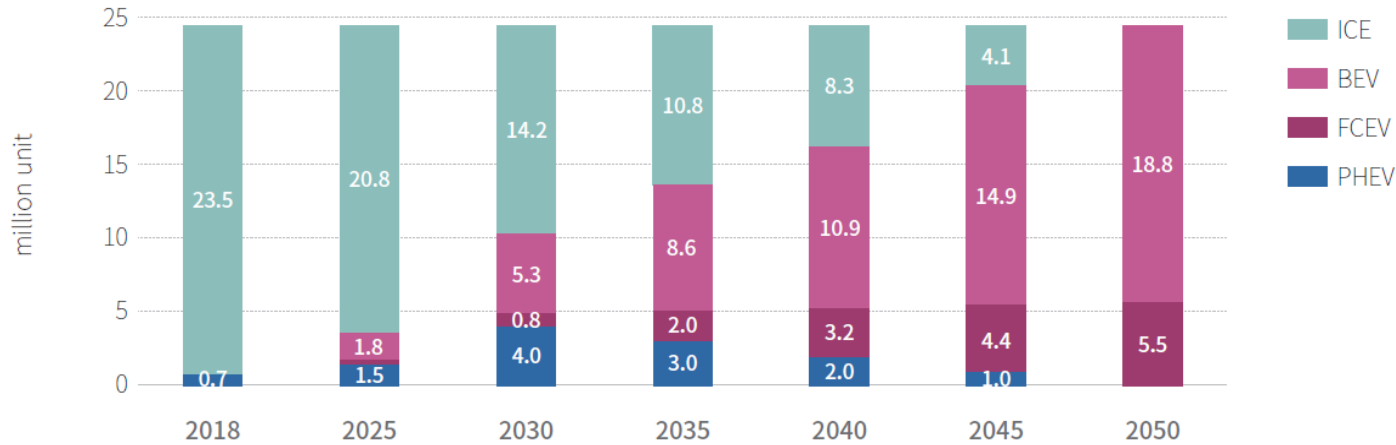
[Demand and supply of hydrogen]



- Demand: Feedstocks for steel and petrochemical production, fuel for high-temperature heat, FCEV, and hydrogen turbines
- Supply : 37% produced domestically from offshore wind, the other 63% of hydrogen supply imported from abroad

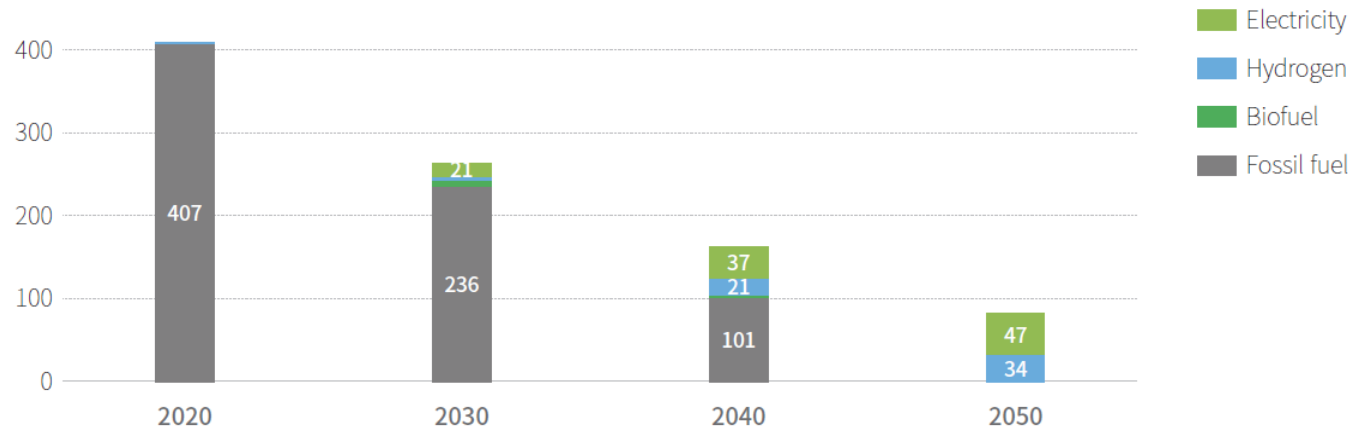
## Rapidly accelerating the transition to electric vehicles & new fuel economy scheme

[Road transport by type]



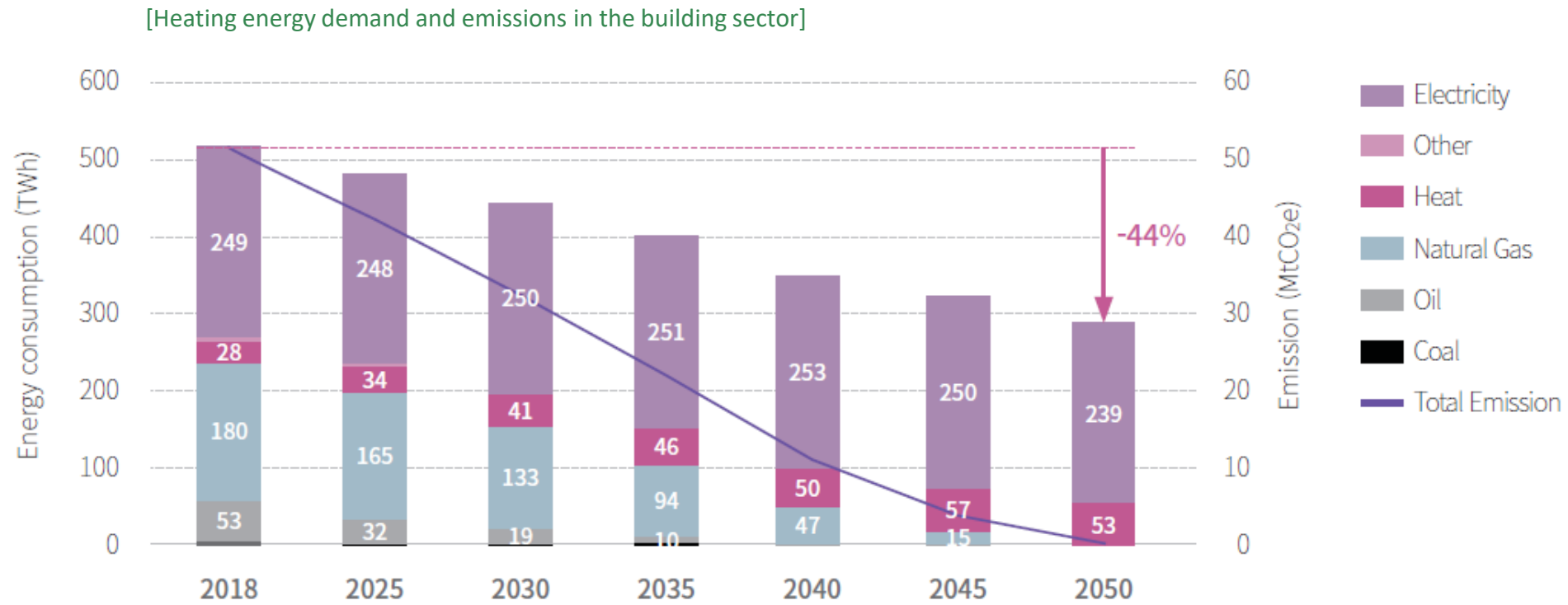
- 10 million EVs by 2030, Ban on ICE in 2040 → 80% cut in emissions in transport
- No fossil fuel consumption in road transport, leading to net-zero transition of refining sector

[Energy consumption of road transport]



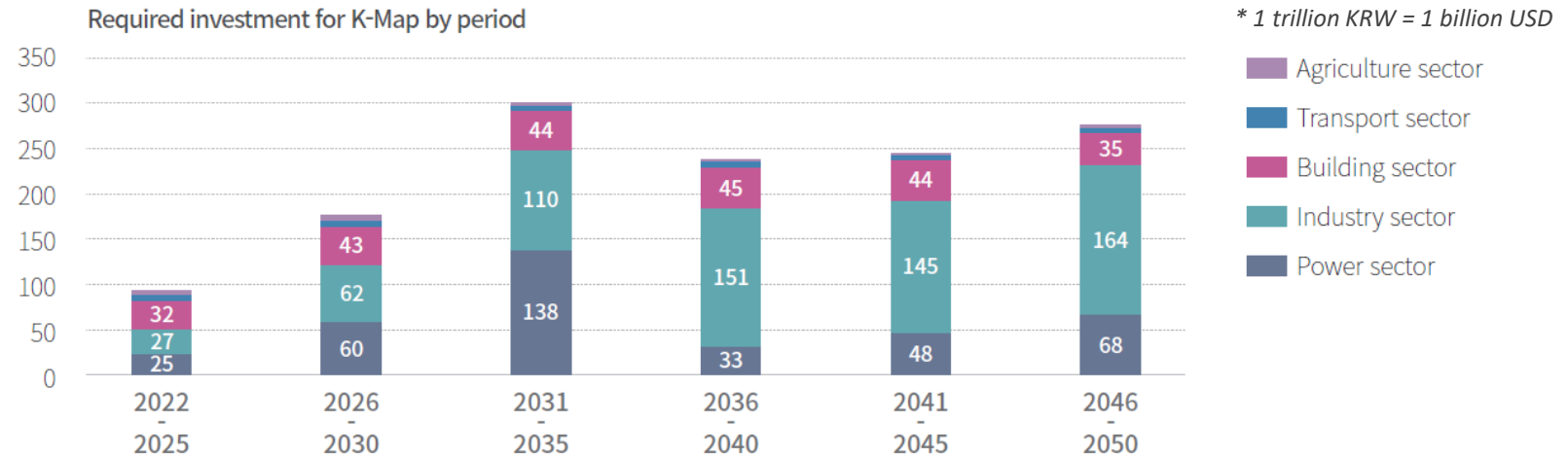
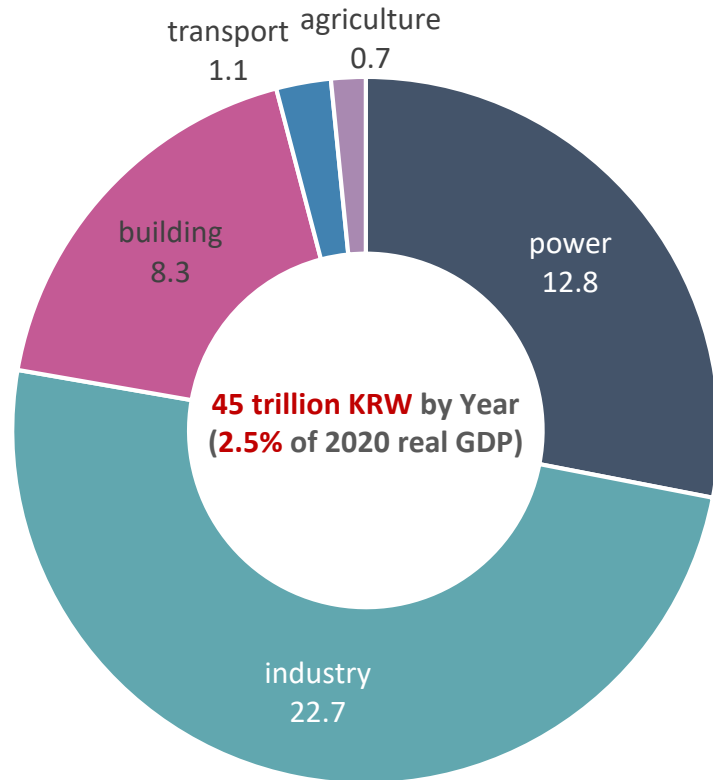
## Energy demand for heating decrease in accordance with the efficiency improvement and fuel change.

- Energy demand decreases from green retrofits and ZEB standards for new buildings.
- Heating is electrified due to a ban on new gas boilers from 2025, deployment of 3.6 million heat pumps and expanded district heating.



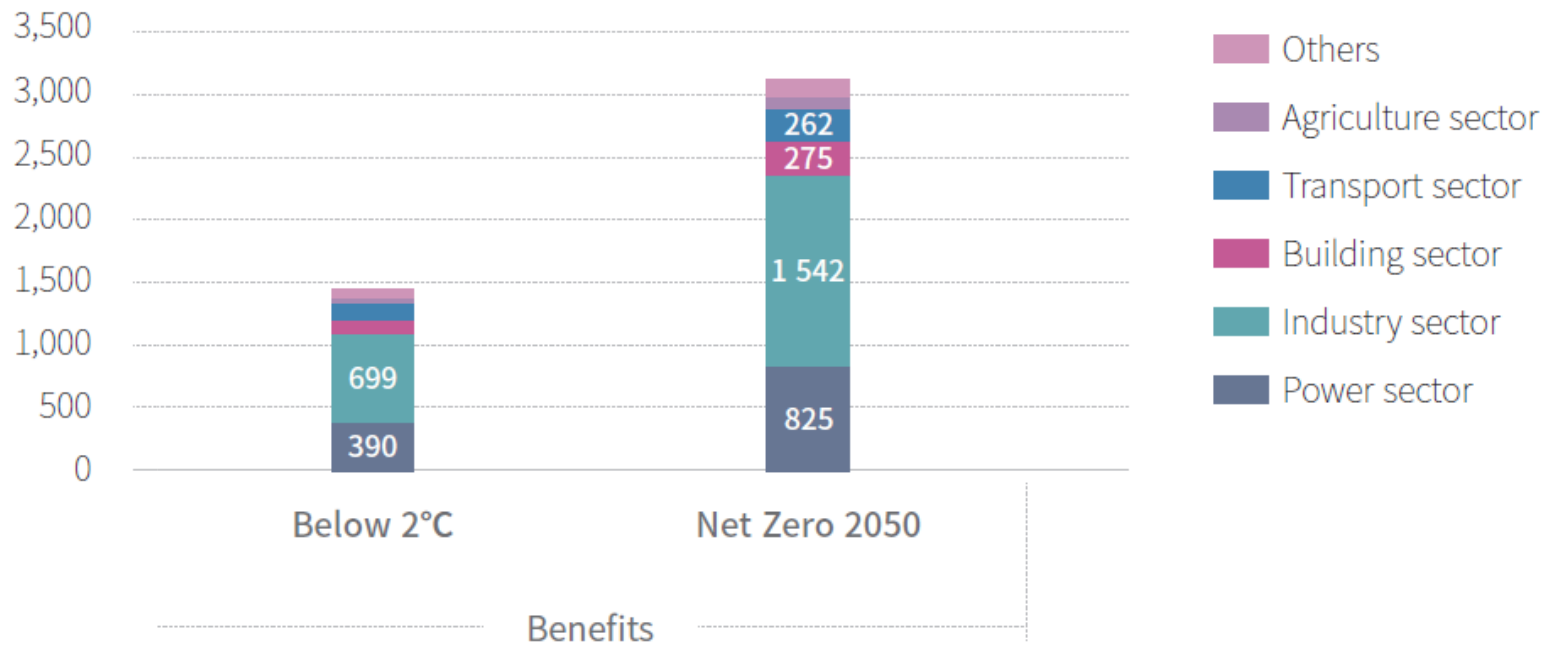
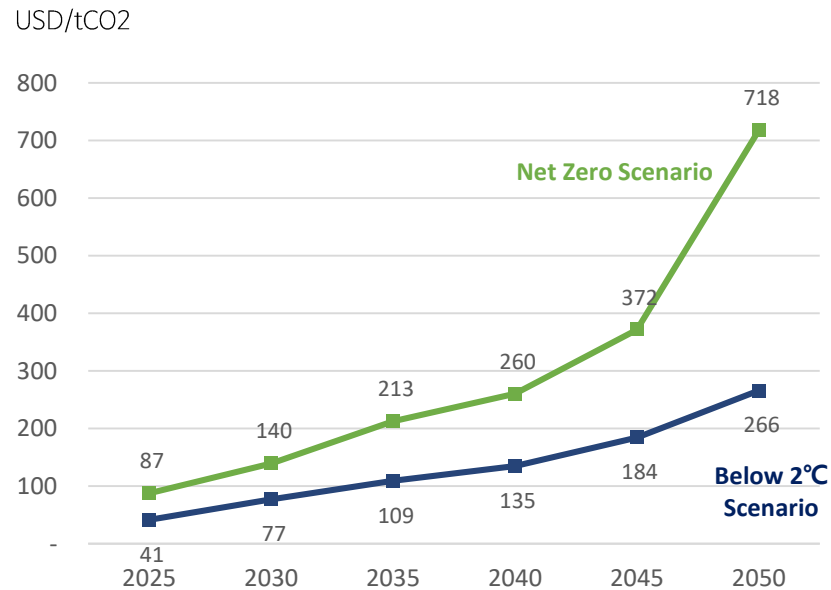
## Net-zero transition in Korea doesn't come cheap, but it's doable.

- Compared to BAU expenses, **1,326 trillion KRW** in total (2022-2050), an annual **45 trillion KRW** (2.5% of 2020 real GDP) required more



## K-map implementation have an annual 50 to 110 trillion KRW of benefits from GHG reductions.

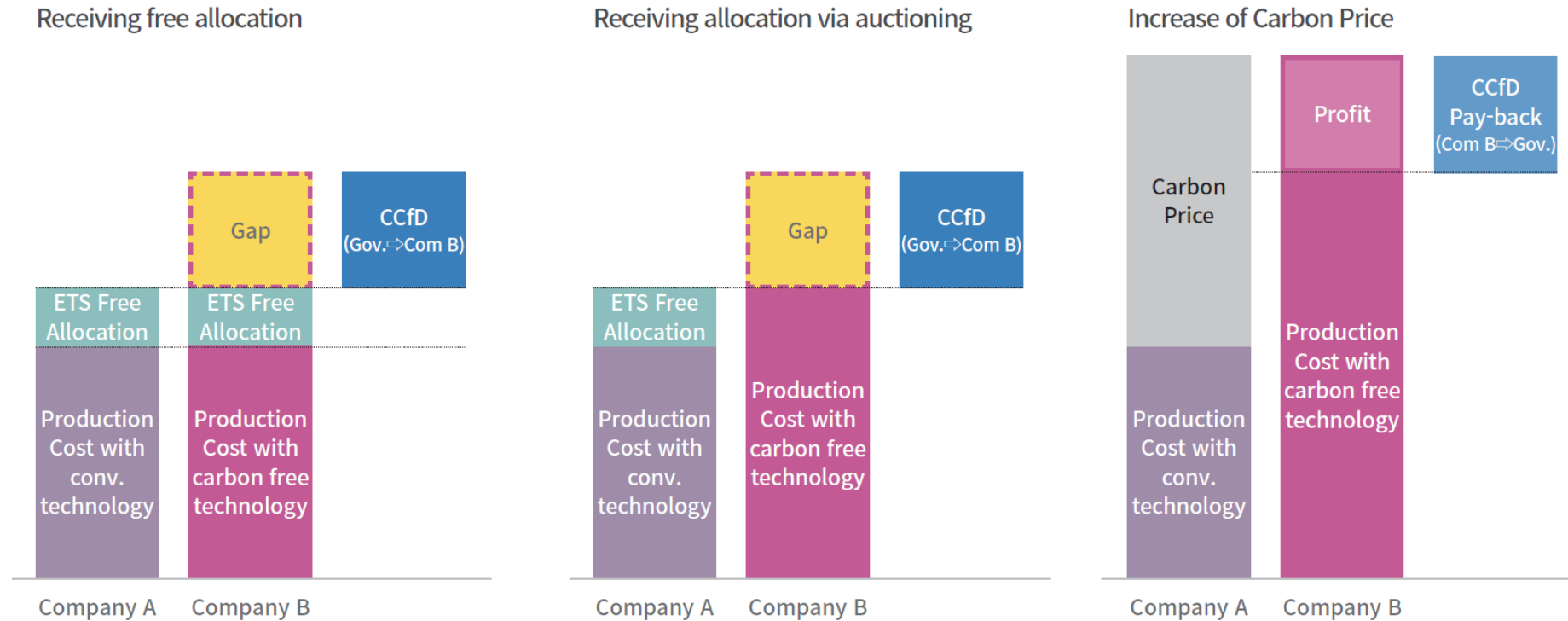
- Benefit is calculated by multiplying the carbon price by the reductions in emission.
- Carbon cost reference : NGFS Net-zero Carbon Price Projection for South Korea (Below 2°C & Net Zero Scenarios)



## Both regulations and support mechanisms working together

- Reinforced regulations : K-ETS, ZEB standards, green procurement
- Support mechanisms : EV subsidies, RE tax breaks, CCfD

[How CCfD works]



\* source: Agora Energiewende



- **Korea can push its GHG target further, achieving an additional 1.6 billion tCO<sub>2</sub> of cumulative reductions by 2050.**
- **The new government has to set aside an additional budget as much as 2.5% of GDP to implement carbon neutrality.**
- **Net-zero transition will require a sizeable investment, but has the potential for a greater social benefit.**

More specifically,

- **RE deployment is the foremost agenda of Korea's decarbonization journey.**
- **To facilitate energy transition to hydrogen, measures to bring down hydrogen prices are necessary.**
- **Early EV deployment is key to accelerate other sectors' decarbonization.**

# THANK YOU

