



Hitachi Zosen INOVA

Hitachi Zosen Inova Etogas GmbH

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Power-to-Gas: why is it not happening? & what does it take for it to happen?

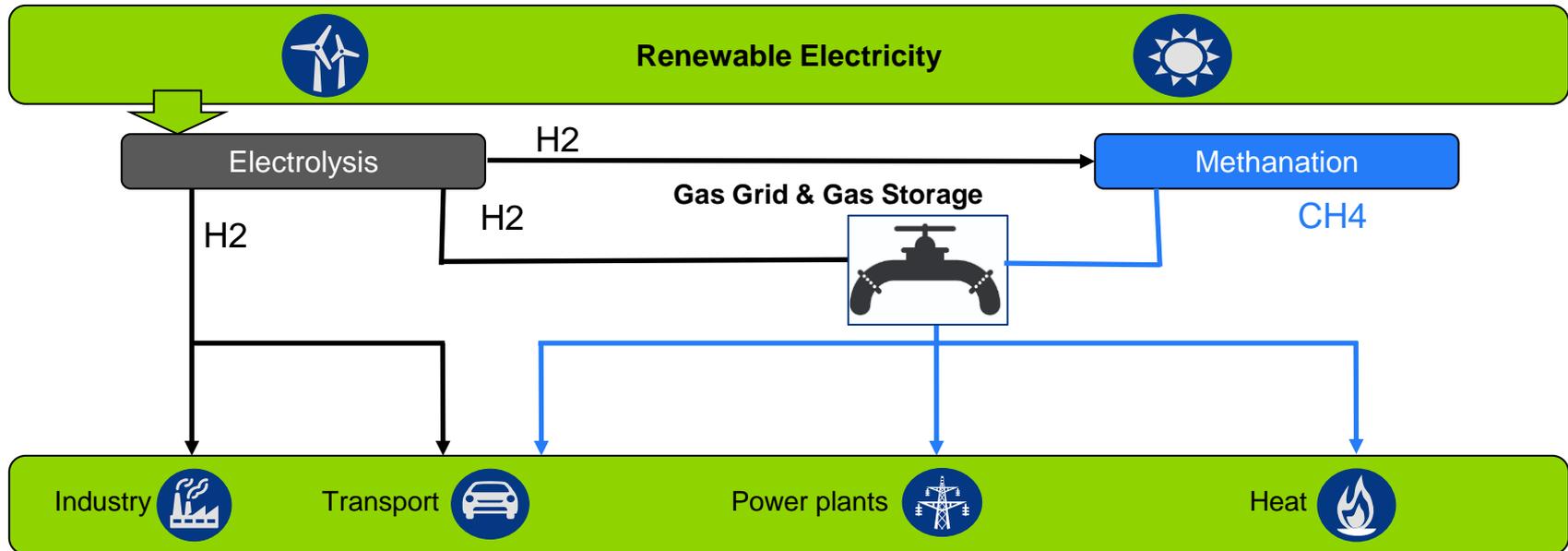
Hitachi Zosen Corporation's 2030 Vision to enable a Carbon Free Economy

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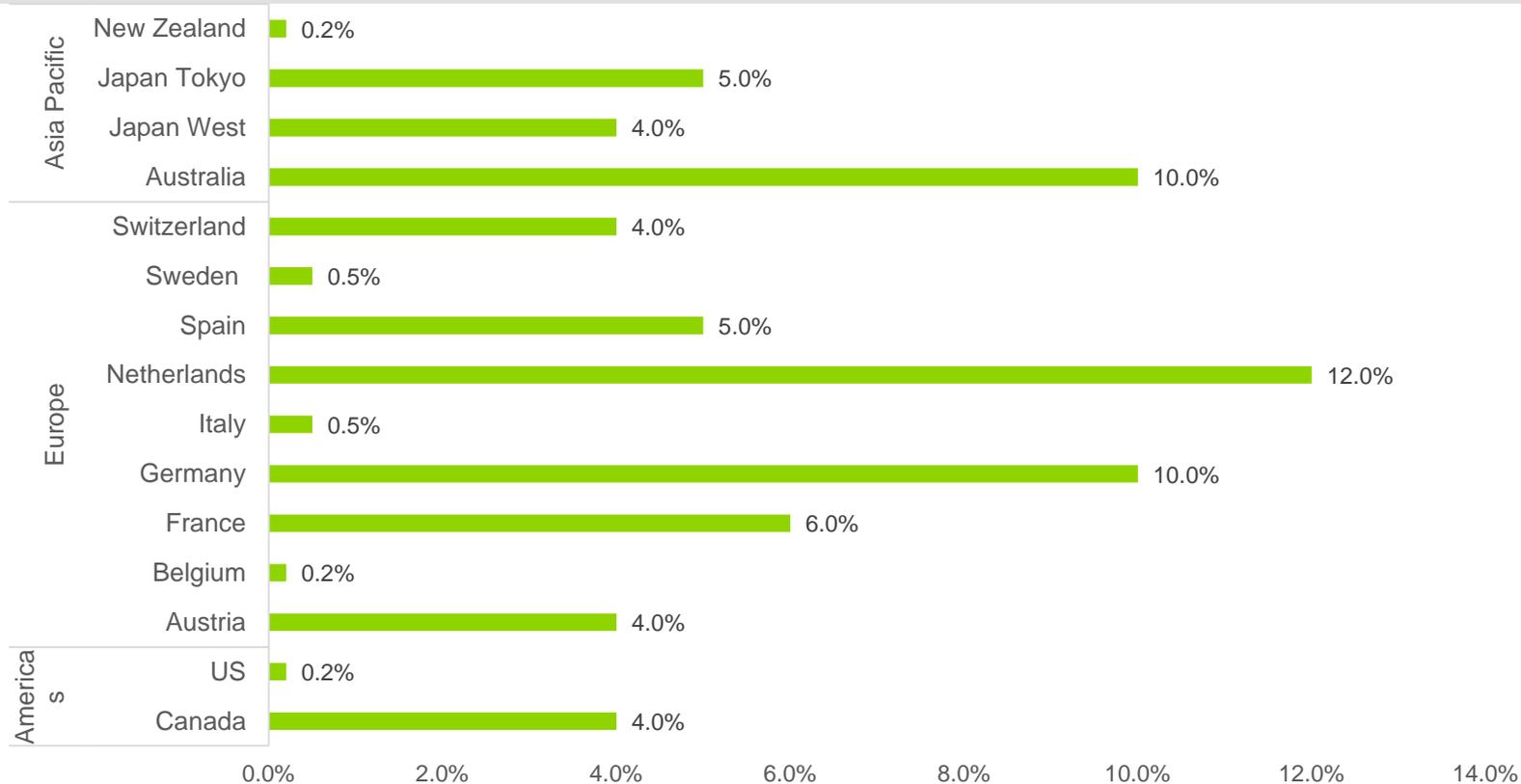
- Hitachi Zosen Corporation (Hitz) is committed to a Carbon Free Economy
- Thermal and biological EfW processes
- AD, gas upgrading, and other sustainable waste management technologies
- Renewable H₂ & CH₄: Power-to-Gas, SOFC
- Offshore wind power, etc.
- 2013: **Hitachi Zosen Inova (HZI) Etogas** built the largest Power-to-Gas plant for Audi in Germany (6.3MW)
- 2017: **HZI Etogas** won the first Power-to-Gas project in Japan

Power-to-Gas Benefits



- | Enables sector coupling and decarbonization of gas grid
- | Seasonal and long-term energy storage using existing or new gas grid
- | Carbon recycling for gas power or other plants with renewable CH₄
- | Zero/near zero emission transport fuel and industrial fuel or feedstock
- | Green H₂ & CH₄ enable deep GHG emission reduction

Other Countries or Regions are ahead on Hydrogen Injection Limits



For SB100 power-to-gas will be needed for 100% zero carbon electricity

Why is power-to-gas not happening in CA and U.S.?

Gap between renewable gas cost & fossil gas price

- | Lack of incentive for closing the gap for renewable gas

Lack of a gas de-carbonization strategy

- | States such as CA and Hawaii has zero carbon electricity goals
- | No official goals for gas grid yet

Lack of access to surplus renewable power

- | Lack of access to electricity price at near production rate

Lack of long term and low risk incentives on marketing renewable gas

- | H2 and methane from renewable electricity is not yet recognized under the renewable fuel standard (RFS) program
- | The uncertainty of programs such as RFS and LCFS makes it hard to finance projects
- | H2 and methane from renewable electricity is not yet recognized for energy storage procurement

Policies and regulations that could help

Renewable Gas Standards:

- | Develop and implement a renewable gas standard for gas grid (RGS)
- | Create feed-in tariffs for renewable gas (H₂ & CH₄), similar to renewable electricity
- | Create Hydrogen injection standards that represent the best practice

Transportation and industry sectors:

- | Require zero/near zero emissions for hard to electrify sectors including heavy transportation and certain industrial sectors (e.g.: cement, steel, plastic, fertilizer, etc.)

Electricity rates:

- | Provide access to surplus renewable power (full or partial exemption from grid fees, taxes & levies) for PtG
- | Provide access to energy storage and grid service market for PtG

Modify or streamline existing policies and regulations

- | Federal RFS
- | LCFS
- | Other incentives (e.g., Cap & Trade offset, Q45 tax credit, toxic emission reduction credits)

Power-to-gas market conditions are promising despite immediate challenges

- | Renewable electricity price keeps coming down and available in greater areas
- | New initiatives in mandated renewable gas procurement
- | New public and private investment in zero and near zero emission cars, vans, buses, trucks, ships, etc.
- | Increasing public awareness of and acceptance to PtG
- | Environmental credits such as LCFS credits and RINs are increasingly accessible
- | Well designed policies and regulations can accelerate PtG deployment

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Thank you for your attention!