Green hydrogen supply: A guide to policy making

IRENA Policy Talks 2021

Green hydrogen supply: policies and practical insights

27 May 2021

Green hydrogen is essential to achieve a net zero emissions system

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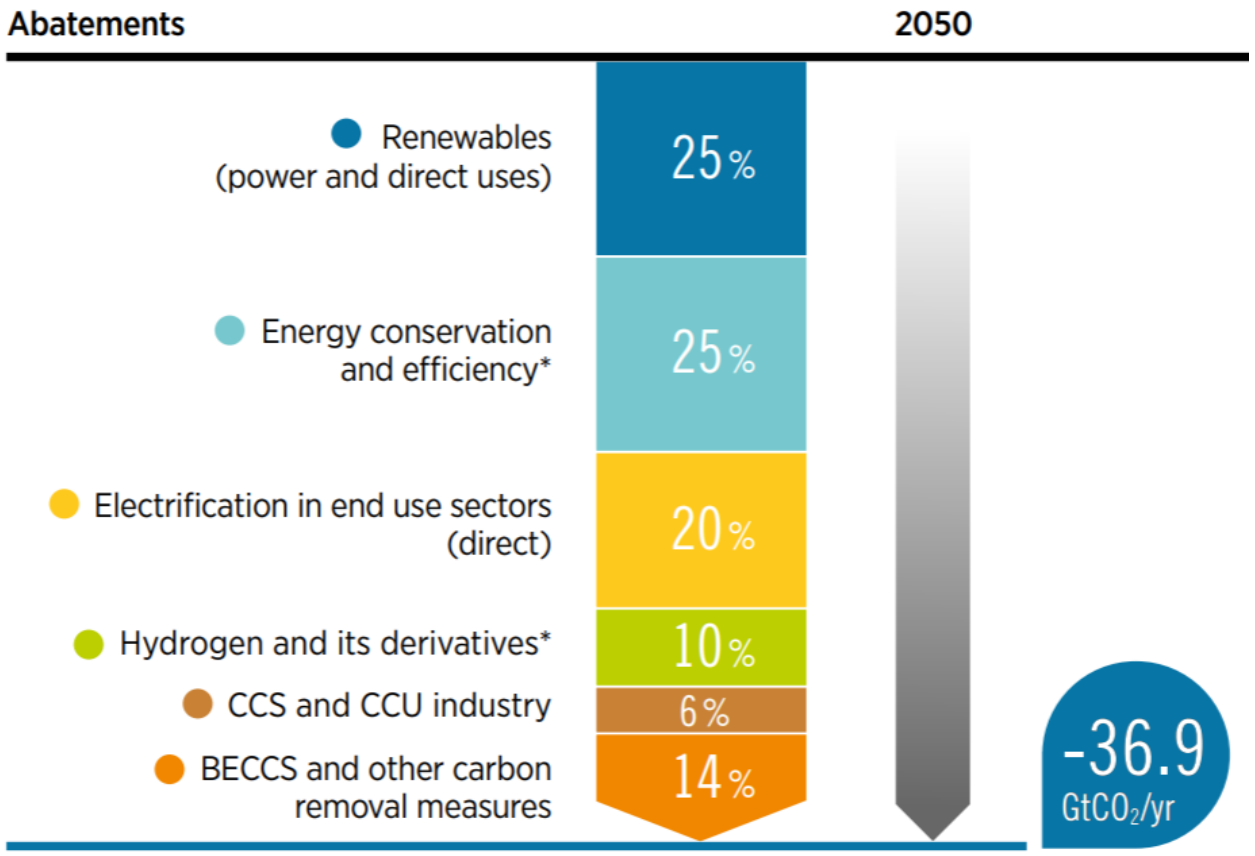
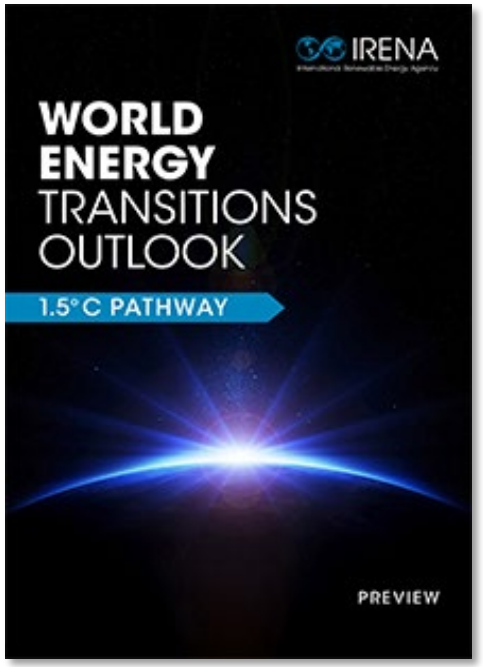
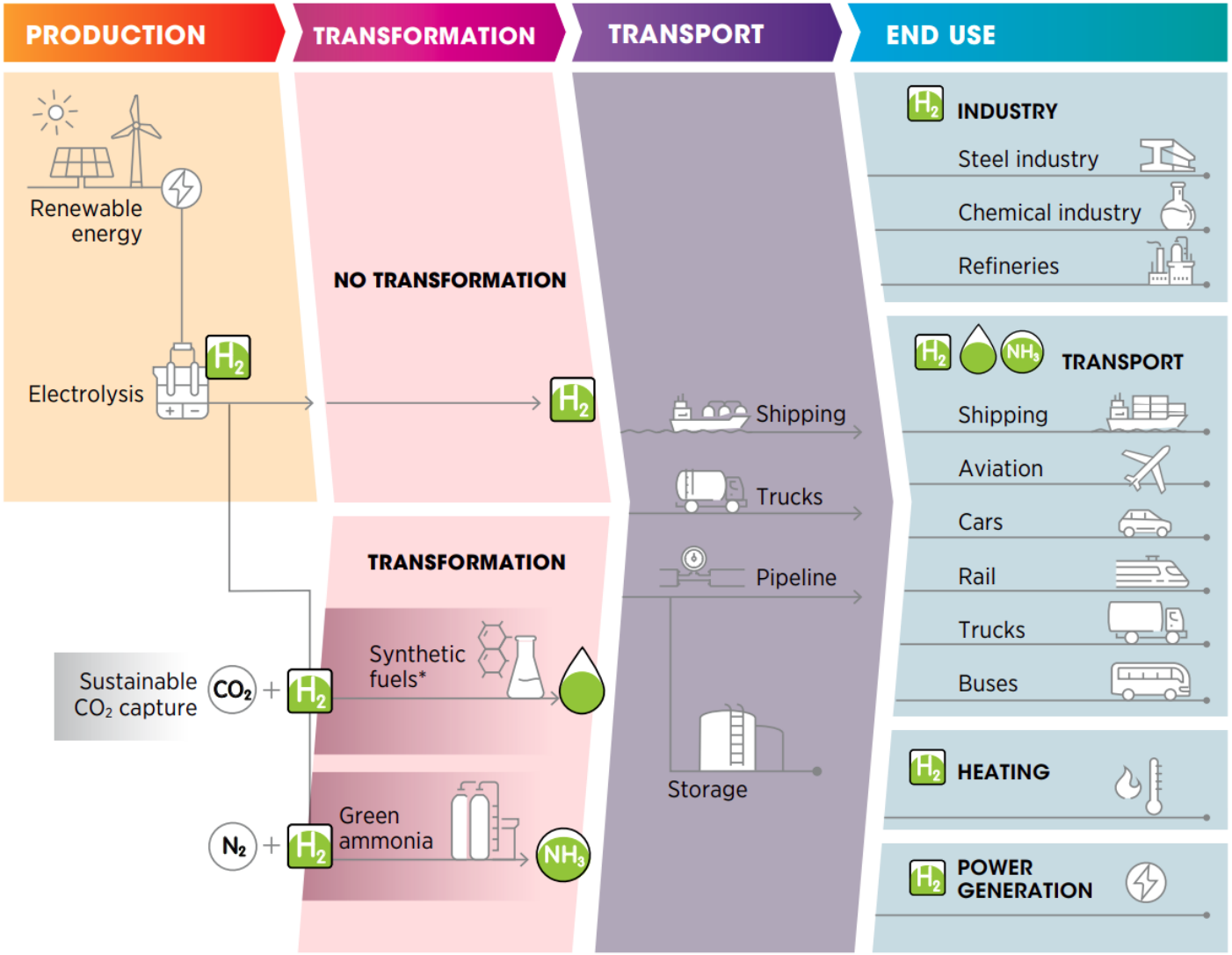
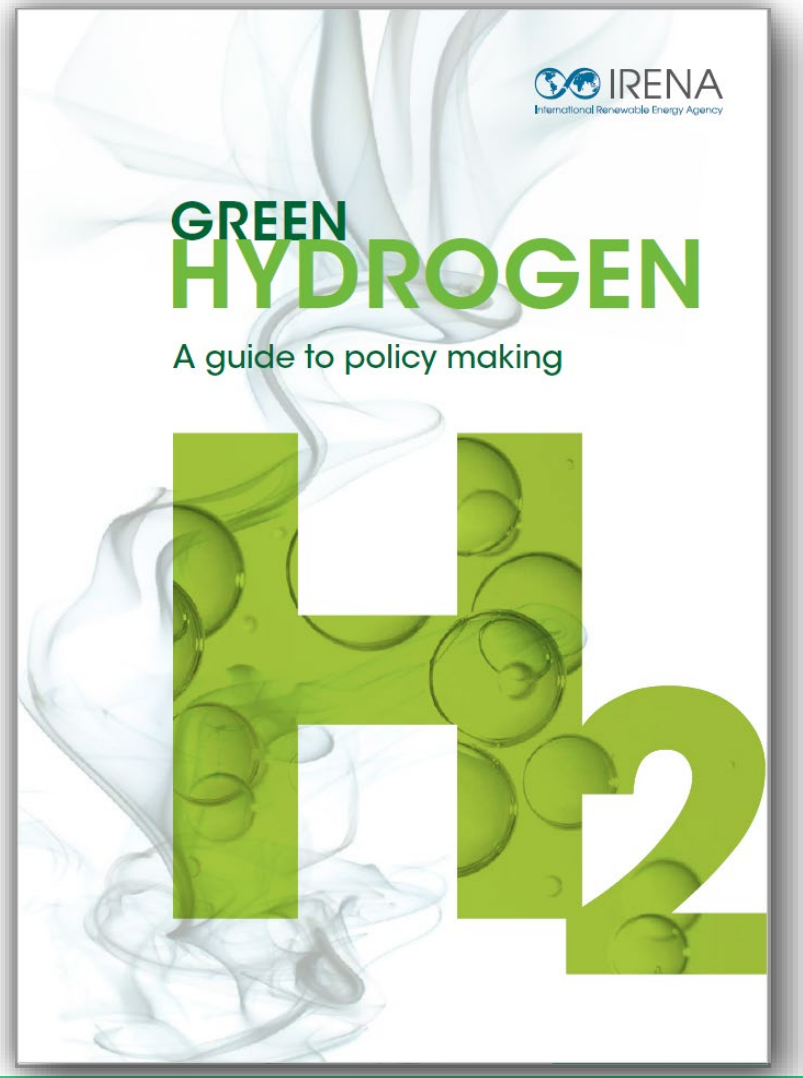
Emissions Pathway to Net Zero





Delving into the challenges… and the solutions





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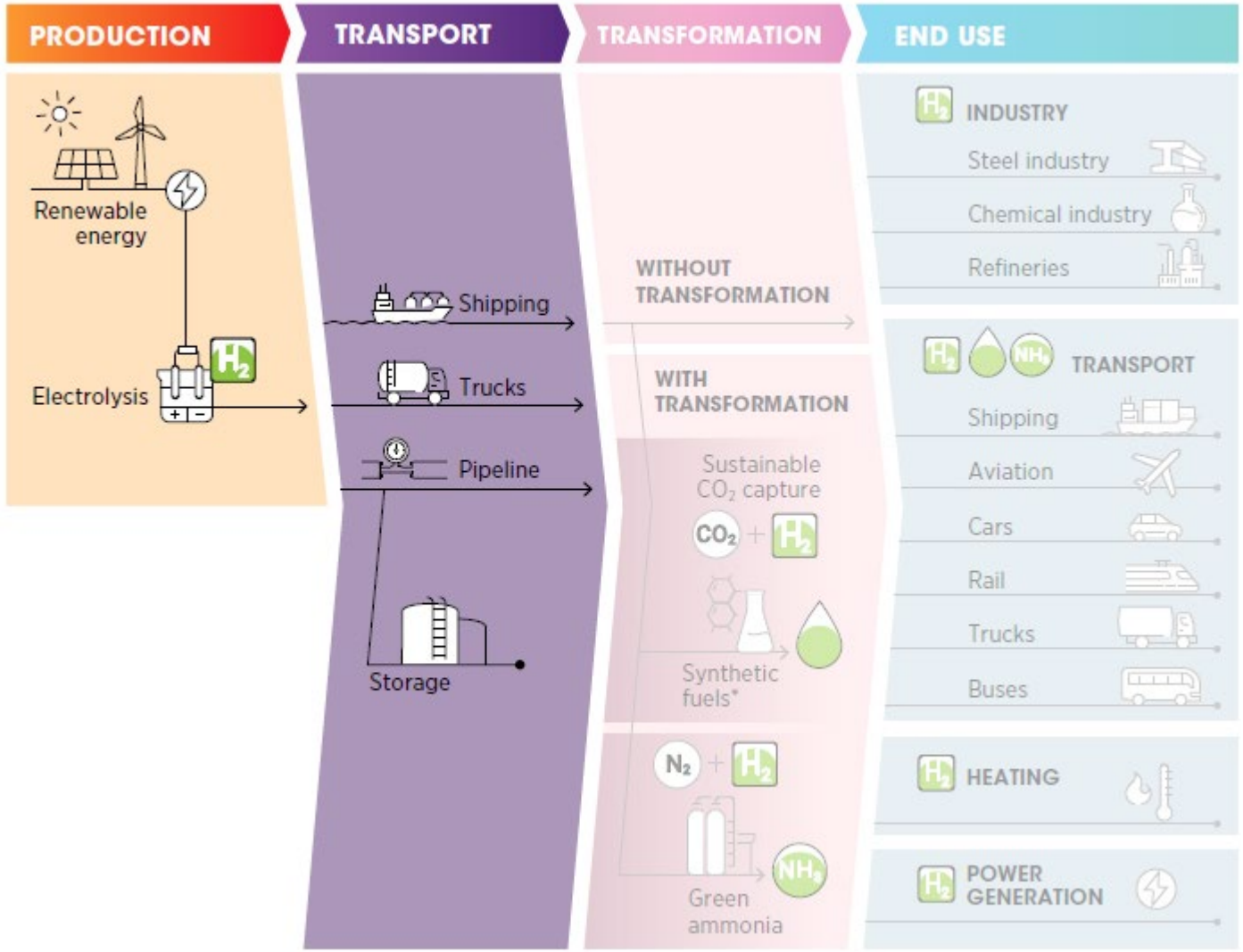
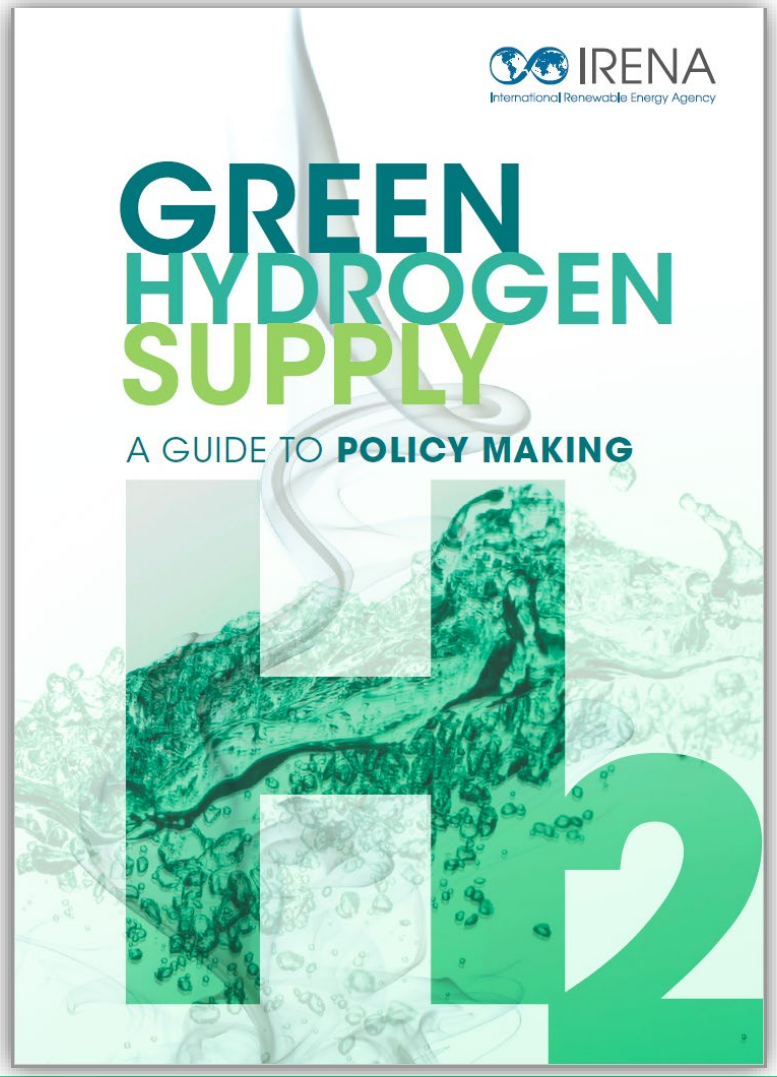
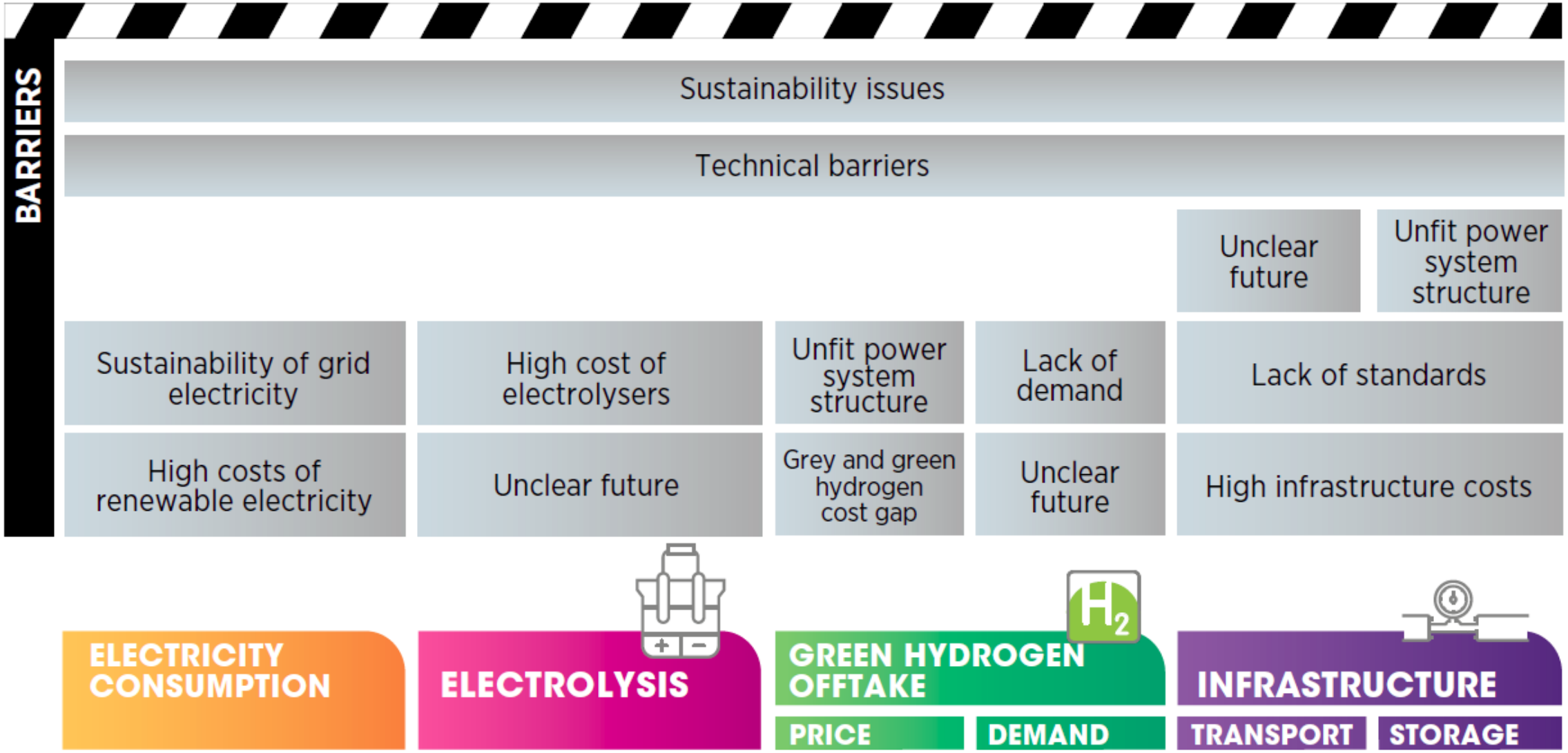




Main challenges for green hydrogen supply



Support to reduce electrolyser costs

High cost of electrolysers

Unclear future

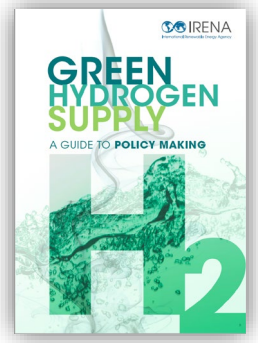
ELECTROLYSIS

Direct financial support

Manufacturing capacity support

Capacity targets

Fiscal incentives



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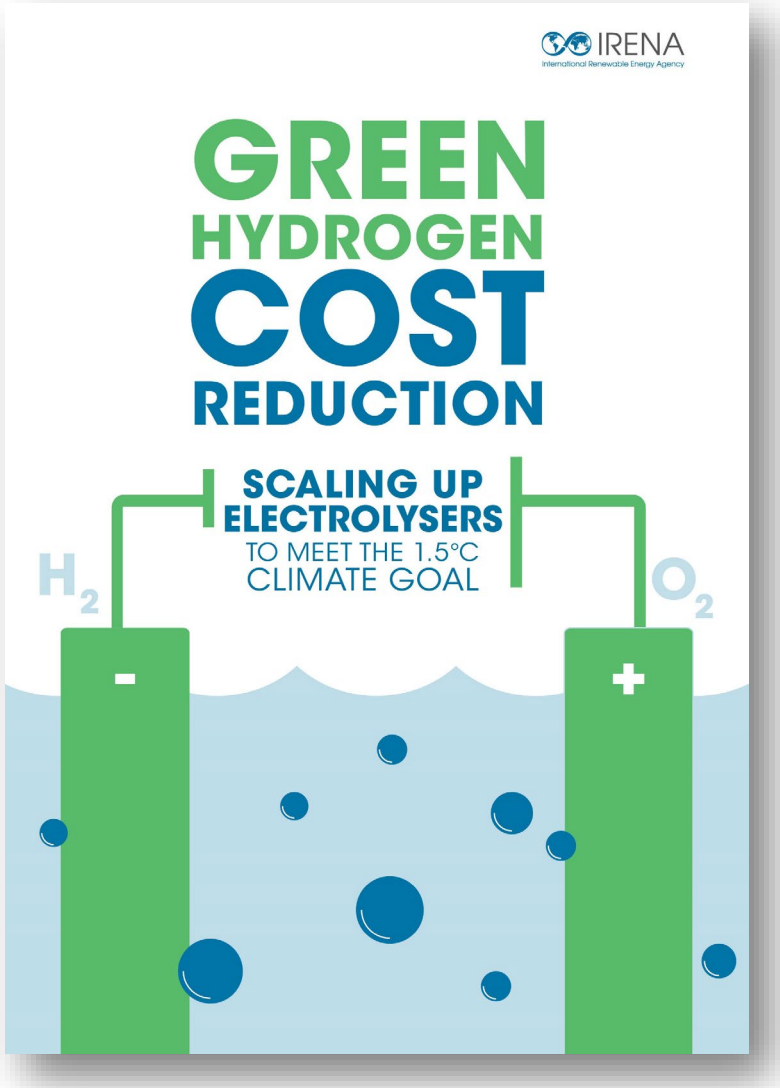

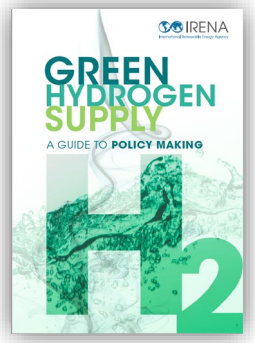

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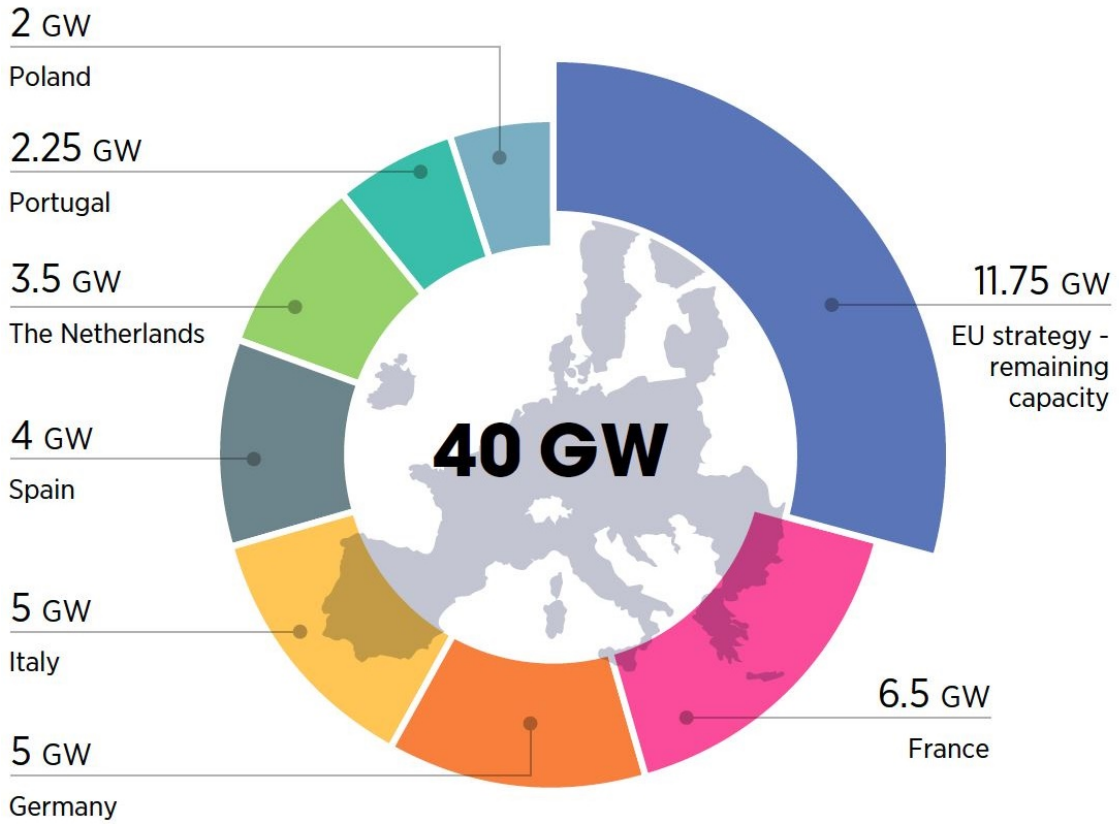
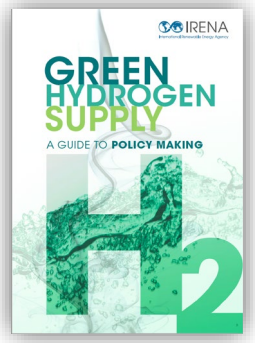
Electrolyser capacity targets in European hydrogen strategies, 2030



Note: The diagram takes the average of the target ranges adopted by the Netherlands and Portugal.

Source: IRENA analysis based on national strategies.



Support to make electricity affordable and sustainable

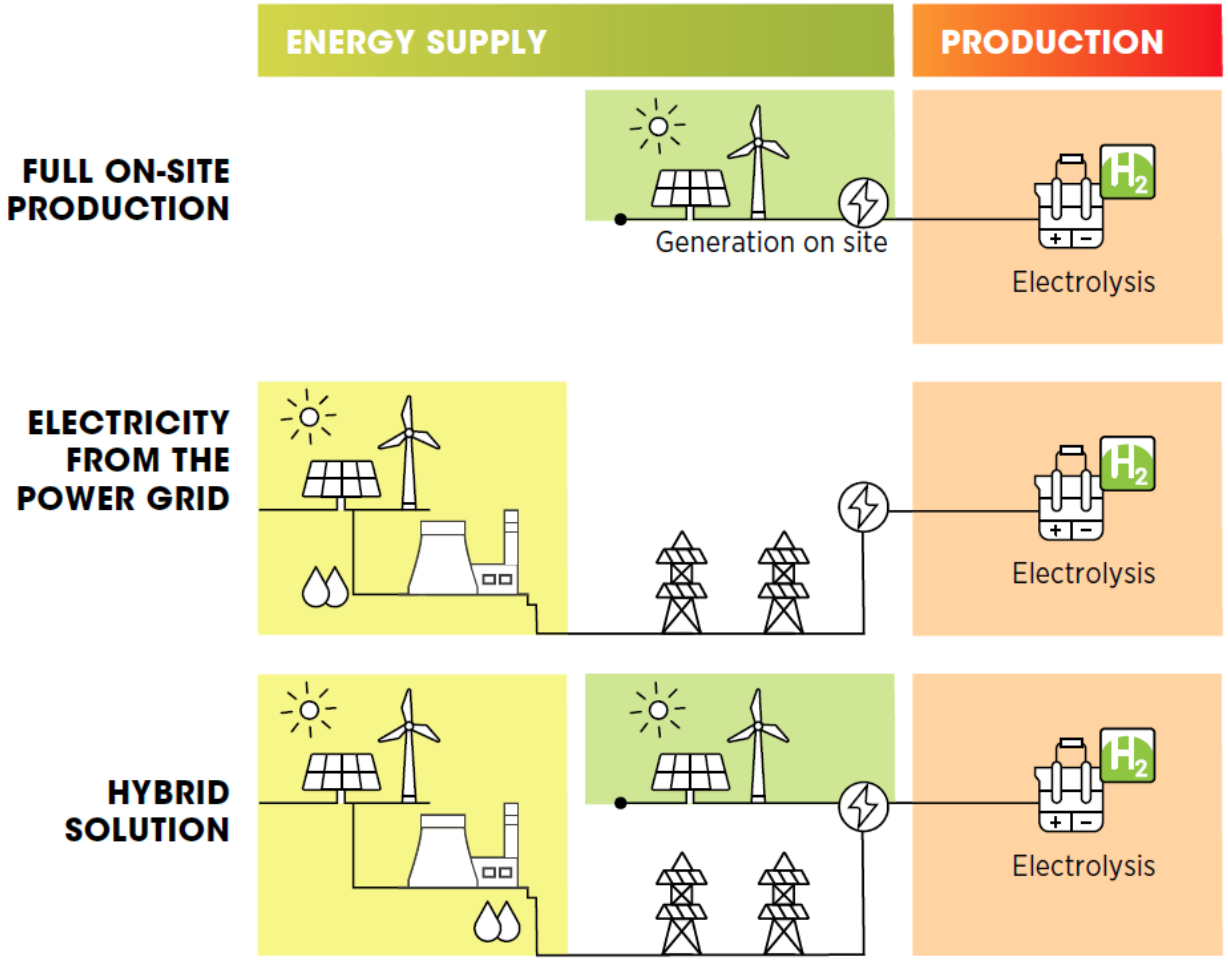
Sustainability of grid electricity

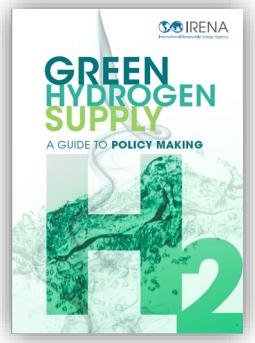
High costs of renewable electricity

ELECTRICITY CONSUMPTION

Exemptions from electricity taxes and levies

Sustainability assurance measures





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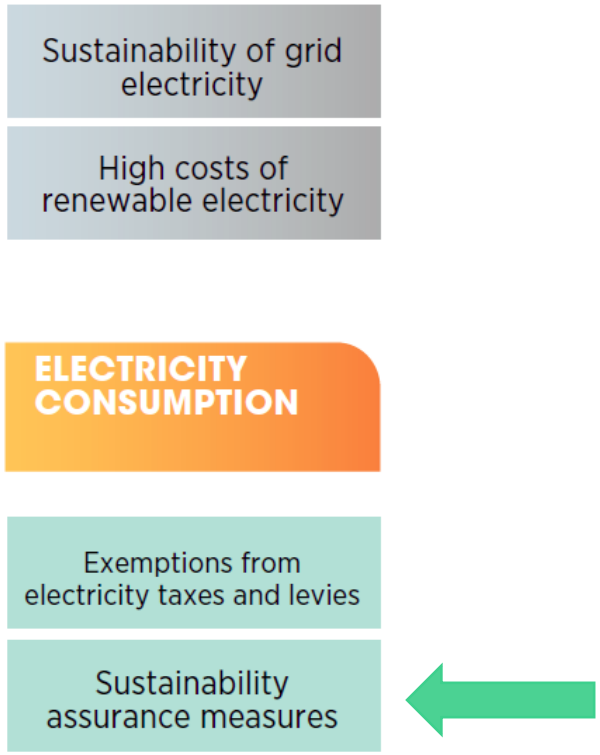
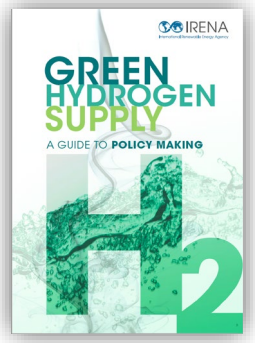


Renewable electricity production and consumption should be **additional**, and with a **temporal** and **geographical** correlation. Measures include:

- Recasting the renewable power capacity target.
- Allow (or impose) PPAs with merchant RE power plants.
- Measures to take advantage of otherwise curtailed energy



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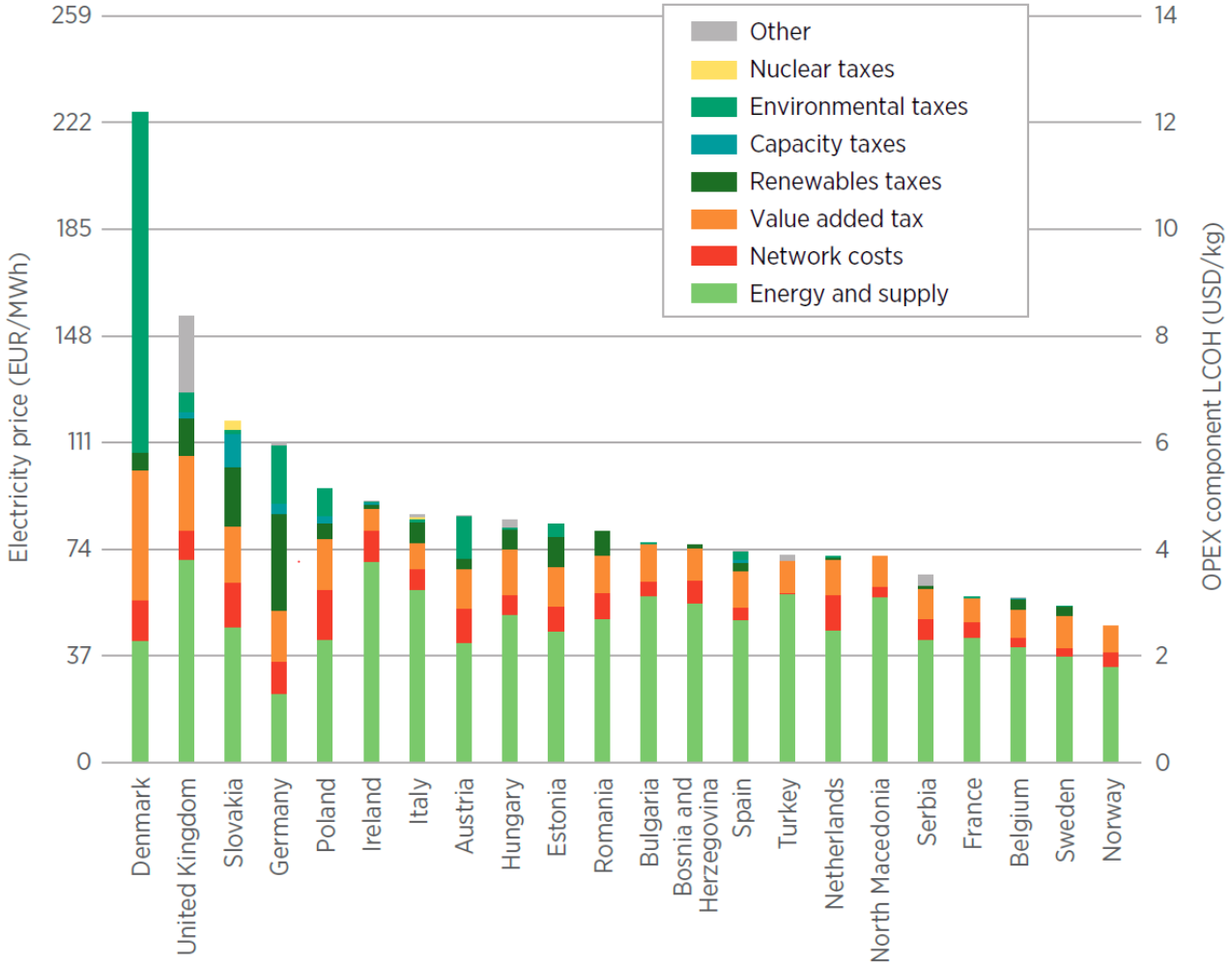
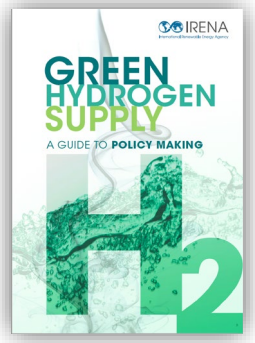




Support to the infrastructure

Unclear future

Unfit power system structure

Lack of standards

High infrastructure costs

INFRASTRUCTURE

TRANSPORT **STORAGE**

Support for green trucks and ships

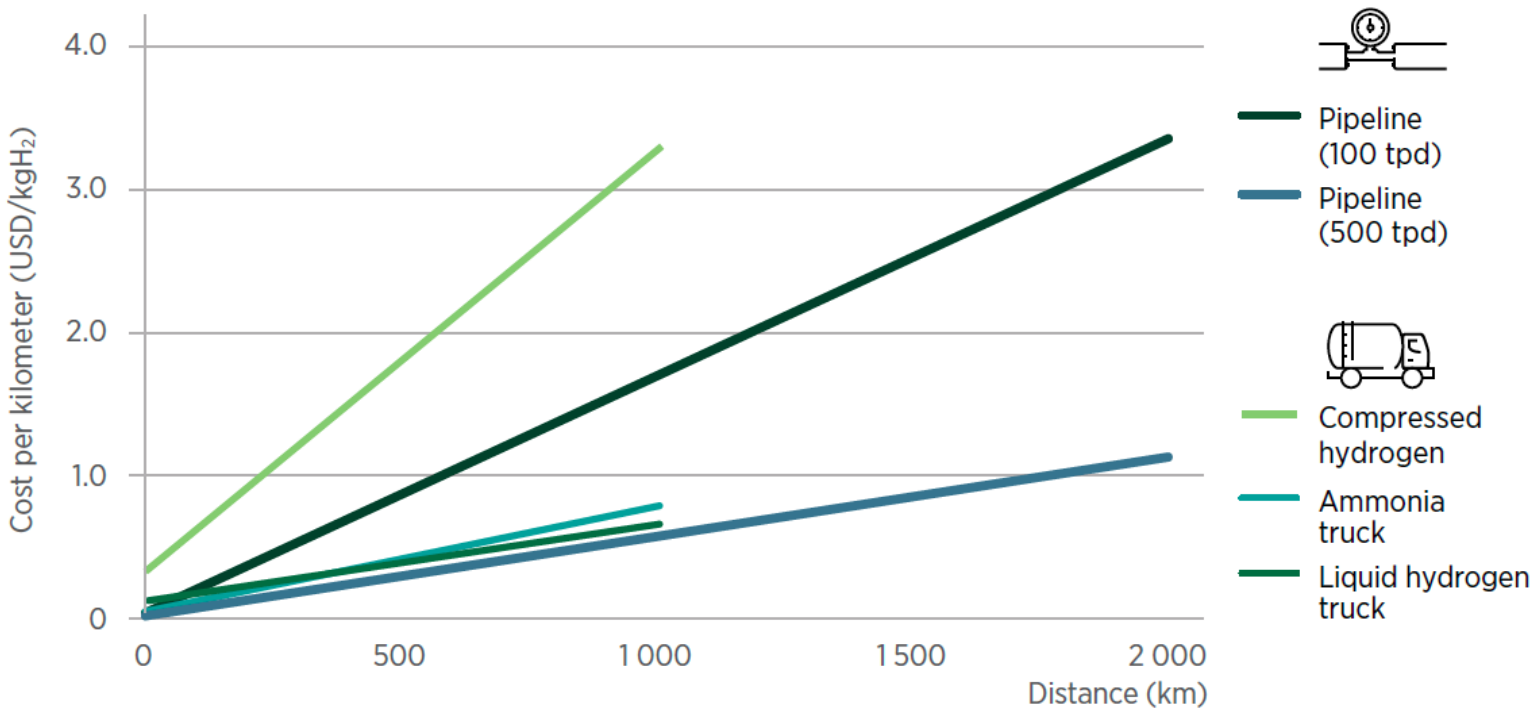
Seasonal storage support

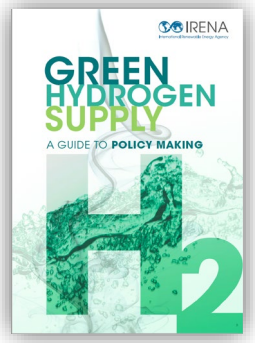
Planning

Creation of standards

Financing

Costs for hydrogen transport as a function of the distance by selected transport mode





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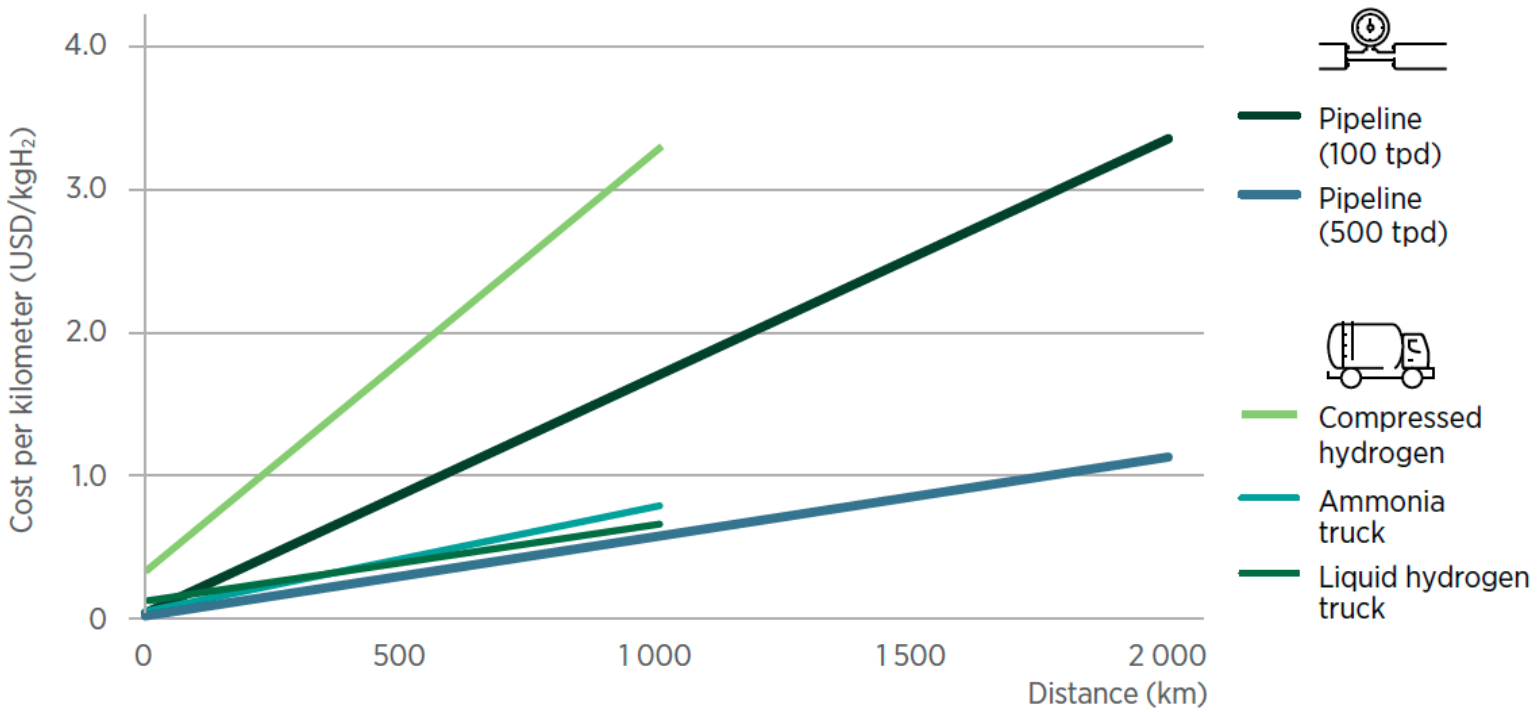

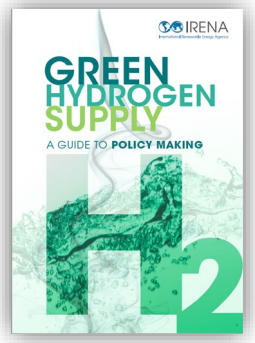

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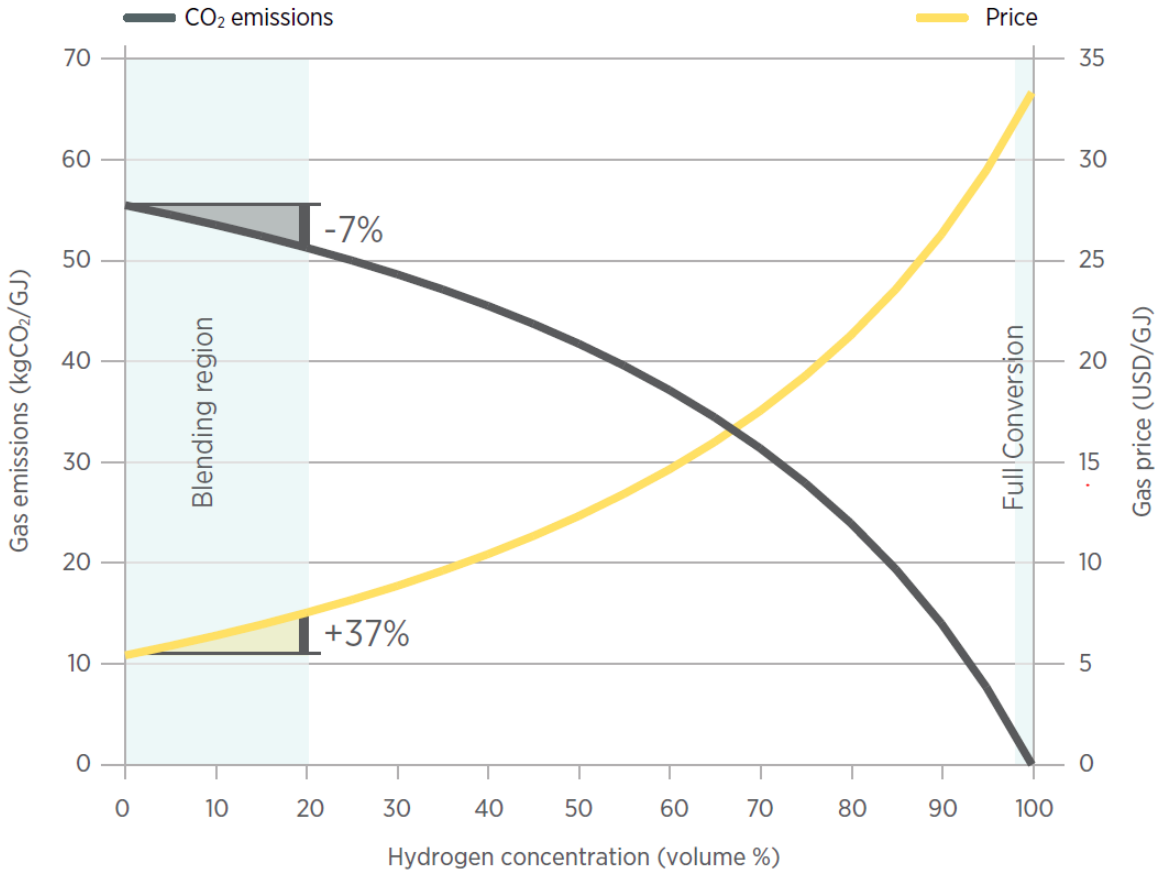
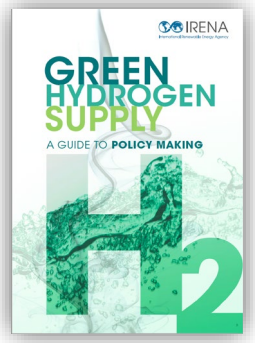
CO2 benefit and gas price increase from blending and converting the gas grid to hydrogen





How to create demand?

Lack of demand

Unclear future

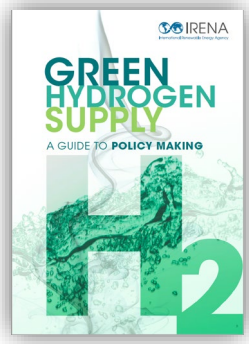
GREEN HYDROGEN OFFTAKE

DEMAND

International agreements

Virtual blending

Gas targets



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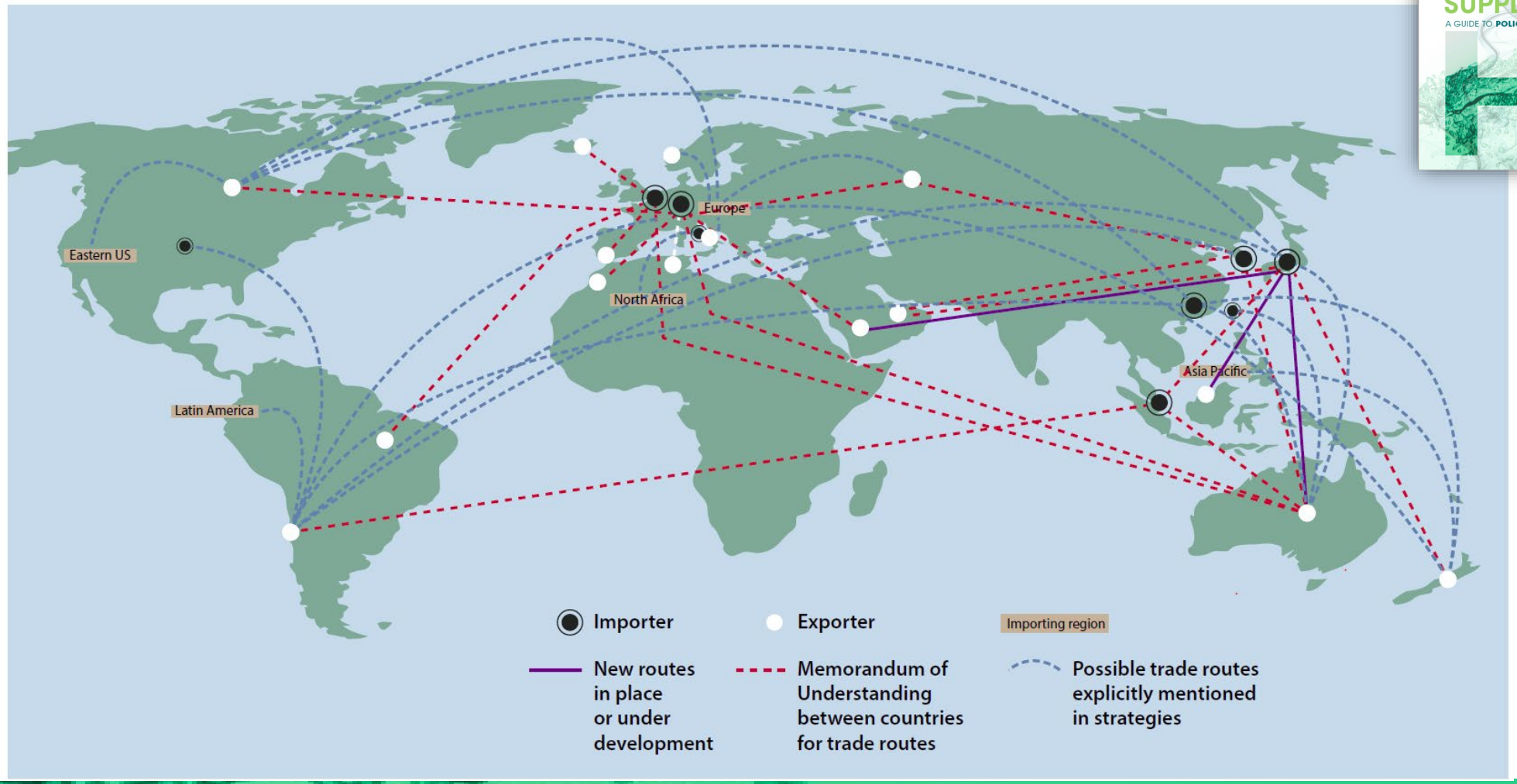
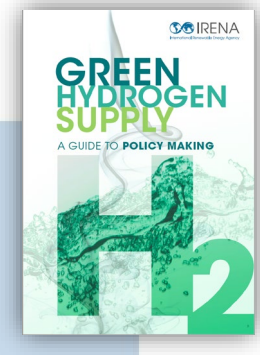
Envisaged trade routes for hydrogen as of 2021





How to decrease the costs of hydrogen?

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Unfit power system structure

Grey and green hydrogen cost gap

GREEN HYDROGEN OFFTAKE

PRICE

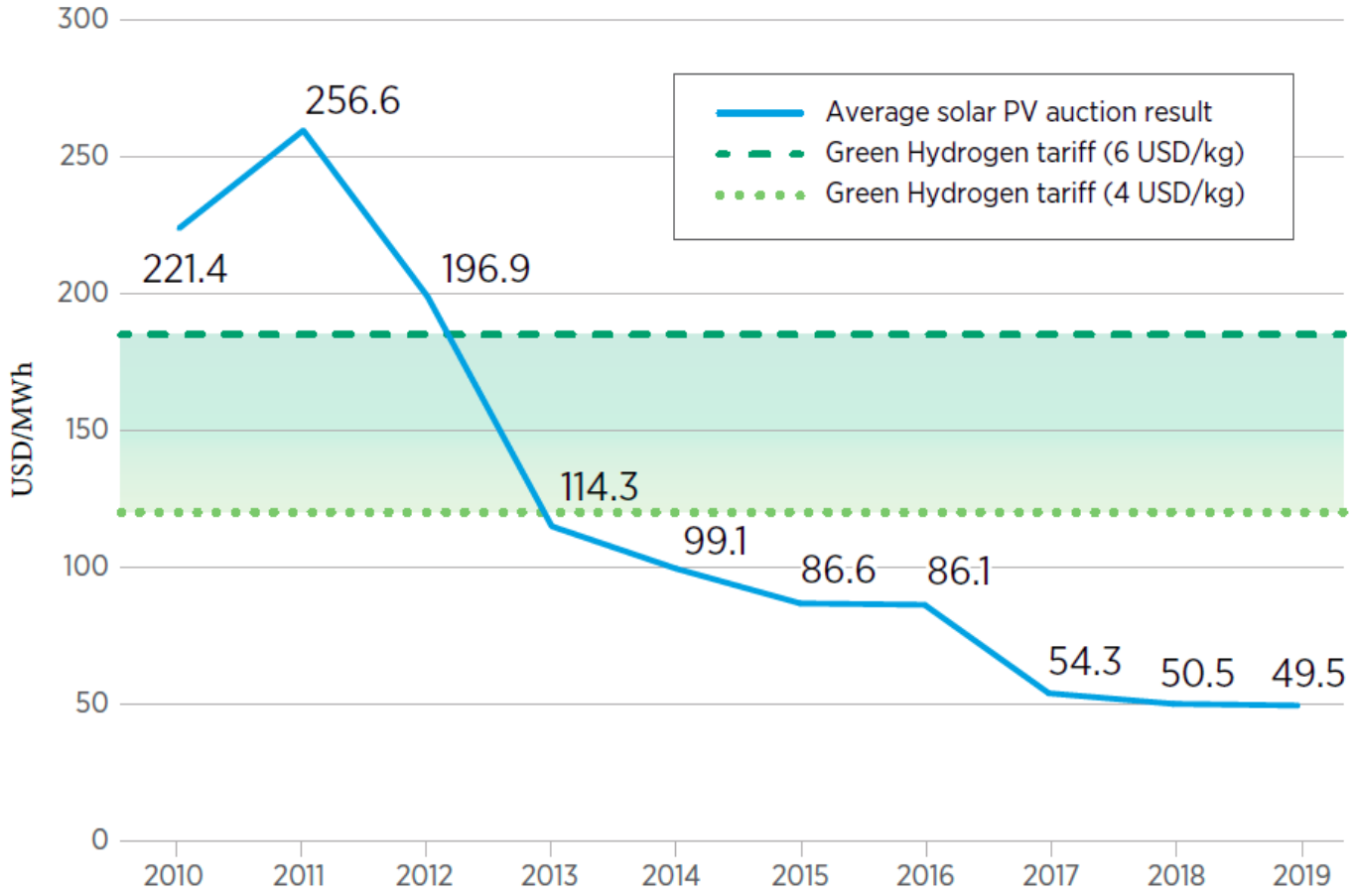
Auctions

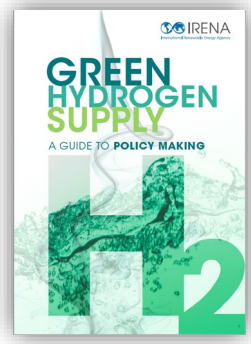
Green gas premium

Fiscal incentives

Ancillary market participation

Comparison between average auction results for solar PV globally (2010-2019) and green hydrogen cost range in 2020





A roadmap for the future

STAGE 1:

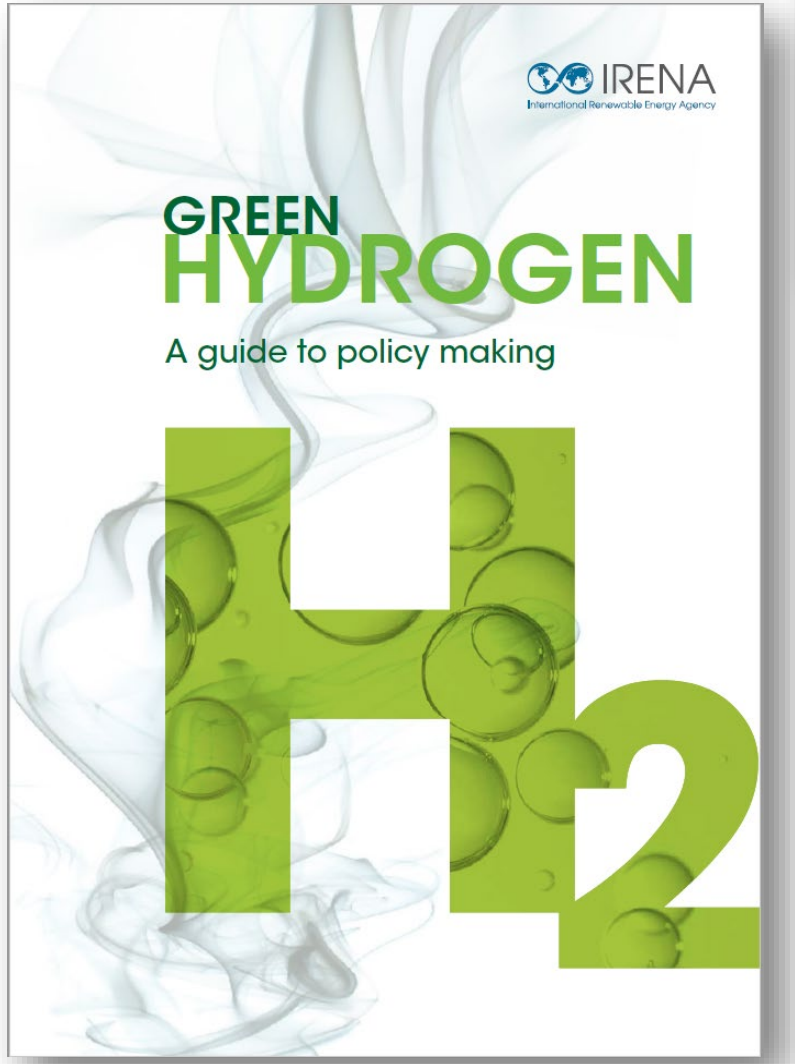
➔ Technology readiness

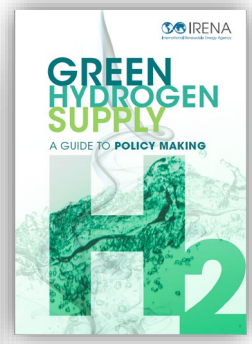
STAGE 2:

➔ Market penetration

STAGE 3:

➔ Market growth





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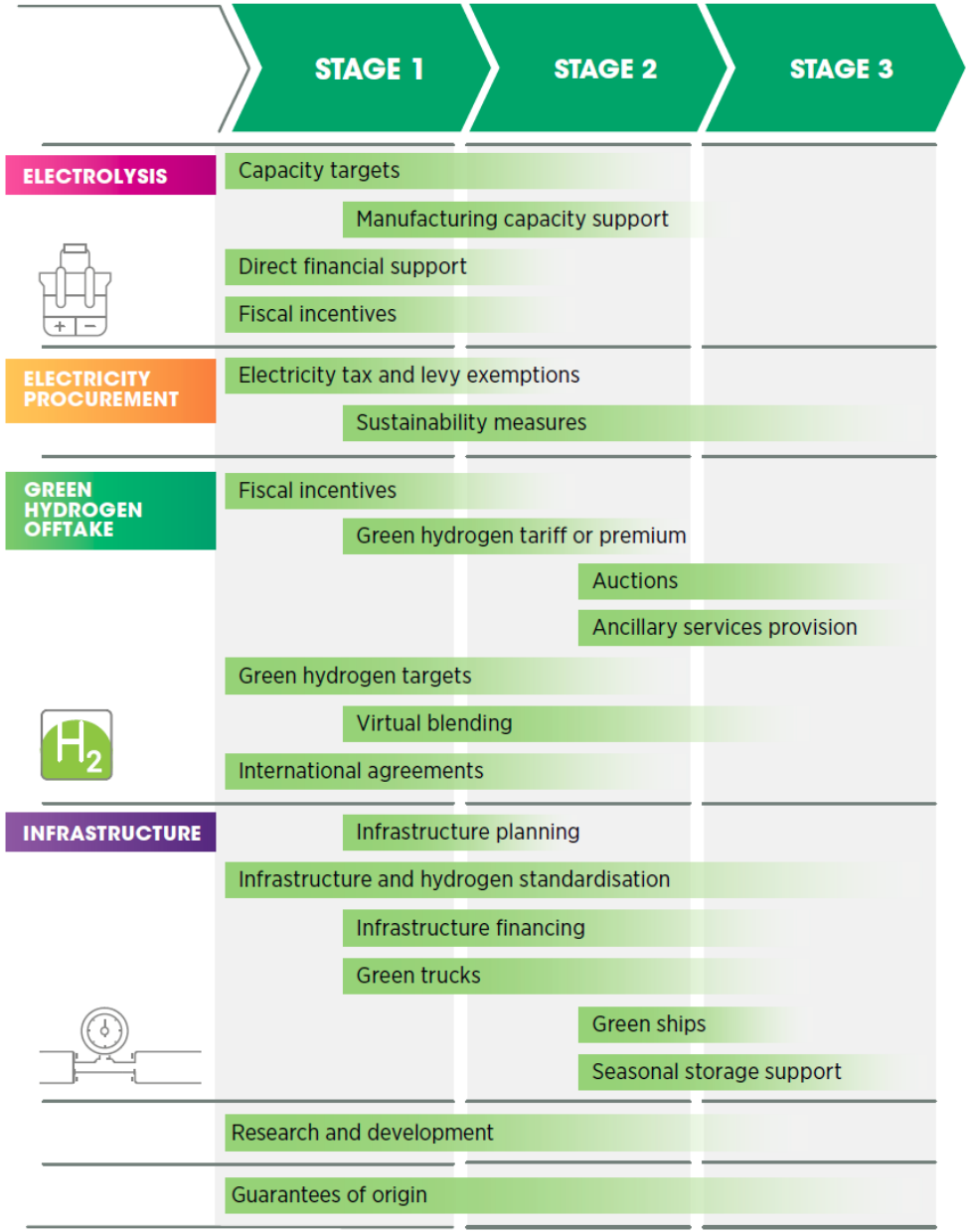

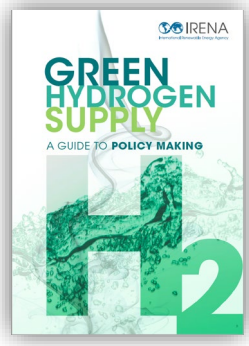


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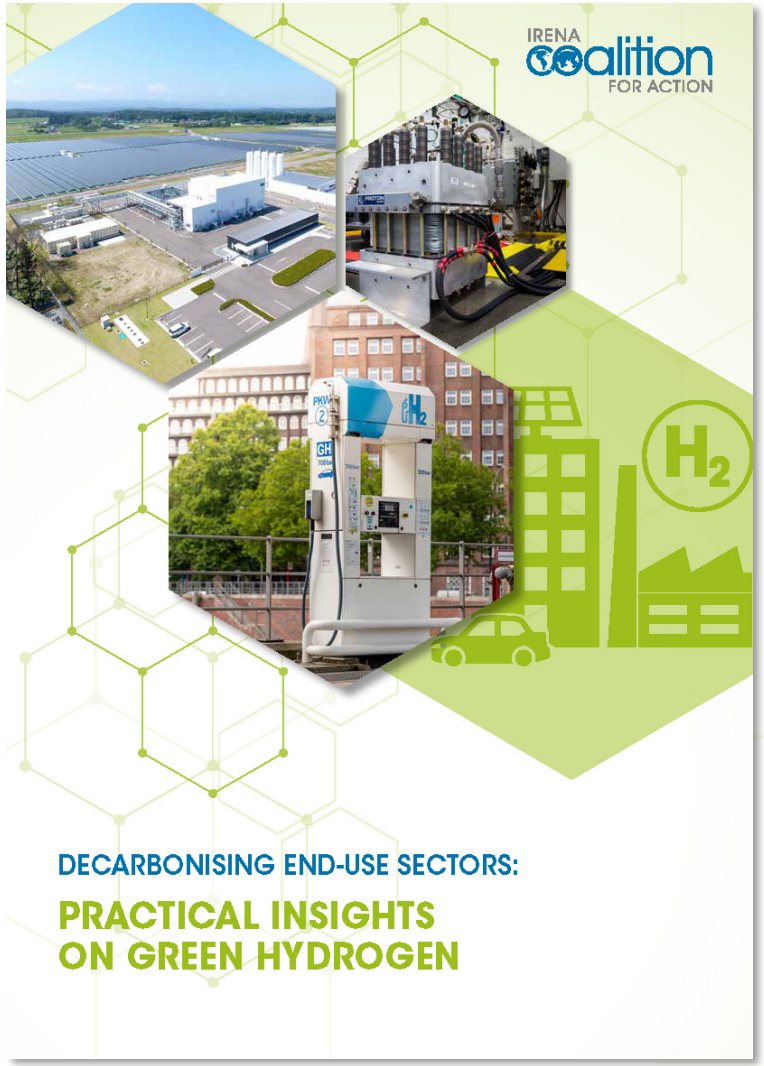
Decarbonising end-use sectors:
Practical insights on green hydrogen

IRENA Policy Talks 2021

27 May

Producing hydrogen from 100% renewables



Green hydrogen is produced from electrolysis powered by renewable energy:

- Sourced directly from a renewable generation facility physically linked to the electrolyser; or
- Sourced from the grid, using models that guarantee the renewable origin of the energy (e.g. PPAs, attribute certificates)

Market opportunities for green hydrogen

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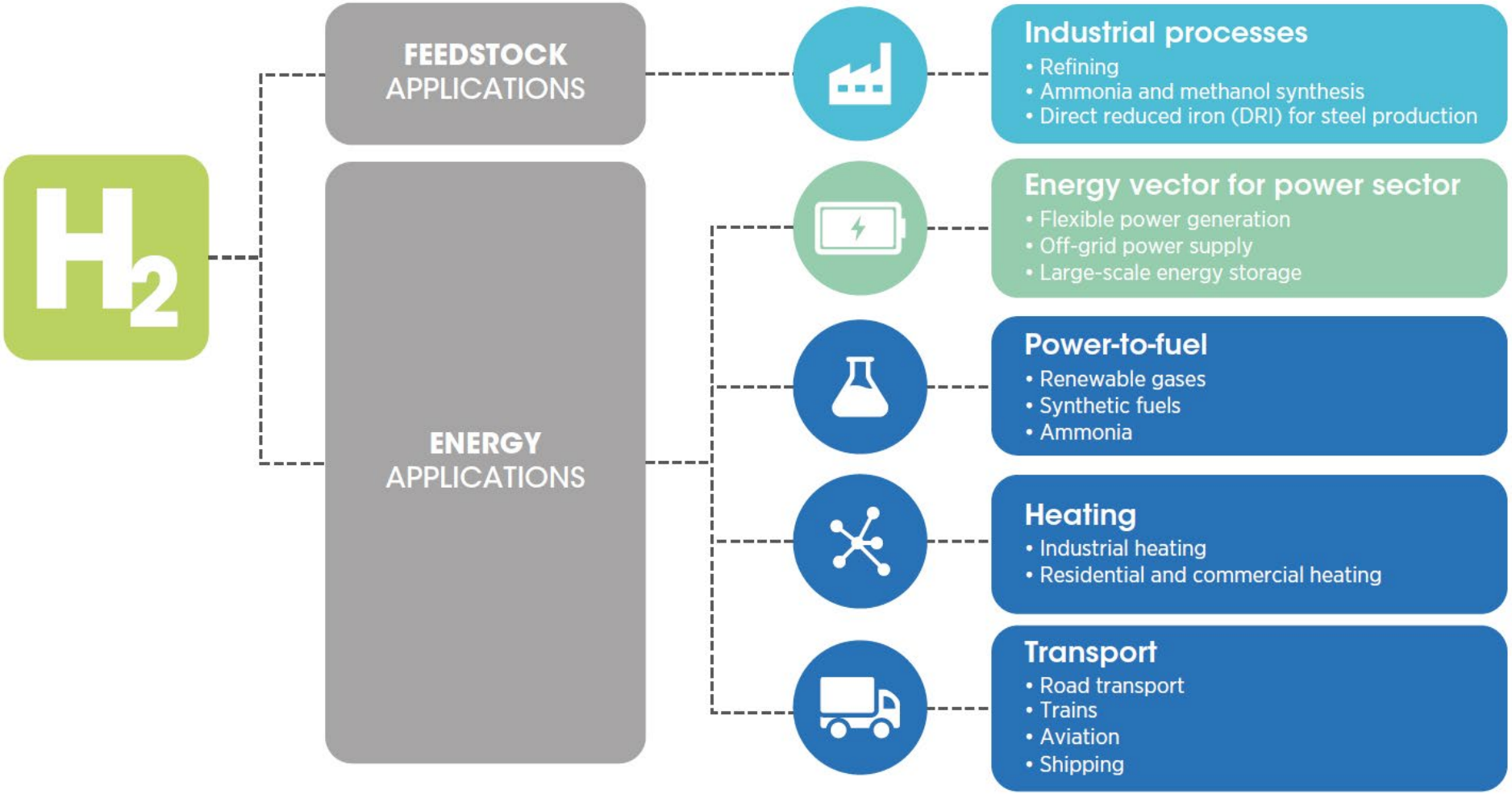
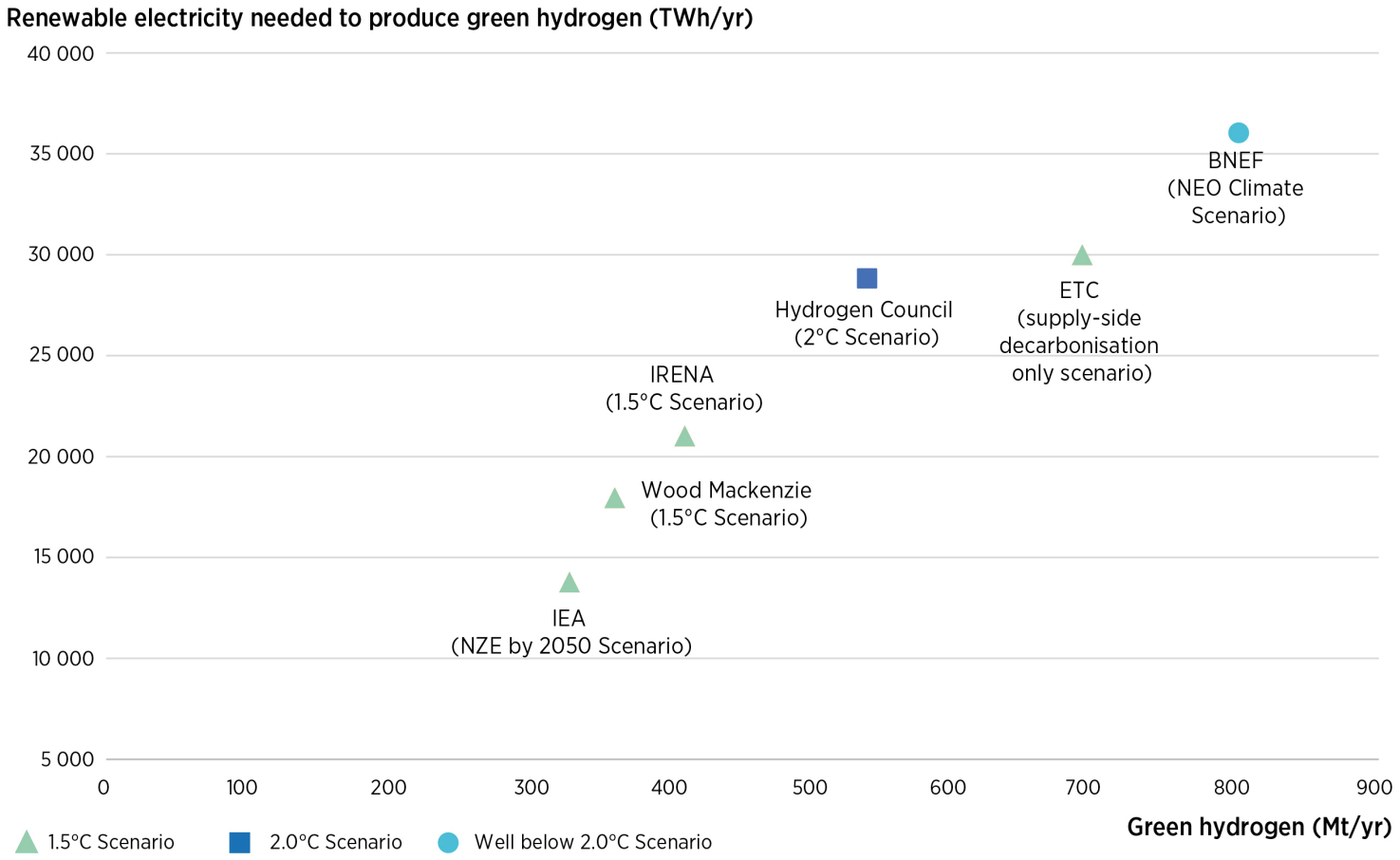


Meeting demand for green hydrogen will require a massive scale up of renewables



Coalition members active in the green hydrogen space expect to collectively develop at least **250 GW** of renewable generation capacity by 2030

Accelerating green hydrogen adoption: The role of strategies and policies

IRENA coalition FOR ACTION

National hydrogen strategies should:

- Back electrolyser targets with sufficient funding
- Enable demand and green hydrogen uptake at all scales
- Include plans for scaling up renewables
- Enable development of certification schemes

Moving towards a global green hydrogen market

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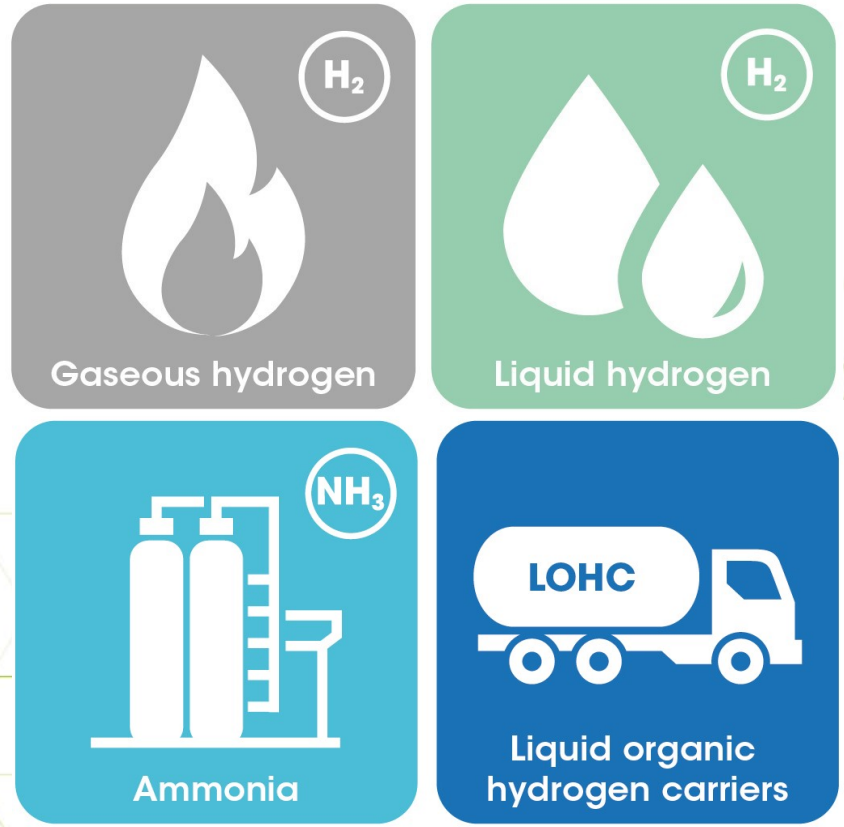
To enable market entry and stimulate market demand, governments must:

- Adapt existing regulatory frameworks governing green hydrogen production, transportation and storage
- Create an international taxonomy for green hydrogen and its derivatives
- Establish certification schemes for green hydrogen



Key takeaways for governments

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- Develop **national strategies and plans** for a sustainable green hydrogen sector
- Implement **financial policies and incentives** to accelerate innovation and deployment
- **Stimulate demand for green hydrogen** through policies such as carbon pricing
- Consider how **electricity grid fees and taxation** affect green hydrogen production
- Prioritise green hydrogen deployment **in hard-to-abate sectors**
- Work with partners to develop **integrated green hydrogen "hubs" or "valleys"**
- **Collaborate with other governments, industry and academia** on R&D, standards and certification principles, and supply chain and trading opportunities

Profiled case studies

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PROJECT NAME	PRODUCTION	END-USE
Queensland Nitrates (QNP)	Alkaline electrolyser	Green ammonia → Ammonium nitrate for explosives
Fukushima Hydrogen Energy Research Field (FH2R)	Alkaline electrolyser	Road transport; Power generation
HYdrogen BReakthrough Ironmaking Technology (HYBRIT)	Alkaline electrolyser	Steel industry
Green H2F Puertollano I	PEM electrolyser	Green ammonia → Fertiliser industry
Power-2-Green Hydrogen	PEM electrolyser	Road transport; Industry
Westküste 100	Electrolyser (TBD)	Green methanol → Road transport; Aviation

THANK YOU!

For more information about the IRENA Coalition for Action, visit
https://coalition.irena.org

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