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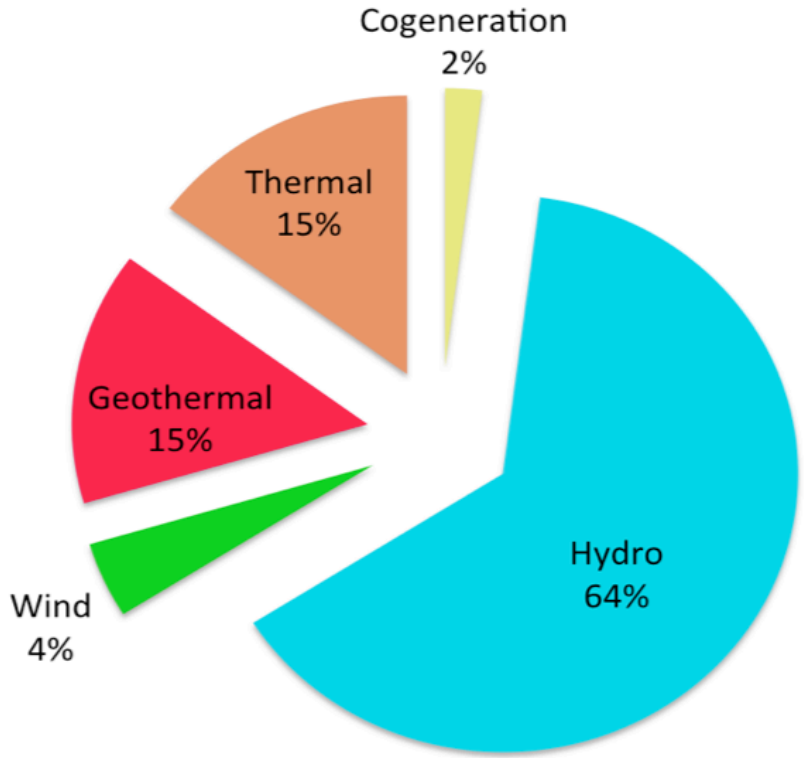
Hydrogen's role in our energy future and what does it mean for wind?

Dr. Linda Wright

New Zealand's Renewable Energy Resources



- 3rd highest renewable electricity generation in OECD, after Norway and Iceland.
- In 2016, 85% of electricity was generated from hydro, wind and geothermal, the highest in 35 years.
- Future consented renewable electricity capacity exceeds 50% of existing generation.
- Domestic electricity projections show flat-line demand.
- Wind = NZ's under utilised renewable resource.

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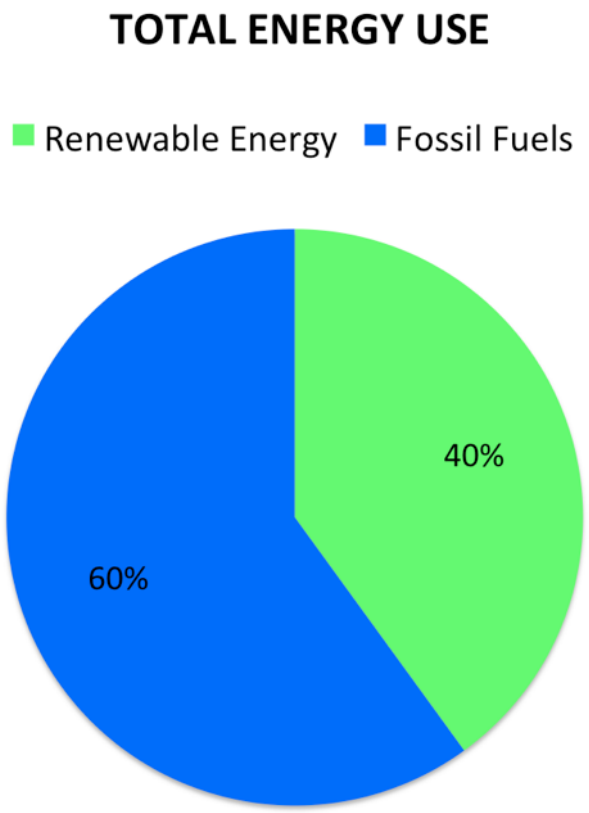
New Zealand's total energy use



- Renewable electricity only accounts for 40% of our total energy use
- 60% of our total energy use is fossil fuels i.e. coal, oil (mainly petrol and diesel) and gas

An increase in total consumer energy demand is being driven by the **transport and industrial sectors.**

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Transport

- Domestic transport accounts for 82% of demand for oil products
- 90% of transport energy is used in road transport
- Freight transport is expected to increase by 48% by 2042

Industry

- Process heat makes up 33% of our total energy use
- 60% of process heat is produced using mainly coal (S. Island) and gas
- 80% of the total process heat is used in the industrial sector

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Our current reality....

- Renewable energy generation is currently dictated by the size of our domestic market. We need increased demand before it becomes economic to bring the additional consented capacity online.
- Increased focus on electrification of our economy….it will not be the only solution because it does not address all of the problems and it definitely creates new ones…recharging infrastructure, generation and transmission, battery constraints.

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Integrated range of solutions....

- We have a growing economy, but the growing energy demands are for transport and industrial process heat, which **currently rely on fossil fuels**.
- To assist us achieve our **climate change obligations** we need to convert our renewable electricity into a zero emission fuel for heavy vehicle fleets, maritime transport and industrial process heat applications.
- **Integrated range of solutions** that optimise operational advantages of EV and H2, grid resilience opportunities, utilise our renewable capability, global leaders.

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Targets

- 100% renewable electricity by 2035
- Zero emissions by 2050
- Which ever way you look at it….we need more renewable generation
- Wind & hydrogen

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Why hydrogen?

Hydrogen generated from New Zealand's renewable electricity can be used as a **high-energy low-emission fuel** for heavy vehicle transport and industrial process heat to meet **domestic demand**, as well as creating a new **export industry**.

Offset generation and transmission constraints during **peak demand periods.**

Distributed generation & **resilience**.

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New Zealand Hydrogen Association

Facilitating the delivery of renewable **hydrogen infrastructure**

Developing opportunities in an emerging hydrogen **R & D** base

Supporting **cohesion** and **collaboration** across NZ

Removing barriers and **supporting progression**

Facilitating **international opportunities**

Raising New Zealand's global profile

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Mission

Positioning New Zealand at the forefront of the global hydrogen economy.

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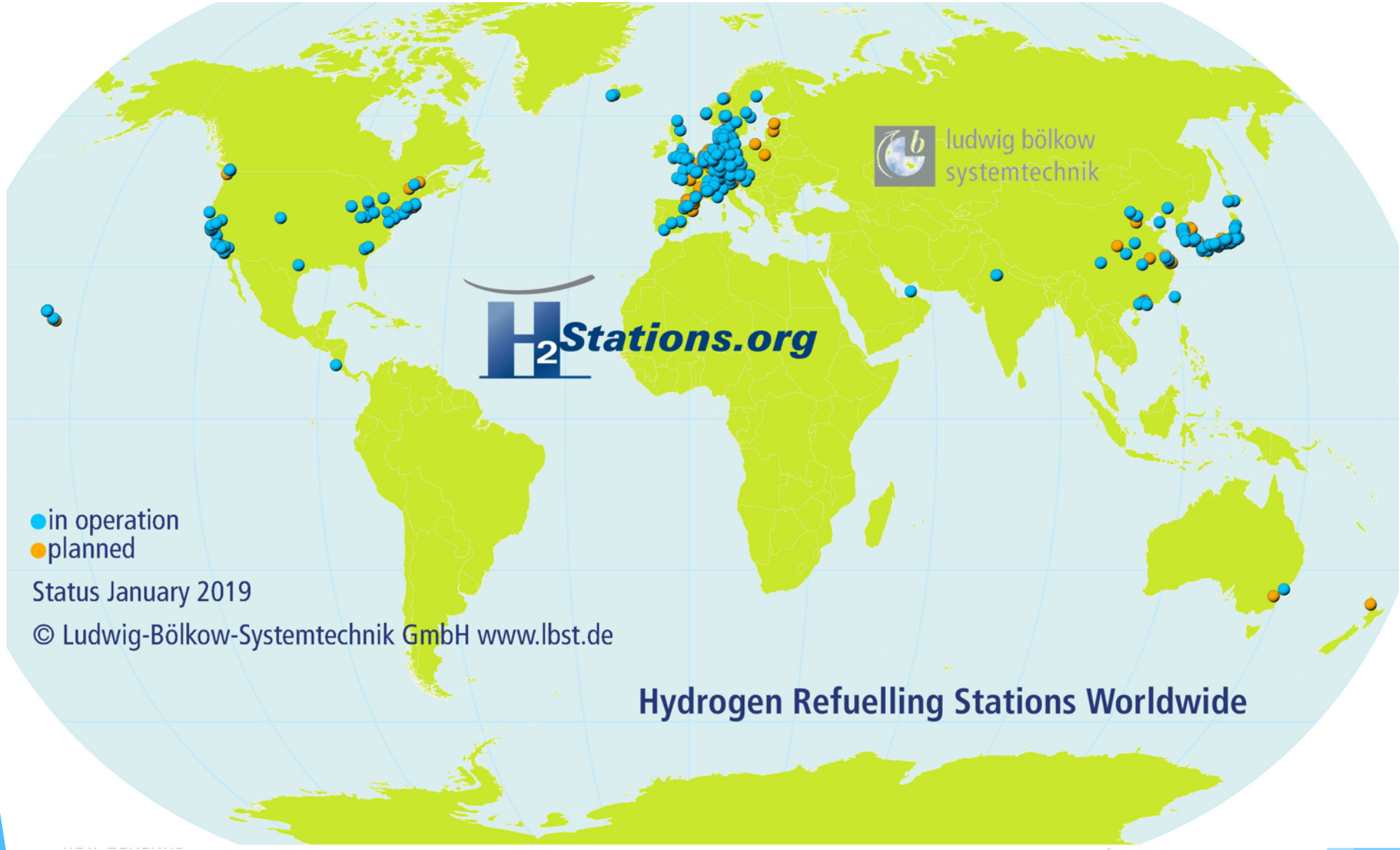
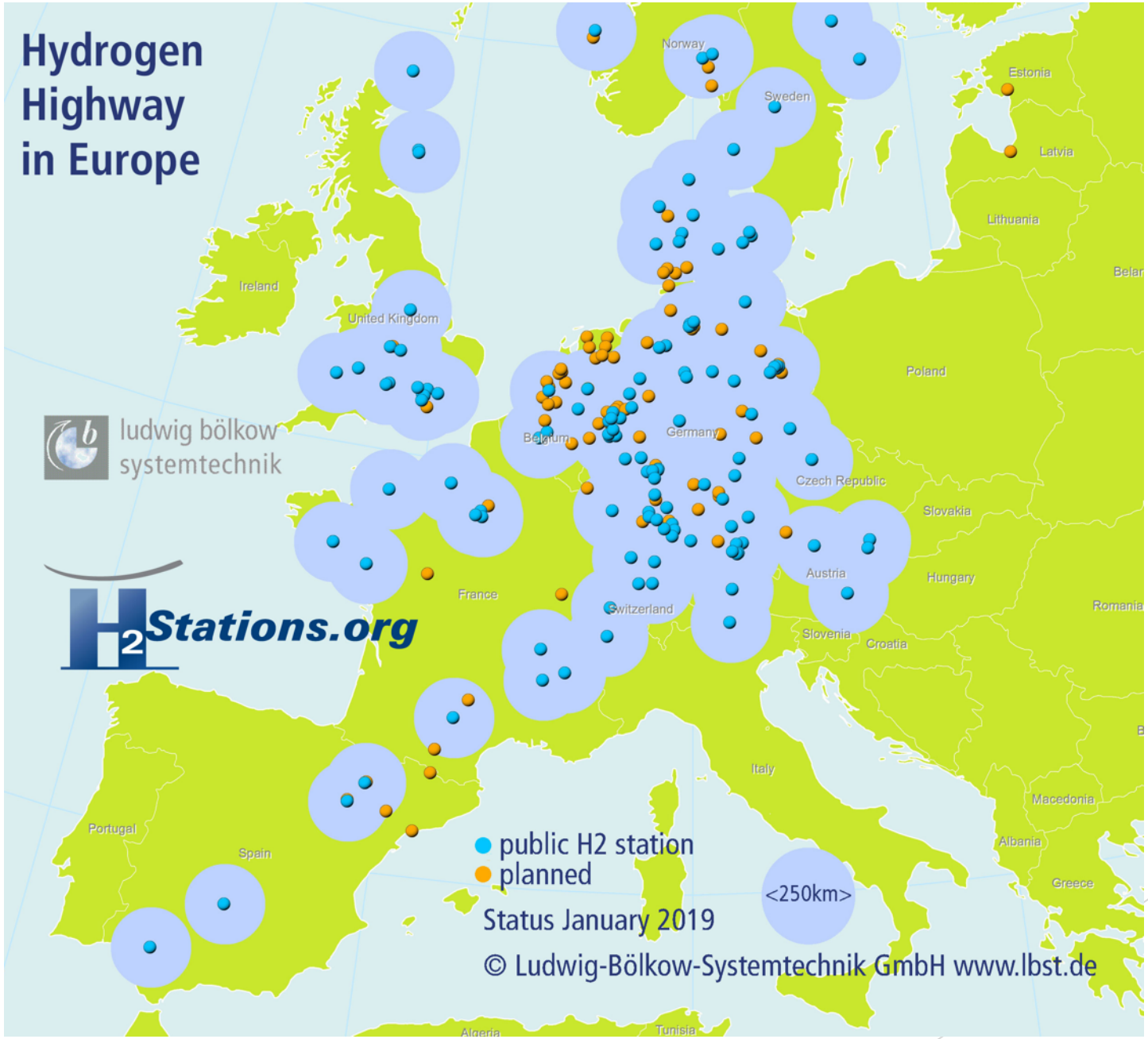
Refuelling infrastructure – global developments





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Asia

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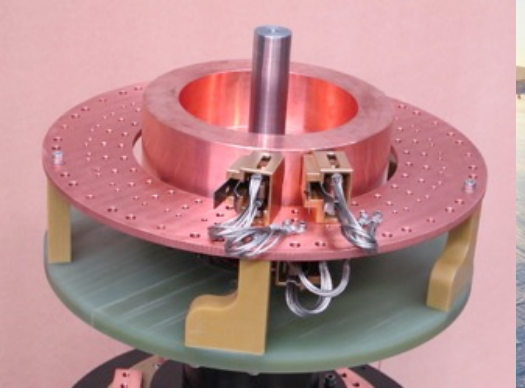

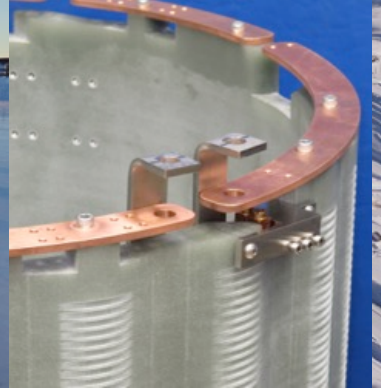


Global developments…

- Hydrogen production….efficiency, cost, scale
- Storage & transport….domestic and international scale
- Grid storage and gas reticulation
- Industrial process heat design and development
- Commercially available fuel cell vehicles, demonstration & development
- Materials handling
- Carbon composites & cryogenic coolers
- Maritime propulsion & aircrafts

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Hydrogen Infrastructure

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Export Potential

- New Zealand has an **abundance of renewable energy**, which has the potential to be exported, starting with Japan
- Japan is seeking to expand its renewable energy interests, with a **strong commitment to developing a hydrogen export market**
- There is established hydrogen capability in Japan and both **governments are seeking collaborative opportunities** to deepen existing relationship and to develop new JV partnerships
- We need to demonstrate **commitment** to build capability and capacity

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Why New Zealand?

- Innovative, dynamic & versatile
- Not overtly litigious
- Abundant renewable energy generation & expertise, particularly wind and geothermal
- Globally iconic tourism offerings for heavy vehicle transport, trains and maritime vessels
- Progressive private sector organisations seeking to decarbonise
- World Heritage Sites, national parks, iwi, island communities and remote off grid locations
- Global profile and focus on transitioning to a low emission economy

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Hiringa and Ballance Wind/Hydrogen JV

- Hiringa / Ballance Agri-nutrients (BAN) Green Urea Joint Venture
- Green urea for fertilizer produced from ~16MW new wind generation from 4 new wind turbines.
- Plant is supplied renewable electricity.
- Green hydrogen is produced with excess power by electrolysis.
- Plant uses green hydrogen to produce urea providing large off-taker.
- Green hydrogen is diverted to higher value zero emission transport network.

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Ballance agri-nutrients HIRINGA




Hydrogen in NZ….

- Not everyone is a fan….some (particularly electricity generators) see it as a niche opportunity
- Government commitment
- Industry commitment
- International commitment and focus
- New Zealand Hydrogen Association
- Current projects….POAL, Refining NZ, Hiringa, QT to Milford Sound, Tauranga
- Build NZ capacity & capability
- Get projects on the ground.

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Advancing New Zealand's Transition to a Low Emissions Economy

www.nzhydrogen.org