



# Shell Energy Scenarios & Hydrogen

Royal Dutch/Shell Group

Alpbacher Technologie Gespräche 2005

# What Shapes Long Term Energy?

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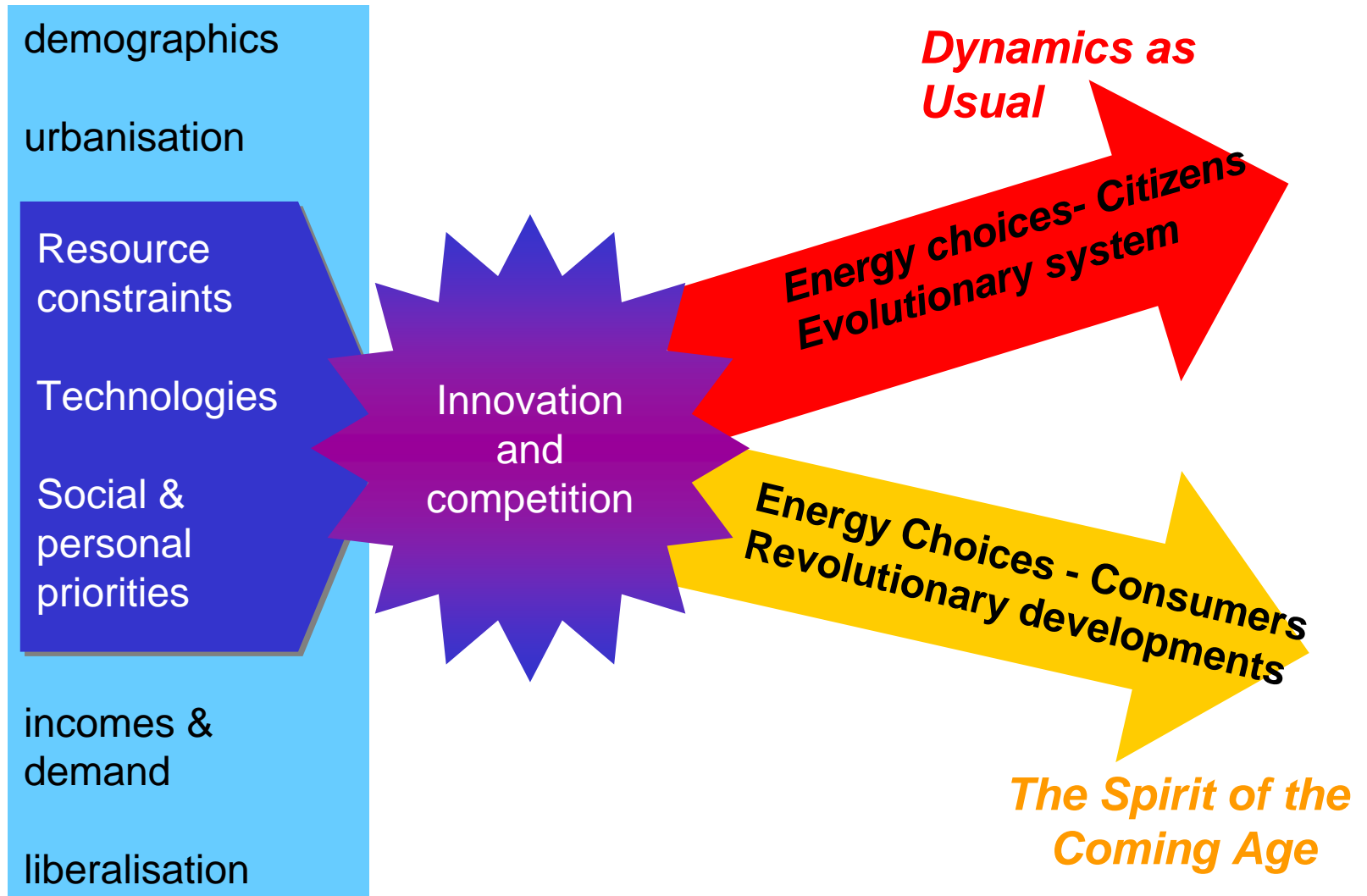
## The contributors

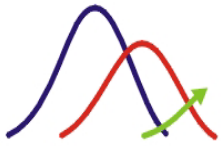
- demography
- incomes
- urbanisation
- liberalisation

## The critical

- resource constraints
- technology
- social and personal priorities

# Energy Branching Points



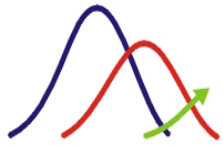


## *Dynamics as Usual*

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Societal pressures for “clean”, “secure” and “sustainable” energy push a direct path to renewables, supported by gas in the medium term

But only after advances in energy storage and a next generation of renewables around 2025. Vehicle efficiency advances prolong the oil transition.



“Rumors of my death are greatly exaggerated”  
Mark Twain

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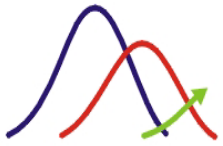
80 mpg Direct Injection



A New Life for Internal  
Combustion Engines



60 mpg Hybrid



# Long Term Renewables wins

## Thin film Solar

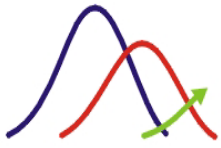


## Biofuels



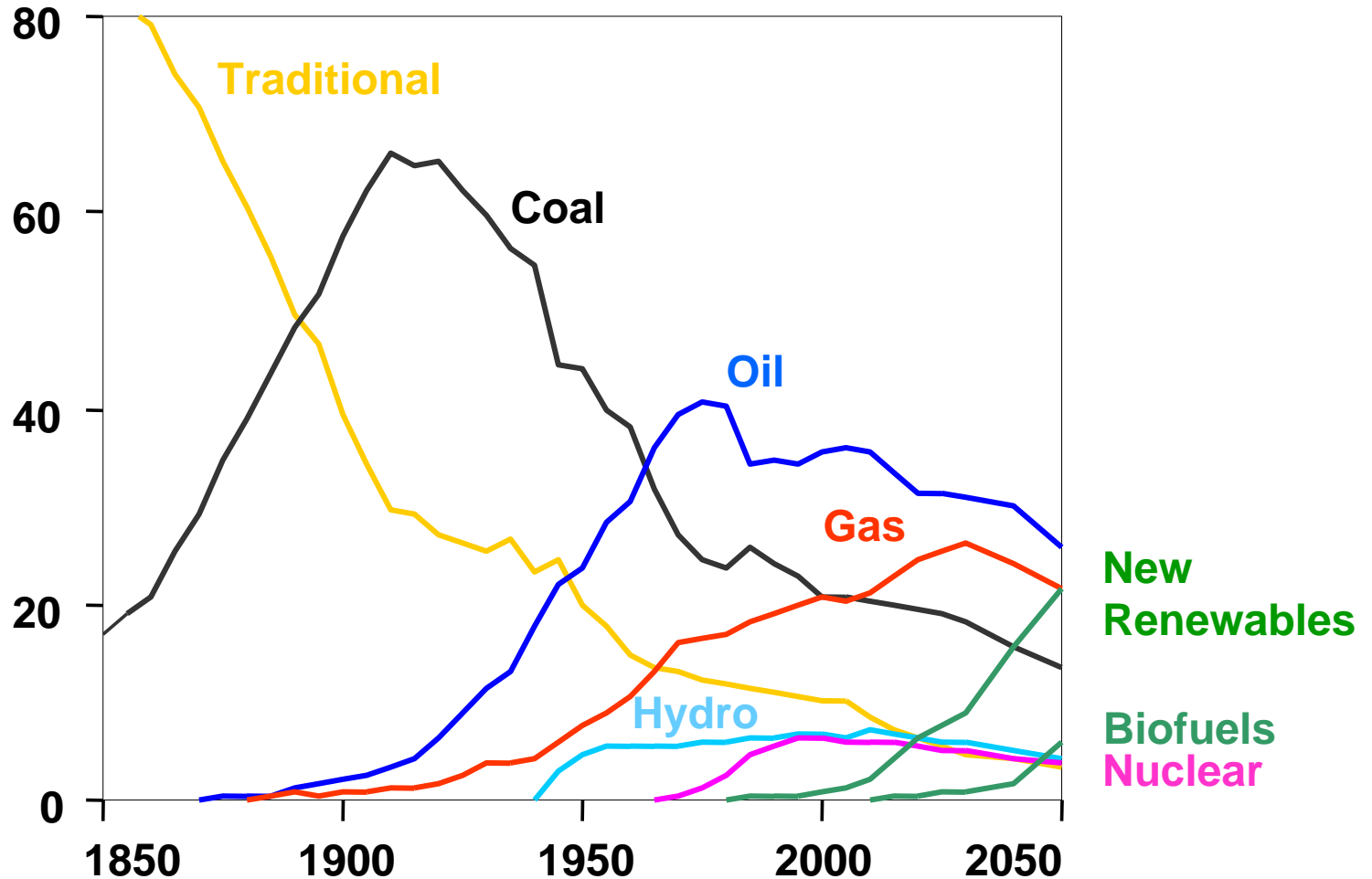
## Diverse Storage

- Thermal
- Pumped hydro
- Compressed air
- Chemical



# Energy Transitions *Dynamics as Usual*

**% of Primary Energy**





## *Spirit of the Coming Age*

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Consumer demands for more convenience, flexibility and independence, supported by advanced hydrocarbon technologies, provide an infrastructure bridge to a hydrogen economy.

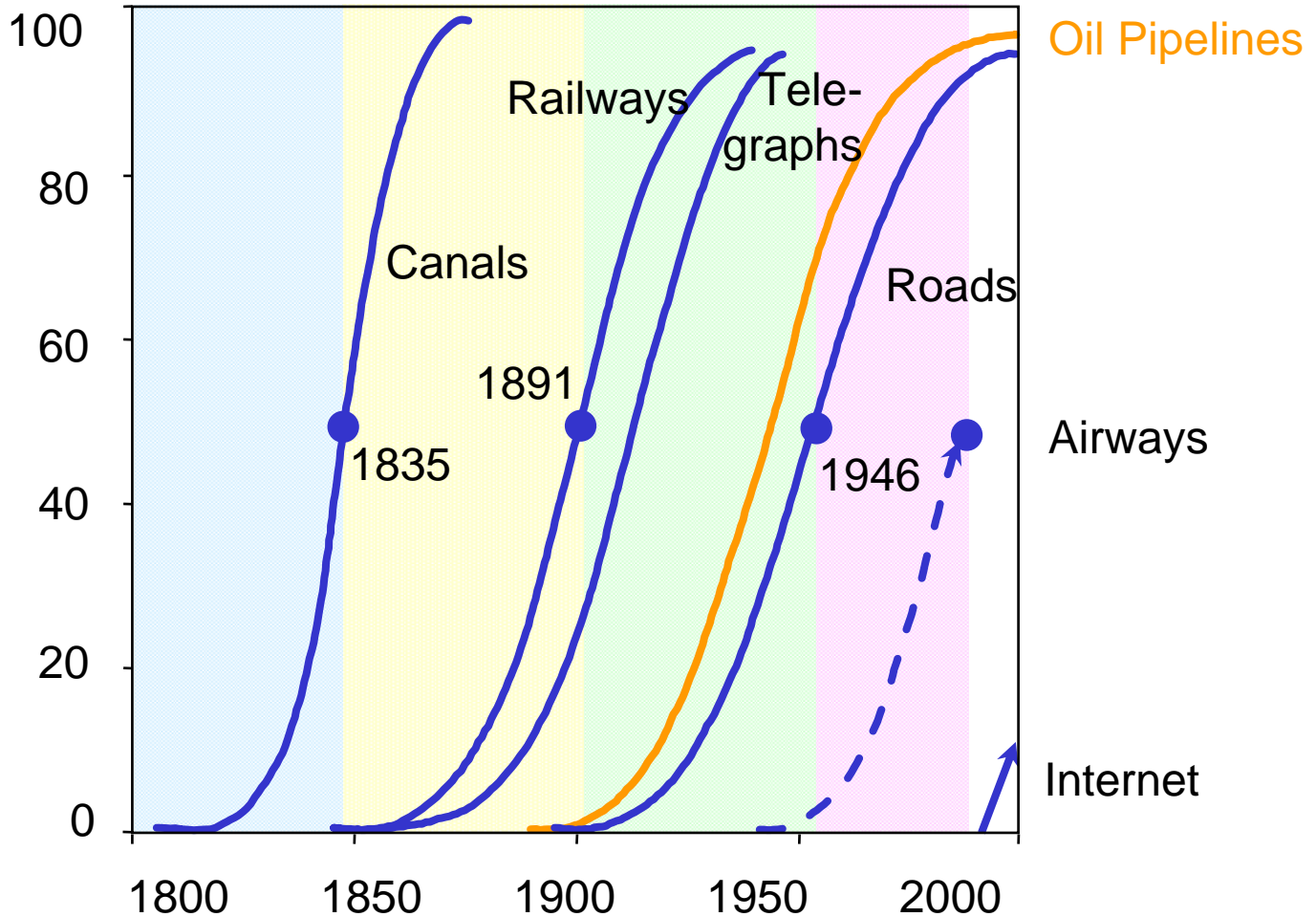
Longer term this creates a large demand pull for sustainable hydrogen and renewables.





# Infrastructure - The Critical Enabler

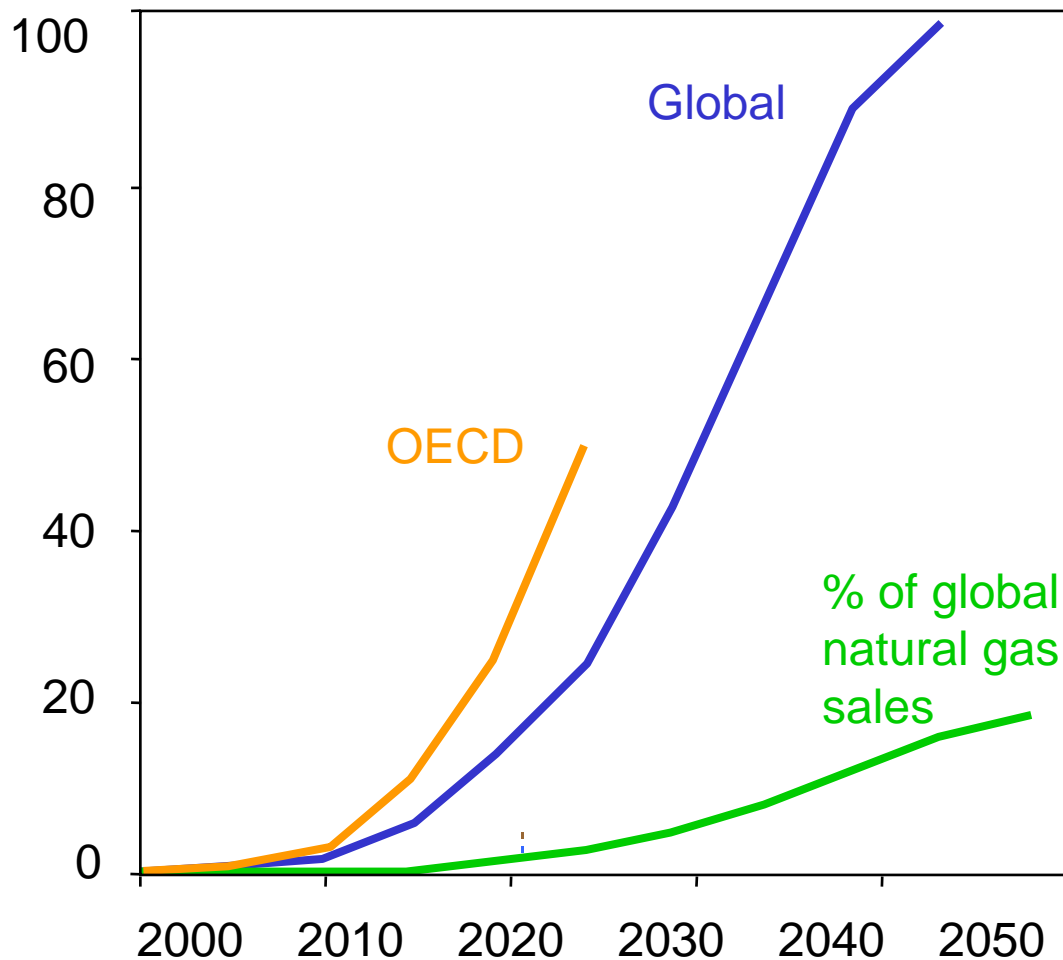
Percentage of maximum US network size





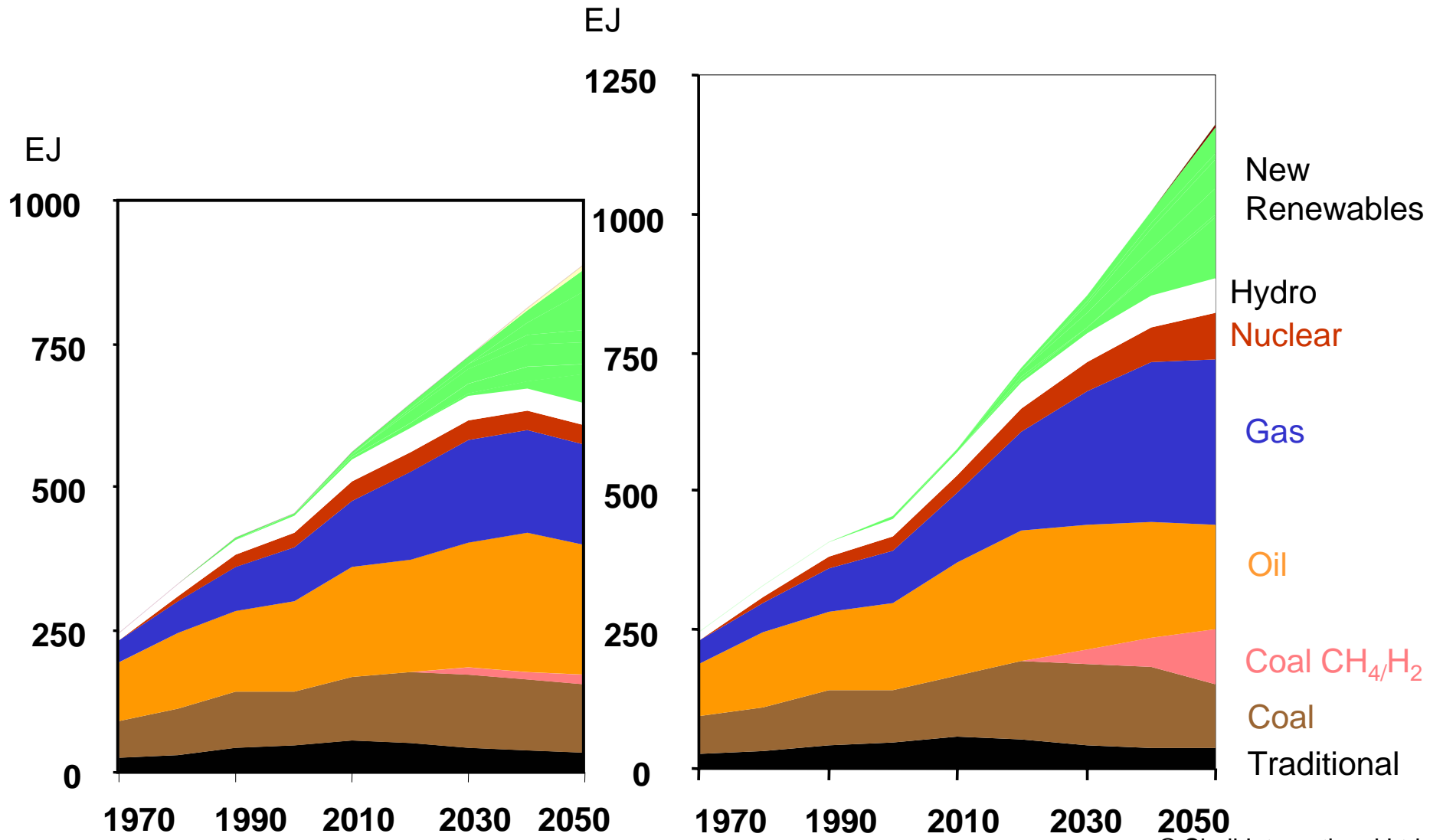
# Fuel Cell Vehicle Share of Sales

% of total



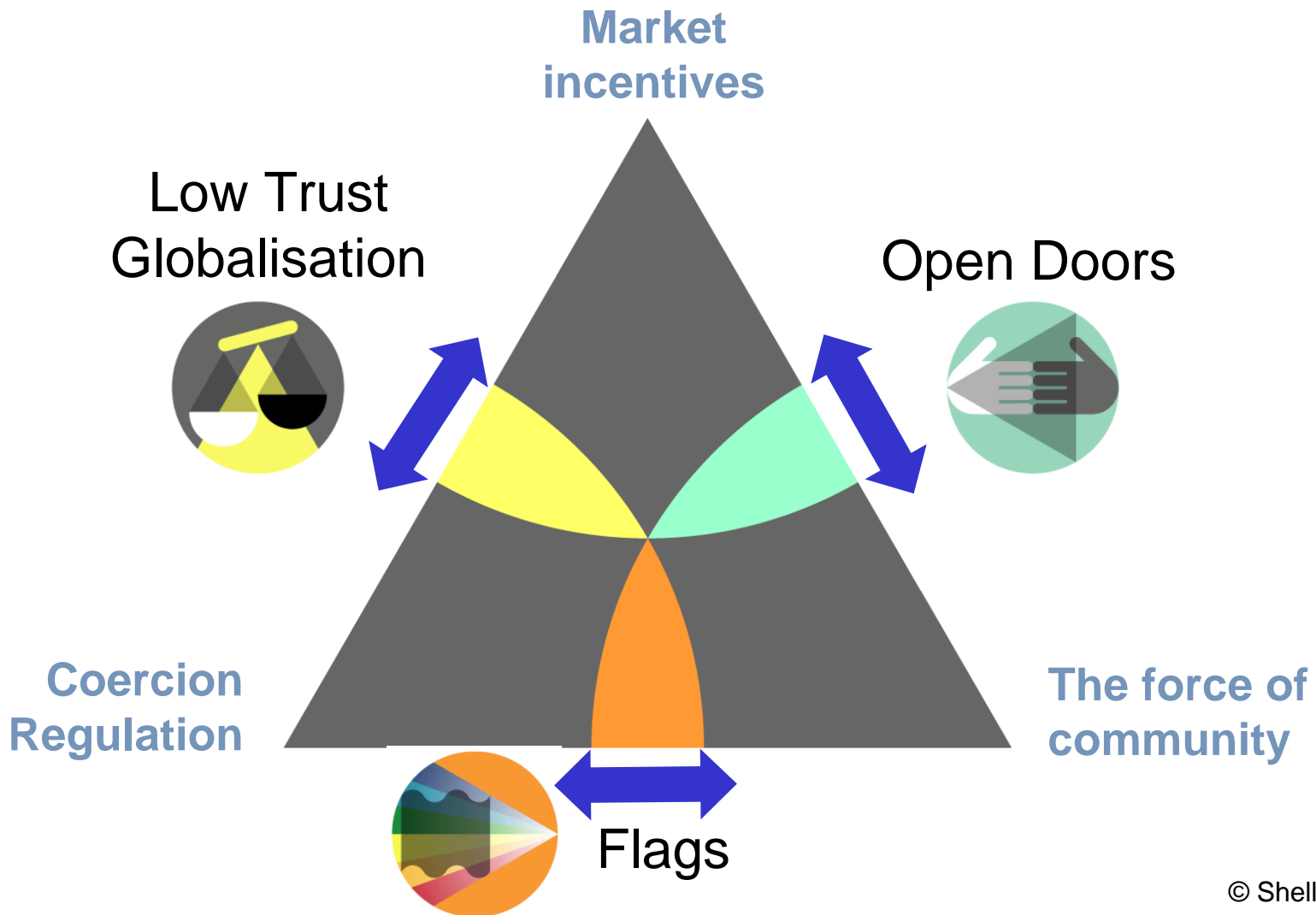
- clean, quiet
- low maintenance
- high performance
- mobile information and entertainment
- ICE cannot compete

# Primary Energy Comparison



# The Three Global Scenarios to 2025

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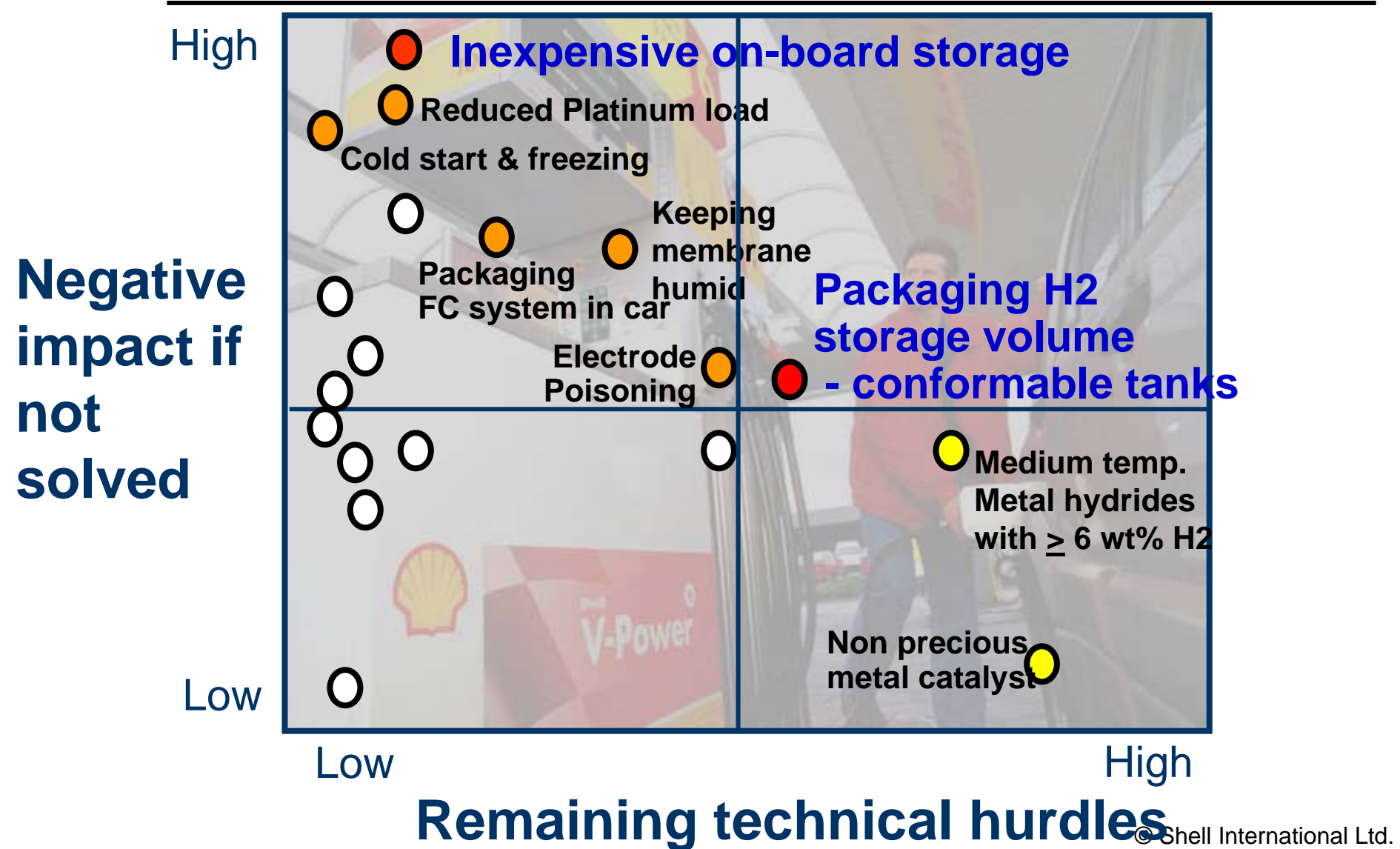
# Hydrogen - Facts not fiction

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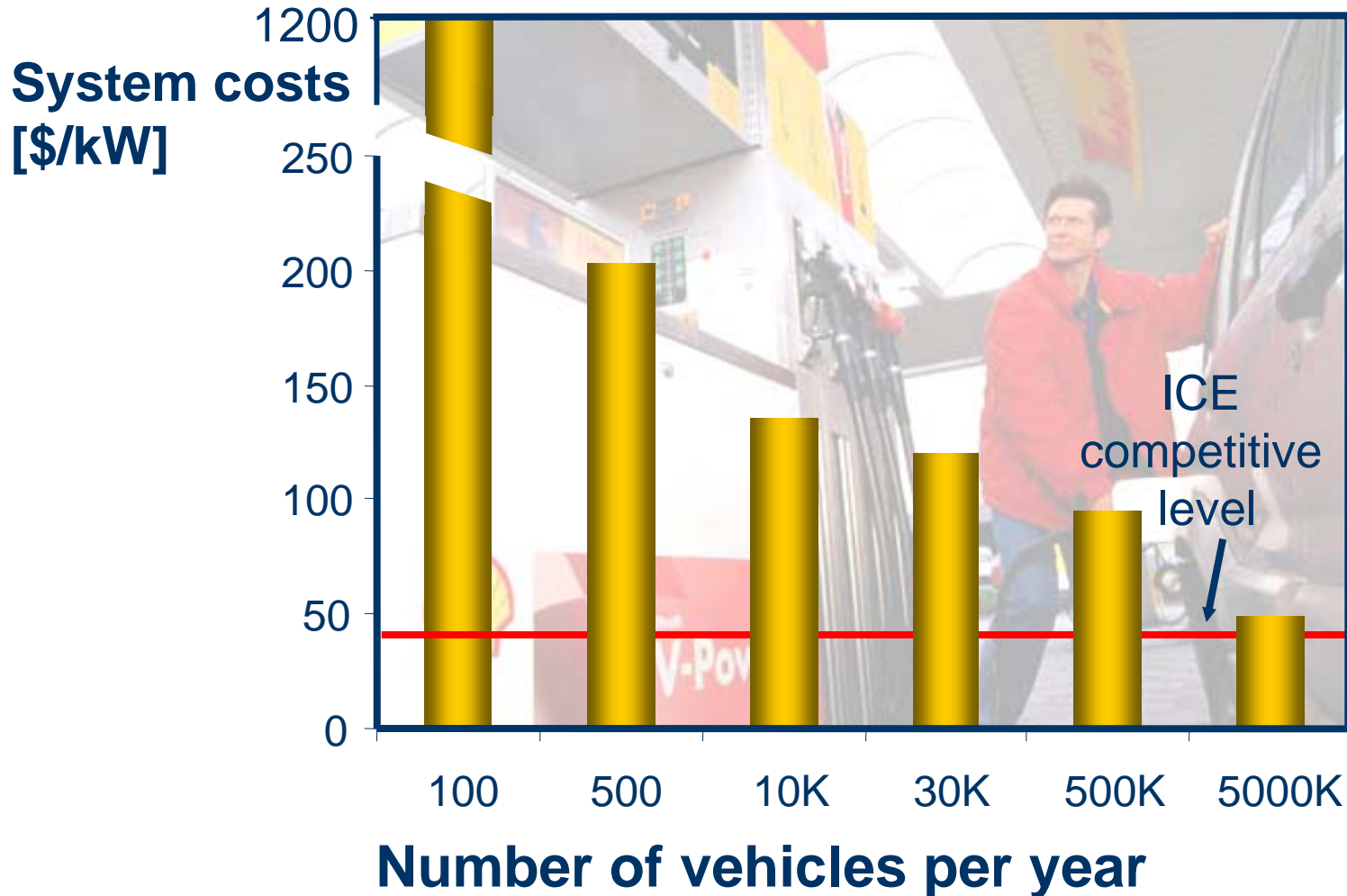
- Japan
- Iceland
- Europe
- North America



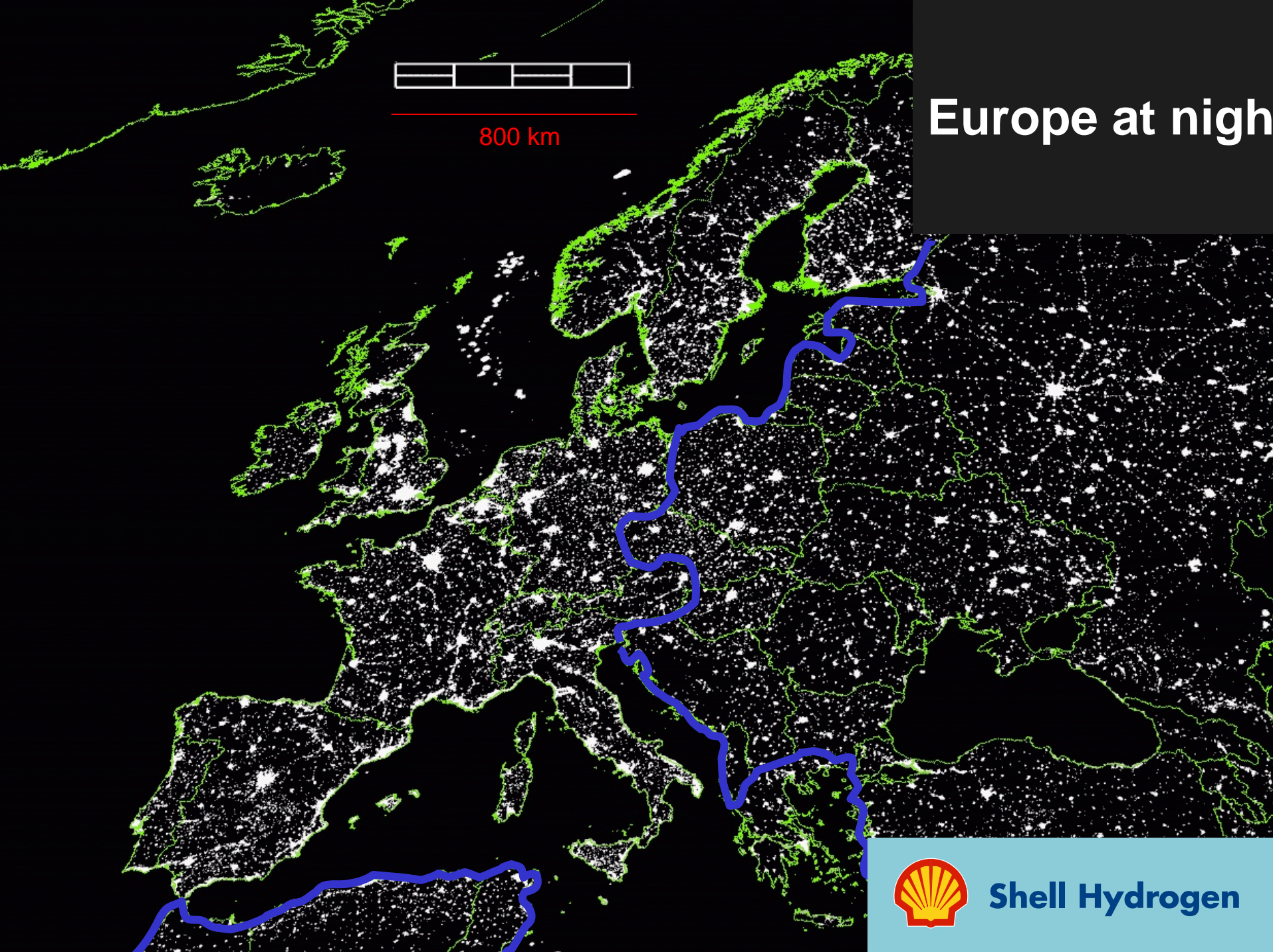
# Technical issues to be addressed



# Cost of FCV drive train as function of production volume

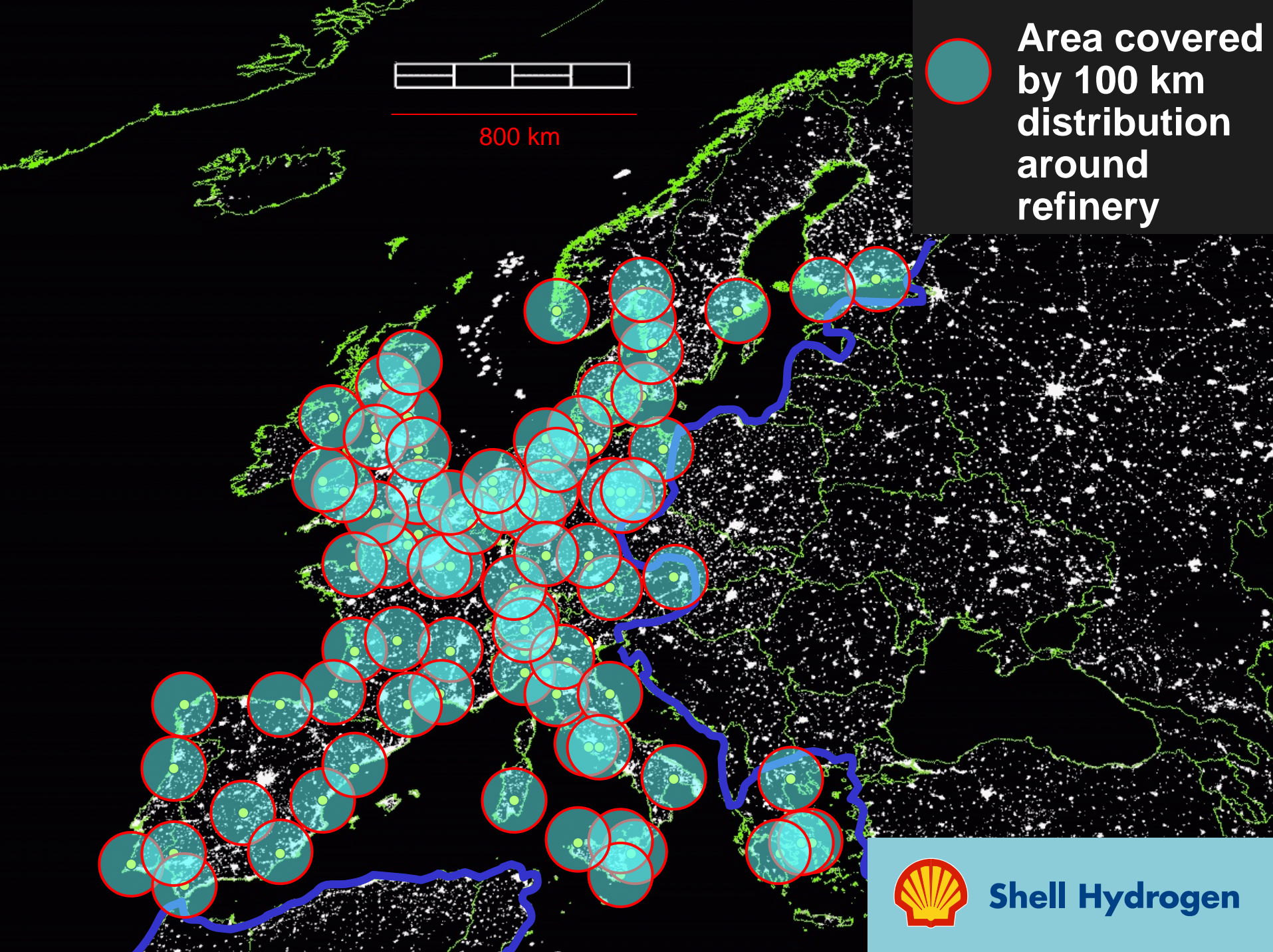


# Europe at night



Shell Hydrogen





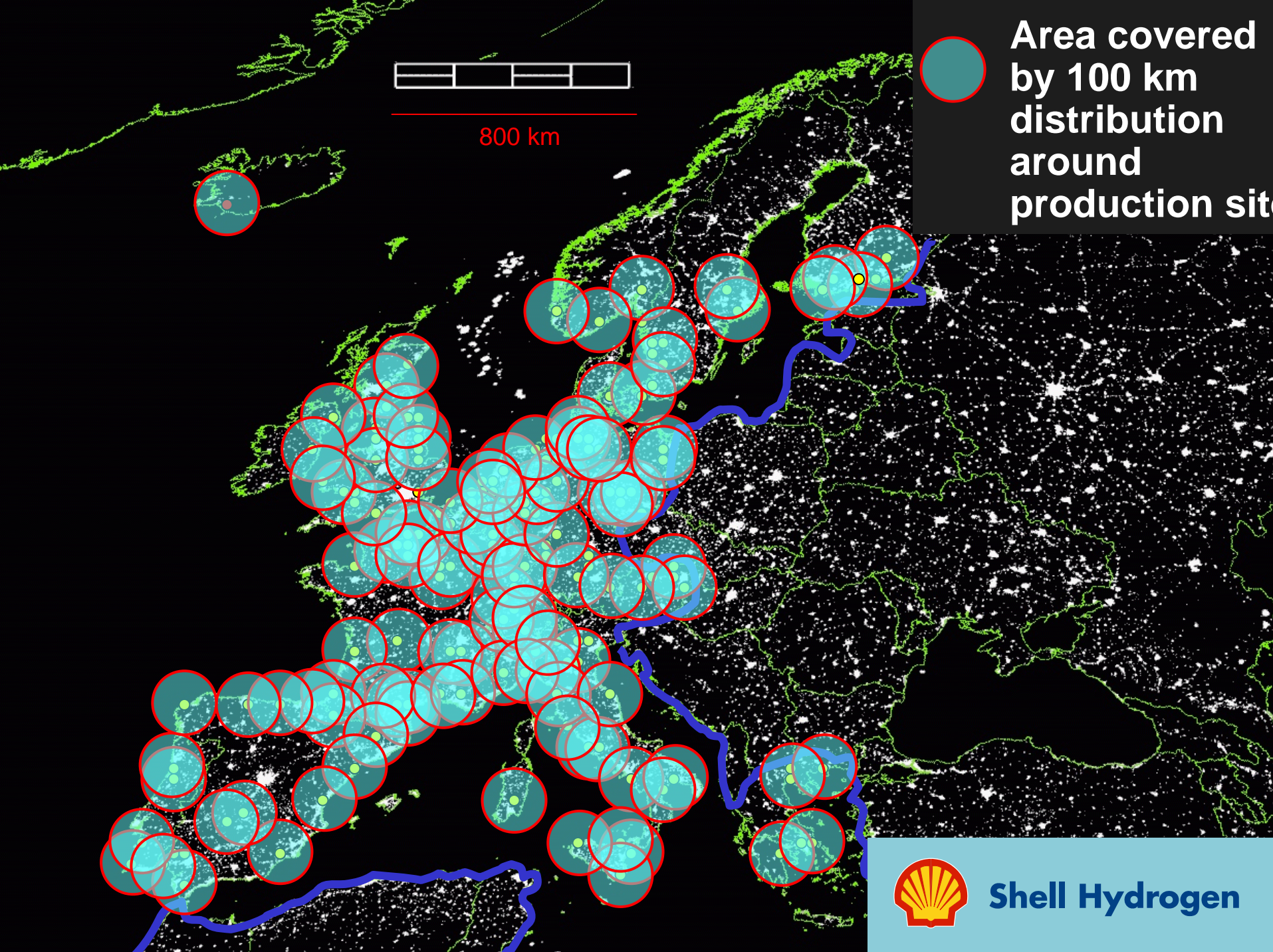
800 km



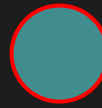
Area covered  
by 100 km  
distribution  
around  
refinery



Shell Hydrogen



800 km



Area covered  
by 100 km  
distribution  
around  
production site



Shell Hydrogen

# A new approach: Mini Networks



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# The next stretch: Mini Networks

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- **Fleets increasing to 100 vehicles and beyond**
- **Fuelled from mini-network of 4-6 integrated hydrogen/gasoline stations**
- **Public Private Partnerships**
  - **More than one vehicle manufacturer**
  - **More than one infrastructure supplier**
  - **Fleet company**
  - **Government & regional/local authority**
- **Focus on transportation in urbanised markets**
  - **E.g. Tokyo, Los Angeles, the Rhine region**
  - **Some stationary power elements**
- **High visibility**

# The Way Ahead

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## **Lighthouse projects, with ...**

- **Coordination mechanisms & incentives, that build ...**
- **Supply chain confidence, supported by ...**
- **Regulations, codes & standards, and ...**
- **Promotion of public awareness**

**Substantial public-private partnerships**

**Where and when?**

