

Energy Efficiency and Urban Infrastructure – Experiences and Examples from Hamburg and Northern Germany

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November 5, 2019, Auckland



1. **Getting Started: About Hamburg and Hamburg`s Economy**
2. The (Regulatory) Framework and Hamburg`s Green-Tech Sector
3. Best Practices / Use Cases

Geographical Position of Hamburg in Europe



Hamburg and its Metropolitan Area



Free and Hanseatic City of Hamburg (Federal State)

- 1.83 million inhabitants
- 2,398 inhabitants per km²
- 320,000 non-German nationals
- 118,000 bn. € GDP / 65,000 € per capita in 2014
- about 350,000 commuters



Source: Metropolitan Area of Hamburg

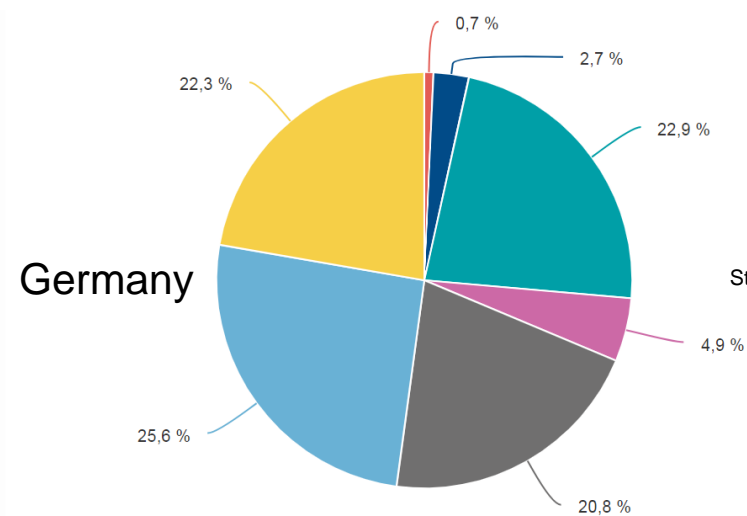
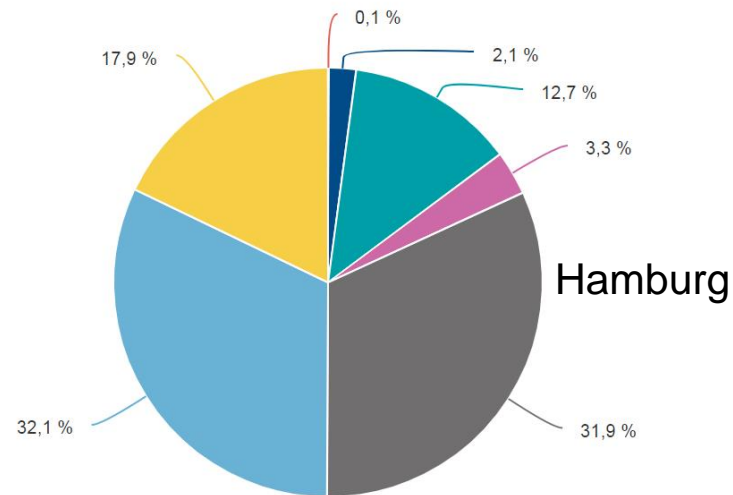
Hamburg Metropolitan Area

- over 5 million inhabitants, 192 per km²
- 205,000 bn. € GDP / 35,065 € per capita in 2013



Hamburg: Economic Structure

Gross Value Added Broken Down by Sectors 2017



Source: Federal Statistical Office,
Statistical Office for Hamburg and Schleswig-Holstein

Agriculture,
forestry, fishery

Manufacturing

Mining, power and
water supply

Construction

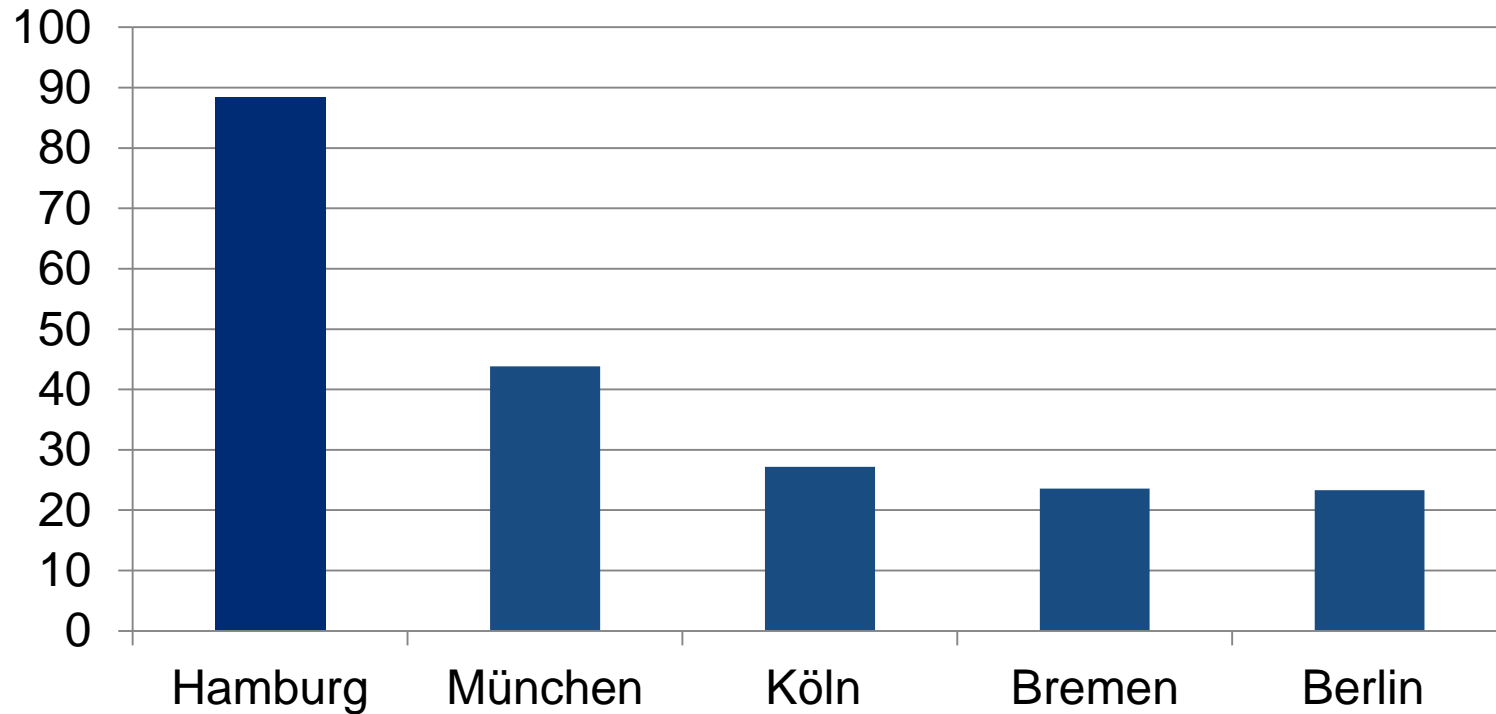
Retail, transport,
tourism, IT

Public and private
service providers

Finance, insurance,
real estate

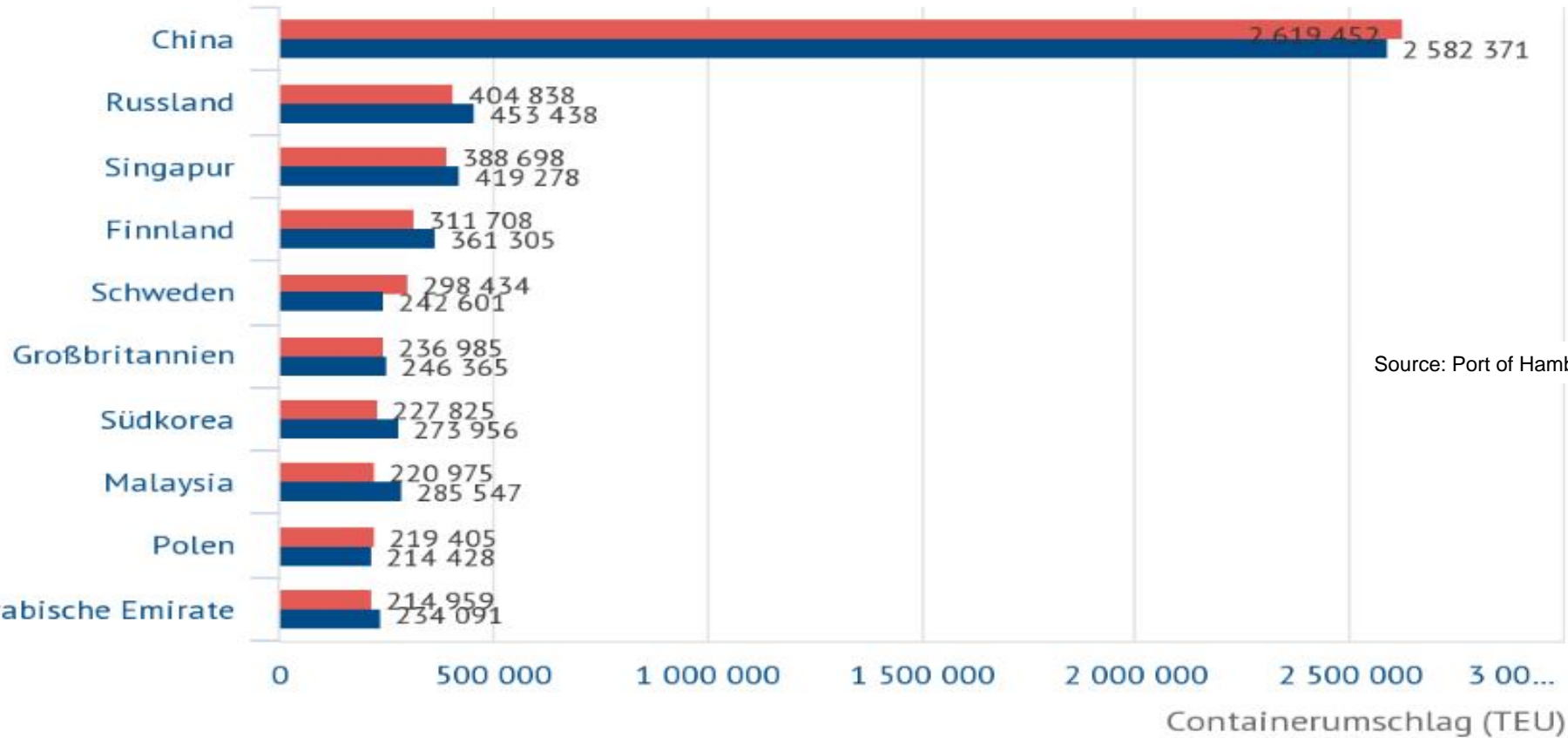
Industry Location Hamburg

Business Volume in the Manufacturing Sector in Bn. Euro (2015)



Source: Federal Statistical Office,
Statistical Office for Hamburg and Schleswig-Holstein

TOP-Ten Container Trading Partners of Hamburg



■ 2016

■ 2017

The Hamburg Chamber of Commerce



- ✚ One of oldest chambers in Europe, founded in 1665
- ✚ Main tasks: services for member companies, (overall) interest representation, self administration of the business sector (e.g. vocational training)
- ✚ 170,000 member companies with 800,000 employees (mandatory membership)
- ✚ 300 chamber staff, 700 entrepreneurs serve as elected representatives on the chamber's committees

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- ✚ The regulatory framework for energy and environmental politics in the German federal states is mostly „made“ in Brussels and Berlin

- [illegible]

The (Regulatory) Framework - Examples

| EU | Germany | Hamburg |
|---|---|---|
| 2030 Climate and Energy Framework | German Climate Protection Law (in legislation), CP-Plan 2050, CP-Programm 2030 | Climate Plan Hamburg and CP-Law (in revision) |
| ETS (Energy Supply + Industry) | National ETS for Building and Transport Sector (in legislation) | Enforcement, Administrative Permits |
| Renewable Energy Device | RE Sources Act | Projects, Consulting, Information, Financial Support |
| Circular Economy Package | Circular Economy Act | Enforcement, recycling campaign of municipal waste company |
| Air Quality Directive | Immission Control Law | Clean Air Plan |
| Water Framework Directive | Federal Water Act | Water Protection Areas, Water Law Permits for companies |
| 40 % less CO ₂ by 2030 (1990) 32 % share for RE by 2030 32,5 % more energy efficiency by 2030 (2020) | 55 % less CO ₂ by 2030 (1990) RE-Share of 50 % by 2030 (only electricity), reducing energy consumption by 50 % in 2050 (2008) | 50 % less CO ₂ in 2030 (1990) Reduction of 2 Mio. tons in 2020 (2012) |

The Green-Tech-Sector in Hamburg

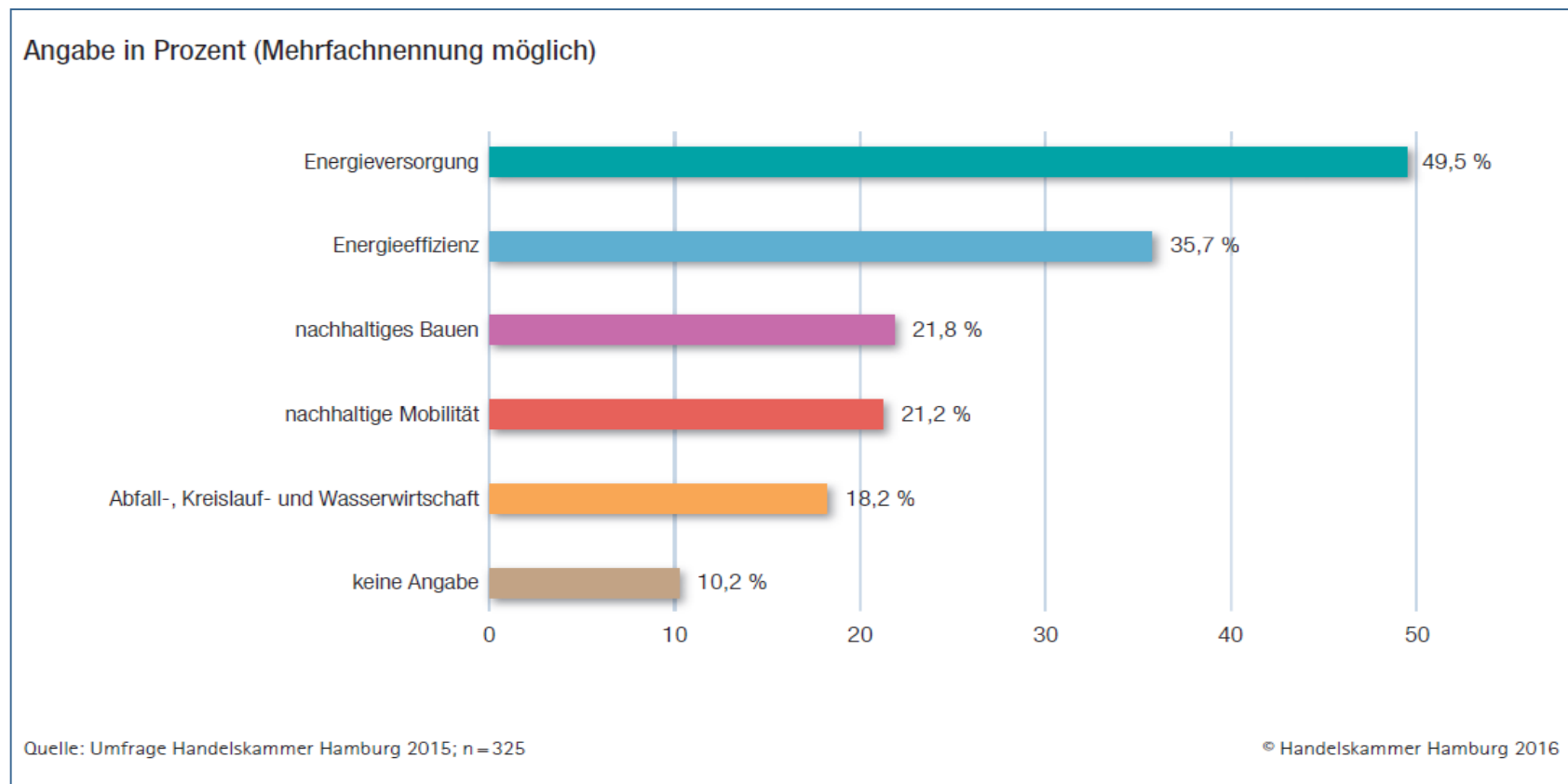
Results of a 2016 Chamber survey

- ✚ The cross-sector industry includes almost 2,500 companies
→ increase by 20 % compared to 2012
- ✚ approximately 53,000 employees in total
→ increase by 60 % compared to 2012
- ✚ about 81 % of the businesses have fewer than 10 employees
- ✚ about 73 % of the businesses expect an increase in employment until 2020



The Green-Tech-Sector in Hamburg

In which of the following fields of green technologies is your company active?



The Green-Tech-Sector in Hamburg

Energy Supply and Services

- ✚ Hamburg is a location for administrative departments and R&D of leading wind energy companies. Production takes place in neighbouring federal states.
- ✚ With LichtBlick AG (612,000 clients) Hamburg hosts Germany's leading eco-power supplier and with Greenpeace Energy eG Germany's leading energy cooperative (22,000 members).



The global on- & offshore expo

27 – 30 September 2016

windenergyhamburg.com

Sustainable and Green Building

- ✚ In 2013, the International Building Exhibition (IBA) took place in Hamburg: smart material houses (e.g. intelligent algae-front), „Energieberg“ Georgswerder und „Energiebunker“
- ✚ “HafenCity”: own a eco-label for sustainable building since 2007, sustainable use of energy resources and environmentally friendly technologies



The Green-Tech-Sector in Hamburg

Sustainable Mobility

- ✚ Hamburg leading German city in charging infrastructure for emobility: 948 charging stations
- ✚ Public transport: 2020 onwards: purchasing only zero-emission buses



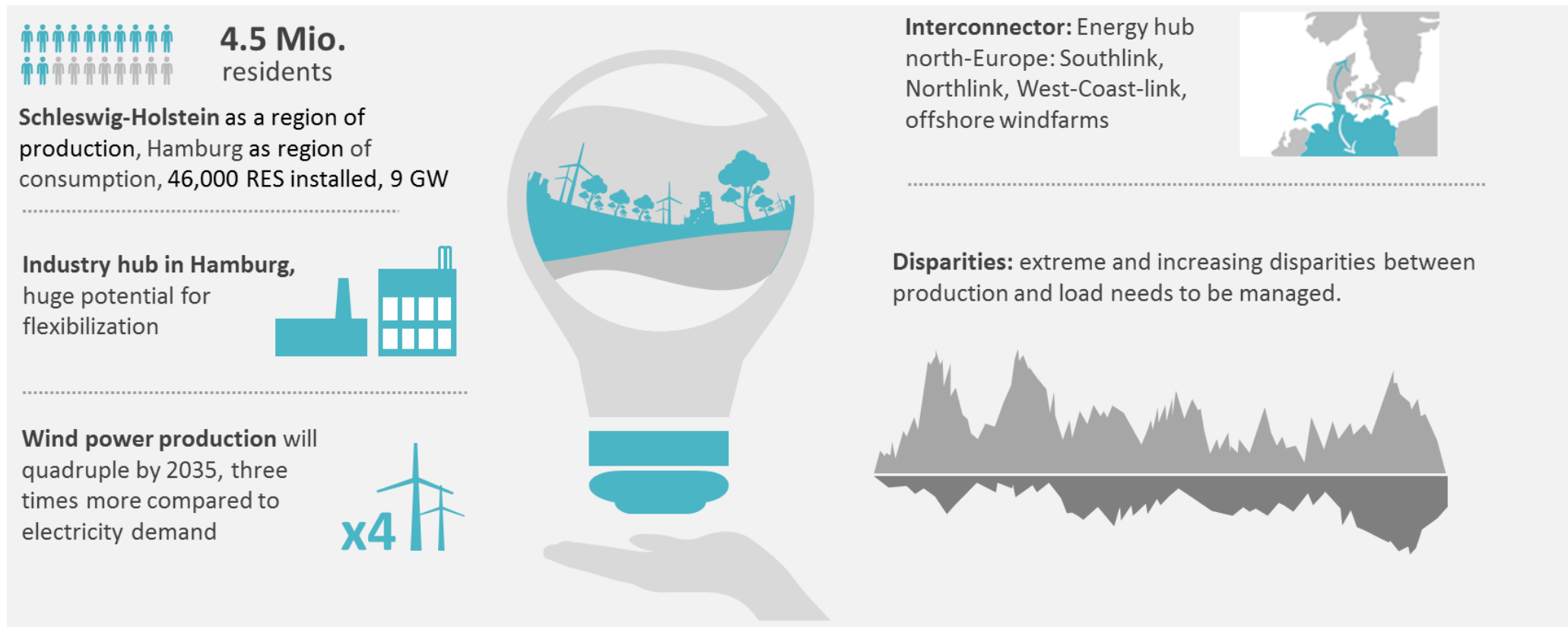
Water, Recycling and Waste Management

- Industrial companies such as Aurubis are increasingly active in the field of recycling and re-use of mineral waste materials
- Recycling of municipal waste is lagging behind
- Reduction of plastic garbage becomes more and more important



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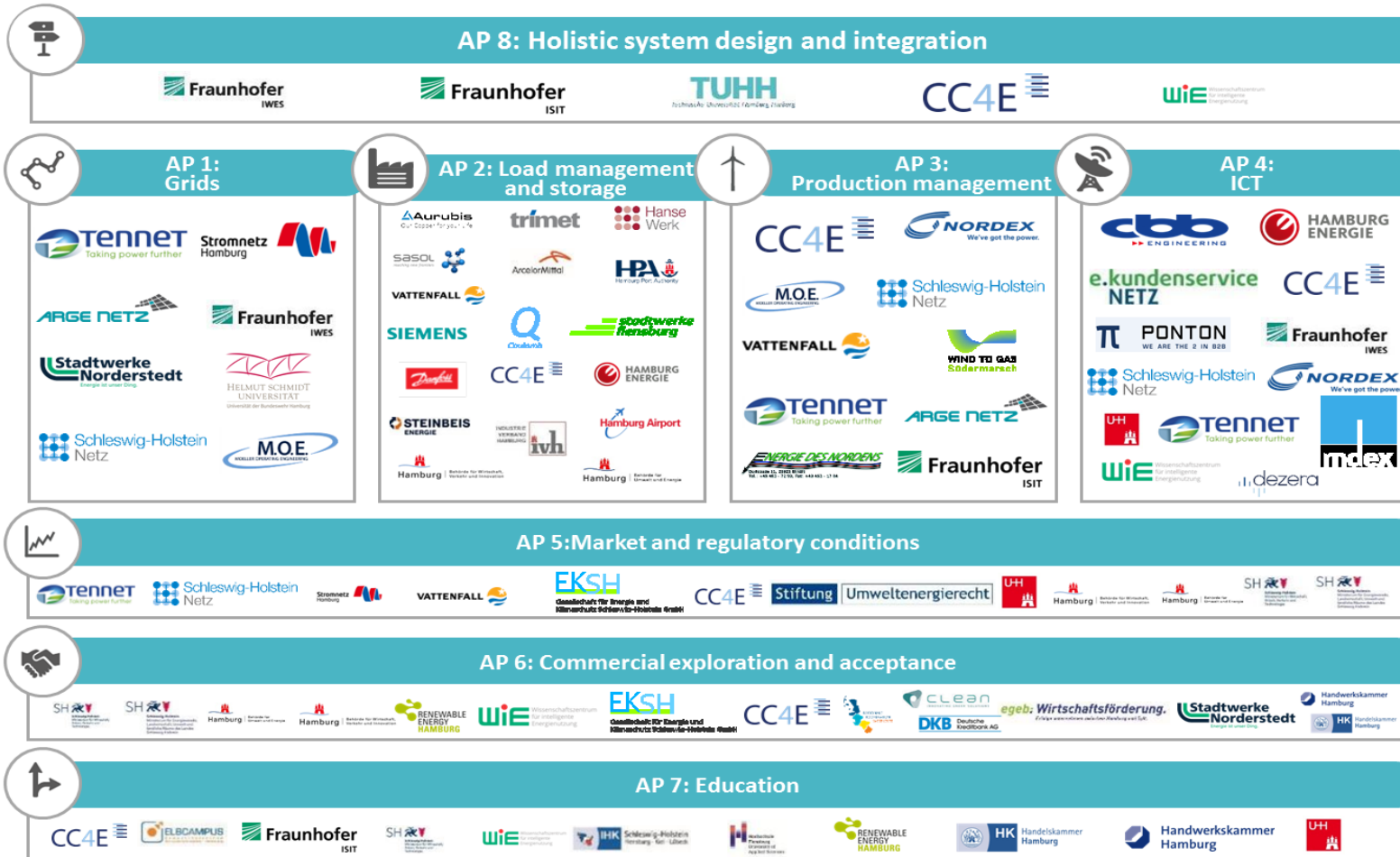
Use-Case I: North Germany's Energy Transition 4.0 (NEW 4.0)



Model region for the main challenges of the German energy transition

Source: NEW 4.0

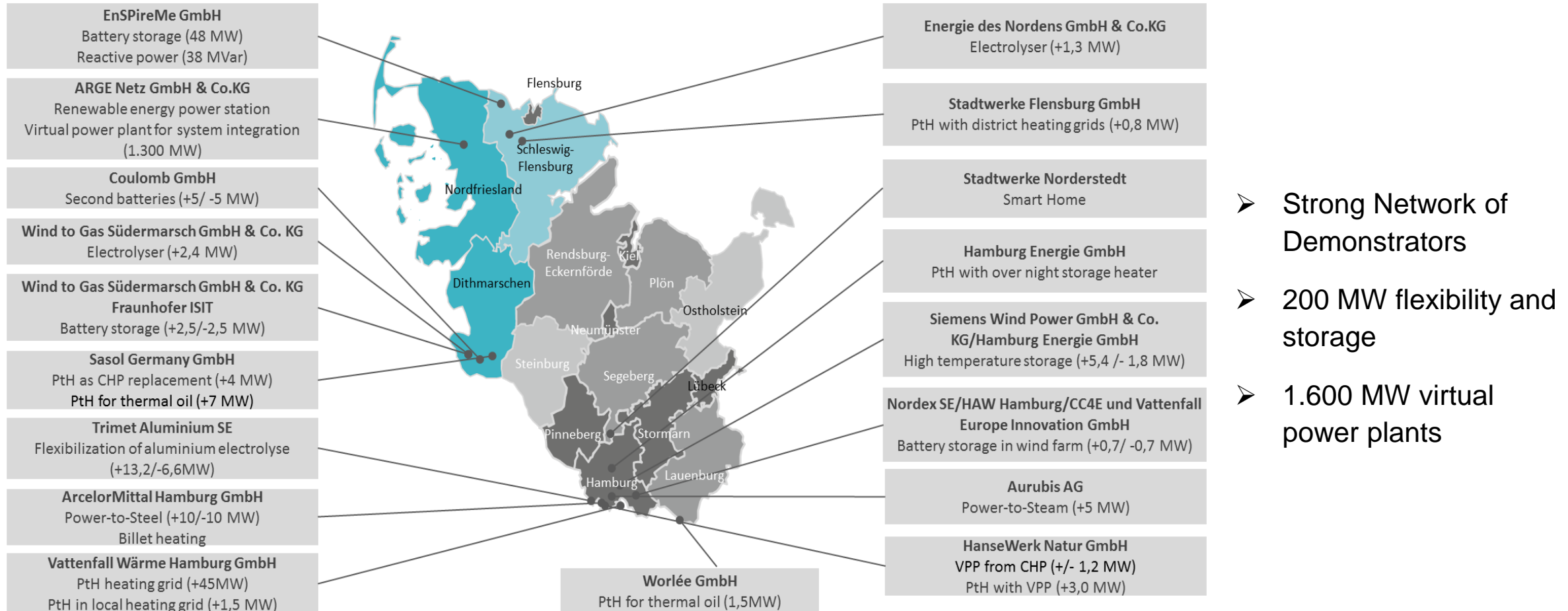
Use-Case I: North Germany's Energy Transition 4.0 (NEW 4.0)



„Showcases for Intelligent Energy“

Source: NEW 4.0

Use-Case I: North Germany's Energy Transition 4.0 (NEW 4.0)

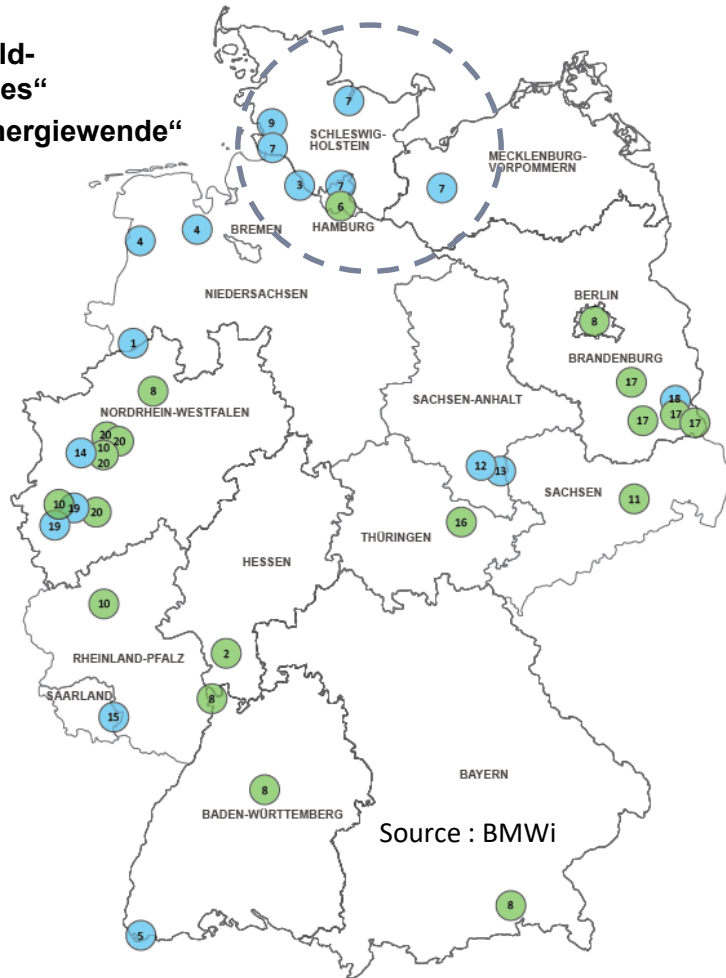


- Strong Network of Demonstrators
- 200 MW flexibility and storage
- 1.600 MW virtual power plants

Source: NEW 4.0

Use-Case II: A Hydrogen-Strategy for Northern Germany

„Real-World-Laboratories“
for the „Energiewende“



Source : BMWi

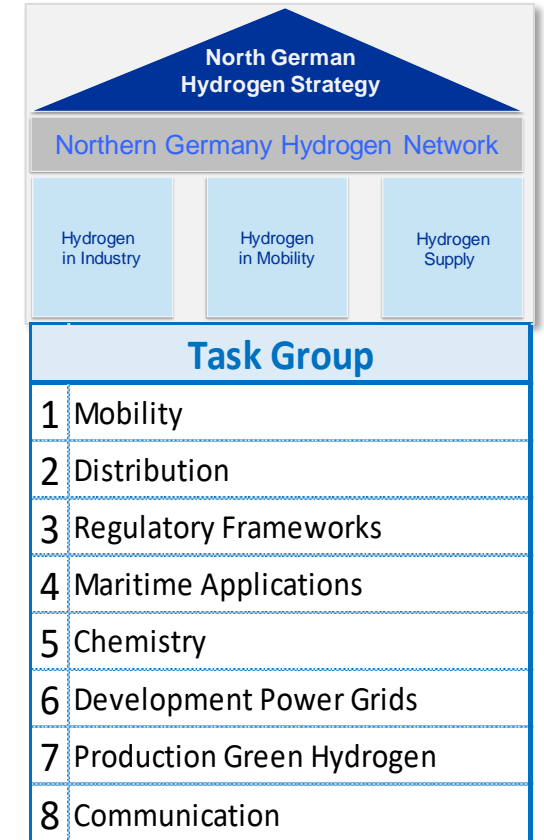
May 2019: the five Northern German Länder introduce outline of a joint hydrogen strategy

Green hydrogen is an „essential element of the energy transition“ „economic and structural political chance“

„Northern Germany is to be established as the leading region of a green hydrogen economy in Germany“



Source : NDR

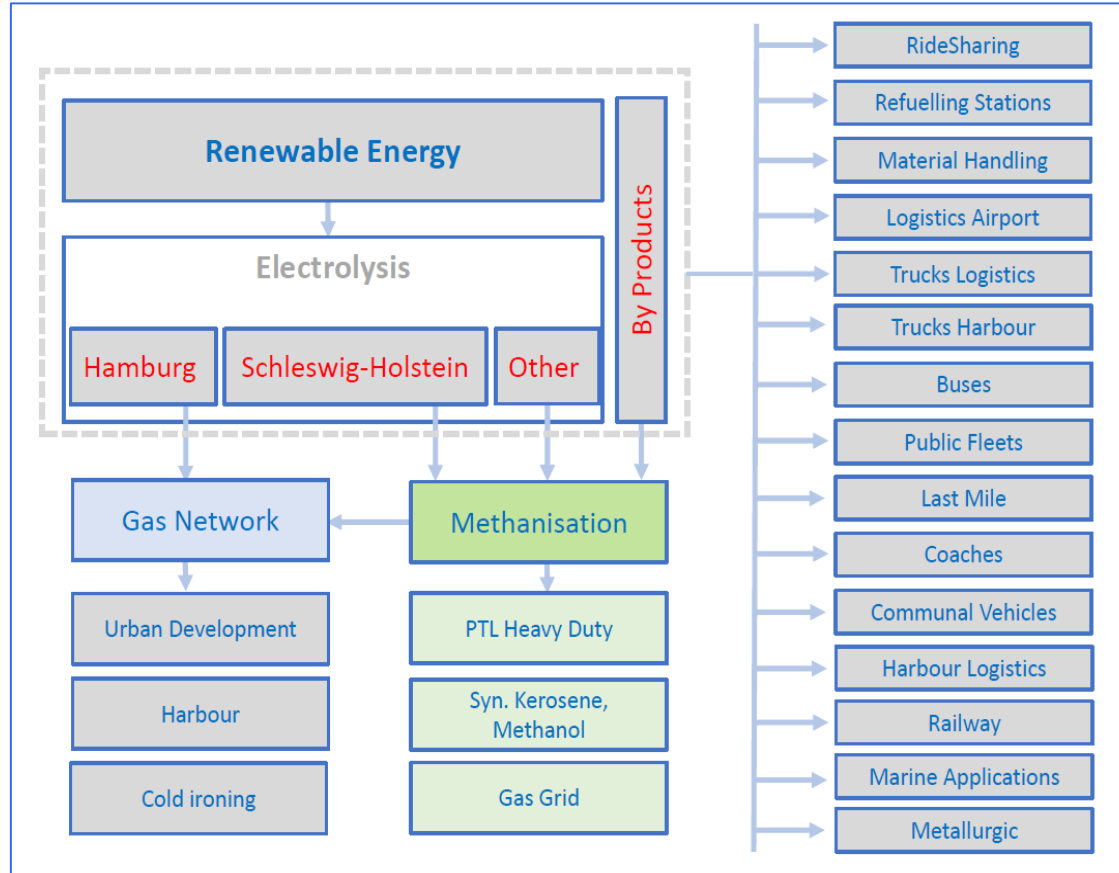
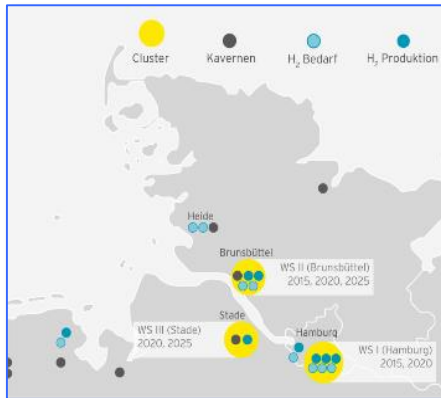


Source: hySolutions GmbH

Use-Case II: A Hydrogen-Strategy for Northern Germany

Mobility

- 5 demonstration fleets
- 5 vehicle types
- 5 operators
- More than 500 vehicles

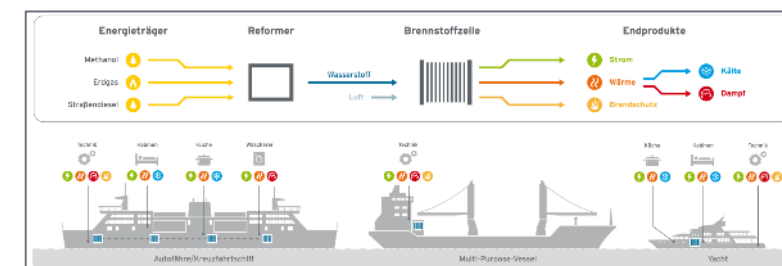


Hydrogen in Northern Germany - an Integrated System

Source: hySolutions GmbH

Use-Case II: A Hydrogen-Strategy for Northern Germany

- Fuel cell buses: two in operation, market survey in preparation
- Vehicle fleets in project Hydrogen Mobility Europe (H2ME)
- Clever Shuttle: 30 Toyota Mirai
- Infrastructure: 4 stations in operation, 3 planned
- Chemical industry: 5 MWeI electrolysis (H+R Ölwerke)
- Power supply with fuel cells on ships (e4Ships)
- Emergency generators with fuel cells – transformer substation (Stromnetz Hamburg)
- Emergency generators with fuel cells– bus depot (Helmut-Schmidt-University)
- 1.6 MW elektrolysis Reitbrook (Uniper)
- Test baggage tractor (Hamburg airport)



Use-Case III: „Re-Inventing“ Hamburg's District Heating

- ✚ Today more than 840 km pipelines and 12 production units
- ✚ 1,800 MW installed power
- ✚ 11,000 clients mostly public buildings, public housing and industry
- ✚ 200,000 households
- ✚ State-owned since 09/2019 (referendum in 2013)
- ✚ almost 50 % will be climate neutral (total 1,220 Gwh/a)
- ✚ Investment costs of 650 Mio. Euro plus 950 Mio. Euro for repurchase

Source: Wärme Hamburg GmbH

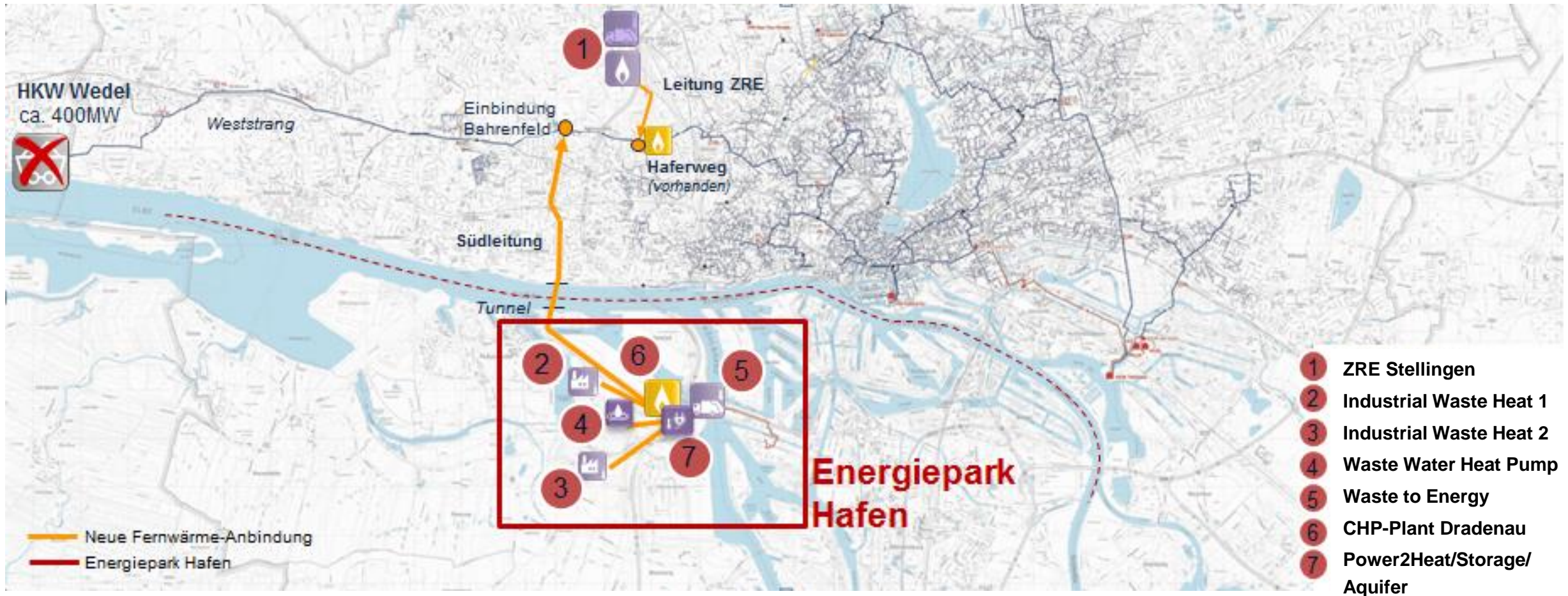
Use-Case III: „Re-Inventing“ Hamburg's District Heating

- ✚ **Phasing out coal:** Shut down of coal plant Wedel by 2025, CHP Tiefstack without coal by 2030
- ✚ **Replace heat plant Wedel by „Energy Park Harbor“:** Reducing 360,000 tons CO₂ by modern gas CHP plant and CO₂-neutral heat (Long-term goal: Replacing natural gas by hydrogen or green gas)
- ✚ **Decentralising production:** two large coal plants will be replaced by modular production – industrial waste heat, waste combustion, large heat pumps, power to heat. This provides for more flexibility and security of supply.

| Unit | Full load hours | Energy (GWh/a) | Power (MW) |
|--------------------------|-----------------|----------------------|------------|
| Industrial Waste Heat | ca. 5,900-7,100 | ca. 100 - 120 | Rund 17 |
| Waste-Water-Heat-Pump | ca. 3,300-5,300 | ca. 100 - 160 | ca. 30 |
| CHP-Plant (gas) | ca. 4,200-4,600 | ca. 530 | ca. 230 |
| Power2Heat | ca. 300 | Collateralization | ca. 20 |
| WtE-Plant | ca. 3,300-5,800 | ca. 130 - 230 | ca. 40 |
| ZRE Stellingen | ca. 5,800 | ca. 350 | ca. 60 |
| Haferweg (Gas, existing) | ca. 200 | ca. 10 | 50 |

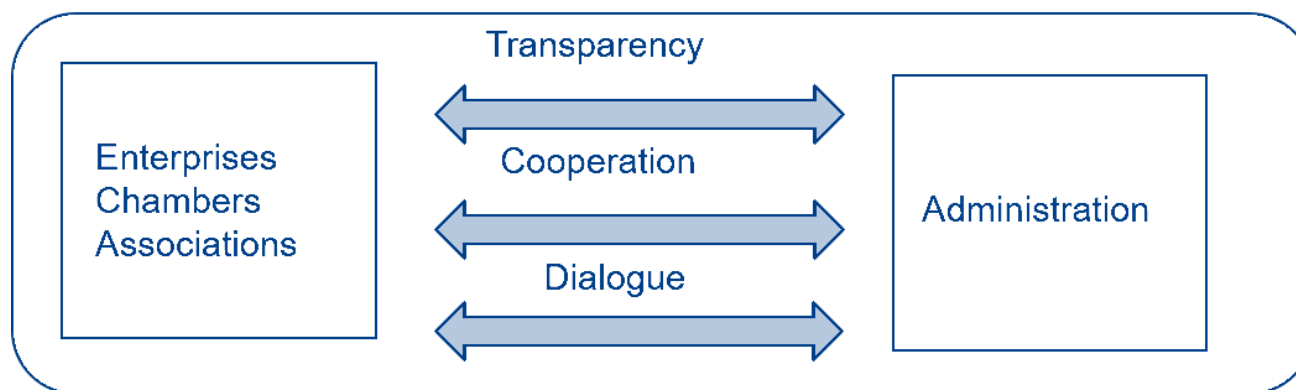
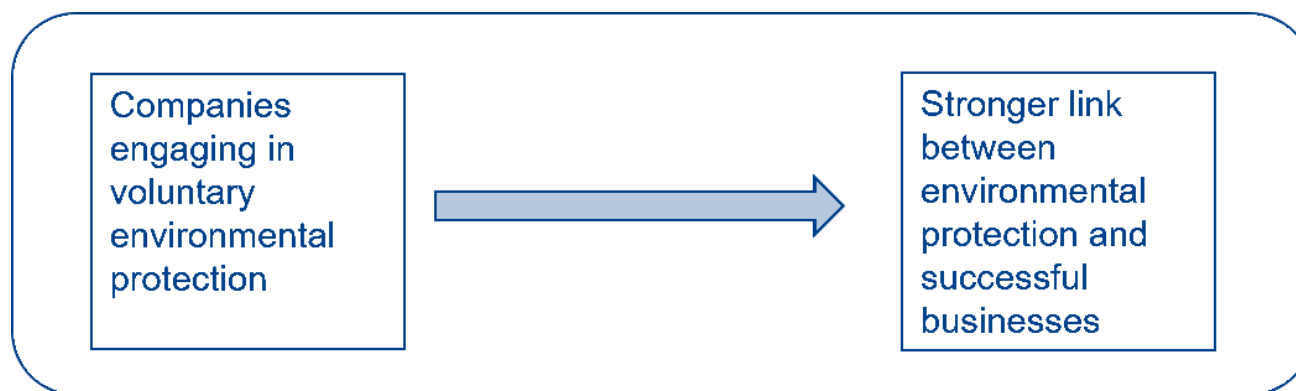
Source: Wärme Hamburg GmbH

Use-Case III: „Re-Inventing“ Hamburg's District Heating

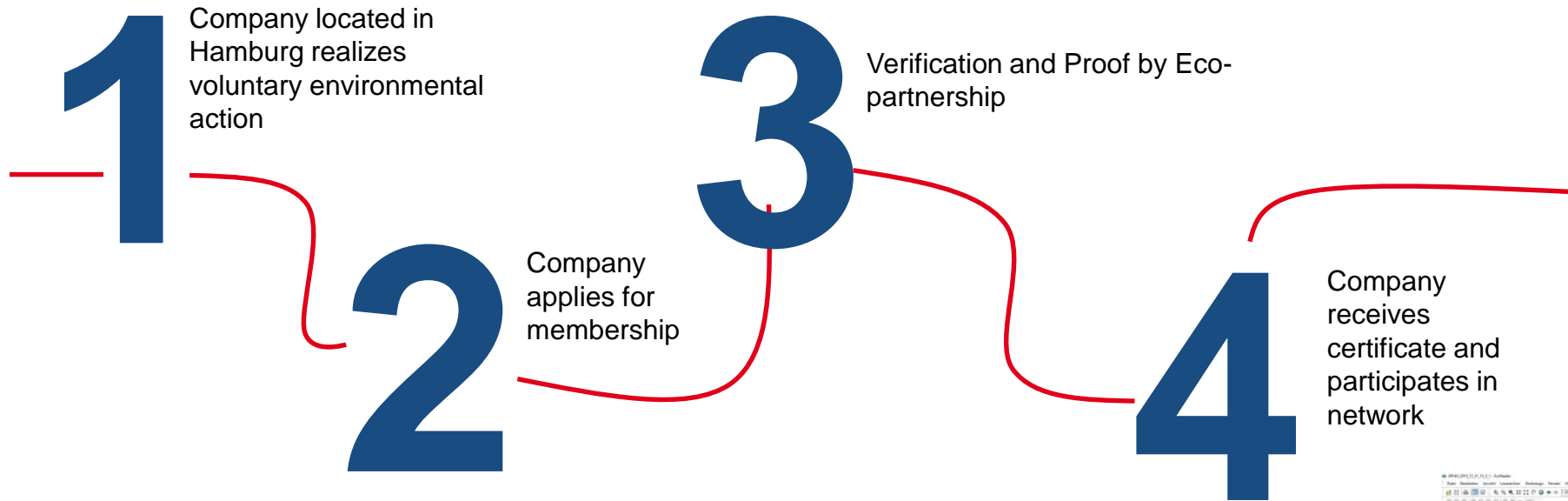


Source: Wärme Hamburg GmbH

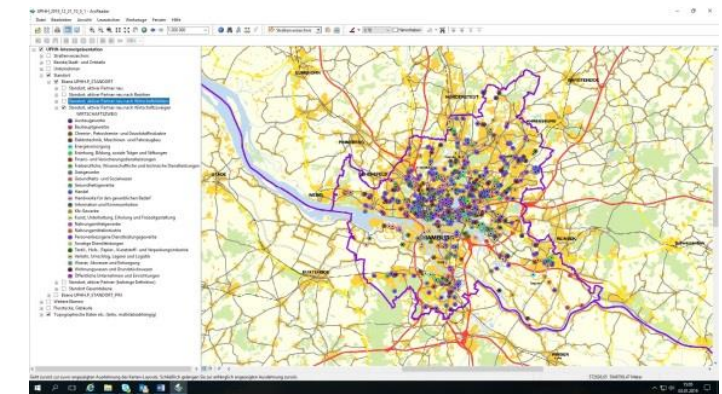
Use-Case IV: The Eco-Partnership Hamburg



Use-Case IV: The Eco-Partnership Hamburg



- Started in 2003, renewed in 2008, 2013 and 2018
- A network of over 1,100 enterprises





Federal Ministry
for Economic Affairs
and Energy



MITTELSTAND
GLOBAL
ENERGY SOLUTIONS
MADE IN GERMANY

Thank you for your attention!

Tobias Knahl, Hamburg Chamber of Commerce
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Facilitator

