



Commercial & Industrial Microgrids

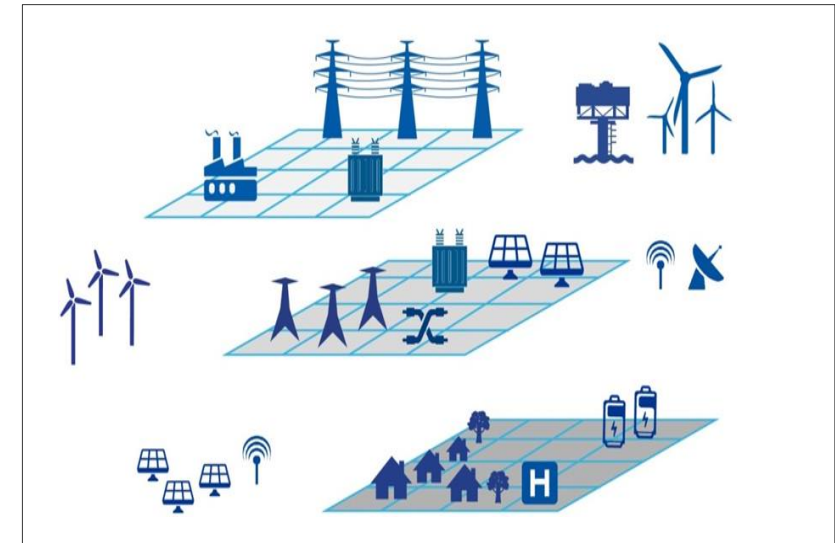
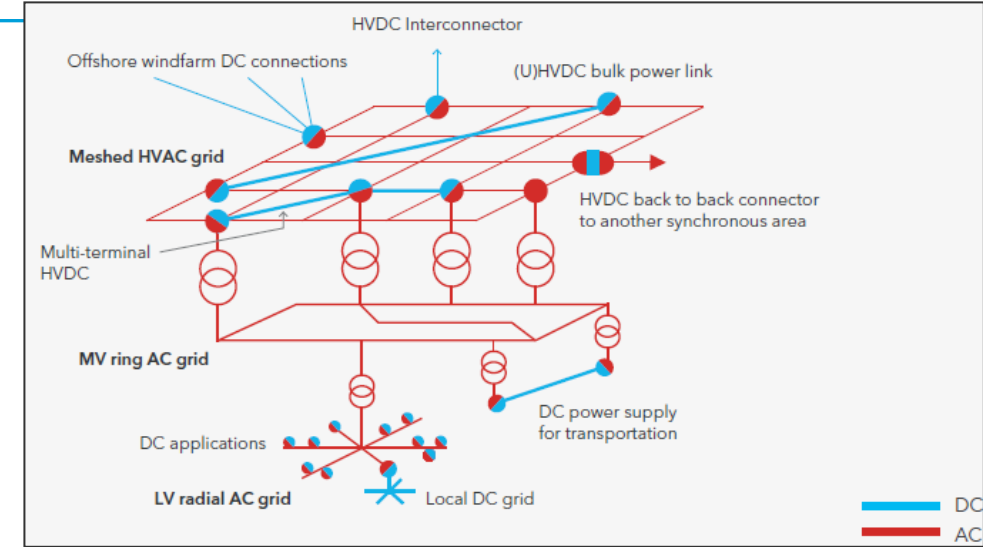
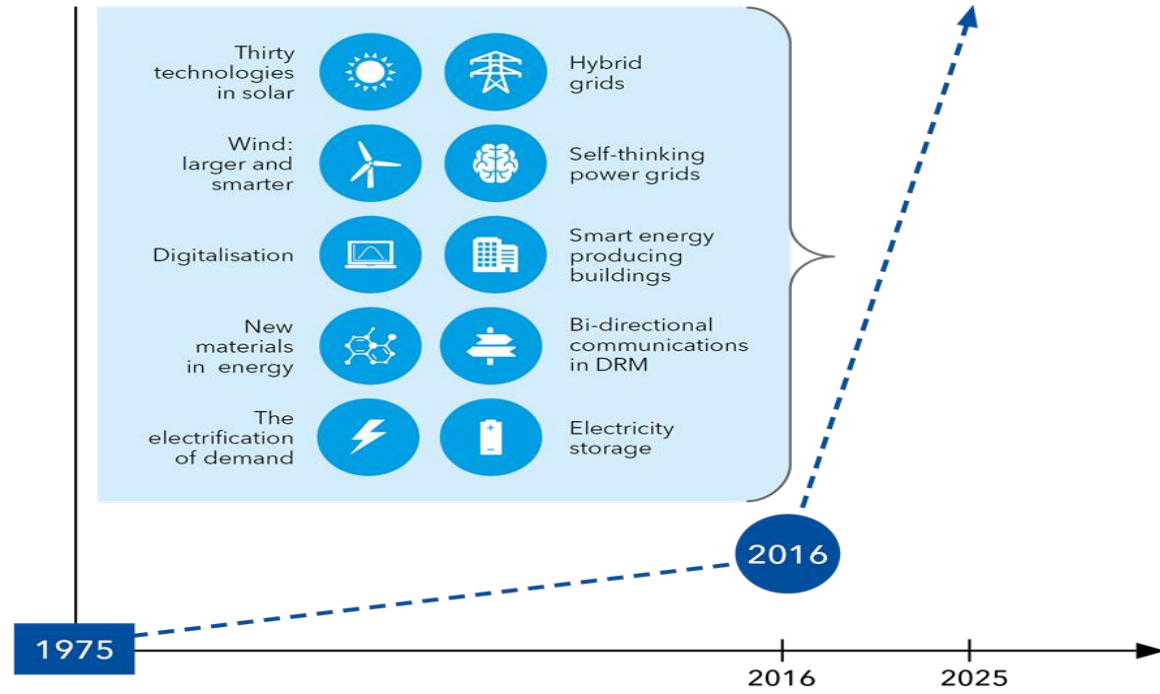
15th September 2020



The largest man made machine on earth

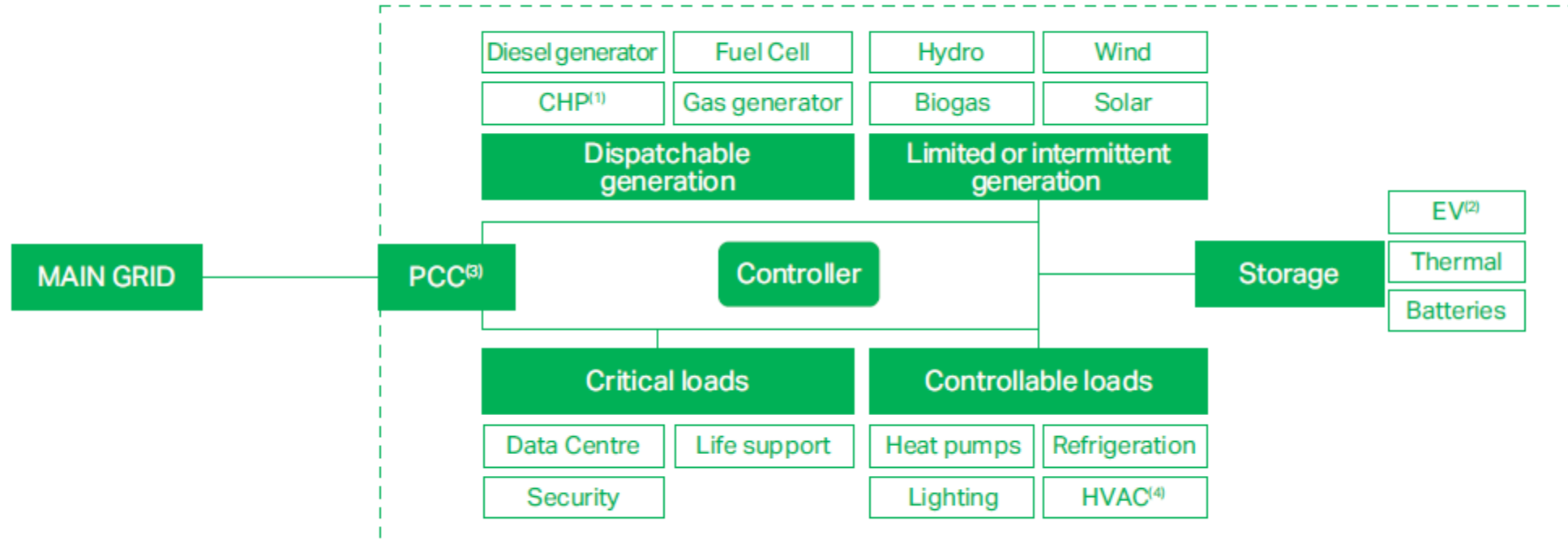
....is changing fast

Adoption of new technologies



Commercial & Industrial Microgrids

Figure 4: General architecture of a microgrid

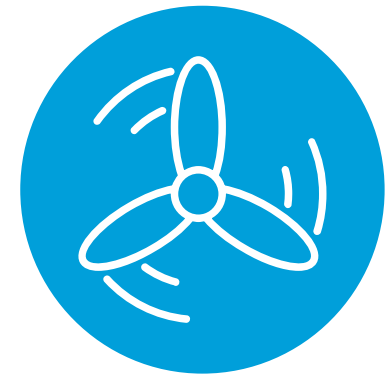
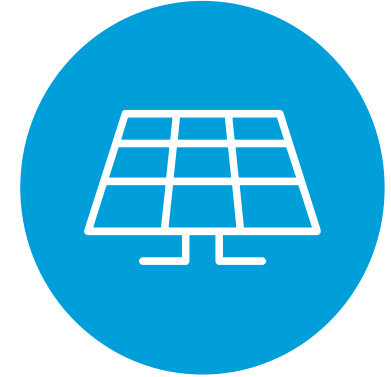
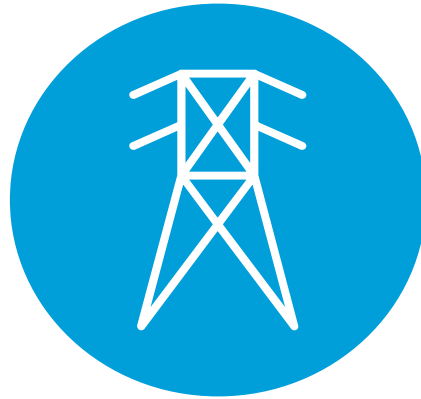


(1) CHP: Combined Heat and Power plant (2) EV: Electric Vehicles
 (3) PCC: Point of Common Coupling (4) HVAC: Heating, Ventilation and Air Conditioning

Ref figure: World Business Council for Sustainable Development



Why will it prosper? Typical examples



The importance of business continuity



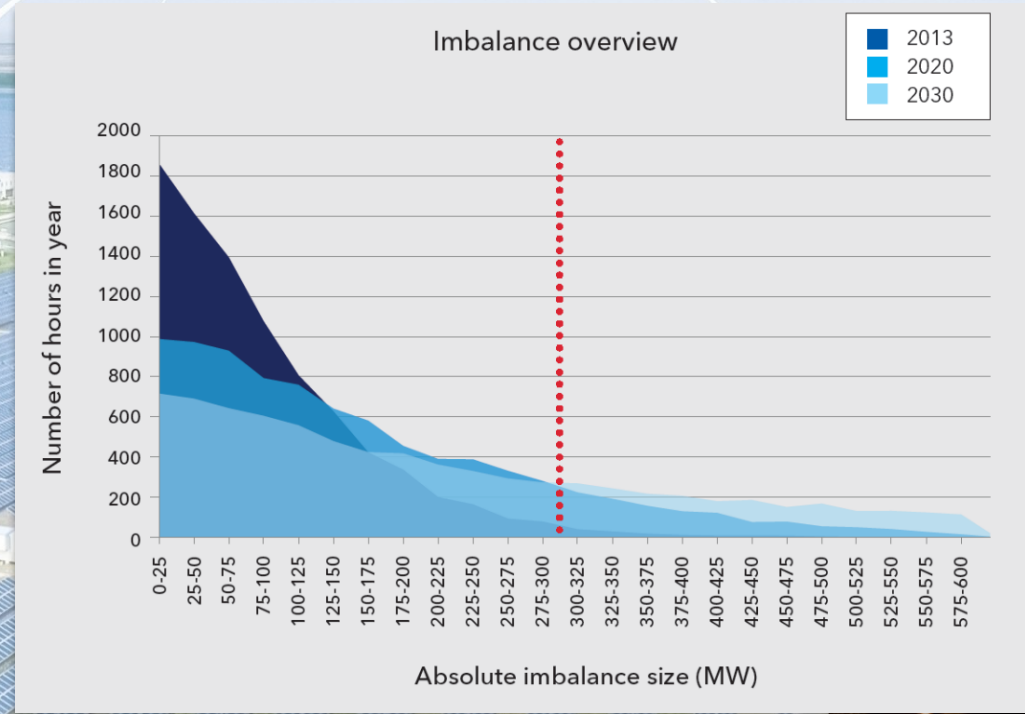
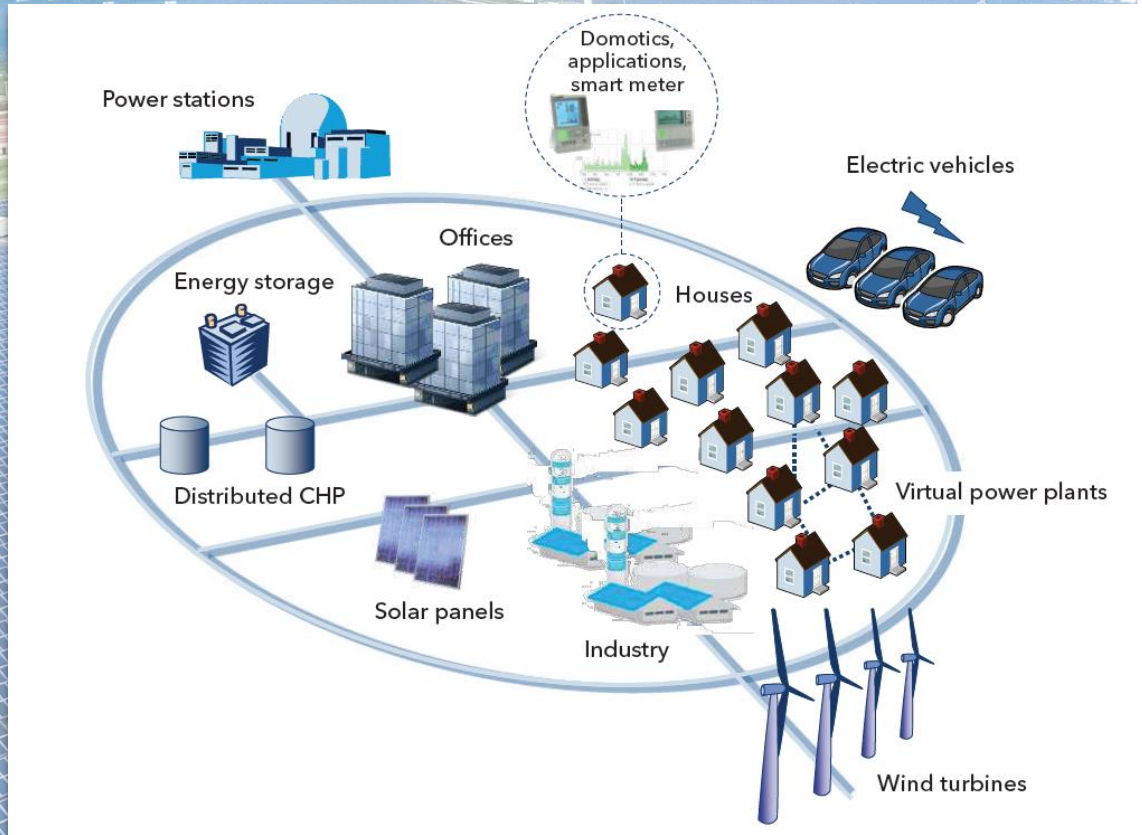
The Energy Transition

Technology has the power to close the emissions gap to well below 2°C.
At DNV GL, we believe a combination of measures can get us there:

The infographic is a grid of 12 items, each with an icon and a text description. The items are arranged in two rows of six. The background is a light blue and white grid pattern.

- 1. Solar and Wind:** Grow solar power by more than **10 times** to **5 TW** and wind by **5 times** to **3 TW** by **2030**, which would meet **50%** of the global electricity use per year
- 2. Batteries:** **50-fold** increase in production of batteries for the **50 million** electric vehicles needed per year by **2030**, plus investments in more storage and balancing solutions to accommodate the growth of solar and wind power
- 3. Power Grids:** Invest more than **\$1.5 trn** annually in the expansion and reinforcement of power grids by **2030**, including ultra-high voltage transmission networks and extensive demand-response solutions
- 4. Energy Efficiency:** Increase global energy efficiency improvements by **3.5%** per year within the next decade
- 5. EV Infrastructure:** Create new infrastructure for charging electric vehicles on a large scale
- 6. Heat Pump and Insulation:** Improved and cheaper heat-pump technologies and improved insulation
- 7. Carbon Capture:** Rapid and wide deployment of carbon capture, utilization and storage installations
- 8. Green Hydrogen:** Green hydrogen to heat buildings and industry, fuel transport and make use of excess renewable energy in the power grid
- 9. Heavy Industry:** For the heavy industry sector: increased electrification of manufacturing processes, including electrical heating. Onsite renewable sources combined with storage solutions
- 10. Rail Transport:** Massive rail expansion both for city commuting and long-distance passenger and cargo transport

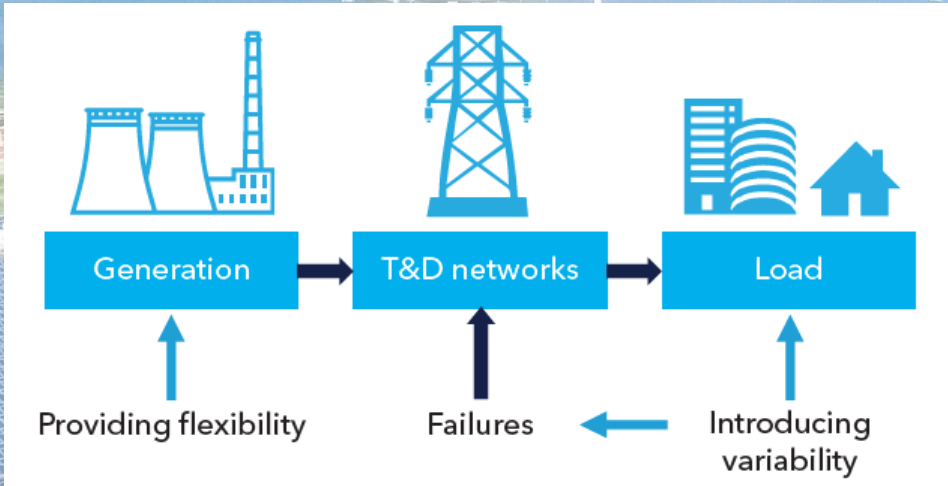
Consequences of high RES



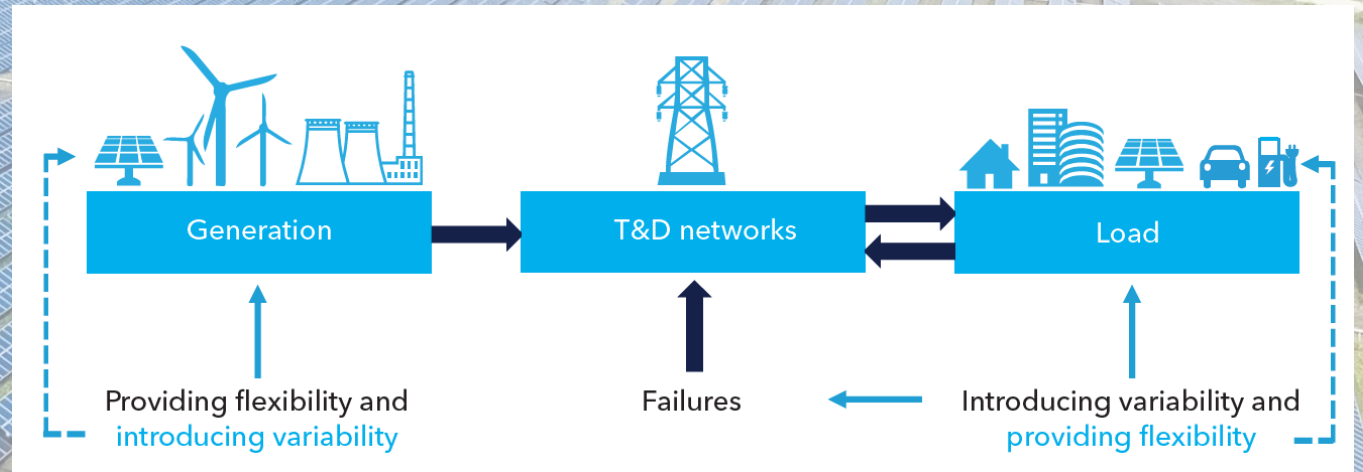
EXCITING TIMES FOR THE DUTCH GRID
 Creating a healthy electricity market for a new energy landscape
SAFER SMARTER GREENER

Sources of variability and flexibility

Conventional



Future



The NNBT

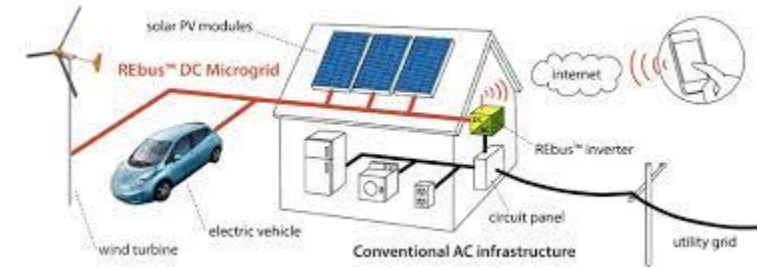
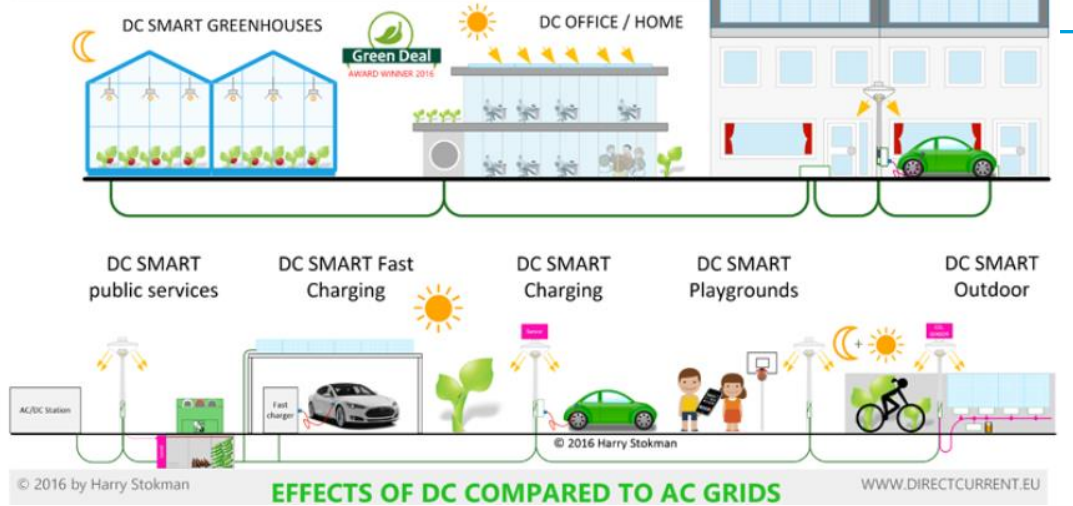


Meshed Microgrids & LV-DC Grids

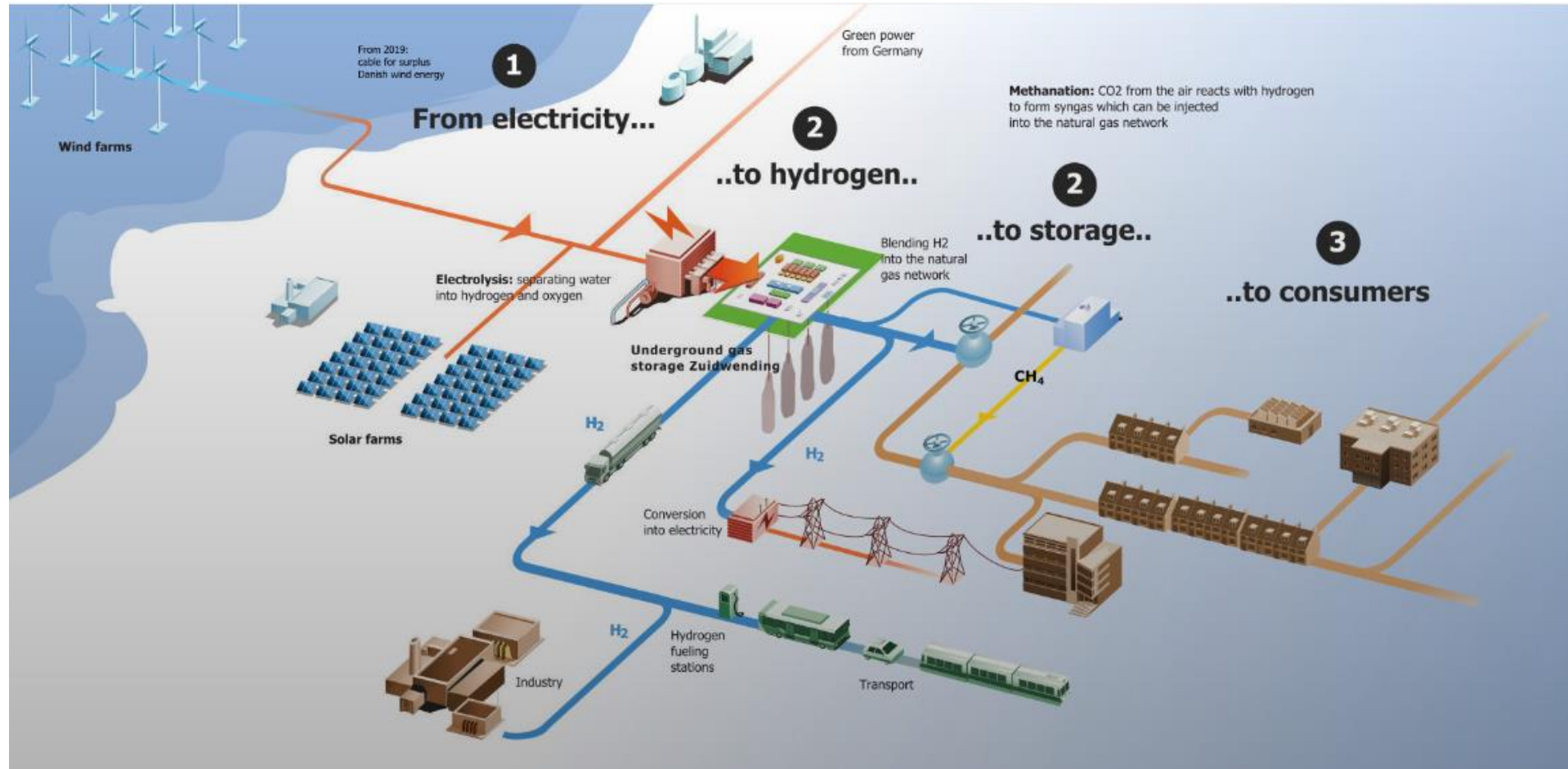


INNOVATIONS BY DIRECT CURRENT BV

WE ARE WORKING ON AND REALIZING A DC WORLD



Merging of infrastructures



Further enquiries



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THANK YOU



Sneak peak on September 29th

- A Fire side chat, without the CO₂ emissions
- A Mining Operator
- A Global Storage manufacturer TESLA (tbc)
- A System integrator ENGIE (tbc)
- An “Energy Hub” Infrastructure Program manager HBR (tbc)