



VISION 2030:
how buildings,
industries and
vehicles would
interact in a more
variable energy
system

March 10th 2021

Texas's black-swan blackout

Texas experienced widespread power outages as a result of extreme winter weather throughout the region.



Hourly electricity demand, net generation, and total interchange (Feb 7–Feb 16, 2021)
Electric Reliability Council of Texas, Inc (ERCOT)
gigawatts



Source: U.S. Energy Information Administration, Hourly Electric Grid Monitor (ERCOT demand, net generation, and interchanges)

Price Spikes

Texas electricity prices have skyrocketed to \$9,000/megawatt-hour



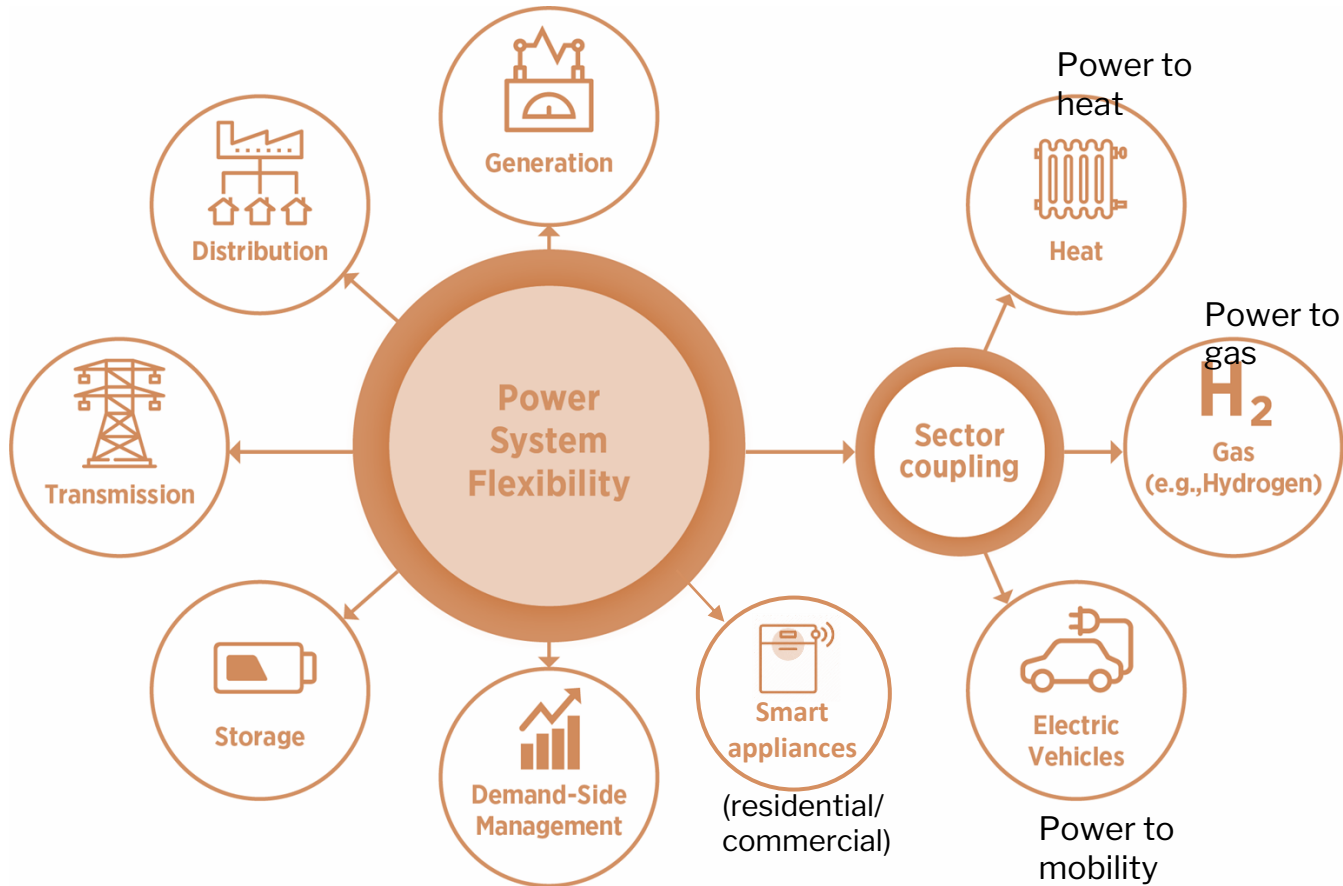
One-in-a-century event but it has demonstrated the fragility of the grid!

Source: Bloomberg

ERCOT (the transmission grid operator) deployed a **variety of resources** to reduce the stress on the grid, allow resources to come back on line and reduce the rotating outages, including **demand response**.



Flexibility enablers in the energy sector



Considering the challenges, flexibility has to be harnessed in all sectors of the energy system: from **power generation** to **stronger transmission and distribution systems**, **storage** (both electrical and thermal) and more **flexible demand** (demand-side management and sector coupling).

*“Avoided investments at distribution level thanks to the procurement of distributed flexibility can be of the order of up to **€5 billion per year up to 2030**”*

Kadri Simson, European Commissioner (Nov. 2020)

By 2050, the global inventory of flexible assets in the residential, commercial and industrial sectors needs to be **10 times higher than it is today**. Less than **2% of the global potential for demand-side flexibility** is currently being utilized (Source IEA).



2030 vision: rising to the challenge

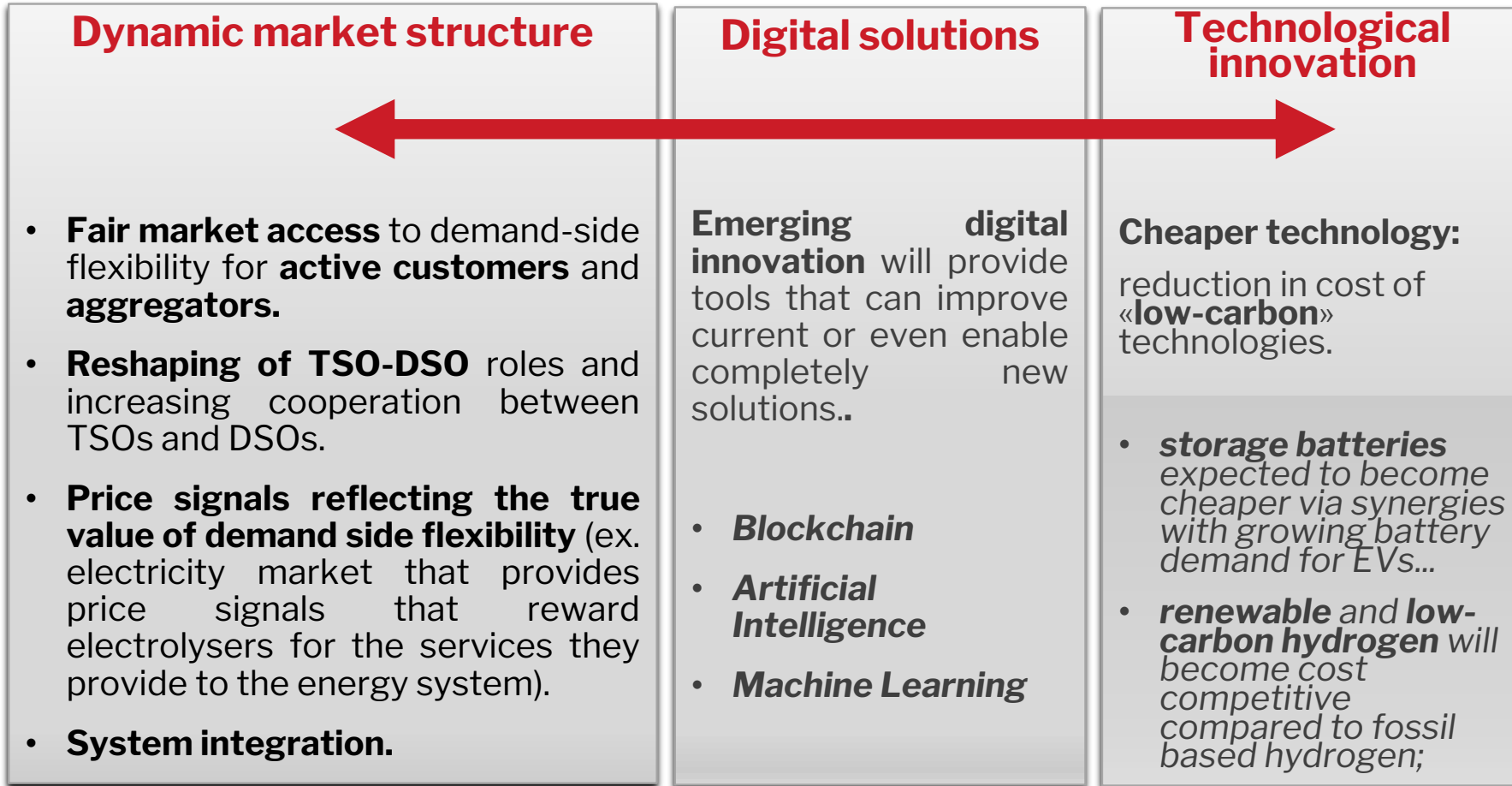
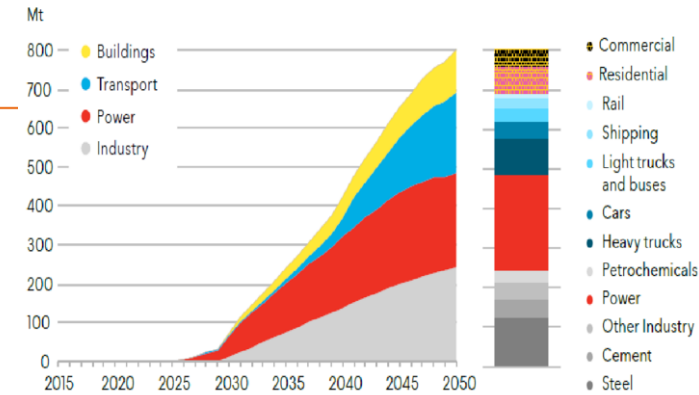
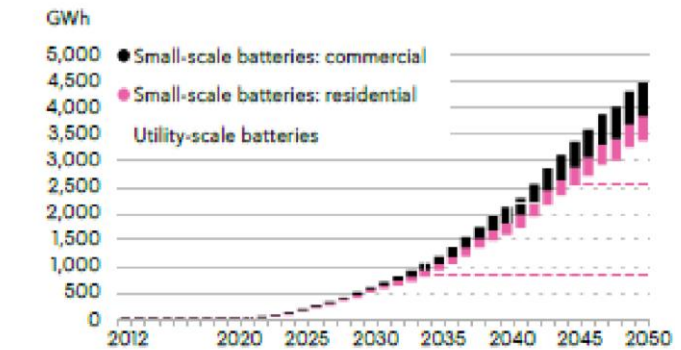


Figure 5: Hydrogen demand in the NCS-CEHP



Source: BloombergNEF. Note: NCS-CEHP is NEO Climate Scenario: Clean Electricity and Hydrogen Pathway.

Figure 3: Global cumulative battery storage energy capacity, 2020-2050

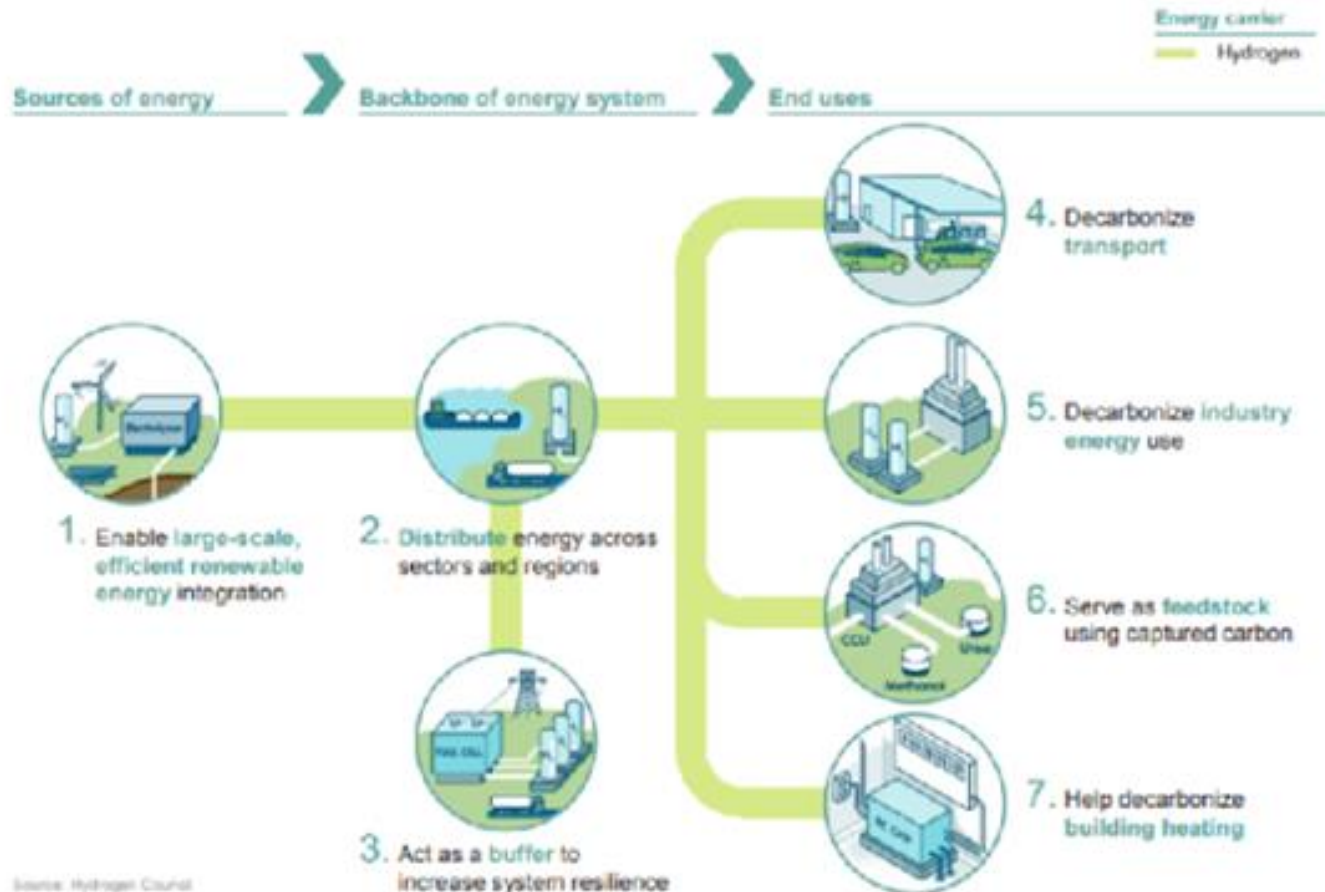


Source: BloombergNEF

Renewable hydrogen is expected to gradually become **cost-competitive** with other forms of hydrogen production. Electrolyser costs to decline from **€900/kW** to **€450/kW** or less in the period after 2030, and **€180/kW** after 2040. (Based on cost assessments of IEA, IRENA and



2030 vision: rising to the challenge



Hydrogen has 7 roles in decarbonizing major sectors of the economy

Renewable hydrogen (produced using mainly wind and solar energy) will start playing a role in balancing a renewables-based electricity system: we will be **transforming electricity into hydrogen** when renewable electricity is abundant and cheap and **providing long-term and large-scale storage**, and **flexibility**

Large-scale deployment of clean hydrogen: hydrogen can replace fossil fuels in some **energy-intensive industrial processes**, such as in the steel or chemical sectors, lowering greenhouse gas emissions and further strengthening global competitiveness for those industries.

“hydrogen could be the most competitive low-carbon solution in more than 20 applications by 2030” (hydrogen council insight feb 17th 2021)



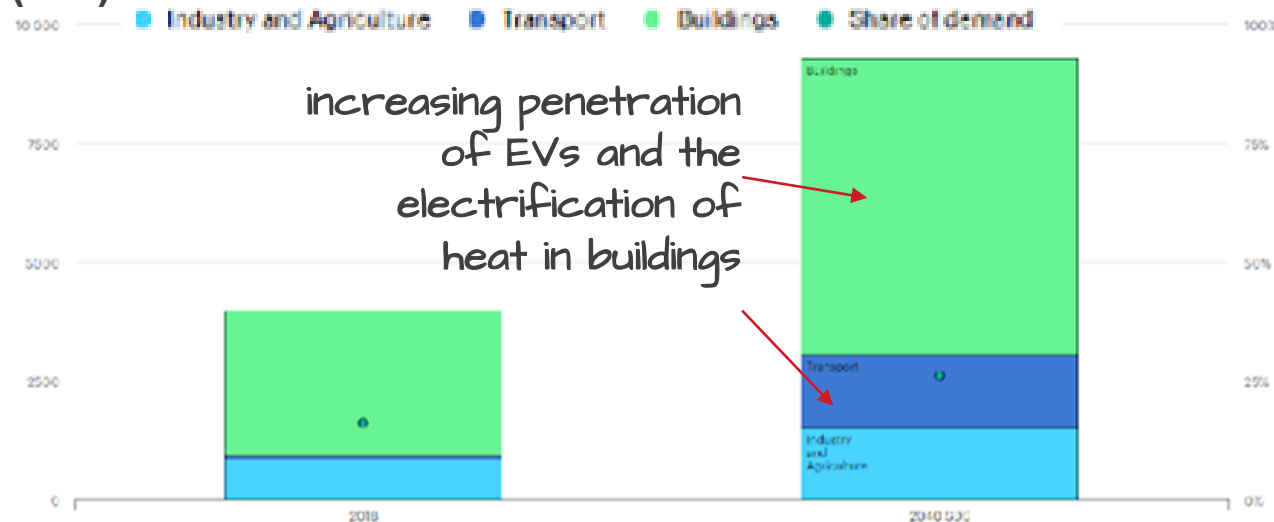
www.epqformula.it

A huge potential

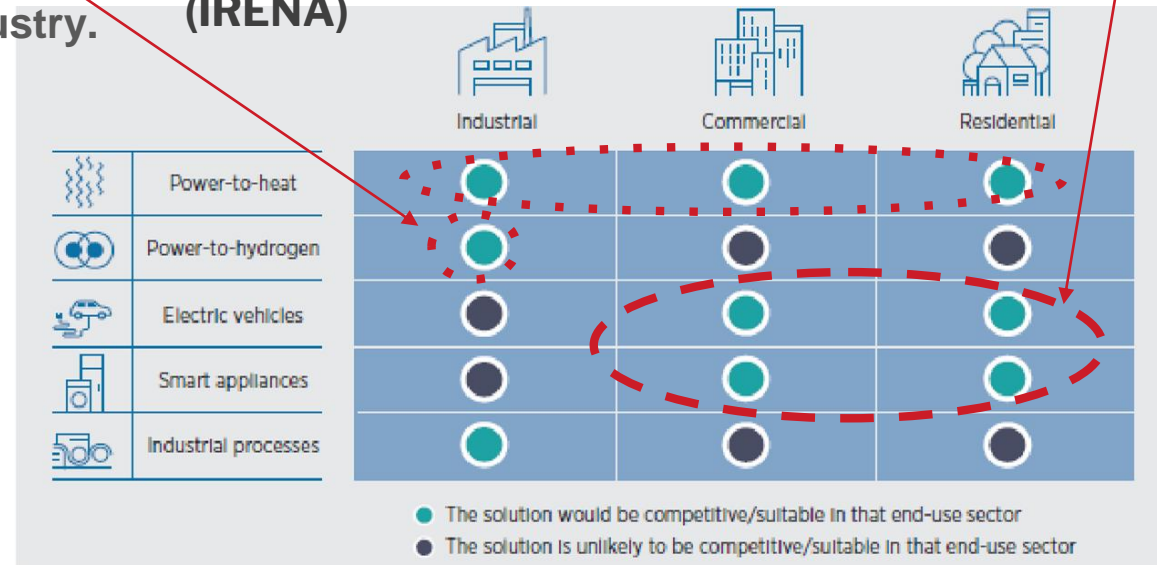
Household decisions to add PV, behind-the-meter batteries or purchase an EV will grow exponentially. This uptake is driven by **cheaper technology** and **“imitation effects”**.

The potential for gaining demand-side flexibility from **hydrogen** production could be larger in **industry**.

DR potential 2018-2040 (IEA)



Different sources of demand-side flexibility (IRENA)



Note: Competitiveness/suitability is based on how inexpensive the solution is in comparison to others for the same sector. For example, the Industrial sector has very few renewable options apart from green hydrogen, whereas direct electrification with renewables is a cheaper alternative for the commercial and residential sectors. Therefore, the potential for gaining demand-side flexibility from hydrogen production could be larger in industry.

The current operational demand-side flexibility of **40 GW** could grow to **200 GW in 2040**, while current potential of 4000 TWh (457 GW average), expressed as the sum of flexible loads at each hour of the year, is expected to grow to 9000 TWh (>1000 GW average) by 2040.

