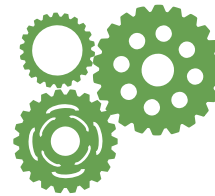


Rethink Electricity Distribution Without Load Following

13
PROJECT
PARTNERS
UK, EIRE,
France,
Belgium

7 PILOT
SITES

~90
HOUSES



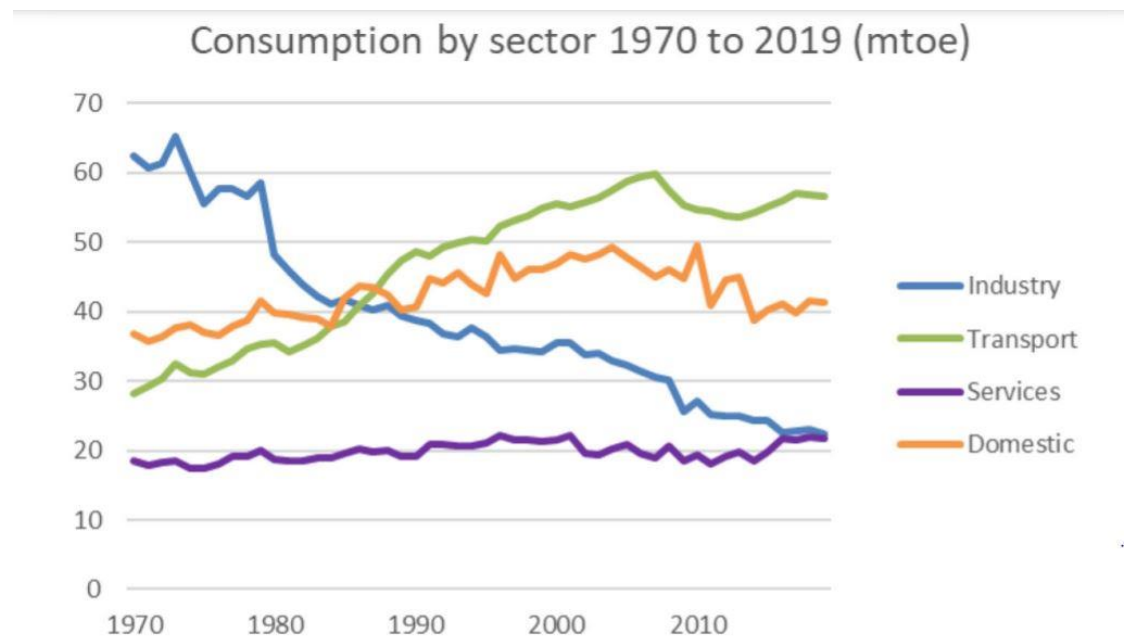
Fitted with batteries,
storage heaters, PV,
PLCs, switches,
sensors.

Reducing CO₂ & bills by optimizing timing of electricity intake thanks to real time AI algorithm. Instructions are transmitted to switches that enable storage at prescribed time. No demand management, no interference with user comfort preferences.

RED WoLF concept: facts and trends underpinning this project. 1.

- “434 TWh go towards meeting the space and water heating requirements of our homes” *Ofgem’s Future Insights Series. The Decarbonisation of Heat. 2016.*
- This scales to ~1.2 PWh (1.2×10^{15} Watt) for NWE (~180 M people).
- On a similar basis, it’s been estimated ~300 M Tonnes of CO₂ every year in the same geo area for home energy demand (all of it).
- Let’s compare UK consumption by sector (in Mega tonne oil equivalent, 1 Mtoe ~ 12 TWh):

From
gov.uk



RED WoLF concept: facts and trends underpinning this project. 2.

- Houses' energy demand in UK is therefore worth the same order of magnitude of transportation
- **More than ½ of this is for space heating/DHW.**
- Heating in cool/cold climate can play a major global role in reducing CO₂
- (Cooling demand from homes has so far small relevance in NWE and cool/cold climates. It's slowly growing but not addressed in RED WoLF)

Electrification:

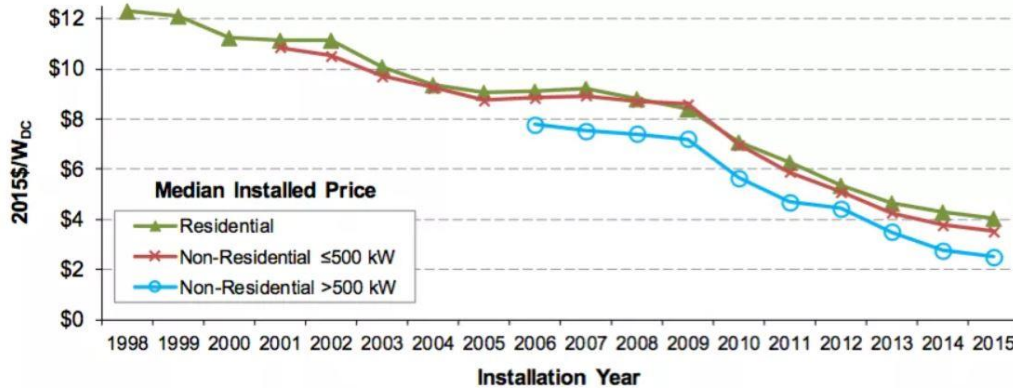
(still ongoing process, int developing countries but also in the West)

- ***Direct way to extend renewables to sectors powered by fossils so far: transportation, heating.***
- ***Grid adaptability to higher energy demand and renewables' variability (deterministic or not) & non-dispatchable nature***

RED WoLF concept: proposed solution

- **RED WoLF improves Grid adaptability by making homes' demand curve **Grid-friendly** through a combination of thermal and battery storage that increases self-consumption and the uptake of low-value/green energy.**
- **Decoupling thermal from battery storage lowers kWh cost. Convert Power to low-grade heat ~irreversible → to be quantified in advance.**
- **→ demand and CO₂ index/price **must be predicted** to select the future time intervals (over next 24 hrs) during which energy will be stored.**
- **RED WoLF houses will neither generate peak power nor demand for peak/load-following plants; they will actually generate a trough in demand at peak time**
- **This mechanism is automatically computed/executed by the home's system, that self-adapt to the Grid through a CO₂/price signal.**

RED WoLF concept: facts and trends making this solution promising. 1.



Price of residential PV installs per W_p (green curve) from 1998 to 2015

From Lawrence Berkeley nat'l lab

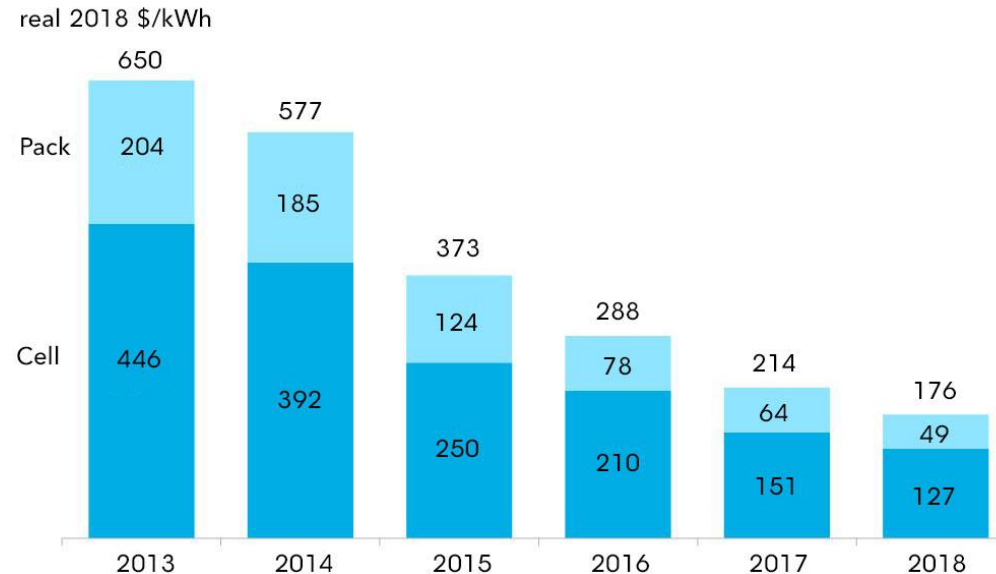
Notes: See Table 1 for sample sizes by installation year. Median installed prices are shown only if 20 or more observations are available for a given year and customer segment.

Figure 6. Median Installed Price Trends over Time

Lithium-ion battery price survey: pack and cell split

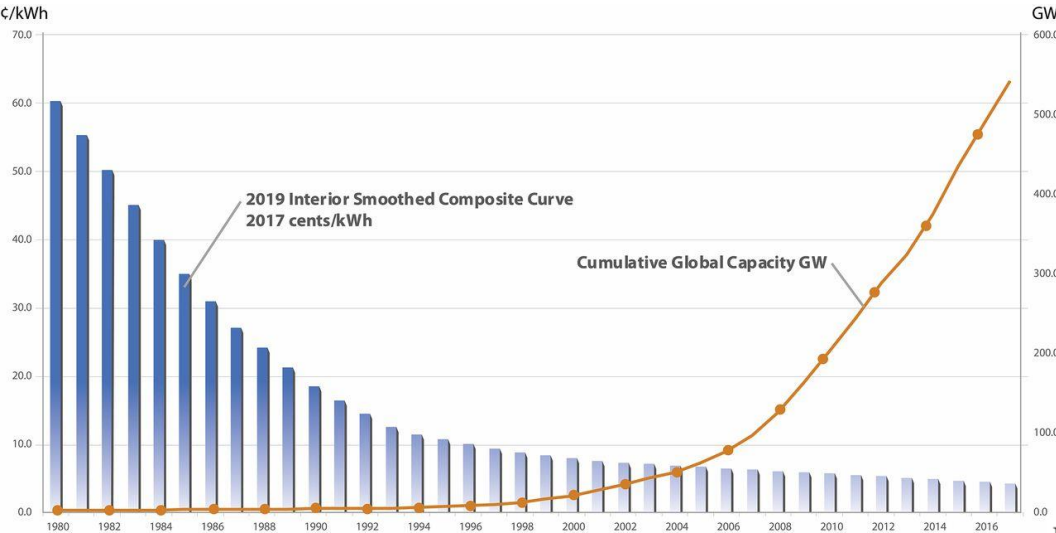
Price of Lithium-ion batteries per kWh (pack and cell)

From Bloomberg



Source: BloombergNEF

RED WoLF concept: facts and trends making this solution promising. 2.

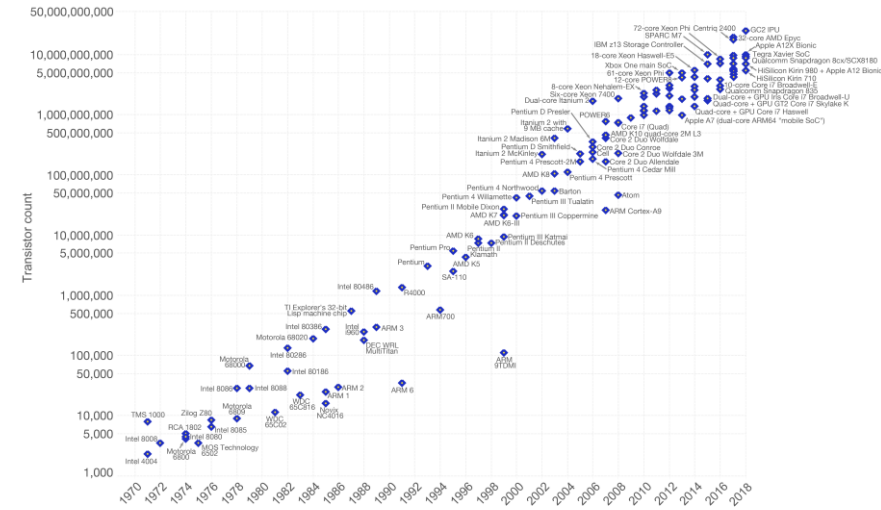


LCOE in \$ cents for wind energy from 1980 to 2018 (blue) and installed global capacity

From Veers et al., Science, 2019

Moore's Law – The number of transistors on integrated circuit chips (1971-2018)

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress – such as processing speed or the price of electronic products – are linked to Moore's law.



Data source: Wikipedia (https://en.wikipedia.org/wiki/Transistor_count)
 The data visualization is available at OurWorldinData.org. There you find more visualizations and research on this topic.

Licensed under CC-BY-SA by the author Max Roser.

- **Devices & computation get cheap**
- **Storing heat can be even cheaper**
- **Energy \$\$ depends on gener. time**
- **EVs → extra storage choice**
- **Electric home cheaper 2 build/serve (less/no pipes inside & across land)**
- **Any Microgen used up locally**