Energy storage in the digital world

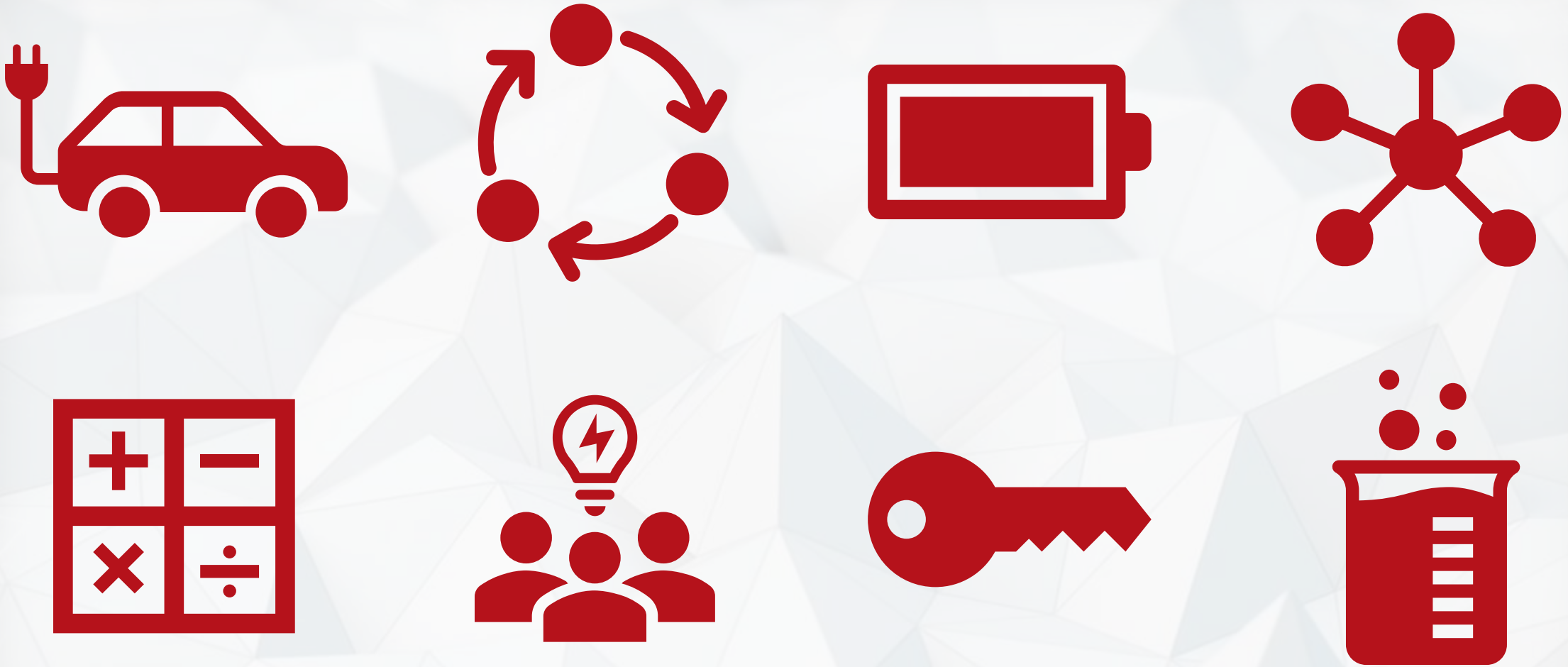
UKES 2019 | Newcastle University | 05/09/2019

Dr Dénes Csala | Lecturer in Energy Storage System Dynamics

UKES2019
UK Energy Storage Conference

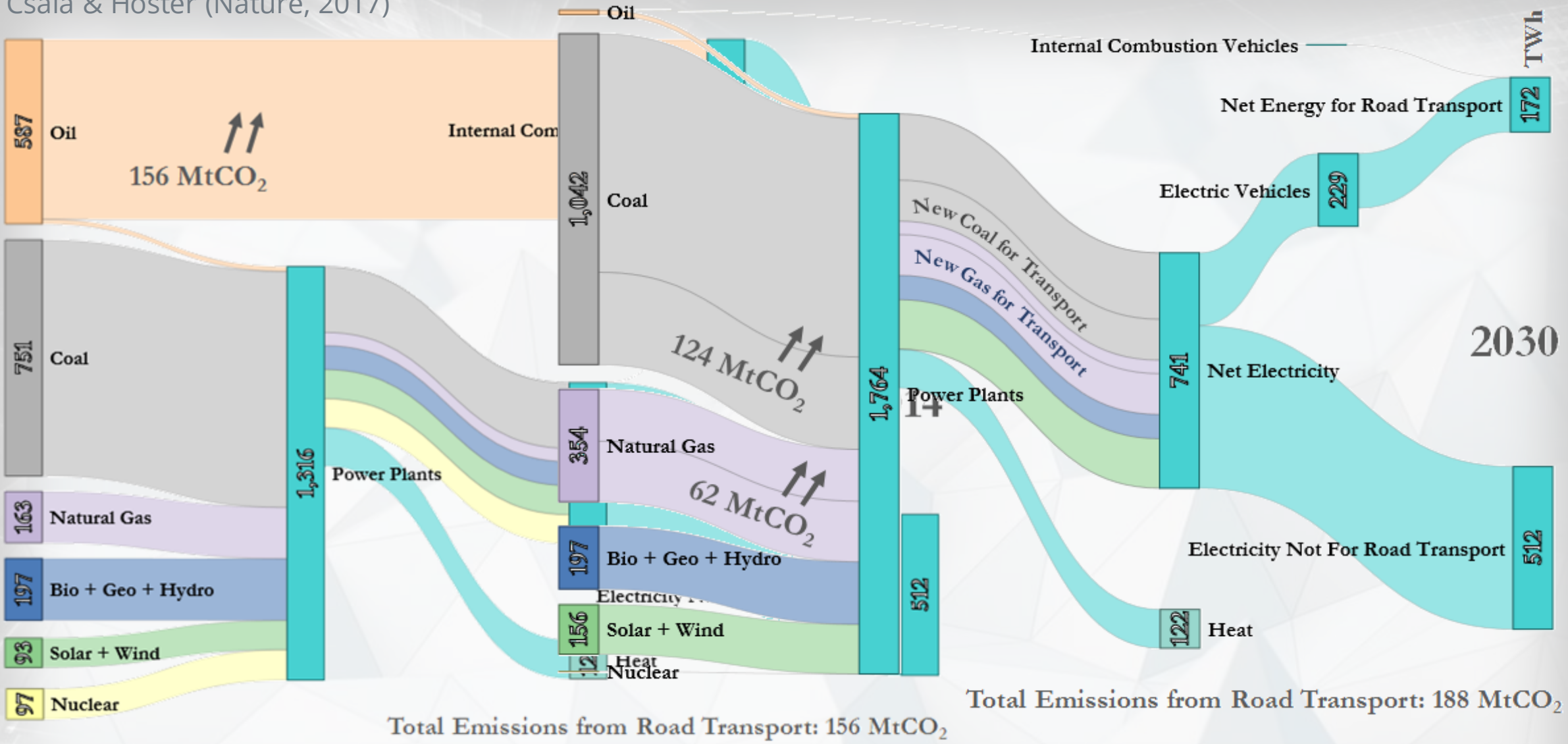
Energy Lancaster | Lancaster University

charging
networks
informatics
machine
modelling
area
grids
data
grid
learning
energy
sub
self
power
text
systems
NLP
smart
mining
virtual
revenue
storage
big
ICT
advice
neighbourhood
analysis
plant
organizing
integration
wireless
investors
meter
architectures

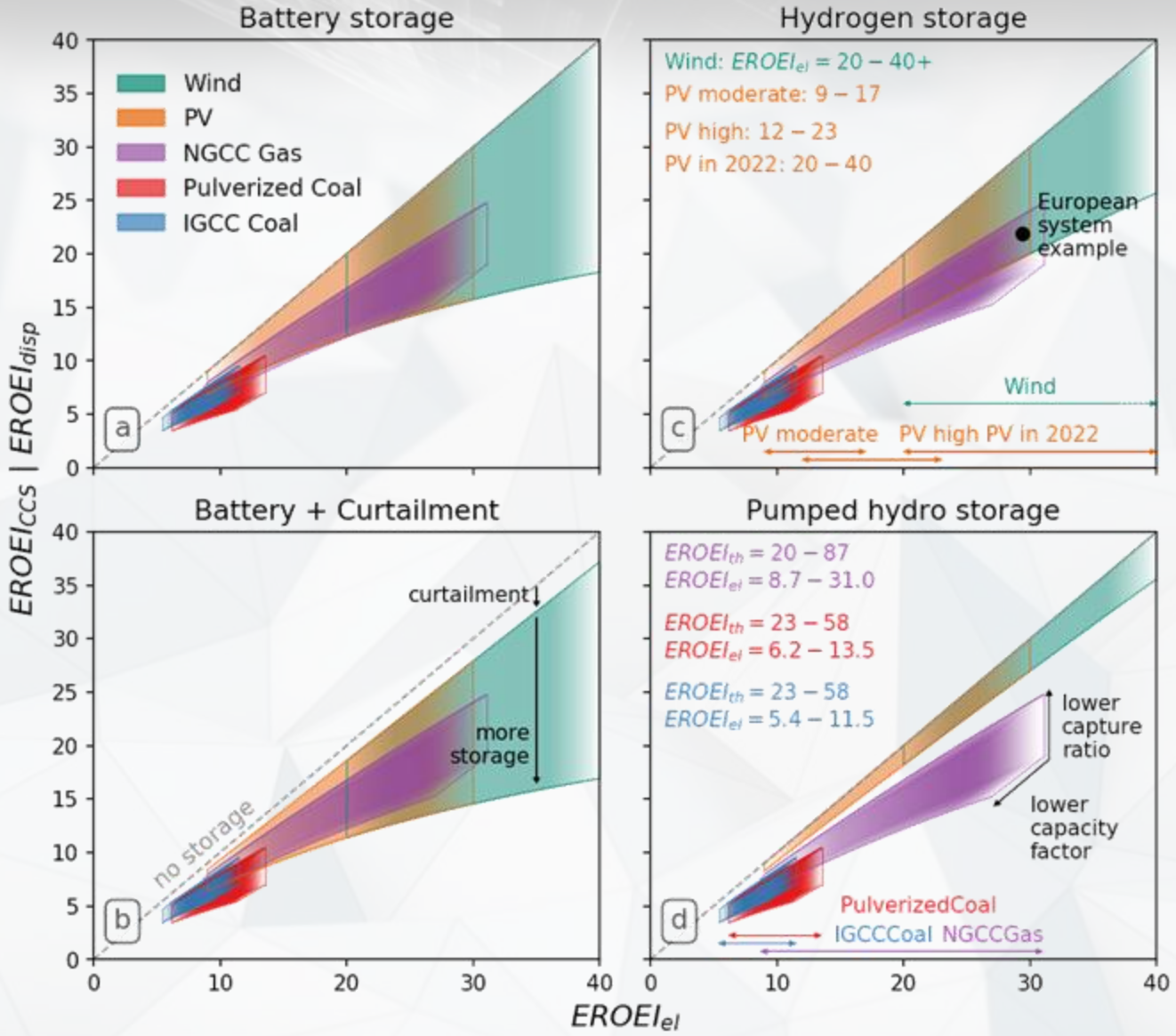


“Today’s funding backs scientists and innovators to collaborate on projects that will deliver a brighter, cleaner future on our roads. We are committed to ensuring that the **UK** is at the forefront of developing the battery technologies needed to achieve our aim for **all cars** and vans to be effectively **zero** emission by **2040**.” - **Nadhim Zahawi, UK Minister for Business & Industry, September 4th, 2019, Faraday Institution**

Csala & Hoster (Nature, 2017)



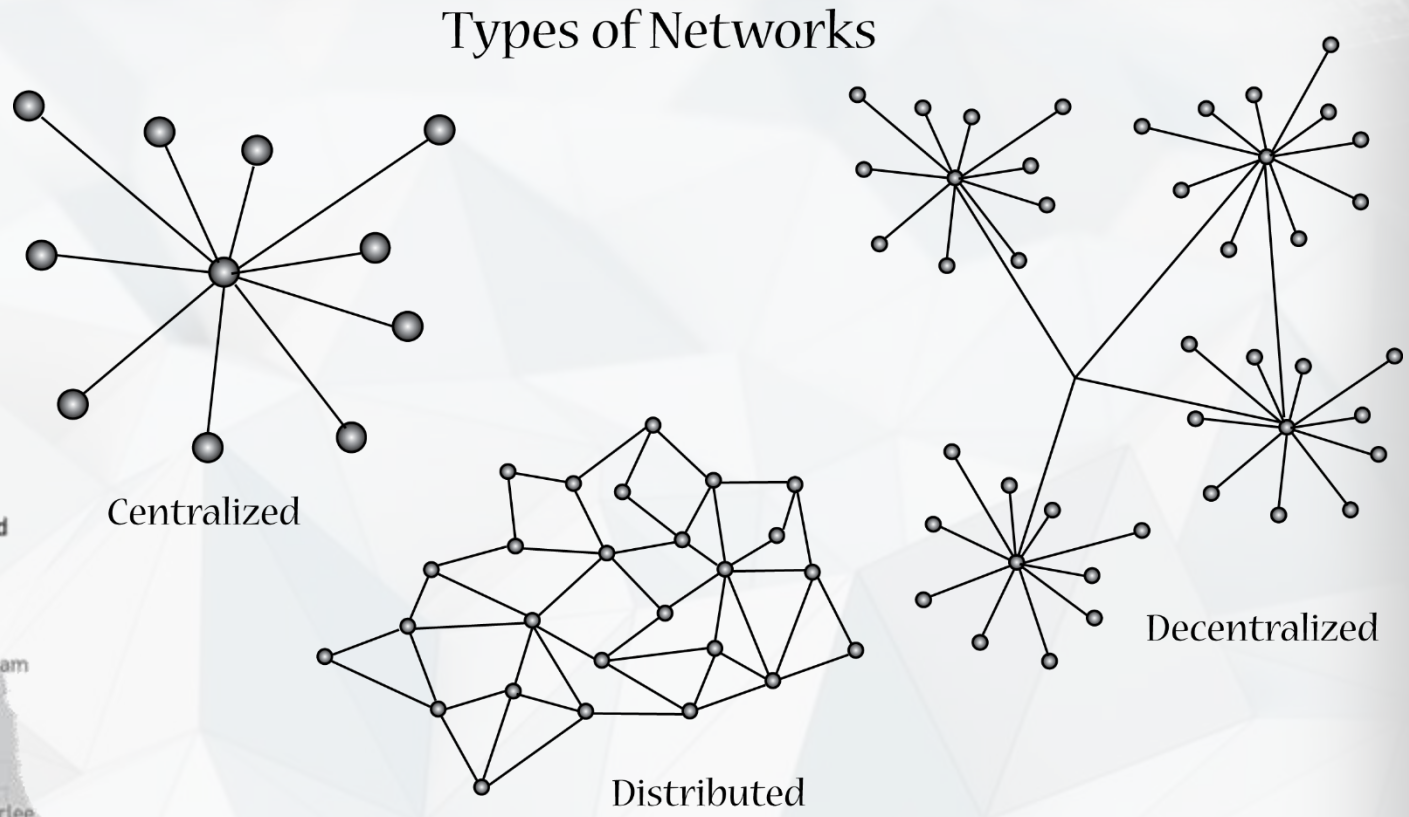
Sgouridis et al. (Nature Energy, 2019)



With batteries or H2 the *worst* cases of renewables + storage compare to the *best* cases of CCS.

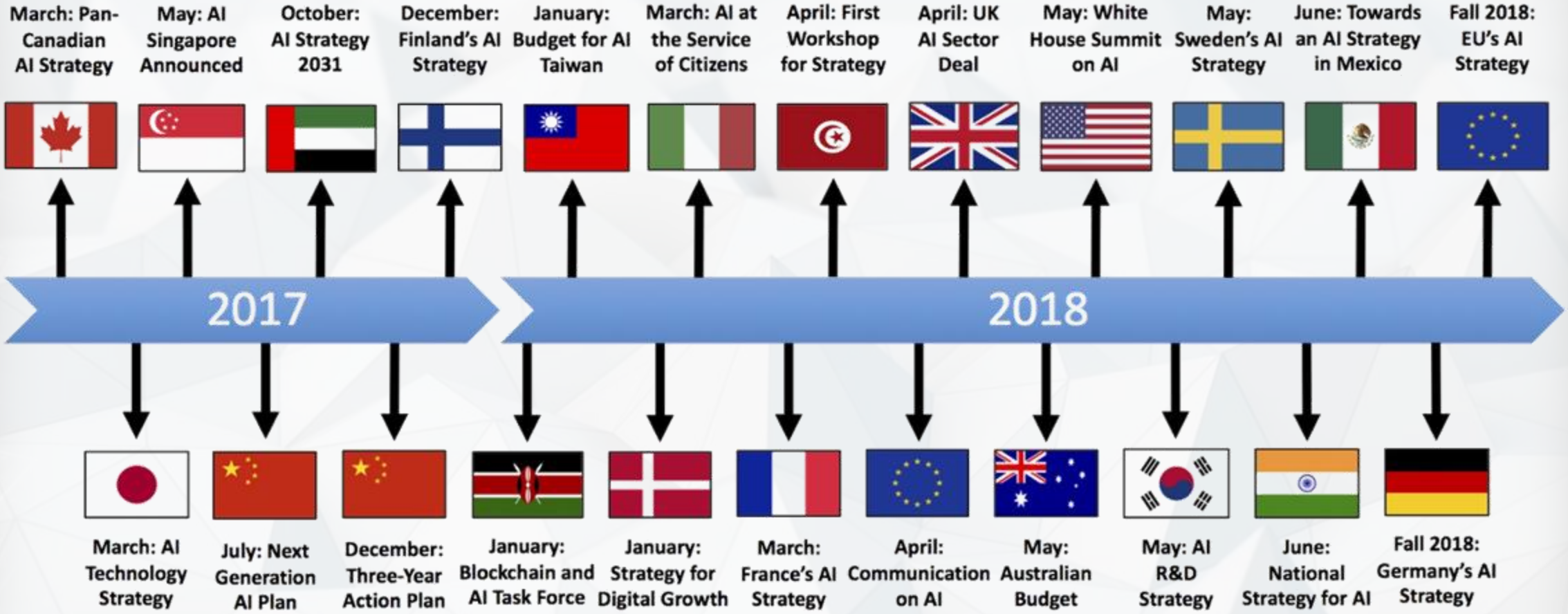
With PHS, there is no comparison.

From a technological transitions viewpoint, growth of the energy storage sector is unavoidable.



https://ebin.josm.pl / OSM (2019)

Artificial Intelligence Strategies



Acciona (2017), Smart Grid Watch (2013)

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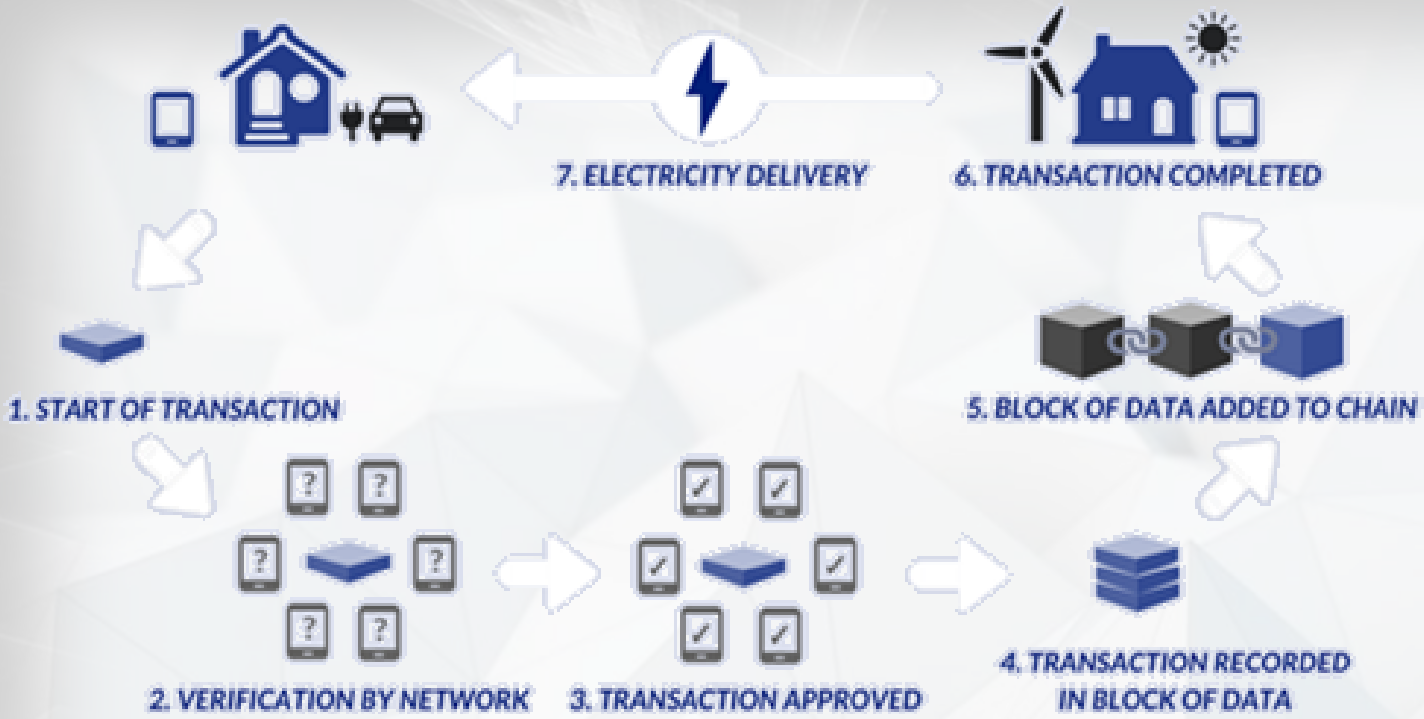
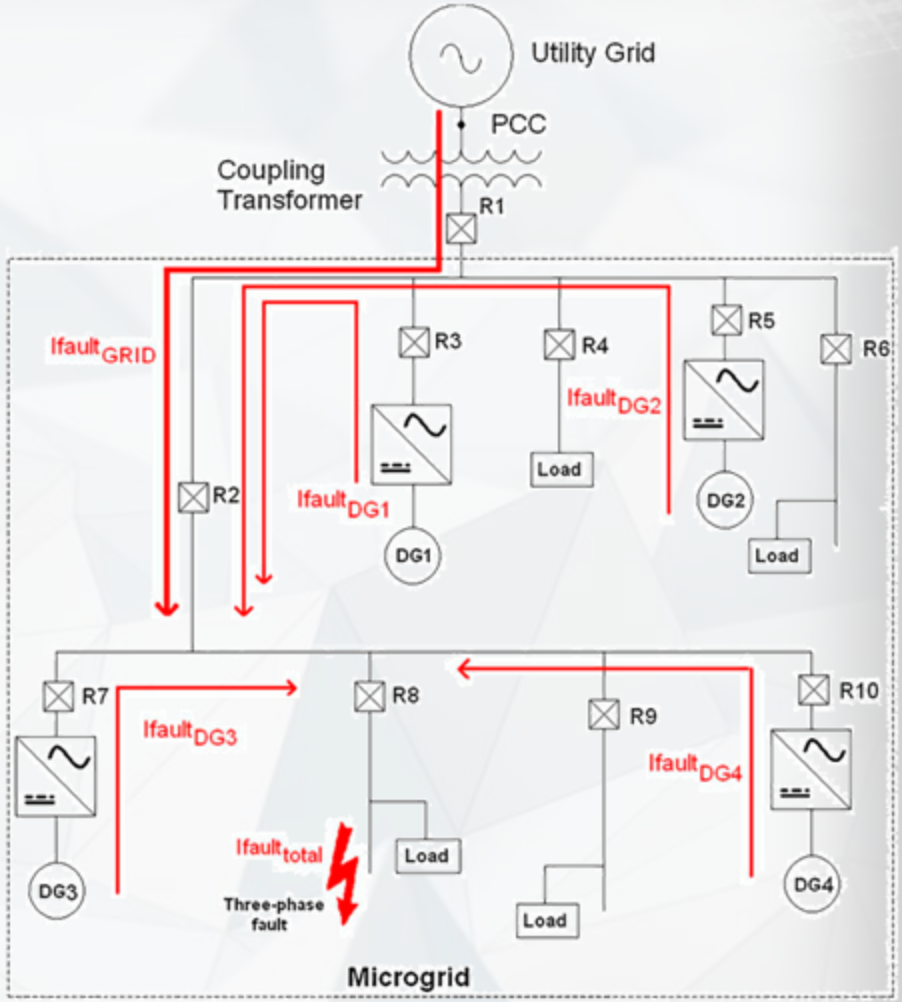
BJTU (2018), Blockstream (2019)



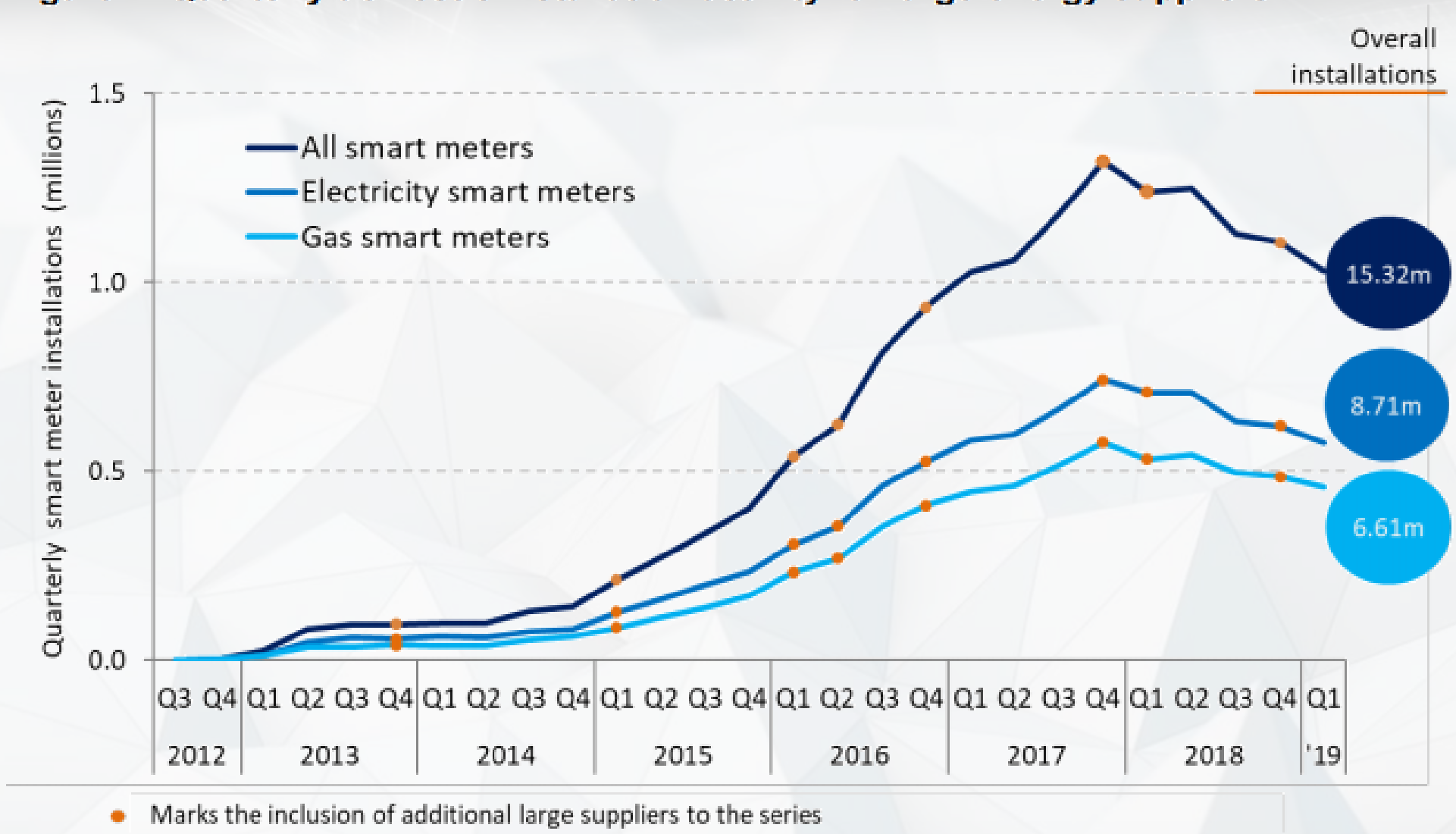


2019 energy trends to watch (Forbes):

- Energy storage
- Microgrids and AI
- Blockchain and IoT

Figure 1: Quarterly domestic installation activity for large energy suppliers

BBC (2019)

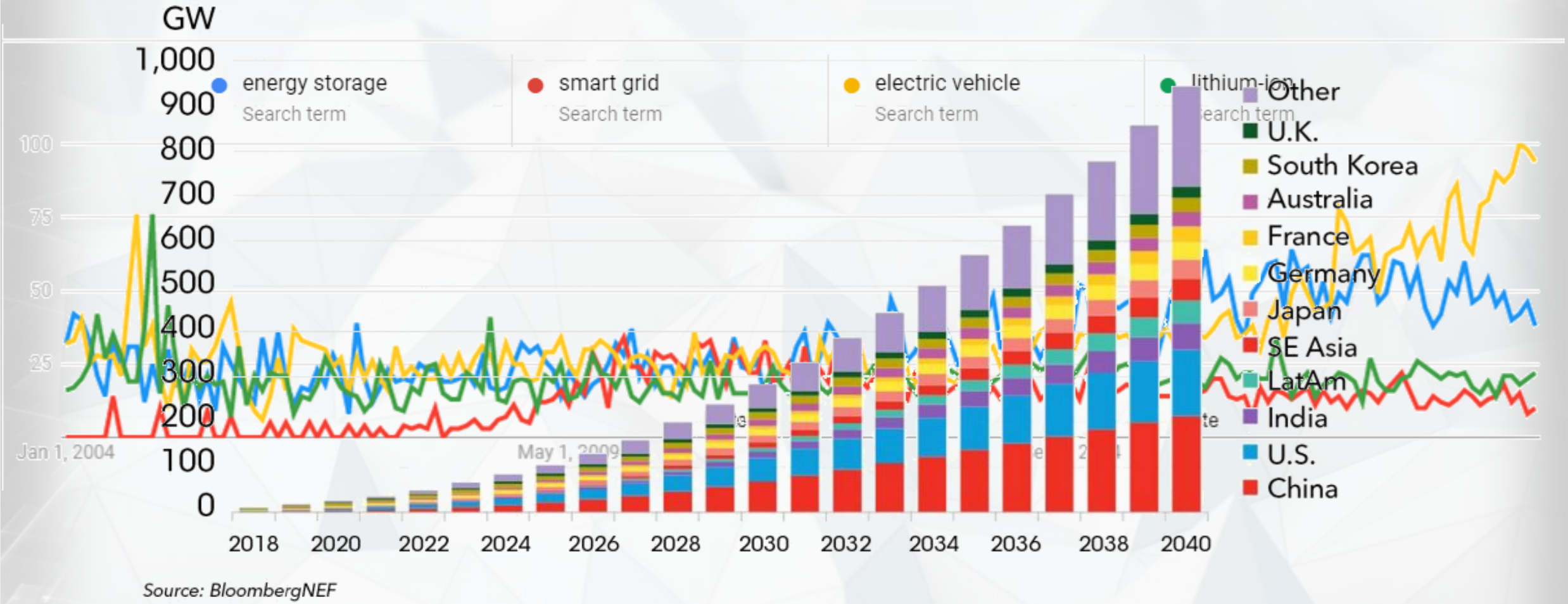


“A next-generation smart grid without energy storage is like a computer without a hard drive: severely limited.”
Katie Fehrenbacher, GigaOm

“With electrical interconnections talks now mentioning numbers up to 5GW, the business case for (long term) energy storage gets more and more difficult..”
Michael Pollitt, University of Cambridge

RAM instead of ROM?

Global cumulative storage deployments



Source: BloombergNEF

Lancaster University Sports Centre
CETAD
County Townhouse
County Main
Ruskin Library
Bowland College
Bowland North
Medical Centre
LEC 3
LEC
Lancaster University Library
County South Residences
Engineering
Physics Building
Fylde College
Furness Residences
Brandrigg Barn
Management School
Postgraduate Statistics Centre
Brantwood
George Fox Building
Fylde College Residences
Fylde College Residences
ISS Building
Infolab21

Lancaster University

Energy Roses

Mathong (2018)

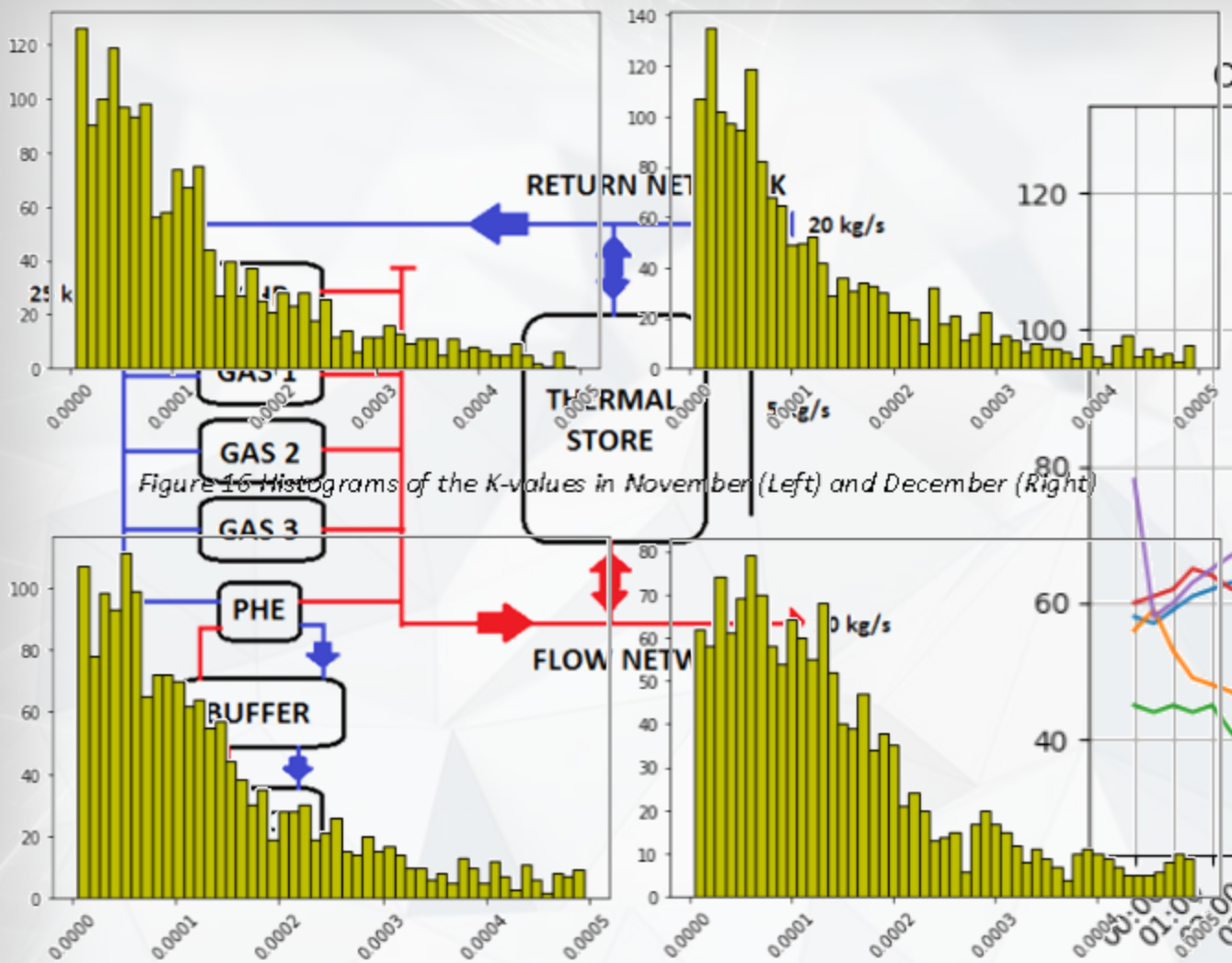
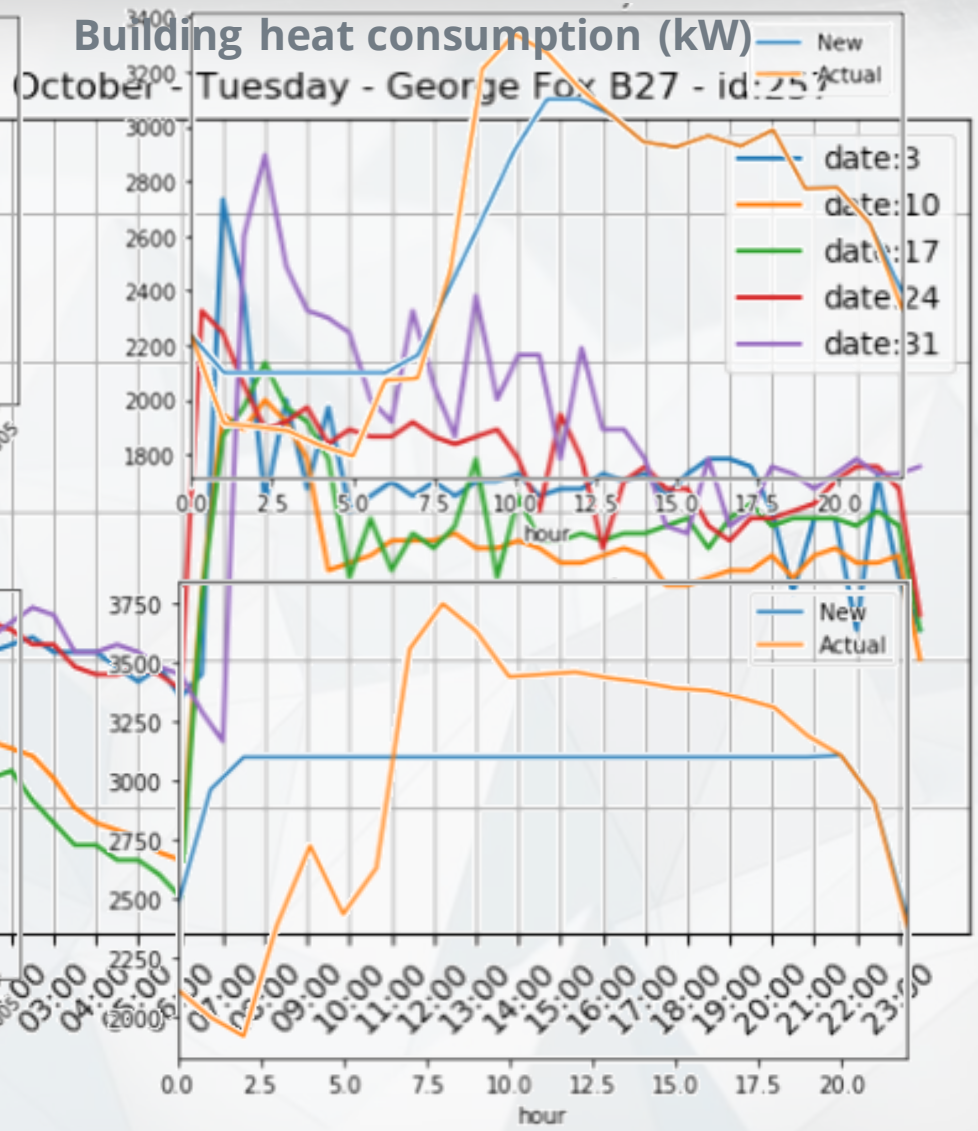


Figure 16 Histograms of the K-values in November (Left) and December (Right)

Figure 17 Histograms of the K-values in January (Left) and February (Right)

Building heat consumption (x 100W)

Building heat consumption (kW)



Thank you!

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