InnoEnergy
Knowledge Innovation Community

# Battery Storage Applications

Webinar - 04 March 2020

Johan Söderbom, Thematic Leader for Smart Grids & Energy Storage

# Agenda

- EIT InnoEnergy
- Battery overview
- Automotive
- Grid side
- Behind the meter
- Generation
- Other applications
- Q&A

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# Who we are

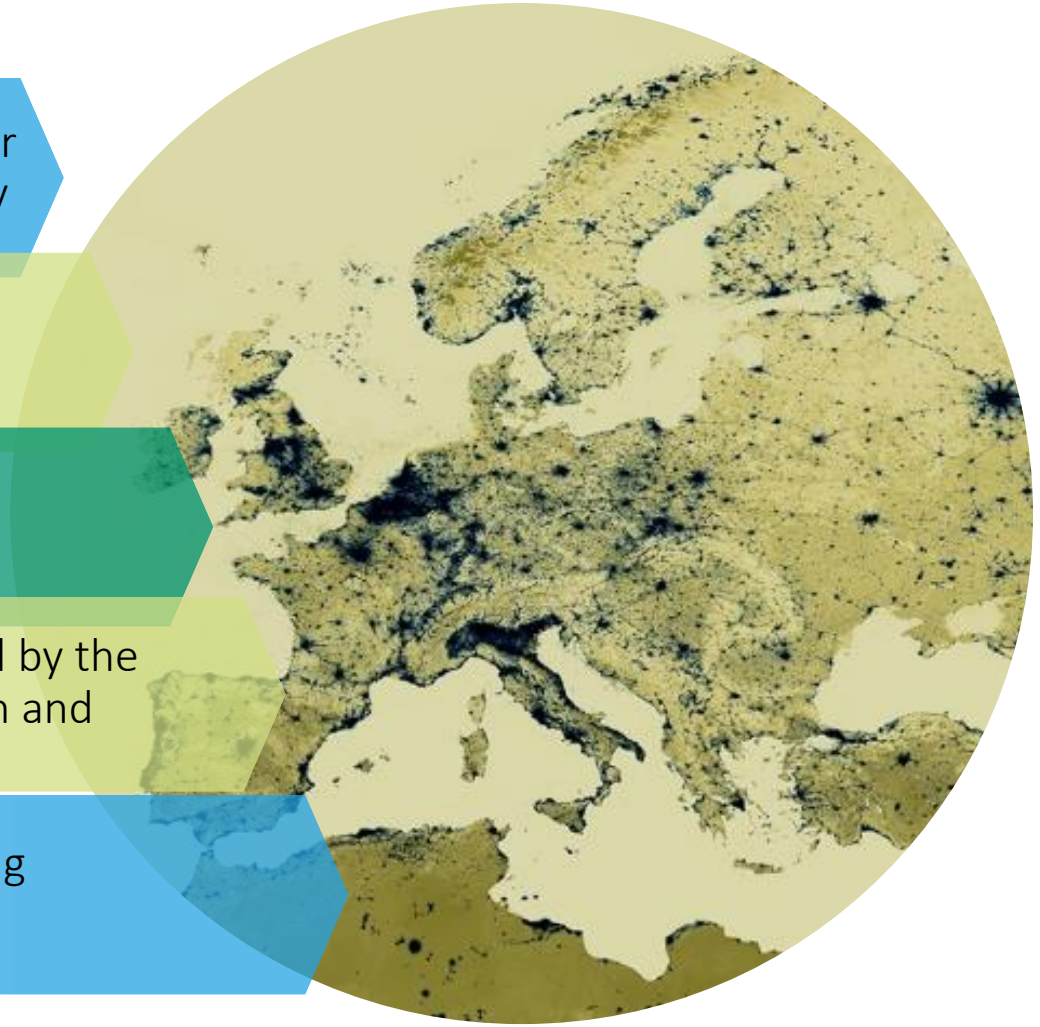
The European Union's engine for innovation in sustainable energy

Empowering every stage of the innovation process

Investing in people, technologies, businesses

Established 2010 and supported by the European Institute of Innovation and Technology, EIT

Public-private partnership aiming for financial sustainability



## Our goals

- Reduce costs of energy
- Reduce CO2 emissions
- Ensure security and safety of supply
- Improve European competitiveness
- Create jobs

# Technological and geographical coverage

Energy for Circular Economy

Energy storage

Energy efficiency

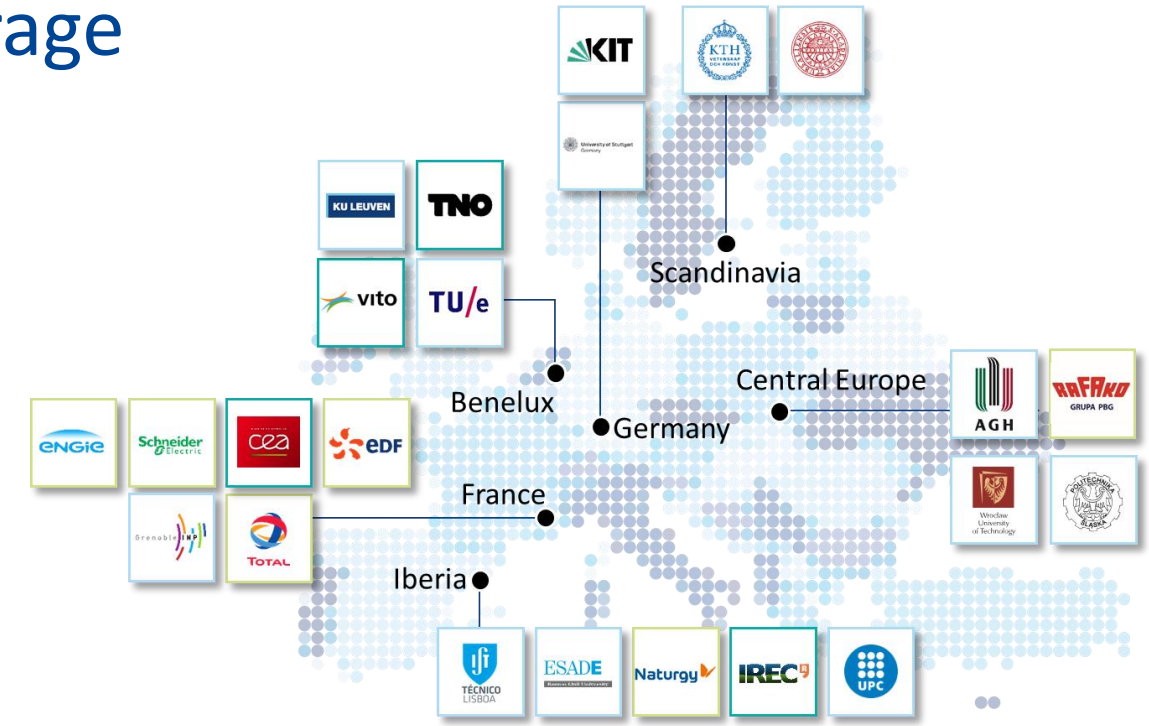
Energy for Transport and Mobility

Renewable energies

Smart and efficient buildings and cities

Smart electric grid

Nuclear instrumentation




All figures correct as of February 2019

**Our Shareholders**

- Research Institutes
- Universities
- Industry Partners
- Regional offices

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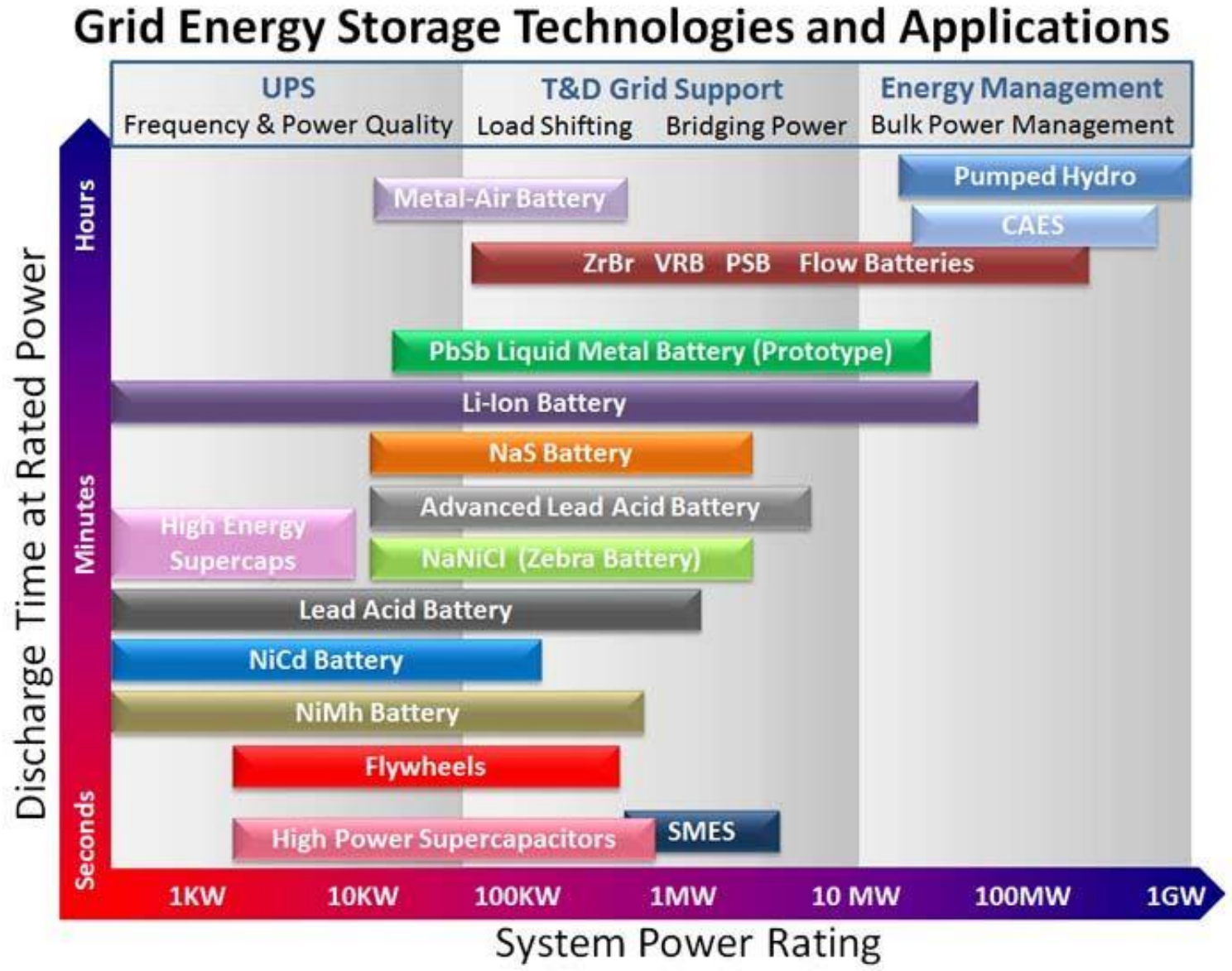
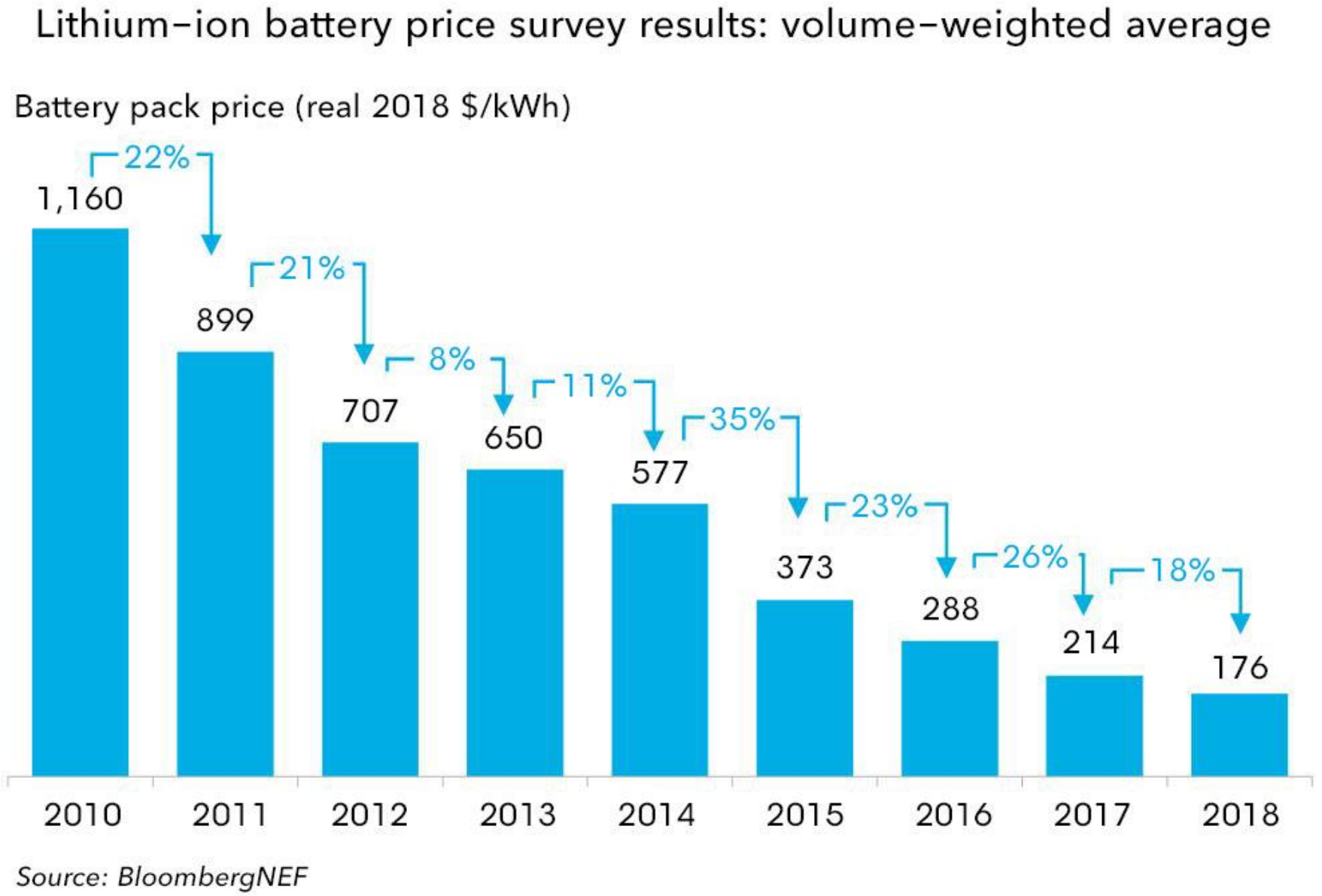
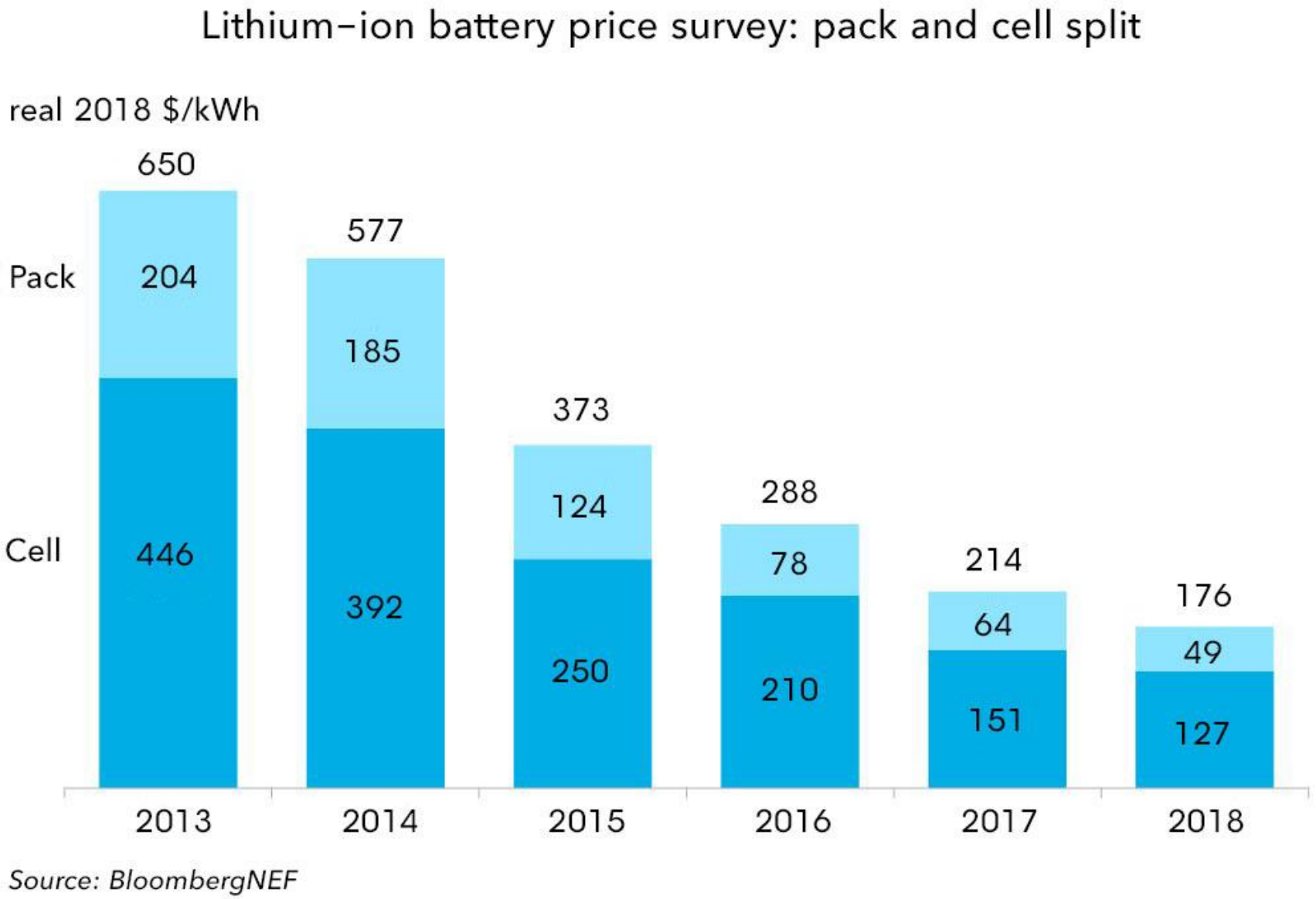



- Covering a large power span
- Mature technology
- Automotive industry is pushing the limits cost/ performance

# Li-Ion battery cost reduction

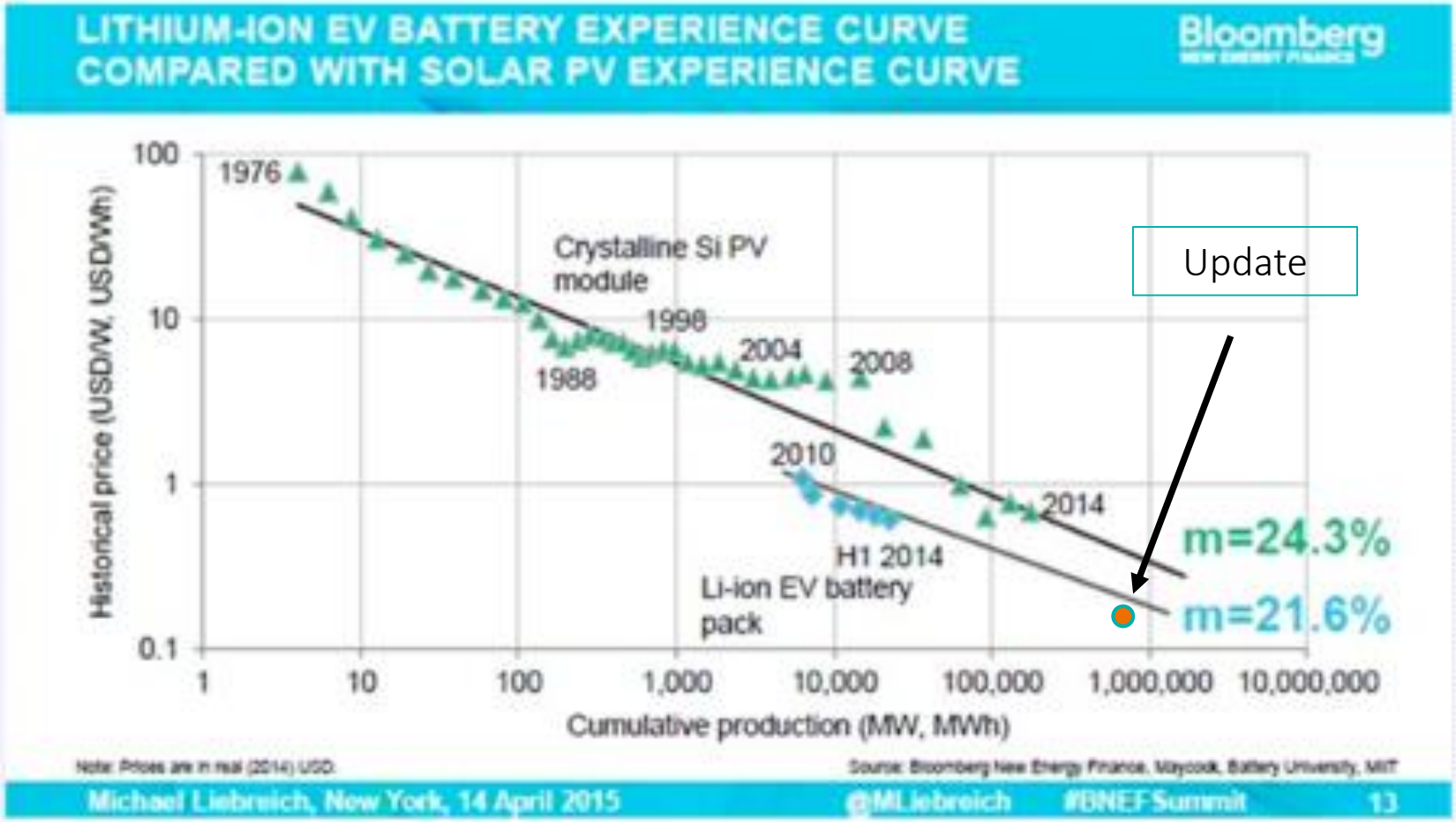


# Rapid learning rate



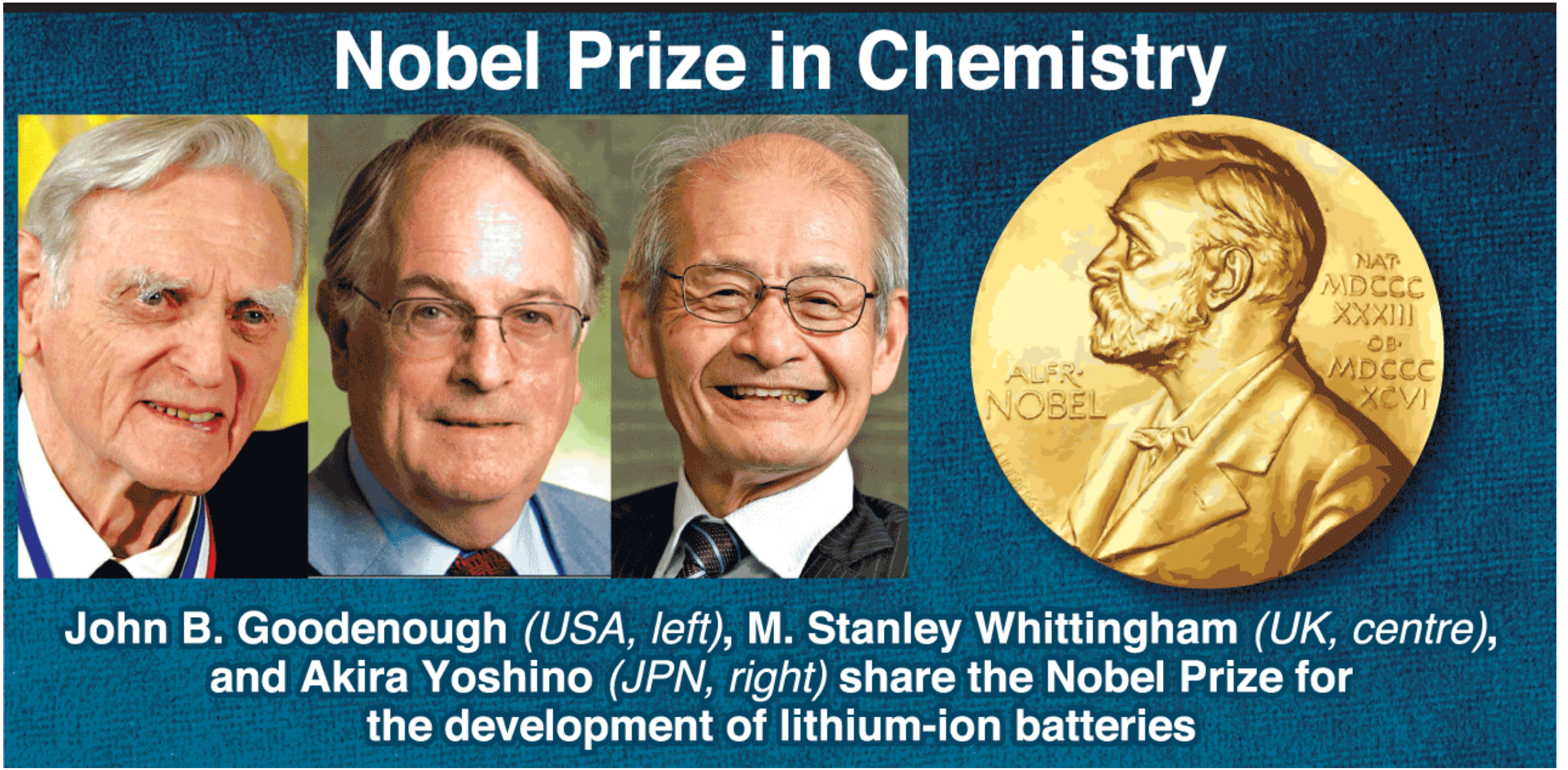

Industrialisation of the battery manufacturing

# Electric Car Battery Costs Are Falling as Fast as Solar Panel Costs




Update

Source: BNEF, Maycock, Battery University, MIT


Nobel Prize in Chemistry
ALFR·
NOBEL
NAT·
MDCCC
XXXIII
OB·
MDCCC
XCVI
John B. Goodenough (USA, left), M. Stanley Whittingham (UK, centre),
and Akira Yoshino (JPN, right) share the Nobel Prize for
the development of lithium-ion batteries

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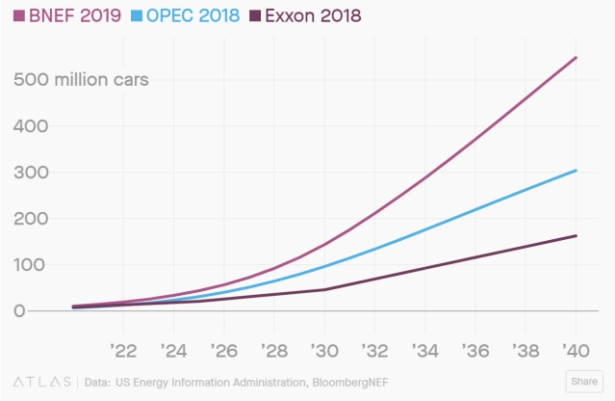
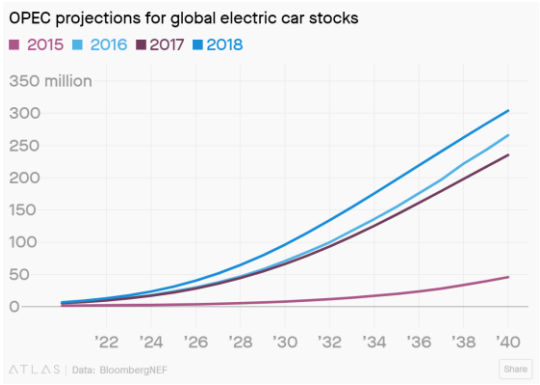
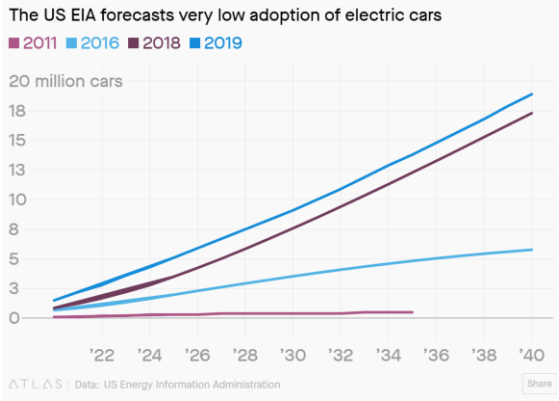
ANYONE'S GUESS

# Researchers have no idea when electric cars are going to take over

By Michael J. Coren · May 18, 2019



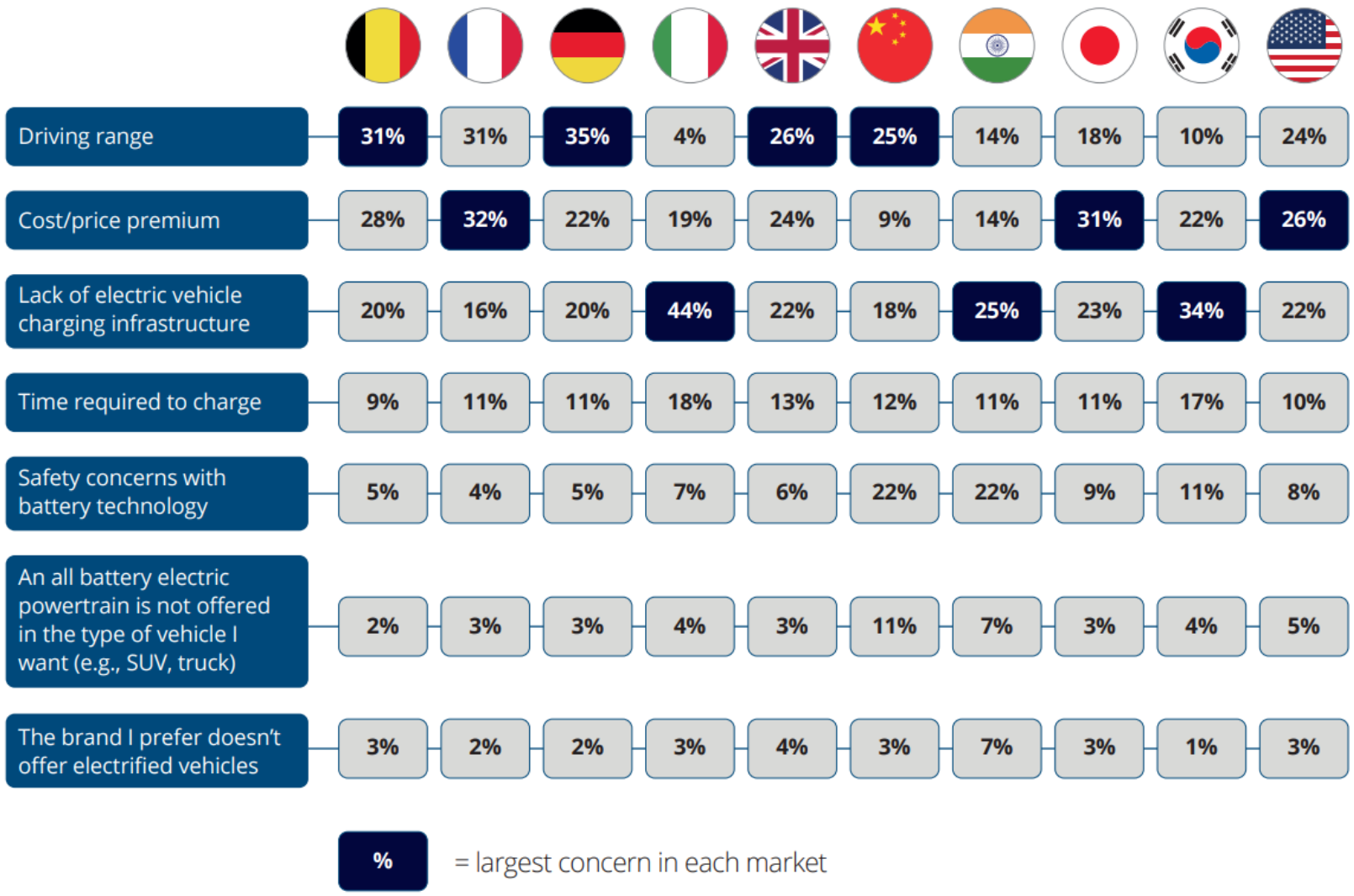




Source: QUARTZ Research

# A new approach at looking on penetration






Source: Deloitte Global Automotive Consumer Survey 2018

What is the largest concern for choosing an electric vehicle as the next car?

# How much range is required ?

Assessing the progress toward lower priced long range battery electric vehicles

Björn Nykvist[a,*], Frances Sprei[b], Måns Nilsson[a]

[a] Stockholm Environment Institute, Linnégatan 87 D, 115 23 Stockholm, Sweden
[b] Department of Space, Earth and Environment, Chalmers University of Technology, 412 96 Göteborg, Sweden

**Consumer acceptance of EV *)**

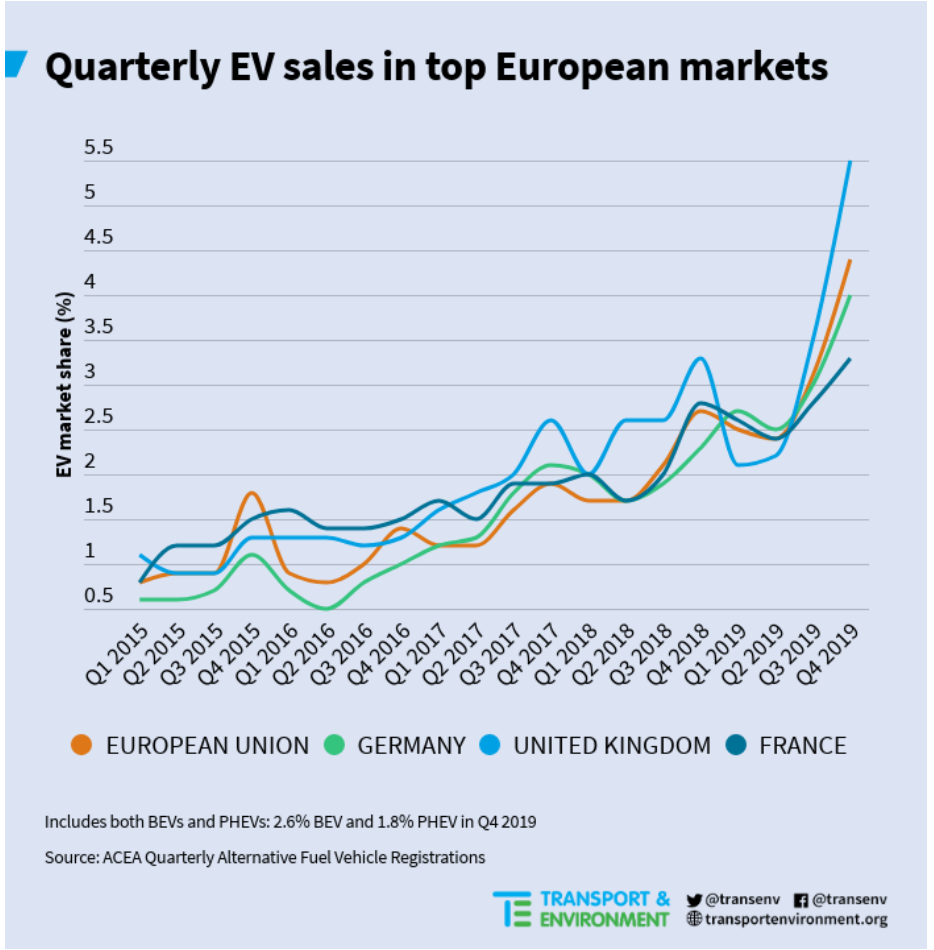
| | |
|---|---|
| **50%** | **300 km** |
| **70-90%** | **350 km** |

***) Not considering recent development in charging**

# Already competitive in selected markets….

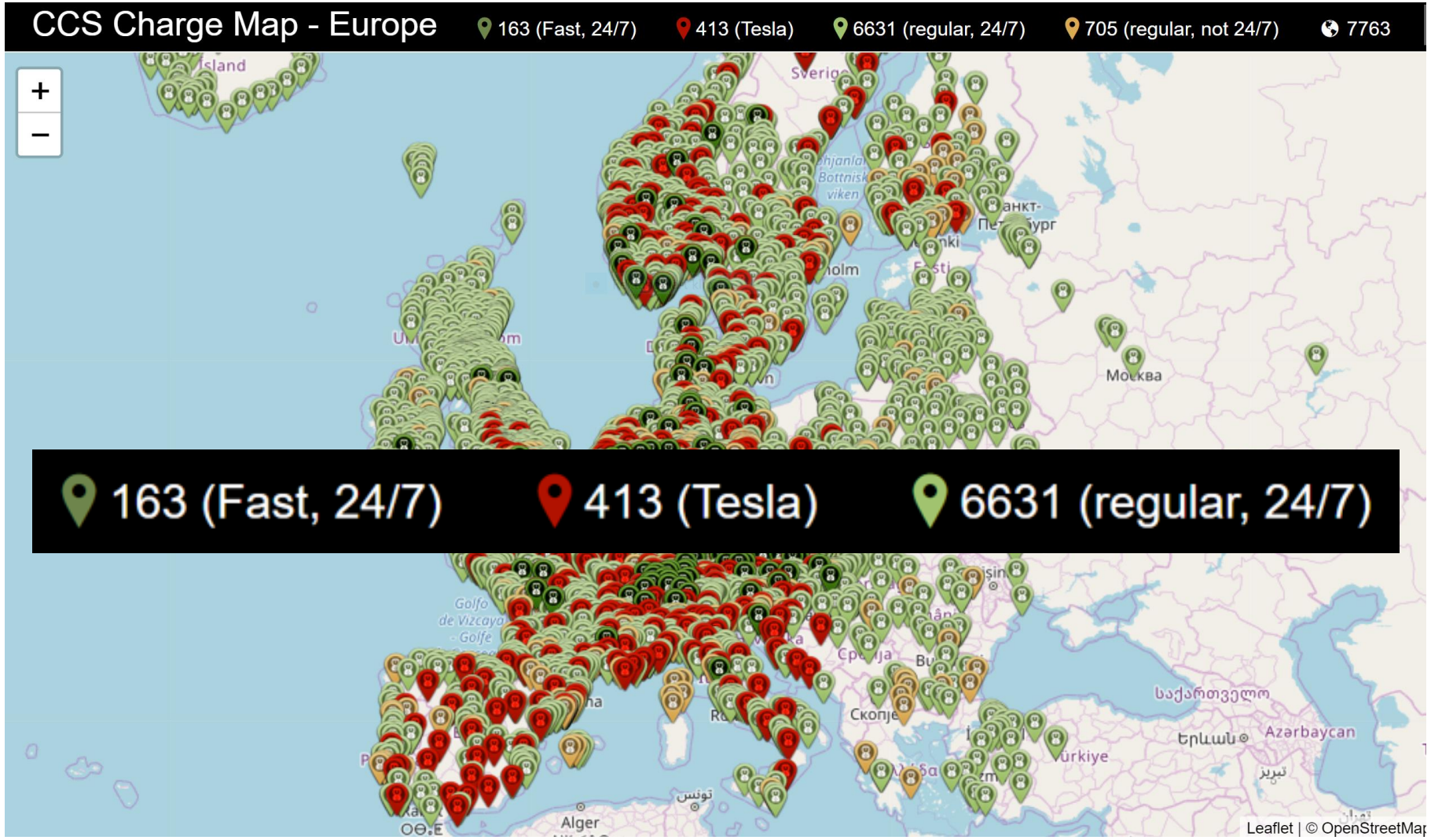
| | Tesla Model 3 LR | BMW 330i | Volvo S 60 T5 |
|---|---|---|---|
| Price as tested SEK | 593780 | 420400 | 398900 |
| Value loss (% per year) | 9,8 | 14,8 | 12,9 |
| Annual fuel cost | 5504 | 26250 | 27200 |
| 0-100 (tested) | 4,7 | 5,9 | 7,2 |
| Range (km tested) | 436 | 760 | 750 |
| TCO (SEK/10km) | 47,97 | 58,9 | 54,58 |

| | Kia e-Niro | XC 40 TE | XC40 T3 |
|---|---|---|---|
| Price as tested SEK | 384900 | 431554 | 385700 |
| Value loss (SEK per year) | 49725 | 47464 | 58000 |
| Value loss (% per year) | 12,9% | 11,0% | 15,0% |
| Annual fuel cost | 4704 | 10931 | 20100 |
| 0-100 (tested) | 7,8 | 7,4 | 9,4 |
| Range (km tested) | 371 | 695 | 780 |
| TCO (SEK/10km) | 38,28 | 42,22 | 45 |



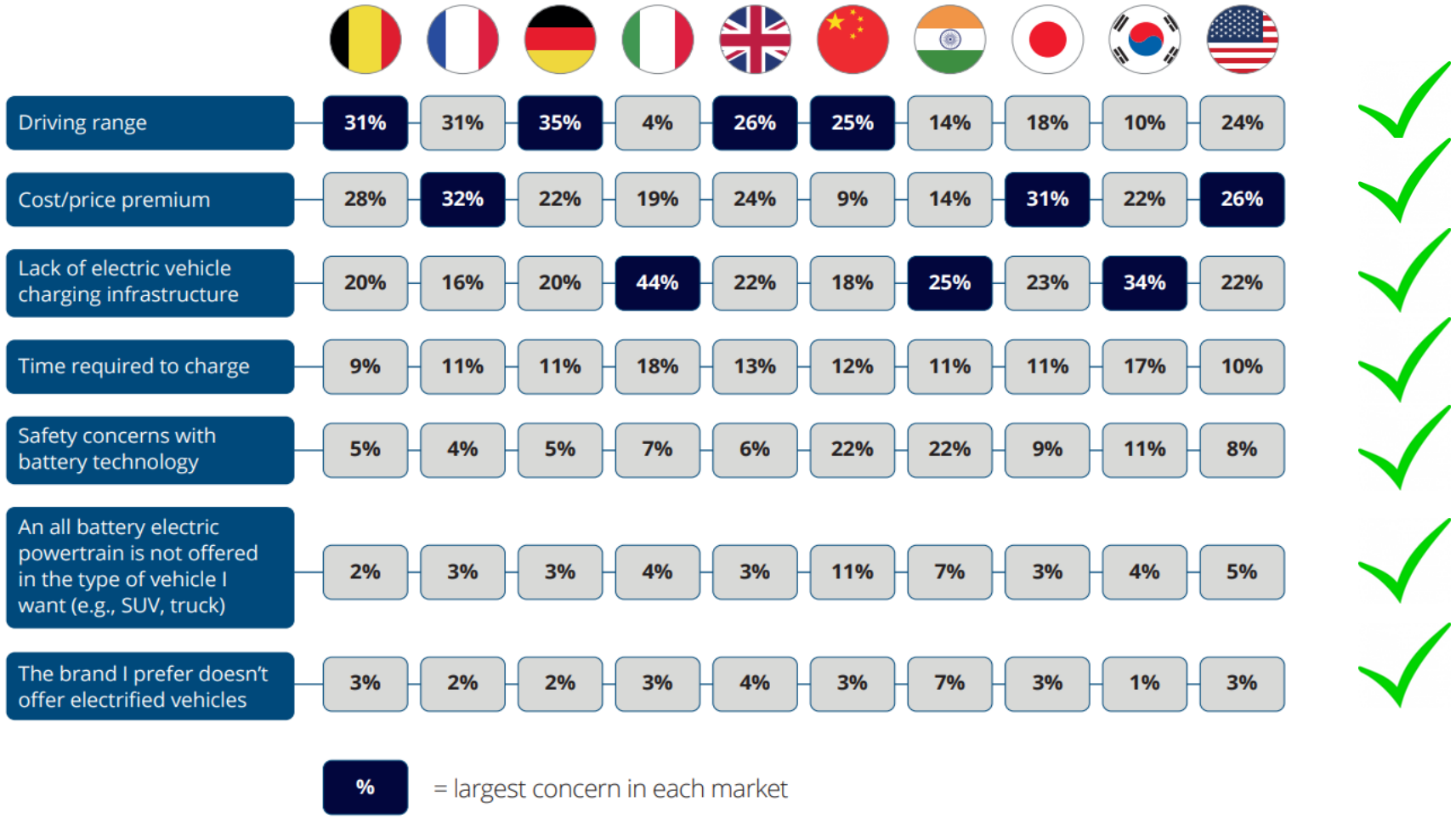
# Lack of charging infrastructure, public charging…..





# Summary concerns...





| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Driving range | 31% | 31% | 35% | 4% | 26% | 25% | 14% | 18% | 10% | 24% |
| Cost/price premium | 28% | 32% | 22% | 19% | 24% | 9% | 14% | 31% | 22% | 26% |
| Lack of electric vehicle charging infrastructure | 20% | 16% | 20% | 44% | 22% | 18% | 25% | 23% | 34% | 22% |
| Time required to charge | 9% | 11% | 11% | 18% | 13% | 12% | 11% | 11% | 17% | 10% |
| Safety concerns with battery technology | 5% | 4% | 5% | 7% | 6% | 22% | 22% | 9% | 11% | 8% |
| An all battery electric powertrain is not offered in the type of vehicle I want (e.g., SUV, truck) | 2% | 3% | 3% | 4% | 3% | 11% | 7% | 3% | 4% | 5% |
| The brand I prefer doesn't offer electrified vehicles | 3% | 2% | 2% | 3% | 4% | 3% | 7% | 3% | 1% | 3% |



Source: Deloitte Global Automotive Consumer Survey 2018

- All the boxes are ticked!
- The Automotive application is a no brainer.

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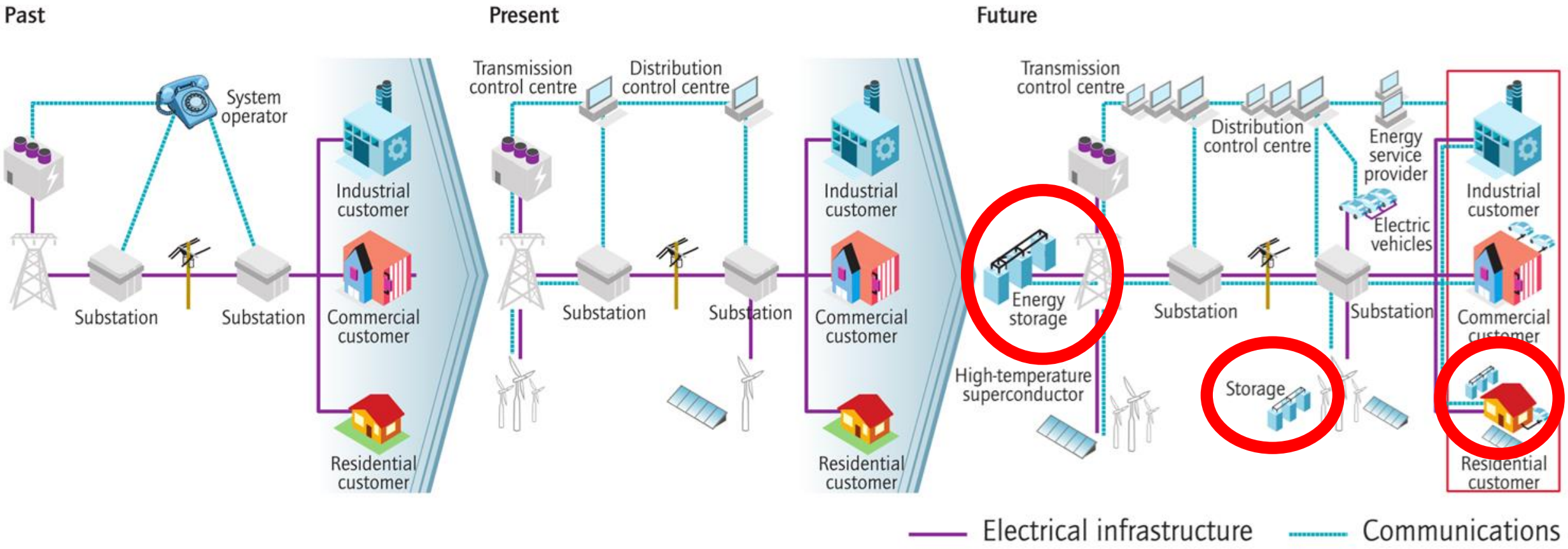
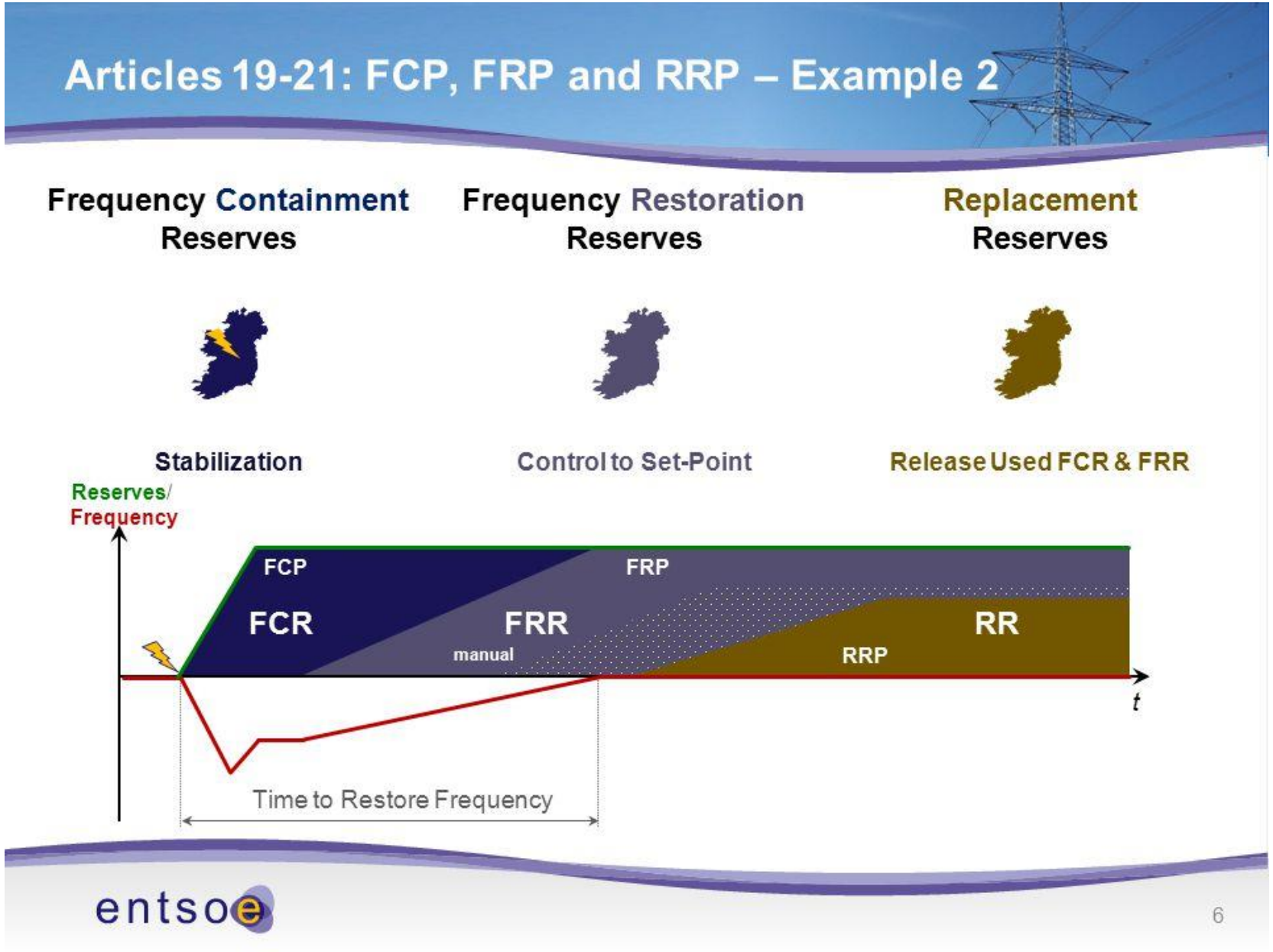
# Storage a key element on all levels in the future system






- Decreasing number of conventional plants will require new reserves
- Batteries are an excellent option for fast response

The 22MW Battery@PyC became operational in May 2018 at Vattenfall´s Pen y Cymoedd Wind Farm in South Wales, UK. It was one of eight projects selected by National Grid to provide Enhanced Frequency Response service to the grid network.

- Fast to deploy
- Cost comparable to other technologies
- Co-locate at site with existing grid access


BRIEF

# PG&E to replace 3 gas plants with world's biggest battery projects

Pacific Gas and Electric (PG&E) have requested approval from the California Public Utilities Commission (CPUC) for four energy storage projects totalling about 2,270 MWh

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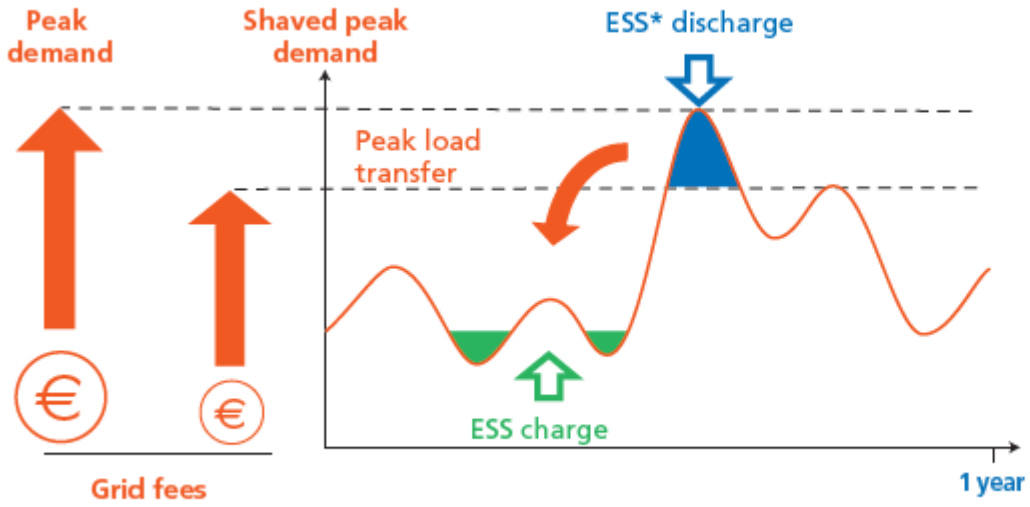
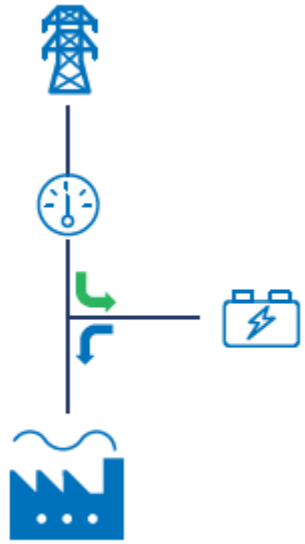
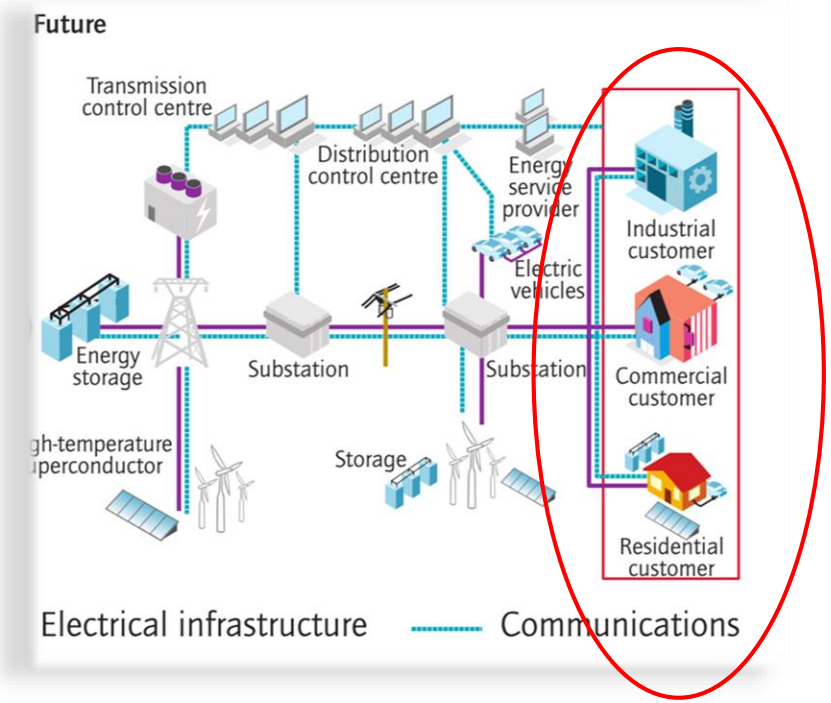
# Shaving peaks means shaving on cost for your network subscription (contracted power)

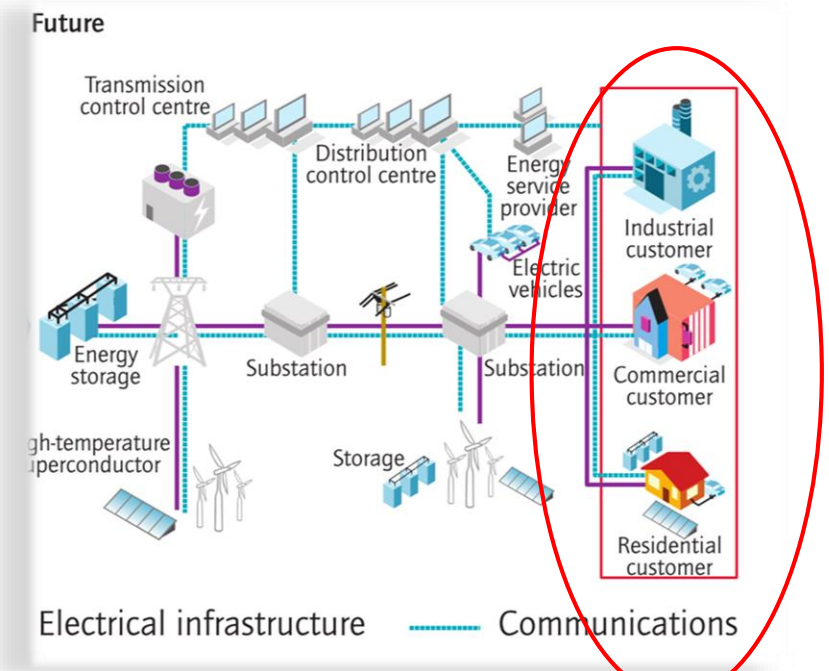


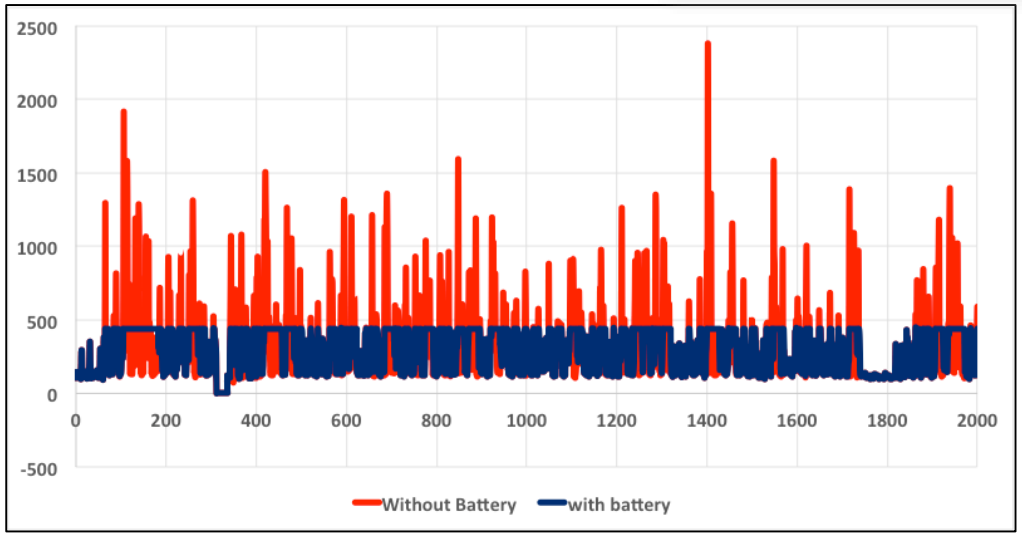





# An alternative to build more grids


"A battery of around 1 kWh per apartment is sufficient to reduce peak load by 40 per cent in the entire building."



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*"Batteries are thought to be used mostly to store energy. Now, however, we will try connecting a battery to a hydropower plant with the idea of improving the plant's ability to function as regulating power for the Nordic electricity network."*

**Martin Lindström, Head of Asset Management Hydro at Fortum.**

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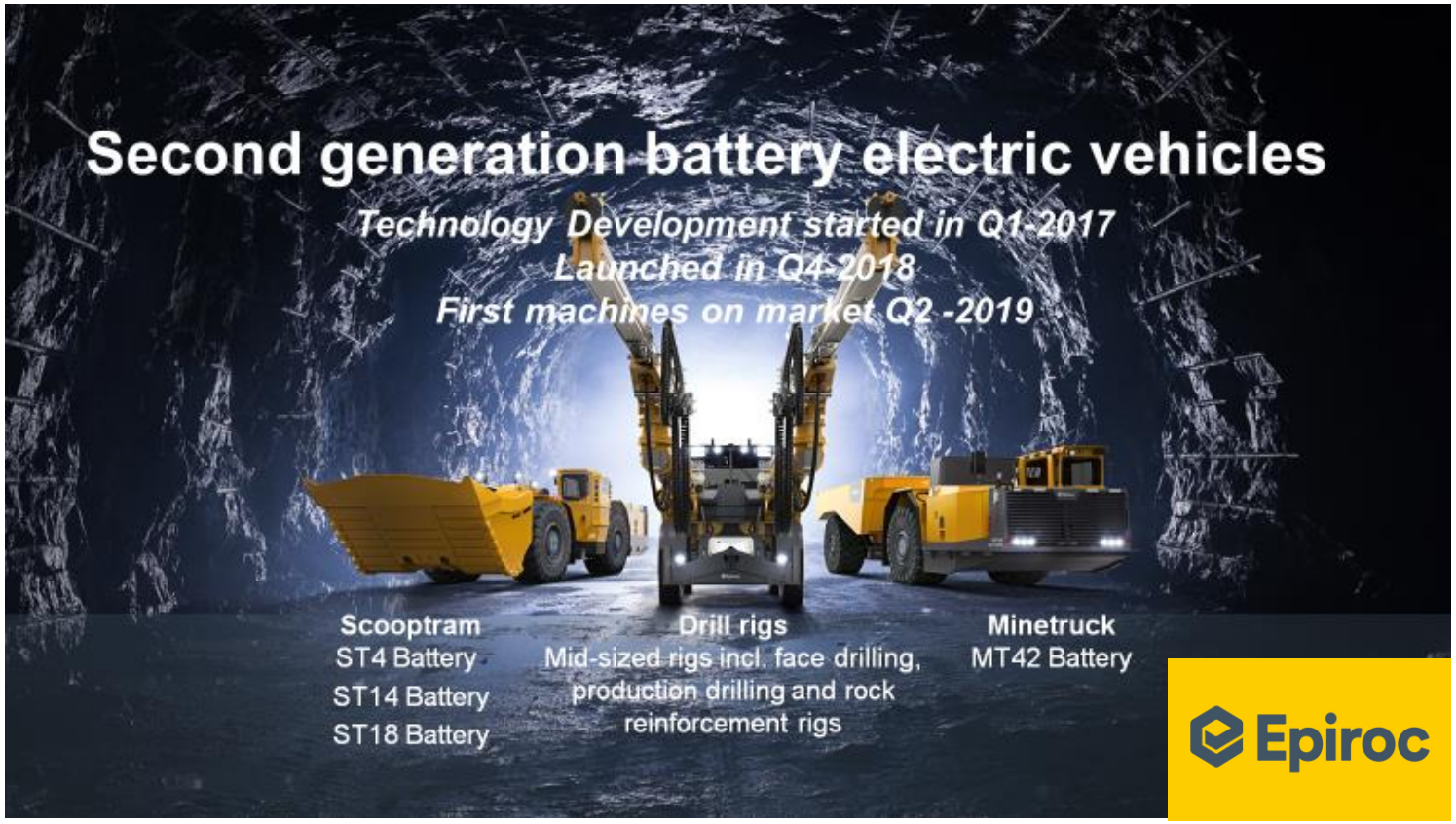


# Volvo CE to launch up to 10 electric excavators and loaders by 2020, replacing diesel models entirely

Wayne Grayson | February 20, 2019

# Electrifying everything with a combustion engine…






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# Battery Storage Masterclass

Explore the trends, navigate the challenges, and exploit the opportunities

**Battery Storage Masterclass**

- 1-2/04/2020 | Uppsala University
  23/04/2020 | Elite Hotels of Sweden AB, Stockholm
- Duration: 3 days
- € 2 100 €

https://sea.innoenergy.com/course/battery-storage-masterclass/info

If you would like more information to help you decide if it is right for you, please contact Ulrika Hynell.
+46 706 685 092 | ulrika.hynell@innoenergy.com

## Johan Söderbom

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**www.innoenergy.com**


InnoEnergy is supported by the EIT, a body of the European Union