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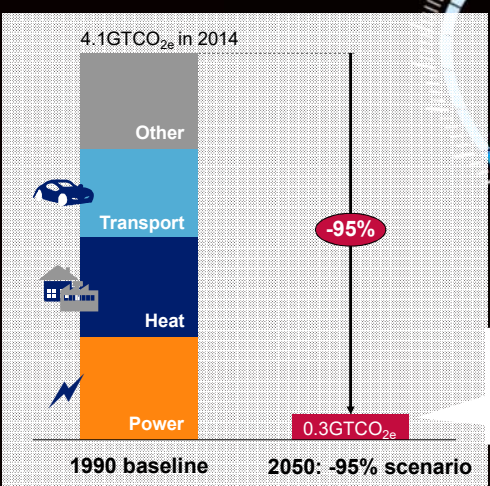

ACCELERATED ELECTRIFICATION

STEPHEN WOODHOUSE

21 May 2019



THE SCALE OF THE CHALLENGE REQUIRES COMPLETE DECARBONISATION OF ENERGY



Year	Power	Heat	Transport	Other	Total
2014	~1.5	~1.5	~0.5	~0.5	4.1
2050 (-95% scenario)	~0.3	~0.0	~0.0	~0.0	0.3

4.1GTCO_{2e} in 2014

1990 baseline

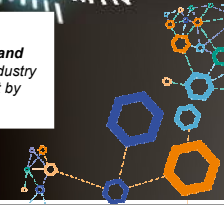
2050: -95% scenario

0.3GTCO_{2e}

-95%

“Did you know?”

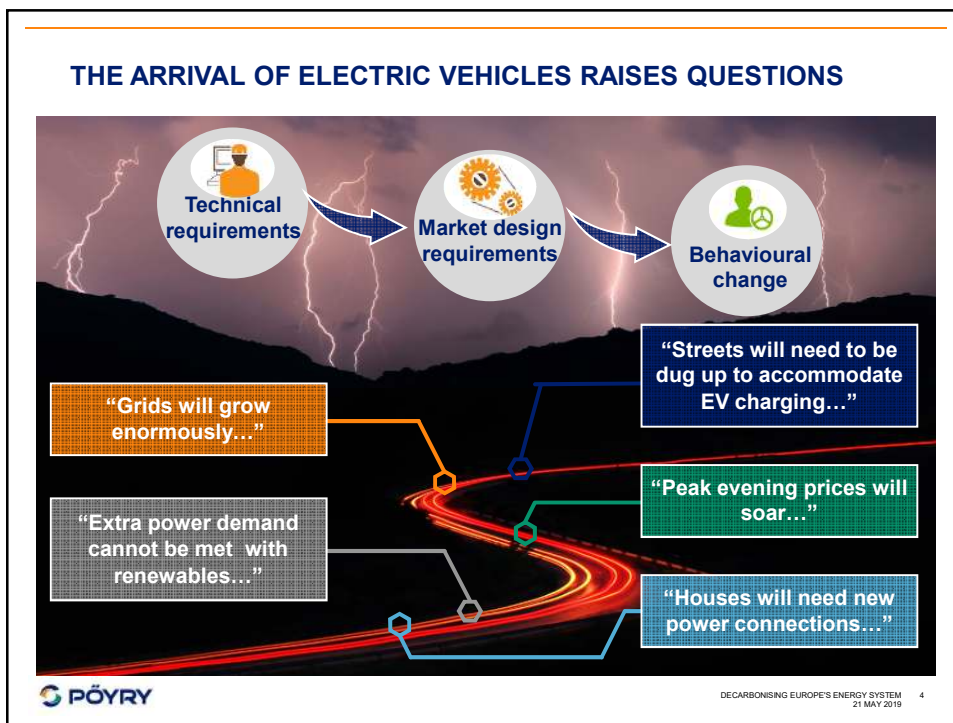
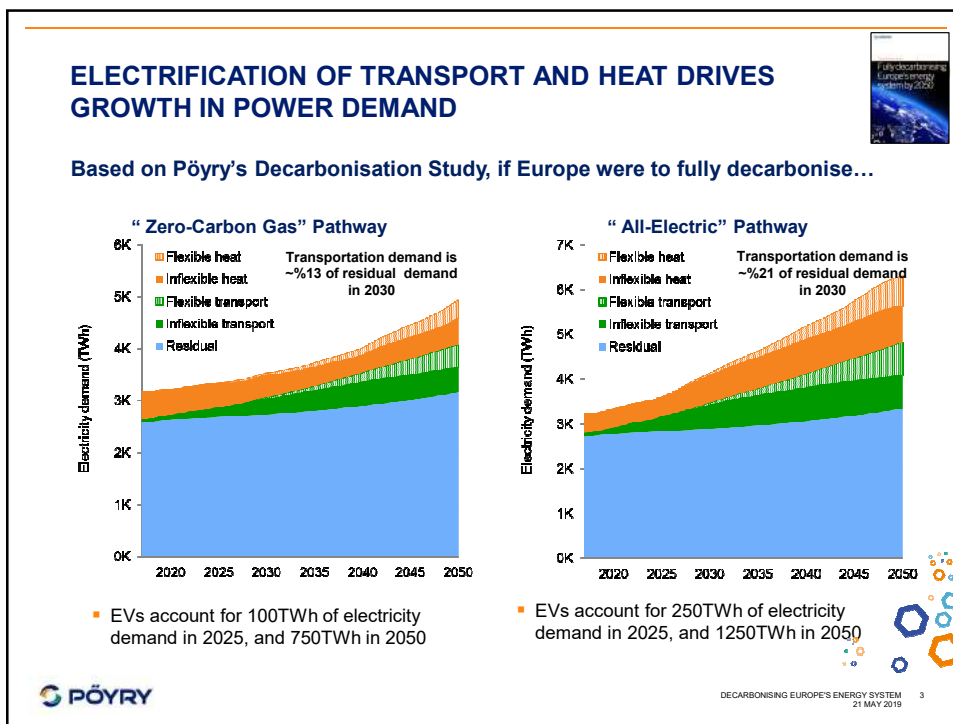
- 2014 emissions in heat and process output from industry exceeds 2050 -95% limit by 220%



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HIGH CAPACITY, LOW ENERGY LOADS

If not managed properly, electrification of transport results in high capacity, low energy loads - at lowest voltage level



Average distance: 19 000 km pa
Consumption: 16 kWh/100 km

Annual total consumption ~3100 kWh
Baseload charging: 0.35 kW

Tesla supercharger: 360 kW
> 1 000 times baseload charging

Home charger: even 11 kW
requires 3 phase supply



Energy transfer, petrol car: 10 kWh/litre
Speed of pumping: ~25-35 litre/min

Capacity of fuel pump: ~ 15-20MW



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THE FUTURE OF TRANSPORTATION IS ELECTRIFIED, CONNECTED AND SHARED



AUTONOMOUS VEHICLES

Thanks to the progresses in artificial intelligence and machine learning the development of autonomous vehicles is progressing fast: cars that require no human intervention (even in complex traffic situations) will redefine individual mobility



CONNECTED NETWORK

Vehicles will be increasingly connected with each other and with the transport infrastructure (traffic lights, restricted traffic areas, parking spots, etc.). At the same time, vehicle users will be able to communicate, work, browse the internet or access multi-media services during the journey



SHARED MOBILITY

Car-sharing solutions are already a reality in many big cities. With the introduction of autonomous vehicles, the business model for customers could shift from looking for a shared vehicle in the neighborhood to ordering a self-driven car 'on-demand'



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FLEXIBLE, INTELLIGENT USE OF DEMAND RESOURCES

On a cold winter day...

Dealing with local network congestion through access rights or pricing

Financially firm	
Non firm	
Local LMP	

LMP: real-time location specific price

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What if?

SMART CHARGING OF ELECTRIC CARS PROVIDE FLEXIBILITY WHILE ENGAGING CUSTOMERS?

I need the car at 7.a.m

Current time 6.30 p.m.
I need 36kWh by 7a.m.at max charging rate 10kW

Please wait, negotiating contract to supply 36kWh by tomorrow morning at 7 a.m ...

Best contract negotiated!

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 **PÖYRY**
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<https://www.povy.com/news/articles/fully-decarbonising-europes-energy-system-2050>

Photos: colourbox.com

