Electromobility and energy transition

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Outline of the presentation

- Why Electromobility is starting?
- Why is it promising for Grids ?
- Why is it promising for Users?

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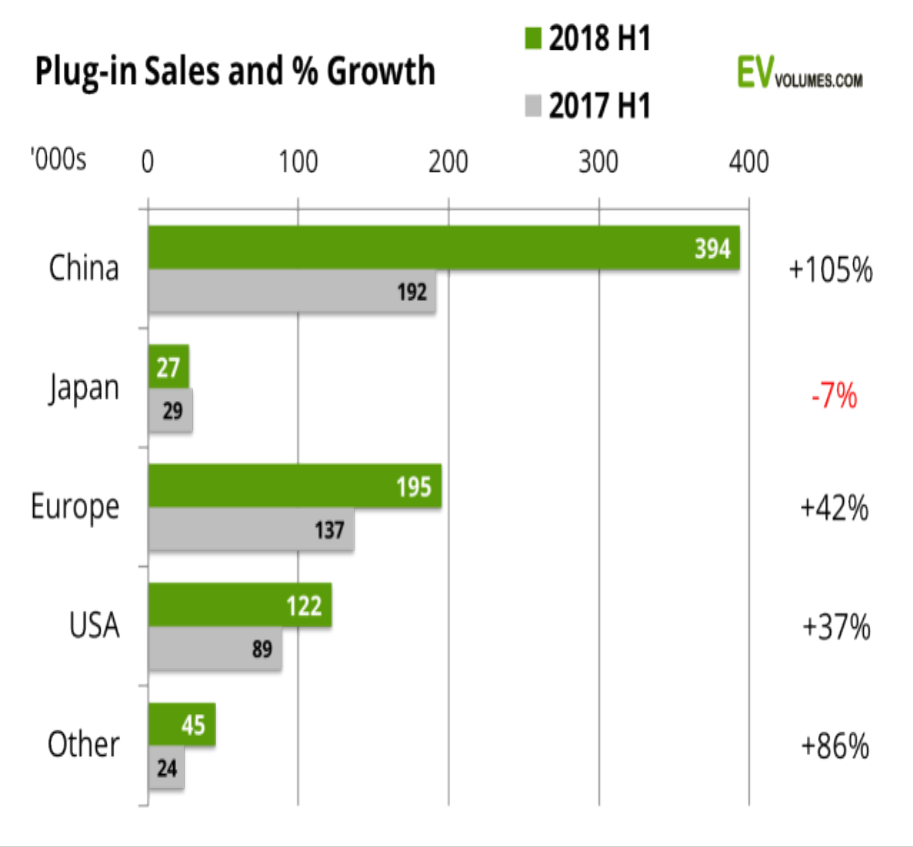
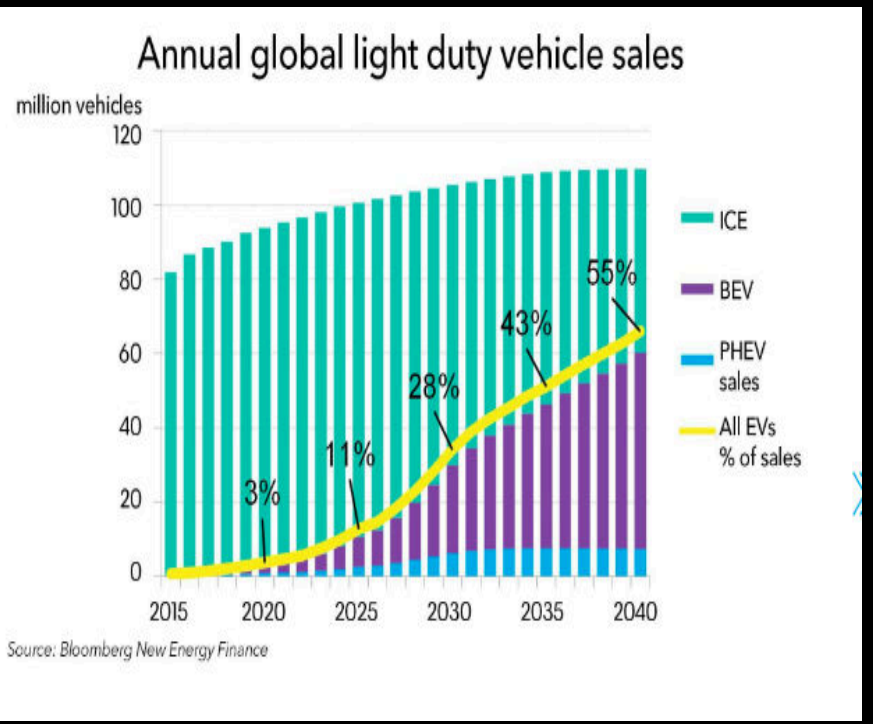
EV sales for personal cars + Electric buses





Source: http://www.ev-volumes.com/country/total-world-plug-in-vehicle-volumes/

Why it is starting?

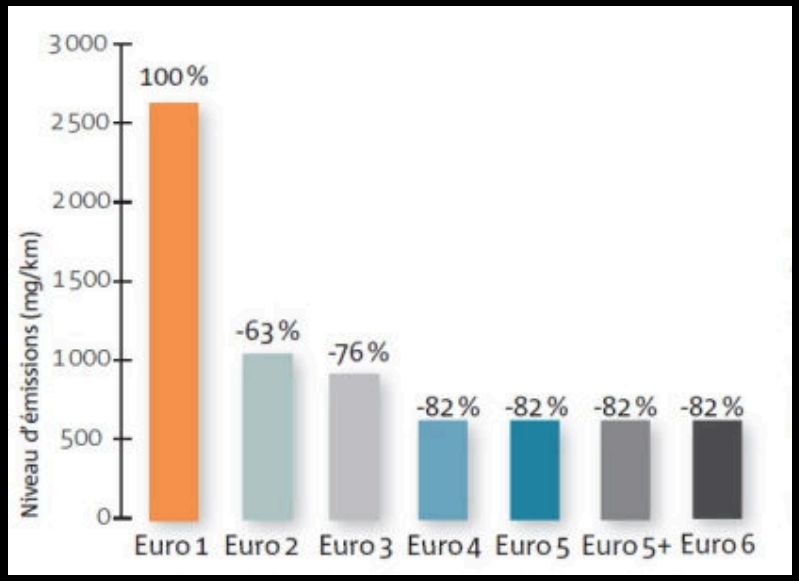
Public action: Sticks and Carrots

Range anxiety decrease

Basic infrastructures exist

Sticks and carrots

Sticks: Banning policies @ local level+ emission reductions for cars



Carrorts

- Public subsidies
  - EV PHEV selling subsidies (State level + local)
  - Charging infrastructure subsidies
  - R&D subsidies

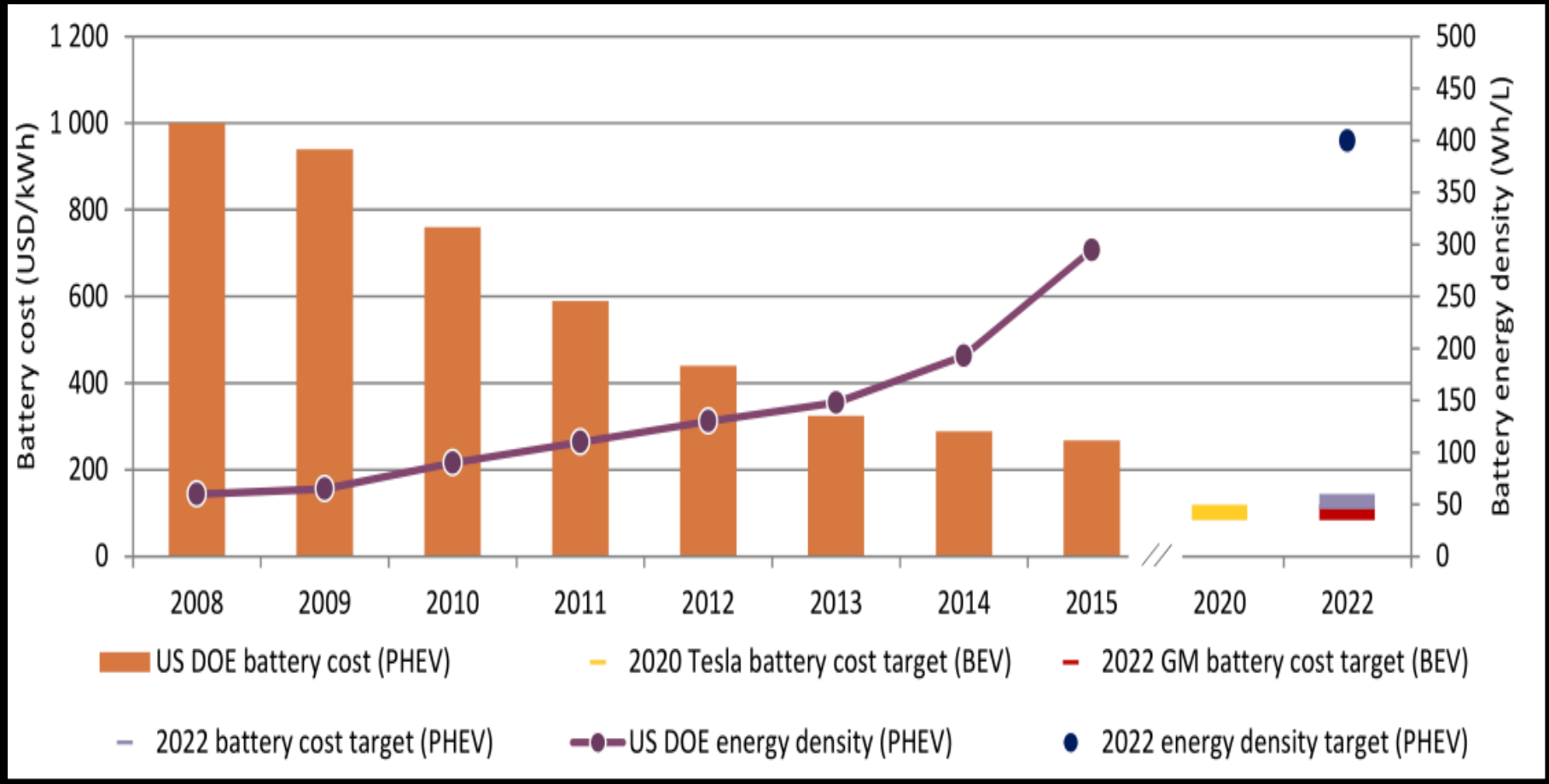
Why it is starting?

Public Subsidies

Range anxiety decrease

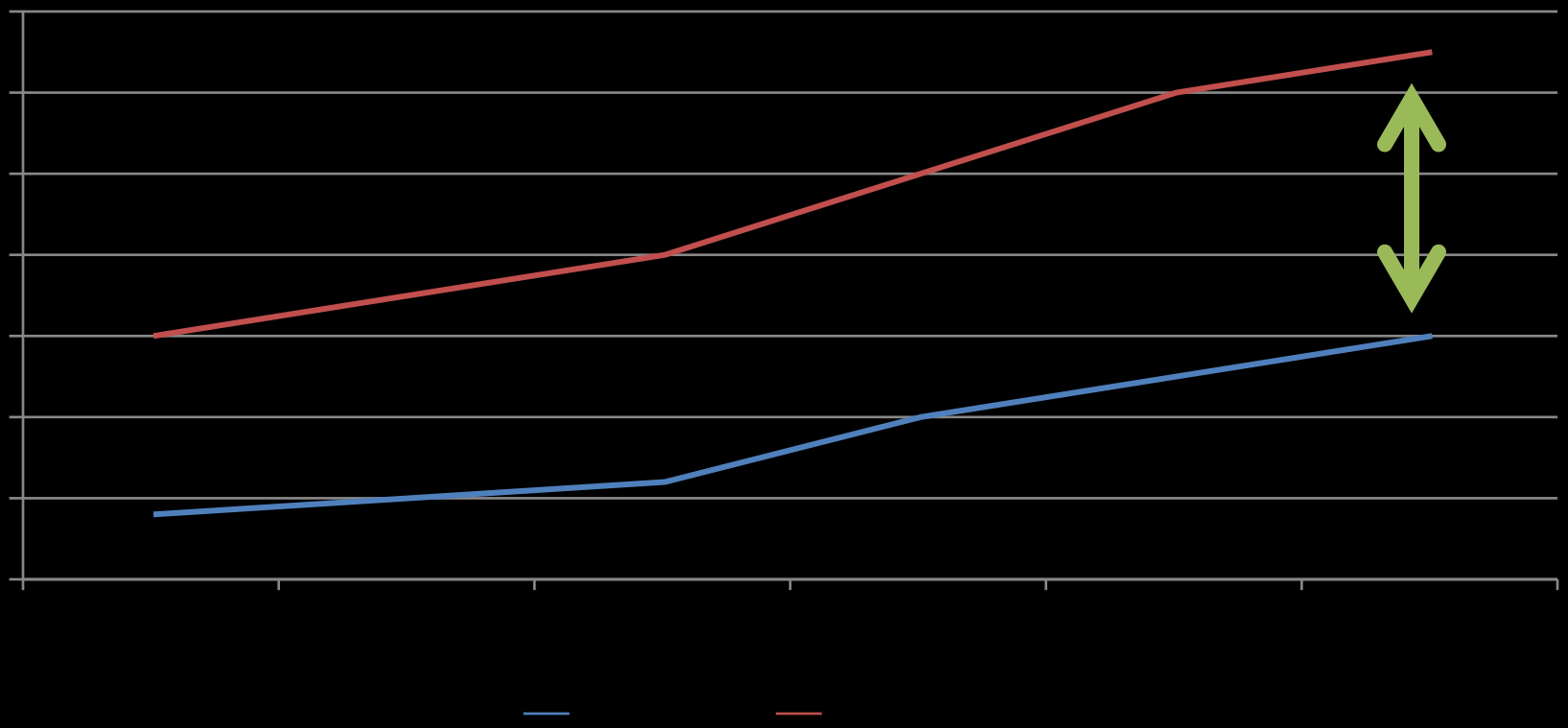
Basic charging infrastructures exist

EVs enjoy a Double dynamic: Increase in ENERGY DENSITY & decrease of COST



Source: IEA Global EV Outlook 2016

Less costs => More capacity / car => less range anxiety

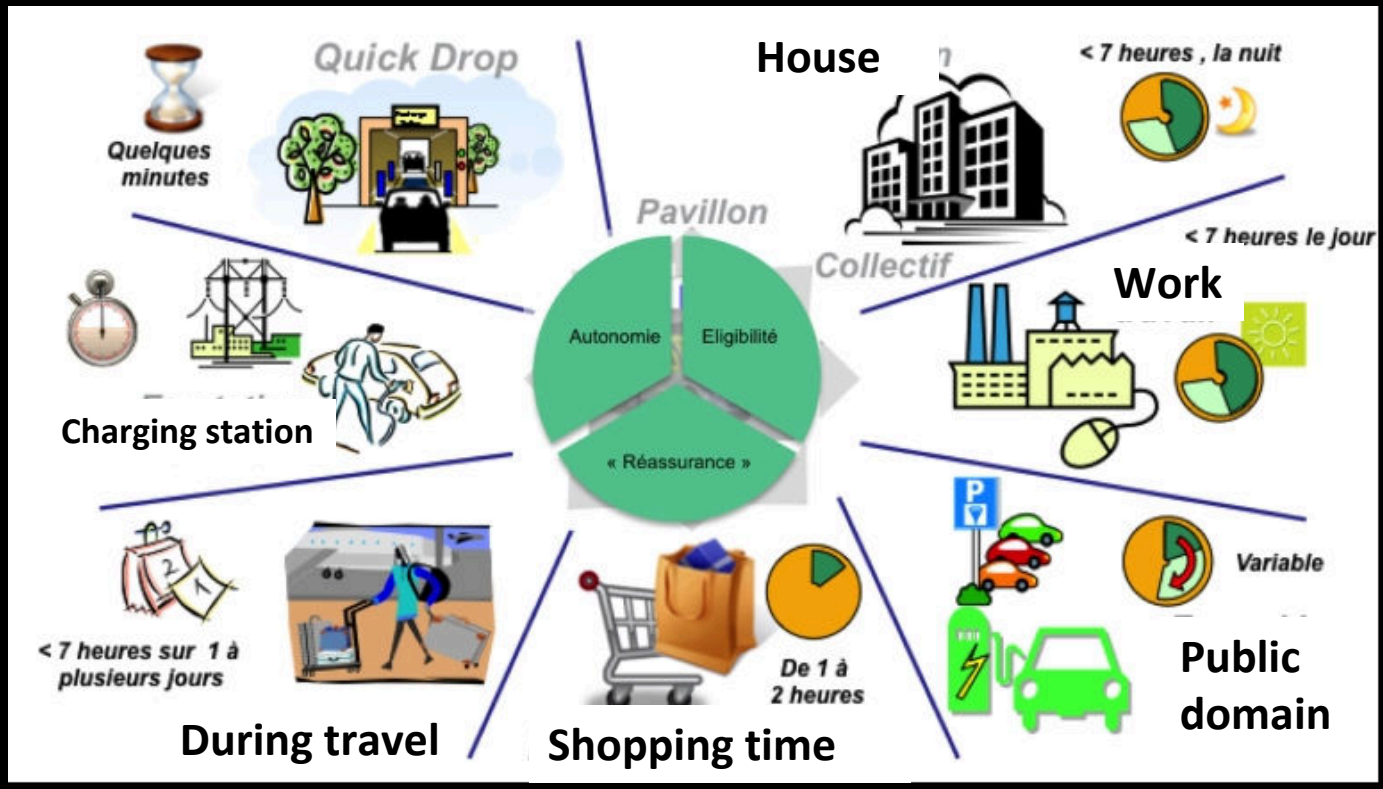


After 2020 = Cost reduction will normaly used to reduce the cost of the EVs

Switching from « range anxiety » to « charging anxiety »

Where and when I can charge?

Minimum charging infrastructures allows to start equipment



7 logical options to charge but 95% of the charging is made at home
but a lot seems to be needed elsewhere to secure the EV buyer

Business models and Data to “explore” for infrastructure charging deployment

Place Characteristics	Home	Work	Fast charge	Tesla Supercharger Charging stations	Ionity Charging stations
Power	3-7 kW	3-22kW	22-50 kW	50-150 kW	350 kW
Time to charge	8-24h	1-3h	40 min 200km	30 min 400km	20 min 500 km
Usages	Commuting trips	Commuting trips	All usages	All usages	All usages
Investment cost per charger	200-500€	500-3k€	15k€-25k€	35-60k€	?
Cost of recharge	2-3€/ 100 km	4€	5 -7€	10-15€	50-80€

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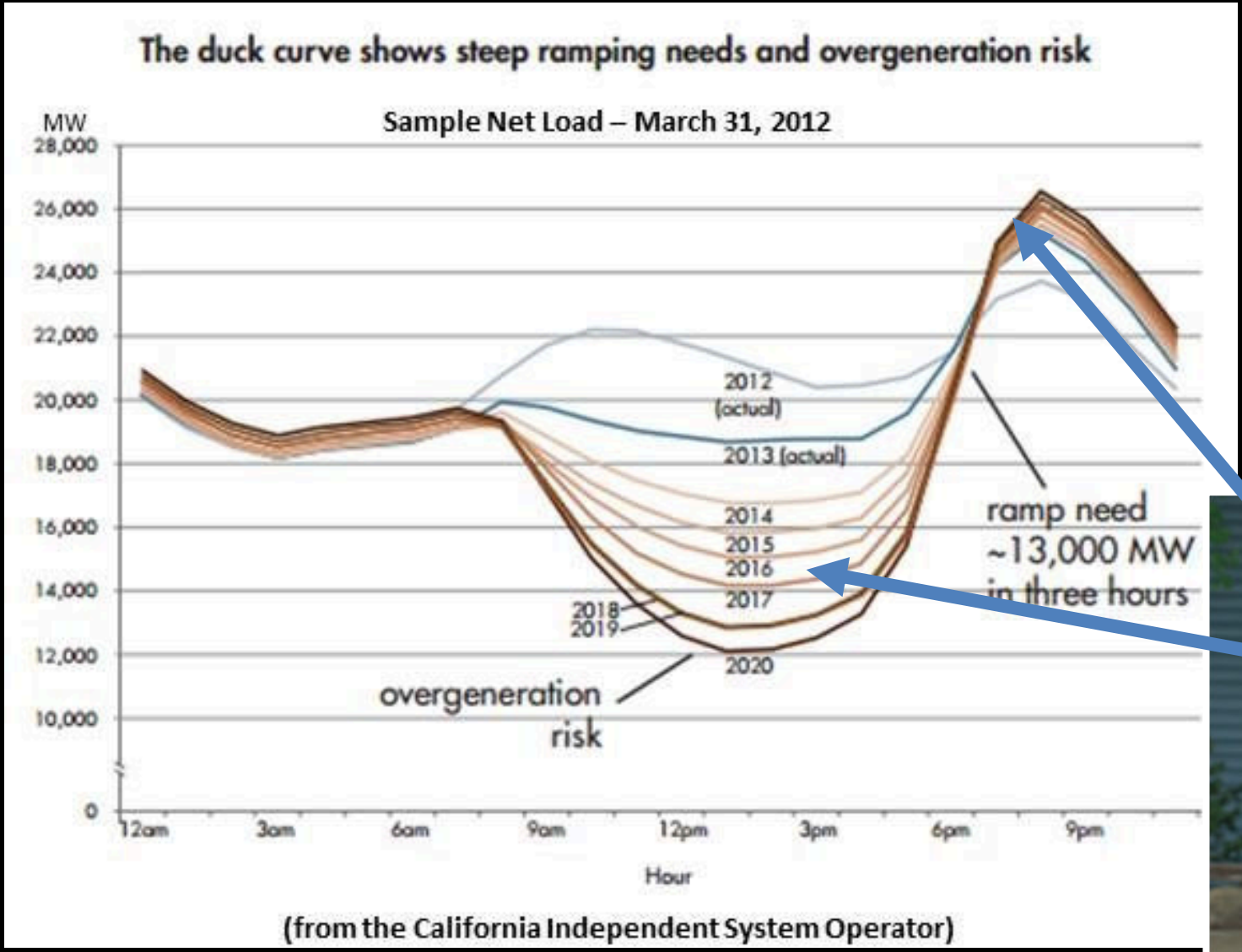
Why is it promising for TSO?

EV killing duck curve?



Problem… Rules are inadapted

Renewable and Sustainable Energy Reviews 81 (2018) 605–614

Contents lists available at ScienceDirect

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Barriers to entry in frequency-regulation services markets: Review of the status quo and options for improvements

Olivier Borne[a,1], Klaas Korte[b], Yannick Perez[c,d,*,1], Marc Petit[a,1], Alexandra Purkus[b]

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[b] Department of Economics, Helm holtz Centre for Environmental Research – UFZ, Permoserstr. 15, 04318 Leipzig, Germany
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Energy Policy 119 (2018) 140–148

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Market integration or bids granularity to enhance flexibility provision by batteries of electric vehicles

Olivier Borne[a,*], Yannick Perez[b], Marc Petit[a]

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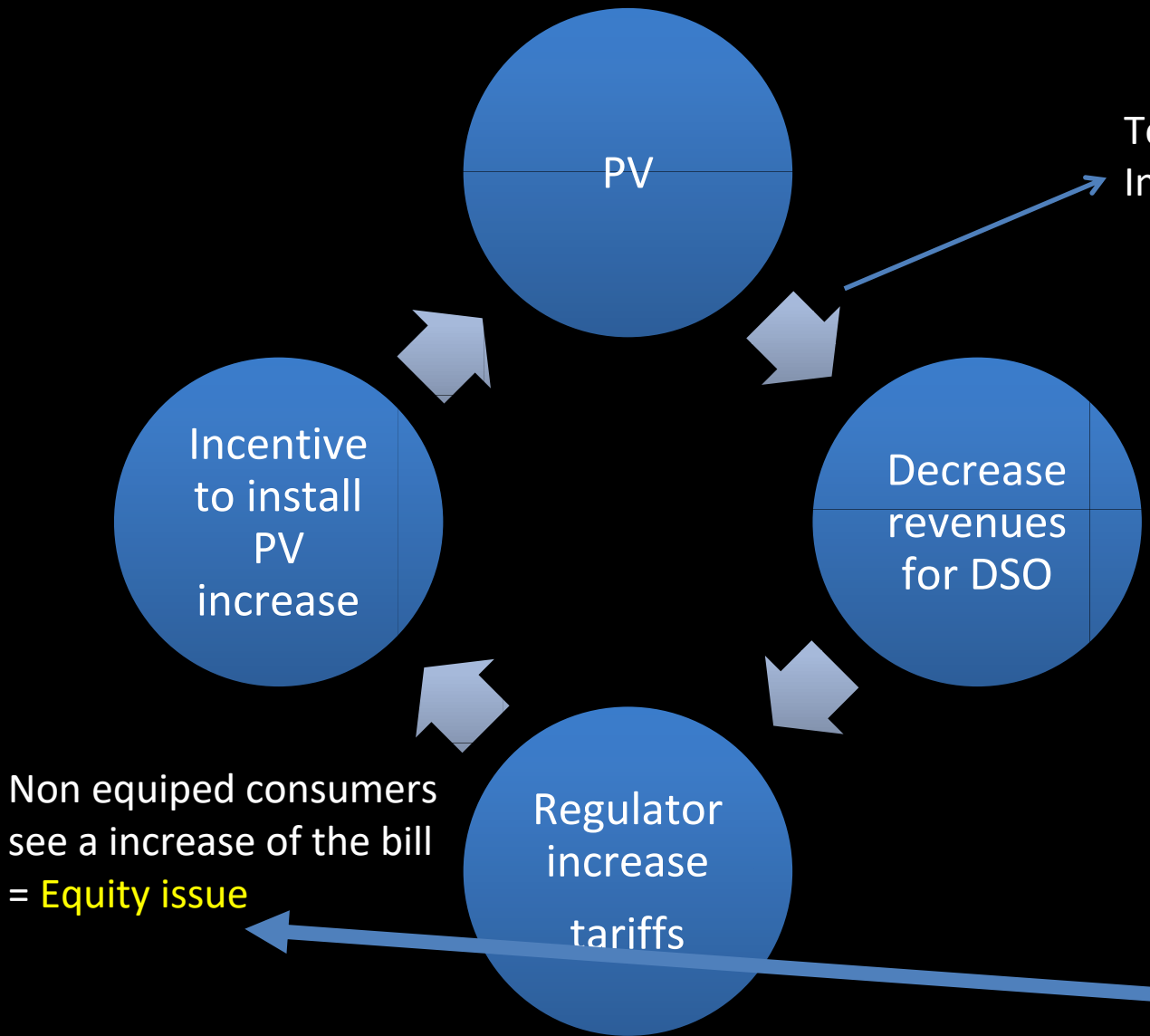
[b] RITM Université Paris-Sud, and LGI, CentraleSupélec, 91192 Gif-sur-Yvette, France

Why is it promising for DSO?

EV solving « Death Spiral » for DSO revenues?



Total costs of the system Increase = Efficiency issue

Non equiped consumers see a increase of the bill = Equity issue

Network tariffs need to be redesigned for **decentralised storage solutions**

But how?

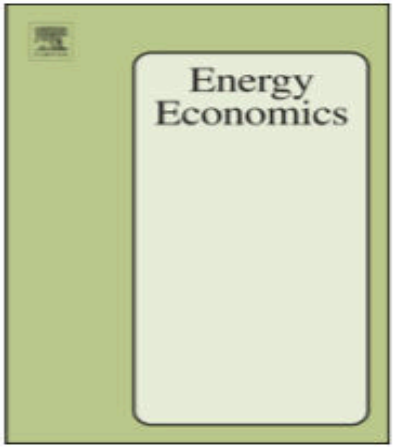
Not an easy question

Network tariff design with distributed energy resources and electric vehicles

Quentin Hoarau[a,b,*], Yannick Perez[a,c]

[a] *RITM, Université Paris-Sud, Faculté Jean Monnet, 54 Boulevard Desgranges, 92330 Sceaux, France.*
[b] *Climate Economics Chair, Palais Brongniart, 28 Place de la Bourse, 75002 Paris, France.*
[c] *LGI, CentraleSupélec, 91190 Gif-sur-Yvette, France*

Accepted Manuscript



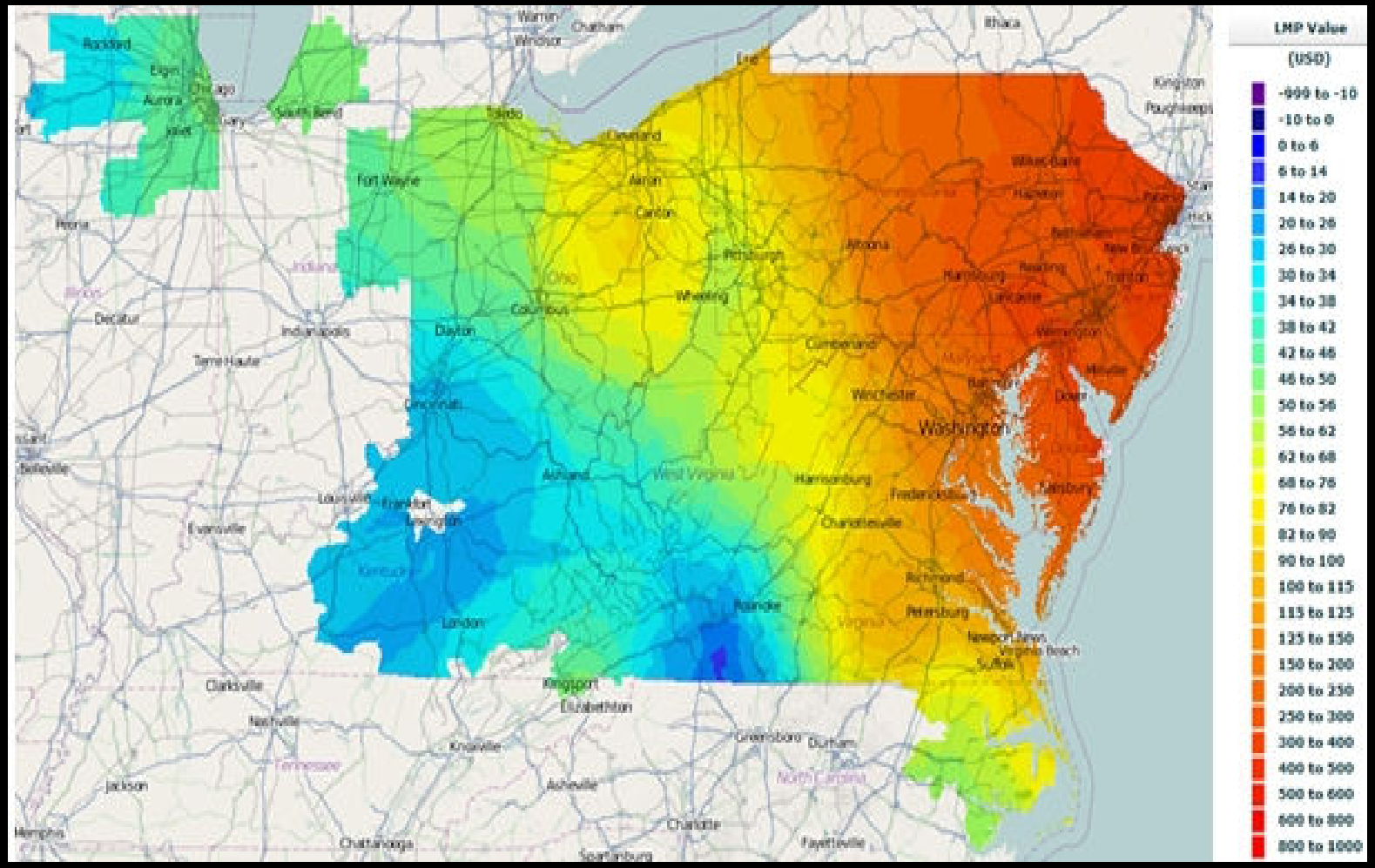
Future-proof tariff design: Recovering sunk grid costs in a world where consumers are pushing back

Tim Schittekatte, Ilan Momber, Leonardo Meeus

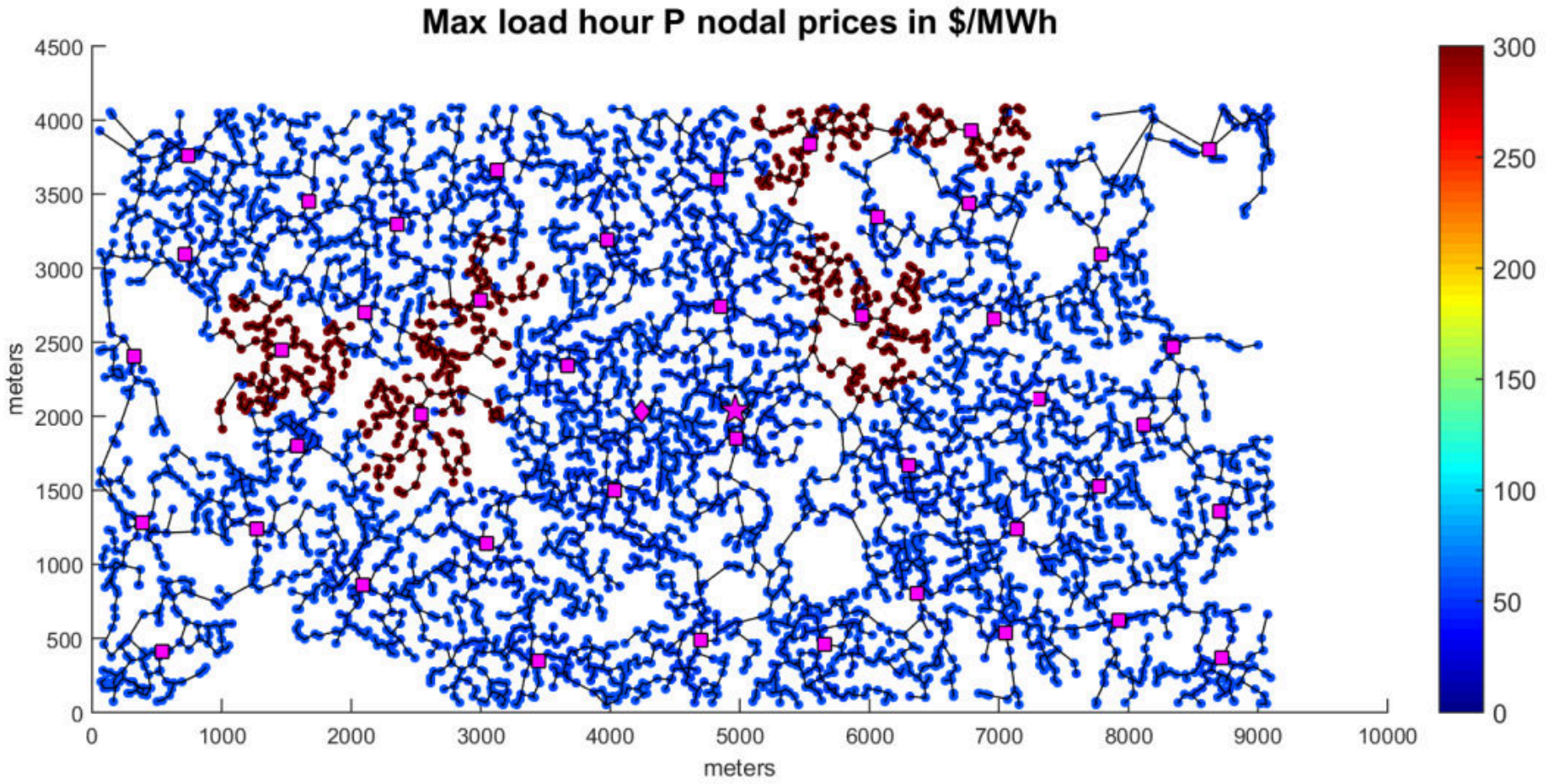
PII: S0140-9883(18)30036-7
DOI: https://doi.org/10.1016/j.eneco.2018.01.028
Reference: ENEECO 3902

Ideally Tariffs need to be :
Decentralized –
Time consistent -
Market based –
Transparent –
for charging-discharging

Existing at the Transport level for Energy



Simulation results for PJM



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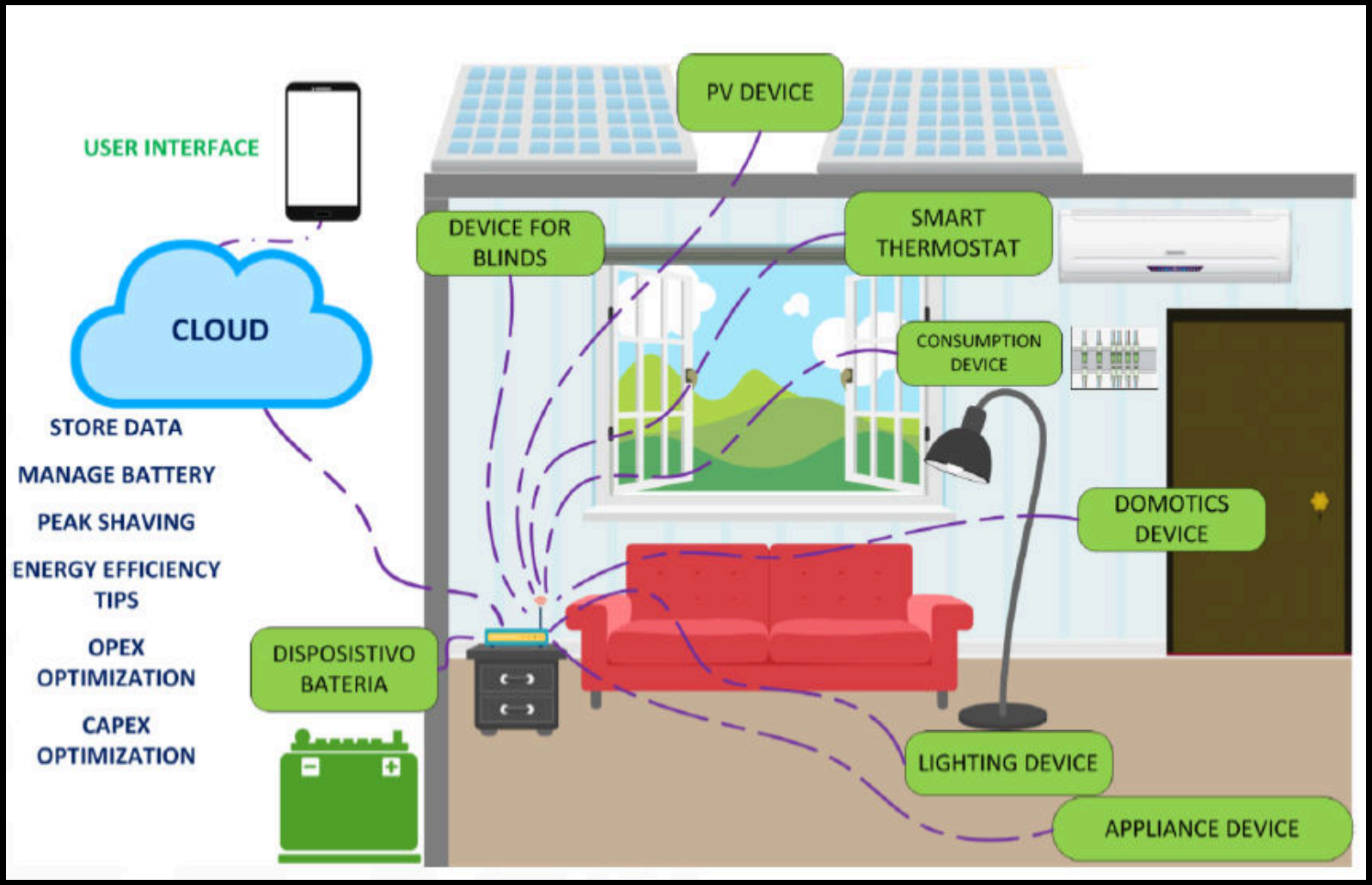
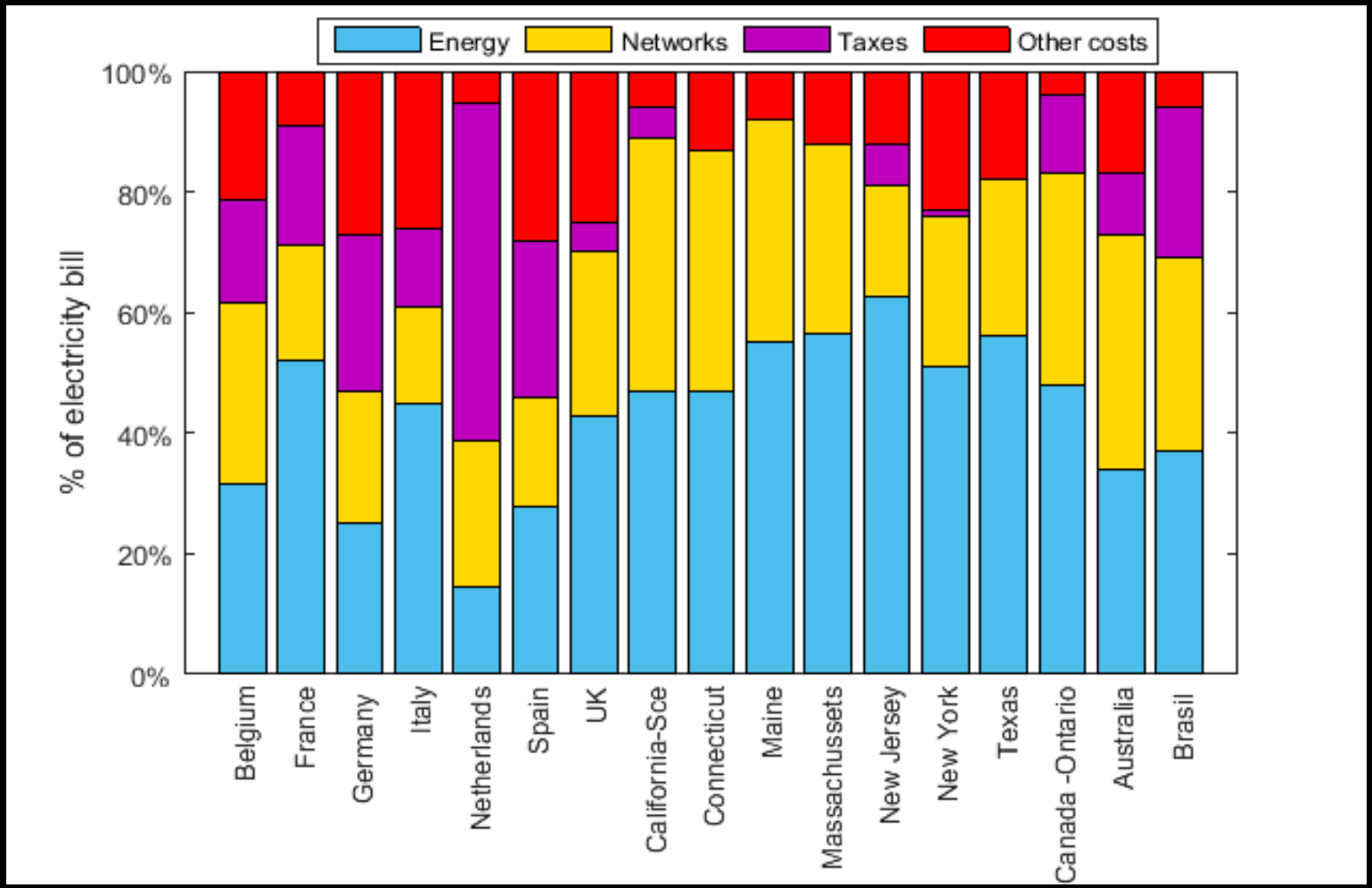
EVs reduce opex of Building / house by savings

Connexion charge (W) and Consumption (Wh)



Empowering consumers
Off grid, cutting taxes, networks charges…

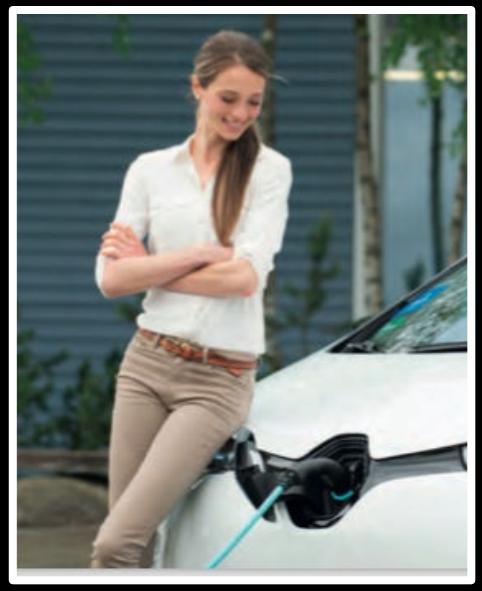
Energy-Networks-taxes-other “costs” => looking for savings with “Behind the meter solutions”



Breakdown of residential electricity bills in different jurisdictions in 2014-2015

Conclusions

Who EVs are going to help?



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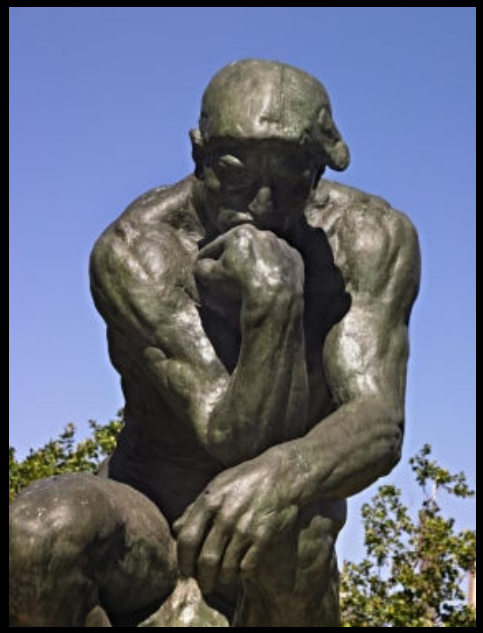

Energy Markets / grids / Behind the meter uses?

Depends on local Energy regulators decisions…

1. Energy market for EV: Need to change the rules
2. Vehicle to Transmission grid : Need to change the rules
3. Vehicle to Distribution grid : Need to change the rules

1. Vehicle to buildings = VtoB : Out of regulators scope
2. Vehicle to Home = VtoH : Out of regulators scope
3. Vehicle to Load = VtoL: Out of regulators scope

To help this process Florence School of Regulation will open soon an Electromobility Area
We are looking for sponsors !

Selected Literature

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