Next steps for energy systems integration

10:00am	Welcome and introduction Agora Energiewende and International Energy Agency (IEA)
Part 1	
10:05am	Global perspectives for energy systems integration Enrique Gutierrez Tavarez, Energy Analyst Electricity, IEA
10:20am	Case study: Transport sector transformation: integrating electric vehicles into Turkey's distribution grids Deger Saygin, Director, SHURA – Turkey
10:35am	Case study: Distribution grid planning for a successful energy transition – focus on electromobility Urs Maier, Senior Associate Energy and Infrastructure, Agora Verkehrswende
10:50am	Case study: Fleet charging patterns and impacts on distribution grids Nicole Thompson, Optimise Prime Consortium Lead and Innovation Director, Hitachi Vantara
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International
Energy Agency

Next steps for energy systems integration

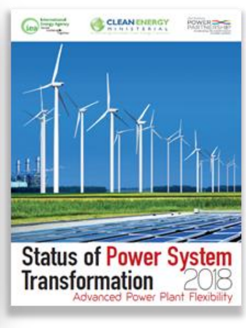
Power System Flexibility Campaign

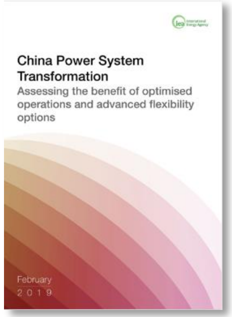
Enrique Gutierrez

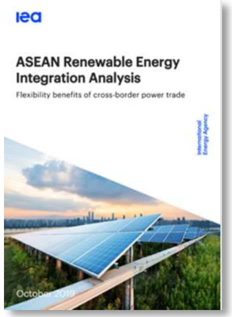
2nd April 2019

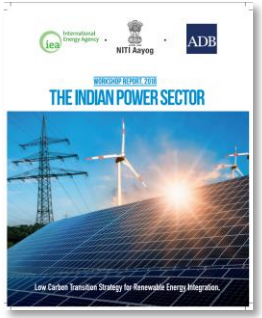
Activities on electricity and energy systems integration

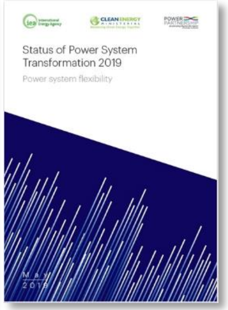
Integration work





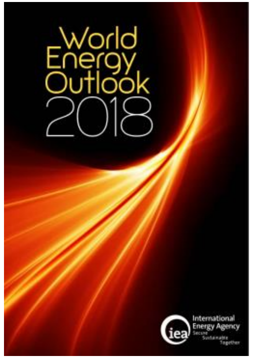


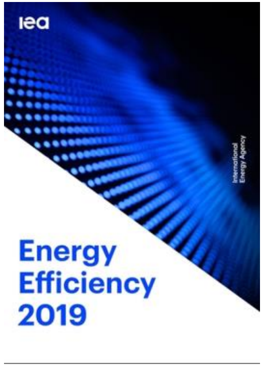


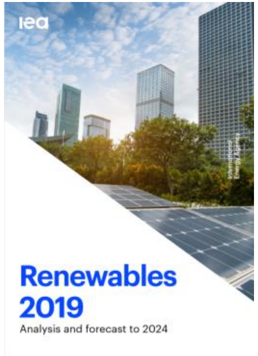


Special report on electricity security

Topical and special reports







The PSF Network

CLEAN ENERGY MINISTERIAL
Advancing Clean Energy Together

21st CENTURY POWER PARTNERSHIP
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

POWER SYSTEM FLEXIBILITY
A CAMPAIGN OF THE CLEAN ENERGY MINISTERIAL

MULTILATERAL SOLAR & WIND WORKING GROUP
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

Co-leads

CEM Members

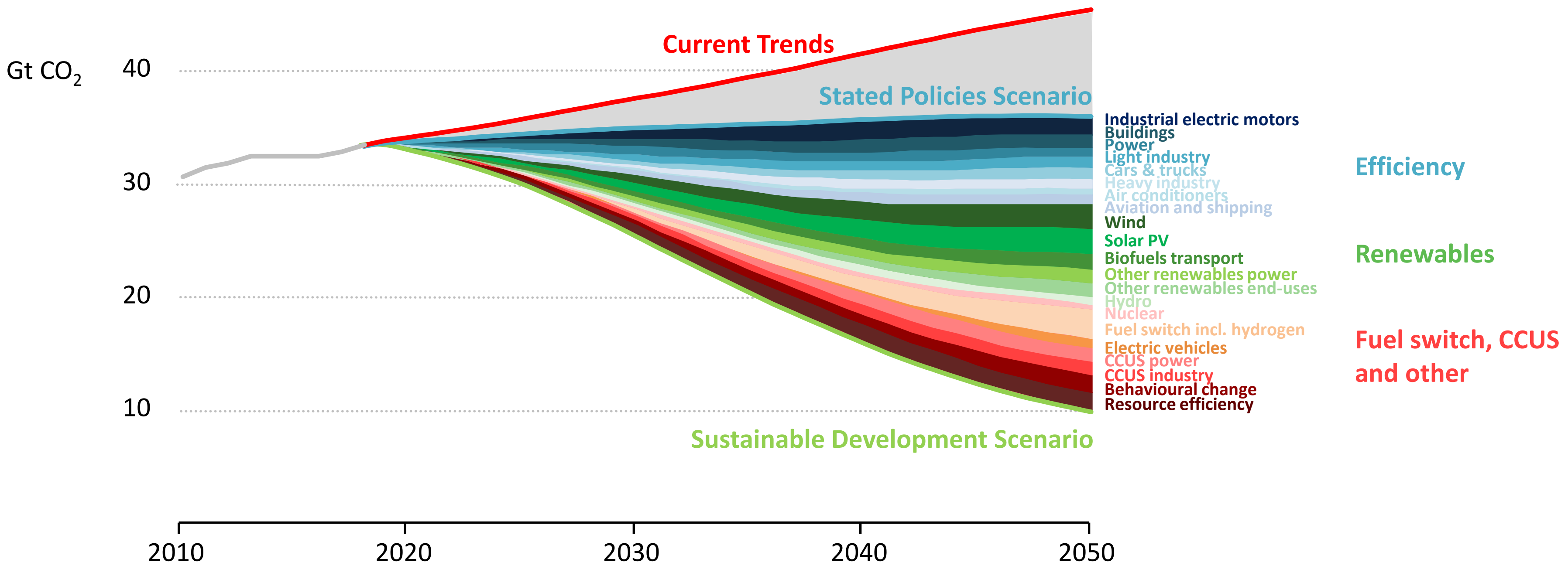
Non-government members

Agora Energiewende, chargepoint, COWI, EDF, ESMAP, epexspot, enel, ENERGINET, ENVISION, First Solar, Fraunhofer ISIT, NEW 4.0 Norddeutsche EnergieWende, GE, giz, J-POWER, KYUSHU ELECTRIC POWER CO.,INC., MHPS, NEXT KRAFTWERKE, Ørsted, REstore, RSE, Senfal, SIEMENS, UK Power Networks, Vestas, VGB POWERTECH

iea

No single or simple solutions to reach sustainable energy goals

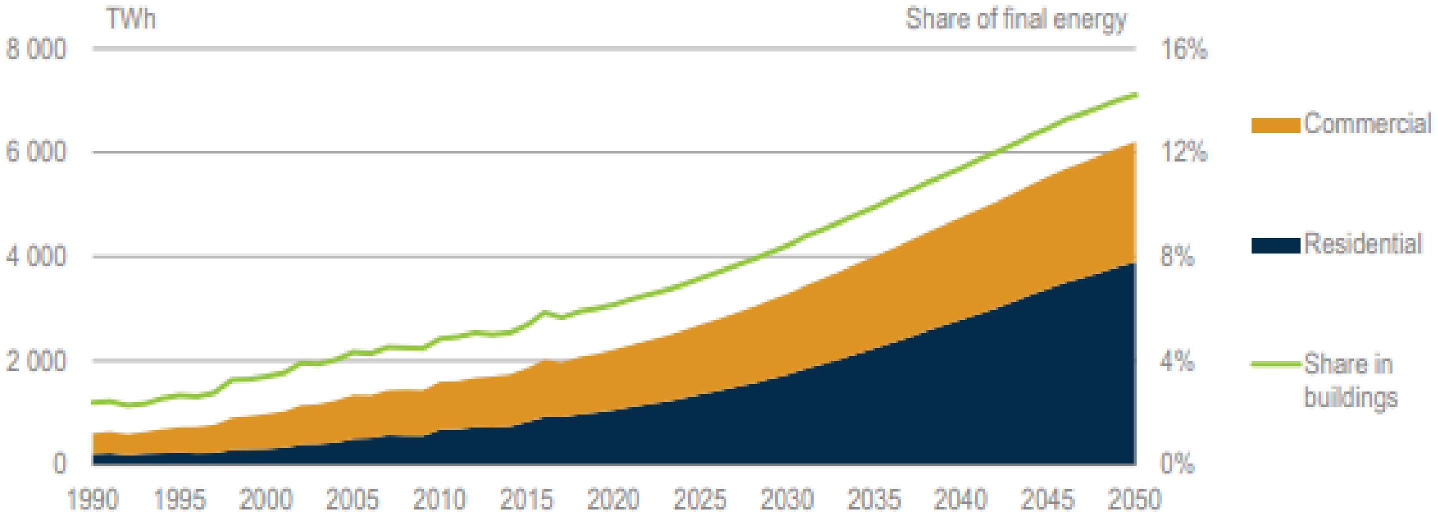
Energy-related CO_2 emissions and reductions in the Sustainable Development Scenario by source



A host of policies and technologies will be needed across every sector to keep climate targets within reach, and further technology innovation will be essential to aid the pursuit of a 1.5°C stabilisation

Space cooling is a key driver for future electricity demand

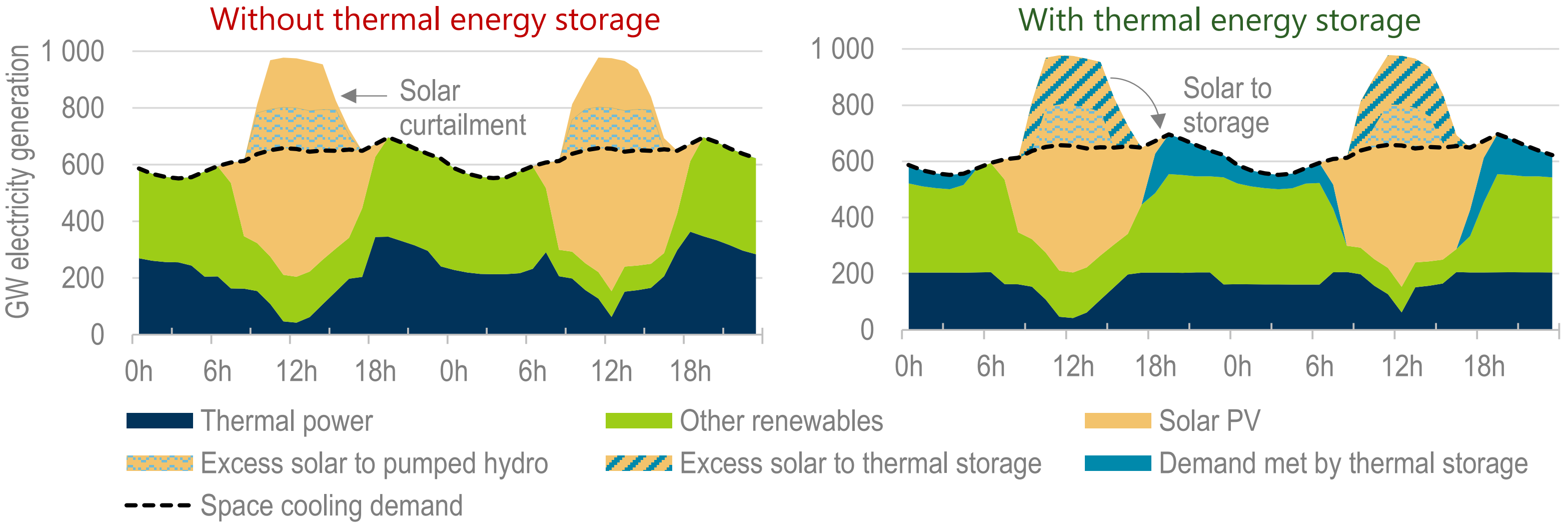
World energy use by space cooling by sector in baseline scenario



On current trends, energy needs for space cooling – almost entirely in the form of electricity – will more than triple between 2016 and 2050, driven mainly by residential cooling

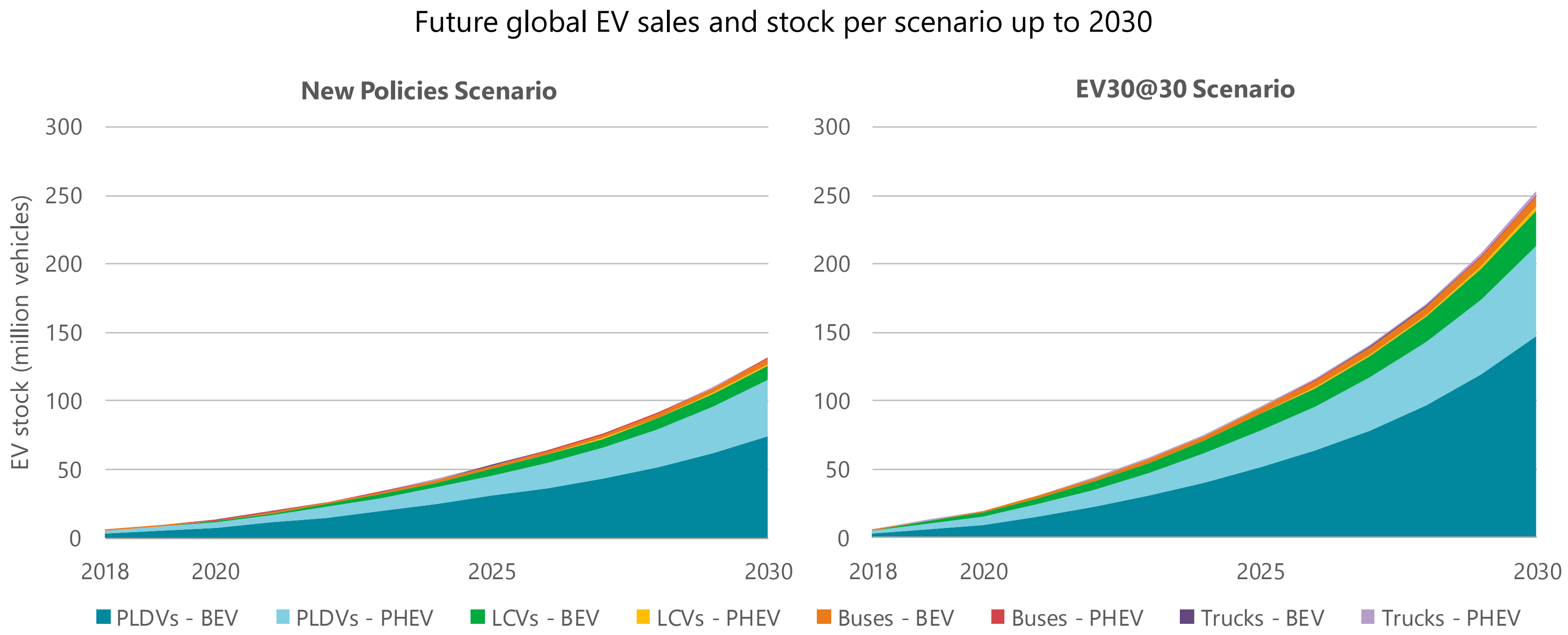
Space cooling as a window of opportunity

Case study from the Future of Cooling showed the benefit of district cooling with thermal storage to cost effectively meet this demand



Renewables can meet almost two-thirds of the global increase in capacity needs for space cooling to 2050. This will require matching VRE profiles with space cooling loads.

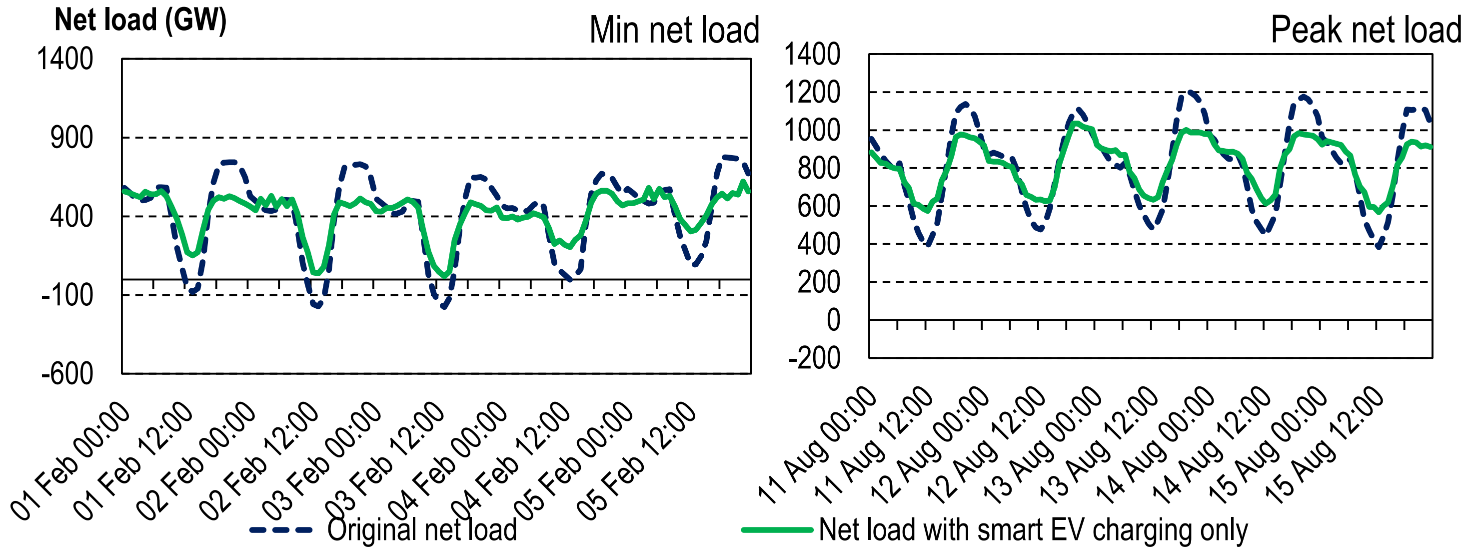
EVs potential = managed increase in electricity demand



Electricity demand from EVs is expected to reach 640TWhs in 2030 in NPS scenario. 1100 TWh in the EV30@30. Slow chargers which can provide power system flexibility will account for 60% of this.

EV demand shaping can contribute to reduce peaks and integrate VRE

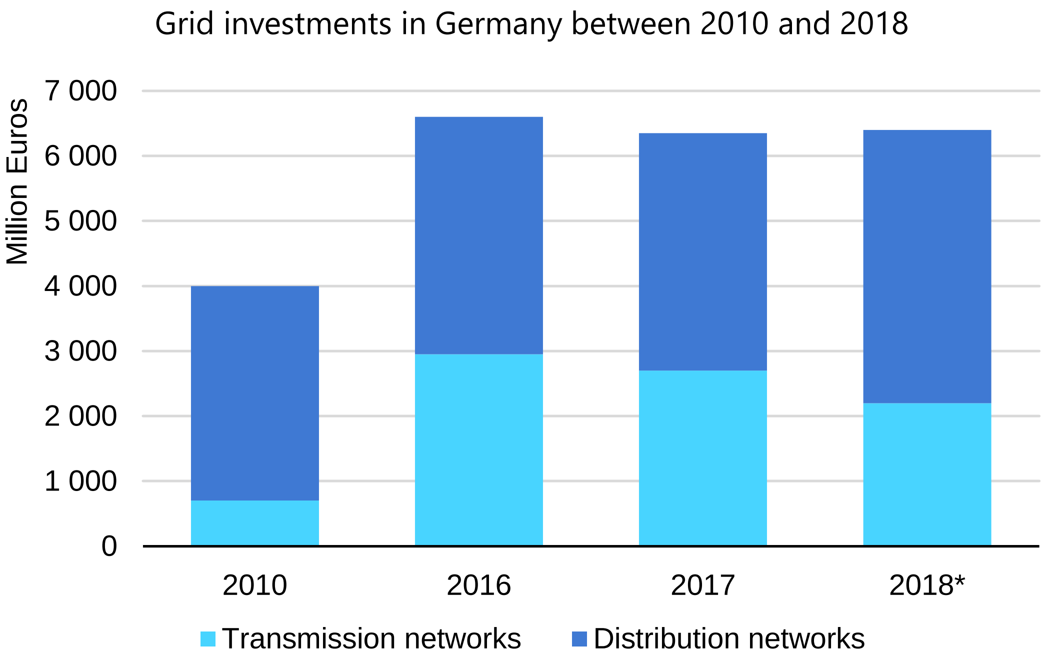
Case study from China Power System transformation report: Modelling SDS for China in 2035

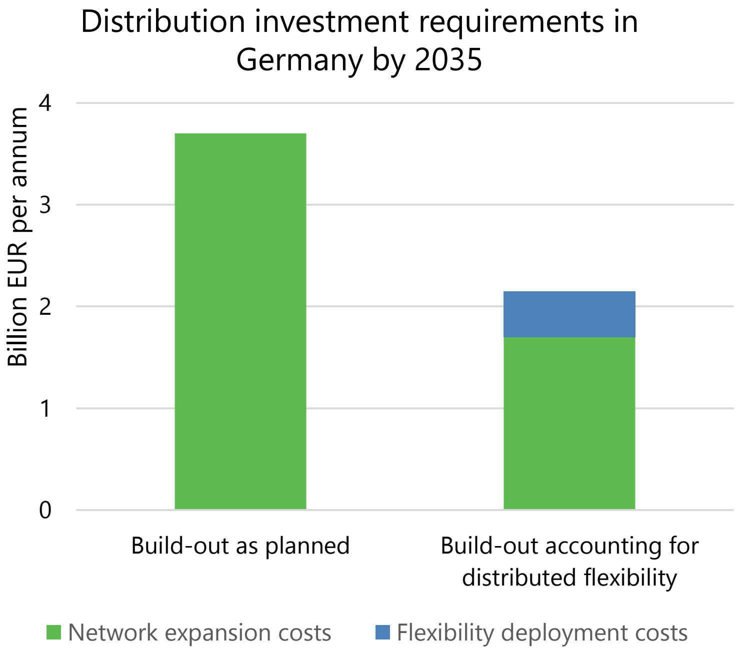


Impact of smart charging to peak load: -165GW (14% of the original load)

Electric mobility has great potential for integrating renewable energy, but only if charging patterns are optimised. This calls for much closer inter-sectoral policy coordination

EV deployment highlights the local value of flexibility





Sources: (Left) BMWi (Right) E-Bridge (2019)

Deploying flexibility from distributed resources can result in significant long-term savings if accounted in long-term resource planning

Improved understanding of mobility needs is key

Category	Charging type	Charging time	Utilisation
Small private cars	Home, Destination, Workplace	Any	Regular but low consumption
Higher performance private cars	Destination, fast-charging	Any	Regular with emphasis on high demand
Mobility fleets	Hubs, Depot, Home	Any	Frequent and very high
Service fleets	Hubs, Depot, Home	Night-time	Frequent and medium
Public transport	Depot	Night-time	Frequent and very high

?

Charging location
Home charging
Street charging
Workplace charging
Hubs
Return to base
Highway / long-distance charging

Source: Adapted from Arup presentation at PSF 2020 workshop

Different mobility services come about with different charging patterns and infrastructure requirements

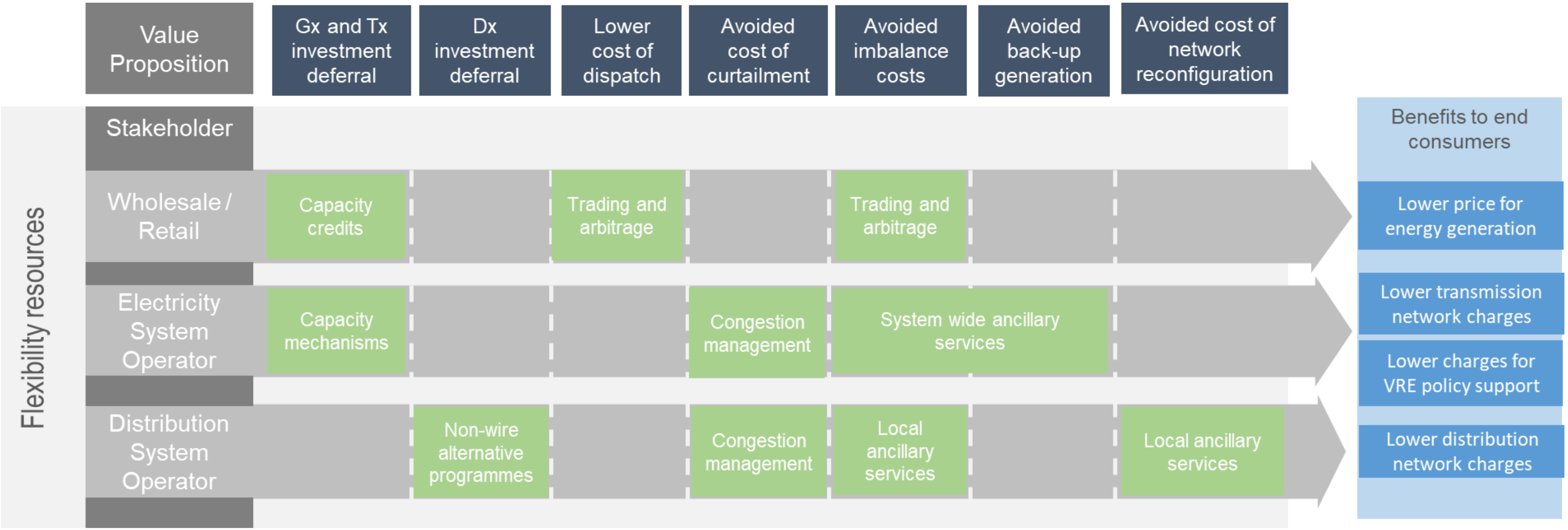
The choice of charging strategy matters

	Technical requirements	Policy requirements
1.- Unmanaged charging	Investments in generation and network capacity	
2.- Smart charging (V1G)	IT systems to monitor and manage speed of charging	Introduction of Time-of-use tariffs
3.- Aggregated smart charging	Interoperability of platforms and charging protocols	Aggregation and access to multiple markets
4.- Large-scale bidirectional (V2G) and smart charging	Wide-spread availability of V2G-enabled charging	Reviewing taxes and levies to avoid double taxation

The long-term impact (or contribution) of electrifying mobility will depend on policy choices today

EV, as other DERs, can contribute to various flexibility services

Illustrative sources of system value for flexibility resources



EVs can help balance the system but that's not their sole purpose. Opening market access can help uncover use-cases for cost-effective deployment

Key takeaways

- **There are different pathways for transport electrification**, all with specific impact and opportunities for power systems in transition
- **Local distribution systems are likely to face the greatest burden of EV integration**. This will require smarter regulation as well as taking steps to upscale lessons learnt from pilots.
- A **coordinated approach for charging infrastructure deployment and network development is key**, both through sufficient coverage of publicly accessible charging and identifying the match with mobility service demand
- **Synergies between EV deployment and VRE integration need to be assessed reasonably,** accounting for the priority of mobility needs over power system needs
- The multiple benefits of greater integration between transport and electricity will **require closer cooperation across authorities, planners, industry, OEMs and utilities**.