Moving to a Distribution System Operator (DSO)

Webinar

14 September 2017

Introductions

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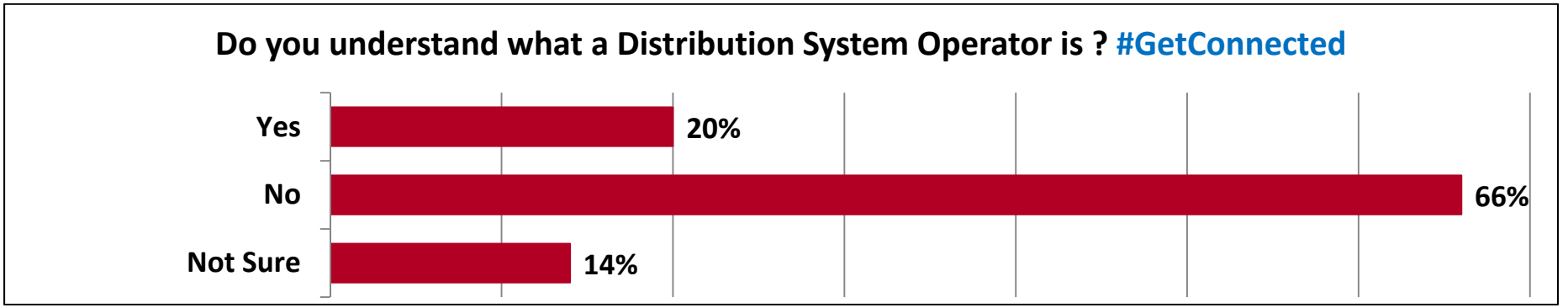
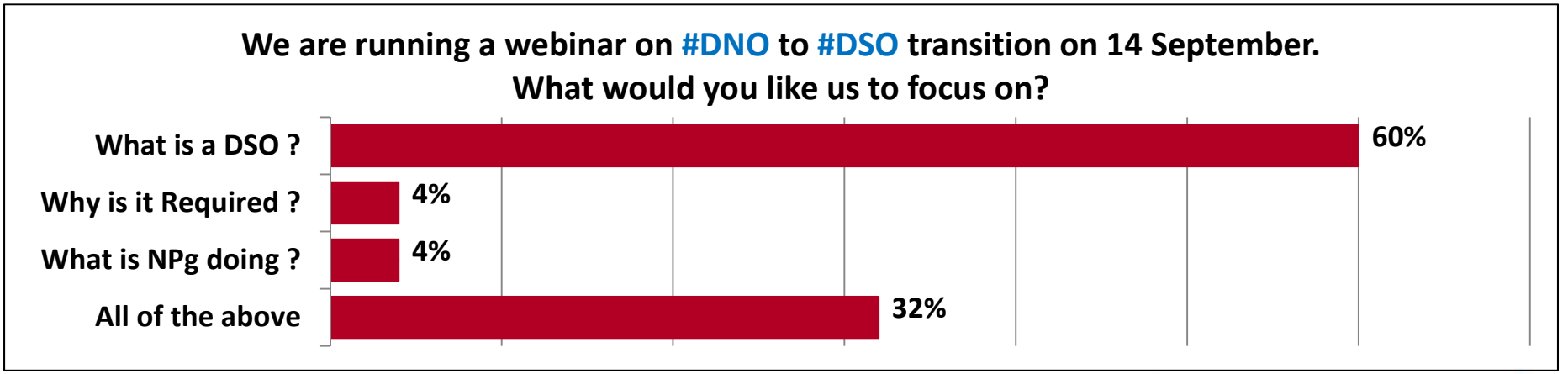
Objectives for this webinar

1. **Share our vision and plans for the transition to DSO** – *introducing more flexibility into the energy system.*
2. **Seek views on this way forward** – *an opportunity for you to engage and shape the direction of the work.*
3. **Provide a link to the Energy Networks Association Open Networks project** – *the primary channel for networks collaboration.*
4. **Meaningful dialogue with all stakeholders** – *clarifying often complex themes.*

Twitter Q&A Feedback – 6 September





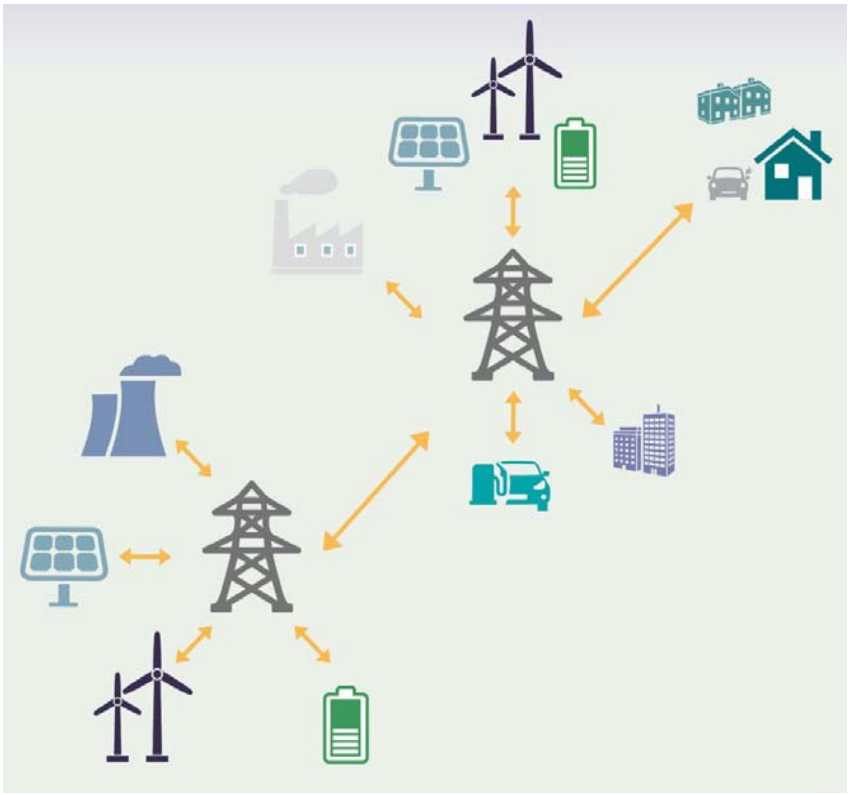
Structure for the webinar

- Drivers for DSO
- DSO definition
- Our DSO vision
- Our DSO activity
- ENA ‘Open Networks’ project
- Next steps
- Questions

Drivers for DSO

A changing system: the need for flexibility & smart solutions

- We are at a time of unprecedented change and uncertainty for the energy system.
- Government's energy policy is that we all need a smarter more flexible energy system.
- The scale of change taking place is already significant in some parts of our system and there is more to come.
- We should utilise flexible technologies instead of traditional reinforcement, including connecting more distribution energy resources (DERs).



Our world is changing fast

UK sets ambitious new 2030s carbon target

Solar panel costs predicted to fall 10% a year

Solar Is Going to Get Ridiculously Cheap

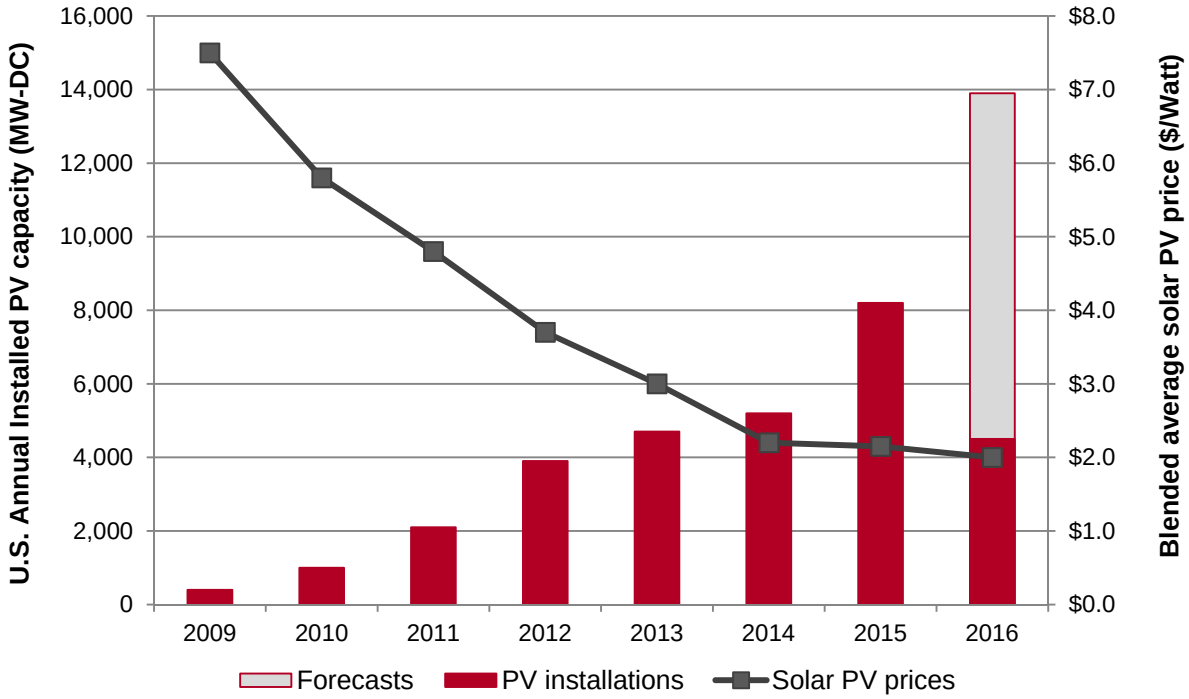
Capacity Market success evidence of 'crucial role' battery storage to play in UK grid

Electric cars will rule the future

Some 147 Gigawatts of renewable electricity came online in 2015 - the largest annual increase ever and as much as Africa's entire power generating capacity.

Renewable energy smashes global records in 2015

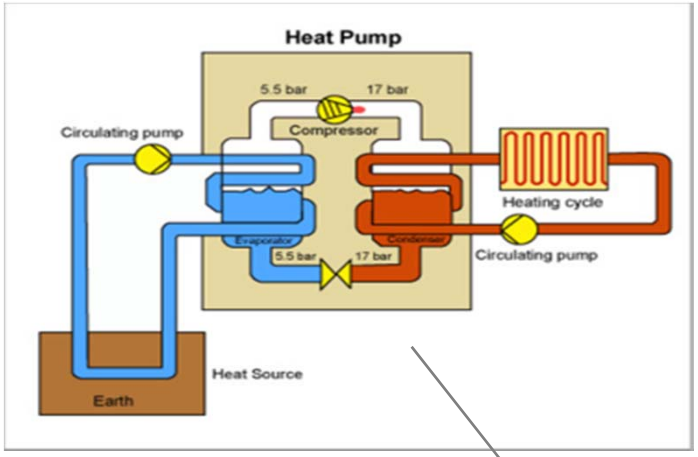
The rise of solar: a technology that has taken off



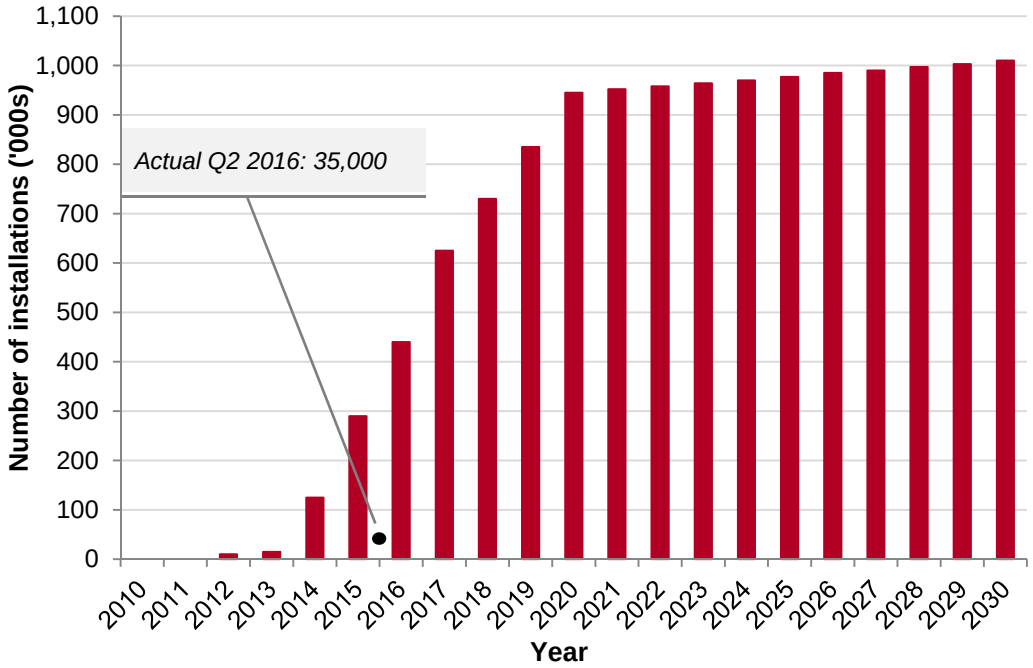
The cost to install solar has dropped by more than 60% over the last 10 years, leading to a rapid expansion and nearly 32GW of total solar capacity – enough to power 6.2 million homes

Source: SEIA research – solar industry data (http://www.seia.org/research-resources/solar-industry-data)

Heat pump deployment highly uncertain: a technology that has not (yet) taken off

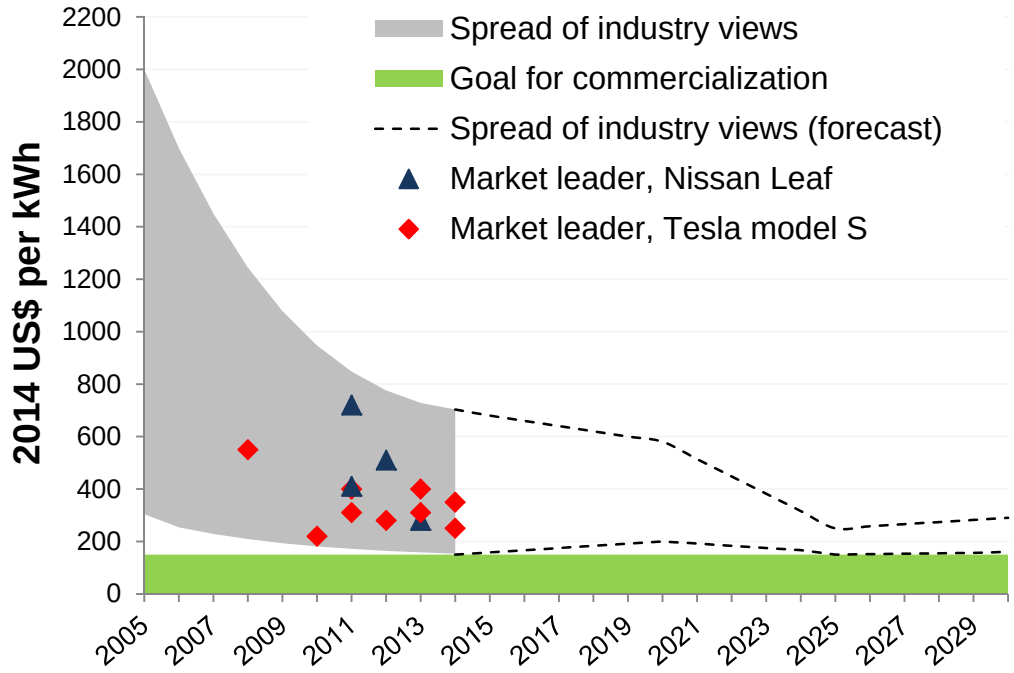


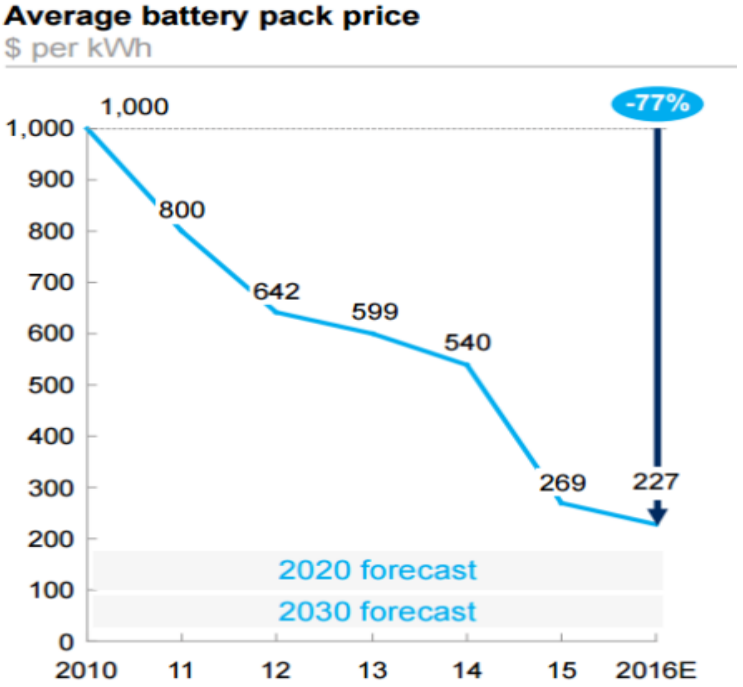
Typical load: 3kW
Impact on household demand: +1kW
Energy shifted to network: 9kW of heat



Source: Frontier Economics: Pathways to high penetrations of heat pumps Oct 2013, modified 2017

Falling cost of batteries is driving the roll-out of EVs and storage towards the mainstream (fast)

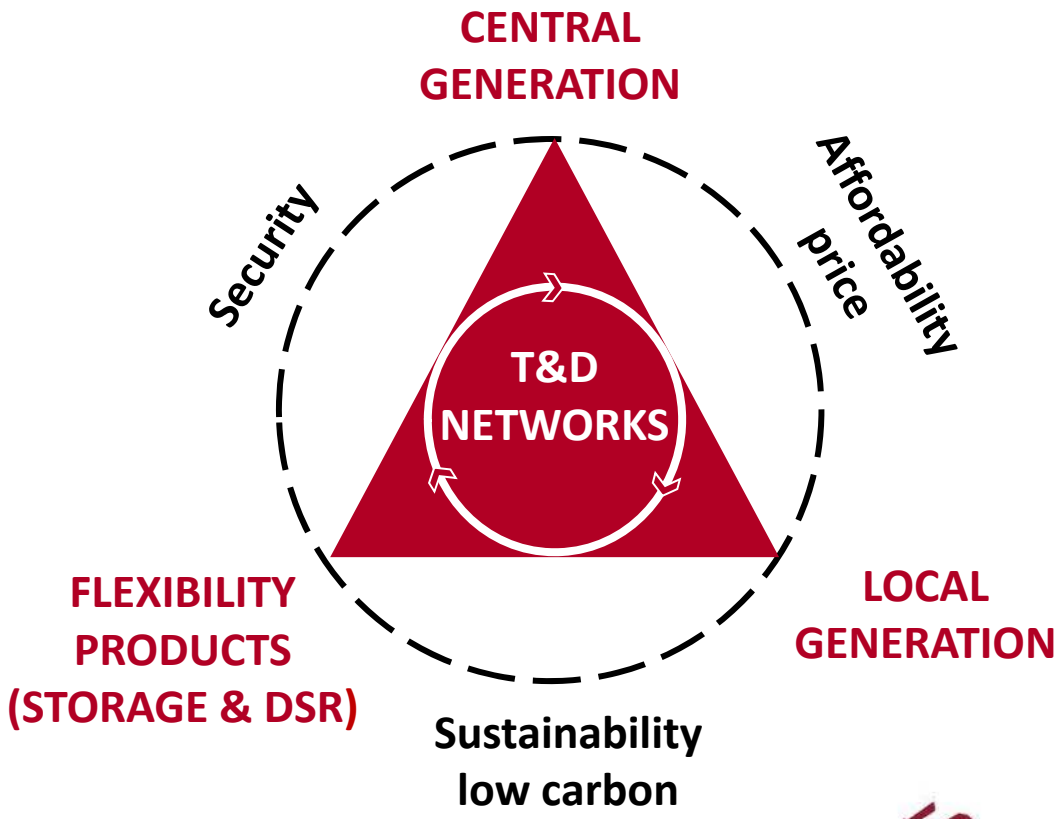




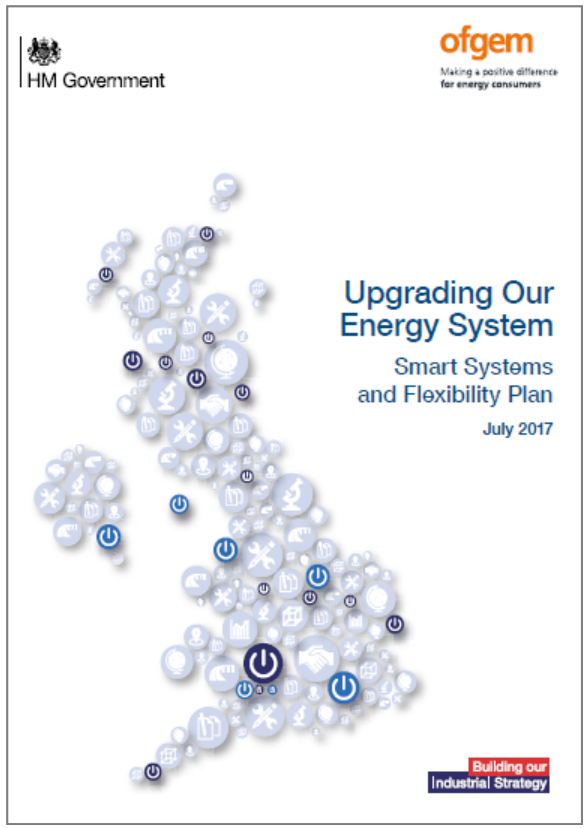
Source: https://electrek.co/

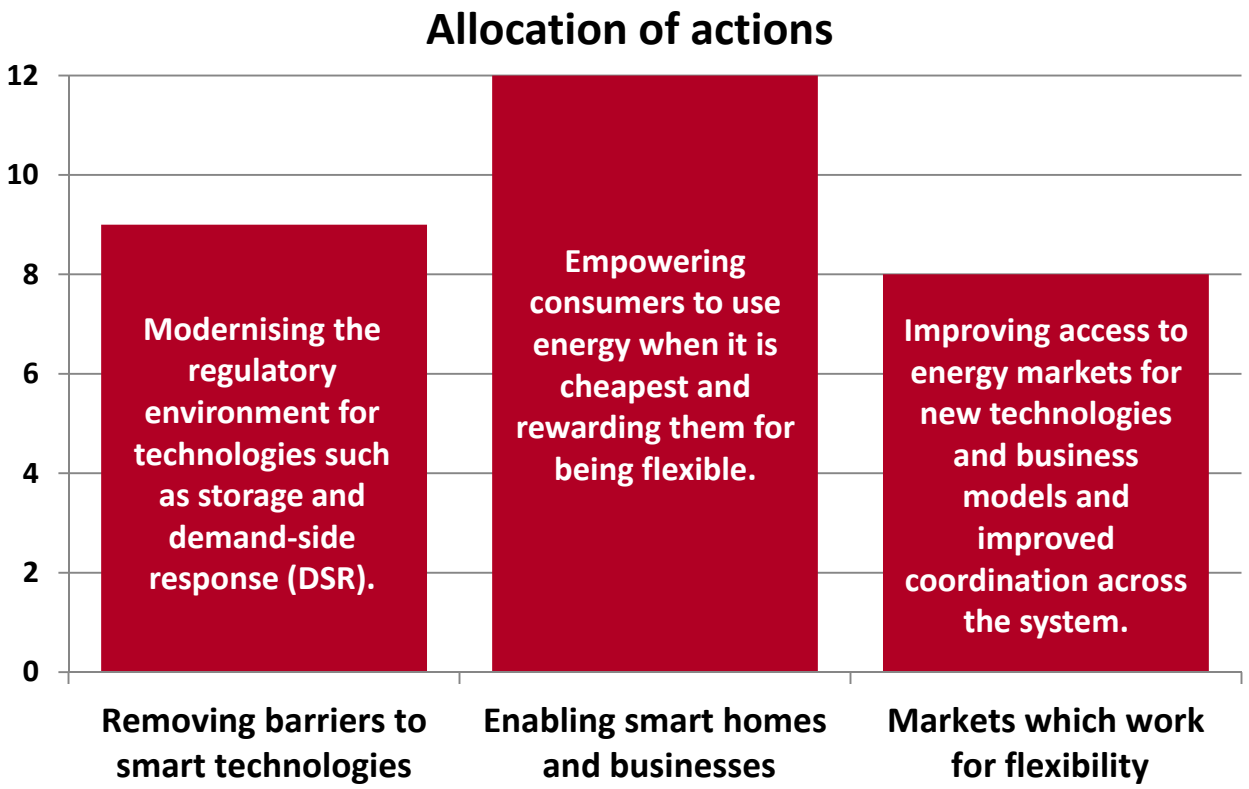
Source: *adapted from Björn Nykvist & Måns Nilsson - Rapidly falling costs of battery packs for electric vehicles (17 October 2014)* http://www.nature.com/nclimate/journal/v5/n4/full/nclimate2564.html

Networks taking centre stage



Smart Systems and Flexibility plan





https://www.ofgem.gov.uk/system/files/docs/2017/07/upgrading_our_energy_system_-_smart_systems_and_flexibility_plan.pdf

DSO Definition

Open Networks – definition of a DSO

- Securely operates and develops an ***active distribution system*** comprising networks, demand, generation and other flexible distributed energy resources (DER).

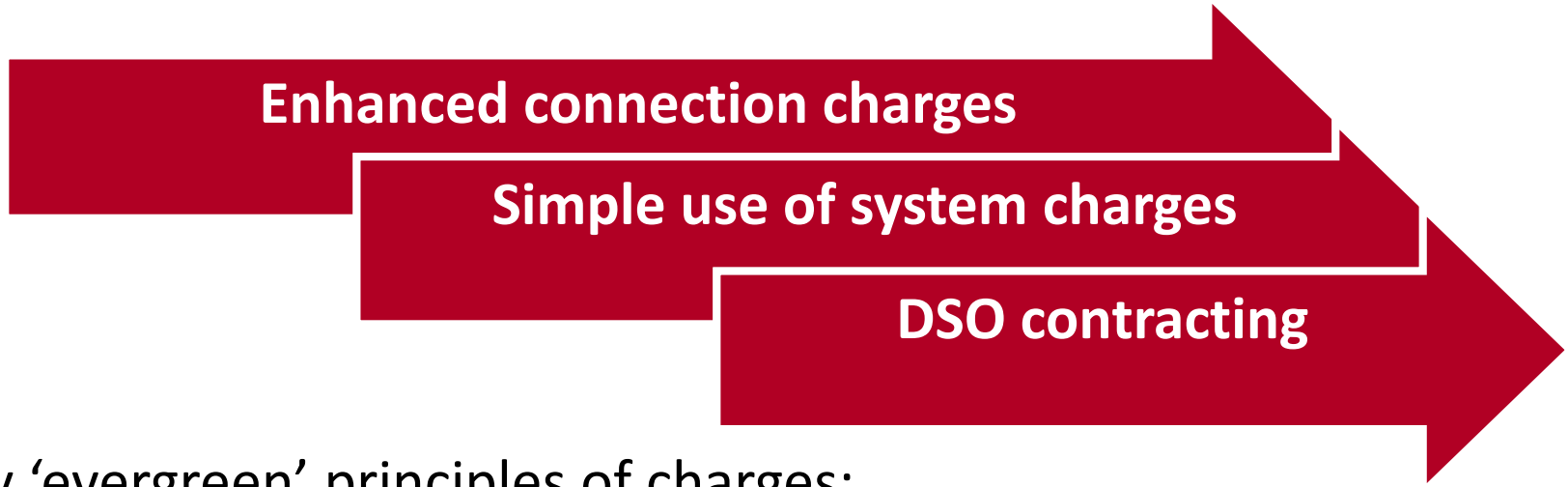
- Acts as a ***neutral facilitator of an open and accessible market***, enabling competitive access to markets and the optimal use of DER on distribution networks to deliver security, sustainability and affordability in the support of whole system optimisation.

- ***Enables customers*** to be both producers and consumers; enabling customer access, customer choice and great customer service.

DSO roles and responsibilities

1. Maintain distribution network resilience and security.
2. Support whole system stability.
3. Provide fair and cost-effective distribution network access.
4. Provide capacity in an efficient, economic, coordinated and timely manner.
5. Support whole system optimisation.
6. Enable and facilitate competition in energy markets.
7. Provide and maintain systems, processes and data to facilitate markets and services.

Changes coming to distribution charges



- Key ‘evergreen’ principles of charges:
  - **Cost-reflectivity** - give price signals to users of the network to encourage overall efficient behaviour.
  - **Cost-recovery** - ensure that networks recover their efficiently incurred sunk investments.
- Key DSO themes:
  - **Fairness** - between customer groups.
  - **Barriers** - to specific technologies or more general efficient system development.

Our DSO Vision

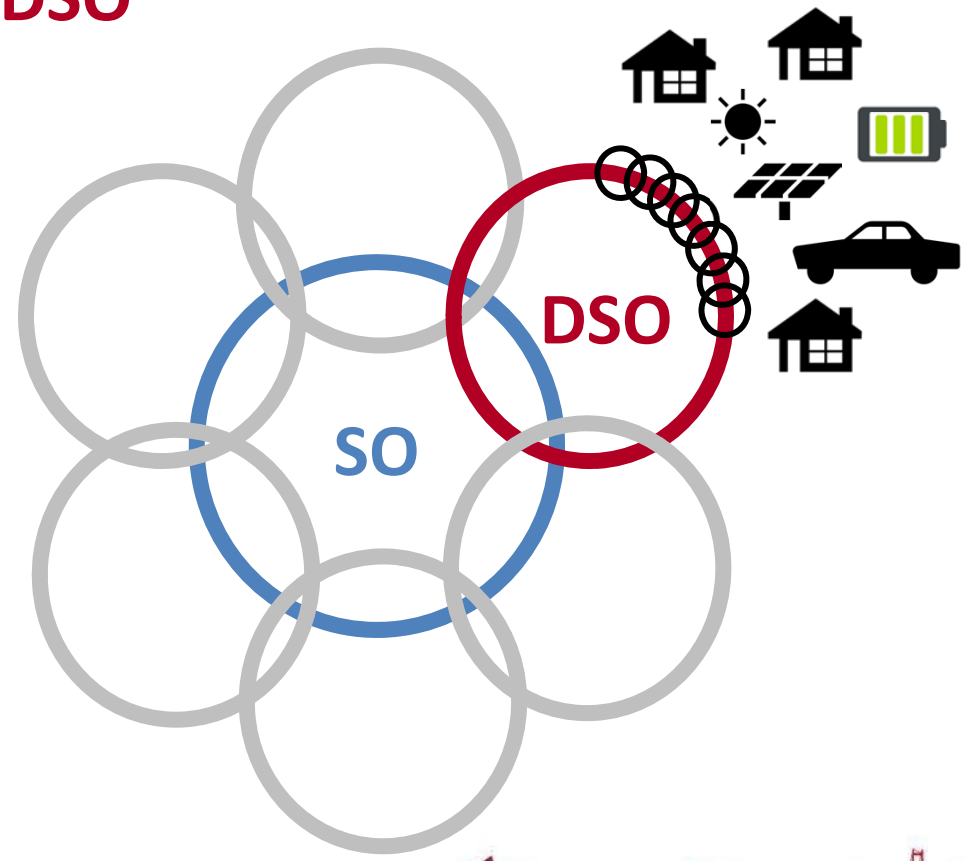
DSO vision

- Transition is required to a customer-led actively managed (and probably semi-autonomous) network…
- …where we are providing a cost-efficient, non-discriminatory and technology neutral physical trading platform…
- …for third parties in our region to participate in the electricity markets.

DSO must provide a compelling value proposition for customers and stakeholders

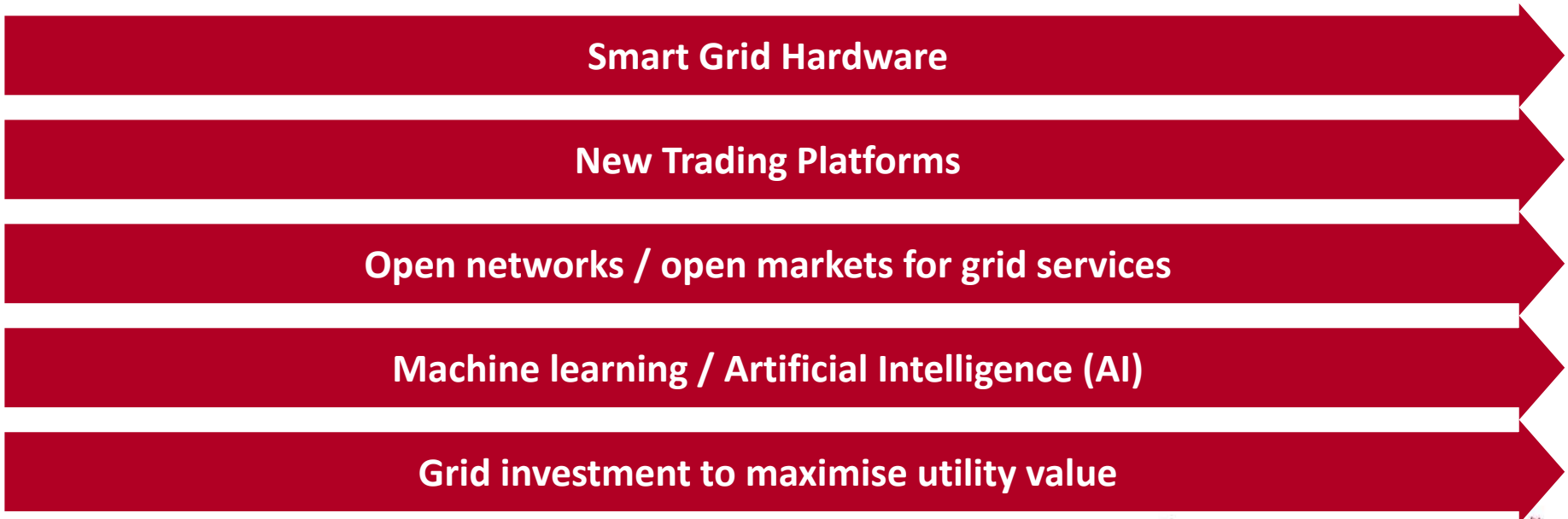
The next steps from DNO to DSO

- Responsible for keeping the network stable and power supplies reliable.
- Regional DSOs of sufficient size and capacity to be accountable.
- Interconnection boosts physical and cyber security resilience.
- Provide the physical trading platform for other parties in the Energy Market.
- Market maker for distribution grid services.
- Enabler to access transmission grid services market.



Further transition from passive to active networks

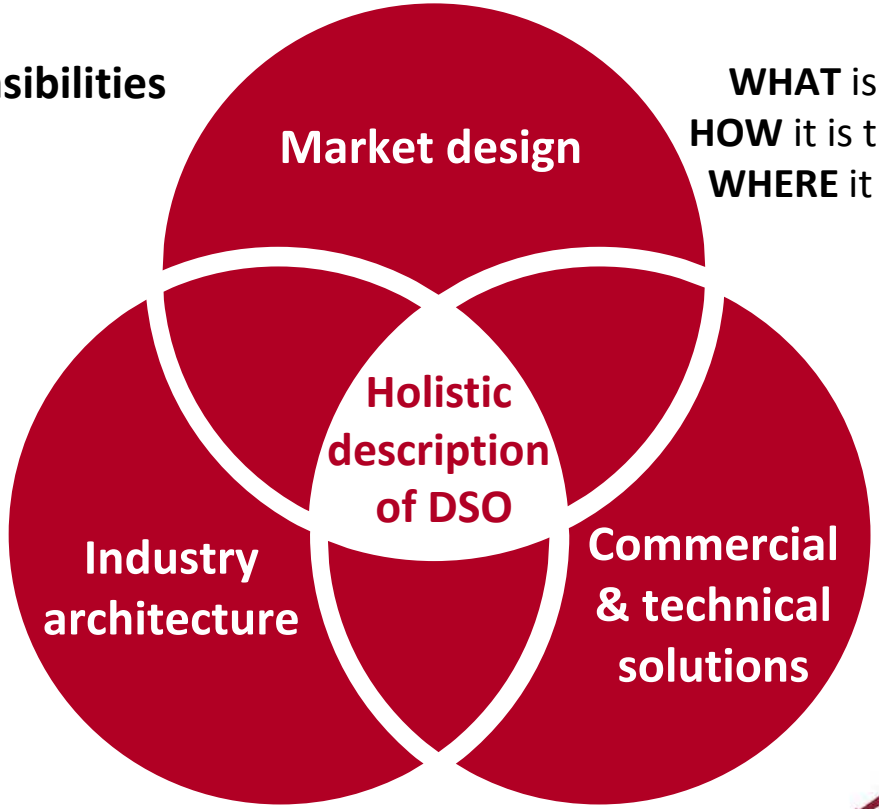
Passive networks	Active networks	Semi-autonomous networks
Passively resilient	Active resilience	Smart resilience
High headroom	Medium headroom	Economically optimised headroom



DSO: Many open questions

Functions, roles & responsibilities

- **WHAT** are the functions?
  e.g. balancing, constraint management etc.
- **WHO** does **WHAT**
  i.e. how are functions grouped into roles, and who undertakes what roles?
- **WHAT** information is exchanged?

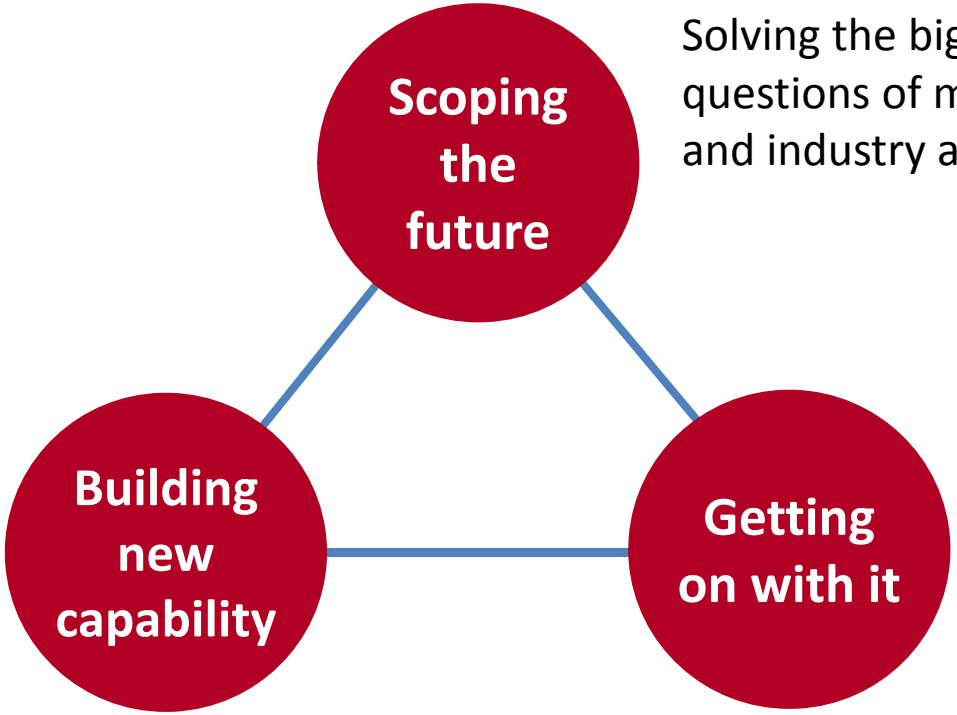


WHAT is traded?,
HOW it is traded? and
WHERE it is traded?

HOW the functions could be executed (E.g. DSR, storage, reinforcement, constrained connections etc.)

Our DSO Activity

Our DSO strategy



Solving the big open questions of market design and industry architecture

Providing new infrastructure and processes

Low regrets steps to demonstrate and learn

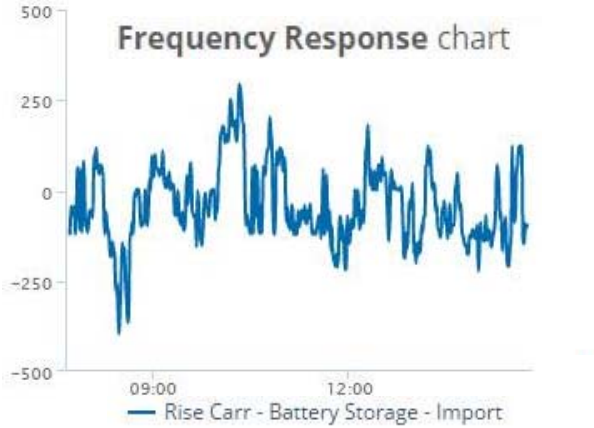
Scoping the future: example - Customer-Led Distribution System

- Examining the future structure of the distribution sector with customer front and central.
  - Accommodating large volumes of DERs at least cost
  - Deliver value to DERs that thrive in a flexibility market
- Identify and demonstrate:
  - The most appropriate market design - what is traded, and how and where it is traded
  - Industry structure - roles of each party and the relationships between the parties
- A *virtual demonstrator* - using laboratory modelling and emulation to provide low cost extension of practical demonstrations.
- Provide the quantified evidence base for the changes required.

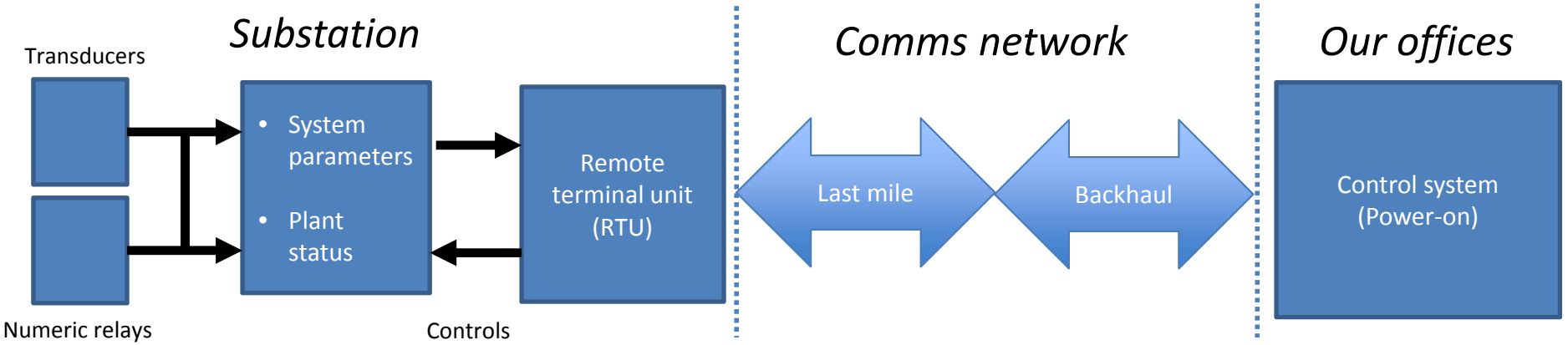
Getting on with it: example - battery trading

- Storage offers flexibility by smoothing intermittent generation or contributing to more active local balancing by the DSO.
- Through aggregator KiWi Power we are providing dynamic firm frequency response to the GB system operator.
- Practical low-regrets innovation through a ‘learning by doing’ approach.
- Revenues earned used for innovation projects.

Customer-Led Network Revolution
2.5MW battery at Rise Carr



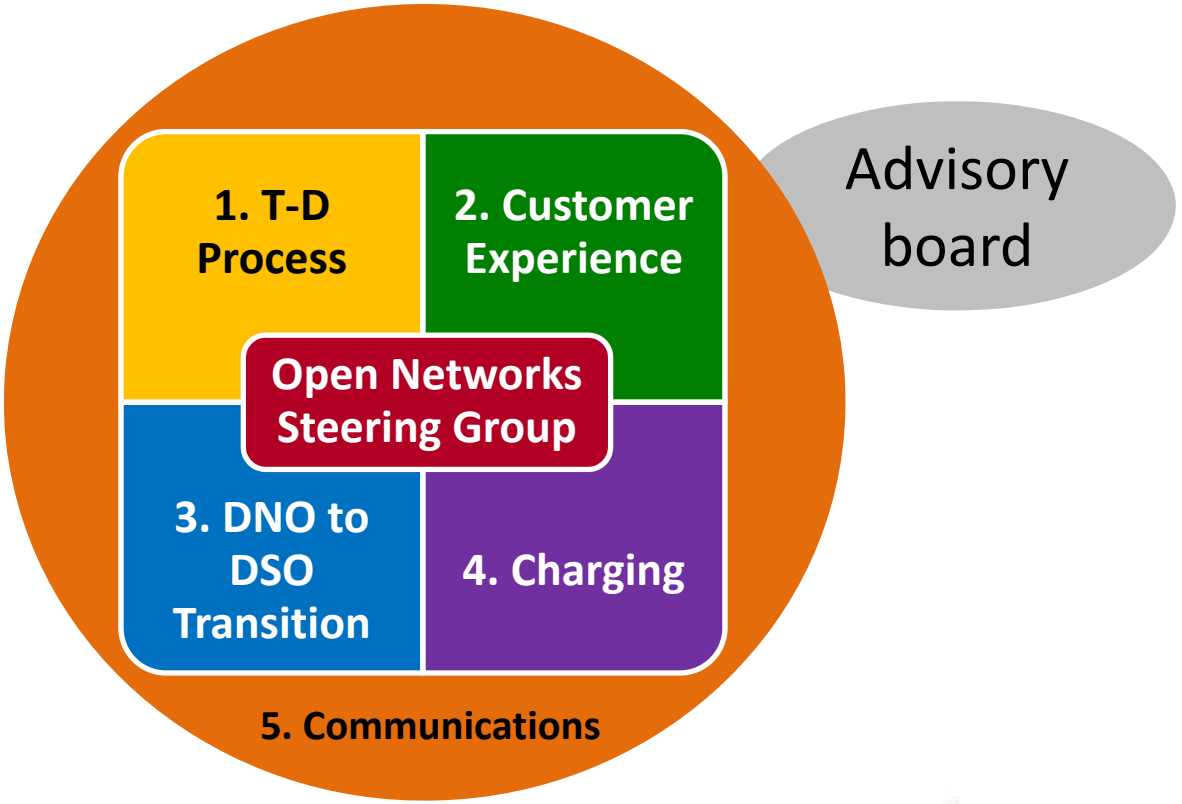
Building new capability: example - smart grid enablers



- **Substation monitoring** - Upgrade all automatic voltage control (AVC) relays to provide real, reactive, phase angle, voltage and current measurements plus tap change indicator.
- **Substation RTU** – Replace time-expired RTUs with more flexible modern equivalents.
- **Comms network** – Replace the last mile radio links with modern IP radio equipment.

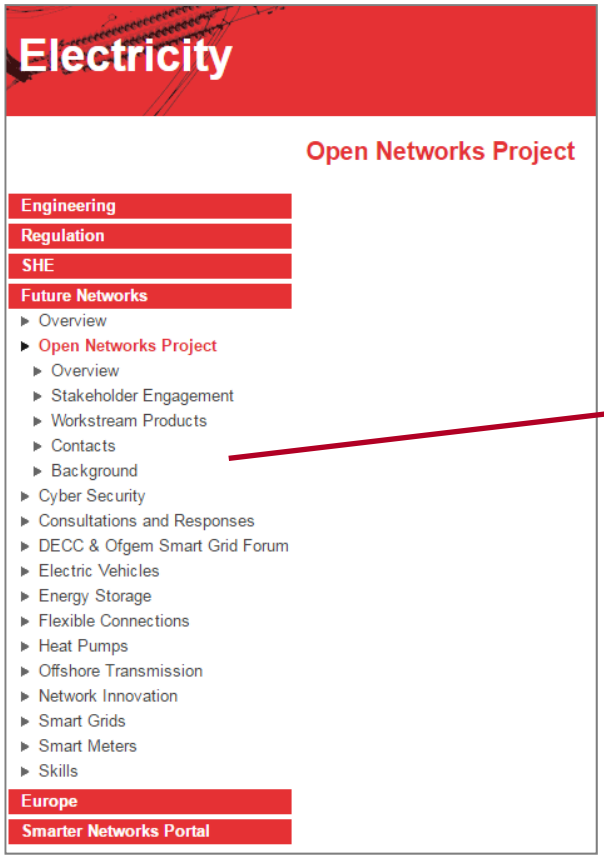
ENA Open Networks Collaboration

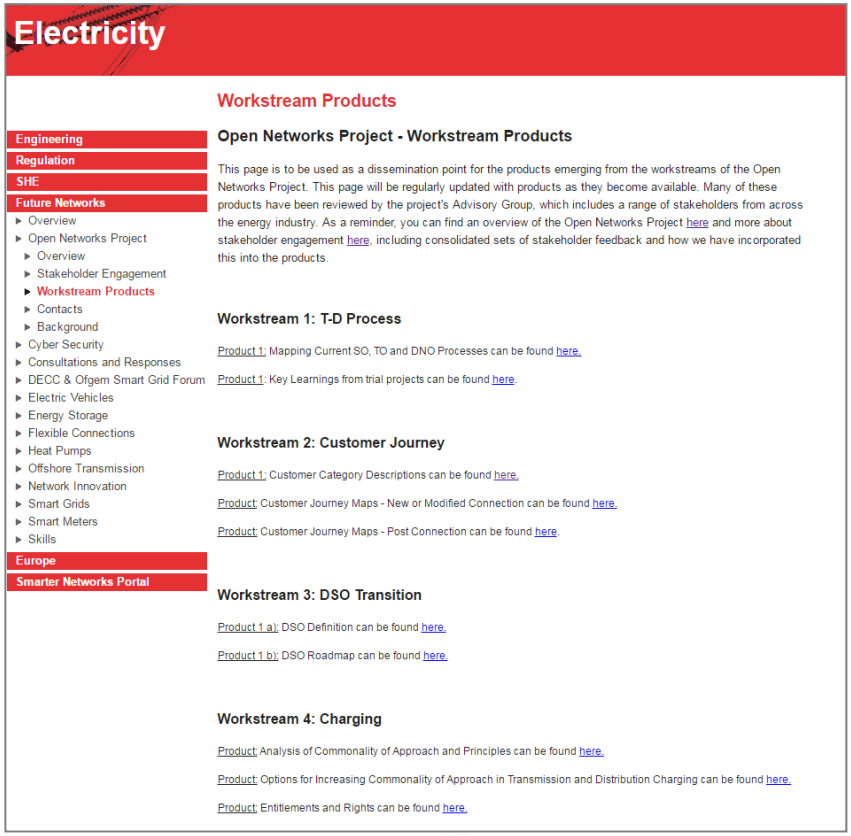
Open Networks project collaboration



http://www.energynetworks.org/electricity/futures/open-networks-project/

Open Networks website





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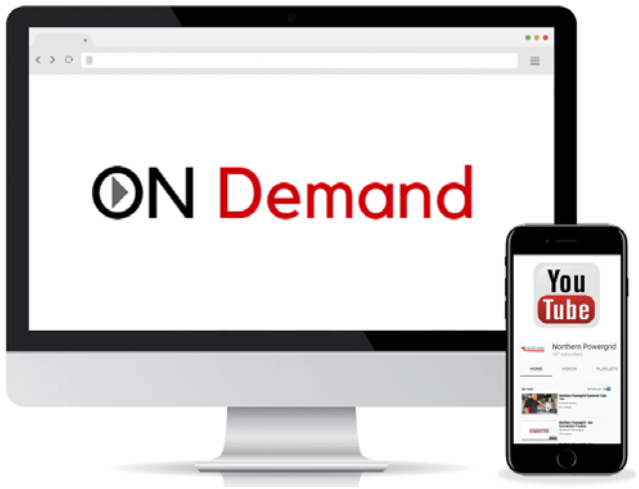
Next Steps

Further engagement

We welcome your views and the opportunity for further engagement.

- Watch the webinar again on demand
- Also available on our YouTube site www.youtube.com/user/NorthernPowergrid
- Email your questions and comments yourpowergrid@northernpowergrid.com .
- Visit our new innovation website http://www.northernpowergrid.com/innovation



Questions