Customer-Led Distribution System

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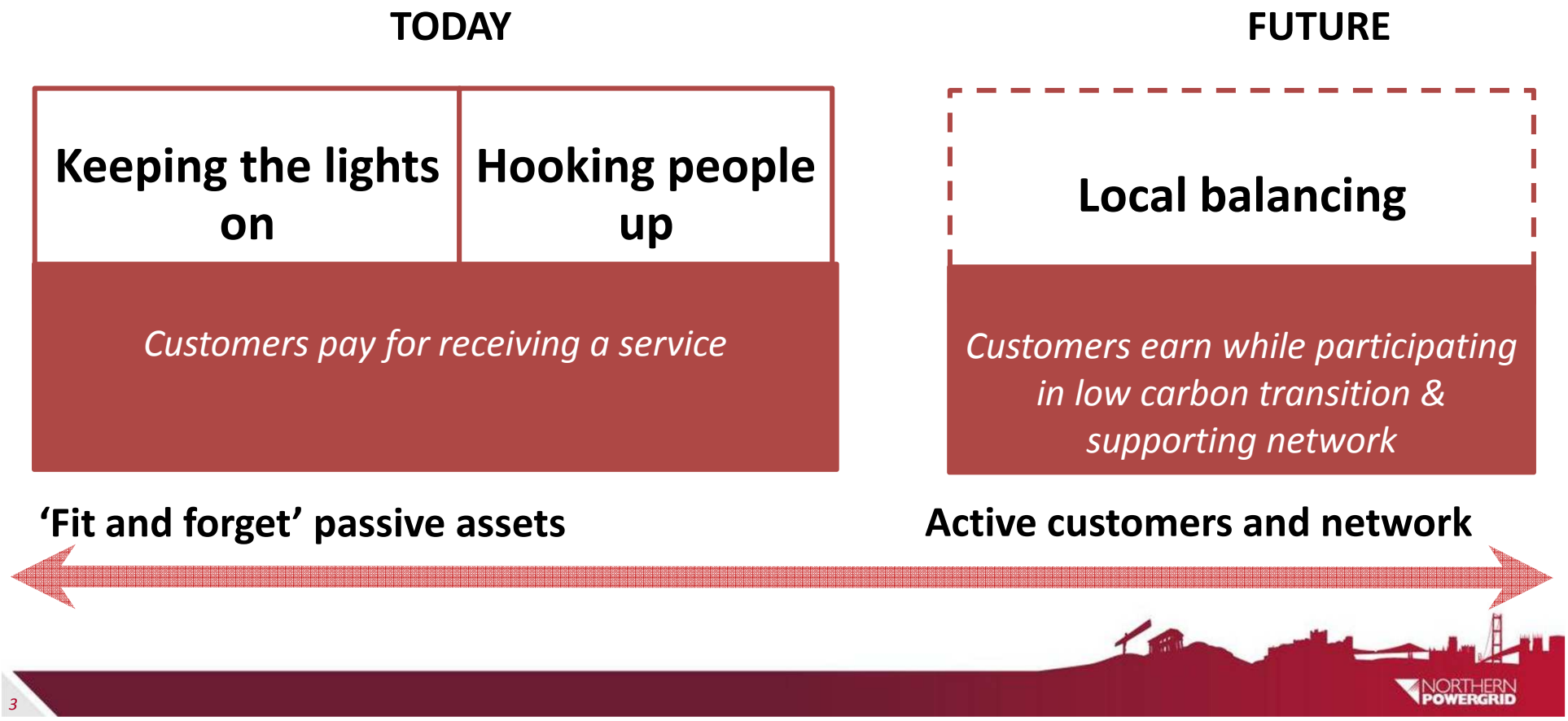
Local markets

- Local markets are key to accessing DER value
- There is more benefit from energy markets than from network markets

Transition to distribution system operator (DSO)



DSO Strategy – Developing our thinking

Solving the big open questions of market design and industry architecture

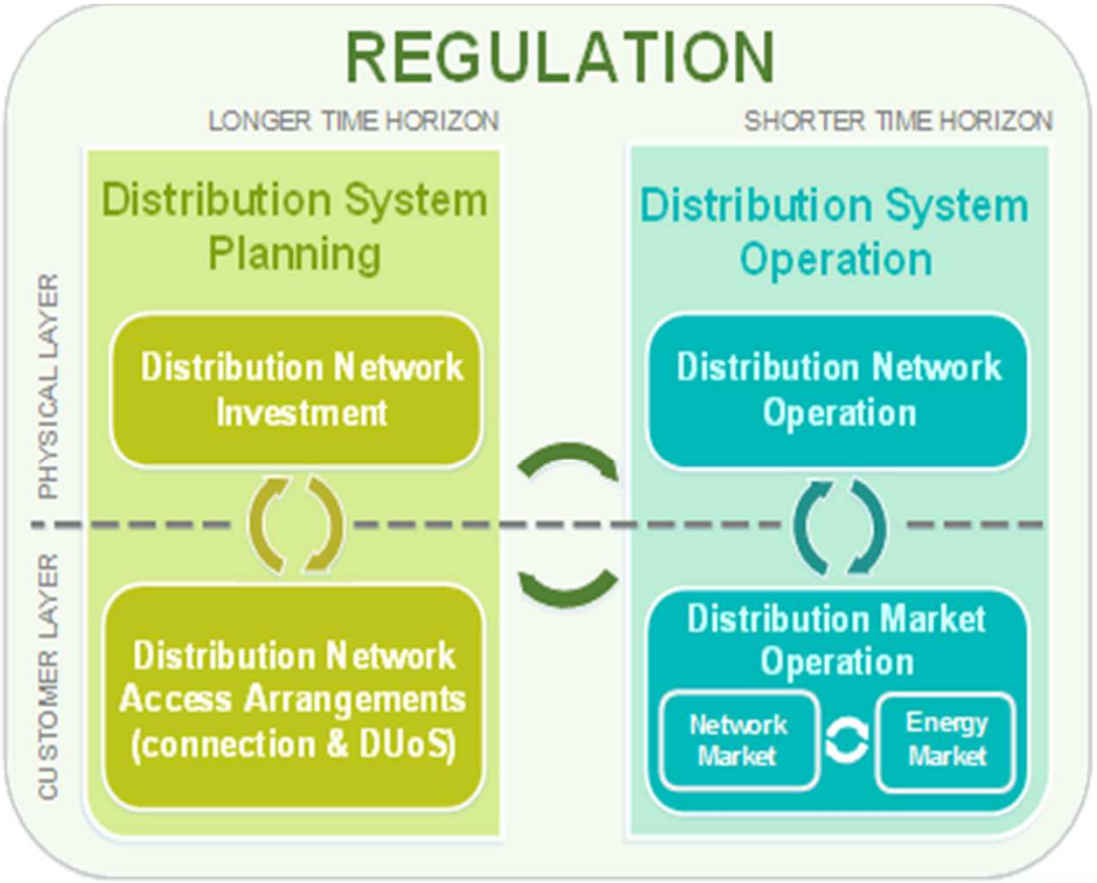
Low regrets steps to demonstrate and learn

Providing new infrastructure and processes

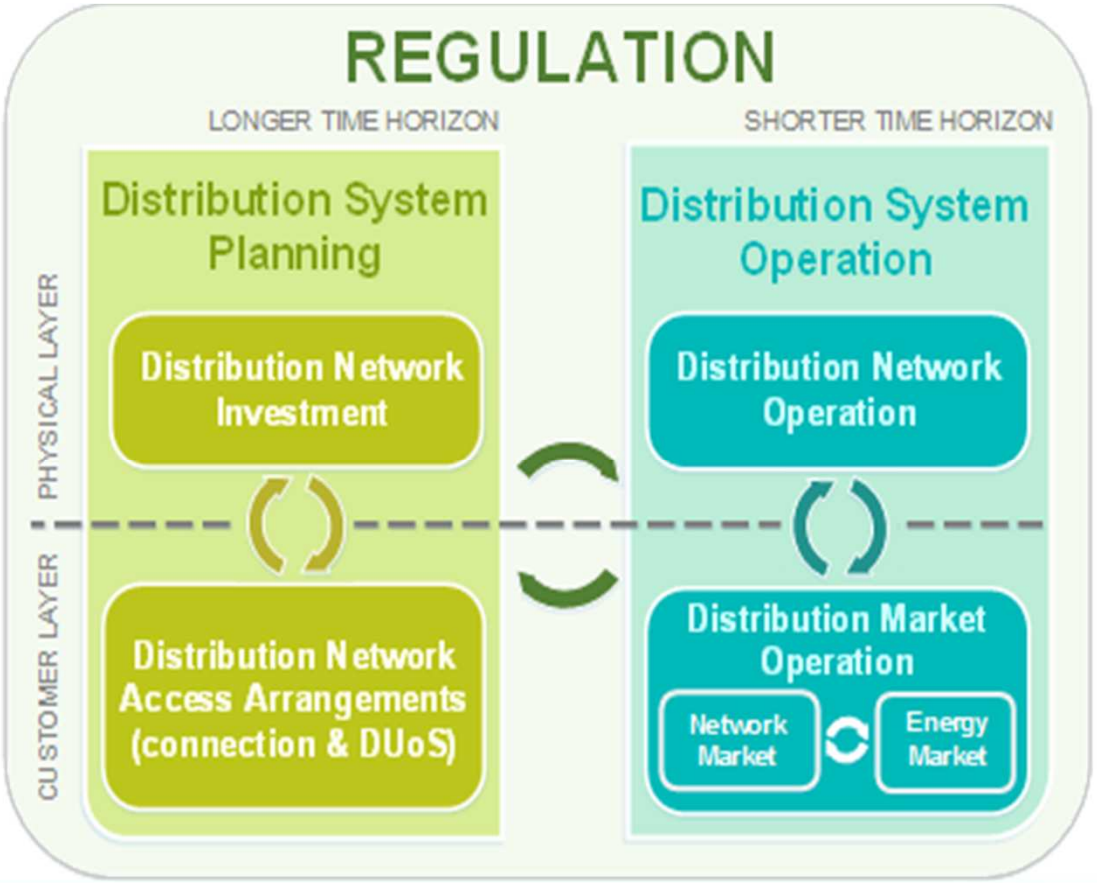
Customer-Led Distribution System (CLDS)

- Examining the future structure of the distribution sector with customer front and central:
  - Accommodating large volumes of distributed energy at least cost
  - Deliver value to customers that thrive in a flexibility market
- Cost efficient desktop studies , modelling and *virtual demonstrator in the lab*
- Potential to collaborate with others to extend their demonstration projects through quick and low cost laboratory studies
- Providing quantified evidence base for customers, the industry and policy makers on different options and the changes required

Distribution system operation: functions & coordination



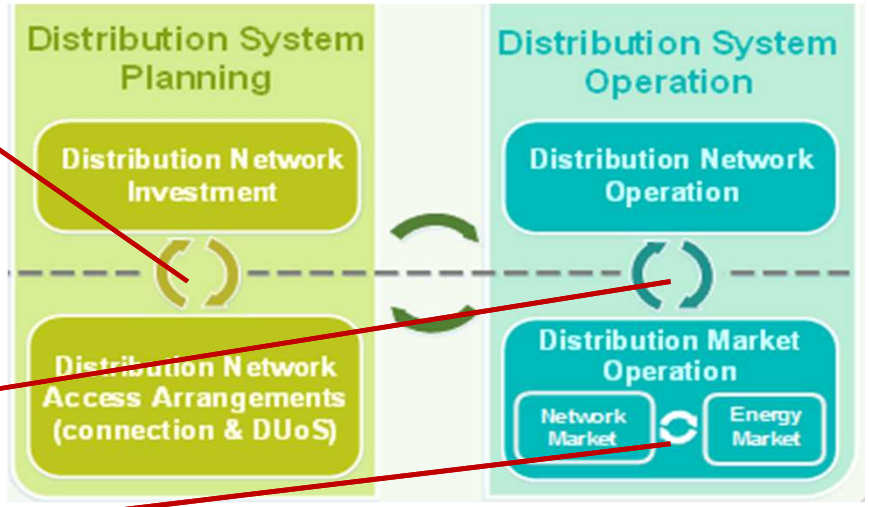
Distribution system operation: functions & coordination



How to accommodate large volumes of DERs at least cost while delivering value to DERs so that they can thrive in market-based conditions?

CLDS focus on less-studied aspects of DSO

	Functions			CLDS project	Other projects
Planning	Distribution Network Planning	Investment planning	Traditional		
			Non-traditional		
		coordination			
		Commercial arrangement	Connection agreement		
			UoS charge		
Coordination between planning & operations					
Operation	Distribution Network Operation	Technical operation	Voltage		
			Thermal		
			Security		
	coordination				
	Distribution Market Operation	Network market	Local market		
			Central market		
		coordination			
		Energy market	Local market		
			Central market		



Objectives of local markets

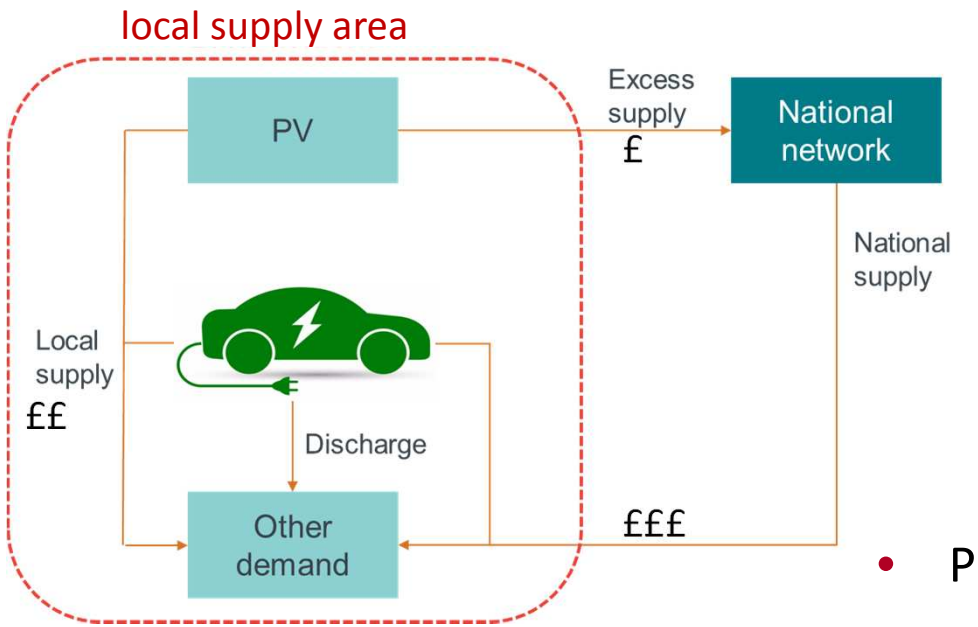
- Local markets can drive smart local energy systems and bring customers into the low carbon transition

  - Local energy market: incentivising flexible load to connect and to follow locally produced clean energy
  - Local network market: payment for flexible response to support local network

Modelling value of local markets

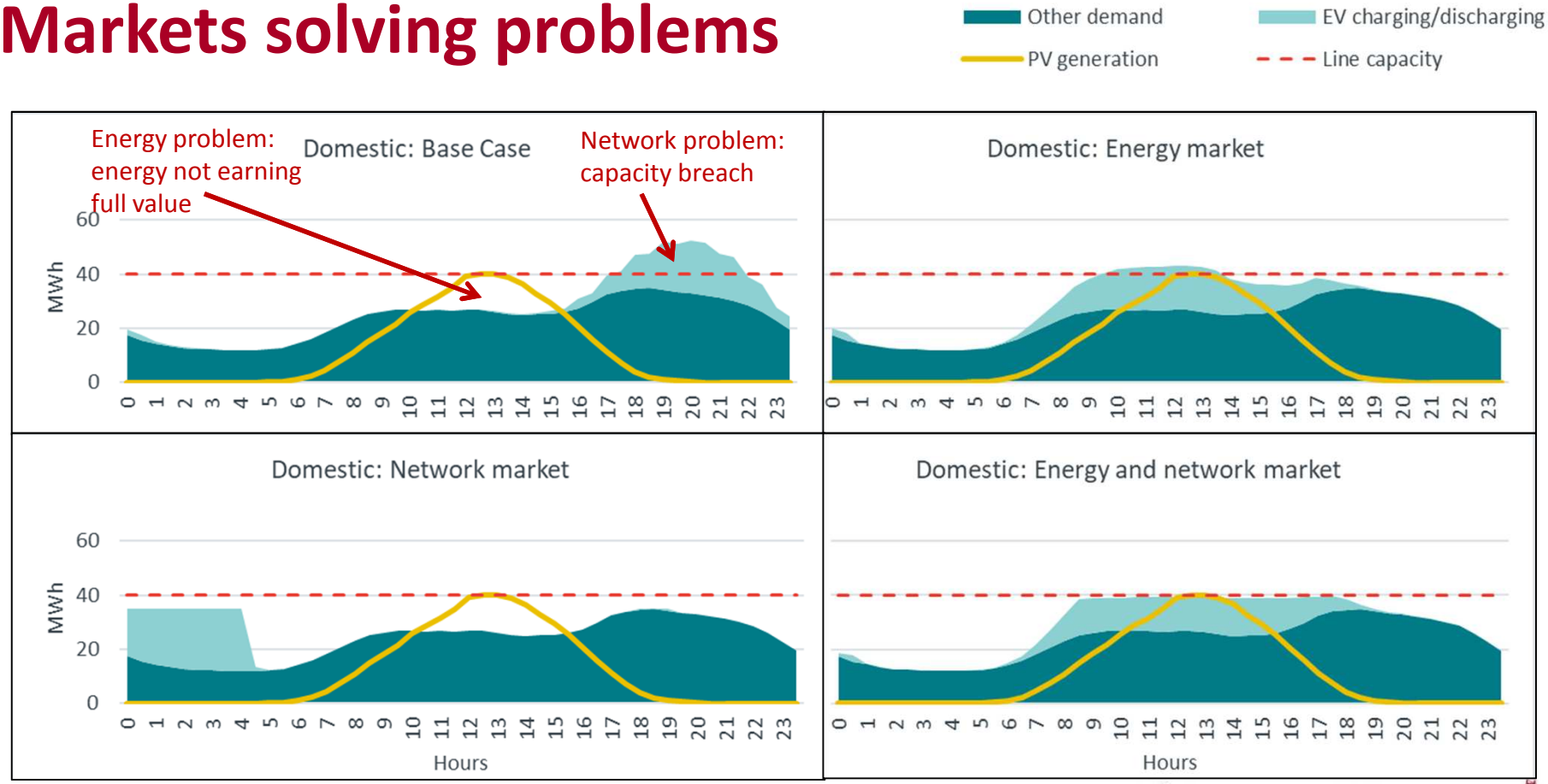
- **What are the key drivers of DER value – value creation?**
  - Different DER mixes, penetrations, time of operation
  - Different network loading conditions
- **What is the value of introducing local markets – Value Capture?**
  - Appropriate market arrangements can capture DER values
  - Market arrangements that fail to reflect value of local energy and network limits may worsen system performance.
- **What does this imply for the DNO to DSO transition?**
  - DSO: consider the most appropriate markets to be introduced where and when, and coordinate different local markets, particularly if there are competing objectives
  - Local flexible customers: opportunities to tap into cheap, clean, local energy
  - Local renewable producer: new revenue stream to support its growth in a subsidy-free environment

Energy system modelled

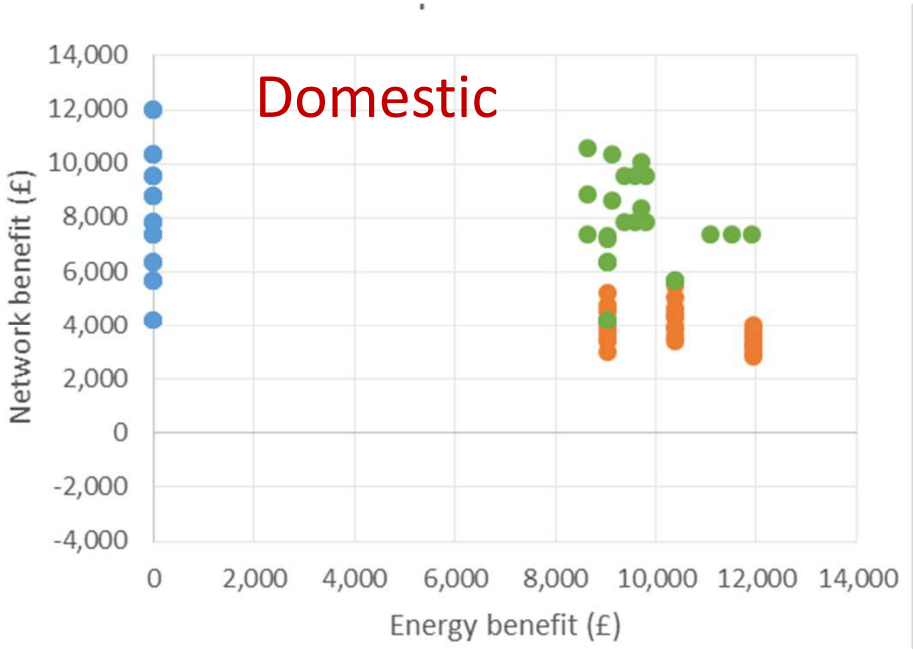


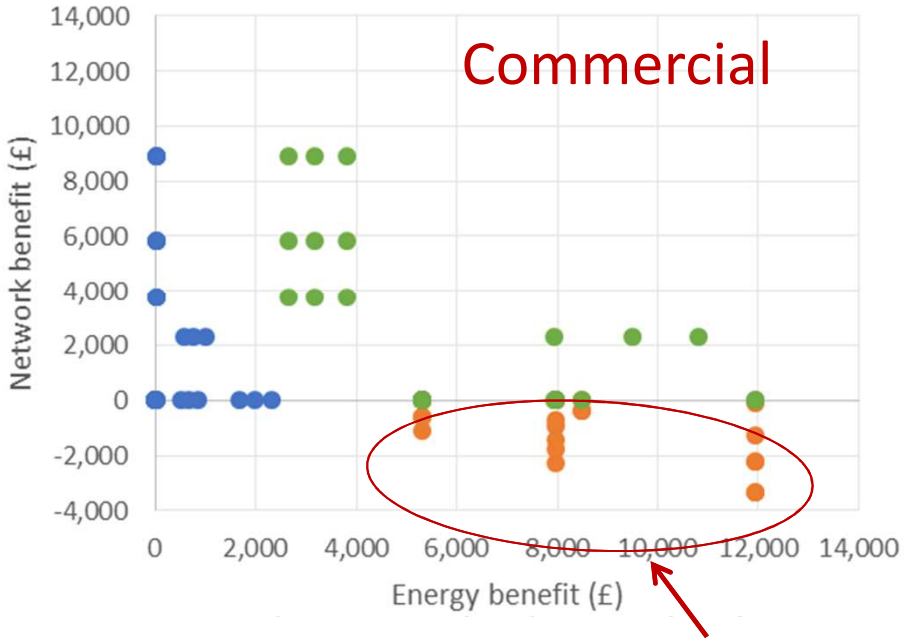
- 2 Network types
- Input parameters 3x3x3 = 27 scenarios
  - PV : low, medium, high
  - EV : low, medium, high
  - General load: low, medium, high
- 4 market arrangements
  - No markets
  - Energy market only
  - Network market only
  - Both markets together
- Price signals to EV & PV owners
  - For energy: 3 differential prices
  - For network: to avoid EV charging at system peak

Markets solving problems



Markets can deliver value….or create problems

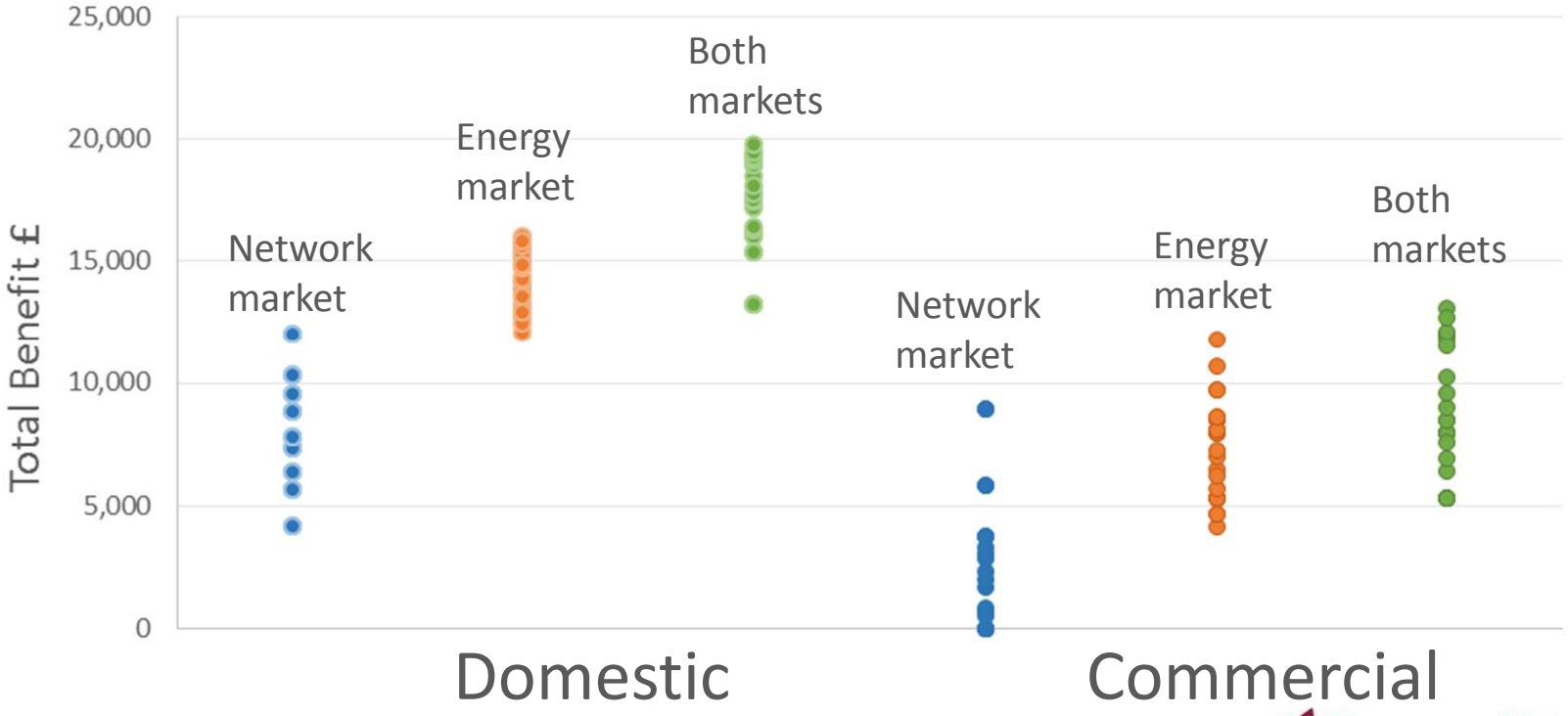




Introducing energy market alone has created a network problem

Energy market Network market Both markets

More benefit from energy market than from network markets, and more when operating together



Key learning points

1. Different locations have different drivers for DER value and require different market arrangements
   - DER mix, penetrations, time of operation
   - Network loading conditions
2. Properly designed local markets create value for DERs to capture
   - Enable peer to peer trading of energy between intermittent generation & flexible load
   - Payment for response to support network
3. Best way to introduce markets: there is no ‘one size fits all’ market solution
   - Take account of local availabilities of generation and flexibility to correctly value both network and energy costs to avoid worsening system performance
   - Staged market introduction to reflect changing conditions in the system, can be energy market alone, or network market alone, or network and energy markets simultaneously

Implications for DSO transition

1. Appropriate local markets are key to accessing DER value
2. Maximising value stream & whole system optimisation
   - DSO: consider the most appropriate markets to be introduced at where and when, coordinate different local markets particularly if there are competing objectives
   - Local flexible customers: opportunities to tap into cheap, clean, local energy, maximising number of DER owners participating is critical
   - Local renewable producer: new and rich revenue stream to support its growth in a subsidy-free environment
3. Introduce both network and energy markets simultaneously ***unless***
   - high costs to set up a market and one set of values (either energy or network) clearly dominates the others

Projects:
Trialling, stakeholder engagement
eg Open Networks

Policy:
- Network charging reform
- Rules for local markets

Find out more…..

- **More on**: www.northernpowergrid.com/innovation

- **Coming soon:** our DSO development plan
- **Stakeholder events**: Leeds 7th Dec 2018, London 23rd Jan 2019
- **Register your interest** on our stall today!