FLEXIBILITY STRATEGY: FOCUS ON LMAs

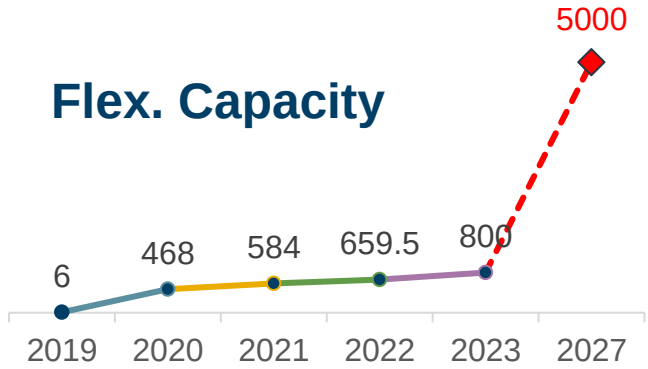
November 2023

Scottish & Southern Electricity Networks

AGENDA

- Progress on SSEN’s Flexibility Strategy
- Principles of the future strategy
- Introduction to LMA
- LMA Next Steps

FLEXIBILITY MILESTONES



- LMAs implemented *in the 1950s*
- Securing island supplies through embedded generation *> 60 years*
- Restoring power during faults through mobile generation *> 30 years*

2015 — First BAU ANM System (Isle of Wight)

2016 — Isle of Wight ANM Scheme

2017 — First Innovation Project Tender; Invented CMZs; First Centralised ANM Tender

2018 — First CMZ Contract (Isle of Islay)

2019 — 6 MW — First CMZ Contract Placed; Project TRANSITION

2020 — 468 MW

2021 — 584 MW — Flexible Power Platform (Web); DPS Platform; First Flexibility Tender by DPS

2022 — 659.5 MW — Centralised ANM Platform

2023 — 800 MW — Third-Party Market Platform Partnership; Flexible Power API; BAU Framework Agreements

2024 — SWAN with ESO Go Live; Dispatch Decision - Making Framework; Product Roadmap

2027 — ED2 Five-year target of **5 GW** flexibility services

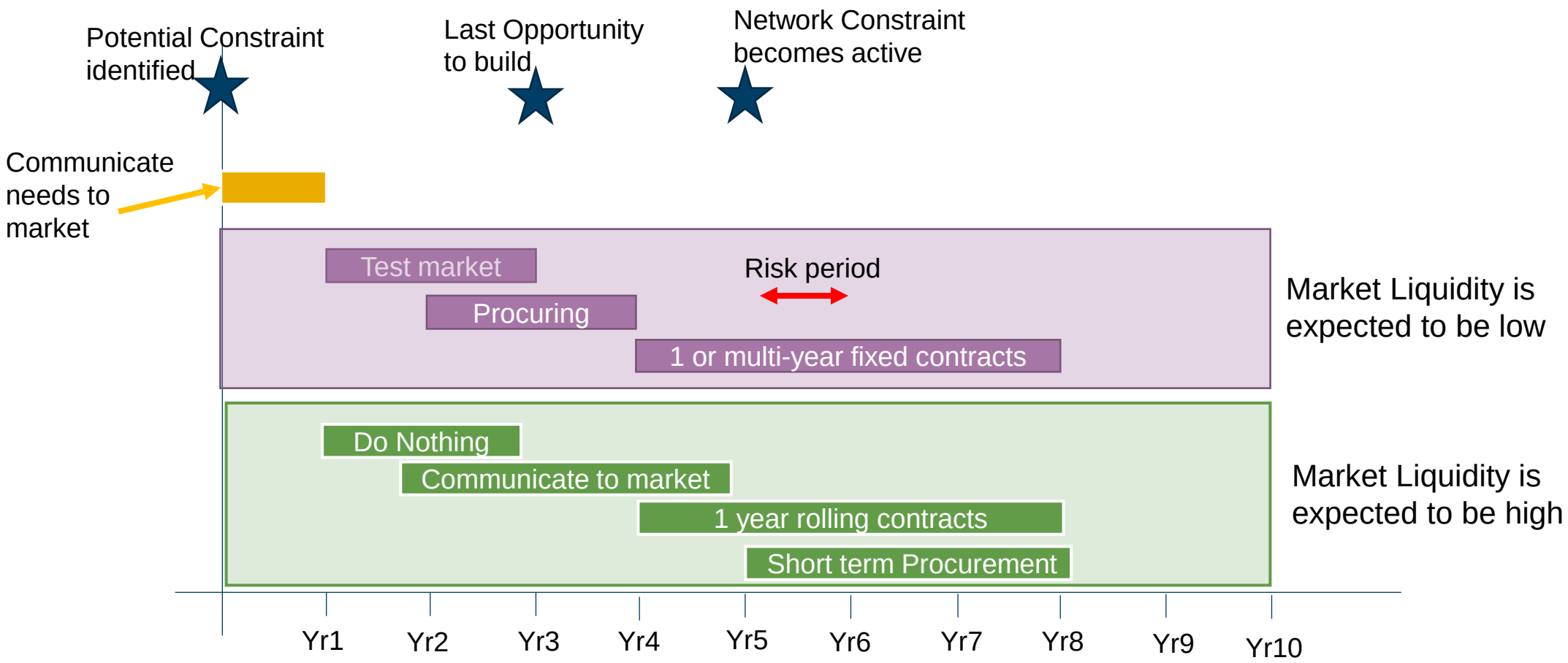
KEY PRINCIPLES

1. Market liquidity will determine when we procure flexibility.

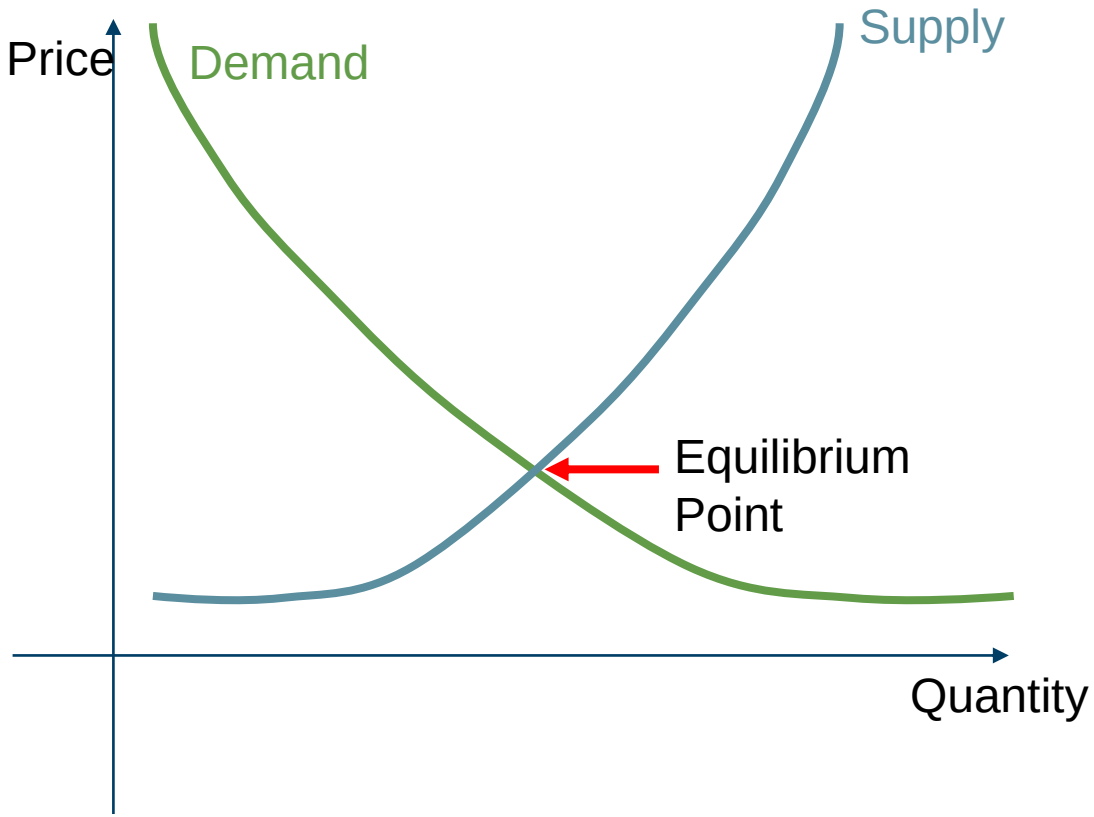
2. Communicating the value of flexibility services within a region.

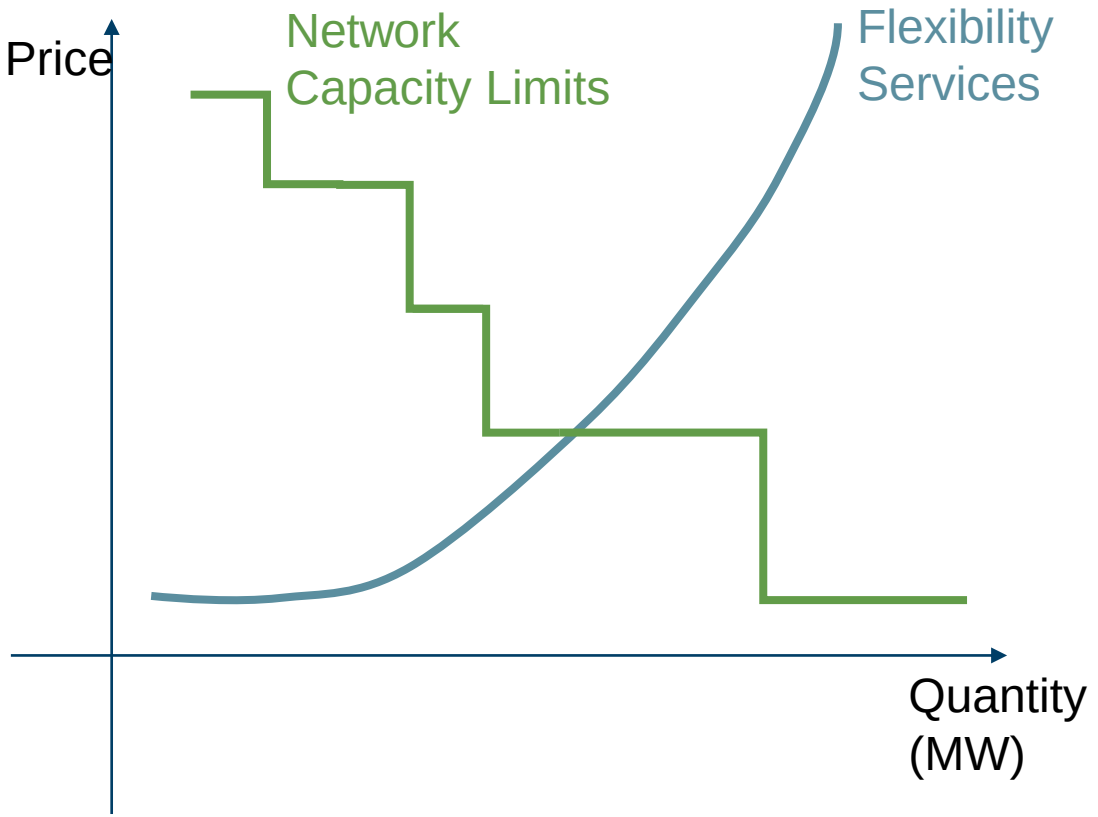
3. The route to LV flexibility is through Diversification Services.

MARKET LIQUIDITY WILL DETERMINE WHEN WE PROCURE FLEXIBILITY



COMMUNICATING THE VALUE OF FLEXIBILITY

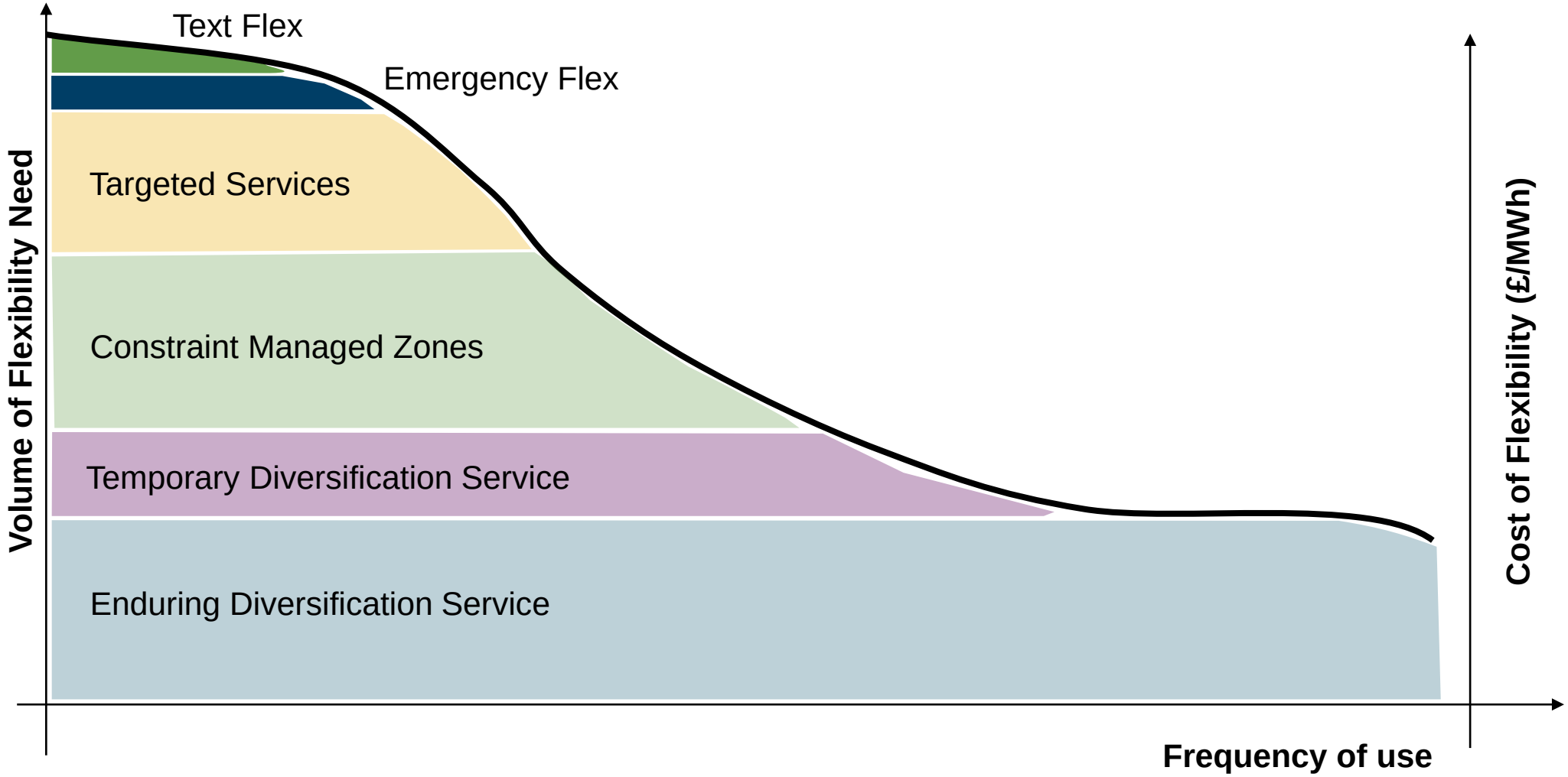




We aim to provide information on:

- Service Value
- Forecast Utilisation Volumes
- Need Dates
- Procurement Horizon

LV FLEXIBILITY THROUGH DIVERSIFICATION



FUTURE OF LOAD MANAGED AREAS (LMAs)

MARKET-DRIVEN DEMAND DIVERSIFICATION SERVICES

(ENDURING FLEXIBILITY FOR LOW VOLTAGE)

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What is an LMA?

THE FUTURE OF LMAs?

In the last 40 years, LMAs and their implementation via the RTS system have brought significant value to customers and the network alike:

- Customers without access to the gas network have benefited from cheaper overnight tariffs for their electric storage heaters
- According to a 2013 report, demand diversification from the LMAs implemented through the RTS system had avoided £700 million in network reinforcement costs (nearly £1 billion in today's money). A saving that has been socialised across all network users.

However,

- The RTS system is due to be retired soon (Dec25)
- LMAs are increasingly misaligned with the direction the industry is taking and can inadvertently limit customers and their supplier's ability to participate in new flexibility service markets.

We need to rethink the use of LMAs…

CURRENT VIEW OF LMAs

To remove LMAs, we will have to change how we think about, identify and manage LMAs.

Moving **from**…

IF

there are properties that have storage heaters or immersion heaters scheduled by the RTS system

THEN

the postcode is declared an LMA and the RTS properties are assigned a specific switching regime.*

* Specified a Line Loss Factor Code which links to a load switching regime in the LMA Notice

FUTURE OF LMAs

A future in which the identification and management of LMAs is more data-driven and dynamic – responding to changes in the network…

IF

The measured/forecast demand in an area of the network is likely to breach a predetermined minimum headroom (and there are coincidental and schedulable loads)…

THEN

Check if the network assets are scheduled for replacement/reinforcement. If not or too far in the future…

THEN

Demand Diversification Services (Flex for LV) should be implemented. If not feasible…

THEN

Reinforcement should be assessed. If not feasible (due to cost or time)…

THEN

Other solutions should be considered in conjunction with other stakeholders

FUTURE OF LMAs PROJECT

- SSEN's RIIO-ED2 (current price control) Business Plan committed to lift around 30 to 50% of LMAs by the end of ED2 and to remove all LMA constraints by the end of ED3, which runs from 2028 - 2033

- The project will initially focus on three workstreams to review LMAs and remove where possible
  - Detailed **Analysis** and enhanced network monitoring (LV and Smart Meter). Liberate where possible, otherwise…
  - Check and inform Planned ED2 **Reinforcement** of possible changes
  - Implement **Flexibility** as Demand Diversification Services *(the focus of this session)*

- Review other potential solutions coming to the market

PROJECT CHALLENGES
DEALING WITH UNCERTAINTY

The project needs to answer several unknowns…

- Can we remove **all** LMAs?
- Can we remove all **constraints** that drive LMAs?
- Will flexibility **reliably** work on the LV network?
- Will enough suppliers and customers **engage** to create a viable flexibility market?
- Is the Smart Meter Network **reliable** enough?
- What if we lose diversification from suppliers and customers **withdrawing** from an established market?
- How do we cope with the constant **change** in the network?
- What are the **options** for constrained areas that won't be reinforced and can't support viable markets?

DEMAND DIVERSIFICATION SERVICES (FLEX FOR LV)

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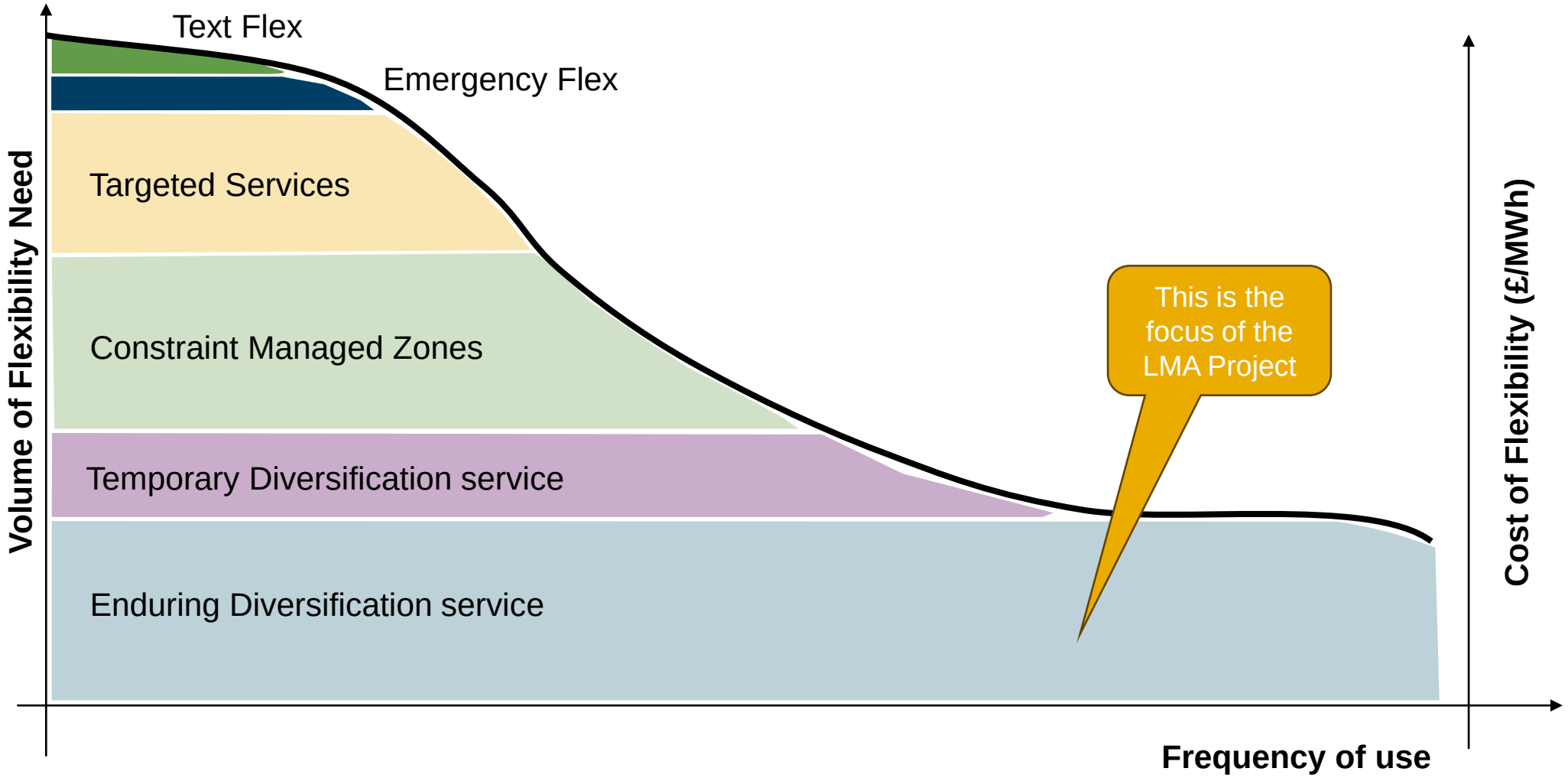
DIVERSITY

- Networks can deliver maximum energy when demand is diversified.
- How diversity is achieved behind the meters is immaterial. (Storage, flexing, embedded generation, energy efficiency)
- However, a single event, such as a dip in the wholesale price, can destroy diversity, overloading networks and risking loss of supply (when flexibility is well established).
- DNOs can place a value on guaranteed and enduring demand diversity.
- Diversity must be created across local cluster of customers, NOT each customer in isolation.

LV FLEXIBILITY THROUGH DIVERSIFICATION



DEMAND DIVERSIFICATION SERVICES (DDS)

- Two DDS being considered
  - Allocated Capacity
  - Dynamic Congestion Response
- There are undoubtedly others
- And there will be no one right answer.
- Over time multiple solutions may be deployed as we learn, and the market and network evolves

ALLOCATED CAPACITY

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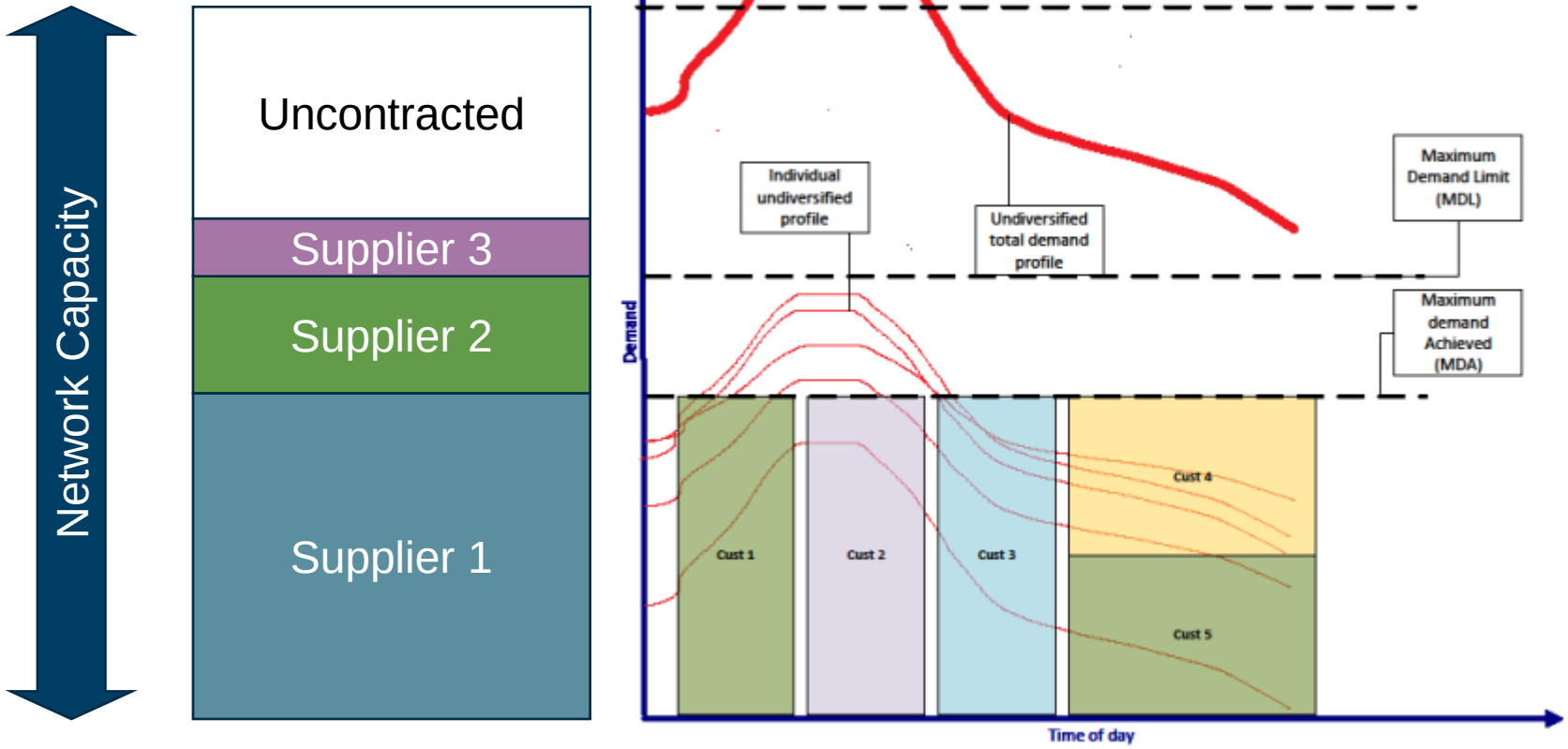
ALLOCATED CAPACITY

Each supplier is allocated a Maximum Demand Limit (MDL) based on units consumed and number of customers in each "zone". They commit to manage their local portfolio of demand (cluster) below that limit for a fixed period in return for a Service Payment.



DYNAMIC CONGESTION RESPONSE

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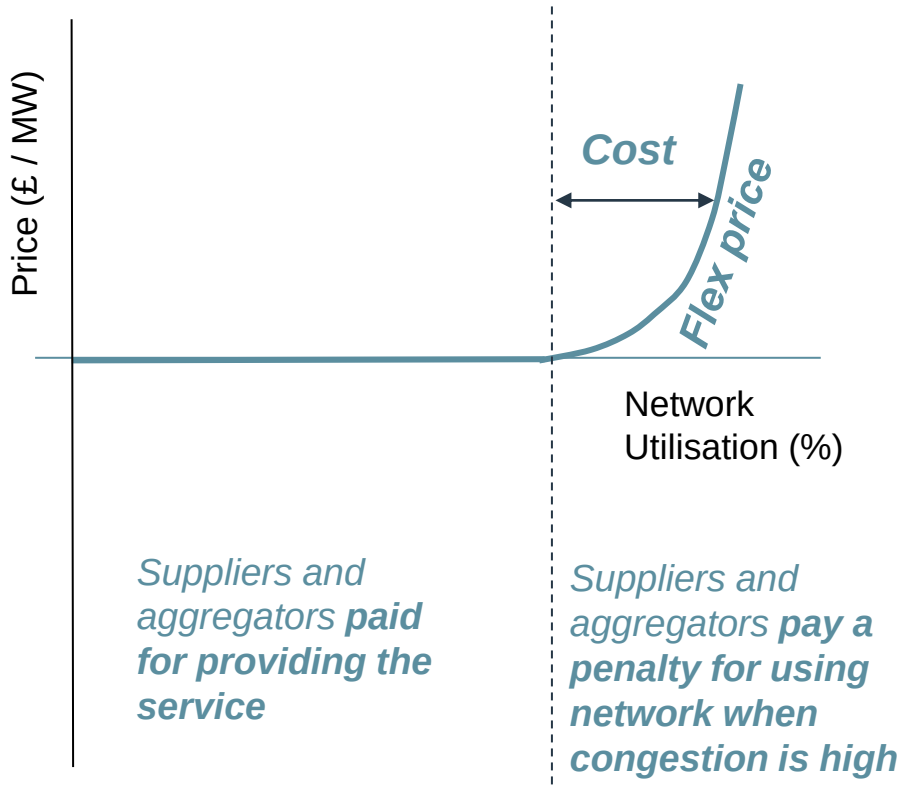
DYNAMIC CONGESTION RESPONSE

*Suppliers and aggregators **respond to real time congestion levels,** rescheduling smart loads to avoid periods of high congestion (and high flex-prices) and making use of periods of low loading and low wholesale prices*

Substation Price-Load curve



Day ahead

- Suppliers and aggregators forecast expected congestion
- Suppliers and aggregators translate the expected congestion level into a “flex price”
- Suppliers and aggregators use the flex price, plus the day-ahead wholesale price to schedule loads

In real-time

- Suppliers and aggregators reschedule smart loads if actual congestion levels rise too high

Demand Diversification Services
Will they work?

SIMULATION WORKSHOP
THE PLAN

- Invite stakeholders to a series of events to involve them in the feasibility study process
  - 28Nov23 – Introduction webinar
  - 30Jan24 – Simulation Workshop

Purpose

- To identify unintended consequences
- To gather stakeholder feedback
- To bring key stakeholders on the “voyage of discovery”
- To gather support from Regulators, Suppliers, Aggregators, and Consumer Advocates.
- To inform the design of Demand Diversification Services

SIMULATION WORKSHOP
HOW WILL IT WORK?

- In-person workshop
- Participants split into teams of pseudo-suppliers
  - A variety of schedulable loads
  - Changing wholesale and flex prices
- Given various scenarios to react to
  - Small LV network vs. HV network
  - Dominant vs. balanced market share
  - Allocated capacity vs. Dynamic Congestion Response
- Plenty of time for discussion and feedback

THE SIMULATION WORKSHOP
HOW WILL IT WORK?

The Master View

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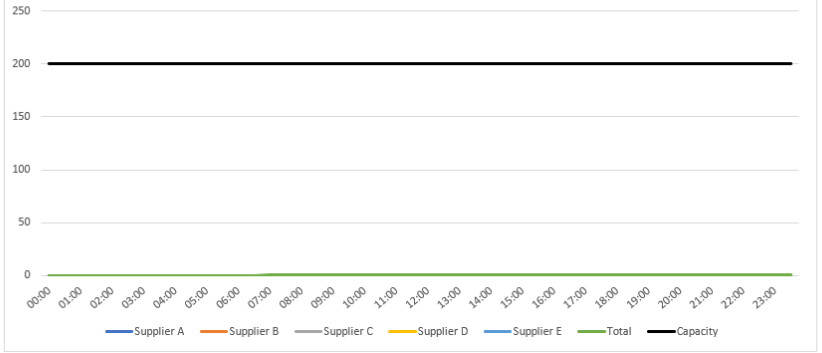
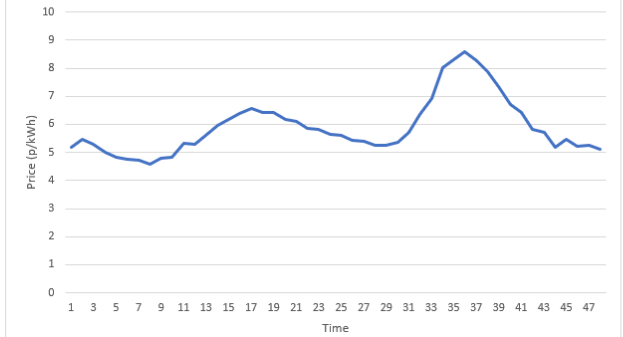
LV Load, *MW*



Price, *p/kWh*



Capacity limit:	***200 MW***
Number of suppliers:	***5***

PASS

AM

Time	00:00	00:30	01:00	01:30	02:00	02:30	03:00	03:30	04:00	04:30	05:00	05:30	06:00	06:30	07:00	07:30	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:30
Supplier A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.02**	**0.04**	**0.06**	**0.08**	**0.11**	**0.13**	**0.15**	**0.17**	**0.19**	**0.21**	**0.23**	**0.25**	**0.27**	**0.29**	**0.31**	**0.34**	**0.36**	**0.38**	**0.40**	**0.42**	**0.44**	**0.46**	**0.48**

PM

Time	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	20:00	20:30	21:00	21:30	22:00	22:30	23:00	23:30
Supplier A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.50**	**0.53**	**0.55**	**0.57**	**0.59**	**0.61**	**0.63**	**0.65**	**0.67**	**0.69**	**0.71**	**0.73**	**0.76**	**0.78**	**0.80**	**0.82**	**0.84**	**0.86**	**0.88**	**0.90**	**0.92**	**0.94**	**0.96**	**0.98**

THE SIMULATION WORKSHOP
HOW WILL IT WORK?

The Master View

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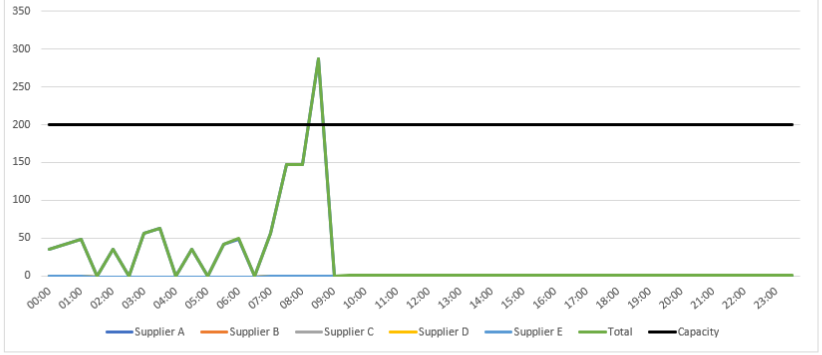
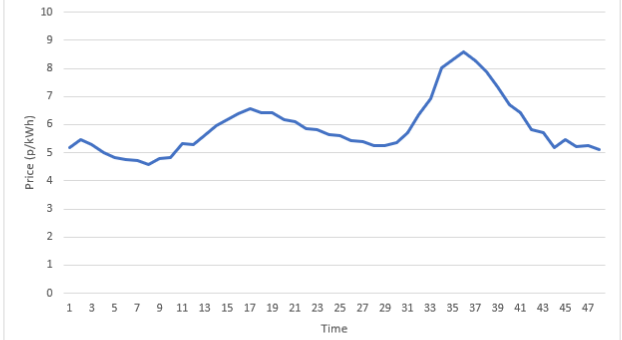
LV Load, *MW*



Price, *p/kWh*



Capacity limit: *200 MW*

Number of suppliers: *5*

FAIL

AM

Time	00:00	00:30	01:00	01:30	02:00	02:30	03:00	03:30	04:00	04:30	05:00	05:30	06:00	06:30	07:00	07:30	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:30
Supplier A	35.00	42.00	49.00	0.00	35.00	0.00	56.00	63.00	0.00	35.00	0.00	42.00	49.00	0.00	56.00	147.00	147.00	287.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**35.00**	**42.02**	**49.04**	**0.06**	**35.08**	**0.11**	**56.13**	**63.15**	**0.17**	**35.19**	**0.21**	**42.23**	**49.25**	**0.27**	**56.29**	**147.31**	**147.34**	**287.36**	**0.38**	**0.40**	**0.42**	**0.44**	**0.46**	**0.48**

PM

Time	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	20:00	20:30	21:00	21:30	22:00	22:30	23:00	23:30
Supplier A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Supplier E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.50**	**0.53**	**0.55**	**0.57**	**0.59**	**0.61**	**0.63**	**0.65**	**0.67**	**0.69**	**0.71**	**0.73**	**0.76**	**0.78**	**0.80**	**0.82**	**0.84**	**0.86**	**0.88**	**0.90**	**0.92**	**0.94**	**0.96**	**0.98**

THE SIMULATION WORKSHOP

HOW WILL IT WORK?

The Supplier View

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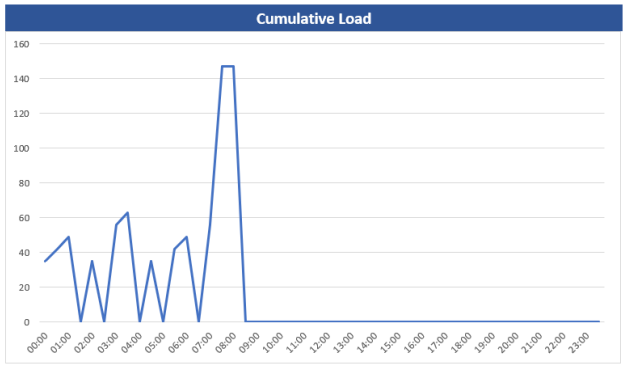
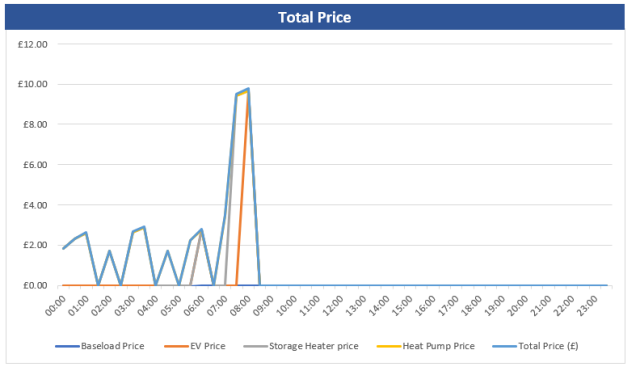
Supplier A Portfolio	
Customers	200
EV customers	20
Storage heater customers	100
Heat pump customers	20

LCT loads		Flexibility Limits		Flexibility Remaining	
		Morning	Whole day	Morning	Whole day
EV Charger	7.0kVA	400.0kVA	800.0kVA	204.0kVA	604.0kVA
Storage Heater	8.0kVA	700.0kVA	1400.0kVA	273.0kVA	973.0kVA
Heat Pump	4.0kVA	250.0kVA	500.0kVA	117.0kVA	367.0kVA





Price (p/kWh)	5.2	5.5	5.3	5.0	4.8	4.8	4.7	4.6	4.8	4.8	5.3	5.3	5.6	6.0	6.2	6.4	6.6	6.4	6.4	6.2	6.1	5.8	5.8	5.6

AM

Time	00:00	00:30	01:00	01:30	02:00	02:30	03:00	03:30	04:00	04:30	05:00	05:30	06:00	06:30	07:00	07:30	08:00	08:30	09:00	09:30	10:00	10:30	11:00	11:30
Baseload	0.0005	0.0004	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0004	0.0005	0.0005	0.0007	0.0007	0.0008	0.0008	0.0009	0.0009	0.0009
EVs On													7				21							
Storage Heaters On	5	6	7		5		8	9	0							21								
Heat Pumps On										5		6			8									
Total Price (£)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Load	35.0	42.0	49.0	0.0	35.0	0.0	56.0	63.0	0.0	35.0	0.0	42.0	49.0	0.0	56.0	147.0	147.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Price (p/kWh)	5.6	5.4	5.4	5.3	5.3	5.4	5.7	6.3	6.9	8.0	8.3	8.6	8.3	7.9	7.4	6.7	6.4	5.8	5.7	5.2	5.5	5.2	5.3	5.1

PM

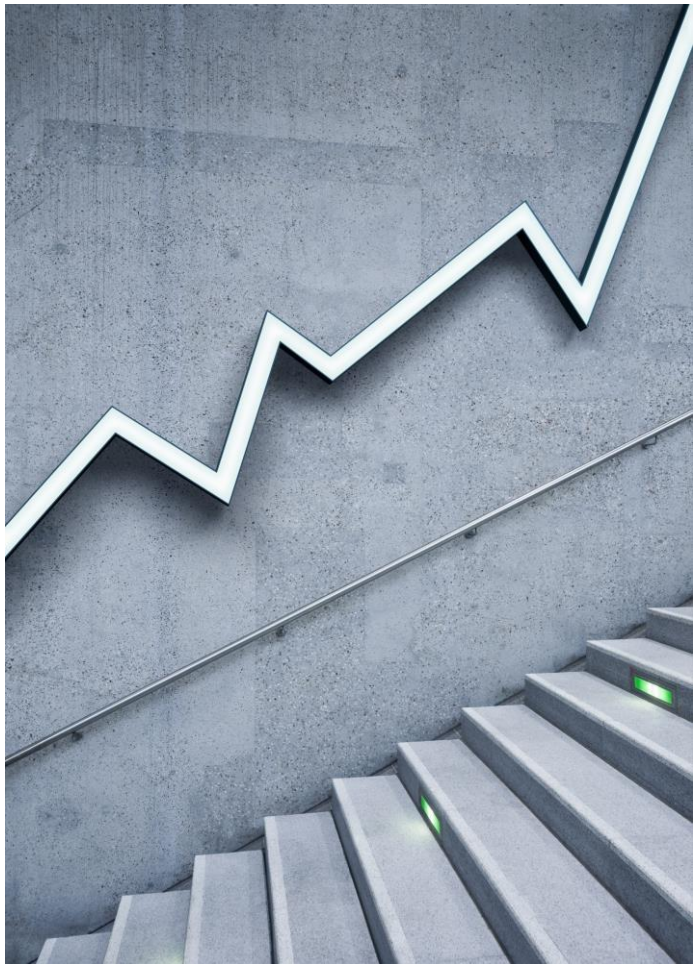
Time	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	20:00	20:30	21:00	21:30	22:00	22:30	23:00	23:30
Baseload	0.0010	0.0010	0.0009	0.0008	0.0008	0.0008	0.0008	0.0008	0.0009	0.0010	0.0011	0.0011	0.0011	0.0011	0.0011	0.0010	0.0010	0.0010	0.0010	0.0009	0.0008	0.0007	0.0006	0.0005
EVs On																								
Storage Heaters On																								
Heat Pumps On																								
Total Price (£)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Load	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Input Data
	Output of Data

Chart1 | Master Sheet | Supplier A | Supplier B | Supplier C | Supplier D | Supplier E | Supplier A (2) | Baseline | PRICE PROFILE | Not used_Sheet2 | Background info | Not used_LV model | Not used_Sheet1

SIMULATION WORKSHOP
NEXT STEPS

- The output from the workshop will be **combined** with technical trials this winter to inform the development of:
  - Commercial trials starting Q3 next year
  - Possible new Open Networks FSA Service Types



CALL TO ACTION!

We need your support for the workshop to be a success – informing how we introduce dependable and enduring flexibility services to the LV network

THANK YOU

SCAN ME

Join our mailing list

Stay in the loop with future Flexibility and LMA engagement through our DSO Newsletter, launching in the new year.

Scottish & Southern Electricity Networks