Open Networks programme

Dissemination Forum

23rd June 2022

Thank you for joining the June Open Networks Dissemination Forum

This meeting will commence at 10:00

- If you are unable to play the audio through your device, you can **dial in by calling** **+44 20 3855 5885** **and using access code** **585503570#**
- All microphones have been set to mute to avoid background noise.
- Please ask questions or make comments **via the chat function** throughout the meeting.
- Please note that the webinar will be recorded and made publicly available on ENA's YouTube channel. Please do not turn your video on if you don't want your likeness to be recorded and shared.
- The slides from the meeting will be made publicly available on ENA's website.
- If you have any feedback you would like to submit to the Open Networks programme , please get in touch with us at opennetworks@energynetworks.org.

Agenda

Item	Start	Finish	Time	Item	Presenter
1	10:00	10:05	5	**Welcome**	Ian Povey (Chair of Whole Electricity System Workstream, ENWL)
Flexibility Services (WS1A)					
2	10:05	10:15	10	**Flexibility Services overview**	Ben Godfrey (Chair of Flexibility Workstream, WPD)
3	10:15	10:30	15	**Overarching Common Framework for Flexibility (WS1A P0)**	Avi Aithal (ENA Technical Lead)
4	10:30	10:50	20	**CEM-CBA interactions report (WS1A P1 & WS4 P1)**	Ian Dunstan (Product Co-Lead WS4 P1, WWU) Gary Dolphin (Product Co-Lead WS4 P1, NG-ESO)
5	10:50	11:10	20	**Dispatch interoperability & Settlement (WS1A P3)**	Joe Davey (Product Lead, WPD)
6	11:10	11:15	5	**Break**	
Whole Electricity System Planning & T-D Data Exchange (WS1B)					
7	11:15	11:25	10	**Whole Electricity Systems overview**	Ian Povey (Chair of Whole Electricity System Workstream, ENWL)
8	11:25	11:45	20	**DER Visibility and Data sharing (2021 WS1B P6)**	Odilia Bertetti (Product Lead, UKPN)
9	11:45	12:05	20	**Further alignment between FES and DFES (WS1B P2)**	Christos Kaloudas (Product Lead, ENWL)
10	12:05	12:10	5	**Break**	
Customer Information Provision & Connections (WS2)					
11	12:10	12:20	10	**Customer Information Provision & Connections overview**	Jim Cardwell (Chair of Connections Workstream, NPg)
12	12:20	12:40	20	**Embedded Capacity Register (WS2 P1)**	Steve Halsey (Product Co-Lead, UKPN) Steve Field (Product Co-Lead, SPEN-D)
Wider Open Networks programme					
13	12:40	12:50	10	**Wider programme updates**	Farina Farrier (Head of ON, ENA)
14	12:50	12:55	5	**Latest & upcoming ENA events**	Emily Jones (Head of Stakeholder Engagement, ENA)
15	12:55	13:00	5	**AOB**	Ian Povey (Chair of Whole Electricity System Workstream, ENWL)

Flexibility Services overview (WS1A)

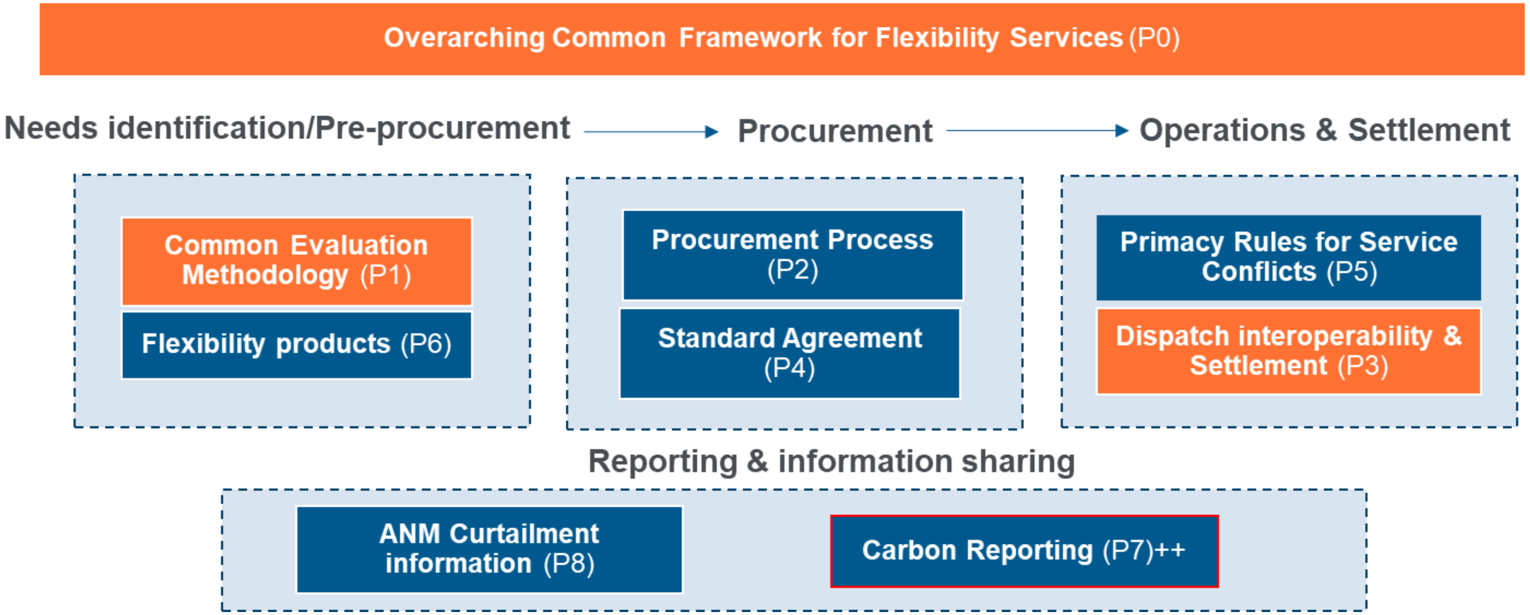
Ben Godfrey (Chair of Flexibility Workstream, WPD)

Flexibility Services overview (WS1A)

- Supporting delivery of actions from Smart Systems & Flexibility Plan,
- Facilitating the development of local flexibility markets through more standardisation (across DNOs and with the ESO), simplification, and transparency in decision-making.

Recent Area

- Flexibility consultation and UK-wide flex figures to be published in late June & July 2022 respectively.
- Simplifying flex service provision through P3 and P4
- Improving transparency through the publication of a Baselining tool, stakeholder engagement on key tools in deciding whether to tender for flexibility, and developing a common framework for flexibility.



Products in orange will be discussed in more detail at this session.

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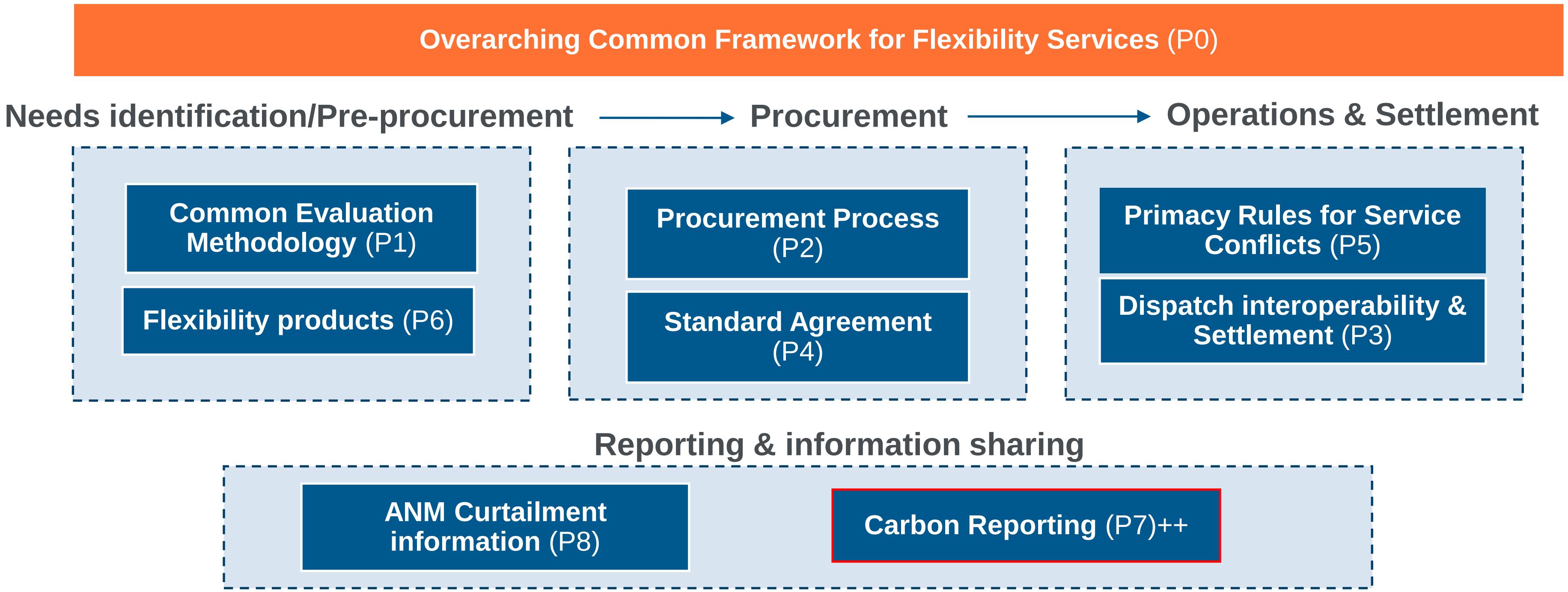
Overarching Common Framework for Flexibility services (WS1A P0)

Avi Aithal (ENA Technical Lead)

Flexibility Services overview (WS1A)

- Supporting delivery of actions from Smart Systems & Flexibility Plan,
- Facilitating the development of local flexibility markets through more standardisation (across DNOs and with the ESO), simplification, and transparency in decision-making.



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Journey so far

2017	2018	2019	2020	2021	2022	2023 & onwards
ED1						ED2

Foundational work for DSO

Detailed modelling & independent assessment

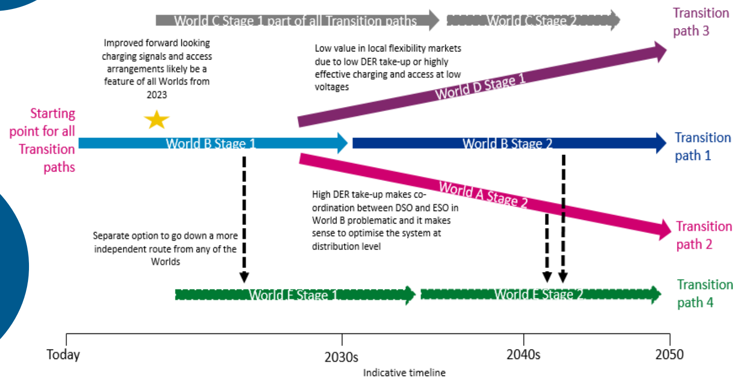
Delivering stronger coordination and least regrets actions

DSO Functions

Principle of neutral market facilitation

Commercial Principles paper 2017

Modelled 5 different Future Worlds with different attribution of roles and responsibilities for DSO Functions.



Independent assessment set out a pathway in the short term on a model of stronger coordination between DNOs and ESO and allows for future changes to roles and responsibilities to deliver the most effective mode.

DSO Transition

- Flexibility Services
- T D Coordination
- Connections
- Whole Energy Systems

Comms & Stakeholder Engagement

Key developments in 2022

- Energy Security Strategy
- FSO governance
- CLASS
- Local energy governance
- SCR decision
- ED2 determinations

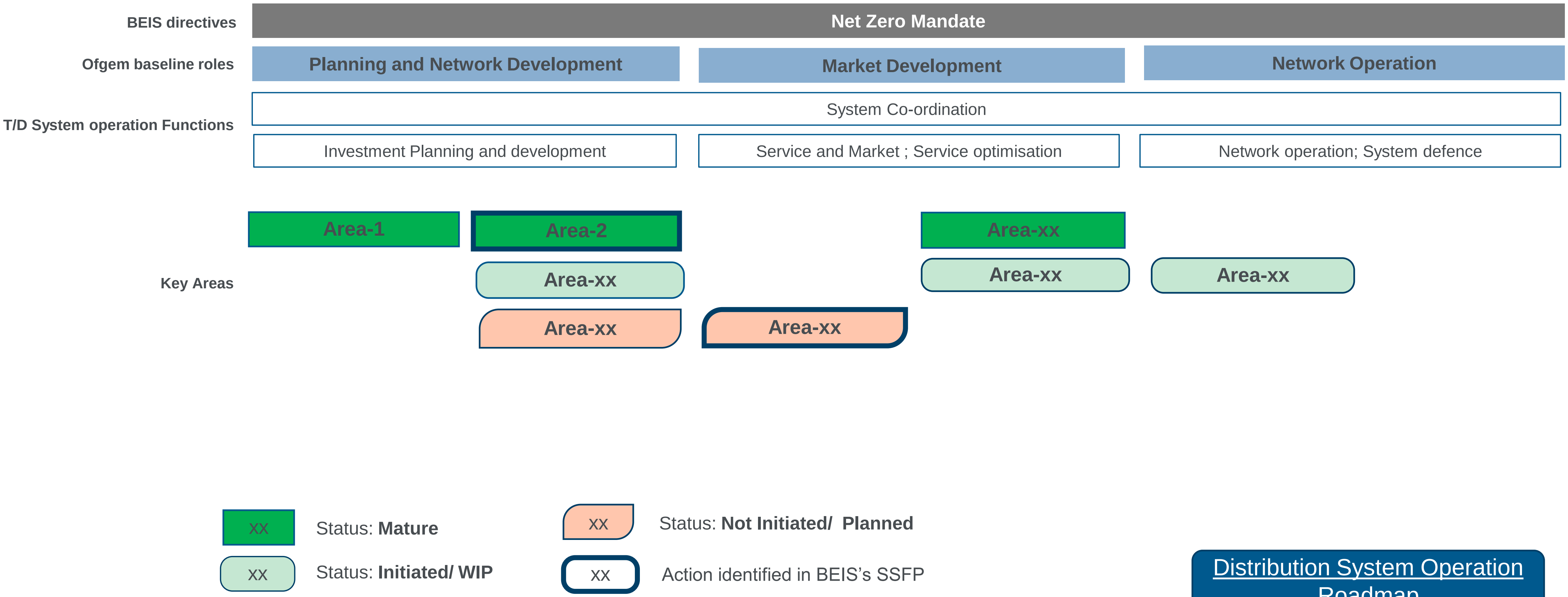
Key deliverables (As per action 3.2 and 3.3 of the Smart Systems Plan)

- **Deliver a standardised approach across distribution networks to procure flexibility by 2023,**
  - through commonly defined flexibility services, common approaches to valuing flexibility, baselining methodologies, pre-qualification, dispatch and settlement, and monitoring requirements.
- Develop and implement a set of primacy rules to resolve service conflicts between ESO and DNO procured flexibility by 2023
- Enable greater participation of ANM enabled Flexible Connections through improved provision of curtailment information.
- **Deliver a common framework for flexibility by 2023 that delivers a Area up in alignment and standardisation across distribution flexibility services, and ESO balancing and ancillary services.**

Deliverable

1. **Common framework for flexibility -** Integrate the various components of flexibility work (covered across multiple products) into a common framework for flexibility.
2. **Strategic flexibility Roadmap -** set out a clear strategic view of further development required to mature processes across key aspects of flexibility

Framework for Flexibility



Distribution System Operation Roadmap

Strategic Flexibility Roadmap

	Key area	Activity under individual Area	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
Planning and Network Development	Key Area-1	Activity-1												
		Activity-2												
	Key Area-2	Activity-1												
		Activity-2												
		.												
		.												
		Activity-yy												

In Development

Implementation to BaU

Continuous improvement

Open Q&A

CEM & Whole systems CBA interactions report (WS1A P1 & WS4 P1)

Ian Dunstan (Product Co-Lead WS4 P1, WWU)
Gary Dolphin (Product Co-Lead WS4 P1, NG-ESO)

Background

- In the last two years the ENA Open Network programme has developed two key cost benefit analysis tools:
- In Work Stream 1A (Flexibility Services) a **Common Evaluation Methodology** and associated Tool
  - allows the user (primarily distribution network operators) to evaluate flexible and non-flexible solution options and provide information and insights to the user for deciding on the appropriate solution
- In Work Stream 4 (Whole System) a **Whole System CBA** has been developed
  - allows the user to evaluate a range of options from a whole systems perspective
- Designed by different Product teams but created in parallel
  - Teams have worked collaboratively to ensure consistency

CEM and Whole System CBA interactions report

- During the creation of both CBA tools, both Product teams have had similar questions on the uses of the two evaluation tools, their overlap and interactions and independencies.
- The report has been written to clarify the similarities, differences and interactions between the two evaluation tools.

CEM and Whole System CBA tools in a nutshell

- **Common Evaluation Methodology Tool**
  - Designed to be used solely by distribution network operators to aid decision making about network intervention solutions by testing different flexibility strategies

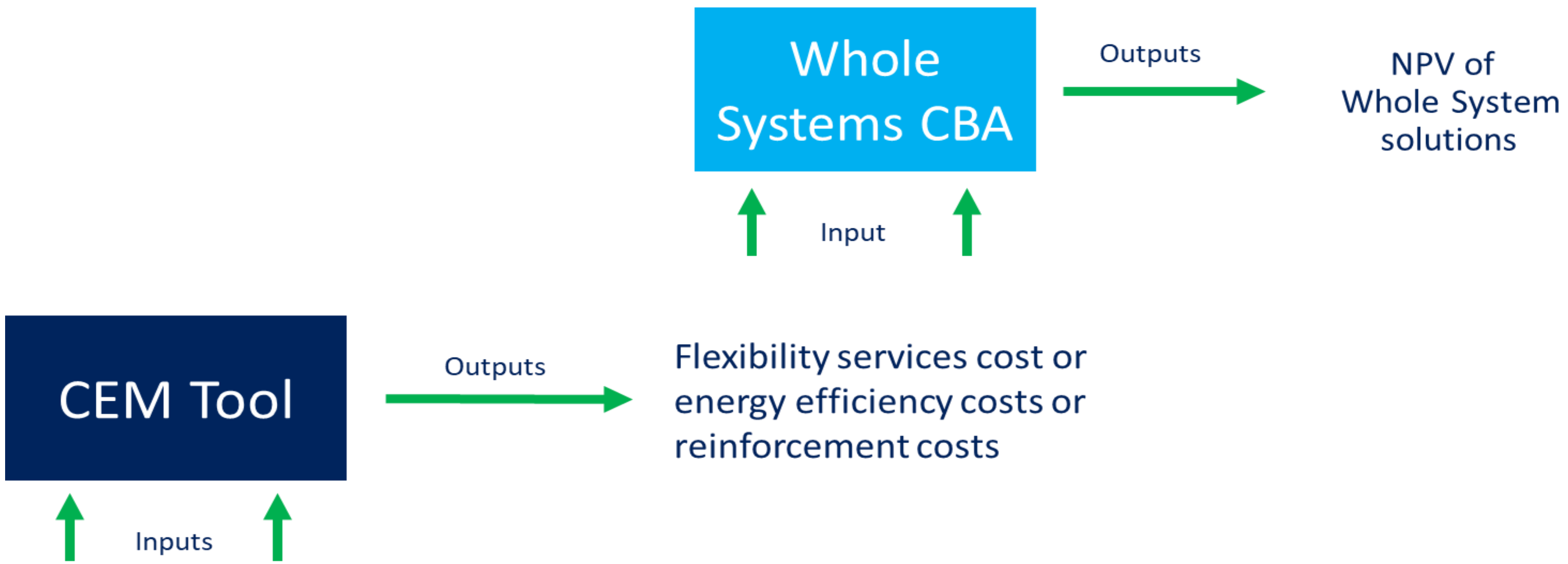
- **Whole System CBA Tool**
  - Allows the user to consider problems through a whole system lens

Key features of the CEM and Whole System CBA tools

	Scope of costs analysis	Scope of benefits analysis	Evaluation methodology	Primary use case	Outputs
Common Evaluation Methodology Tool	DNO costs only	DNO benefits only	Built on the Ofgem CBA template with fixed parameters	Evaluates flexibility services	Financial analysis of each solution, including optimal contract period, ceiling price and option value
Whole Systems CBA	A range of licensee and third-party costs	A range of licensee and third-party benefits	Built on the Ofgem CBA template with ability to vary fixed parameters	Evaluates a whole system problem	Financial analysis of each solution, including sensitivity analysis, tipping points and distributional impacts

CEM and Whole System CBA can be used in conjunction

- The output of the CEM Tool can be used as an input to the Whole System CBA



Conclusions

- The CEM and Whole System CBA are both evaluation tools
- Both built around the Ofgem CBA
- CEM more aligned to Ofgem CBA – only takes into account costs and benefits of the DNO user
- Whole System CBA has been developed to take into account a range of costs and benefits from across multiple parties, for example between gas and electricity networks, or interactions with transport, water, waste etc
- The two tools can be used in conjunction, with the output from the CEM used as an input to the Whole System CBA
- The Product Teams have considered whether the two tools should be combined
  - This has been declined due the resulting complexity of the model
- The two Product Teams will continue to work collaboratively to ensure underlying methodologies and techniques remain consistent where appropriate

Open Q&A

Dispatch interoperability & Settlement (WS1A P3)

Joe Davey (Product Lead, WPD)

2022 Work

- Building on previous 2019 WS1A P3
- Focus on standardisation of dispatch and settlement processes
- First half of 2022 will focus on dispatch
- Second half of 2022 will focus on settlement
- For dispatch the product will consider interoperability across various systems (DNO, ESO, and third-party platforms)

Definitions

Dispatch (from 2019 work)

- "*Process through which the DNO informs a flexibility provider of the required level of service within operational timescales*"

Dispatch Interoperability

- "*A standard set of policies and procedures to communicate and instruct a Service Provider to deliver a contracted service*"

- The process of dispatching services has been decoupled from individual products as much as possible
  - Minimises dependencies on other WS1A products
  - Reduces risk of standardisation limiting the future development of flexibility products

Phases of Dispatch

- Declaration of availability by Service Provider
- Acceptance of offered services by System Operator
- Scheduling of services to run by System Operator
- Instruction of services to run by System Operator
- Cease instruction to stop operation of services
- Monitoring of services
- Post-action reporting
- Cancelation of dispatch

Current View

- General view is that APIs will be used to manage dispatch in the long term
  - Other methods are likely to be retained as backup options or for smaller FSPs
- WS1A P3 members are open to the idea of adopting a common API
  - Needs to be suitably flexible to accommodate potential future requirements
- Currently exploring the key data and messages that would need to be exchanged through a common API
  - Technical specifications are excluded from the scope of the product group therefore the likely outputs will include a recommendation to develop a common API standard as further work
  - If it is possible the preference will be to utilise an existing dispatch standard for this common API

Application Programming Interfaces (API)

- Connection between computers / programs
- Provides a standard way of exchanging predefined messages between systems
  - Different platforms can utilise the same API
  - Hides the internal complexities of systems
- Enables the automated processing of data from multiple sources at scale

```
https://data.nationalgrideso.com/api/3/action/datastore_search?resource_id=db6c038f-98af-4570-ab60-24d71ebd0ae5&limit=2
```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              "SETTLEMENT_PERIOD": 21,
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              "EMBEDDED_WIND_CAPACITY": 6545,
              "EMBEDDED_SOLAR_FORECAST": 2890,
              "EMBEDDED_SOLAR_CAPACITY": 13080
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           "TIME_GMT": "10:00",
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           "EMBEDDED_SOLAR_CAPACITY": 13080
     }
]
```


Example extract from National Grid ESO Embedded Solar and Wind Forecast API

Impact of a common API

- APIs will require the input of software developers to implement, both on dispatch platforms (System Operator side) and Service Providers systems
  - Where a System Operator utilises an existing API consideration will need to be given as to what the impact of moving to a new API would be and how long the existing API should be supported for
- API will need to have suitable flexibility for future developments (such as new services)
  - Change management of API will be key to its long terms success
- Adoption of a common API could lead to the development of ‘off the shelf’ solutions to interface with System Operators dispatch platforms

Open Q&A

Break

Whole Electricity System overview (WS1B)

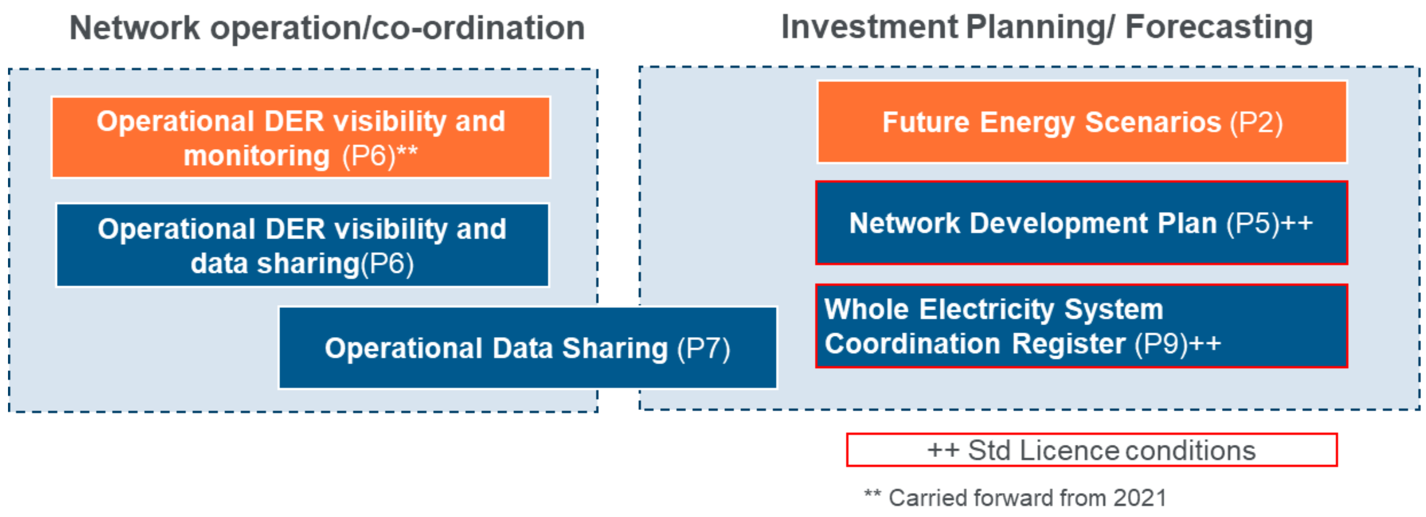
Ian Povey (Chair of Whole Electricity System Workstream, ENWL)

Whole Electricity System overview

- Optimise existing planning and forecasting processes across the Transmission-Distribution boundary, through streamlining of Future Energy Scenarios (FES) and Distribution Future Energy Scenarios (DFES) by identifying synergies and reviewing key assumptions in their building blocks.
- Develop and implement approaches to improve the quality and the consistency of data sharing in operational and planning timescales between DNOs, TOs, ESO, and non-network market participants.

Recent Area

- Improving standardisation across T-D boundary through aligning GSP definitions and defining FES-DFES alignment requirements.
- Taking a more ambitious approach to network co-ordination through rescoping DER Visibility and Data sharing
- Upcoming webinar on 27th June on what the "Best View" and Distribution Future Energy Scenarios are, and their use in Network Development Plans, alongside an overview of the recently published co-ordination registers.

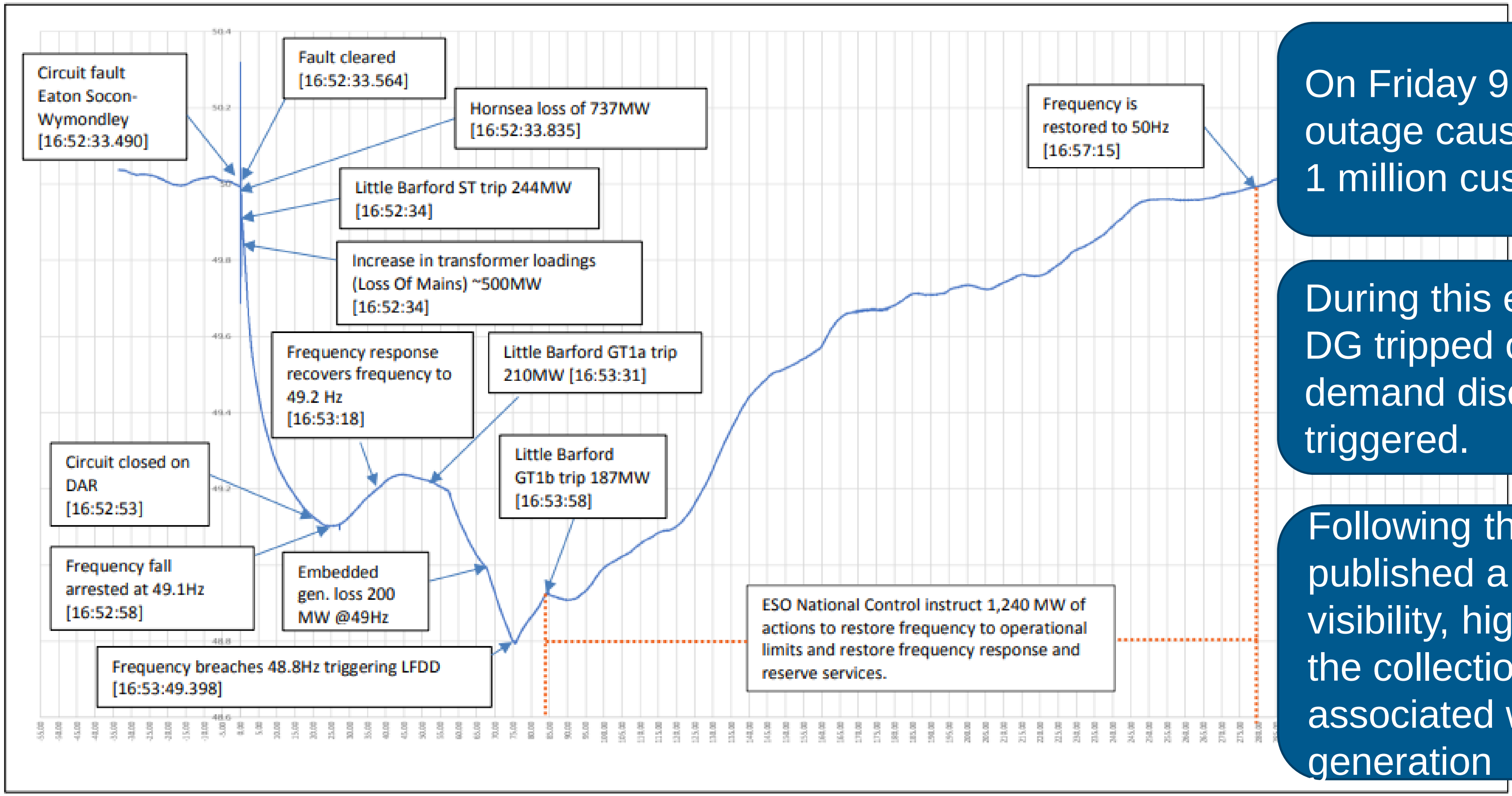


Products in orange will be discussed in more detail at this session.

DER Visibility and monitoring (2021 WS1B P6)

Odilia Bertetti (Product Lead, UKPN)

Background – 9th of August 2019 event



On Friday 9 August 2019, a power outage caused interruptions to over 1 million customers

During this event, a large amount of DG tripped or de-loaded resulting in demand disconnection being triggered.

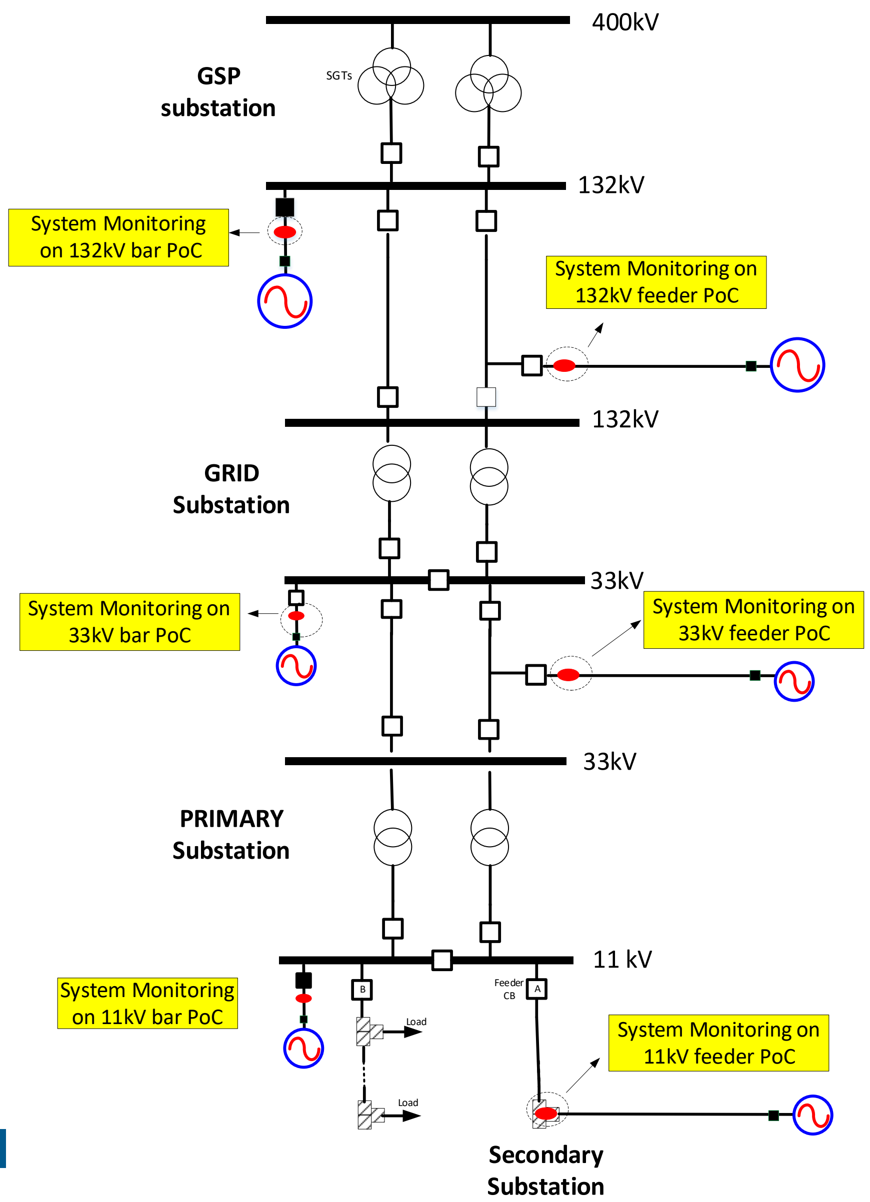
Following the event, Ofgem published a call for evidence on DG visibility, highlighting the shortfall in the collection of real time data associated with distributed generation

WS1B Activities and Deliverables

Deliverable	Activity	Description
Deliverable A	Use Cases definition	• Identify use cases for DER visibility and monitoring for the ESO and DNOs
Deliverable A	DER Data points list for each use case	• Define a list of parameters to be collected from DER PoC for each of the use cases
B	Volume and Impact of use cases	• Assess the volume (frequency of occurrence) and the impact (network risk, commercial, stability CB system) of each use case
C	Functional Specifications	• Define the functional specification (accuracy, resolution of data capture etc) for the identified DER data points
Deliverable D	DER Visibility Gap analysis	• Assessment on the level of visibility that DNO have over generation sites
Deliverable D	Cost	• Quantify the investment that would be required for monitoring, collecting, storing and disseminating real time operational data associated with DG POC
Deliverable D	Benefits	• Quantify the value that additional data points will provide to improving the planning, security and real time operation of the GB transmission

Operational DER visibility – boundary

- **DER Type:** generation sites. Demand has been excluded from the scope.
- **Voltage Level**: Distributed connected generation sites, connected to EHV and HV voltage levels. LV sites have been excluded from the scope.
- **DER Capacity**: We initially considered anything (>0MW) connected from HV to EHV. Minimum capacity has been advised by the CBA results.
- **DER Connection Date**: applies retrospectively to existing DERs. Generators connected after April 2019 are required to have monitoring and controlling capability in place as per by EREC



WS1B P6 – Use Cases, Volumes and Data Points (Deliverable A and B)

DER Visibility Use Cases

DER providing service to DNO only

- 1. Flexible Connections dispatch (ANM)
- 2. Flexibility Service dispatch

DER proving service to ESO only

- 3. Ancillary and Balancing services
- 4. System Restoration (black start)
- 5. Capacity Mechanism Planning

DER providing services to a DNO and ESO

- 6.Whole-system coordination (resolving conflict of Services)

All DER -Improvement of existing processes

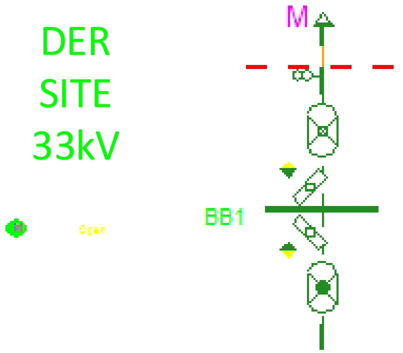
- 7. System resilience (Major network event recovery)
- 8. Improved real-time Network Operation
- 9. Improved Outage Planning processes (DNO)/ Network Access Planning (ESO)
- 10. Improved Network Planning processes (DNO)/ Network Access Planning (ESO)
- 11. Improved Demand forecasting processes
- 12. Real-time DSO Data transparency
- 13. DER compliance with relevant standards

Market facilitation (non-DSO services)

- 14. Facilitation of new Markets (e.g. peer-to-peer)

DER Data points list

Data category	Data points
Operational Metering Data	• Amps, Volts, W, VARs • Breaker/isolator Status
Other Raw PoC Data	• Power Factor, Frequency • Breaker and Isolator status • Power Quality Monitoring • Weather Data
Processed Data	• Load Factor • Power Available • State of Energy
Forecasted Data	• MW Forecasted /Declared MW output
Availability Data	• DER under maintenance (Availability (0/1)) • MW Capacity in Service • Planned DER outage
Market Data	• Service contracted, Volume of Service contracted, Volume of service forecasted, Volume of service dispatched
Static Data	•Capacity, Technology Type and PQ envelope •Ramp-up and ramp-down rates •Minimum partial output •Fault infeed parameters •Protection settings •Address, MPAN and Site Number



Telemetry Data (SCADA)

Operational metering:

- Amps
- kW
- kVAr
- kV

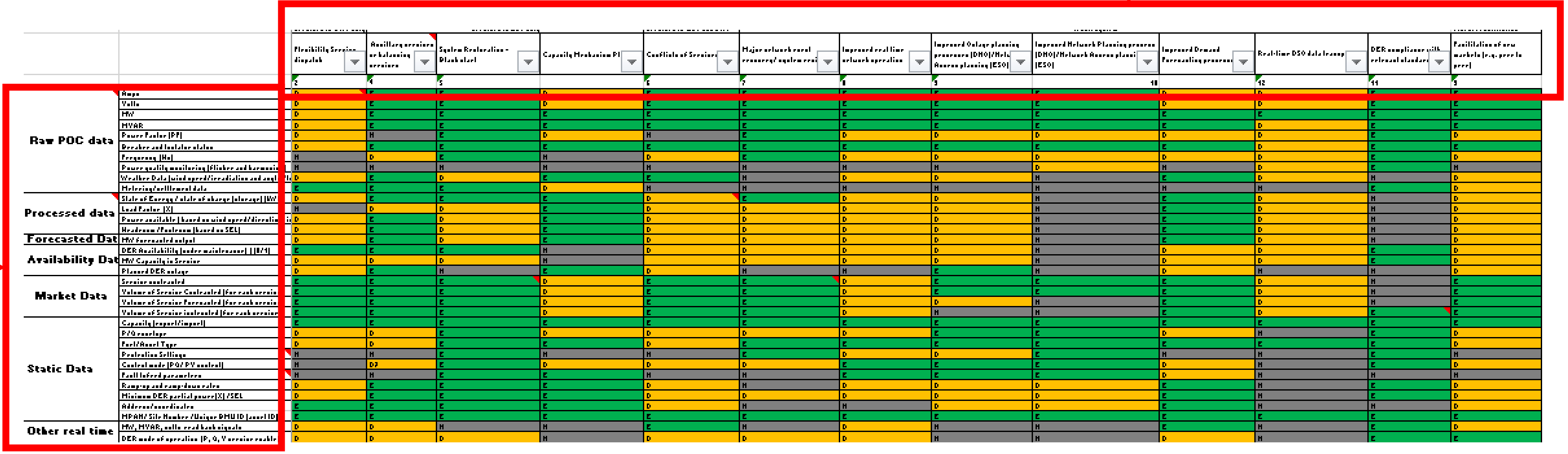
CB status

WS1P P6 Data Points Mapping

The use Cases have been mapped to the identified DER data points, as follow:

- **Essential Data**
- **Desirable Data**
- **Data not required**

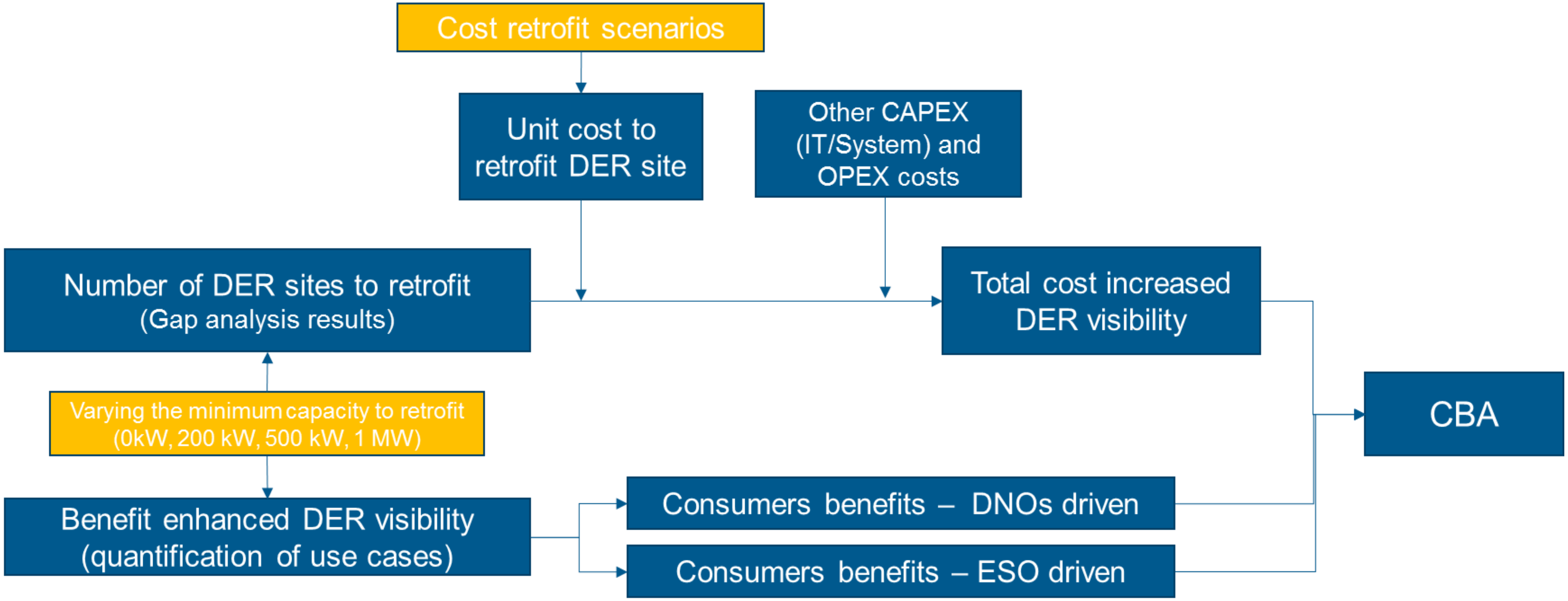
Use Cases



DER Data Points

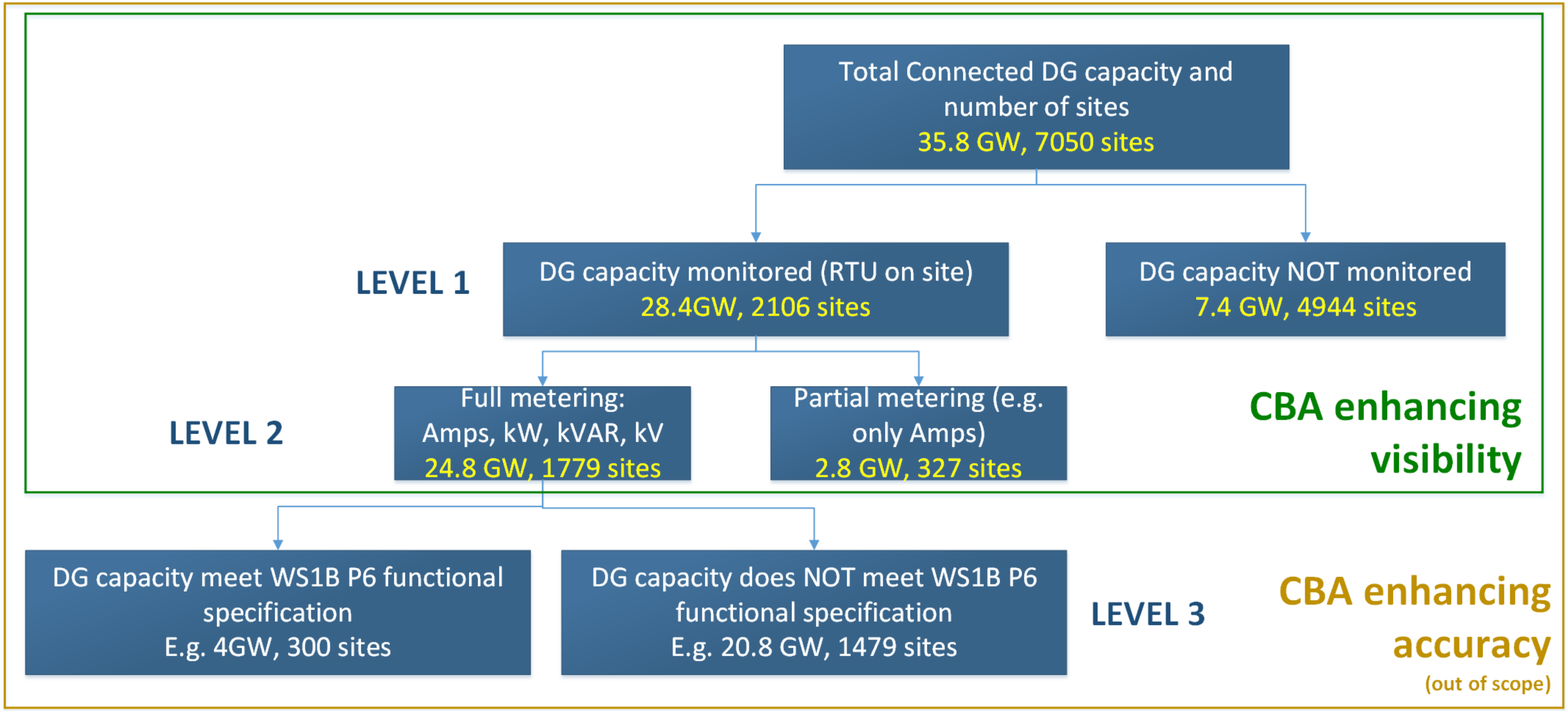
WS1B P6 – Cost Benefits Analysis (Deliverable D)

Approach taken to deliver CBA



CBA aims at providing evidence on the minimum DER capacity worth retrofitting

Operational Metering Gap Analysis



DER visibility – DNOs Gap Analysis results

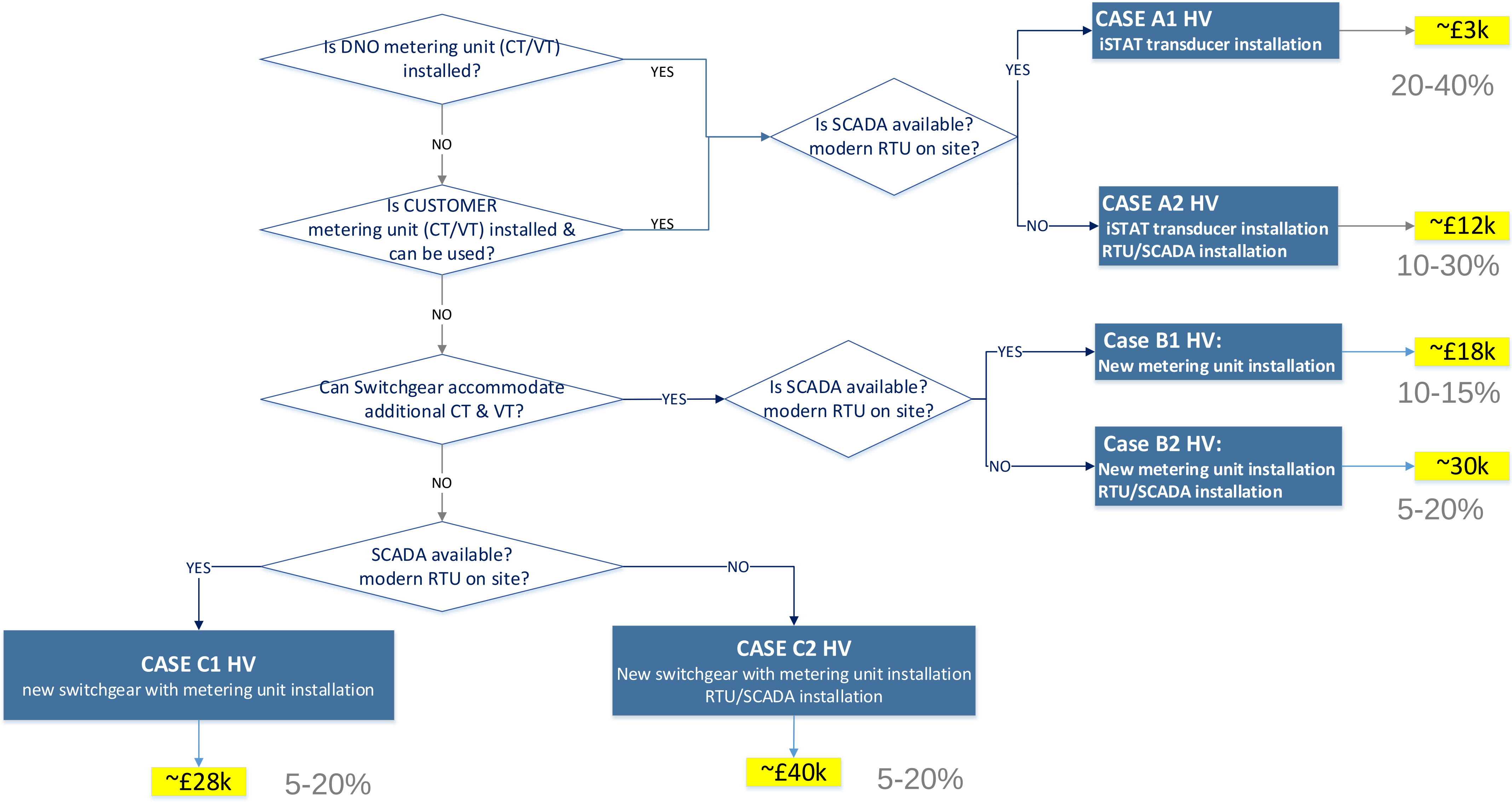
DNO TOTALS	TOTAL (EHV + HV)	EHV	HV
Total Capacity [GW]	35. 8GW	28.2 GW	7.6 GW
Monitored Capacity [GW]	28.4 GW	26.7 GW	1.6 GW
Un-monitored capacity [GW]	7.4 GW	1.5 GW	5.9 GW
Unmonitored Capacity [% of total]	20.6%	5%	78%

Unmonitored sites	Sites/capacity not monitored	0-200 kW	200-500 kW	500 kW- 1 MW	1-10 MW	>10 MW
Number of Sites	4944	1894	1055	630	1297	68
Total Capacity	7.4 GW	0.19 GW	0.32 GW	0.34 GW	5.9 GW	0.68 GW
% of capacity		3%	4%	5%	79%	9%

Costs Retrofitting DER sites

Cost of Retrofitting HV DER connection

5.9 GW out of 7.4GW on un-monitored capacity falls into this category



CAPEX Cost to enhance DER visibility

CAPEX

- Cost retrofit DER

CBA scenario	Minimum Capacity to retrofit	Number of sites to retrofit	Retrofit Cost BEST case	Retrofit Cost WORST CASE
SC1	> 0kW	5265	**£69.5 M**	**£131.2 M**
SC2	> 200 kW	3373	**£46.1 M**	**£87.3 M**
SC3	> 500 kW	2316	**£33 M**	**£62.8 M**
SC4	> 1MW	1686	**£25.2 M**	**£41.5 M**

- IT

Costs are based on £1250/1000GB of memory and 425 MB/site

A pair of FEPs (£30k) can accommodate approximately 500 new sites

CBA scenario	Minimum Capacity to retrofit	Number of new sites on SCADA	Number of FEPS required	FEPs cost	Storage cost	TOT CAPEX IT cost
SC1	> 0kW	5265	11	£158k	£50 K	£208k
SC2	> 200 kW	3373	7	£101k	£32 K	£133k
SC3	> 500 kW	2316	5	£70k	£22 K	£92k
SC4	> 1MW kW	1686	3	£51k	£16 K	£66k

OPEX COST to enhance DER visibility

£50/site/year
annual field team cost, includes labour, mileages etc;
Support contracts with RTU suppliers

£4.5k for EHV sites and £200 for HV sites. Replacement cycle 10 years

Cellular comms contract 100£/site/year.

PI data points storage £1/data points/year

CBA scenario	Minimum Capacity to retrofit	Number of new sites on SCADA	Faults resolution on site	Battery Replacement Cost	Comms cost	Data Storage	TOT
SC1	> 0kW	5265	£263 K/year	£173 K/year	£526 K/year	£263K/year	£1.23M /year
SC2	> 200 kW	3373	£169 K /year	£135 K/year	£337 K/year	£169K/year	£0.81M/year
SC3	> 500 kW	2316	£116 K /year	£114 K /year	£232 K/year	£115K/year	£0.58M/year
SC4	> 1MW	1686	£84 K/year	£101 K /year	£169 K/year	£84K/year	£0.44M/year

Customers Benefits Enhanced Visibility - ESO/DNOs Driven

ESO/customers benefit Quantifications

A. Benefits arising from reduced thermal congestion costs

High level use case	CBA methodology
3. Ancillary and balancing service provision	Constraint costs = constraint volumes x unit cost. Greater volume of providers could reduce average unit cost by 0.25%
8. Real time operations	Constraint costs = constraint volumes x unit cost of constraint 5% improved forecast data proportioned by proportion of visible DG realised
9. Outage planning	Constraint costs = constraint volumes x unit cost of constraint 3% improved limits; more accurate data by proportion of visible DG realised
10. Long term development	Constraint costs = constraint volumes x unit cost of constraint 2% better demand data by proportion of visible DG realised

B. Benefits arising from improved system resilience

Reducing impact and frequency of high impact low probability events

High level use case	CBA methodology
7. System resilience	Value = VoLL * %demand loss reduction * demand * duration of loss

C. Benefits arising from improved system restoration

Utilising distributed generation to restore power following a black start event

Benefits developed as part of the Distributed Restart bid document (£115M NPV by 2050).

DNOs/customers benefit Quantifications

1. Benefits arising from Flexibility Service Use Case

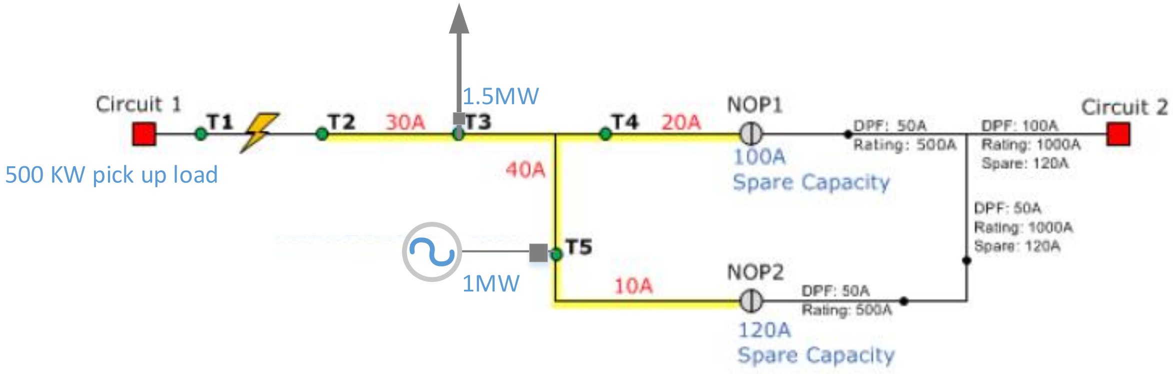
Without DER visibility DNOs would over dispatch in the expectation that not all capacity will be delivered reliably. In some cases, all the dispatched capacity will be delivered which would exceed our requirement and we would incur unnecessary cost. If we had real time visibility of DER we could detect when the DER has failed to deliver and dispatch more as required.

	Benefit Quantification
£/year savings=	MW over dispatched * [£/MWh payment] * [hours/year dispatch]* [Historical under-delivery figures] *Unmonitored capacity%

2. Benefits arising form real Time Network Operation (APRS) use case

APRS automatically executes a sequence of switching actions to isolate the fault and restore power to the rest of the network. APRS only uses the feeder pick up load, and generation could be masked. Masked generation on the feeder could cause APRS mal operation, executing switching action which cause additional faults, affecting Customer interruptions.

Saving	Benefit Quantification
£/year saved	[# of feeders at risk of APRS mal-operation] * [faults/feeder/year] *[number of customers affected * average power]* [average interruption duration] *Voll (6000 £/MWh)



CBA Results

DER Visibility CBA results

As part of the operation metering Gap Analysis, it was identified that the total 7.4 GW on unmonitored capacity across DNOs network is mostly made up of generators in the 1-10MW capacity bracket corresponding to 5.9 GW of capacity (79% of the total unmonitored capacity).

Retrofitting all the invisible 1365 sites above 1MW (SR4) would provide an additional 6.6 GW DER visibility, whereas retrofitting all the invisible 3579 sites below 1MW, would provide an additional visibility of 0.86 GW as shown in Table below.

Unmonitored sites	Sites/capacity not monitored	< 1MW	>1MW
Number of Sites	4944	3579	1365
Total Capacity	7.4 GW	0.86 GW	6.6 GW
% of capacity		11%	89%

Cost Benefit Analysis results showed that the benefits from the additional DG visibility with capacity below 1MW, which accounts for a total 0.66 GW of capacity, are not considerable compared to the benefits that would be unlocked from the visibility of DG with capacity 1MW and above, which accounts for total 6.6GW. This assessment may change in the future with further maturing of flexibility markets and DSO.

CBA scenario	Min	Max
SC4 Benefits (ESO + DNOs)	£2.48/year	£25.4/year
Additional Benefits of SC1 (0kW) compared to SC4 (1MW)	£0.2 M/year	£1.7 M/year
Additional Benefits of SC2 (200kW) compared to SC4 (1MW)	£0.1 M/year	£1.4 M/year
Additional Benefits of SC3 (500kW) compared to SC4 (1MW)	£0.08 M/year	£0.7 M/year

DER Visibility CBA results

For each of the retrofit scenario, we have assessed the payback period of capital expenditure rto retrofit DER sites, which looks at the time it takes to recover the cost of the initial investment based on the calculated yearly customer benefits, driven by DNOS and ESO use case.

Scenario	Capacity to retrofit	Cost Scenario	Min Benefits	Average Benefits	Max benefits
SC1	>0 kW	Min Cost	>20	5	3
		Max Cost	>20	10	5
SC2	>200 kW	Min Cost	>20	4	2
		Max Cost	>20	7	4
SC3	>500 kW	Min Cost	~20	3	2
		Max Cost	>20	5	3
SC4	>1 MW	Min Cost	12	2	2
		Max Cost	13	4	2

Open Q&A

FES and DFES – Focus on standardisation & alignment (WS1B P2)

Christos Kaloudas (Product Lead, ENWL)

Purpose of energy scenarios

Distribution Future Energy Scenarios (DFES)

- primary purposes
  - strategic planning of electricity distribution systems & networks
- other purposes
  - supporting local stakeholder decarbonisation & other plans
  - supporting Local Area Energy Plans (LAEPs), Local Heat & Energy Efficiency Strategies (LHEES) and Climate Action Plans (CAPs)
  - supporting FES, e.g. with local plan data reflected in distribution connected demand and generation

Future Energy Scenarios (FES)

- primary purposes
  - strategic planning of transmission network
  - national system operability & security of supply analysis
- other purposes
  - supporting energy industry stakeholder plans
  - supporting DFES, e.g. with national data, FES framework and transmission connected generation

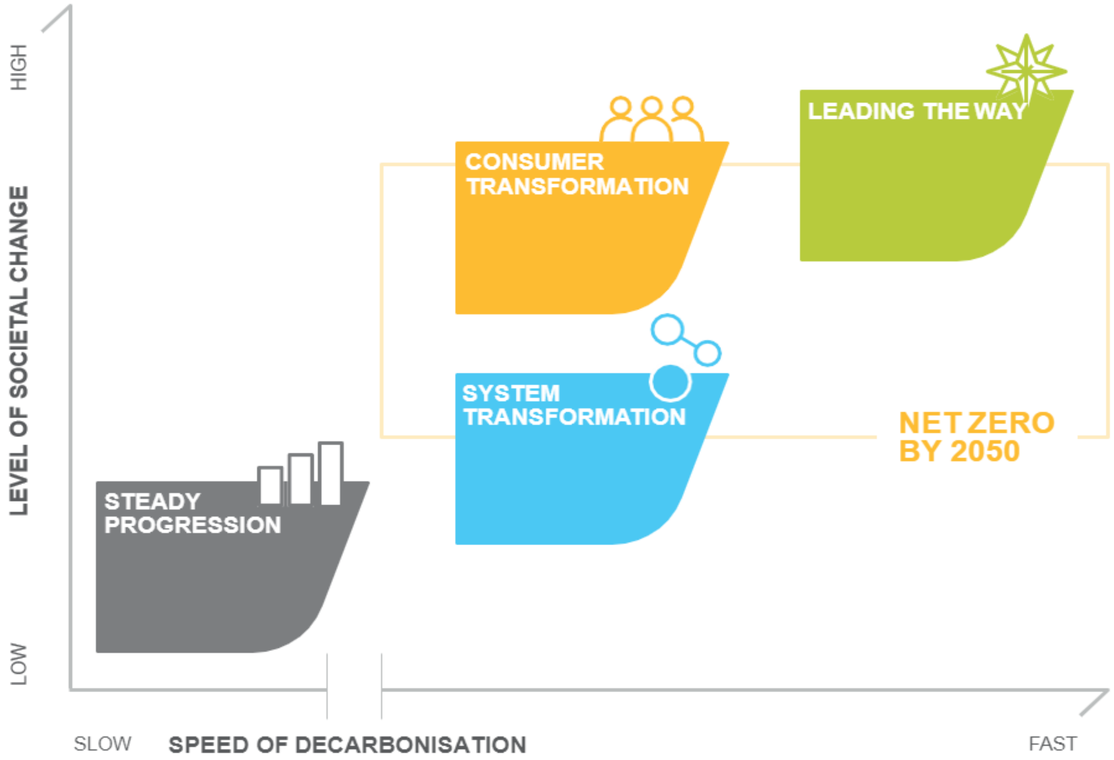
DFES – FES alignment

Initial alignment & feedback model

- established in 2020 within ENA Open Networks
- alignment process between DFES and FES agreed and established by DNOs and ESO
  - to improve standardisation
  - to better facilitate information exchanges
  - to support whole system thinking and processes
  - to help industry participants identify network issues and opportunities

DFES – FES alignment

common scenario framework (2021)



**in late 2022 the Steady Progression scenario will be replaced by Falling Short scenario. This is still part of the same framework.*

Common scenario framework

- four scenarios following same rationale around speed of decarbonisation vs level of societal change
- same high level assumptions, e.g. high EV uptakes in Consumer Transformation in both DFES and FES

Use of building blocks (feedback loop)

- data exchanges for agreed building blocks (demand & generation components)
- comparison of forecasts facilitates convergence of assumptions where appropriate

DFES – FES alignment

Building blocks (draft 2022)

- electric light vehicles (plug in cars, vans, motorbikes)
- electric heavy duty vehicles
- heat pumps (domestic & non-domestic)
- domestic electricity consumption
- industrial & commercial electricity consumption
- onshore wind generation
- photovoltaics (domestic and non-domestic)
- battery storage (domestic and non-domestic)

Use of building blocks

- building blocks used for comparison & alignment purposes
- selection of building blocks based on common, key technologies where direct numerical comparison is sensible
  - e.g. peak demand not part of building blocks as numerical alignment impossible due to higher demand diversification towards higher voltage levels
- DFES and FES consider additional technologies beyond building blocks
  - e.g. transmission connected nuclear generation in FES and various electric heating options for planned local stakeholder developments modelled in DFES

DFES standardisation – common methodology framework

Defining the scenarios → **Capture regional growth in each scenario** → **Production of forecasts** → **Forecast outputs** → **Publication**

Capture regional growth in each scenario

- evidence base & stakeholder engagement
- customers
- local authorities
- local enterprise partnerships
- local housing planning
- local energy strategy
- local economic & industrial strategy

Production of forecasts

Stage 1: baseline (historical data, base year)

Stage 2: pipeline (planned developments, connections, network planning info)

Stage 3: long-term growth (zero carbon targets, LA action plans)

Forecast outputs

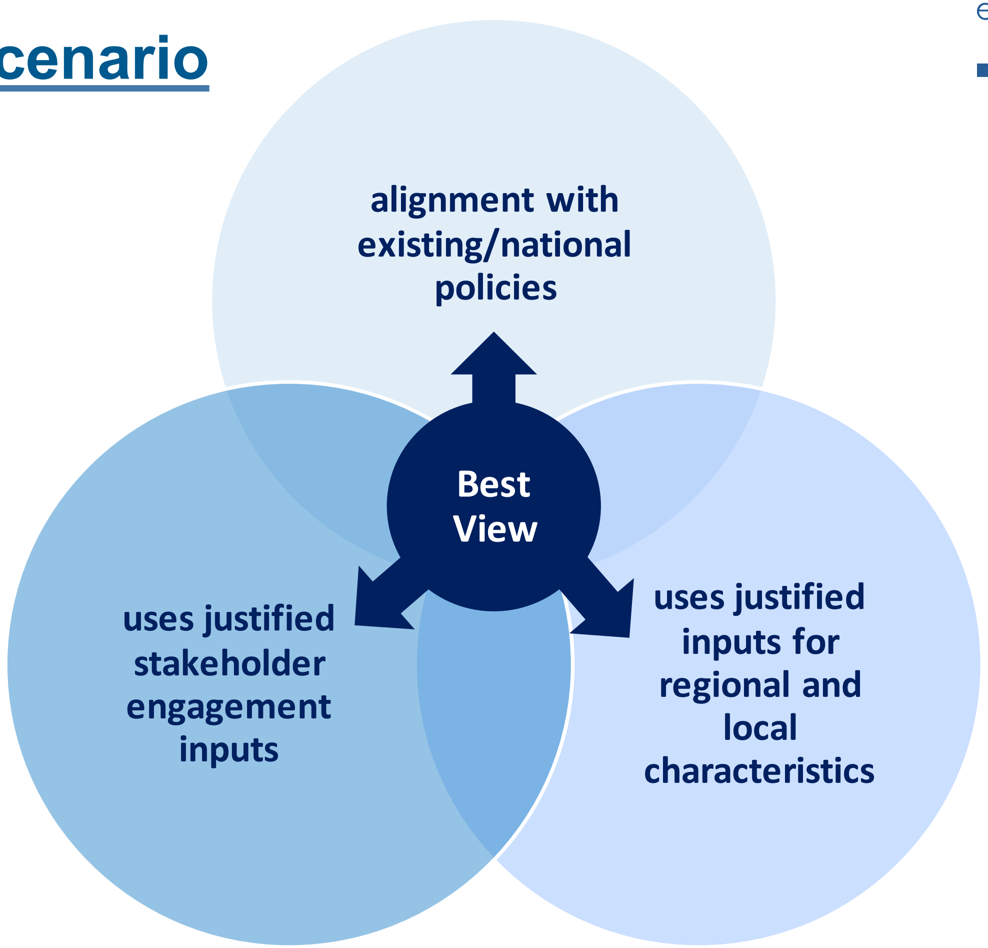
- demand, generation, storage
- seasonal outputs
- daily/half-hourly profiles

Publication

- DFES reports
- regional forecast data

DFES standardisation – “Best View” scenario

- 5th scenario included in DFES
- “Best View” scenario is defined as the highest certainty scenario across all other DFES scenarios, focusing in specific on certainties that can be justified in a 1-10 years horizon acknowledging that longer term forecasts can be more uncertain.
- to produce the “Best View”, each building block needs to be checked against three categories to justify that the developed scenario reflects the highest certainty for the region



DFES as part of standardised DSO planning processes

Stakeholder engagement & LAEPs/LHEES
Ongoing
DFES considers local stakeholder plans (LAEPs/LHEES) and actions together with national policies and regional data. LAEPs/LHEES and stakeholder plans also supported by DFES.

Distribution Future Energy Scenarios
(annual Nov-Dec)
A range of scenarios for electricity demand, distributed generation and storage.

Long Term Development Statement
November and May update (annual)
Future distribution network requirements for the next five years.

Network Development Plan (NDP)
(biannual , May)
NDP (from 2022), part of Clean Energy Package, details future distribution network requirements for one to ten years beyond publication.

Open Q&A

Break

Customer Information Provision & Connections overview (WS2)

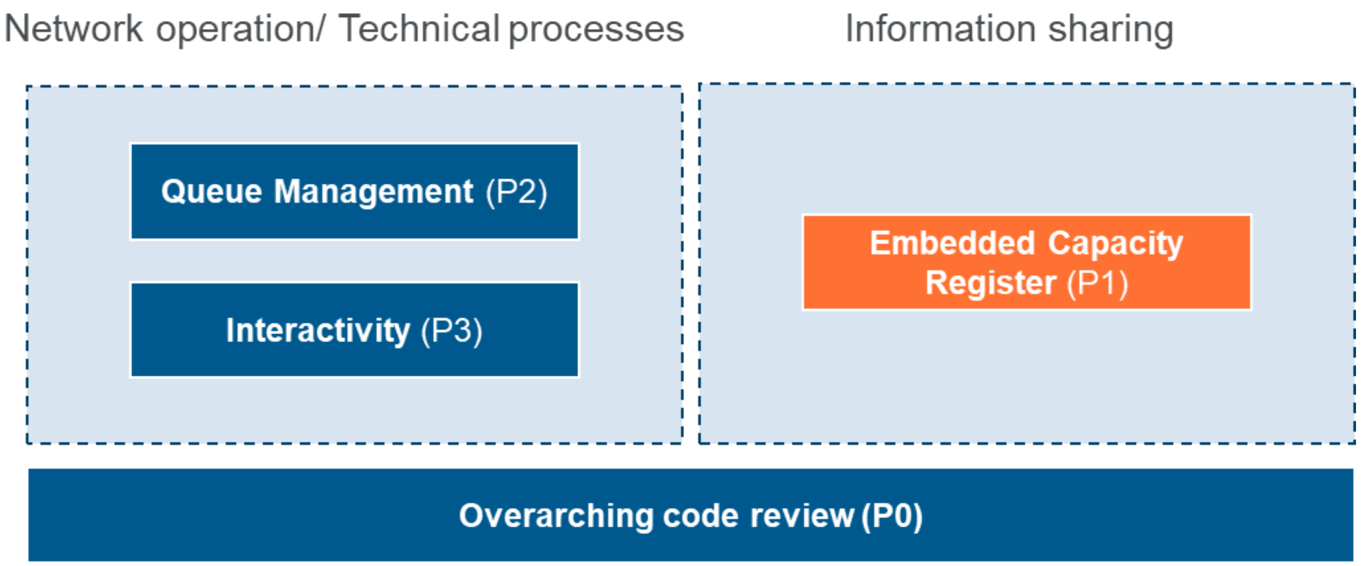
Jim Cardwell (Chair of Connections Workstream, NPg)

Connections overview (WS2)

- Enhance information provision to customers to aid them through the connections and contracting processes and facilitate the realisation of value for their connected technology.
- Communicate whole electricity system needs and facilitate the translation of this into value for asset developers and owners as well as 3rd parties outside direct DSO contracted services (as highlighted in the Flexibility Workstream).

Recent Area

- Preparatory Area to assess the impact of Queue Management, with impacts expected to be seen from July onwards.
- Embedded Capacity Register (ECR) change in CUSC mod timeline
- Continued work to digitalised the ECR



Products in orange will be discussed in more detail at this session.

Embedded Capacity Register (WS2 P1)

Steve Halsey (Product co-lead, UKPN)
Steve Field (Product co-lead, SPEN-D)

Agenda

- ECR – what it is
- Background
- Current position
- Planned activities
  - Digitalisation

The ECR – what it is

- This ECR data includes a list of generation projects accepted to connected or already connected to networks with a capacity of **>1MW.**
- The ECR (embedded capacity registers) has been developed by Open Networks under the Customer Connections & Information provision workstream (WS2 P1).
- The current ECR is published individually by DNOs in a common spreadsheet format and is updated monthly.
- As part of the scope for this year, Open Networks has identified the need to extend the current ECR to include assets up to **50KW,** which significantly increases the amount of data.
- The product team has established that given the scale of data, a spreadsheet solution will no longer be appropriate and a database solution would be necessary.

The ECR – what it is

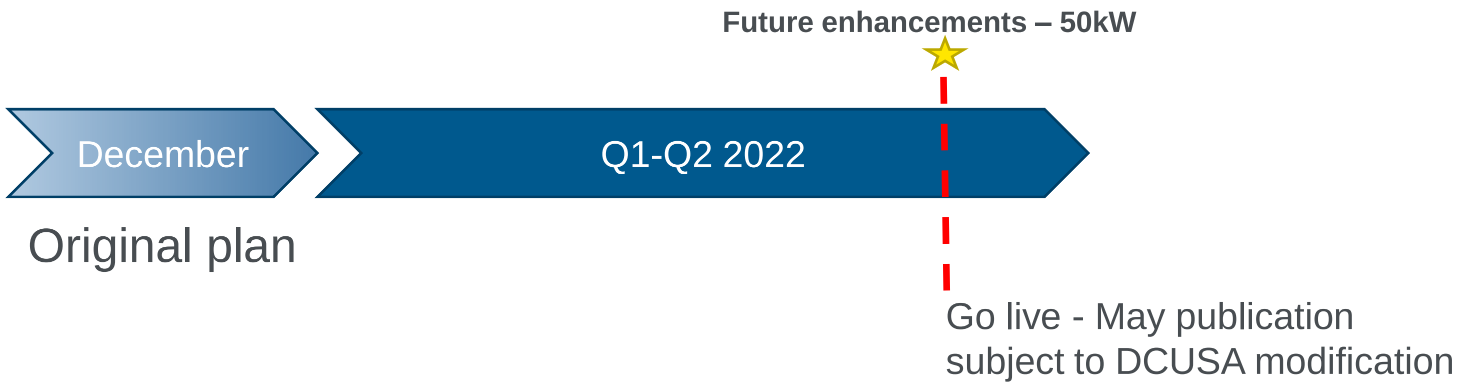
General Data

Export MPAN /	Import MPAN /	Customer Name	Customer Sit	Address Line 1	Address Line 2	Town/ City	County
1030082301361		SHANKS WASTE MANAGEMENT LIMITED	WESTCOTT VENTURE PARK, PHASE 2A AND	WESTCOTT VENTURE PARK	WESTCOTT	Aylesbury	Bucks
1050000628018		SITA UK	SUFFOLK EFW	BRAMFORD RD		GT BLAKENHAM	Suffolk
1014569292506		A I A MANAGEMENT LTD	BENTWATERS BUS PK	RENDLESHAM		Woodbridge	Suffolk
1050000636890		Dalkia PLC	LISTER HOSP	COREYS MILL LANE		STEVENAGE	Herts
1030077948383		REN POWER INVESTMENTS UK LIMITED	PV SOLAR (CARLTON FARM)	Yarmouth Road		North Walsham	Norfolk
1030082301361		SHANKS WASTE MANAGEMENT LIMITED	WESTCOTT VENTURE PARK			AYLESBURY	Bucks
1030081316507		AMEYCESPA (EAST) LTD	WASTE SITE DONARBON	ELY RD		WATERBEACH	Cambs
1030076624736		RPC GROUP PLC	PROMENS ELLOUGH BECCLES			BECCLES	Suffolk
1050000612807		AEE Renewables plc	REYDON FARM	Quay Lane		Waveney	Suffolk
1050000640655		Freedom Group	PIL MEMBRANES	ESTUARY RD		KINGS LYNN	Norfolk
Data not available		MBA Consulting Engineers	OCADO GYPSY MOTH AVE	HATFIELD BUS PARK		Hatfield	Herts
1050000664025		GREENVALE MARCH FLOODS	GREENVALE MARCH FLOODS	FERRY RD		Wimlington	Cambs
1030081926920		Harlaxton Engineering Services Ltd	CANTELUPE FARM	Harlingfield		Cambridge	Cambs
1050000496725		Matrix Networks Limited	SCOTTOW RD, AD PLANT,	AD PLANT		Norwich	Norfolk
1050000841971		Savills	SCOTTOW ESTATE SOLAR FARM			Norwich	Norfolk
1050000698405		HOBACK SOLAR LIMITED	HOBACK FARM	WIMPOLE		ROYSTON	HERTS
1030078123184		AGRI GEN LTD	Building 568	BENTWATERS PARK	Rendlesham	Woodbridge	Suffolk
1030072846525		Biffa Waste Services	(6U0598) Eye Landfillsite	Eyebury Road	Eye	PETERBOROUGH	Cambs
Data not available		Power Control Solutions	OLIVER RD			WEST THURROCK	Essex
1050000613856		21C Eco Energy	STOWBRIDGE FARM STRETHAM			Burwell	Cambs
1050000567492		Solar Power Generation Ltd	EGMERE ARFIELD	BUNKERS HILL		Walsingham	Norfolk
1050000559330		Adgen Energy Ltd	ADVANCED THERMATREATMENT	RATTYS LANE		Hoddesdon	Herts
1050000595462		Solar Inc Ltd	HOLMBRINK FM	REACHES DROVE TRACK		Walpole	Suffolk
1030000470352		Energy Developments (UK) Ltd	BELLHOUSE LFG			STANWAY PIT	Essex
1050000521735		Solarcentury	HARDINGHAM FARM	HARDINGHAM FARM	HARDINGHAM	Norwich	Norfolk
1030083946097		UK Solar Parks Ltd	SKYLARK MEADOW	CAXTON RD		BOURN	Cambs
1050000574221		Erca NRG Ltd C/o RenEnergy Ltd	WESTON LONGVILLE PV FM			Weston Longville	Norfolk
1030083804870		Countryside Renewables Ltd	SITE OFF FORDHAM ROAD	NEWMARKET		Newmarket	Suffolk

Export MPAN /	Postcode	Country	Location (X-coordinate): Eastings (where data is	Location (y-coordinate): Northings (where data held)	Grid Supply Point	Bulk Supply Point	Primary	Point of Connection (Voltage (kV)
1030082301361	HP18 0NX	England	471900	216700	SUNDON 132kV	AYLESBURY EAST GRID 132/33kV	WADDESDON PRIMARY 33/11kV	11kV
1050000628018	IP6 0LE	England	612250	248700	BRAMFORD GRID 132kV	STOWMARKET GRID 132/33kV	-	33kV
1014569292506	IP12 2TW	England	635372	254094	BRAMFORD GRID 132kV	WICKHAM MARKET GRID 132/33kV	BENTWATERS PRIMARY 33/11kV	33kV
1050000636890	SG1 4AB	England	552207	227408	WYMONDLEY MAIN 132kV	WYMONDLEY GRID 132/33kV	VERITY WAY PRIMARY 33kV	11kV
1030077948383	NR28 9NA	England	628800	328360	NORWICH MAIN 132kV	THORPE GRID 132/11kV	ORTH WALSHAM PRIMARY 33/11k	11kV
1030082301361	HP18 0NX	England	471900	216700	SUNDON 132kV	AYLESBURY EAST GRID 132/33kV	WADDESDON PRIMARY 33/11kV	11kV
1030081316507	CB25 9PG	England	548820	269096	BURWELL MAIN GRID 132kV	HISTON GRID 132/33kV	LANDBEACH PRIMARY 33/11kV	11kV
1030076624736	NR34 7TD	England	644361	288332	BRAMFORD GRID 132kV	ILKETSHALL GRID 132kV	HENSTEAD PRIMARY 33/11kV	11kV
1050000612807	IP18 6SG	England	648735	278037	BRAMFORD GRID 132kV	HALESWORTH GRID 132/33kV	-	33kV
1050000640655	PE30 2HS	England	561197	321803	WALPOLE GIS 132KV	KINGS LYNN GRID 132/33kV	AUSTIN STREET PRIMARY 33/11kV	11kV
Data not available	AL10 9BD	England	521295	209461	ELSTREE AIS 132KV	HATFIELD GRID 132kV	TUNNEL PRIMARY 33kV	11kV
1050000664025	PE15 0UW	England	535456	293299	WALPOLE GIS 132KV	MARCH GRID 132/33kV	CHATTERIS PRIMARY 33/11kV	11kV
1030081926920	CB23 1LY	England	541323	254038	EATON SOCON GRID 132kV	LITTLE BARFORD 132/33kV	-	33kV
1050000496725	NR10 5DP	England	626600	324300	NORWICH MAIN 132kV	THORPE GRID 132/33kV	SCOTTOW PRIMARY 33kV	11kV
1050000841971	NR12 8EY	England	627664	321656	NORWICH MAIN 132kV	THORPE GRID 132/11kV	-	33kV
1050000698405	SG8 5QB	England	535160	248616	EATON SOCON GRID 132kV	LITTLE BARFORD 132/33kV	-	33kV
1030078123184	IP12 2TW	England	634731	253561	BRAMFORD GRID 132kV	WICKHAM MARKET GRID 132/33kV	BENTWATERS PRIMARY 33/11kV	11kV
1030072846525	PE6 7TH	England	523168	301835	WALPOLE GIS 132KV	ETERBOROUGH EAST GRID 132/11	-	11kV
Data not available	RM20 3ED	England	558028	177365	WEST THURROCK GRID	WEST THURROCK GRID	HEDLEY AV HSS	11kV
1050000613856	CB6 3LF	England	551521	273166	BURWELL MAIN GRID 132kV	BURWELL LOCAL GRID 132/33kV	-	33kV
1050000567492	NR22 6AZ	England	590491	338157	WALPOLE GIS 132KV	HEMPTON GRID 132kV	GMERE AIRFIELD SOLAR FARM 33	33kV
1050000559330	EN11 0RF	England	538890	208890	RYE HOUSE 132kV	RYE HOUSE GRID 33kV	YE HOUSE LOCAL PRIMARY 33/11	11kV
1050000595462	IP26 5LA	England	574000	298499	WALPOLE GIS 132KV	MARCH GRID 132/33kV	NORTHWOLD PRIMARY 33kV	11kV
1030000470352	CO3 5NN	England	594850	222340	RAYLEIGH MAIN 132KV	ABBERTON GRID 132/33kV	SHRUB END PRIMARY 33/11kV	11kV
1050000521735	NR9 4EG	England	605432	304682	NORWICH MAIN 132kV	EARLHAM GRID 132/33kV	-	33kV
1030083946097	CB23 2SX	England	541586	257501	EATON SOCON GRID 132kV	LITTLE BARFORD 132/33kV	BOURN PRIMARY 33kV	11kV
1050000574221	NR9 5LG	England	608740	315810	NORWICH MAIN 132kV	SALL GRID 132kV	WESTON LONGVILLE PRIMARY 33k	11kV
1030083804870	CB8 7LG	England	563070	267320	BURWELL MAIN GRID 132kV	BURWELL LOCAL GRID 132/33kV	EXNING PRIMARY 33/11kV	11kV

Background

- Started life as SWRR – system wide resource registers
- DCP 350 raised by BEIS PTE to enhance existing SWRR's
- 1st ECRs published
- Customer feedback identified the need to extend the current ECR to include assets from a base of **50KW,** which significantly increases the amount of data.
- A spreadsheet solution will no longer be appropriate and a database solution would be necessary.



Current position

- DCP 399 raised to codify lowering of entry threshold
- Verbally shared with DCUSA panel in early 2022
- Advised Part 2 matter – proceed straight to change report
- Formally submitted to panel – May 2022, not approved
- Feedback
  - Poor communication/visibility to IDNOs
  - Insufficient clarity on timeline
  - Reasoning behind 50kW
  - WG established
- Recovery mode
  - Likely implementation November

Digitalisation Key ambition

To make the data contained in the ECR easily accessible to all users with a vested interest in embedded resources. The ECR is an information-rich report currently distributed across a number of tables bundled and distributed as an Excel workbook.

The overarching principle of the digitalisation strategy is to ensure ECR data is available for consumption in whichever way best suits the end user. This can be via an API, using geospatial visualisation or in a table.

Multiple digitalisation solutions have been considered since the start of this year. A decentralised approach where each DNO hosts a digitalised version of its own ECR emerged as the best and most sustainable solution.

The product team are currently developing a standardised machine-readable format for the ECR and agreeing on the API architecture required to push ECR data.

A recommendation paper setting out decentralised option is available on the ENA website.

Open Q&A

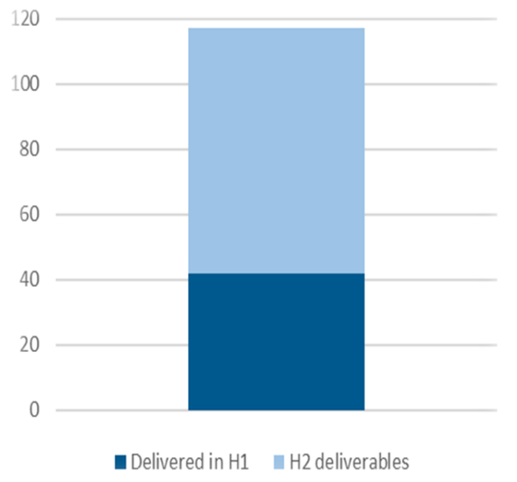
Wider programme updates

Farina Farrier (Head of ON, ENA)

Wider programme updates

Progress to date

42 of 117 deliverables completed. A full timeline of deliverables to date can be found here



On track to deliver 2022 programme in full

Recent activities

2023 scoping has kicked-off

Factoring in key industry developments and stakeholder input

Mitigating DNO-ESO service conflicts

Trialling Primacy Rules in collaboration with FUSION

Upcoming activities

Flexibility consultation

Launching end of Jul-22 to seek feedback on all ON flexibility work

Transition to implementation planning

Translating recommendations into short-medium term implementation plans for actioning across GB.

Latest & upcoming ENA events

Emily Jones (Head of Stakeholder Engagement, ENA)

Latest & upcoming ENA events

- **Whole Electricity Systems webinar**
  27th June, 14:00 – 15:00. Registration details available on ENA's website.

- **Whole Systems Cost Benefit Analysis (CBA) workshops**
  5th July and 12th July, 14:00 – 16:00. Registration details available on ENA's website.

- **Next for Net Zero webinar: Delivering decarbonised home heating**
  5th July, 14:30 – 16:00. Registration details available on ENA's website.

- **National Grid ESO Power Responsive Summer Event**
  13th July, 10:00 – 20:00 with ENA presenting at 14:00. Registration details are available online.

- **Business Green flexibility webinar**
  23rd August

More information on upcoming events is available on the ENA website.

AOB

Ian Povey (Chair of Whole Electricity System Workstream, ENWL)

Useful Links

Programme Scope for 2022

2021 End of Year report

Stakeholder events & supporting material

Open Networks homepage

We welcome feedback and your input

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