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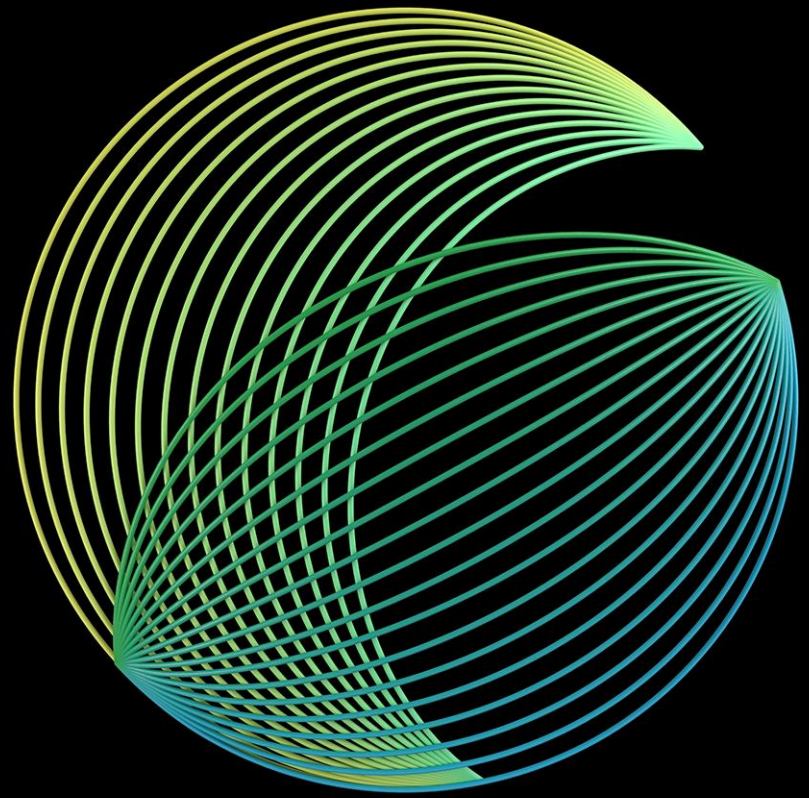


Project EDGE

NAG meeting

Deloitte Financial Advisory Pty Ltd

22 March 2022

Deloitte Access Economics

Agenda

1. **CBA Process Overview**
2. **Introduction to the CBA Scenarios**
3. **Rule Changes, Reforms and Timing Assumptions**
4. **Scenario 1 and Associated Assumptions**

CBA Process Overview

Purpose of the Project EDGE Cost-benefit Analysis (CBA)

The Project EDGE CBA's purpose

Project EDGE establishes a DER Marketplace where customer DER would be used by DER aggregators to provide DER services in exchange for customer and aggregator benefits.

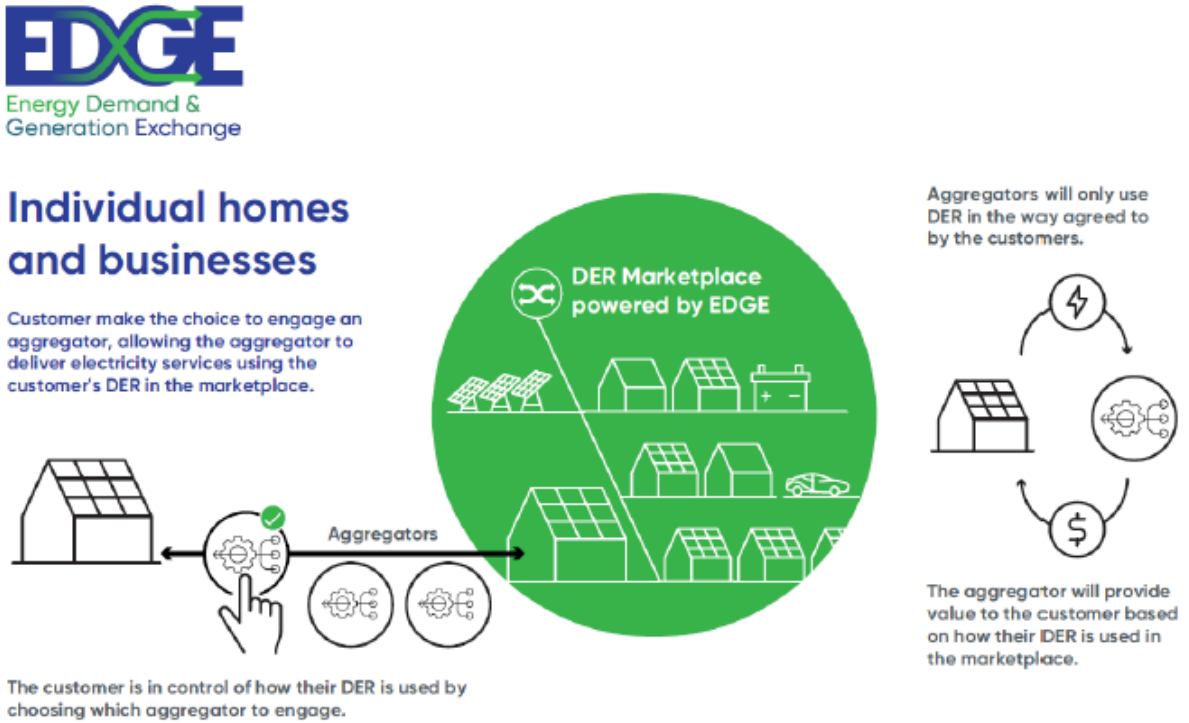
The purpose of the CBA is to identify and analyse whether the implementation of an operational distributed energy resources (DER) Marketplace (after the proof-of-concept version is tested in the Project) is in the long-term interests of electricity consumers.

The CBA also assesses the conditions under which a DER Marketplace would be in the long-term interests of consumers (for example, through its expected impacts on DER operation, penetration and customer demand) in line with the national electricity objective (NEO).

If so, the CBA will also assess under which scenarios adding more complexity and sophistication to the DER Marketplace may be justified.

An example of this is assessing how distribution network limits should be considered in wholesale dispatch and how DER participation in central dispatch should be progressively achieved.

How EDGE's DER marketplace would operate from an electricity customer's perspective



The Project EDGE CBA Process

Development of the CBA

The CBA for this project will be developed through the following:

1. Define a development path to be tested. Under the scope of this project, this involves the establishment and operationalisation of a DER Marketplace

2. Define a counterfactual development path which will be used as a base case (Scenario 1) to be compared against the development path. It should be stressed that while the development path acknowledges the progressive deployment of distinct, functional feature sets as the DER Marketplace is increasingly operationalised, the value generated from each stage of feature addition is not necessarily mutually exclusive of precedent works, nor is it able to be assessed mutually independently within the Project

3. Identify and quantify the present value of costs that will be borne in order to establish and operate a DER Marketplace, making sure to only include costs that would have not occurred under the defined base case, which include and are not limited to:

    - project development costs
    - operating and maintenance costs
    - costs incurred due to the law, regulations or other administrative requirements

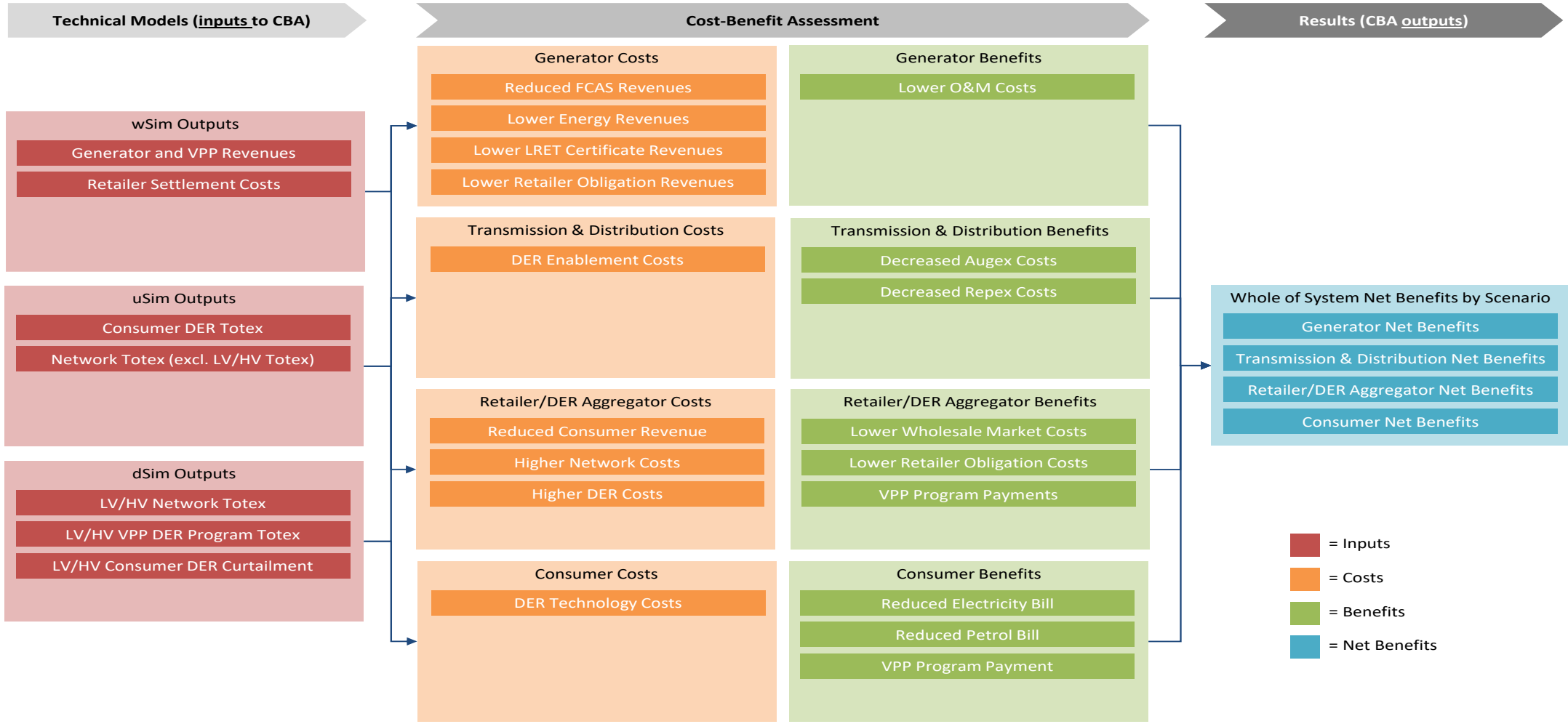
4. Identify and quantify the present value of benefits that will be recorded as a result of the establishment and operationalisation of a DER Marketplace, again including only those benefits which are additional to the base case

5. Based on estimated costs and benefits, quantify the net economic benefit of a DER Marketplace under agreed scenarios.

Key CBA elements and their relationship with the Project EDGE Technical Modelling

The CBA will require important electricity market inputs to be developed through technical modelling. These inputs and the CBA variables that they would affect are covered in the figure below.

The CBA Framework and its inputs from the Technical Modelling



Whole of System Modelling Methodology

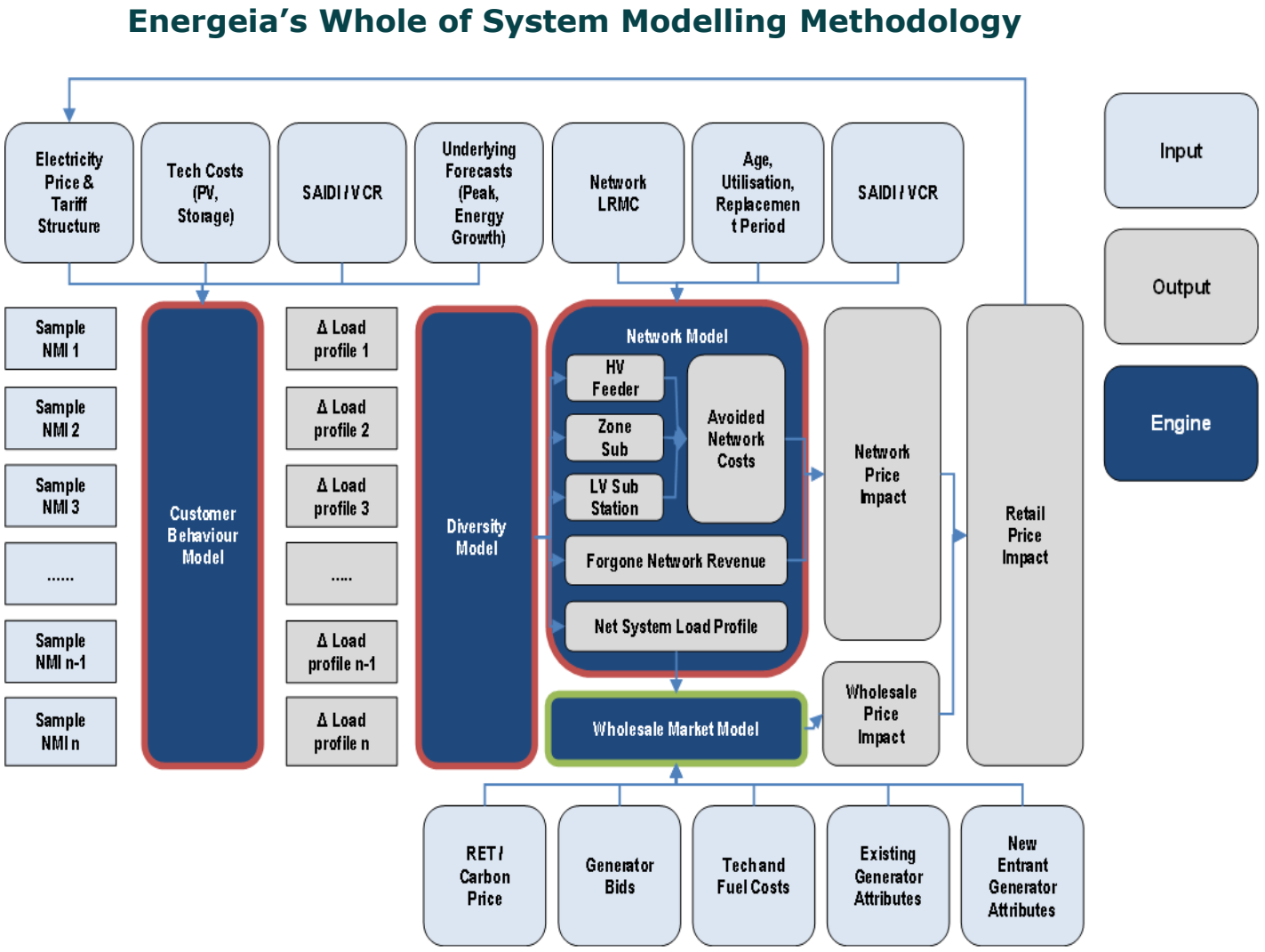
Load, DER penetration and DER

The Technical Modelling that will be conducted by Energeia will utilise their whole-of-system modelling platform, which is itself comprised of modelling sub-platforms.

Energeia's bottom-up, whole-of-system modelling methodology is depicted here.

Through this process, Energeia:

- models customer behaviour including DER adoption
- then turns this behaviour into 30 minute interval load profiles
- maps the load profiles to distribution and transmission assets, costs and revenues, national electricity market (NEM) wholesale market prices, and ultimately network and retail tariffs
- feeds those results into the consumer behaviour model.



Introduction to the CBA Scenarios

The Project EDGE CBA Scenarios

The Project EDGE CBA scenarios are designed to provide a framework for measurement of incremental benefit of the project marketplace in different future external market environments. The first and last scenarios are used to bookend the analysis moving from a rudimentary operating envelope and market design to a sophisticated data hub and local service exchange.

- The CBA scenarios are structured in a way that ensure there is variation across at least one out of three key areas:
  - the load and DER assumptions
  - a set of arrangements around the:
    - constraint optimisation frequency
    - co-optimisation model
    - DOE optimisation methodology and target operating model
  - the inclusion and exclusion of a data hub and local service exchange.

The aim of this session is to, together with DNSPs, refine the operating envelope assumptions, identify key constraints and determinants in moving away from rudimentary operating envelopes to advanced operating envelopes, and identify the key costs and benefits of increasing DOE sophistication.

Key scenario elements for the 10 different CBA scenarios

Scenario Element	1	2	3	4	5	6	7	8	9	10
Load and DER Assumptions	AEMO Step Change					Renew ECA High				
DOE / Market Arrangemets										
Constraint Optimization Frequency	Daily	Daily	Daily	Intra-day	Intra-day	Daily	Daily	Daily	Intra-day	Intra-day
Co-optimization Model	VPP Only	VPP Only	VPP Only	100%	100%	VPP Only	VPP Only	VPP Only	100%	100%
DOE Optimization Methodology	Approximatio	Approximatio	Approximatio	LV Data Driven	LV Data Driven	Approximatio	Approximatio	Approximatio	LV Data Driven	LV Data Driven
Target Operating Model (TOM)	Nameplate Pro-rata	Max Service Value	Max Service Value	Economic Optimisation	Economic Optimisation	Nameplate Pro-rata	Max Service Value	Max Service Value	Economic Optimisation	Economic Optimisation
VPP Standards and P2P/H&S Integration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Data Hub			✓		✓			✓		✓
Local Services Exchange			✓		✓			✓		✓

Rule Changes, Reforms and Timing Assumptions

Future rule changes, their expected impacts and CBA incorporation options

The following areas of planned regulatory change incorporate a significant part of our regulatory assumptions. They were identified through our gap analysis and classified according to their impact on Project EDGE for CBA incorporation.

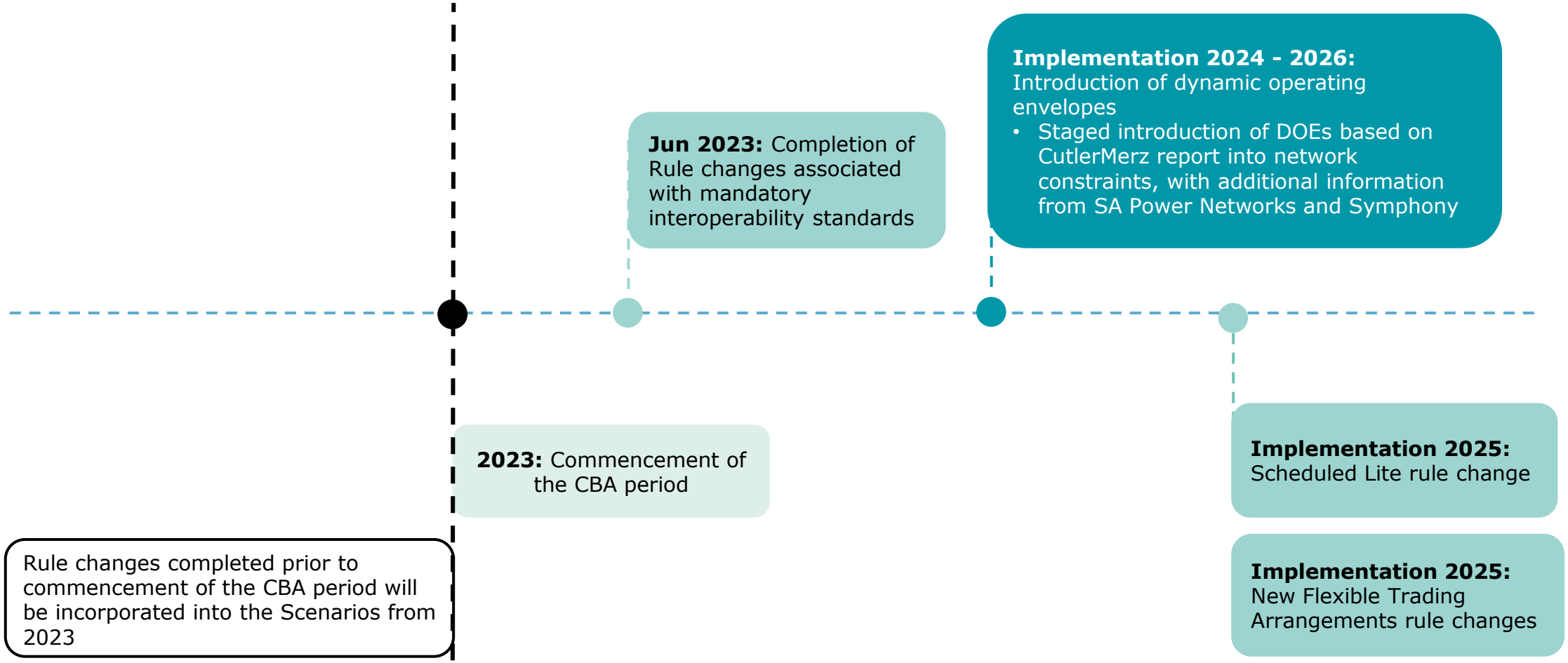
Material

Minor

Rule change	Objective	Implications	Expected impacts	Proposed CBA incorporation
Rule changes requiring new solar/storage installations to comply with DOEs	• Requiring new DER to automatically switch off when needed by a DNSP's DOE from late 2023/early 2024	• It is already proposed that all DER would need to comply with rudimentary DOEs for all scenarios	Material	Scenario 1
Scheduled Lite rule change	• VPPs could voluntarily let AEMO know their dispatch plans	• Improved AEMO/DNSP visibility of VPP intentions	Moderate	Scenarios 2-5
New Flexible Trading Arrangements rule changes to enable increased DER participation	• Allow customers to get their electricity from a retailer and sell solar exports to a VPP provider using the same meter	• Key mechanism for increasing DER penetration and VPP competition	Moderate	Scenario 1 consumer cost reduction
Rule changes associated with mandatory interoperability standards	• Prevent customer DER assets from being locked-in to one service provider or service	• More customer convenience, leading to increased VPP competition	Moderate	Scenarios 2-5
Governance of DER technical standards – the final determination has now been made	• Encourages improved DER standardisation	• Improved VPP benefits and participation	Minor	Assumed in Scenario 1. Impacts expected to be immaterial
Medium-Term Projected Assessment of System Adequacy (MT PASA) rule change	• Enhance pre-dispatch information reporting to AEMO to better understand how to operate the network safely	• Improved VPP uptake incentives due to better opportunities for customers to support network operations	Minor	Assumed in Scenario 1. Impacts expected to be immaterial

Rule change completion and implementation timeframes in relation to the CBA

The defined timeline for expected rule change completion and implementation is illustrated below. Rule changes scheduled for completion prior to the CBA period will be included from commencement.



Scenario 1 and Associated Assumptions

Load, DER penetration and DER assumptions

The AEMO Step Change scenario:

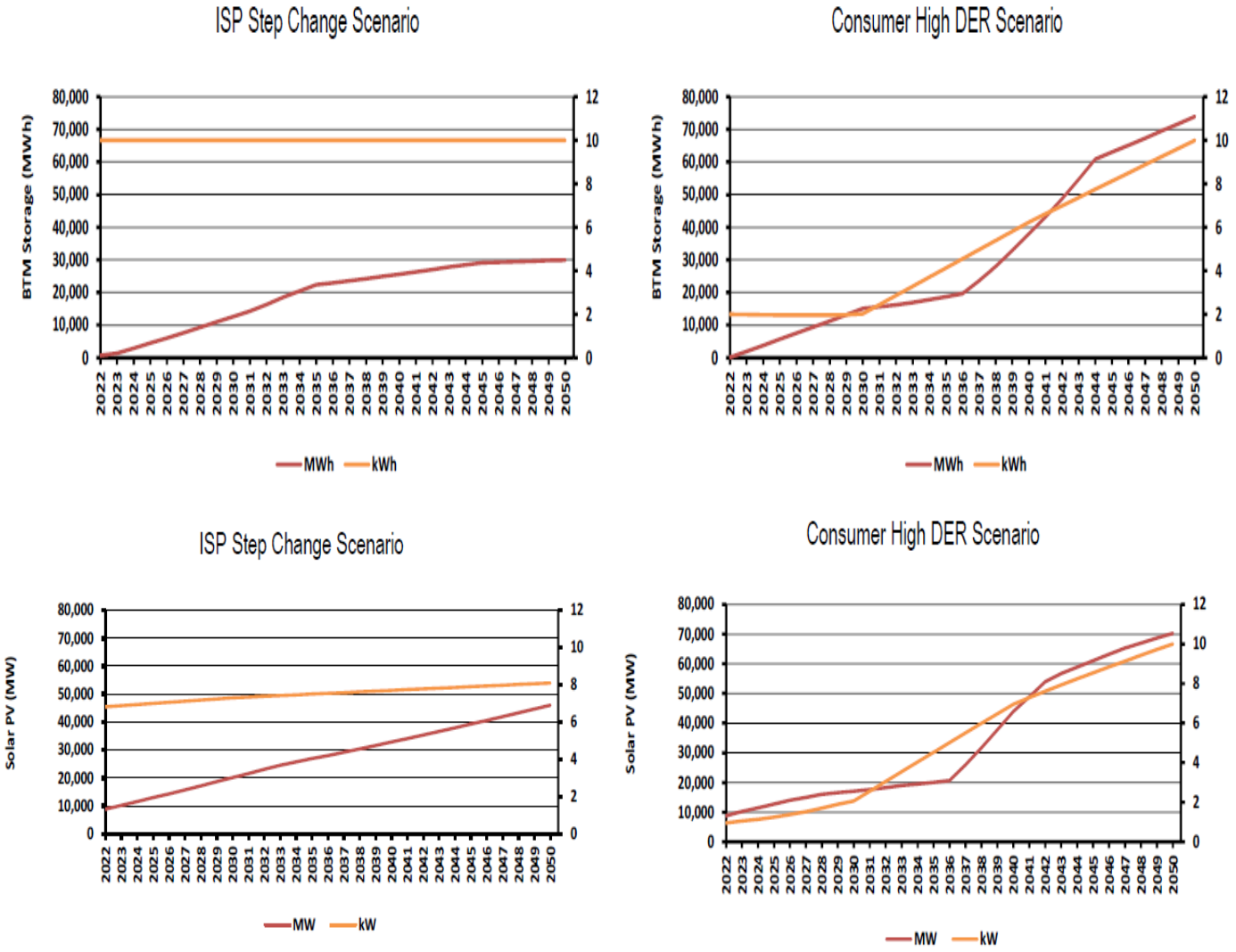
AEMO included five possible future scenarios in its most recent ISP, and its recent draft 2022 ISP selected the Step Change scenario as the most likely one to occur.

This scenario involves a consistently fast-paced transition from fossil fuels to renewable energy resources in the NEM compared to AEMO's other ISP scenarios. Scenario 1 of this CBA incorporates the load and DER assumptions of AEMO's Step Change scenario. Other scenarios either use this step change scenario as well or use the Renew/ECA Consumer High scenario.

Contrast with the Renew/ECA Consumer High scenario

The Renew/ECA Consumer High scenario comes from Energeia's 2021 Renew DER Optimisation (Stage II) final report. This scenario contains higher load and DER assumptions, as indicated by the MW and MWh trendlines in the figures to the right.

Contrast between the two DER uptake scenarios for consumer battery storage and solar PV (in MWh/MW)



Source: Energeia's 2021 Renew DER Optimisation (Stage II) final report

Scenario 1

What is Scenario 1

Scenario 1 is a business-as-usual approach to market operations, rather than an approach involving the implementation of Project EDGE. Scenario 1 represents a datum of rudimentary operating envelopes from which we can capture the changes in market expenditure as a result of increased sophistication in operating envelopes and trading platforms.

Scenario 1 involves:

- A rudimentary operating envelope with day ahead forecasting
- maintaining the current wholesale market and dispatch engine as the singular wholesale market for electricity
- the occurrence of ongoing and economically prudent activities
- activities that would occur in the absence of a credible option.

The rationale for Scenario 1

Scenario 1 provides a conceivable case for future DER integration that does not include Project EDGE or an equivalent DER marketplace which would provide services requested by the Australian Energy Market Operator (AEMO) or a distribution network service provider (DNSP).

The aim is to quantify the impacts of marginal changes in market participation, which are represented by different scenario factors such as:

- the constraint optimisation frequency of the DOEs (daily or intra-day)
- optimisation (complexity of participation) – pro-rata vs. more sophisticated methods.

Key scenario elements for Scenario 1

Scenario Element	Scenario 1
DOE / Market Arrangements	
Constraint Optimization Frequency	Daily
Co-optimization Model	VPP Only
DOE Optimization Methodology	Approximation
Target Operating Model (TOM)	Nameplate Pro-rata
VPP Standards and P2P/H&S Integration	Yes
Data Hub	No
Local Services Exchange	No

Dynamic Operating Envelope Arrangement assumptions (1)

The Current Modelling Method

Our current modelling method assumes that a rudimentary DOE primarily involving flexible exports would be operative in Scenario 1. For our current model to accurately capture the impact of incremental advances to operating envelopes, two additional assumptions would be required:

- More sophisticated DOEs will be implemented in line with their expected benefits, and
- The shift from rudimentary to dynamic operating envelopes is broadly considered necessary and to occur in the near term

Do you agree with these assumptions?

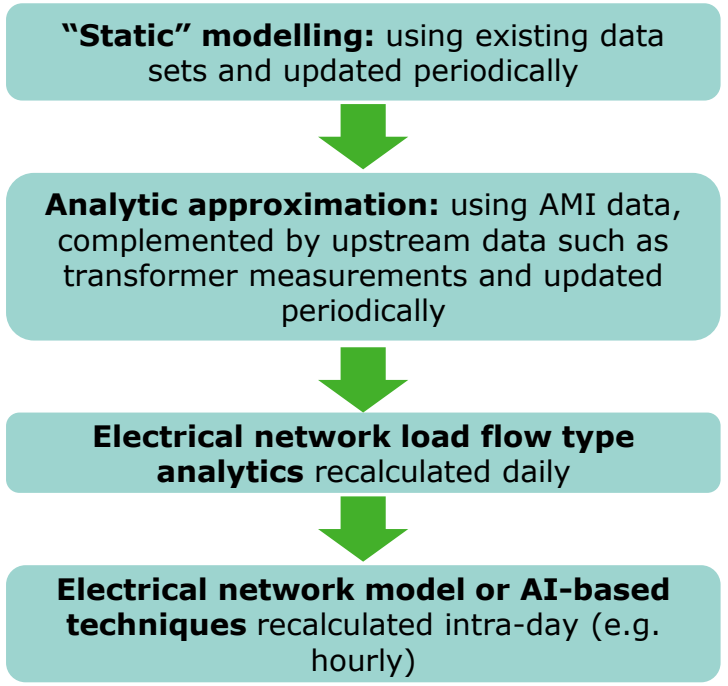
Determinants for the Increase of Sophistication of DOEs

As shown on the top right, DOEs can have various levels of sophistication.

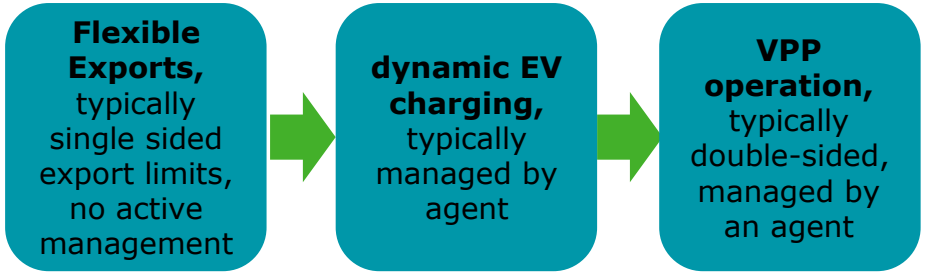
What drives the decision to transition from static operating envelopes into more sophisticated dynamic operating envelopes? Potential determinants include:

- The proportion of hosting capacity that is actively used
- Installed DER capacity in the relevant network
- The relative proportion of ***active/managed*** DER capacity in the relevant network
- Other – e.g., AEMC rule changes.

Process for the increasing sophistication of DOEs



Progression from managed to active DER



Dynamic Operating Envelope Arrangement assumptions (2)

Current state of DOE development in the NEM:

DOEs are currently being considered by the majority of the NEM's DNSPs.

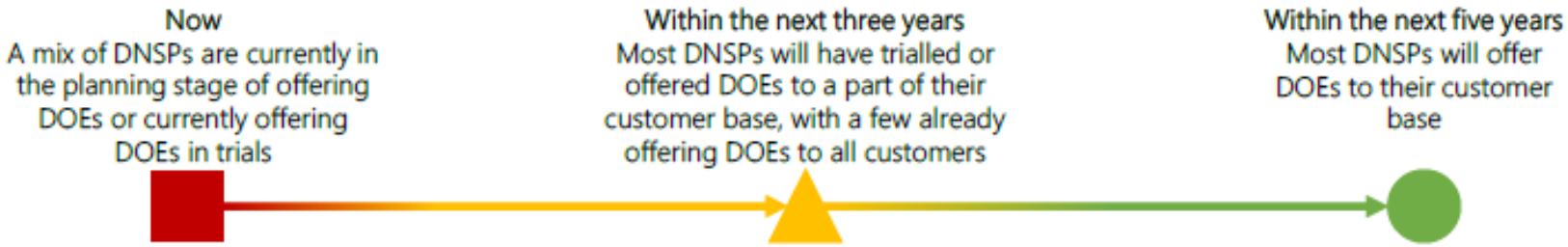
SA Power Networks (SAPN), AusNet Services and Energy Queensland are the DNSPs leading the development of DOEs in Australia.

There are various ongoing projects and trials at different scales and maturities that are testing different DOE dimensions.

Eight DNSPs are currently offering DOE services in a trial capacity, with other DNSPs currently in the planning stage.

More detail on the dynamic envelope expectations for individual DNSPs are provided on the next slide.

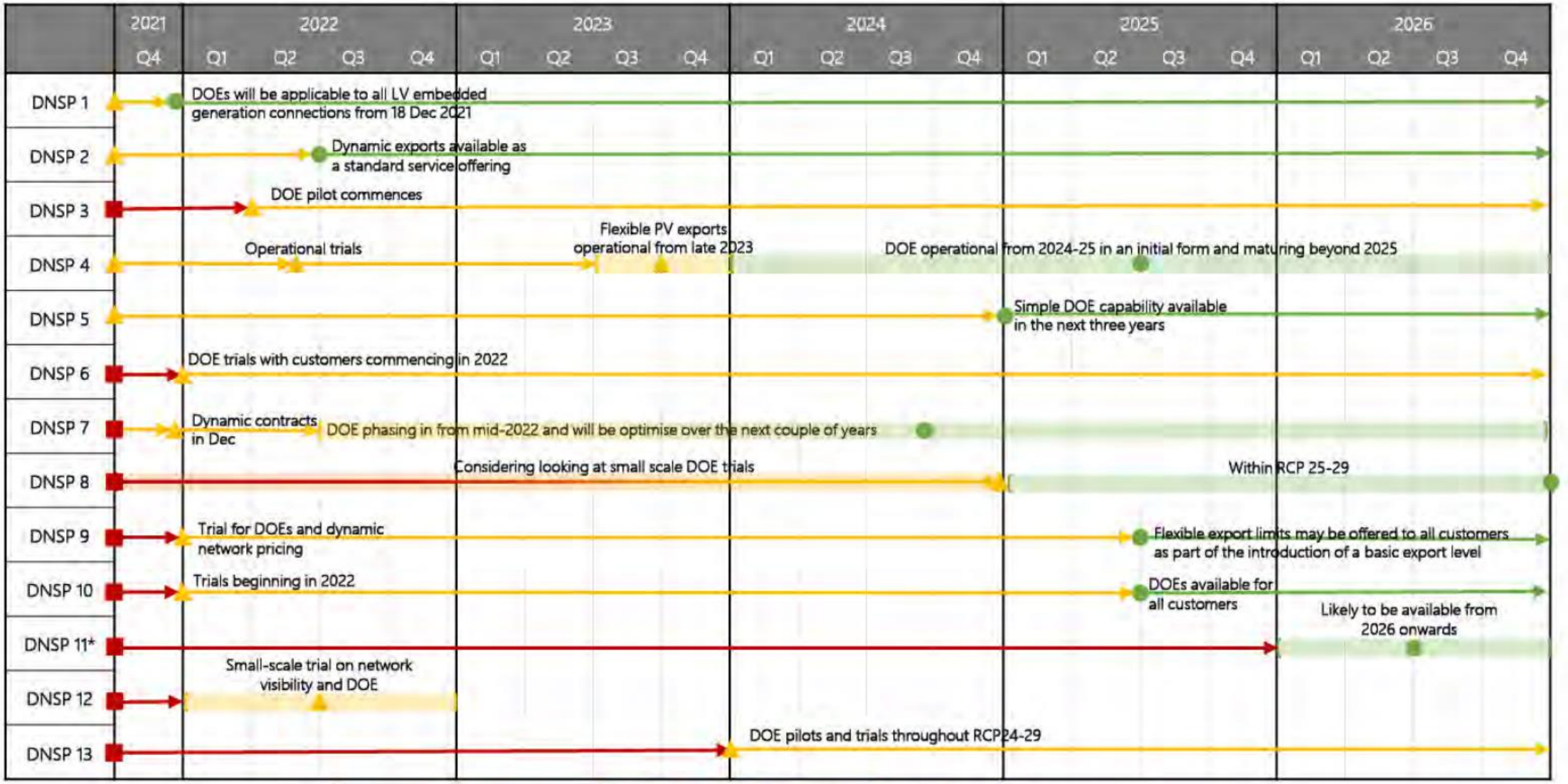
Summary of the timeline to offer small-scale DOEs



Source: DEIP Dynamic Operating Envelopes Workstream: Outcomes Report

Dynamic Operating Envelope Arrangement assumptions (3)

Planning Stage □ | Trial basis / Partial Offering △ | Offering to All Customers ○



Source: DEIP Dynamic Operating Envelopes Workstream: Outcomes Report

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