

Project EDGE | Cost Benefit Analysis methodology

Demonstrations Insights Forum | 10 March 2022

Agenda



Item	Lead	Timing
Welcome, Acknowledgement of Country	Ryan Batchelor (Nous)	5 min
Quick project status update	Nick Regan (AEMO)	5 min
Cost Benefit Analysis methodology presentation	Jonathon Curry (Deloitte)	50 min
Close and next steps	Ryan Batchelor (Nous)	

A photograph of a dense forest of tall, thin trees with green foliage under a blue sky. The trees are the central focus, with their trunks and branches creating a complex pattern against the sky. The ground is covered in green grass and some low-lying plants.

Acknowledgment of Country

We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

We pay our respects to their Elders past, present and emerging.

Project EDGE update

Current position

- Continuing to develop key platform functionality and capabilities along the path to Milestone 3.
- Trial formally begins with go live date on May 1, 2022 with basic functionality.
- Signed up 50 customers into the trial and have begun a formal EOI process to onboard additional aggregators into the program
- Project EDGE Research Plan has been published on the AEMO website

Key upcoming activities

- Deployment of the live marketplace and platform environment
- Continue engagement with key stakeholders
- Progress customer acquisition for next phase (including additional) C&I customers

AEMO has published the Project EDGE Research Plan

- The Research Plan forms the foundation of project EDGE test activities.
- The Research Plan will guide the delivery of Project EDGE and creates the pathway to generating an empirical evidence base
- The plan was developed using an iterative approach with broad stakeholder engagement feedback.



<https://aemo.com.au/initiatives/major-programs/nem-distributed-energy-resources-program/der-demonstrations/project-edge>

Seven research questions have been identified and prioritised to be addressed by Project EDGE.

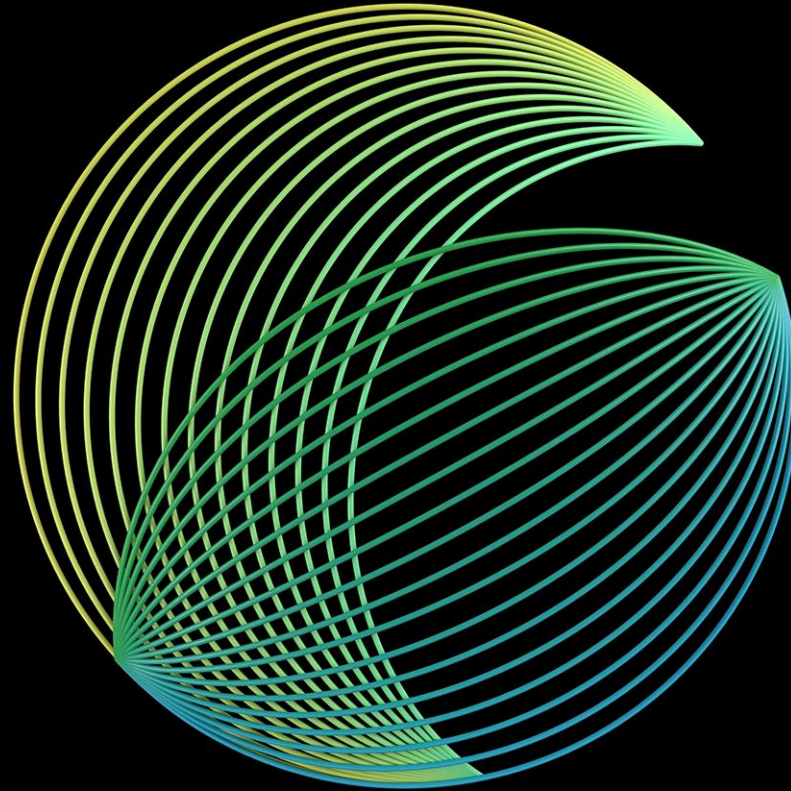
Research questions	Summary of hypotheses	Related Objectives
Customer RQ.1 How can the DER Marketplace be designed to enable simple customer experiences, deliver the needs of customers and improve social license for active DER participation?	a) Customer decisions to invest in DER to participate in the DER Marketplace are influenced by multiple factors. b) Customers are willing to participate if other use trips and provide sufficient value over time. c) Minimising complexity enables aggregator participation and enables provision of value.	1, 3, 6
CBANEO RQ.2 Does the DER Marketplace promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers?	a) A DER Marketplace can deliver net positive economic benefits for all consumers. b) Local service exchange enables DNP network deferral. c) A distributed mode provides a more efficient, scalable and simple approach to data exchange. d) Roles and responsibilities of actors are largely aligned to current roles.	1, 3, 4, 6, 7
Operating envelope design RQ.3 How does operating envelope design impact on the efficient allocation of network capacity while enabling the provision of wholesale energy and local network services?	a) Operating envelope design has a material impact on network operation and efficient services. b) Technical and economic outcomes improve when uncertainty is accounted for in the calculation of operating envelopes. c) Efficiency of operating envelope design and implementation can increase as DER uptake increases. d) Network capacity allocation should focus on maintaining utilisation and yielding higher net economic benefit for all consumers, rather than being driven by local network services.	1, 2, 3, 7
Wholesale integration RQ.4 How can the DER Marketplace facilitate efficient activation of DER to respond to wholesale price signals, operate within network limits and progress to participation in wholesale dispatch over time?	a) DER participation in wholesale market can be achieved progressively and align with DER reforms. b) System Operator and DNP interactions can be defined and implemented efficiently to maintain DER within limits at all times. c) The aggregator should be responsible for ensuring DER value stack instead of the market operator co-ordinating services.	1, 2, 3, 4
Local network services RQ.5 How can the DER Marketplace facilitate efficient and scalable provision of local network support services from DER so that network efficiency benefits are realised for all customers?	a) Network reliability can be managed through local network services from customer DER. b) DNP barriers to relying on local network services from DER can be overcome through procurement mechanisms. c) Local network services characteristics and procurement can be standardised across regions.	3
Efficient data exchange RQ.6 What is the most efficient and scalable way to exchange data between industry actors, considering privacy and cyber security, to benefit all consumers?	a) A distributed mode provides a cost-efficient, scalable and simple approach to data exchange. b) Decentralised digital infrastructure with appropriate security and governance provides efficiency and participation opportunities and cost offsets. c) AEMO and DNP need to develop capabilities that maintain a secure and resilient power system and distribution network respectively.	4, 5, 6
DNP investment and capability RQ.7 How could DNP investment to develop DSO capabilities improve the economic efficiency of the DER Marketplace?	a) There is an optimal combination of DNP investment in network and DER based non-network solutions that provides higher economic efficiency and improved operation of the DER Marketplace as DER increases.	1, 4, 7

1. Wholesale market participation enabled at scale	4. Efficient scalable and secure data exchange enabled	5. Integrated technology	7. Cost-benefit analysis	7. Stakeholder engaged according to best practice practices
2. Distribution network limits in wholesale dispatch considered	3. Efficient and scalable trade of local network services	6. Defined roles and responsibilities	8. Customer perspective engaged	10. Evidence-based implementation recommendations

Legend: Customer (green), Wholesale market integration (orange), Local services (blue), Efficient data exchange (purple)

Cost Benefit Analysis

Deloitte.



Project EDGE

DIF Workshop

Deloitte Financial Advisory Pty Ltd
10 March 2022

Deloitte
Access **Economics**

1. The CBA's purpose, process and key assumptions

- Purpose of the Project EDGE Cost-benefit analysis (CBA)
 - The Project EDGE CBA process
 - CBA Timeline
 - Key CBA assumptions

2. CBA inputs from Technical Modelling

- Key CBA elements and their relationship with the Project EDGE Technical Modelling
 - Whole of System Modelling methodology
 - Example State and National experience and results

3. Stakeholder engagement plan

- Consultation timeline

4. Key identified CBA costs and benefits

- Expected benefits associated with Project EDGE
- Expected costs associated with Project EDGE

The CBA's purpose, process and key assumptions

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



The Project EDGE CBA 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.

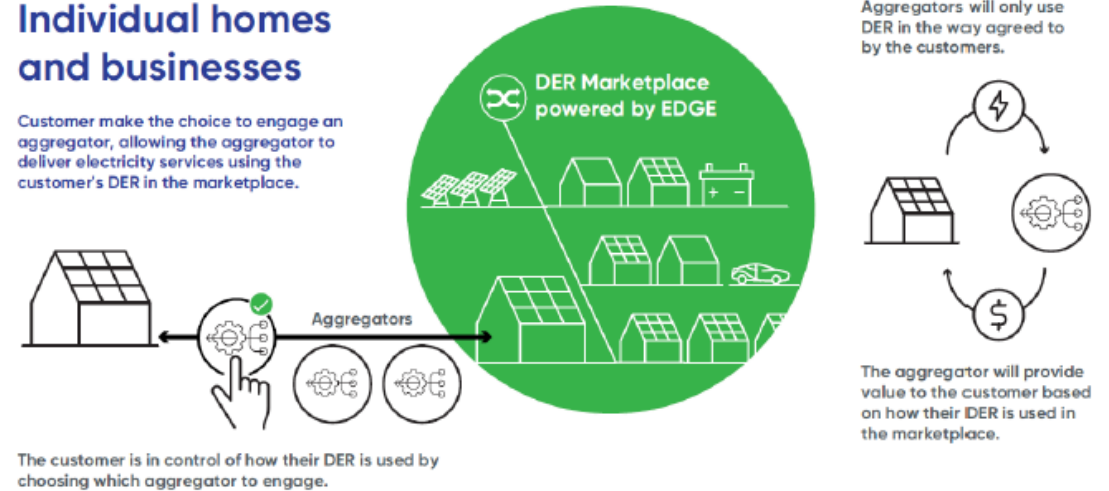
An example of this is assessing how distribution network limits should be considered in wholesale dispatch and how DER participation in central dispatch should be progressively achieved.

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



Individual homes and businesses

Customer make the choice to engage an aggregator, allowing the aggregator to deliver electricity services using the customer's DER in the marketplace.



The Project EDGE CBA process

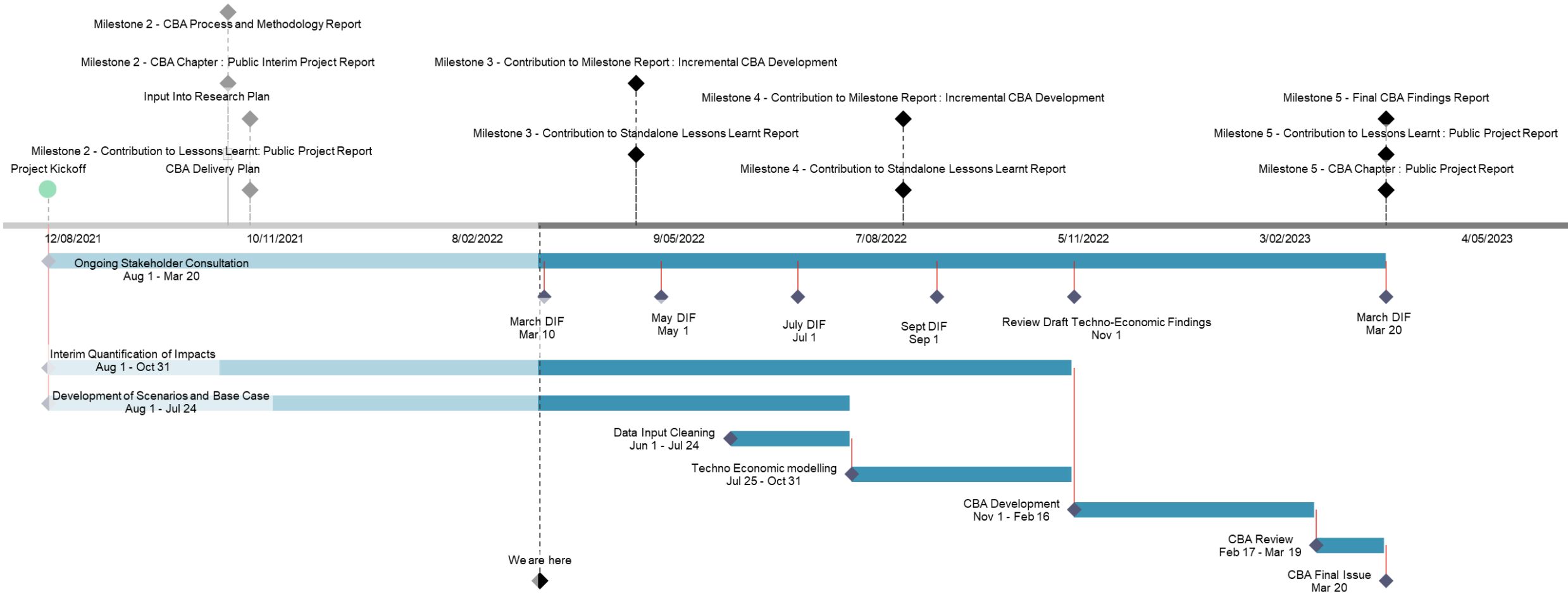


Development of the CBA

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 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.

CBA Timeline



Key CBA assumptions



The key assumptions that will be incorporated into the CBA are outlined below.

Project EDGE CBA Parameters and inputs

Parameter	Input
Referent groups	Customers, Aggregators, Retailers, Distribution Network Service Providers (DNSPs) as Distribution Service Operators or Distribution Network Operators, AEMO
Period of analysis	20 years
Base year	FY23
Discount rate (lower bound) ¹	4.83% ² (subject to change)
Sensitivity analysis ³	To be determined based on the identification of risks during stakeholder engagement

¹ As per AER CBA guidelines, the lower boundary discount rate should be the regulated cost of capital.

² AER (April 2021), Final Decision AusNet Service Distribution Determination 2021-2026, < <https://www.aer.gov.au/system/files/AER%20-%20Final%20decision%20-%20AusNet%20Services%20distribution%20determination%202021%E2%80%9326%20-%20Overview%20-%20April%202021.pdf>>

³ Required to test how robust the outputs are to different input assumptions.

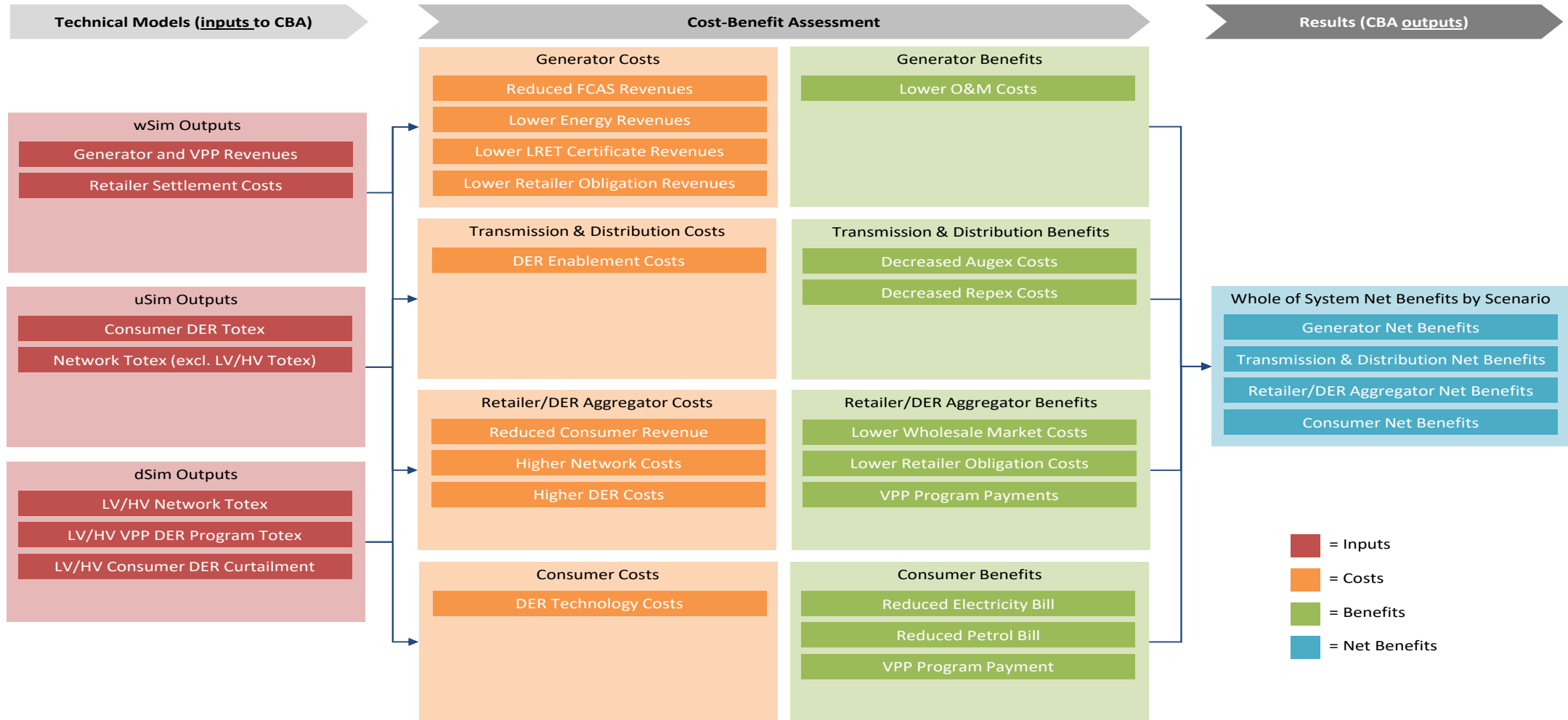
CBA inputs from Technical Modelling

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

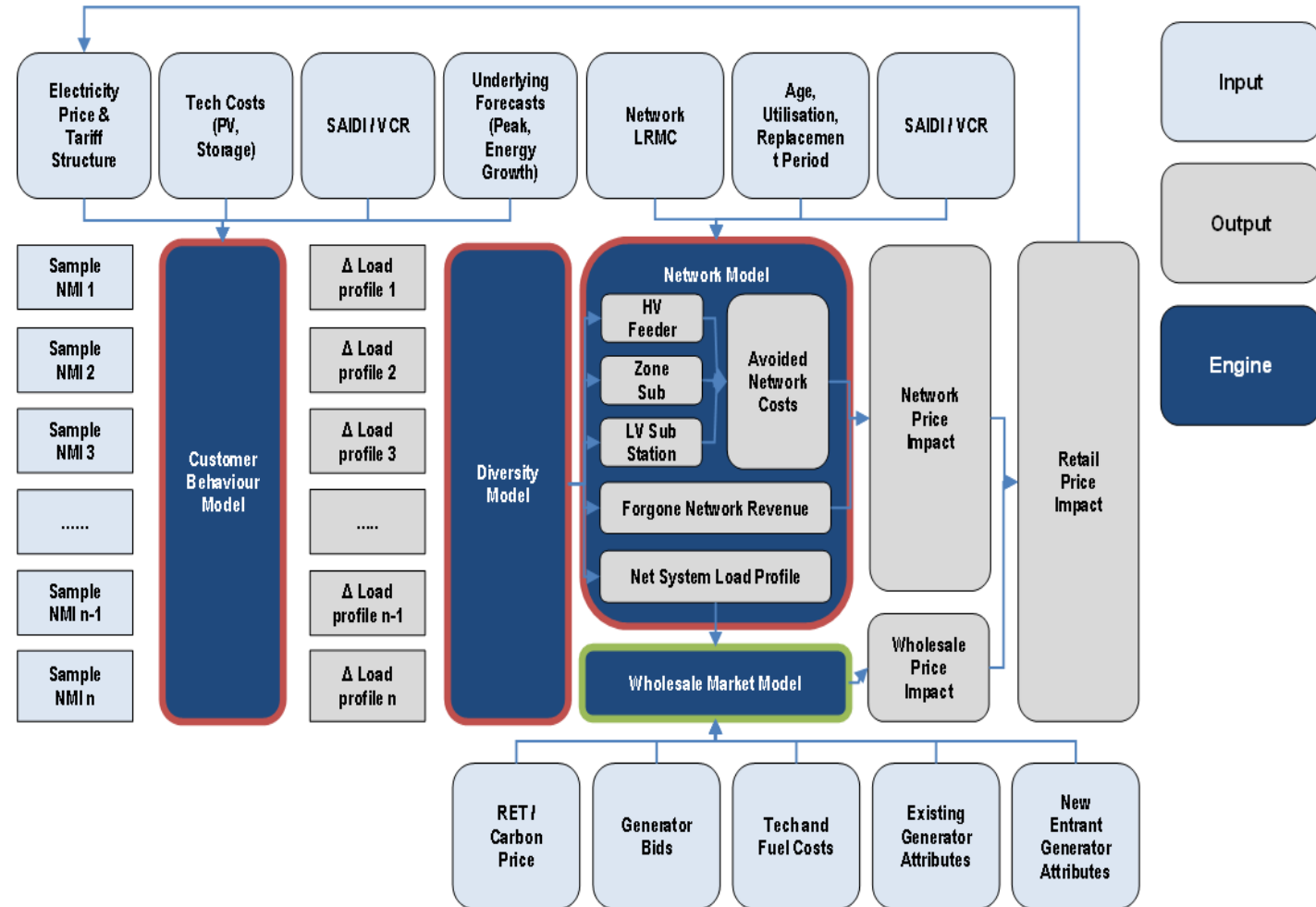
The Technical Modelling that will be conducted by Energeia will utilise their whole-of-system modelling platform, which is itself comprised of modelling sub-platforms.

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.

Energeia’s Whole of System Modelling Methodology



Example State and National Cost Benefit Assessment experience and results

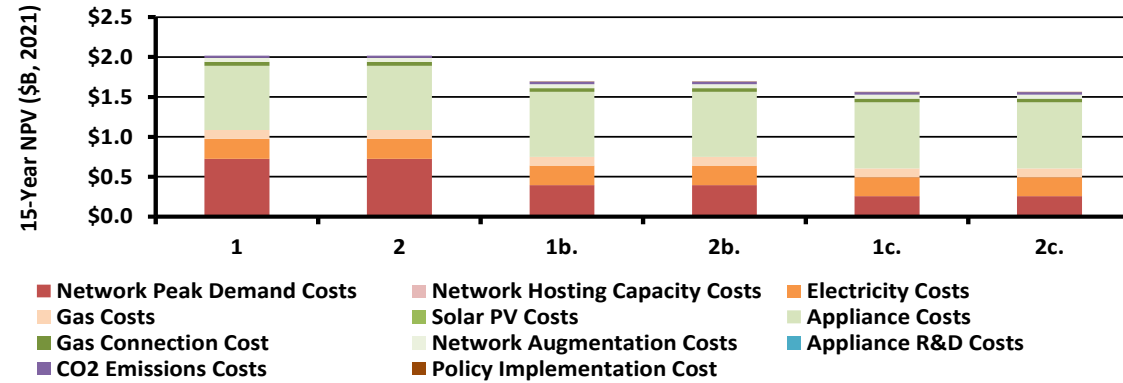


Energeia's techno-economic modelling tools are already configured to model discrete effects of DER enablement and integration.

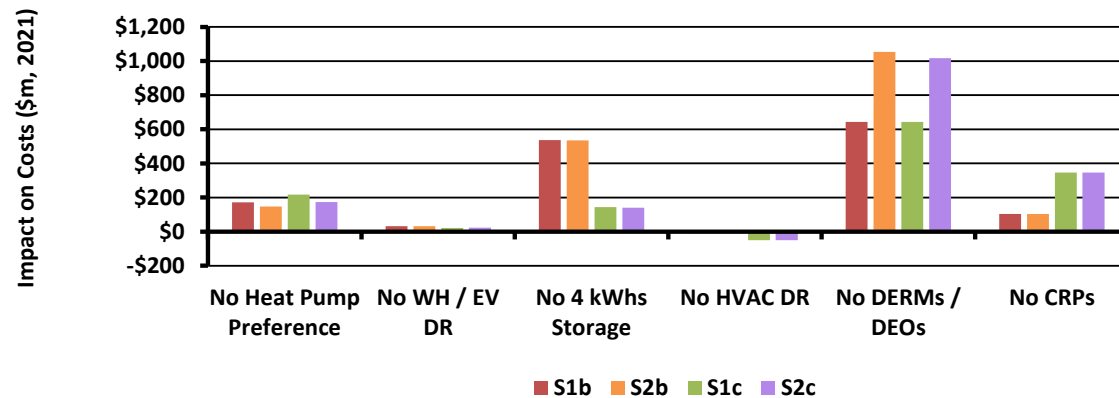
The example slides to the left illustrate our ability to report on impacts by stakeholder, and to identify the contribution of discrete technology, including systems and DER.

We will augment our existing platforms using our rapid prototyping techniques, which will enable industry co-design of the technical modelling solution for the project (detailed in next slide).

Illustrative Cost Benefit Assessment by Stakeholder



Illustrative Sensitivity Analysis – Note DERMS/DEO



Stakeholder engagement plan

Consultation timeline

Over the course of the project, all project stakeholders will have an opportunity to review and consult on project methodology, research plan, assumptions, and draft findings. Consultations will occur roughly every three months, with emphasis on ensuring clear communications lines are established with the sub-group of Targeted Stakeholders identified by the Project EDGE team.

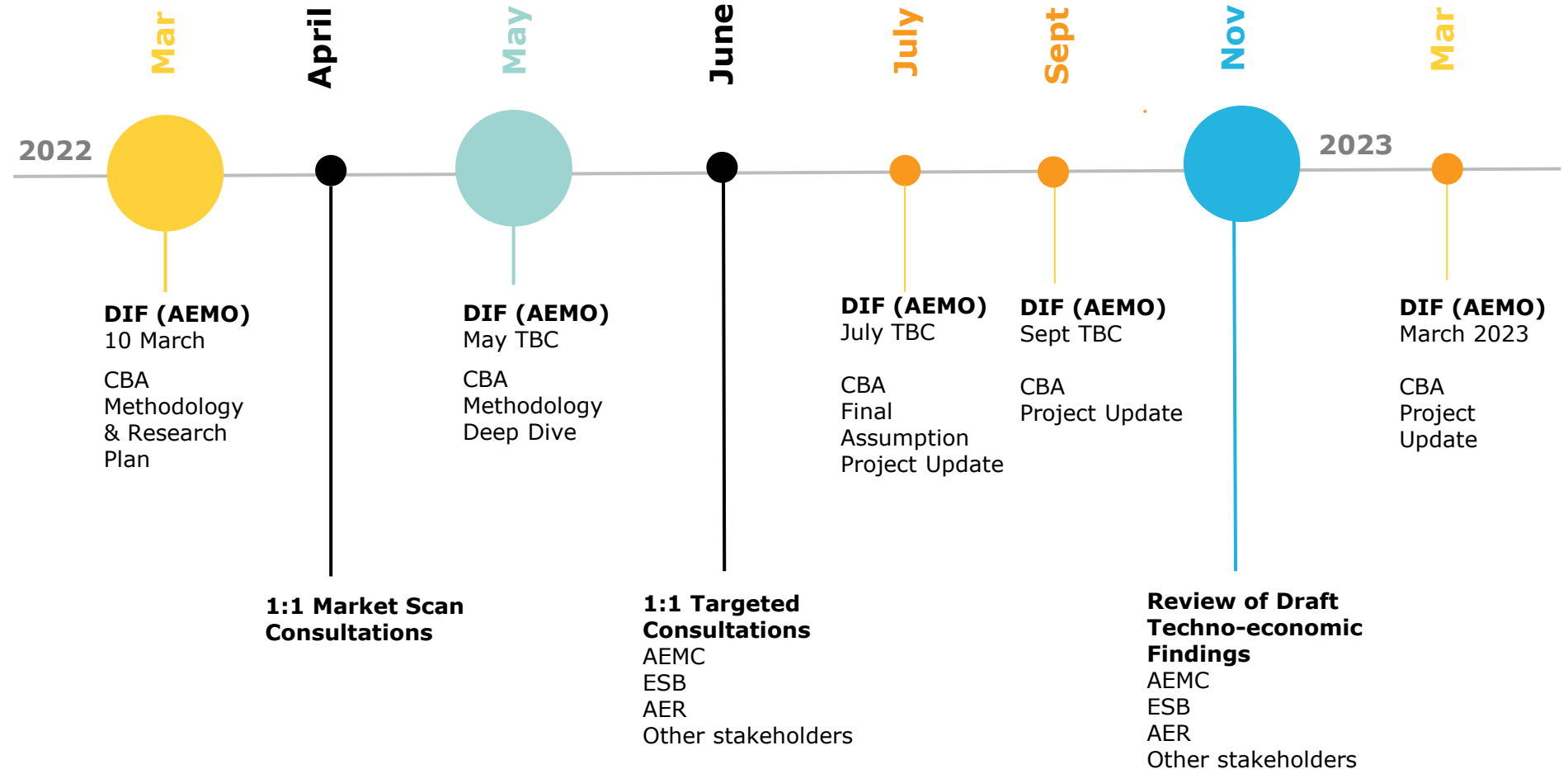


Guiding Principles

- Stakeholders are part of the journey/broader team
- Feedback is considered and processed and responded to where appropriate
- Targeted stakeholders receive specific consideration – ensure little risk of missing out
- Consultative approach reduces project outcome risk
- Staged approach allows regular consideration
- Gateways for decision making achieve clear finality on decisions, move-forward points.

Targeted Stakeholders

Project Edge Team
(AEMO, Mondo, UniMelb, AusNet, ARENA)
Australian Energy Market Commission (AEMC)
Energy Security Board (ESB)
Australian Energy Regulator (AER)



Key identified CBA costs and benefits

Expected benefits associated with Project EDGE

Project EDGE benefits for electricity customers

Project EDGE benefits for electricity customers include electricity bill cost reductions and a reduction in DER curtailment which would provide increased financial benefits.

Customer reliability benefits due to reduced and shorter occurrences of planned and unplanned outages are also a key likely benefit of a Project EDGE DER marketplace.

Project EDGE benefits for DNSPs

The benefits for DNSPs largely involve the ability to defer network augmentations or the ability to operate their distribution networks more efficiently. DNSPs can also benefit from additional options for maintaining stable network operations, such as through DER supporting voltage management.

As DNSP operations are funded by electricity customers, the improved efficiencies and services outlined here would have positive flow-on impacts for electricity customers as well.

Additional Project EDGE benefits

The final set of benefits are those that directly affect multiple parties.

The benefit of promoted DER penetration by a DER marketplace helping to reduce carbon emissions is the key identified example of a common benefit.

Additionally, the benefits of greater DER visibility, predictability and control would be directly available to both DNSPs and AEMO as the wholesale market operator.

Key benefits associated with Project EDGE



Benefit	Benefit Category
Planned and unplanned outage support	Customers
Reduction in DER curtailment	Customers
Reduced electricity bills	Customers
Avoided replacement/asset derating	Networks
Reduced line losses	Networks
Voltage management	Networks
Increased DER hosting capacity	Networks
Capex (augex and repex) deferral	Networks
Reduction in emissions intensity	All
Benefits of greater visibility, predictability, and control for AEMO and network operators	DNSPs / AEMO

Expected costs associated with Project EDGE

Project EDGE costs faced by DNSPs

The cost inputs for the CBA are costs that are relevant to the operationalisation of Project EDGE.

Many costs faced by DNSPs are expected to flow to electricity customers as they 'fund' DNSP operations.

Specific costs relating to the development and deployment of the DER Marketplace from a technology perspective will be provided by the Project's technology subcontractor, PXiSE, as well as by the Energy Web Foundation (EWF).

These costs will represent the costs of implementing the simple marketplace, including those such as developing and hosting the data exchange and bids and dispatch system.

Project EDGE costs faced by other parties

Several other parties also face possible costs through the implementation and operationalisation of Project EDGE.

The costs listed here include specific costs borne by:

- Retailers and aggregators
- Customers
- Generators.

In addition, the costs of complying with laws, regulations and administration would be faced by DER Marketplace participants as a whole.

Key costs associated with Project EDGE



Cost	Cost category
Technology costs (with regards to the Platform and also technology costs within the DNSP environment related to the Project)	Networks
Operating and maintenance costs (with regards to the Platform and also technology costs within the DNSP environment related to the Project)	Networks
Electricity network costs	Networks
Cost of complying with laws, regulations and administration	DER Marketplace participants
Retailer / Aggregator costs ('cost to serve')	Retailer and aggregators
DER technology costs	Customers
Generator costs	Generators



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Close and next steps