Integrating Energy Storage Systems

High-Level Design – Industry Q&A Forum

4th Feb 2022

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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.

Agenda

1. Introduction
2. High-Level Design
   a. Registration
   b. Dispatch
   c. Settlements and Prudentials
   d. Integration Aspects
3. Project Planning
4. Next Steps

Interactive Q&A with Slido

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#IESS

- Please use the Audience Q&A to ask and upvote questions throughout the session
- There will be breaks to verbally answer questions after each topic (registration, dispatch, etc) and at the end of the presentation.
- We are expecting many questions today, and as such we may only have time to address the top voted questions verbally.
- If your question is selected, we may unmute you to ask your question verbally to make sure we have the full context.

Introduction

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Purpose and Overview

- Integrating Energy Storage Systems (IESS)
  - Introduces important changes to NEM arrangements – particularly for registration and dispatch.
  - Major step toward the ESB's vision of the trader-services model.
- The purpose of this industry Q&A forum is to:
  - Present the main components of the IESS design and proposed arrangements for implementation.
  - Provide an avenue for questions or considerations from industry.
  - Support stakeholders submissions on the HLD (due 11th Feb)
- However:
  - The intent is not to re-open discussions on policy issues.
  - We encourage feedback raised today also be provided in writing via the HLD submission process.

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Context

- The ESB prepared advice for ministers on a suite of post 2025 reforms for the NEM.
- The IESS rule change forms part of the ESB's DER implementation plan.
- AEMO tasked with preparing an IT and regulatory roadmap for the implementation of the reforms. The Reform Delivery Committee (RDC) will guide the development of the roadmap - it consists of:
  - Market bodies – AEMC, AER and AEMO
  - Industry participants representing – AEC, ENA and CEC
  - Consumer representatives – ECA, MEUA, EUAA and PIAC
- A *NEM2025 Implementation Roadmap* is due to be released at the end of March 2022.
  - Implement reforms in a timely and efficient manner.
  - Co-ordinate regulatory and IT change across industry.
  - Provide transparency to stakeholders on the implementation program.
- IESS is one of the more advanced of the various NEM2025 initiatives, reaching a final Rule determination in December 2021 with full implementation due mid-2024.

Activity	Date
Rule Change Request	23rd Aug 2019
Final Determination	2nd Dec 2021
High-Level Design	16th Dec 2021 **Feedback due 11th Feb**
Transitional Aspects Baseline Implementation Release *SGAs providing FCAS and Aggregate Conformance*	31st Mar 2023
IESS Go-Live: Final Implementation Release	3rd June 2024

IESS Design and Implementation

IESS HLD document was published on AEMO's website on 16th Dec 2021

- The IESS high-level design aligns with AEMC's Final Determination.
  - Focus is now on the implementation approach.
- The high-level design is being used as an input to the IT design, and to guide our analysis of the regulatory changes.
- AEMO will update industry on implementation approach following:
  - industry feedback (due 11th Feb 2022); and
  - further market system and regulatory analysis.

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Registration and Classification

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Integrated Resource Provider and Bidirectional Unit

- A new category is introduced – the Integrated Resource Provider.
  - Use by participants with storage resource and hybrid systems
  - Also technology neutral category.
  - Can classify end user connection points (nominate as FRMP)

- Accompanied by a new resource type – the bidirectional unit.
  - Resources that **produce and consume** energy (excluding auxiliary load)

What is classified	Label (NER)	Eligible Categories			
		IRP	Generator	Customer	DRSP
Scheduled bidirectional unit	Scheduled IRP	✓			
Non-scheduled bidirectional unit	Non-Scheduled IRP	✓			
Scheduled generating unit	Scheduled Generator	✓	✓		
Semi-scheduled generating unit	Semi-Scheduled Generator	✓	✓		
Non-scheduled generating unit	Non-Scheduled Generator	✓	✓		
Small resource connection point (small GU / small BDU)	Small Resource Aggregator	✓			
Scheduled load	Market Customer	✓		✓	
Market connection point	Market Customer	✓		✓	
Ancillary service unit	Ancillary Service Provider	✓	✓	✓	✓

Small Resource Aggregator and Ancillary Service Unit

- Market Small Generation Aggregator will move to the IRP, using the label Small Resource Aggregator
  - Will also be able to provide market ancillary services
- Ancillary service unit is a consolidative term – it replaces
  - ancillary service generating unit
  - ancillary service load

What is classified	Label (NER)	Eligible Categories			
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Scheduled bidirectional unit	Scheduled IRP	✓			
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Scheduled generating unit	Scheduled Generator	✓	✓		
Semi-scheduled generating unit	Semi-Scheduled Generator	✓	✓		
Non-scheduled generating unit	Non-Scheduled Generator	✓	✓		
Small resource connection point (small GU / small BDU)	Small Resource Aggregator	✓			
Scheduled load	Market Customer	✓		✓	
Market connection point	Market Customer	✓		✓	
Ancillary service unit	Ancillary Service Provider	✓	✓	✓	✓

Integrated Resource Provider: Use by Participants

- Use of the IRP will be mandatory for all participants with resources that have both generation and load (above auxiliary load) at a single connection point. Market Small Generation Aggregator will no longer exist, and such participants will also use the IRP category.

- Use of bidirectional unit classifications will also be mandatory for most storage/bidirectional resources,
  - Stand-alone storage ≥ 5 MW must be classified as a scheduled BDU.
  - Storage < 5 MW may be classified as a non-scheduled BDU.

- **Exception:** Resources with a dead-band (typically pumped hydro) will continue to use dual classifications.
  - Unit will be classified as both a scheduled generating unit and scheduled load.
  - Participant will transition to the IRP category.
  - It would be challenging for NEMDE to optimise such resources under a single DUID, as such resources cannot continuously transition from charging to discharging.

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Integrated Resource Provider: Transition

Registration Grace Period:

The period commencing on the effective date and ending six months after the effective date.

- Existing participants with non-exempt bidirectional resources will need to re-register and – in most cases – reclassify their units no later than three months before the registration grace period.
- It is proposed that a transition process is put in place to assist affected existing participants with their readiness:
  - AEMO will work with industry to develop a transition process.
  - Participants will need to apply to AEMO to re-register.
  - However, no fees will be incurred, and existing participants will not be required to demonstrate that the integrated resource system will be capable of meeting its performance standards.
  - Requires change to energy and FCAS bidding, and dispatch systems for single DUID participation.
- Optionally, Generators and Customers may apply to change their registration category to IRP.

AEMO is seeking feedback from affected participants on considerations that could facilitate the transition to the IRP category and bidirectional unit type

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Small Resource Aggregators

- Market Small Generator Aggregators will be able to provide market ancillary services from the Transitional Period (Baseline Release - March 2023).
  - To do so, they will be deemed to be a Market Customer (for the purposes of providing ancillary services), and
  - Be able to apply to classify the connection point as an ancillary service load.

- When the Rule becomes effective, Market Small Generator Aggregators will be automatically transferred to the IRP category. Their existing market generating units taken to be market connection points.
  - Small bidirectional unit will accompany the term small generating unit.
  - A nameplate rating limit of 5 MW at a connection point will apply to be considered a small bidirectional unit.

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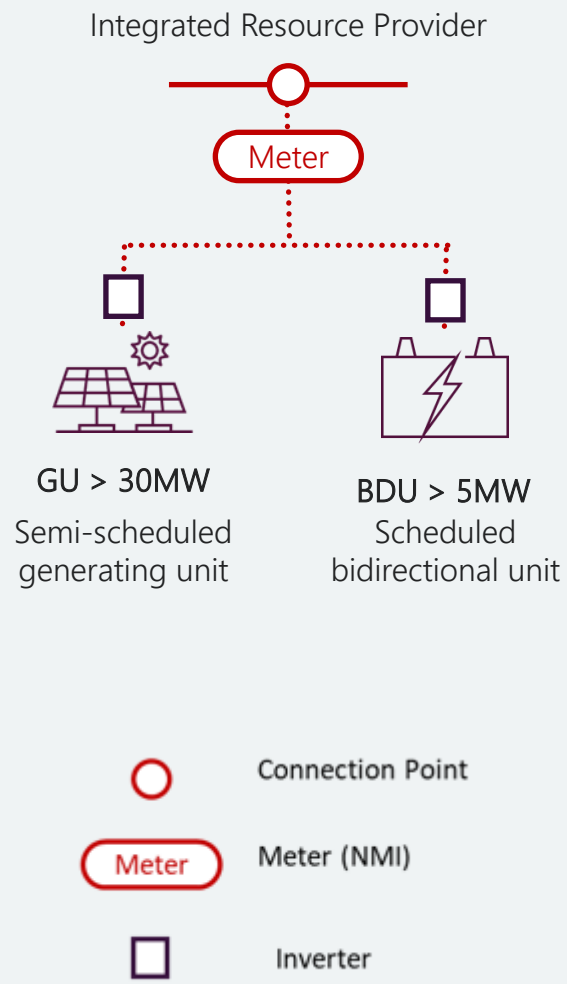
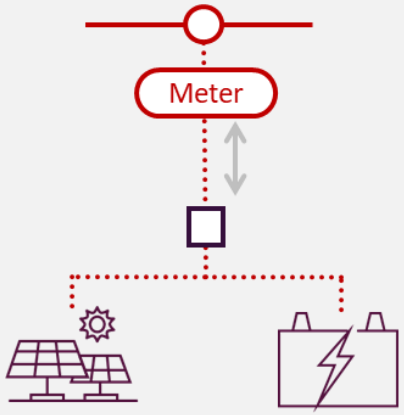
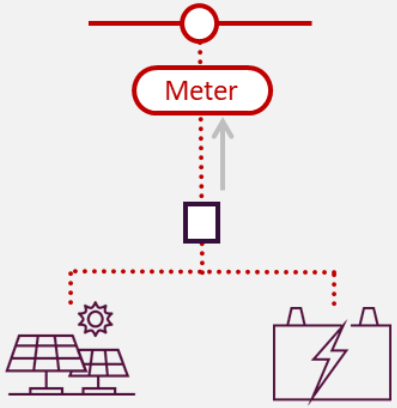
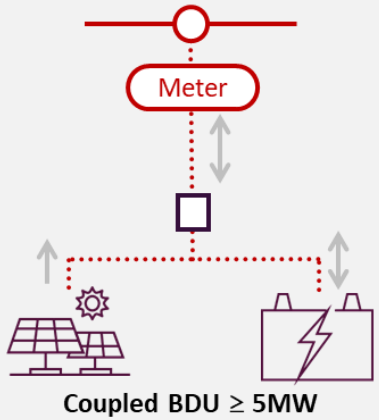
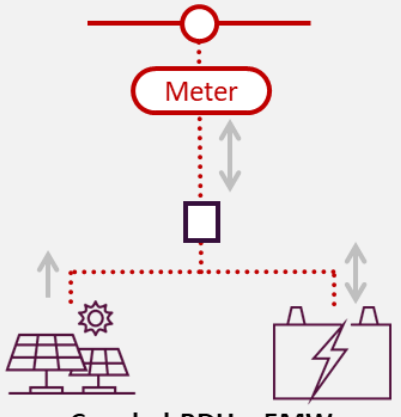
Hybrid Systems

- IESS better integrates hybrid systems into the NEM.
- Classification, bidding and scheduling will occur separately for each unit behind the connection point.
- Performance standards will be set and assessed at the connection point.
  - Performance standards will take into account each unit behind the connection point, and the possible operating modes of the system.
- There are many possible hybrid configurations – the High Level Design document presents arrangements for a number of use cases.



Coupled production units

- **Coupled production unit:** A production unit with separate plant that share equipment (e.g., inverter – DC coupled).
- Operator registers as an IRP.
- Various classification options - but with some limitations and resulting scheduling implications.

Integrated Resource Provider  **Coupled BDU ≥ 5MW** Scheduled bidirectional unit	Integrated Resource Provider  **Coupled BDU ≥ 5MW** Semi-scheduled generating unit	Integrated Resource Provider  **Coupled BDU ≥ 5MW** Semi-scheduled generating unit Scheduled bidirectional unit	Integrated Resource Provider  **Coupled BDU < 5MW** Non-scheduled bidirectional unit
Single set of bids/dispatch instructions 20 bid bands – **generation and consumption**.	Single set of bids/dispatch instructions. 10 bid bands – **generation only**. Dispatchable capacity limits (5MW)	Separate bids/dispatch instructions for each unit. **10 bid bands for a GU, 20 bid bands for a BDU.**	Non-scheduled – **no bidding or dispatch instructions**.

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Dispatch

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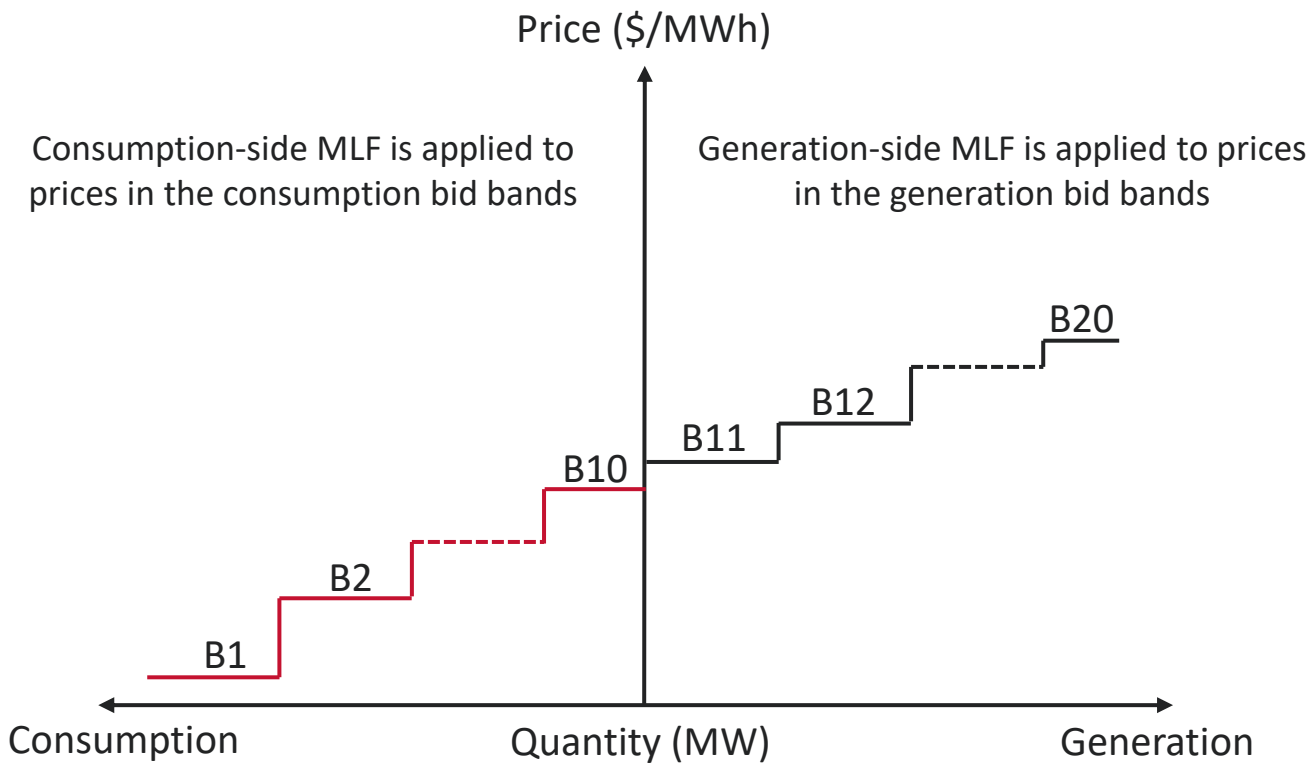
Bidding and Dispatch of Scheduled BDUs



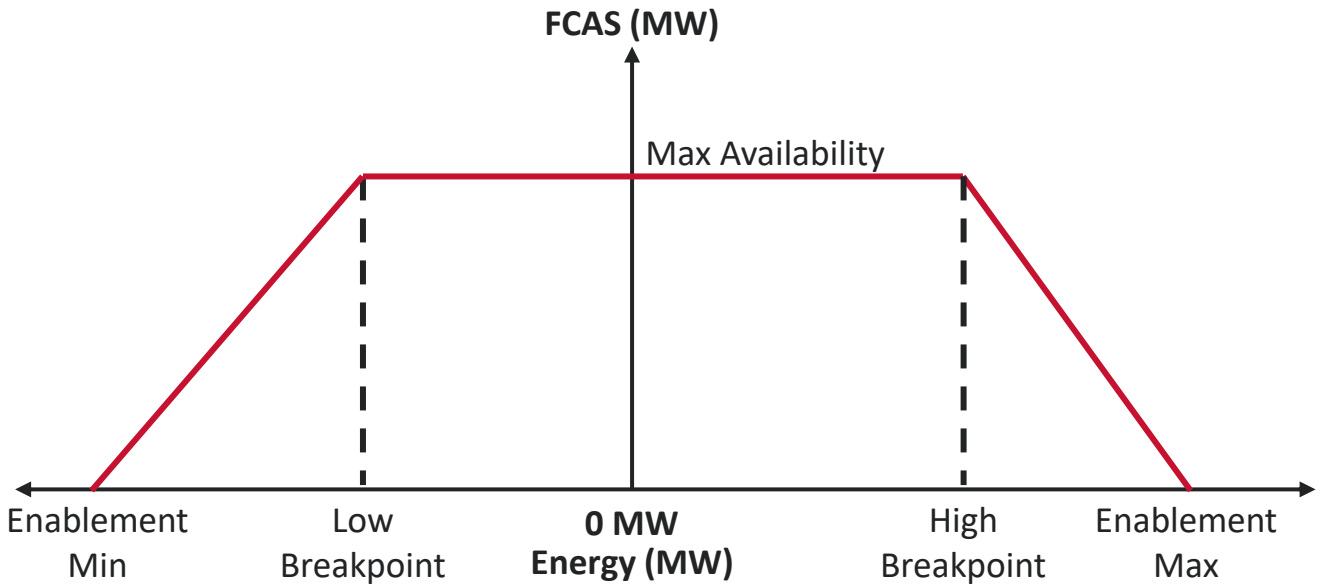
For participants required to update systems for new bidding and dispatch arrangements, AEMO is seeking to better understand the changes and impacts.

Arrangements for Scheduled BDUs

- 20 bid bands for energy
  - 10 for load-side capacity
  - 10 for generation-side capacity
  - All bid bands required to be monotonically increasing.
- 10 bid bands per FCAS service
- Receive a single dispatch instruction covering generation and consumption.
- Dual availabilities, marginal loss factors and sets of ramp rates.
- Bid validation will ensure bids are monotonically increasing across all price bands.

**Note storage facilities like pumped hydro that have a dead band when transitioning from generation to consumption, will be required to register as an IRP but will maintain dual classifications.*

BDU Bidding From FCAS



Restrictions on maximum enablement may be required to ensure system stability during contingency FCAS deployment.

- BDUs will have up to ten bid bands for each FCAS service – as for all ancillary service units.
- Bids for FCAS may specify the *enablement min, enablement max, high/low breakpoints* on the consumption or the generation side.
- NEMDE will allow for enablement across the 0 MW point.

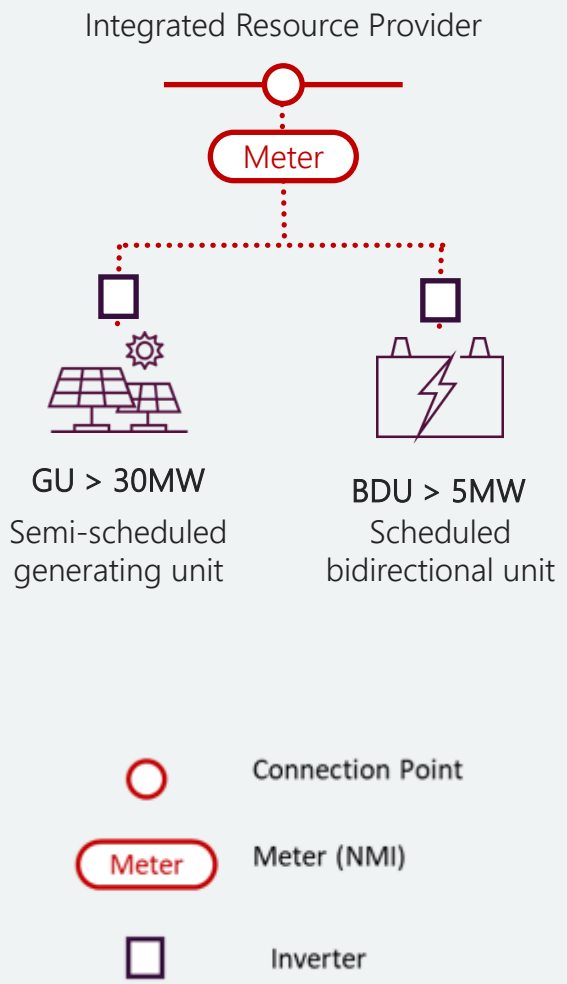
Hybrid Systems and Aggregate Conformance

- Classification, bidding and scheduling will occur separately for each unit behind the connection point. That is, for each scheduled or semi-scheduled resource,
  - A separate set of bids will be submitted; and
  - A separate dispatch instruction will be issued

- Dispatch conformance will be **assessed in aggregate** – e.g., a battery will be able to firm up intermittent output.

- In some dispatch intervals, particular units may be required to conform individually.
  - For example, due to binding system strength or voltage constraints.
  - This will be communicated through a **Individual Conformance Flag**, specific to each DUID, **issued with each dispatch instruction**.
  - Other units can continue using aggregate conformance

Aggregate conformance introduced from the Transition Period (Mar 2023)



Settlement and Prudentials

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Non-Energy Cost Recovery (NECR) Framework

Cost Recovery Market Participants:

- Generators
- Integrated Resource Providers
- Customers

- NECR updated so that payments apply equally to all *Cost Recovery Market Participants*, removing existing differences due to registration category.

- Recovery will be based on a participant's share of **gross consumed energy** and/or **gross sent out energy** in an interval across its connection points.

- Data streams will be available from Global Settlements (May 2022):
  - Adjusted Consumed Energy (ACE)
  - Adjusted Sent Out Energy (ASOE)

- NEM still has many Type 6 accumulation meters (~8.5 million).
  - These will use continue to use current arrangements until replaced with smart meters.

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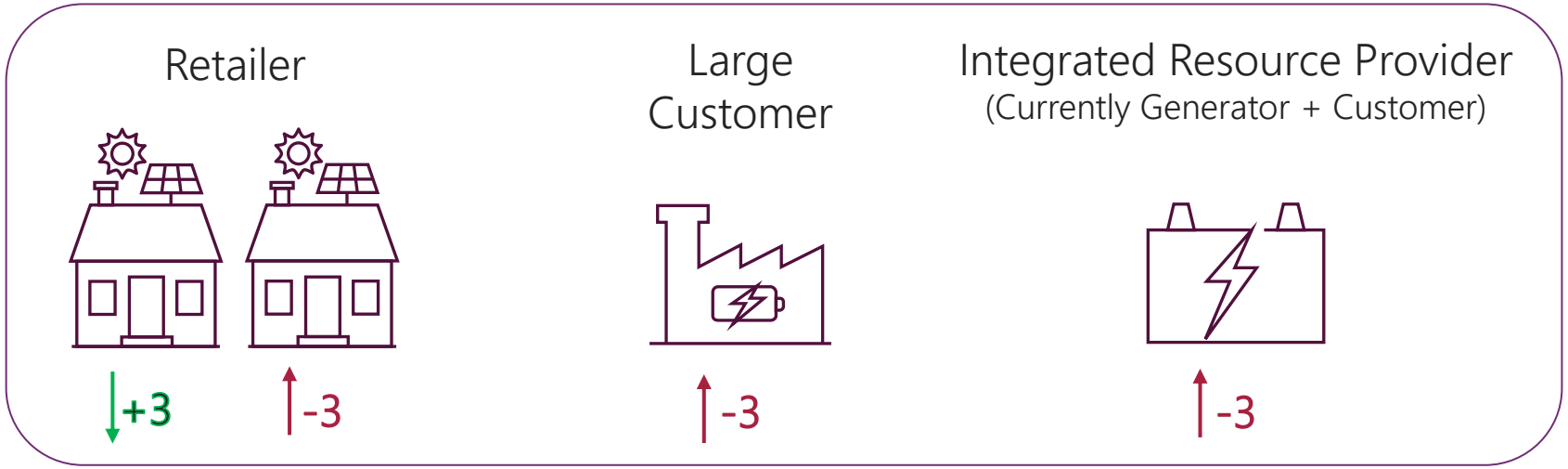
Non-Energy Cost Recovery Example



Participant	Net Consumption	Gross Consumption
Retailer	0	-3
Large Customer	-3	-3
Integrated Resource Provider	-3	-3
Total	-6	-9

Current arrangements: Large Customer and IRP each pay 50% of the relevant NECR charges.

IESS arrangements: Retailer, Large Customer and IRP each pay 33%.

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Integration

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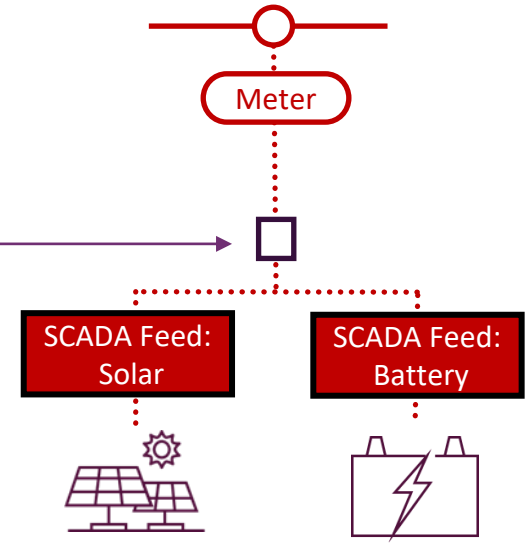
Integration: Forecasting and Planning

IRPs will be integrated across various AEMO functions and business areas

- Bidirectional units will be integrated into operational planning and forecasting processes.
- IESS Rule allows the classification of intermittent capacity as a scheduled BDU, when part of a coupled production unit.
  - AEMO will not forecast intermittent capacity in a scheduled BDU (as part of a coupled production unit).
  - Participant must forecast intermittent capacity over the pre-dispatch and ST PASA timeframes.
- May still require separate SCADA feeds for each resource for operational awareness.

As unit is scheduled, participant is obligated to forecast (aggregate) availability, and bid/rebid according to that availability.



Scheduled BDU
(Coupled Production Unit > 5 MW)

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Integration: Operational Planning

AEMO publishes various PASA and other studies across different time horizons, e.g.,

- MT PASA
- ST PASA
- Pre-Dispatch Schedule
- Pre-Dispatch PASA

- IESS does not directly/significantly alter these processes, but bidirectional units will be incorporation into PASA processes.

- Energy constraints for bidirectional units are as for other energy-constrained resources:
  - weekly limits for MT PASA; and
  - daily limits for ST PASA.

- AEMO is also exploring how state-of-charge of bidirectional units should or could be included in the PASA processes and NEMDE.

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Integration: Retail and Metering

IRPs will be integrated across various AEMO functions and business areas

- IRPs can classify end-user connection points, subject to retail authorisation requirements.
- As such, IRPs will be incorporated into the Markets, Settlements and Transfer Solution (MSATS) system.
  - Will be able to be nominated as the FRMP for a connection point by a customer; and
  - Will have access to MSATS functions such as NMI discovery and end-user transfer rights.
- IESS progresses Flexible Trading Arrangements Model 1, by extending the SGA framework to bidirectional flows (storage, EVs).
  - The IRP for the secondary small resource connection point will be treated as a FRMP in MSATS, as above.

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Integration: Settlements and Prudentials

- Settlements and prudential systems will incorporate the Integrated Resource Provider.
- Ultimately, the approach to calculating prudential settings for Market Participants with storage will not materially change.
- IESS itself does not change Causer Pays Frameworks.
  - However Causer Pays is the subject of the *Primary Frequency Response Incentive Arrangements Rule Change*.

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Project Planning

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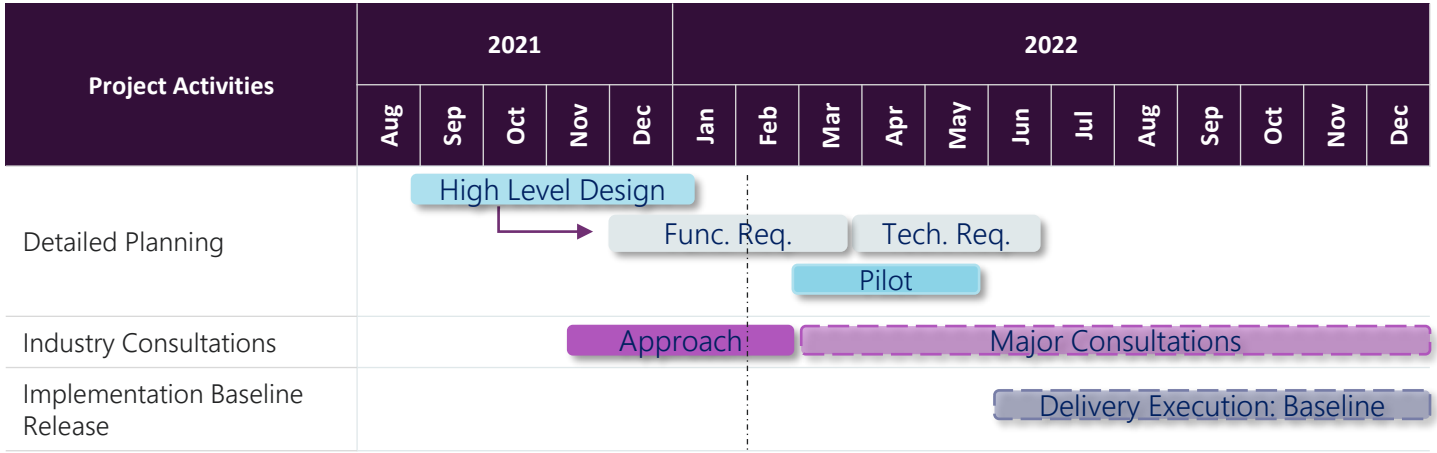
Planning

Current as of 4 Feb 2022

- AEMO is currently in the Detailed Planning phase of IESS implementation:
  - High level design based on the approved rule changes completed, being expanded and captured as functional and technical requirements.
  - Pilot to commence shortly to further inform Dispatch and Registration functional and technical requirements
  - Resourcing ramp-up for the next phase – Delivery Execution
  - Industry consultation approach being prepared

Are there any important requirements for how we engage with industry during this implementation project?



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Execution

Current as of 4 Feb 2022

- AEMO will adopt a two-stage major release approach for the Execution Phase:
  - Baseline Release to deliver priority / transitionary items for Dispatch and Registration functional areas
  - Final Release to complete IESS implementation, integrate Settlements and Retail functions, and allow extensive Market Trials ahead of final go-live release
  - Industry consultations to run in parallel with implementation releases

Identified Impacts to Market Systems

Registration Management Client	Forecasting – ECM, AWEFS, ASEFS, DFS,	PASA	NEMDE	Compliance Monitor	MSATS	Settlements, Billing and Metering
Introduce IRP category and new classifications, as well as various options for coupled production units.	Incorporate forecasting for coupled production units which are semi-scheduled with battery capacity.	BDUs and hybrid/coupled systems will need to be integrated into PASA processes and systems	Bidding and dispatch under a single DUID for scheduled BDUs; Bid validation; 20 Bid Bands FCAS trapeziums for hybrid systems. Dispatch instructions for hybrids	Apply constraints to units/hybrid systems Monitor & report individual/ aggregate dispatch conformance	Provide IRPs with functions such as NMI discovery, nomination as FRMP, etc.	Update for new Non-Energy Cost Recovery arrangements. Integrate IRP into settlements, billing, prudential requirements.

To accommodate IESS rules requirements:

- System development will prioritise delivery of changes for Dispatch and Registration systems, followed by Settlements and Retail systems.
- AEMO will deliver a baseline release to meet the transitionary requirements for SGA FCAS and aggregated conformance
- AEMO will deliver a final, fully integrated release to meet all IESS requirements, scheduled in June 2024
- The dual market release approach allows early delivery of priority items, and establishes a baseline for related AEMO projects to start their system development.

Regulatory Approach

AEMO is currently planning for the required procedural changes

- IESS Rule Change makes over-arching changes.
  - Several new participant/classification types
  - Fundamental terminology changes.
- This results in a significant procedural and regulatory changes:
  - Approximately 50-100 affected procedures, guides, etc.
  - The Rule allows a streamlined process for changes that are only of a *minor and administrative* nature.
- AEMO is currently analysing the changes required, and will release a regulatory approach to stakeholders for feedback.

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Next Steps and Final Q&A

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Next Steps

The Detailed Planning Phase will continue through early 2022.

- AEMO will update *High-Level Design* following
  - Industry feedback (due 11th Feb 2022)
  - System and regulatory analysis
- AEMO will issue a draft of the *IESS Regulatory Approach d*ocument for consultation with industry.
- Next IESS stakeholder workshop will be held early in April 2022.
- The *NEM2025 Implementation Roadmap* is also being prepared by the Reform Delivery Committee, for release at the end of March 2022.

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For more information

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