Reform Delivery Committee

Round 2 Workshop 1

3 March 2022

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

We pay respect to their Elders past, present and emerging.

Welcome

Agenda

1. Introduction
2. Relationships
3. Roadmap Pathways
4. Next Steps and Close
5. Participant Impact Assessment review/optional

Appendix A: Grouped Technology Solutions

Appendix B: Functional Relationship Mapping

Appendix C: Standard Implementation Process & Assumed Timeframes

Please note that this meeting will be recorded for note taking purposes and not for publication.

Introduction

Overview and recap from our Round One December workshops

*The **"NEM2025 Implementation Roadmap"** is to establish a basis upon which AEMO and stakeholders may navigate the breadth of ESB reforms over the coming few years, de-risking delivery and informing implementation timing*

- In design of the NEM2025 Implementation Roadmap ('Roadmap'), the Reform Delivery Committee (RDC) aim to set out a program that:
  - Implements reforms in a timely and efficient manner;
  - Co-ordinates regulatory and IT change; and
  - Provides transparency to stakeholders on the implementation program

Key Round One Workshop Outcomes

- AEMO & Committee members agreed the suite of reform initiatives to be included in NEM2025 Implementation Roadmap V1
- AEMO & Committee members agreed the roadmap should capture those key initiatives that impact a subset of stakeholders (e.g., TNSPs – System Strength Planning)
- AEMO & Committee members formed an understanding of the initial high-level impacts across the reform initiatives

Scope of NEM2025 Implementation Roadmap (Version 1)

Pathway	Reform Initiative
Resource Adequacy Mechanism	• Increased MT PASA Information
Essential System Services	• Fast Frequency Response • Mandatory Primary Frequency Response • Operating Reserve Market • System Strength (Planning)* • Structured Procurement & Scheduling Mechanism
Integration of DER & Flexible Demand	• Integrating Energy Storage • Flexible Trading Arrangements (Model 2) • Scheduled Lite • Dynamic Operating Envelopes • Distribution Local Network Services • Turn-up Services • DER Platform Registry Services • Market & System Operator Integration
Transmission & Access	N/A at this time
Data Strategy	• Data Services • EV Charging Standing Data Register • Bill Transparency • Network Transparency

**Led by transmission network service providers*

This workshop seeks to facilitate assessment of implementation approaches & pathways

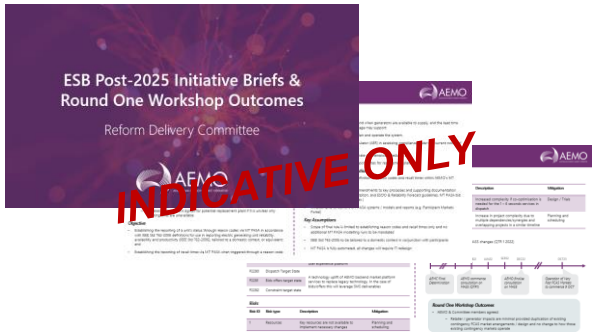
- Over the coming years there is likely to be a sustained high-rate of disruption for which the energy sector needs to prepare
- As a result, implementation of the NEM 2025 reforms, and therefore the roadmap itself, needs to recognise the current and changing environment facing AEMO and participants to ensure delivery and cost efficiency
- This will necessitate being both tactical and strategic in consideration of the various aspects and pathways in development of the roadmap to design and build capabilities with flexibility to adapt as markets mature and change

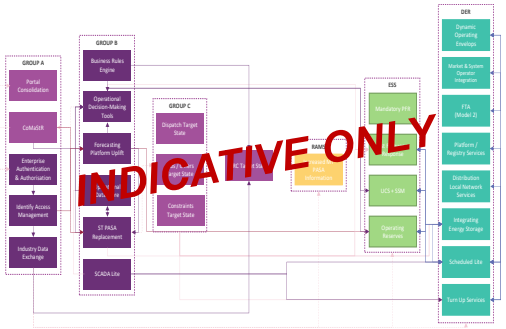
WORKSHOP OBJECTIVES	WORKSHOP APPROACH
• Understand relationships and dependencies across initiatives (AEMO & ESB)	• AEMO assessment and mapping of relationships • Workshop discussion
• Identify key insights and assumptions and their impact on development of pathways	• AEMO assessment of key insights / assumptions • Workshop discussion

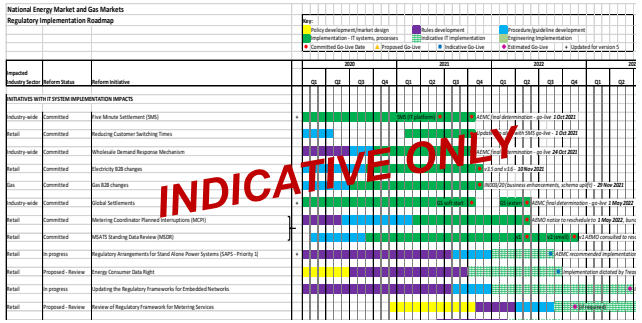
A walkthrough of the first draft Roadmap will be provided in Workshop 2 incorporating feedback from today's workshop on key relationships, groupings and pathways

Artifacts to aid assessment of grouping, sequencing and prioritisation pathways

The **Participant Impact Assessment** will help assess groupings, sequencing and prioritisation of pathways







Reference Material

- Outline of individual initiatives including problem statement, objectives, scope, assumptions, dependencies and schedule
- Building upon the material shown during Workshop 1 and to be used as reference material for the final roadmap
- Workshop 1 feedback included

Relationship Mapping

- Draft mapping accounting for all ESB and AEMO initiatives
- Relationships range from: Functional, Deadline, Sequencing (Design or Implementation / Operation), Policy, Trials, Technology (Base), Technology (Strategic)
- Provides a basis to identify bundling, sequencing and prioritisation pathways

Roadmap Walkthrough

- Draft roadmap building on the work completed to date
- Identification of project sequencing, bundling, timing including key milestones and alternative pathways
- Opportunity to provide feedback on format, information captured

PRE-READING ***TO BE DISCUSSED TODAY*** ***TO BE DISCUSSED AT NEXT WORKSHOP***

Relationships

Technology Solutions & Functional

The Roadmap will require an understanding of key technology solution & functional relationships

Technology Solutions

- We have explored the relationships between initiatives to identify pre-requisite base and strategic enabling technology solutions
- The relationships among the various pre-requisite technology enablers together with an understanding of their scope and status (e.g., inflight) means they can be grouped and sequenced accordingly

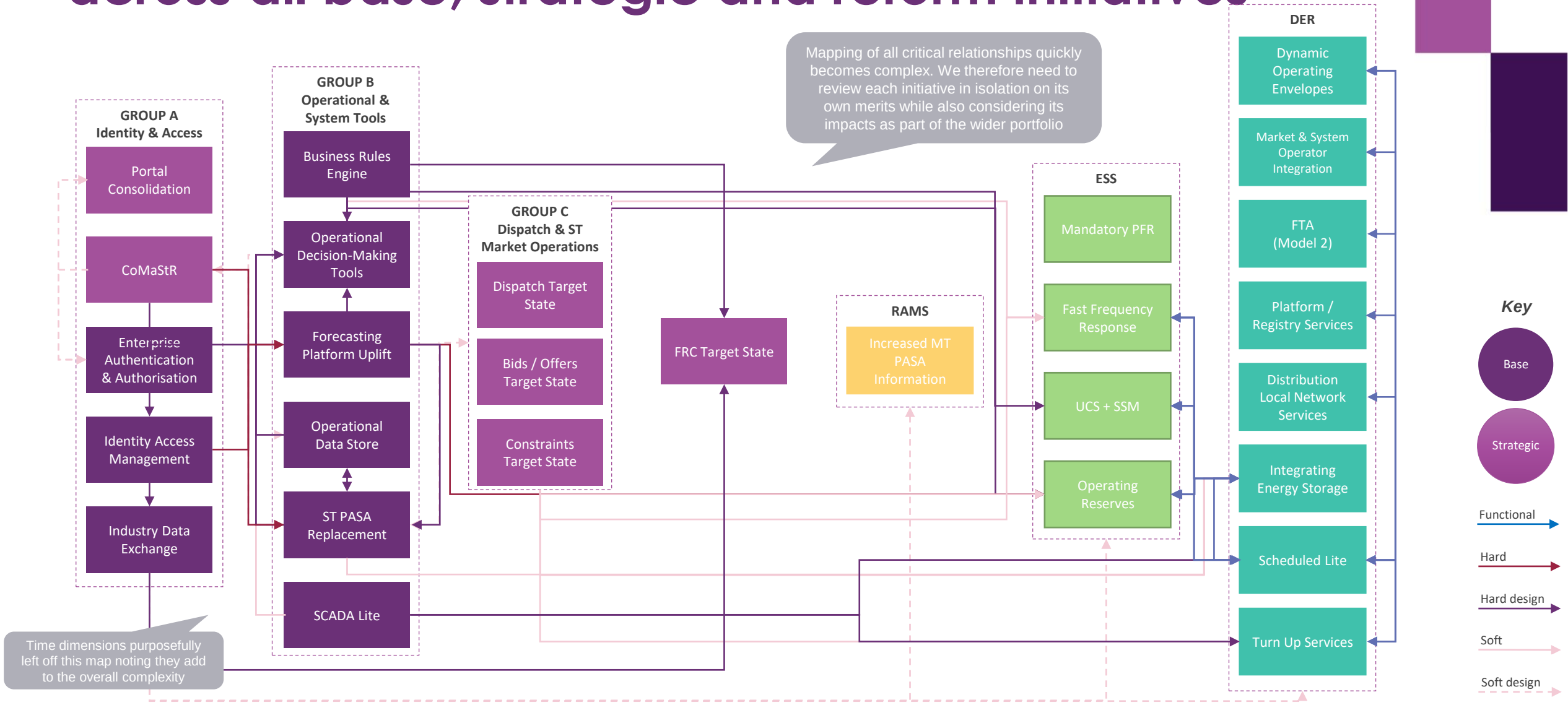
Relationship type	Description
Hard	Technology solution / initiative is dependent on the design and implementation of another
Hard design	Technology solution / initiative is dependent only on the final design of another
Soft	Technology solution / initiative is not dependent on the design and implementation of another however there are strategic benefits
Soft design	Technology solution / initiative is not dependent on the final design but will be influenced by the design of another

Functional

- In addition to those known technology solutions, we have explored those functional relationships across initiatives that need to be factored across potential pathways
- These relationships will improve the overall efficiency of implementation across the wider reform program

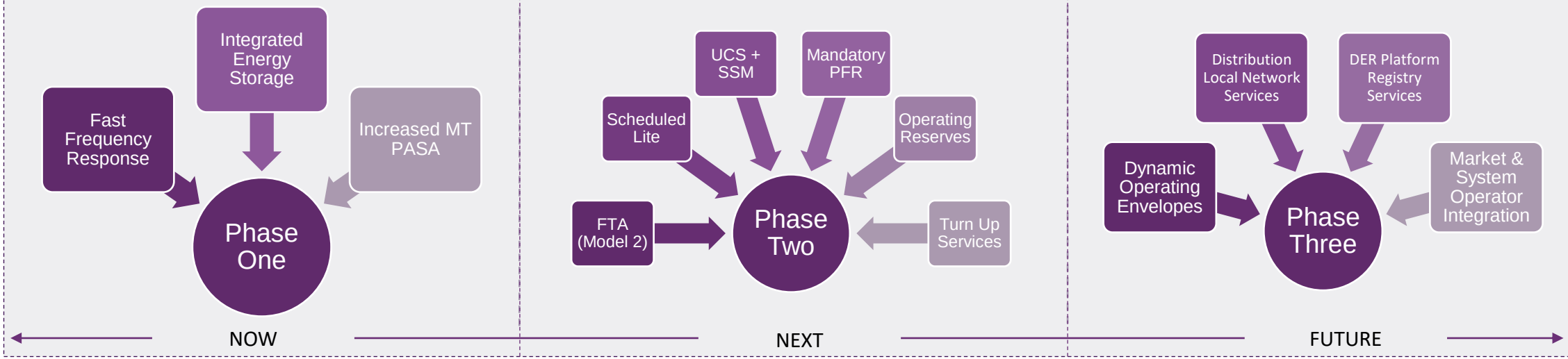
Relationship type	Description
System or Process	The initiative will touch upon the same system or process (see heatmap)
Deadline	The initiative has a firm deadline that overlaps with delivery of another
Trials	The scope of the initiative is subject to current or future trials
Policy	The scope of the initiative is subject to ongoing and related policy work

Initiative relationships have been mapped across all base, strategic and reform initiatives

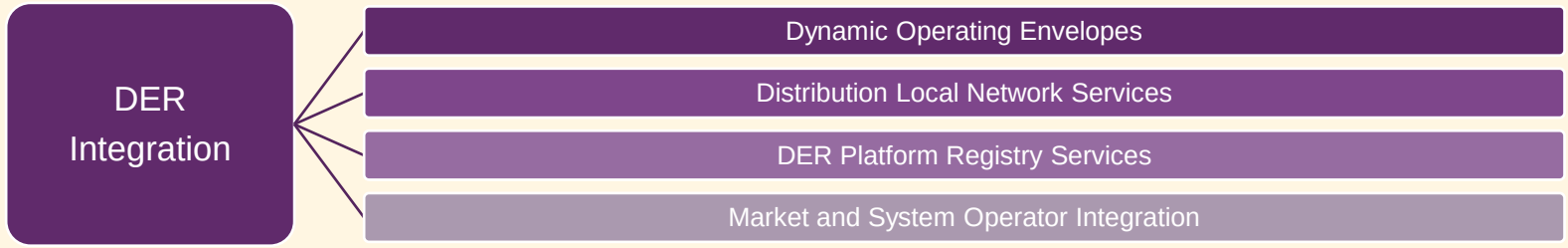


Reform initiatives may be grouped and sequenced across scope and time

EXAMPLE GROUPINGS IN ACCORDANCE WITH ESTIMATED IMPLEMENTATION DATE

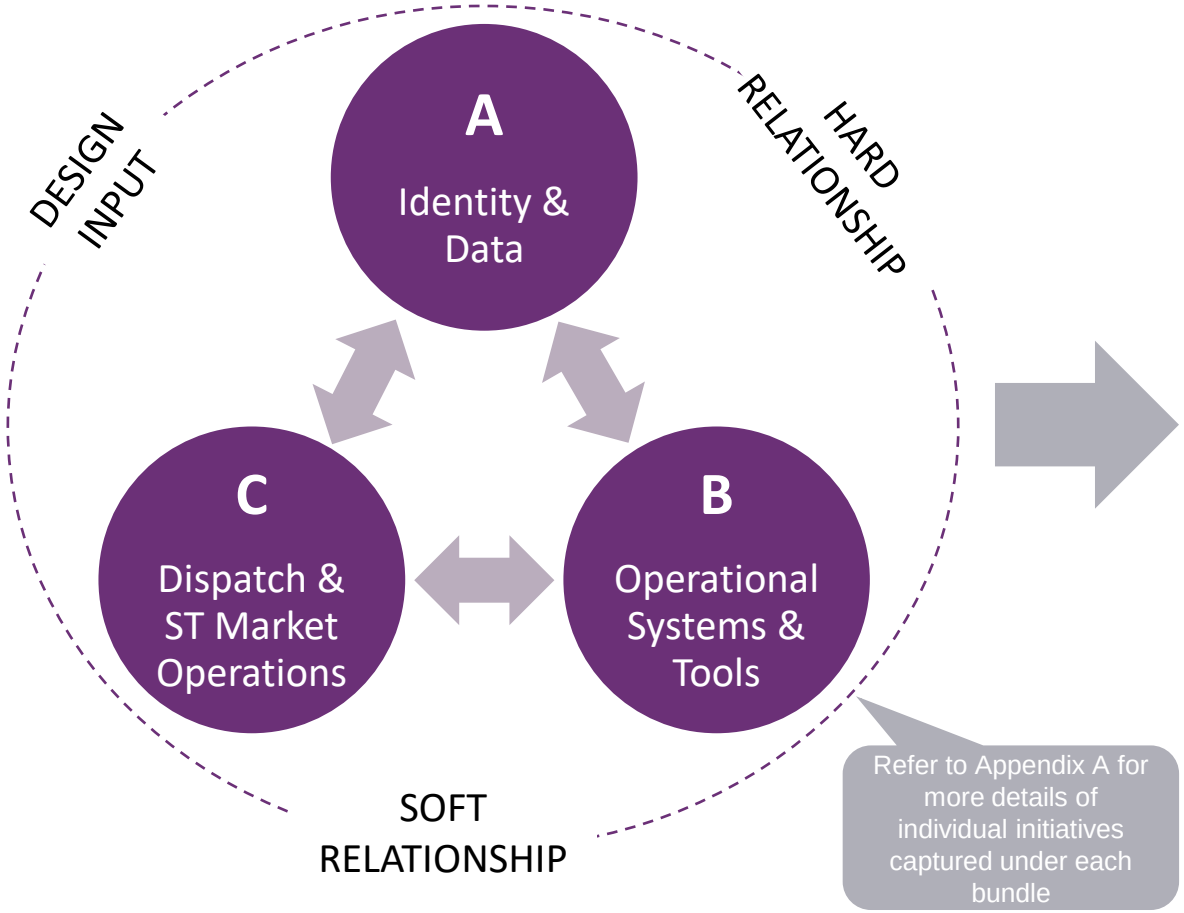


EXAMPLE GROUPINGS IN ACCORDANCE WITH SCOPE



EXAMPLES ONLY
Our challenge as a Committee is to assess the optimal grouping, sequencing and prioritisation pathways given known relationships

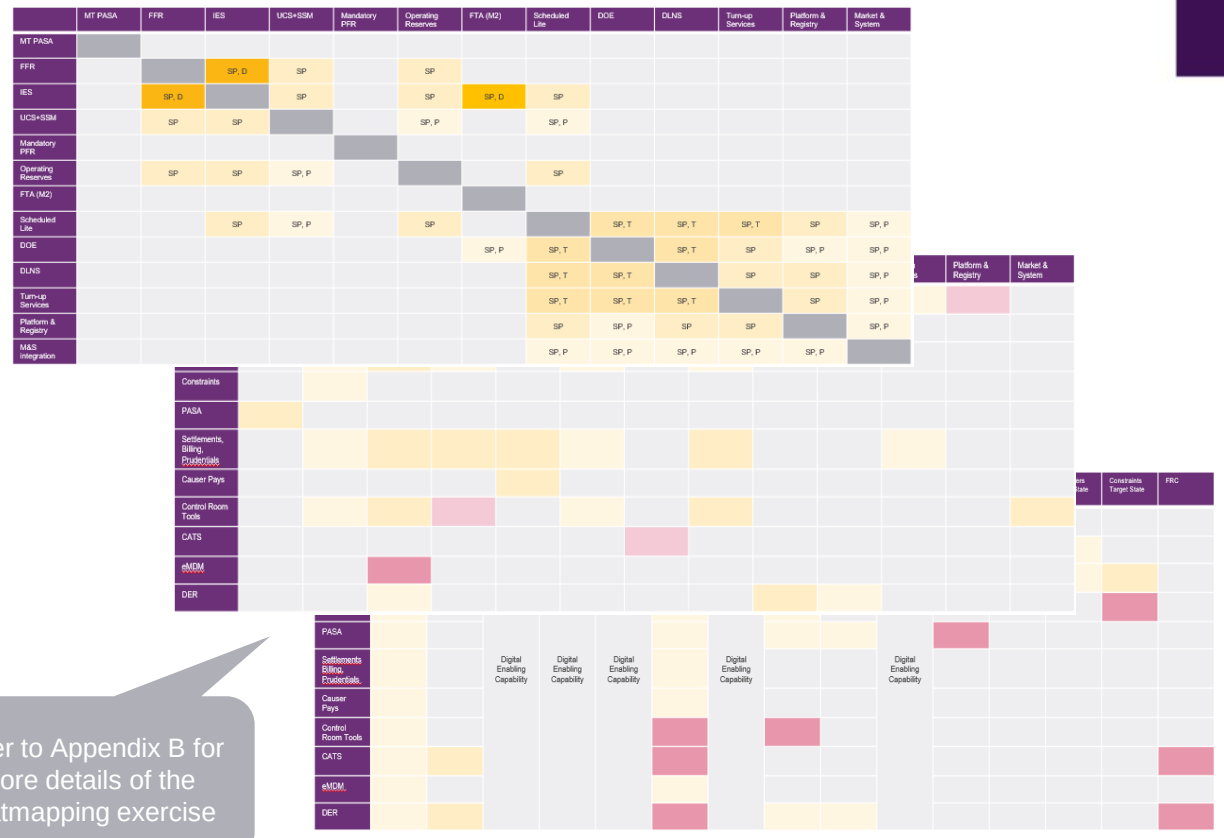
Relationships across technology solutions provide for a mix of pre-requisite base and strategic initiatives



- AEMO has identified three key groupings in relation to its own strategic or foundational initiatives
- Each grouping provides for a mix of:
  - ***Base dependency work*** to deliver an uplift to base capability on which reforms are dependent
  - ***Strategic dependency work*** to effectively futureproof capabilities and scalability of systems thereby avoiding investment in systems that will become end-of-life shortly after the reforms take effect
- Key relationships have been identified and mapped within and across each of the three groups (A, B and C)
- **Unlike the reform initiatives, where timeframes may be dictated by a regulatory deadline, sequencing of the strategic or foundational initiatives proves more complex**
- In addition to these groups AEMO's initiative 'FRC Target State' is a key enabler the reform initiatives (e.g., Flex Trading Arrangements Model 2)

A heatmap of the functional relationships helps inform opportunities to group and sequence

- AEMO has completed a heatmap assessment identifying:
  - ***Functional relationships across NEM 2025 reform initiatives*** – here AEMO has identified those system, process, policy, trial and deadline relationships
  - ***Significance of the functional impacts from the NEM 2025 reform initiatives***
  - ***Significance of the functional impacts from AEMO's own strategic and foundational initiatives***
- This analysis highlights the critical touch points for AEMO and participant systems and aids in the consideration of alternative groupings and pathways
- For example, FFR, UCS+SSM and Operating Reserve all have similar touch points and impacts across the various functions
- However, in implementing FFR it may be beneficial for this initiative to be considered in isolation in order to ensure the regulatory deadlines are met



Refer to Appendix B for more details of the heatmapping exercise

Questions to the Committee

- Relationships
  - What are the priority pre-requisites from a participant perspective?
  - Are any relationships missing?

Let’s jump on to jamboard using the link in the chat.

Roadmap Pathways

NEM 2025 Implementation Roadmap Development

The roadmap can lay the foundations for the future however comes with trade-offs

- The transformational nature of the reforms present an opportunity to lay the foundations of future capabilities that will be needed as the system and market evolves and matures over time
- However, uncertainties regarding policy, market design, trials, effective dates and current life cycle of systems for example will challenge the formation of the roadmap and the individual pathways considered

This presents a critical threshold consideration for the RDC

How we define the threshold for earlier incorporation of technology investments that set-up long-term capabilities and efficiencies, and address industry pain-points, into the delivery of the reforms has the potential to impact timeliness and overall efficiency, including costs, of the NEM2025 reform program

The trade-off is potential deferral of implementation dates for the reforms

Given the number of factors at stake and depending on the individual initiative it is likely the pathways chosen and therefore the roadmap itself falls somewhere across the spectrum

For example: Implementation of FFR based on current timeline and scope may best be facilitated via investment in legacy systems prior to strategic / foundational investment (Bundle C - Dispatch and ST Market Operation). Implementation of Operating Reserves (subject to final design) may allow for strategic investment in Group B initiatives first

Three over-arching pathways (with potential variations within each) to implementing the reforms

- The following provides examples of the alternative pathways that may be adopted across the spectrum and subject to the "threshold" preference of the Committee

Pathway 1 (Regulatory Led)
Maintains assumed / estimated regulatory timeframes by delivering the reforms primarily through existing systems

- Implements all the reform initiatives in sequence without considering shared system impacts and future state technology investment efficiencies
- This pathway largely removes delivery of foundational and future technology investment initiatives from the roadmap except for those without which a reform could not be delivered – 'true' hard dependencies
- **Advantages:** All assumed / estimated reform effective dates are met
- **Disadvantages:** Risk of cost inefficiencies due to investment in systems that will need to be upgraded or replaced in the near future. Potential limitations of current solutions under high DER uptake scenarios.

Pathway 2 (Strategic / Foundational)
Targets delivery of strategic and foundational initiatives in order to lay a platform for implementation of reform initiatives

- This pathway focuses on strategic / foundational initiatives that enable the reforms under a future state that facilitates scalability and limits the number of investments that may be required in the future as the market continues to transform and mature. The bundling approach in this pathway seeks to minimise the number of times the same systems are changed creates implementation efficiencies
- **Advantages**: Ensures initiatives are delivered in a cost-efficient manner reducing the burden on participants, consumers and AEMO through technology solutions that will keep pace with rapid transition and deliver capabilities and support functions beyond 'Day 1'
- **Disadvantages**: This pathway pushes back delivery dates for the reforms beyond the currently assumed regulatory timeframes creating additional risk and complexity when it comes time to deliver

Pathway 3 (Hybrid)
A hybrid approach that aims to deliver both reform and strategic / foundational initiatives

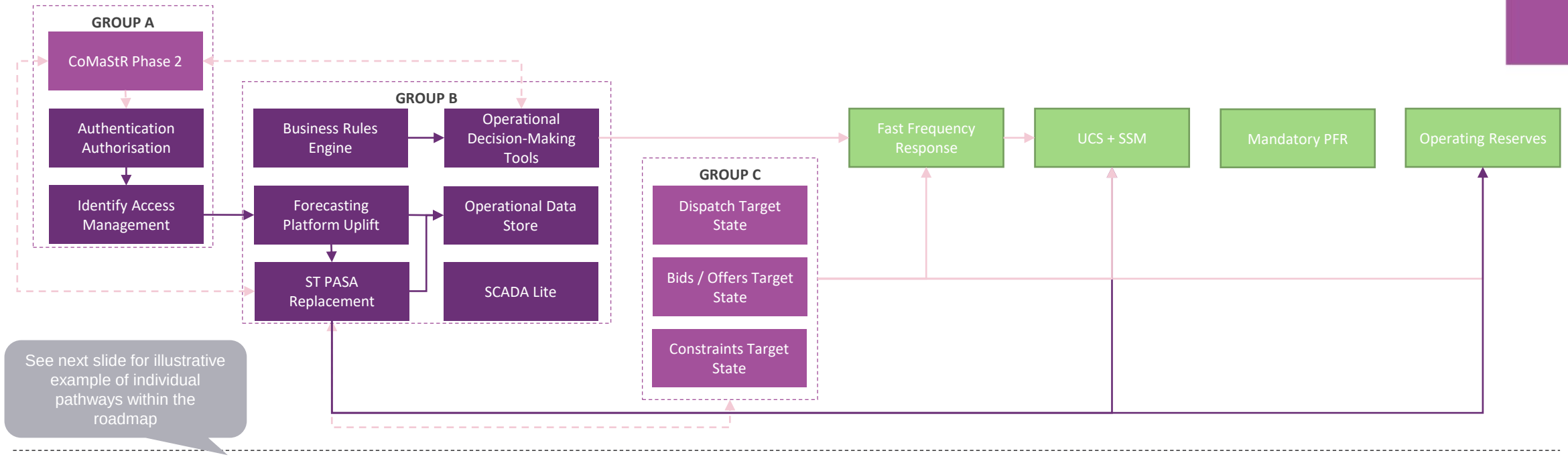
- Reforms are implemented within the assumed / estimated regulatory timeframes and target state initiatives are prioritised and / or compressed to align with the effective dates where possible. Shared system impacts are not necessarily considered in the bundling and sequencing which may result in implementation inefficiencies and larger volumes of scheduled releases.
- **Advantages:** Reform initiatives are delivered alongside key strategic / foundational investments potentially minimising delays
- **Disadvantages:** Potentially high-risk due to the compressed delivery time of complex target state initiatives. This may result in design and implementation risks that could end up delaying the introduction of reforms and costing more

The pathways require consideration of various trade-offs affecting overall program efficiency

Future reforms such as a Capacity Mechanism or Congestion Management Model will require a reconsideration of the pathways and trade-offs within the Roadmap

Trade-off	Description
Program Optimisation	• Coordination of regulatory and IT change in a timely and efficient manner, and consideration of shared system impacts to bundle reforms to minimise the number of system releases • *Example: Collectively adopted pathways provide for optimal grouping, sequencing and prioritisation of AEMO, participant and NEM 2025 initiatives*
Regulatory Timelines	• Capacity to meet regulatory timeframes • *Example: A strategic / foundational pathway would necessitate delay to the implementation of reform initiative in order to establish new foundational systems / processes*
Overall Cost Efficiency	• Implements reforms in a timely and efficient manner and at least whole-of-system cost • *Example: A short term focus may require building upon legacy systems that are nearing their end-of-life and need to be replaced. This may still require transition to a target state at a later date adding costs*
Risks	• Minimises overall implementation risks • *Example: Delay of an individual initiatives over time may create different delivery risks in the future such as the challenges of managing a larger bundle of reforms including resourcing and variations in scope*
Scalability	• Flexibility to adapt to future changes • *Example: The extent to which a pathway delivers target state reforms / initiatives with capabilities beyond those required for 'Day 1'*
Participant Investment and Operations	• Considers impact on participant investments (timing and scale) required for each delivery pathway as well as impacts on participants day-to-day operations and administration • *Example: A regulatory led pathway would maintain existing systems (and pain points) but would require further participant investment to transition to strategic systems over time.*

An example: Applying the pathways to ESS



Pathway 1 (Regulatory Led)

- **NOW:** FFR delivered due to regulatory timeline, Critical 'Base' technology solutions delivered
- **NEXT:** Mandatory PFR pushed to 'Next' due to the re-scheduled publication of AEMC final determination, UCS+SSM delivered
- **FUTURE:** N/A

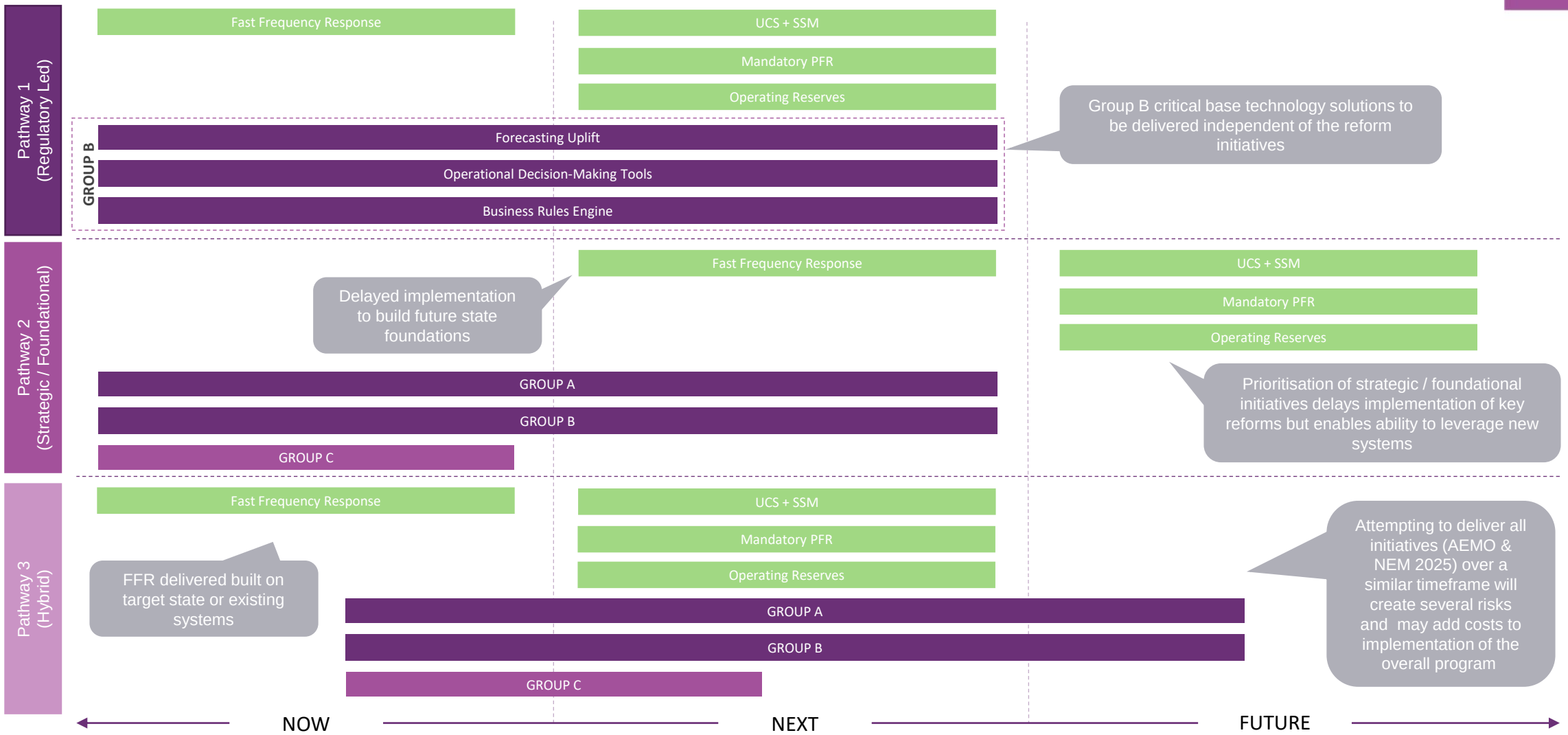
Pathway 2 (Strategic / Foundational)

- **NOW:** Implementation of GROUP A, B and C initiatives prioritised ahead of NEM 2025 reforms to establish future state technology solutions
- **NEXT:** FFR delivered outside of current regulatory deadline
- **FUTURE:** UCS+SSM, OR and Mandatory PFR delivered

Pathway 3 (Hybrid)

- **NOW:** FFR delivered on target state or existing systems due to regulatory timeline, Commencement of GROUP A, B and C Initiatives
- **NEXT:** Mandatory PFR, UCS+SSM and OR delivered, GROUP C Initiatives implemented
- **FUTURE:** GROUP A and B Initiatives implemented

An example: Applying the pathways to ESS (continued – illustrative purposes only)



Questions to the Committee

- Trade offs
  - Are there additional trade offs to consider?
  - Are there priority criteria, if so which ones and why?
- Roadmap pathways
  - Is regulatory led the highest priority, if so why?
  - Is strategic/foundational led the highest priority, if so why?

Let’s jump back to jamboard using the link in the chat.

Next Steps and Close

Next Steps

Proposed actions	Responsibility
Provide initial feedback on initiative relationships	Committee members
Provide initial feedback on grouping or sequencing as it impacts participant constituents	Committee members
Provide initial feedback on key issues in relation to the Roadmap, and particularly different strategic issues for comment including: perspectives on trade-offs, different potential pathways, issues highlighted by the pathway	Committee members
Finalise first draft Roadmap reflecting pathways and release to Committee	AEMO
Finalise and release materials including initial draft Roadmap for Workshop 2 on Thu 10 March. Take on board any points from Workshop 1 that require a different approach	AEMO

See you next at…

Workshop

- Round 2 – Workshop 2: Thu 10 March

Committee meeting

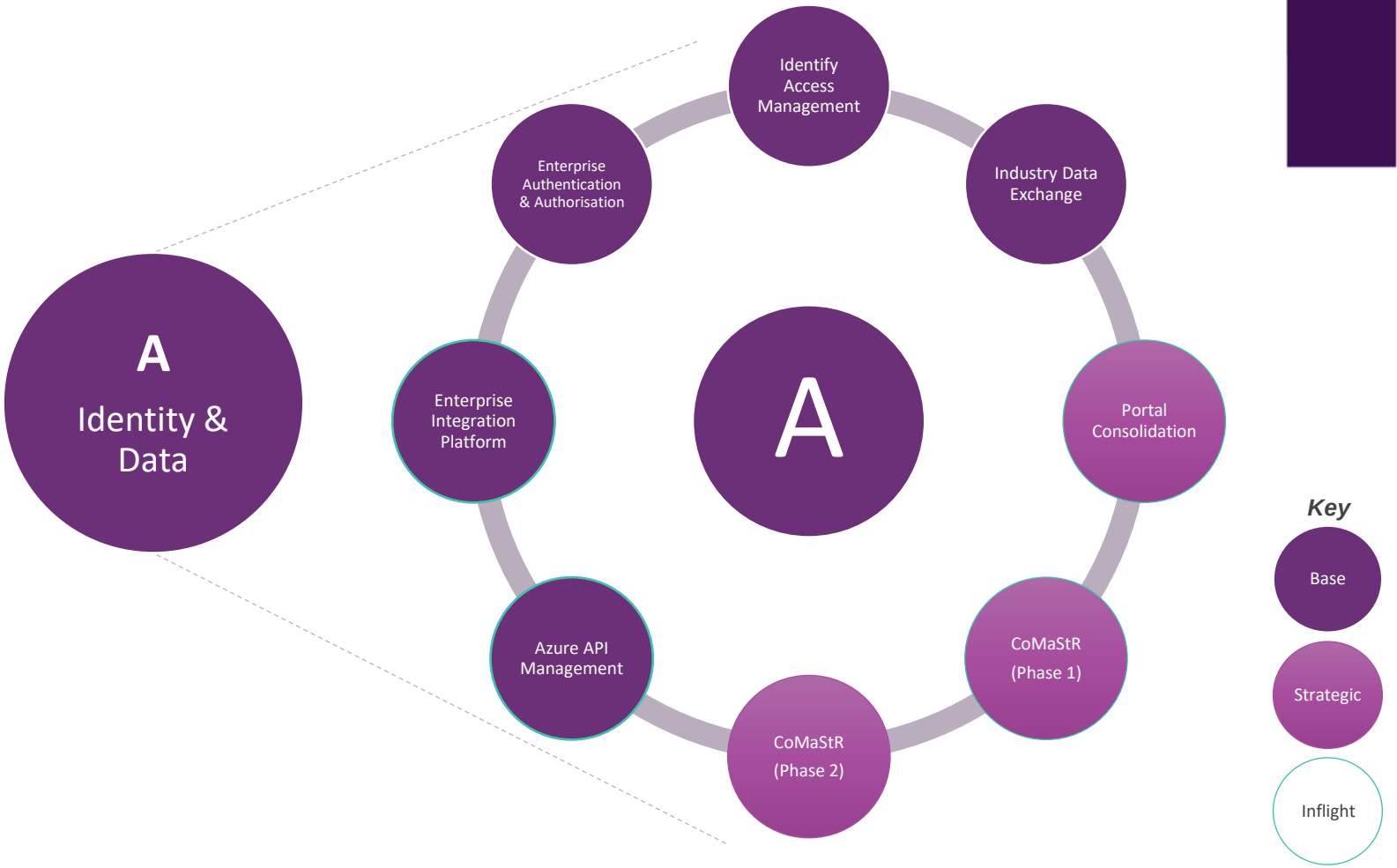
- Meeting 3: Mon 21 March

Appendix A

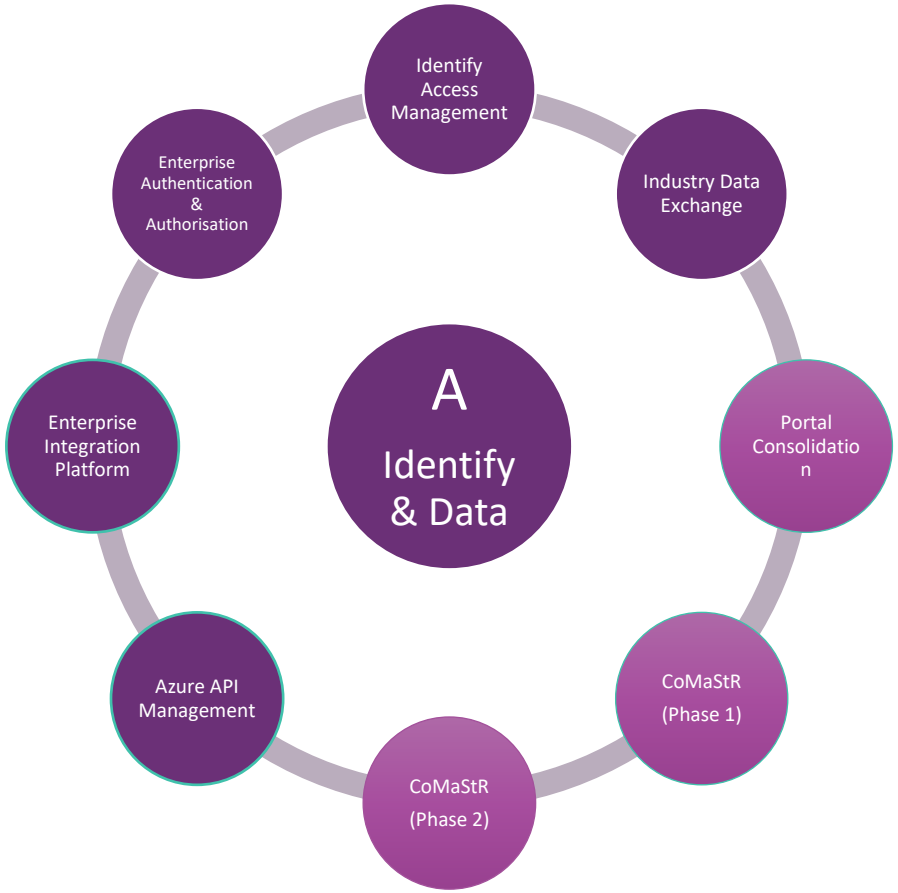
Grouped Technology Solutions

Group A supports the tools that enable efficient identification, authorization and transfer of data

- The initiatives within Group A enable a strategic approach to implementing the capabilities for AEMO and Market Participant interactions and data exchange elements of the reforms
- Group A is the key enabler for an FRC target state (not shown) that future-proofs a two-sided market
- Example key relationships within Group A:
  - Enterprise Integration Platform & Azure API Management → Industry Data Exchange (Hard / Hard Design)
  - Identity Access Management → Industry Data Exchange (Hard)
  - Portal Consolidation → Enterprise Authentication & Authorisation (Soft Design)
- Example key relationships across bundles:
  - Identity Access Management (Group A) → Forecasting Platform Uplift (Group B) (Hard)
  - CoMaStR (Group A) → Operational Decision-Making Tools (Group B) (Soft Design)



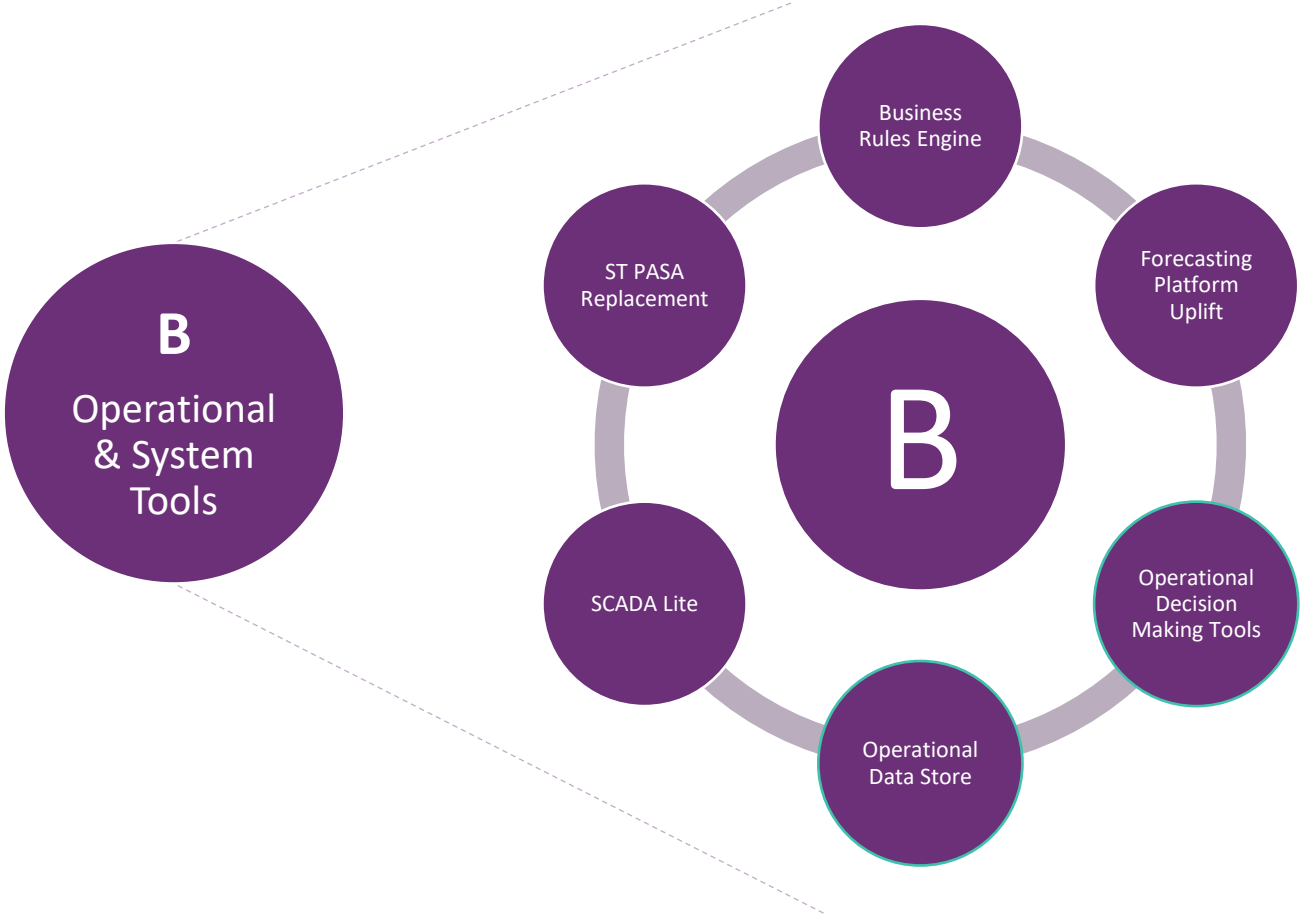
Group A – Identity & Data Strategic and Foundational Initiatives



Strategic / Foundational Initiative	Description	Relationship Type
Portal Consolidation	A single pane of glass user experience for participants accessing all AEMO browser-based services.	**Soft design:** Enterprise Authentication and Authorisation
Consolidated master data repository (CoMaStR) (Phase 1)	An internal master data management platform hosting information about power system asset data (e.g. NMI standing data, DER devices) used by AEMO market systems.	N/A – relationship with NEM2025 exists through Phase 2
CoMaStR (Phase 2)	Extension of the scope for CoMaStR Phase 2 to enable the specific-needs of the core NEM2025 reforms.	**Hard:** ST PASA Replacement (Bundle B) **Hard design:** Forecasting Platform (Bundle B) **Soft design:** Enterprise Authentication and Authorisation, Operational Decision-Making Tools (Bundle B)
Identify Access Management	A unified mechanism to authenticate participant users and applications when accessing AEMO services.	**Hard:** Forecasting Platform (Bundle B) **Hard design:** Industry Data Exchange
Industry Data Exchange	Unified access to AEMO services across all markets using modern authentication and communication protocols. This initiative will leverage Identity Access Management.	**Hard design:** FRC Target State **Soft design**: All core reform initiatives
Enterprise Authentication & Authorisation	The architecture and patterns underpinning authentication and authorisation (access) target state processes to facilitate identity and access management.	**Hard design:** Identity Access Management **Soft design:** Portal Consolidation

Group B strengthens the tools needed to operate the power system

- As the power system continues to transition, and the new markets mature, operating with existing systems increases operational risk
- The tools that could be delivered through Group B are critical to the operation of a secure and stable system into the future
- Example key relationships within Group B:
  - Business Rules Engine → Operational Decision-Making Tools (Hard)
  - Operational Data Store → Forecasting Platform Uplift & ST PASA Replacement, Operational Decision-Making Tools (Hard)
- Example key relationships across bundles:
  - ST PASA Replacement (Group B) → CoMaStR (Group A) (Soft Design)
  - Business Rules Engine → FRC Target State (not shown) (Hard)

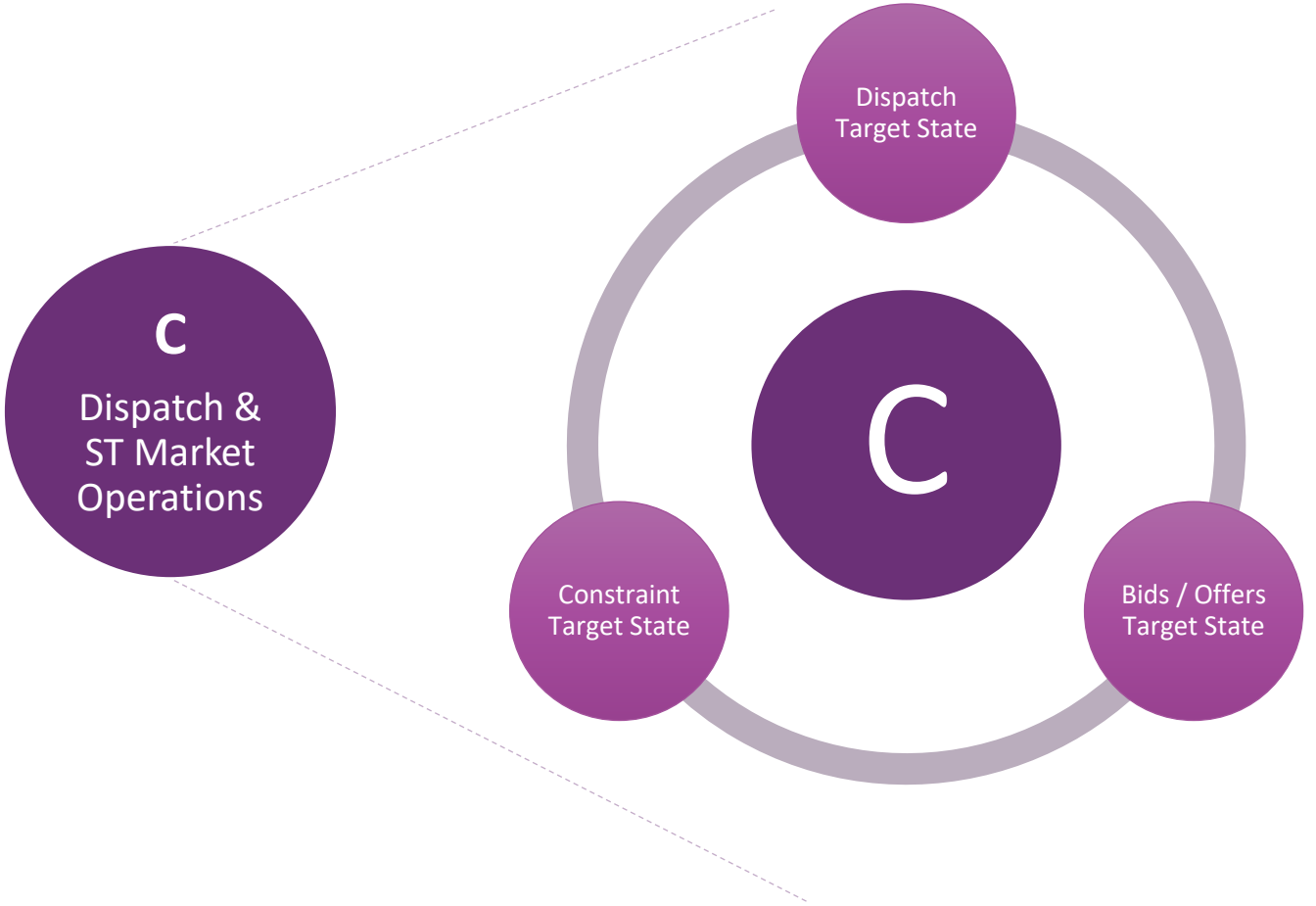


Group B – Operational & System Tools Strategic and Foundational Initiatives

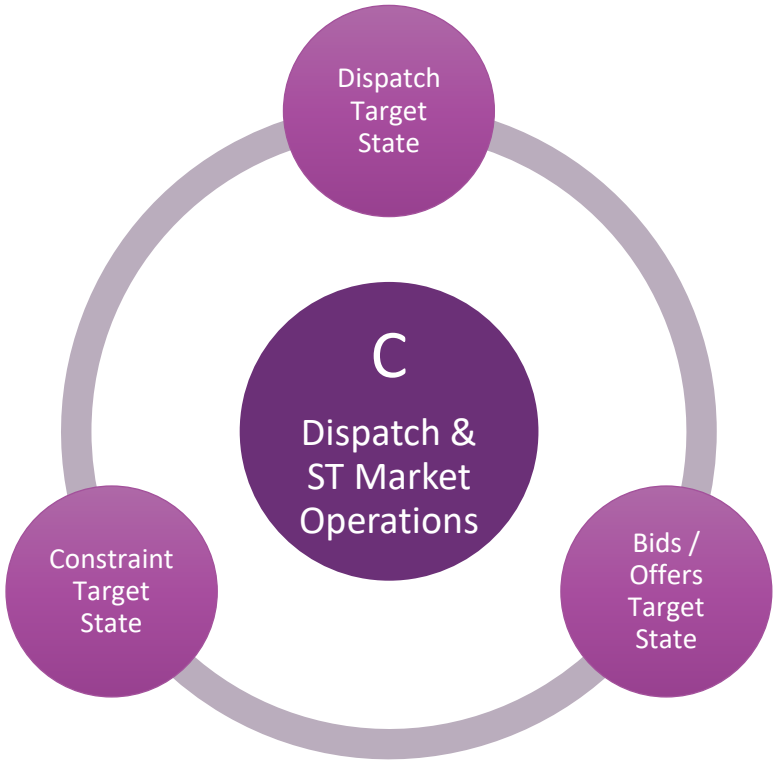
Strategic / Foundational Initiative	Description	Relationship Type
Business Rules Engine	An internal technology capability within which business rules and processes are defined. Core market platforms will leverage this capability as a foundation building block.	**Hard design:** Operational Decision-Making Tools, FRC Target State
Forecasting Platform Uplift	A converged modelling platform that supports model development, interfaces for forecasting-as-a-service providers and layered blended models across a number of modelling domains e.g. demand and VRE.	**Hard:** Operating reserves **Hard design:** Operational Data Store, ST PASA Replacement
Operational Decision Making Tools	A refresh of the user interfaces used by the AEMO control room operators. Multiple disparate User Interfaces converged into single user experience platform.	**Hard design:** UCS + SSM, Operating Reserves **Soft:** Fast Frequency Response
Operational Data Store	Establishing a capability for storing high volume of operational transactional data at near-real-time.	**Hard design**: Operational Decision-Making Tools, ST PASA Replacement
SCADA Lite	A low cost mechanism to support telemetry services.	**Hard design:** Scheduled Lite, Turn-up Services, **Soft:** Operational Data Store
ST PASA Replacement	Review of the Pre-dispatch (PD) and Short Term (ST) PASA methodology and supporting systems and processes.	**Hard design:** Operational Data Store, Operational Decision-Making Tools **Soft:** Integrating Energy Storage **Soft design:** Dispatch and ST Market Operations Target State, CoMaStR Phase 2

Group C supports the ongoing viability of core short-term market functions

- AEMO's existing systems for dispatch, bids and offers, and constraints, are nearing the end of their technical life
- As the energy transition continues, these functions will be increasingly required as the new markets are established and a higher volume of participants emerge placing further strain on their continued operation use
- Example key relationships within Group C:
  - Each of those strategic initiatives captured under Group C are related
- Example key relationships across groups:
  - All of Group C → ST PASA (Bundle B) and vice versa (Soft Design)



Group C – Dispatch & ST Market Operation Strategic Initiatives



Strategic / Foundational Initiative	Description	Relationship Type
Dispatch Target State	A technology uplift of AEMO backend market platform services to replace legacy technology. In the case of bids/offers this could leverage 5MS deliverables.	**Soft:** Fast Frequency Response, Integrating Energy Storage, Turn-up Services, Operating reserves **Soft design:** ST PASA Replacement
Bids / Offers Target State		
Constraint Target State		

Appendix B

Functional Relationship Mapping

Functional Relationship Mapping – NEM2025 Reform Initiatives

	MT PASA	FFR	IES	UCS+SSM	Mandatory PFR	Operating Reserves	FTA (M2)	Scheduled Lite	DOE	DLNS	Turn-up Services	Platform & Registry	Market & System
MT PASA													
FFR			SP, D	SP		SP							
IES		SP, D		SP		SP	SP, D	SP					
UCS+SSM		SP	SP			SP, P		SP, P					
Mandatory PFR													
Operating Reserves		SP	SP	SP, P				SP					
FTA (M2)													
Scheduled Lite			SP	SP, P		SP			SP, T	SP, T	SP, T	SP	SP, P
DOE							SP, P	SP, T		SP, T	SP	SP, P	SP, P
DLNS								SP, T	SP, T		SP	SP	SP, P
Turn-up Services								SP, T	SP, T	SP, T		SP	SP, P
Platform & Registry								SP	SP, P	SP	SP		SP, P
M&S integration								SP, P	SP, P	SP, P	SP, P	SP, P	

Key: SP = System or Process, D = Deadline, T = Trails, P = Policy ***Heatmap:*** SP | SP, P | SP, T | SP, D | Same initiative

Functional Relationship Heatmap (AEMO) – NEM2025 Reform Initiatives

	MT PASA	FFR	IES	UCS+SSM	Mandatory PFR	Operating Reserves	FTA (M2)	Scheduled Lite	DOE	DLNS	Turn-up Services	Platform & Registry	Market & System
Registration													
Offers													
Dispatch													
Constraints													
PASA													
Settlements, Billing, Prudentials													
Causer Pays													
Control Room Tools													
CATS													
eMDM													
DER													

Key: No impact | Low impact | Medium impact | High impact | Significant impact

Functional Relationship Heatmap (AEMO) – Foundational & Strategic Initiatives

	Portal Consolidation	CoMaStR	Identify & Access Management	Industry Data Exchange	Enterprise Authentication Authorisation	Business Rules Engine	Forecasting Platform Uplift	Operational Decision Making Tools	Operational Data Store	SCADA Lite	ST PASA Replacement	Dispatch Target State	Bids/Offers Target State	Constraints Target State	FRC
Registration			Digital Enabling Capability	Digital Enabling Capability	Digital Enabling Capability		Digital Enabling Capability			Digital Enabling Capability					
Offers															
Dispatch															
Constraints															
PASA															
Settlements Billing, Prudentials															
Causer Pays															
Control Room Tools															
CATS															
eMDM															
DER															

Key: No impact | Low impact | Medium impact | High impact | Significant impact

Appendix C

Standard Implementation Process &
Assumed Timeframes

Standard implementation process and assumed timeframes

- Uncertainty not only over the effective dates for reforms but also on the final design requires assumptions to be made on the anticipated complexity and impacted systems and the timelines required to implement the reform
- To facilitate the development of the roadmap, where regulatory and design uncertainty remains, a standard implementation process and assumed timeframes was applied

#	Implementation phase	Low complexity (mths)	Medium complexity (mths)	High complexity (mths)
1	Policy development and design	6	6-12	12
2	Rules development (begins at open Rule Change Request, ends at Final Determination)	6	6-12	12-24
3	Initiation (once Rules are defined), includes high-level pre-execution design	3	3	4
4	Detailed pre-execution design (applies to more complex initiatives)	N/A	N/A	6-12
5	Procedure/Guideline development	6	9	12
6	Solution delivery	9	12	18
7	Industry testing and trials	3	4	6

- Proposed implementation timeframes for AEMO's strategic pre-requisite initiatives reflect the 'last date' by which they must be delivered if they are to enable dependent reform initiatives and are subject to final regulatory determinations and internal resourcing and funding constraints