Network Access Quantity

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Questions and answers

Q&A will be facilitated at the end of the session over Teams chat.

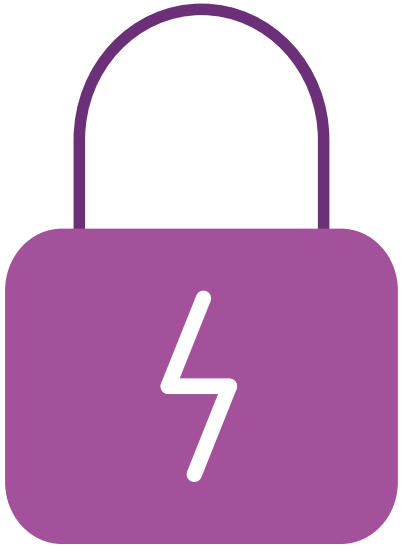
We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

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

NAQ Introduction

WA is now Security Constrained!

WA's RCM is also Security Constrained!



Agenda

1. RCM and NAQ Concepts
2. NAQ Calculations
3. RCMCEs (for NAQ)
4. NAQ Results
5. Q&A

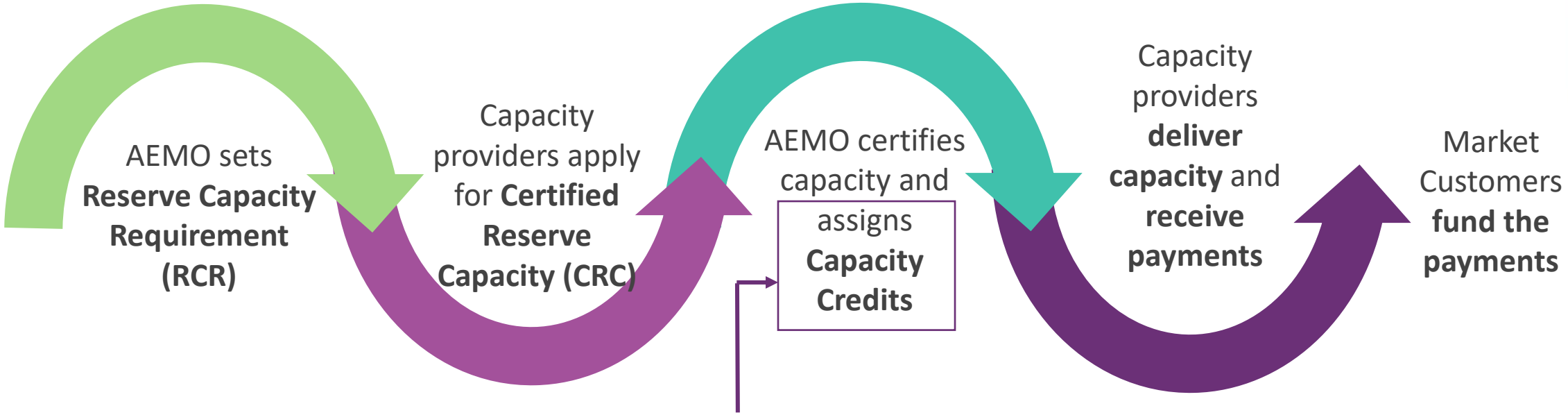
RCM and NAQ Concepts

Reserve Capacity Mechanism (RCM)

Network Access Quantity (NAQ)

Reserve Capacity Mechanism (RCM)

Ensures sufficient capacity in the SWIS to meet peak demand two years in the future, in line with RCR expectations set in the ESOO.



Before assigning Capacity Credits, AEMO assess the **Network Access Quantity** (NAQ).

- In MWs: a metric for likely maximum facility output at time of Peak.
- Limits the Capacity Credits a Facility may receive

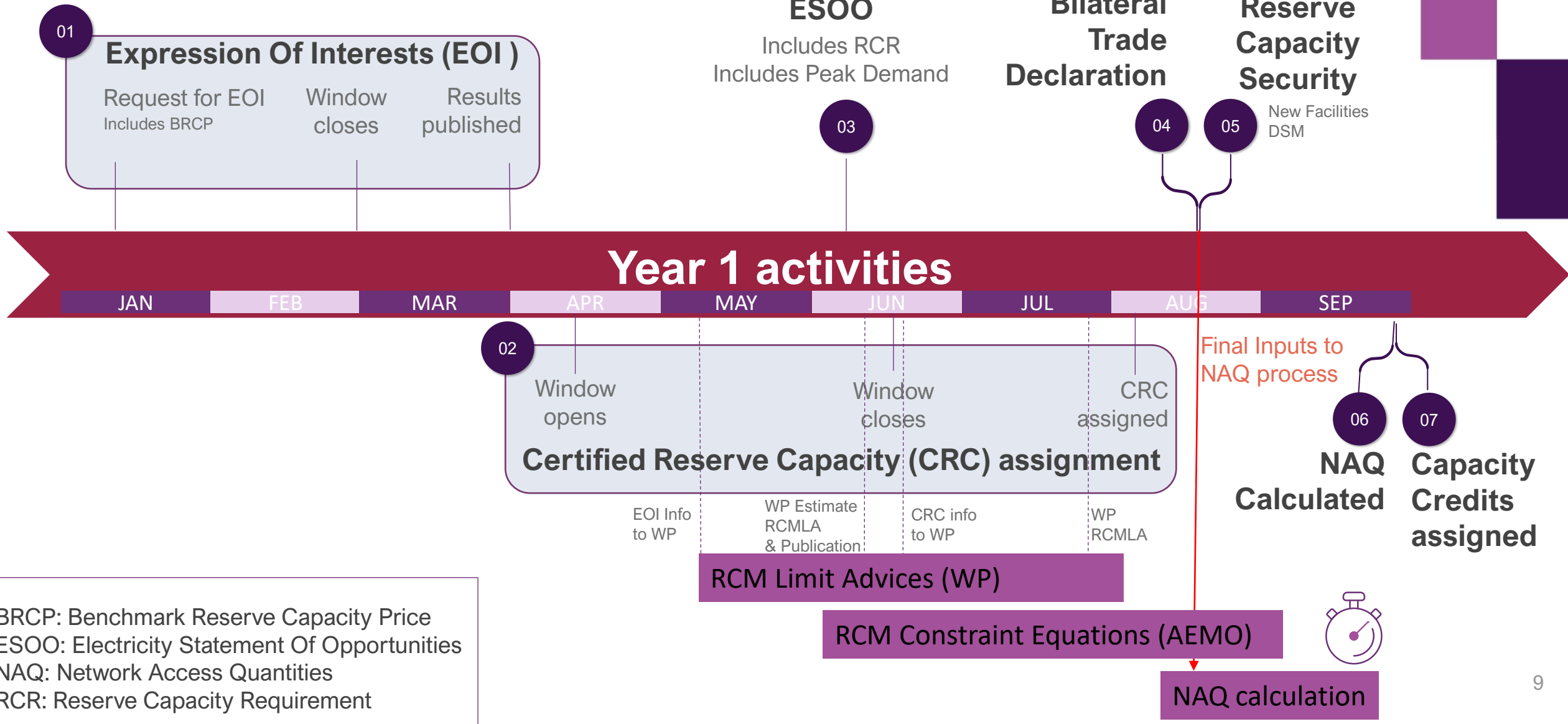
Roles associated with NAQ process

- **EPWA:**
  →Write the Rules to be followed when determining Network limits and assigning NAQ

- **Western Power:**
  → Determine the Network limits

- **AEMO:**
  → Create RCM Constraint Equations using Network limits
  → Assign NAQ in accordance with the Rules implementing the NAQ model

NAQ Activities in the RCM Process



BRCP: Benchmark Reserve Capacity Price
ESOO: Electricity Statement Of Opportunities
NAQ: Network Access Quantities
RCR: Reserve Capacity Requirement

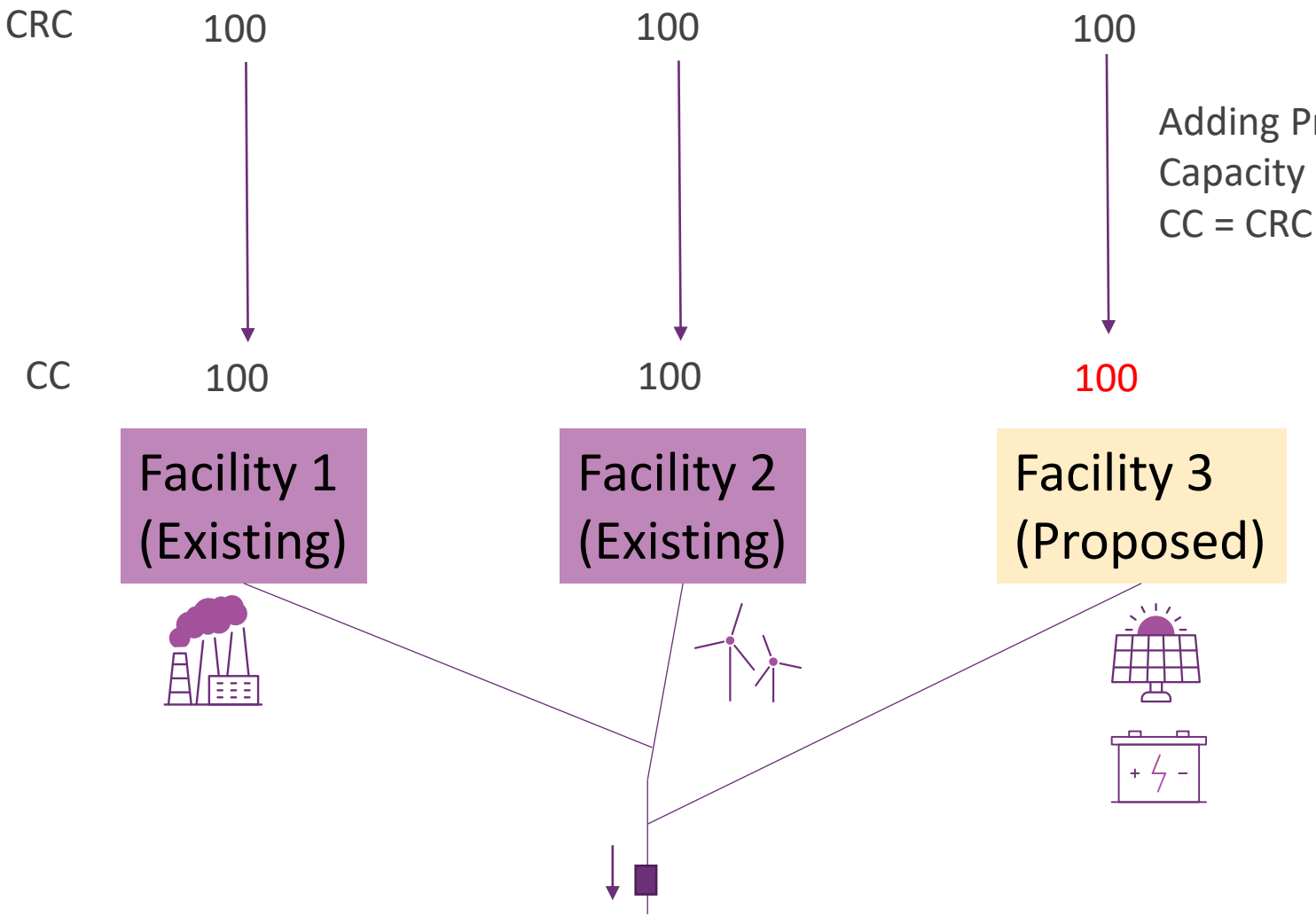
How is Network Access Quantity (NAQ) determined?

A Facility's NAQ is determined by three key factors:

- **Facility's physical capability**
- **Network access limit**
- **Facility Priority Order**

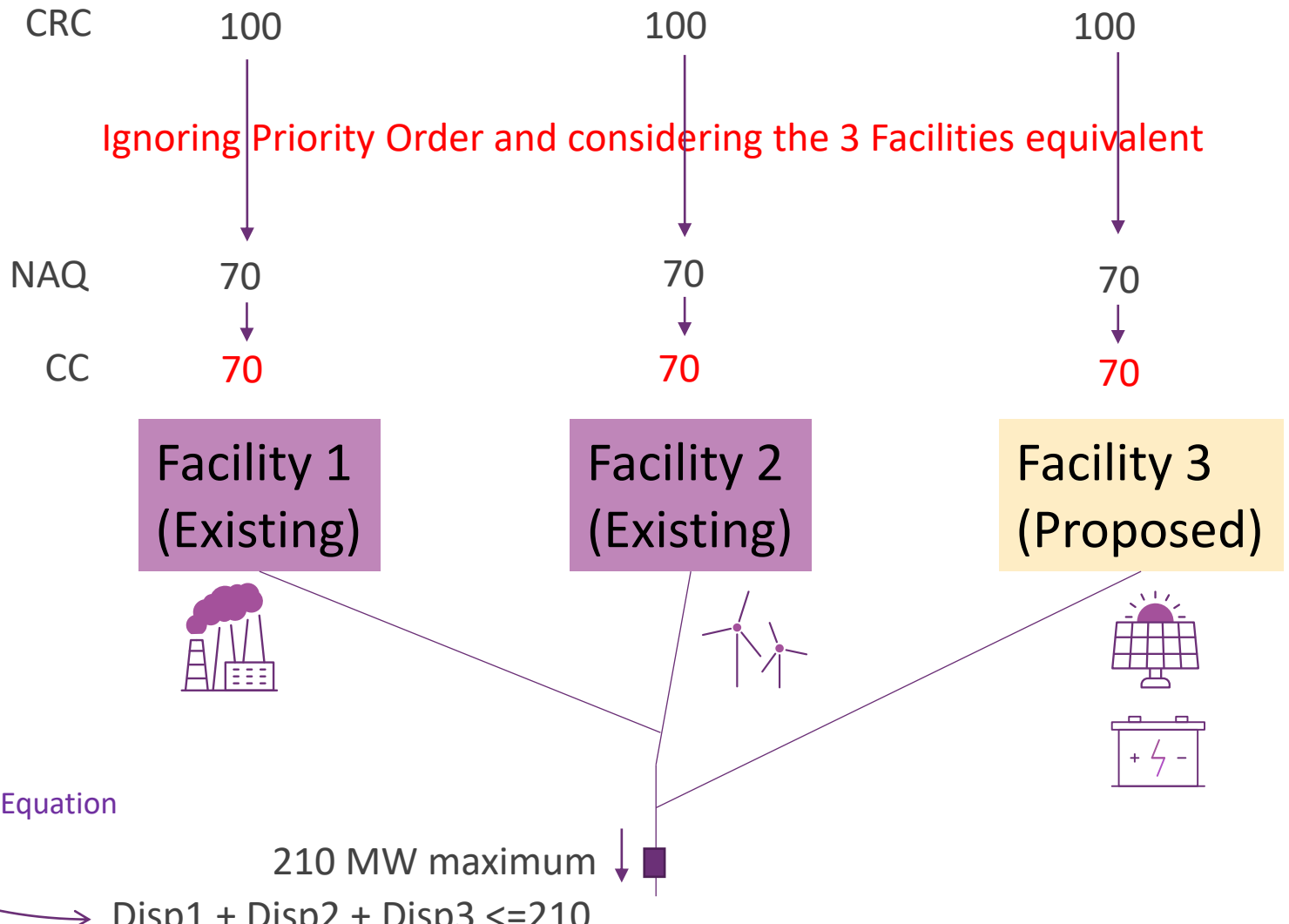
NAQ Calculations

CC Assignment before NAQ framework



Adding Proposed Facilities until Reserve Capacity Requirement (RCR) met.
CC = CRC when a Facility is selected

NAQ – General Concept



Priority Order for to access NAQ

1. Existing NAQ Facilities (assessed up to previous NAQ)
2. Existing NAQ Facilities (assessed up to CRC)
3. Committed Network Access Funding (NAFF)
4. Committed Facilities (or Upgrades) non-NAFF
5. Proposed Facilities (or Upgrades)

NAQ Model Terminology

- Prioritisation Step
- NAQ Ceiling
- NAQ Floor
- Preliminary NAQ
- Final NAQ

What is a NAQ Entity?

- AEMO will use the concept of a NAQ Entity in the NAQ Model as opposed to a Facility.
- This ensures we can assess an Upgrade separately from the Facility in the NAQ Model.
- An Upgrade (for the purposes of Appendix 3) is where there is an increase in the nameplate capacity of the Facility

Facility		
Facility_WF1		
Components	**CRC**	**NAQ Upgrade**
Facility_WF1_IGS_01	50	False
Facility_WF1_IGS_01_UPG	10	True
Facility_WF1_ESR_01	10	False

NAQ Entities	CRC
N_Facility_WF1	60
N_Facility_WF1_IGS_01_UPG_01	10

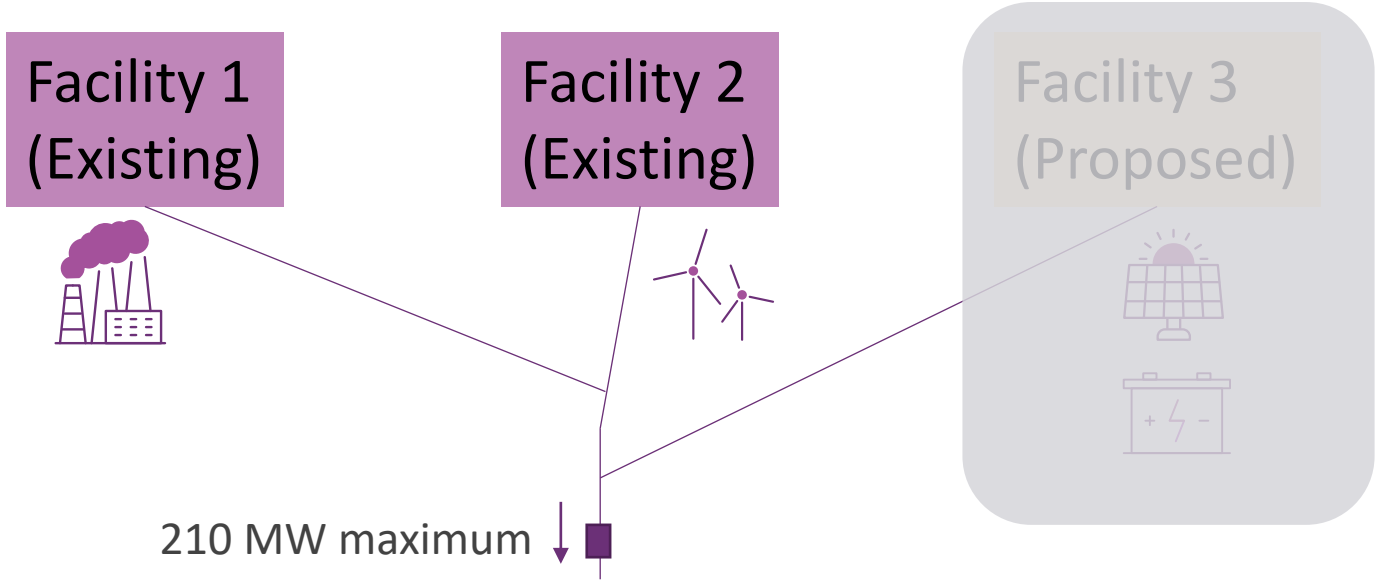
Note: The following slides only refer to Facilities (for simplicity) but the model considers NAQ Entities

NAQ – Priority Order Concept

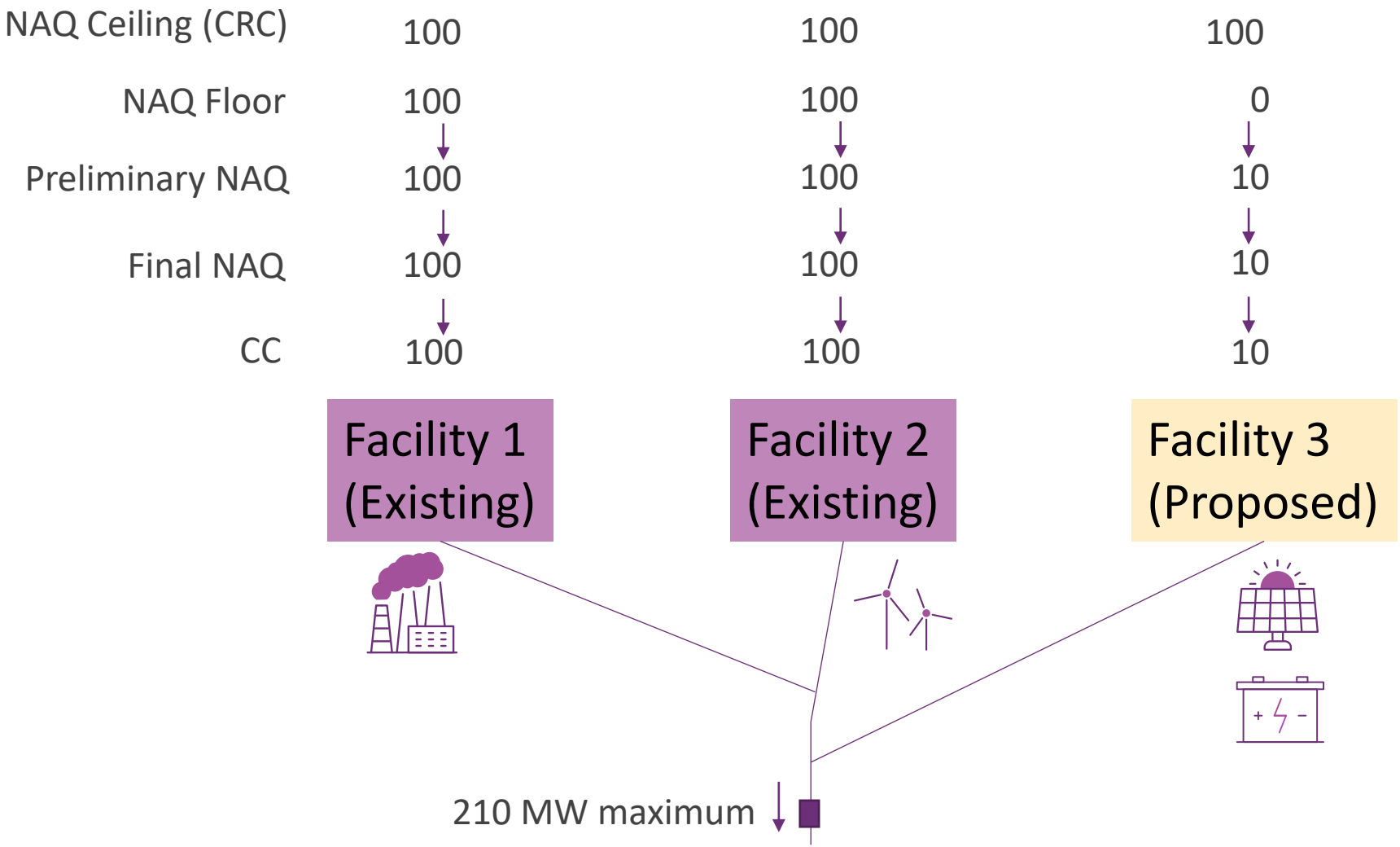
NAQ Ceiling (CRC)	100	100
NAQ Floor	0	0
Preliminary NAQ	100	100
Final NAQ		
CC		

First Prioritisation Step

Setting NAQ Floor of following Prioritisation Step



NAQ – Priority Order Concept



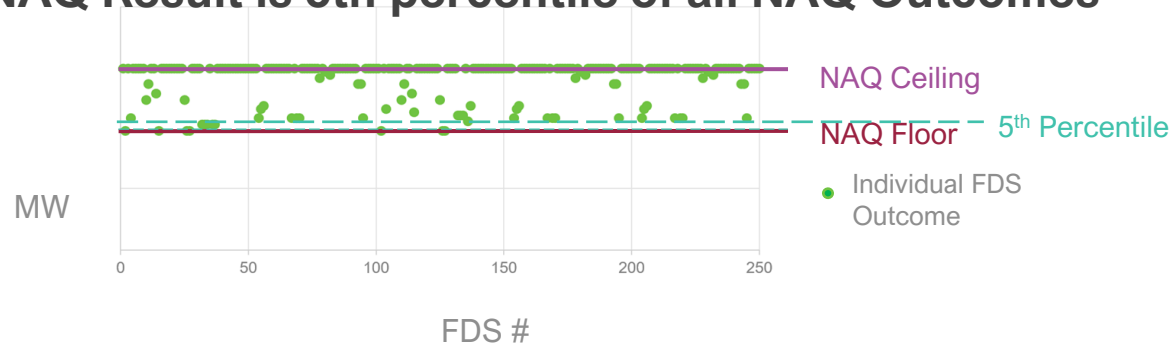
Second Prioritisation Step

NAQ – Likelihood Concept

- **Assessment of NAQ Outcome across a high number of Facility Dispatch Scenarios (FDS)**

	Random FDS #1:			Random FDS #2:			Random FDS #3:		
	F 1	F 2	F 3	F 1	F 2	F 3	F 1	F 2	F 3
NAQ Ceiling (CRC)	100	100	100	100	100	100	100	100	100
NAQ Floor	100	100	0	100	100	0	100	100	0
Initial Dispatch	100	100	100	0	50	100	100	50	100
Final Dispatch	100	100	10	0	50	100	100	50	60
NAQ Outcome	100	100	10	100	100	100	100	100	60

- **NAQ Result is 5th percentile of all NAQ Outcomes**



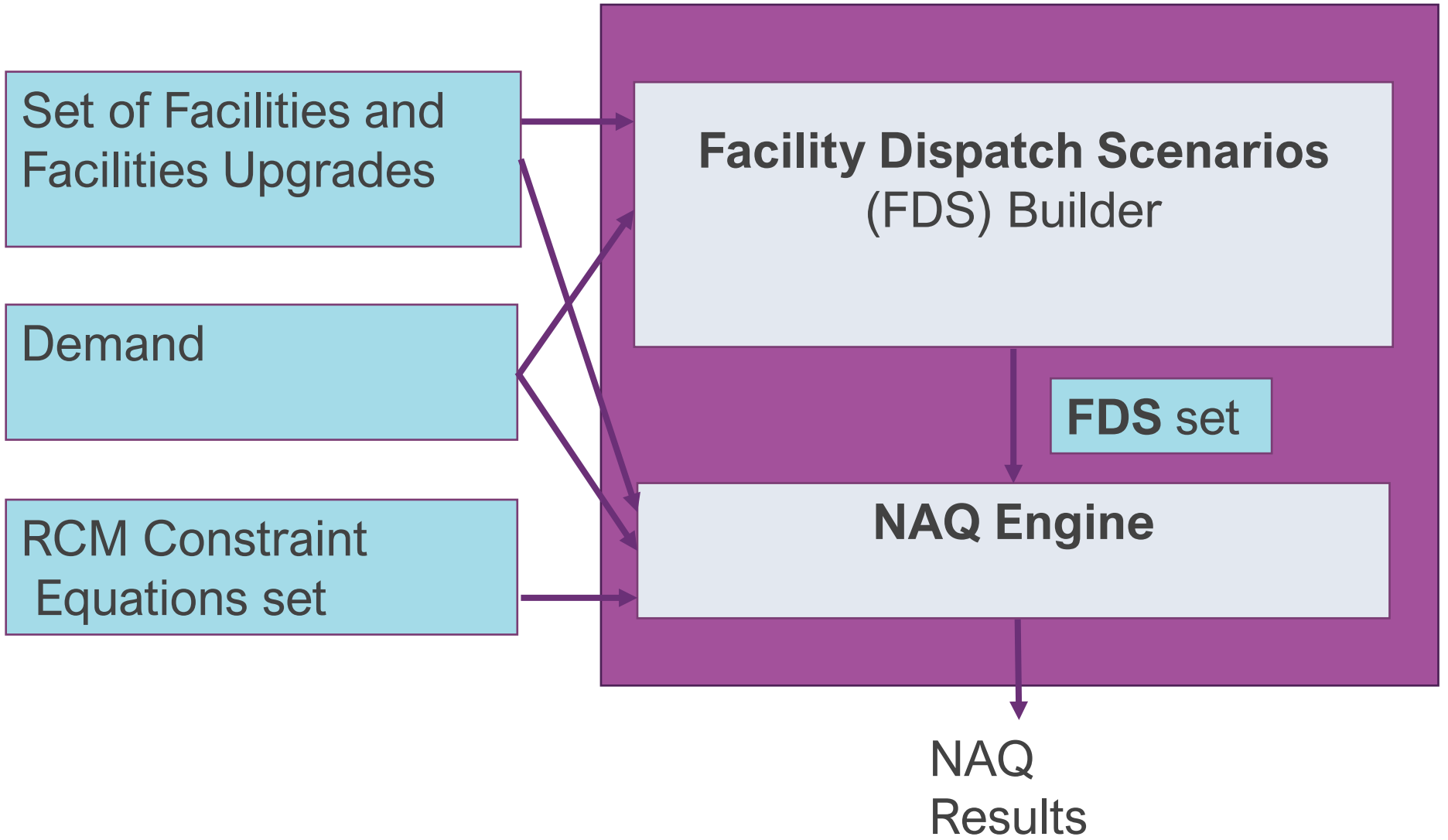
F 1
CRC = 100
NAQ = 100

F 2
CRC = 100
NAQ = 100

F 3
CRC = 100
NAQ = 50

210 MW maximum

Prioritisation Step NAQ Calculation



NAQ step process workflow

Prepare inputs for Prioritisation Step:
- Select Facility set
- Associate each Facility:
  - NAQ Ceiling
  - NAQ Floor
- Select the relevant Constraint set

Perform NAQ model Run for Prioritisation Step
→ assign Preliminary NAQ

Final NAQ

Capacity Credits

compare total NAQ with RCR when adding Proposed Facilities

Excess / Shortfall

Set NAQ Floor using Preliminary NAQ

NAQ Entity	CRC	NAQ Step 3A	NAQ Step 3C	NAQ Step 4	NAQ Step 5	NAQ Step 6
Facility 1 (Existing)	100	80	100	100	100	100
Facility 2 (Existing)	300	250	250	250	260	260
Facility 3 (Committed NAFF)	200			180	180	190
Facility 4 (Committed)	100				90	90
Facility 5 (Proposed)	200					150
Facility 6 (Proposed)	100					100

Total NAQ : 890

Shortfall = 10 MW

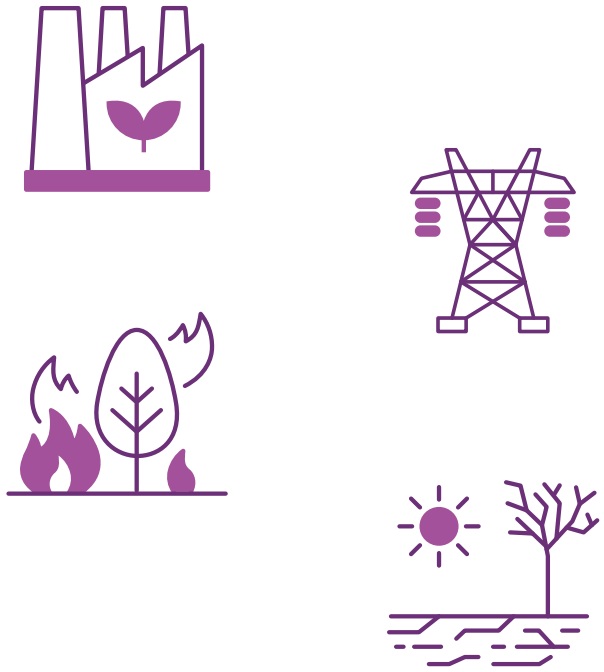
Reserve Capacity requirement : 900

RCMCEs

Reserve Capacity Mechanism Constraint Equations

RCMCEs - Introduction

- An RCMCE represents:
  - the impact of ***RCM facilities***,
  - on a specific ***network limit***,
  - after a specific ***contingency***
  - during a ***specific network state***
    - *^ most of the work goes into this one!*



RCMCE - Name

RCM2022_Step3 < {NorthLine1} [NorthLine 2]

- Just a way of summarising what the equation is for:
  - With the network configured for RCM cycle 2022
  - If NorthLine1 Tripped
  - NorthLine2 might be damaged
  - Because we exceeded a thermal limit

RCMCE - Contents

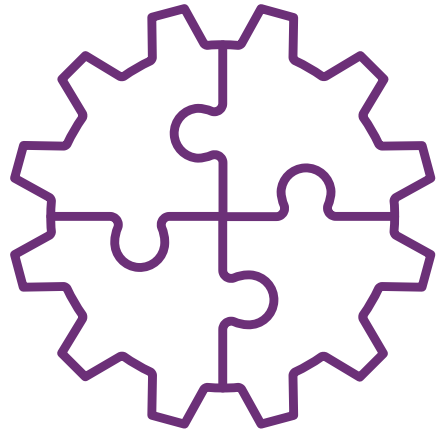
$$0.2North_{WF1} + 0.3North_{GT1} - 0.1South_{G1} \leq 110 - 0.2North_{Small1}$$

- Coefficients describe “how much impact”.
- Signs describe “help or hinder”.
- Ratings represent the limit.
- Side represents “controllability”

RCMCE - Method

1. Configure a Power System “Load Flow Model”
   - What is that?
2. Undertake “Contingency Analysis”
   - Why?
   - What is a “Credible Contingency”
3. Undertake “Sensitivity Analysis”
   - Why?

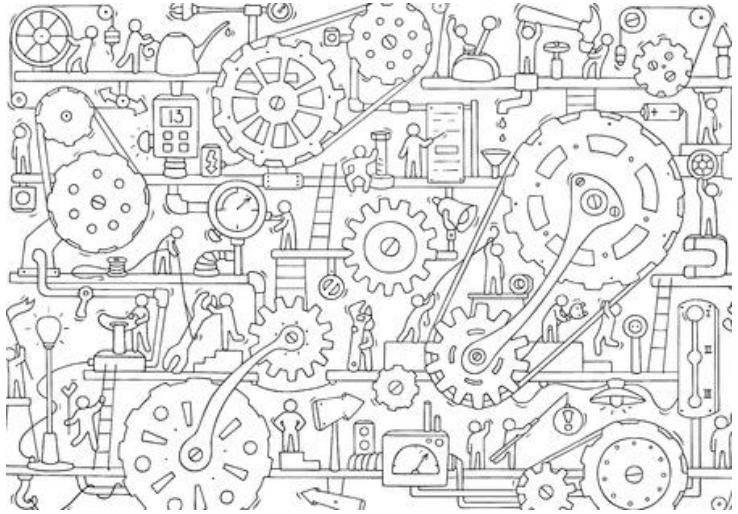
- P.S. what about “non thermal”?



NAQ Results

2022 RC Cycle Outcome (First NAQ application)

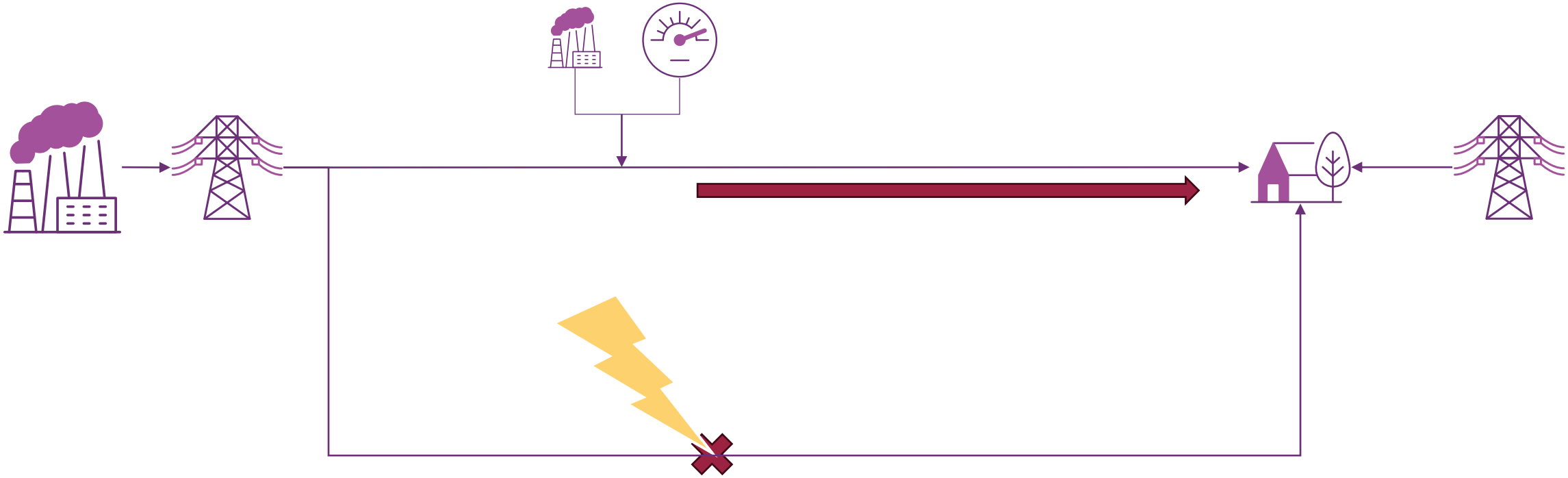
- “The most complicated unity function ever devised”

CRC = 1 →  → NAQ = 1

- …only on the surface.

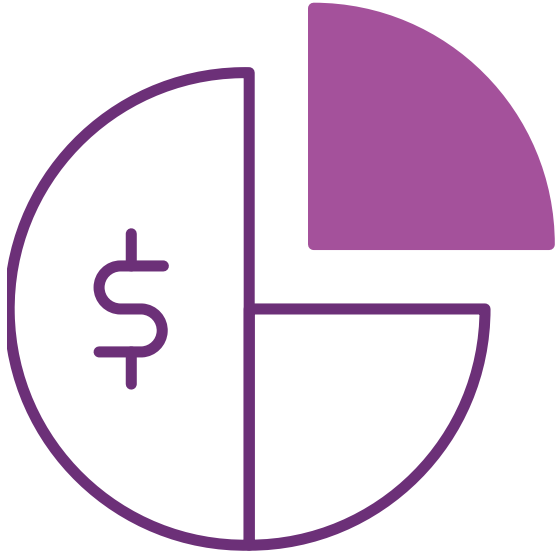
2023 RC Cycle Outcome (The First NAQ Reduction)

- Facilities are "MRR" NAQ Reduced ~20%



2023 RC Cycle (The First NAQ Reduction)

- Frequently Asked Questions:
  - If a facility is next to a load, doesn't the facility supply power to that load? How can it cause congestion elsewhere?
  - A DSP is a reduction in load. Loads can reduce consumption at any time with no notice. How is it possible to receive a NAQ reduction?

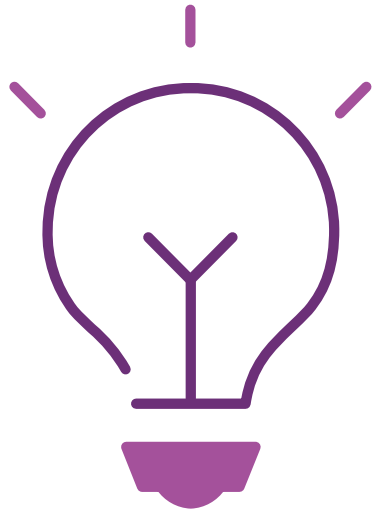


Other uses of NAQ Model

- The NAQ model has also been used to:
  - Assist with Supplementary Reserve Capacity (SRC) process
  - Assist with Non-Co-Optimised Essential System Service (NCESS) procurement.

Future Work

- Improved Automation
- Changes to suit new rules as they are being developed
- Evaluate modifications to increase the overall capacity efficiency



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