Grid Interconnection Process – Lessons from Australia

March 2024

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Jarman

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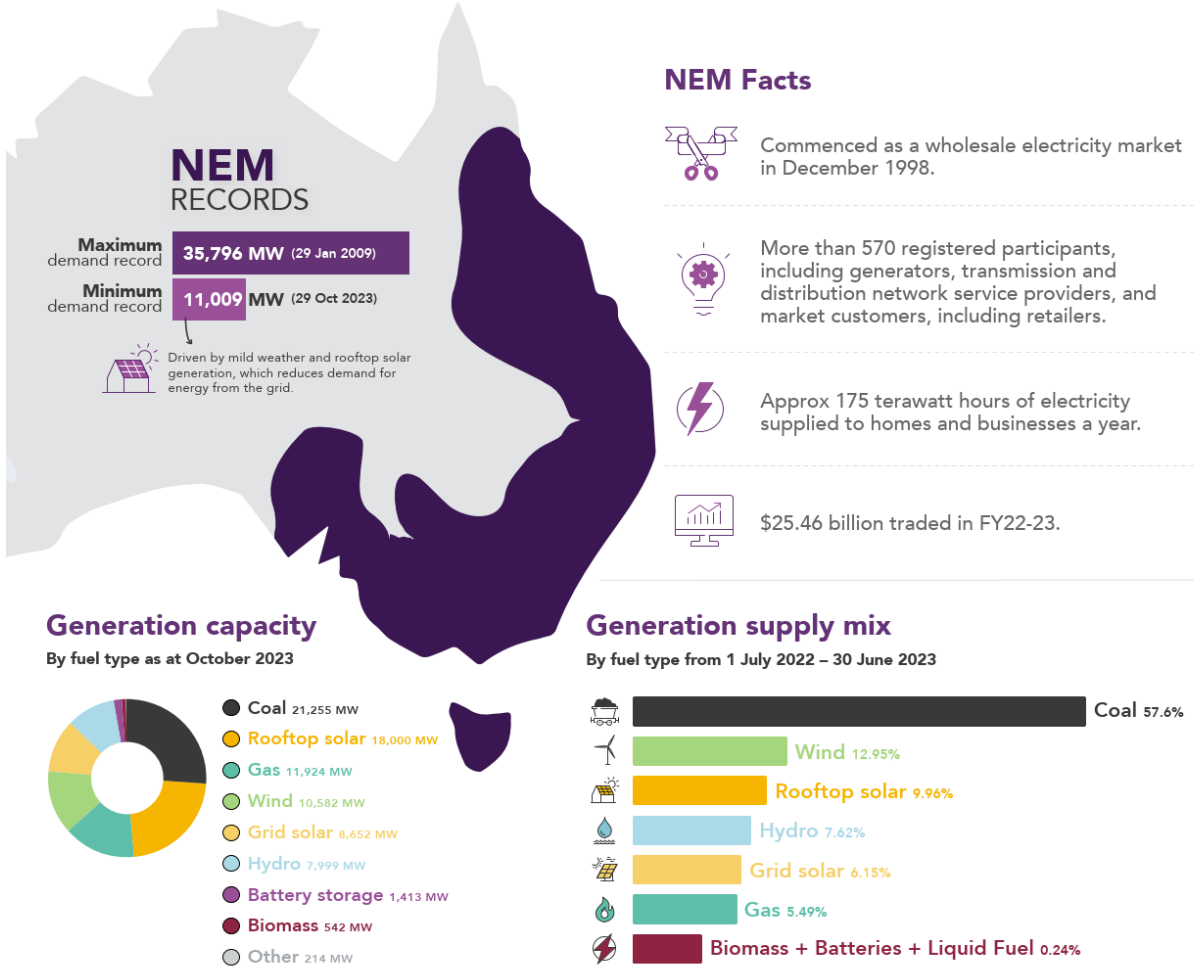
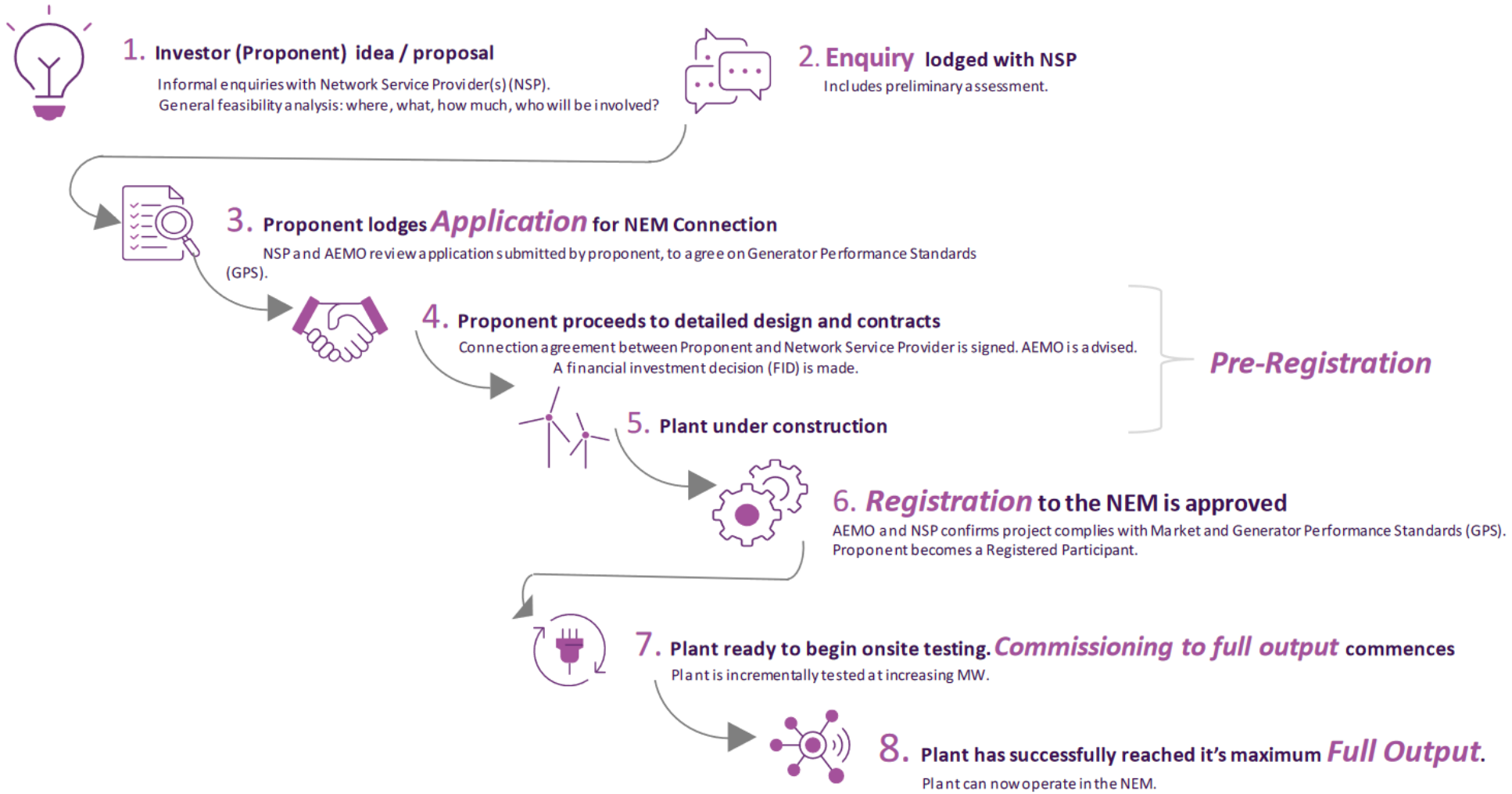
- **Introduction**
- **Part 1: Overview of AUS**
  - Overview of the National Electricity Market
  - Overview of the Grid Interconnection Process
- **Part 2: Lessons learned**
  - Lesson 1: Writing rules
  - Lesson 2: Standards and engineering discretion
  - Lesson 3: Sample studies
  - Lesson 4: Skillset and workforce

Australia has an open electricity market, large grid, small population, dwindling synchronous fleet and rapid renewables growth



1. National Electricity Market Fact Sheet | AEMO | January 2024 [source]

The Australian generation interconnection process is thorough and mostly standardised across the country



1. Connections scorecard guide | AEMO | November 2023 [source]

Australia has an installed capacity of ≈70GW, a queue of ≈100GW and is commissioning ≈3GW/year

Fig. 1 Connection projects underway - monthly changes

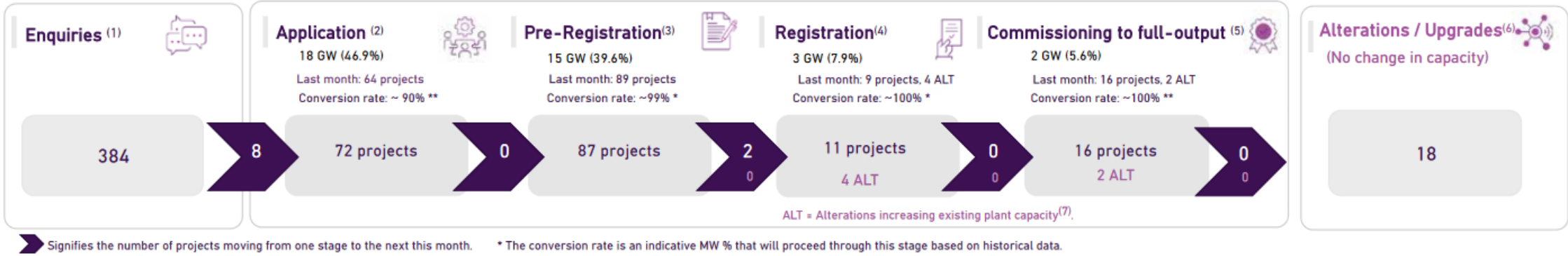
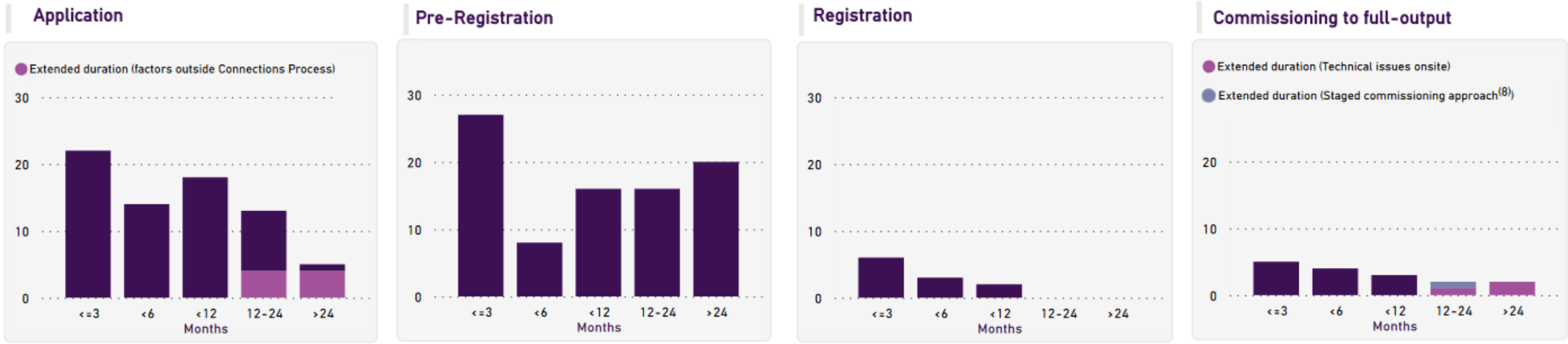


Fig. 3 - Current number of projects in each Stage by Duration



1. Connections scorecard | AEMO | January 2024 [source]

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Lesson 1: Define engineering terms when writing electricity rules

Asynchronous generating systems

⋮

(1) to assist the maintenance of *power system voltages* during the fault:

(i) capacitive reactive current in addition to its pre-disturbance level of at least 4% of the *maximum continuous current* of the *generating system* including all operating *asynchronous generating units* (in the absence of a disturbance) for each 1% reduction of *voltage* at the *connection point* below the relevant range in which a reactive current response must commence, as identified in subparagraph (g)(1), with the *performance standards* to record the required response agreed with *AEMO* and the *Network Service Provider*; and

1. National Electricity Rules v207 | AEMC | March 2024 [source]
2. Rule change - **Performance standards for reactive current response to disturbance | AEMC | May 2022 [source]**

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maximum continuous current

In respect of a *generating system*:

(a) where assessed at the *connection point*, the current at the *connection point* corresponding to the largest amount of *apparent* power required by the *generating system's performance standard* under S5.2.5.1, at the *normal voltage*; and

1. National Electricity Rules v207 | AEMC | March 2024 [source]
2. Rule change - **Performance standards for reactive current response to disturbance | AEMC | May 2022 [source]**

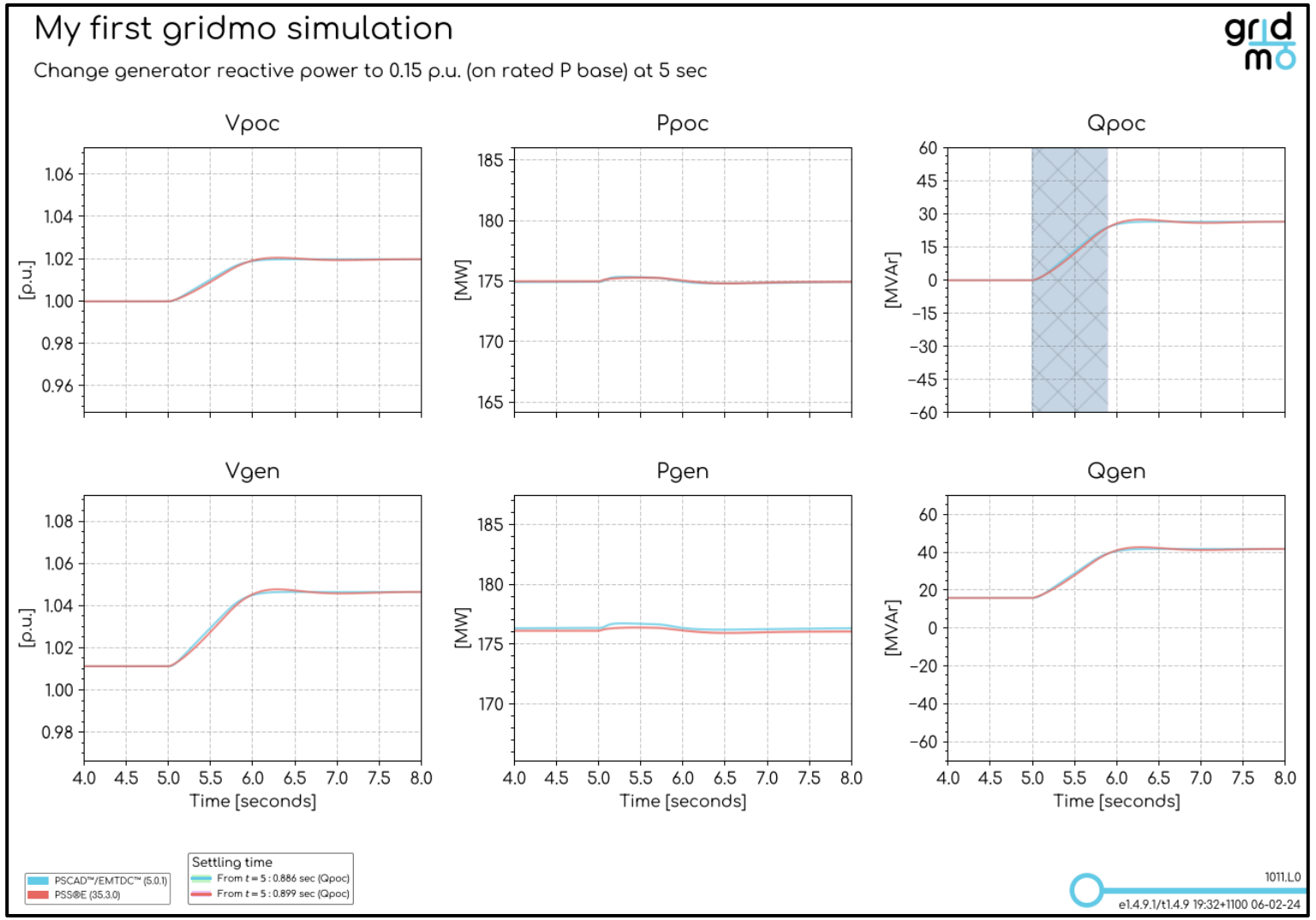
Lesson 2: Electricity rules should encourage efficiency but leave room for engineering discretion

Generator Performance Standards can have three levels:

- **Minimum Access Standard (MAS)**
- **Negotiated Access Standard (NAS)**
- **Automatic Access Standard (AAS)**

1. National Electricity Rules v207 | AEMC | March 2024 [source]

Lesson 3: Complete a sample interconnection study each time when introducing new electricity rules



- **PSS®E Static**
- **PSS®E Dynamic**
- **PSCAD™**
- **Data**
- **Plotting**
- **Table**
- **Analysis**

Lesson 4: Software engineering ≠ power systems engineering. Ensure the growing workforce is developing power systems knowledge

Power systems software:

Use cases:

Grid connection studies	500 tests	X	2 software	X	5 scenarios	X	2 submissions
		X	5 iterations				

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