Transmission access reform

Public forum

18 July 2024

AEMC

ACKNOWLEDGEMENT OF COUNTRY

The AEMC acknowledges and shows respect for the traditional custodians of the many different lands across Australia on which we all live and work. We pay respect to all Elders past and present and the continuing connection of Aboriginal and Torres Strait Islander peoples to Country. The AEMC office is located on the land traditionally owned by the Gadigal people of the Eora nation.

Welcome

Victoria Mollard – Executive General Manager, Economics and System Security

Agenda

1	Welcome	Victoria Mollard, Executive General Manager, AEMC
2	Opening remarks and project update	Sally McMahon, Commissioner, AEMC
3	Modelling access reform to inform investment decisions	Victor Stollmann, Senior Adviser, AEMC and ACIL Allen
4	Stylised network model to inform stakeholder understanding	Phillip Munro-Laylim, Adviser, AEMC and Endgame Economics
5	Q & A	AEMC team
6	Next steps	Jessie Foran, Principal Adviser, AEMC
7	Closing remarks	Anna Collyer, Chair, AEMC

Presenters

Anna Collyer
Chair

Sally McMahon
Commissioner

Victoria Mollard
Executive General Manager

Jessie Foran
Principal Adviser

Victor Stollmann
Senior Adviser

Phillip Munro-Laylim
Adviser

Purpose of todays transmission access reform forum

The purpose of today is to:

- **Provide you with a project update:** with some key workstreams delivered and stakeholder feedback on our consultation paper showing a lack of support for the hybrid model, we will provide you an update on our evolved thinking and intended approach leading up to September
- **Present outcomes from two workstreams from our project plan:**
    - ACIL Allen's advice on modelling access reform to inform investment decisions
    - Endgame Economic stylised network model to inform stakeholder understanding
- **Provide stakeholders with the opportunity to ask questions.**
    - Our chair, Anna Collyer, Commissioner Sally McMahon, the project team and our consultants are available to answer questions on specific pieces of work, or transmission access reform in general.

AEMC's transmission access reform review 2024

- Following the **November 2023** Energy Ministers' Meeting, the **AEMC was asked to take the lead** on further design work of the transmission access reform (TAR) package.
- The central part of this package is the **hybrid model made up of the CRM and priority access.**
- The AEMC **self-initiated the review** and published Terms of Reference on **7 March 2024**.
- The AEMC published a **consultation paper** on the hybrid model on **24 April 2024**.
- The AEMC will be making **final recommendations** in **September 2024** to Energy Ministers regarding the hybrid model.
- We have received **39 stakeholder submissions** to the consultation paper, that broadly showed that **non-consumer stakeholders have concerns** with both components of the hybrid model for various reasons.
- We have also engaged with stakeholders through a **variety of meetings and discussions** since the consultation paper publication, including:
  - four TWG meetings,
  - various industry body briefings, and
  - ongoing discussions with AFMA.
- These **meetings are ongoing** as we work to prepare final recommendations to Energy Ministers.

Housekeeping

1. This forum is being recorded for note-taking purposes. Please note the privacy and recording statements in the invitation and check
2. Materials presented today along with a meeting summary will be published on our website.
3. All participants are currently in ‘listen-only’ mode.
4. Use the Q&A button at the bottom of your screen to ask questions.
    - Please focus your questions on the relevant agenda item and keep broader questions to the Question session at the end.
    - We will prioritise questions with the most ‘upvotes’ first.
    - You may be asked to speak to the question you have submitted via the Q&A button.

COMPETITION PROTOCOL

COMMUNICATION AND MEETING GUIDELINES

Attendees must ensure that all communications (including emails and verbal discussions) adhere to the ***Key Principles***.

This forum will be conducted in accordance with the following rules:

- The agenda for this forum does not include anything that could contravene the Key Principles set out in this protocol.
- We will read and minute the below *competition health warning*:
  - Attendees at this forum must not enter into any discussion, activity or conduct that may infringe, on their part or on the part of other attendees, any applicable competition laws. For example, attendees must not discuss, communicate or exchange any commercially sensitive information, including information relating to prices, marketing and advertising strategy, costs and revenues, terms and conditions with third parties, terms of supply or access.
  - Participating in this forum is subject to you having read and understood the protocol including the Key Principles.
- We will keep accurate minutes of the forum, including details of attendees.
- If something comes up during the forum that could risk contravening any competition laws, attendees should:
  - Object immediately and ask for the discussion to be stopped.
  - Ensure the minutes record that the discussion was objected to and stopped.
  - Raise concerns about anything that occurred in the forum with their respective legal counsel immediately afterwards.
- All attendees understand that any competitively sensitive matters must be subject to legal review before any commitment/agreement can be given.
- Any decision about whether, and on what terms, to engage with customers and suppliers is an independent and unilateral decision of each attendee.

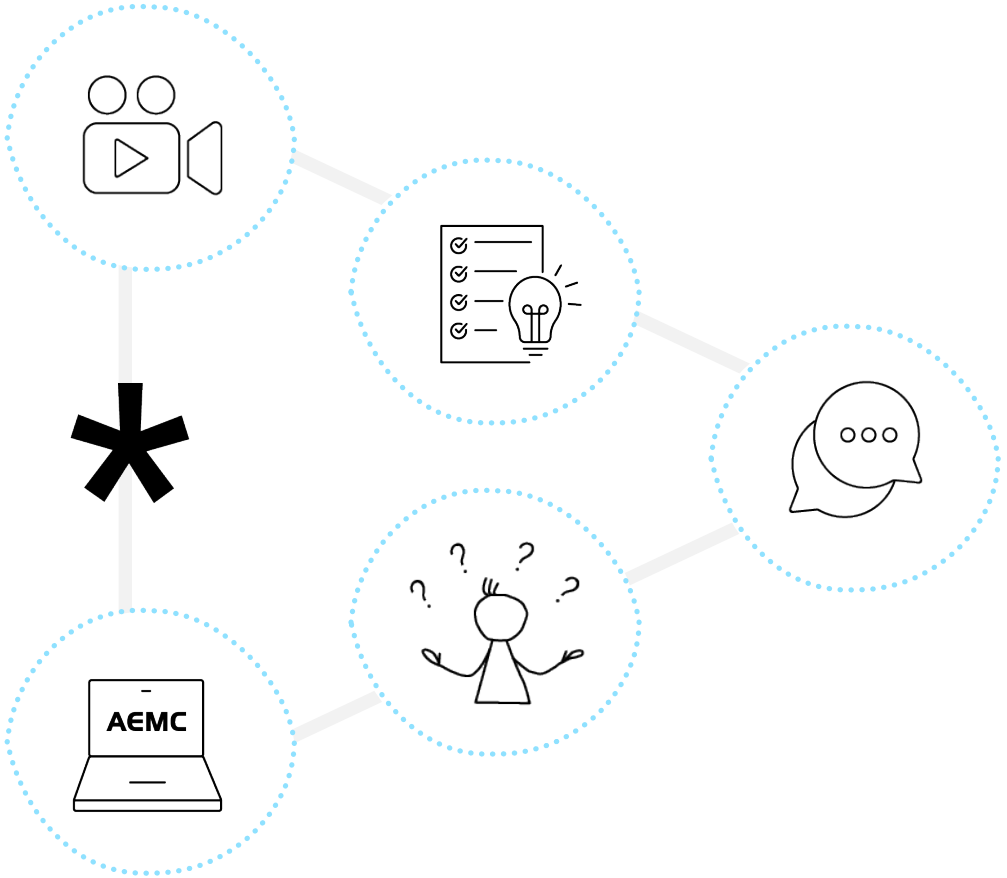
CONSENT TO USE OF PERSONAL INFORMATION

By participating in this workshop, **you give your consent** to our collection, use and disclosure of the personal information you provide to us during this workshop (like your name) for the purpose of completing our consultation and publishing our draft and final determinations and reports on this rule change or review.

This may include **publishing a recording or transcript of the workshop, including your questions or comments.** We will not publish any participant questions or comments that we consider inappropriate, including offensive or defamatory language.

Please read our privacy policy for more information.

We may publish a transcript or recording of this workshop, which may include your questions or comments



Opening remarks

Sally McMahon – Commissioner

Framing today's discussion

1. Setting the scene – the congestion issue

2. The new status quo – the policy landscape has changed since TAR was initiated

3. Stakeholder feedback

Address congestion issues in investment and operational timeframes

The hybrid model is designed to address congestion issues in the investment and operational timeframes. Four objectives were developed by the Energy Security Board (ESB) in conjunction with jurisdictions and stakeholders.

INVESTMENT TIMEFRAMES

The level of congestion in the system is consistent with the efficient level.

OPERATIONAL TIMEFRAMES

When congestion occurs, we dispatch the least cost combination of resources that securely meets demand.

1

Investment efficiency: Better long-term signals for market participants to locate in areas where they can provide the most benefit to consumers, taking into account the impact on overall congestion.

2

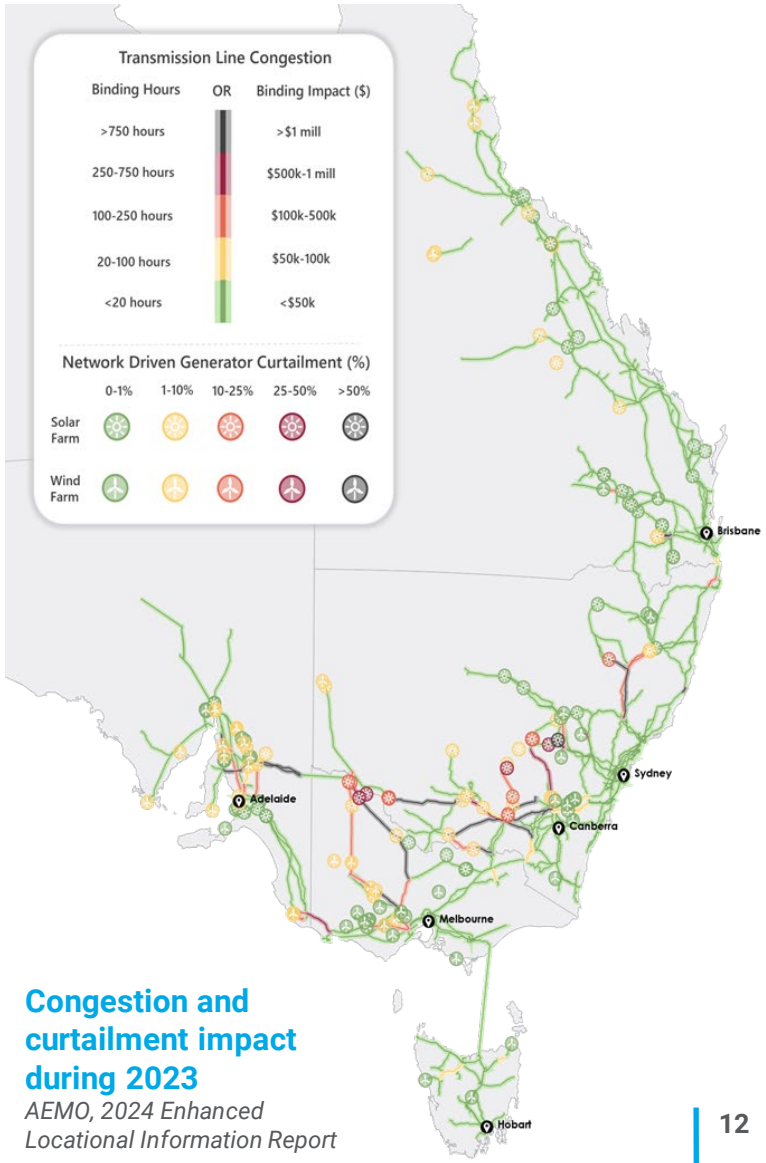
Manage access risk: Establish a level playing field that balances investor risk with the continued promotion of new entry that contributes to effective competition in the long-term interests of consumers.

3

Operational efficiency: Remove incentives for non-cost reflective bidding to promote better use of the network in operational timeframes, resulting in more efficient dispatch outcomes and lower costs for consumers.

4

Incentivise congestion relief: Create incentives for demand side and two-way technologies to locate where they are needed most and operate in ways that benefit the broader system.



Congestion and curtailment impact during 2023

AEMO, 2024 Enhanced Locational Information Report

Stakeholder feedback

- We understand that you do not support the hybrid model because you consider:
  - It will **not deliver** the **reform objectives**.
  - The benefits do not outweigh the **cost and complexity**.
  - Government policies such as the **Capacity Investment Scheme (CIS) and Renewable Energy Zones (REZ) schemes**, as well as **curtailment itself**, provide **sufficient locational investment signals** to negate the need for access reforms.
- Other concerns and opposition related to views that:
  - the **Energy Security Board's** (ESB) **cost benefit analysis is inadequately robust** and should not be relied on,
  - **priority access is not needed** to improve investment certainty and/or would result in less efficient investment,
  - the **congestion relief market** (CRM) **is too complex** and **costly** to implement,
  - the **CRM could reopen power purchase agreements (PPAs)** and increase risks and uncertainty in the financial markets,
  - the AEMC has **insufficient time** to work through stakeholder concerns and **provide firm recommendations** to Ministers by September.
- Stakeholders that supported, or were neutral for, the proposed reform **generally acknowledged the need and intent of TAR**, although were **cautious regarding the potential, unintended consequences**. Some expressed preference for simpler approaches (e.g. government schemes).
- The reform was **supported by consumer groups**, because **consumer benefits** drive this reform.
- Some stakeholders supported the **CRM as a standalone**, **voluntary mechanism** that could complement the existing market.

We will reflect these views in our final advice to Energy Ministers.

Introduction: modelling access reform to inform investment decisions

Victor Stollmann – Senior Adviser, Economics and System Security

ACIL Allens (Paul Hyslop, Steven Wallace, and Jonathan Ben-Tovim)

Modelling access reform to inform investment decisions

The task of consider for modelling access reform for investment decisions

As part of the project plan agreed by Ministers, we set out to determine if priority access could be modelled for investment decisions and, if so, what impacts priority access might have for investors.

We engaged ACIL Allen for this work and requested technical advice on:

1. How congestion modelling is currently completed in the NEM and how it contributes to the investment case of an intending participant.
2. Could priority access, as currently designed, be included in the usual modelling undertaken for investors in generation, and if so, how?
3. Whether the inclusion of priority access in the congestion modelling (if possible) would likely have the desired impacts on outcomes for an individual new generator.
4. Whether priority access could provide more certainty (relative to the status quo) to intending investors about the revenues a project would earn over its lifetime.
5. Whether modelling of this nature would likely improve over time (e.g. modelling of MLFs).

ACIL Allen will present on their completed modelling and technical advice in response to modelling access reform to inform investment decisions.

Paul Hyslop
CEO

Johnathan Ben-Tovim
Principal

Stephen Wallace
Director

Modelling access reform to inform our final recommendations

The modelling task has provided a wider perspective on the reform

Having used the TWG forum to consult with stakeholders on the preliminary approach to this work, we understand some stakeholders are concerned about:

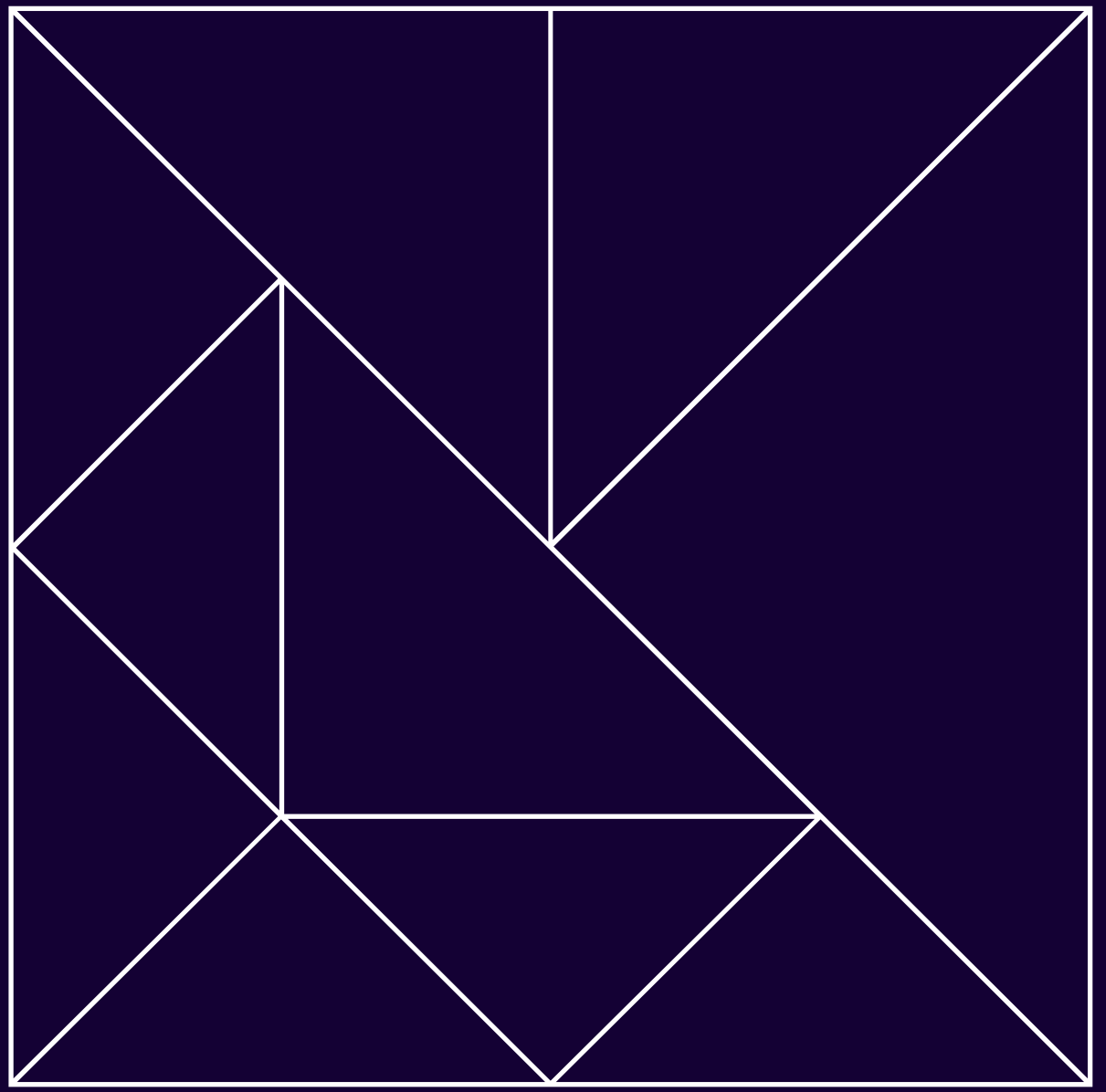
1. assumptions of 100% participation in the CRM,
2. contracting and financial markets,
3. accounting for schemes such as REZs and the CIS,
4. impact of wide-reaching system security and outage constraints, and
5. alignment with AEMO's ISP.

This feedback has been important, and informed our thinking on the reform more broadly, not just the hybrid model.

17th July 2024

Priority Access Modelling

AEMC Transmission Access Reform



ACIL ALLEN

Scope of Work

- The AEMC asked for ACIL Allen to advise whether the effects of priority access can be meaningfully modelled by intending participants to support investment cases.
- In particular, AEMC requested technical advice on the following:
  1. How congestion modelling is currently completed in the NEM and how it contributes to the investment case of an intending participant
  2. Could priority access as currently designed be included in the usual modelling undertaken for investors in generation
     - Could a generator model the cash flow effects of priority access relative to the status quo and its impacts on congestion caused by new entrants.
     - Could a generator anticipate where its access would be limited/reduced by higher priority generators at certain points on the grid.
  3. Whether, in ACIL Allen's opinion, priority access could provide more certainty (relative to the status quo) to intending investors about the revenues a project would earn over its lifetime.
  4. Whether modelling of this nature would likely improve over time.

Congestion modelling and generation investments in the NEM

- Undertaking a generation investment is complex as it requires drawing together a range of uncertainties into a coherent package, which is then used to convince debt and equity providers to invest. For variable renewable energy (VRE) projects, the most significant risks are:
  1. volume risk (driven by uncertainty around the variable renewable energy source supplying the generator)
  2. price risk – exposure to volatile spot prices and demand for VRE PPAs
  3. economic curtailment (insufficient demand to use available renewable generation)
  4. network congestion.
- The first three risks can be modelled deterministically, and the effects can be predicted with some degree of certainty based on assumptions or modelled stochastically to develop a robust distribution of outcomes. In addition, the first three risks can, to some extent, be managed or mitigated by entering part or whole of meter-based PPAs and employing bidding strategies to avoid generating when prices are below a project's price of indifference/SRMC.
- Under current arrangements, network congestion is difficult to forecast because of the uncertainty associated with the location of future investment and the potential for future investment to alter the priority of dispatch when congestion occurs, with later entry potentially crowding out earlier entry.

Can priority access provide more certainty for investors?

- Prior to doing any modelling, we expected that introducing a hybrid priority access and CRM regime would make the NEM operations and investment decisions more efficient. We expected the hybrid regime would reduce the risks of new-generation investments' access being cannibalised by later investments wanting to locate in similar electrical locations.
- In theory, priority access combined with CRM should provide more certainty for future investors, but this hypothesis needed to be tested to see whether it is a reasonable assumption. To do this, we developed a simple prototype that compares the operations and generation development plans based on generators making profit-maximising investments over a 15 year horizon with (a) status quo arrangements and (b) priority access.

Incorporating priority access into investment modelling

- To incorporate priority access into investment modelling, the following need to be done:
  - **Dispatch and pricing**: Implement a two-pass dispatch process (the hybrid model) and determine the appropriate prices. The first pass involves priority access, and the second pass involves physical dispatch (CRM).
  - **Settlements**: determine spot market settlements (priority access and physical – CRM) and any contract settlements
  - **Market bidding**: implement sensible bidding strategies for the priority access dispatch and the physical dispatch
  - **Network modelling and security constraints**: develop a network model which includes future network enhancements and determine (formulate) appropriate network and other security constraint equations
  - **Market-based new investment**: develop a process for determining market-based new investments under priority access

Hybrid Model - dispatch and pricing

- To model priority access and CRM dispatch and pricing, the following need to be done:
  - Implement a two-pass dispatch process: access dispatch immediately followed by a CRM physical dispatch where:
    - the access dispatch and pricing is the same as the current NEM dispatch and pricing
    - the CRM physical dispatch uses a new set of CRM energy bids for those participating in the CRM, and it includes a new set of CRM deviation constraints which can be used to limit the deviation of a dispatchable resource's CRM physical dispatch from its access dispatch
    - the CRM dispatch targets are assumed to be the actual metered dispatches for the dispatch interval and consequently become the starting states for the next access and CRM physical dispatches
  - Calculate the CRMPs for each dispatchable resource from the CRM physical dispatch optimisation as the nodal prices. This could be done directly from the nodal prices of a DC load flow model that explicitly models the transmission network or could be calculated based on the shadow prices of the binding network constraints as is currently done with NEMDE.

Hybrid Model - Network Study Modelling

- ACIL Allen would model the network and security constraints required for priority access and the physical dispatch (CRM) along very similar lines to what we currently do.
- This is because the physical network and security constraints are precisely the same for a normal NEM dispatch, a CRM physical dispatch and an access dispatch with priority access.

Market modelling of new investments

- The most challenging part of modelling priority access is determining market-driven entry investments.
- ACIL Allen would use a similar approach to what we currently do, where we use small generic investments to indicate the business opportunities of investing in different technologies in a region at a particular time. For the priority access model, we would extend this to all major network locations at which a variety of generation investments could be made. This would not be a centrally planned least-cost set of generation investments but market-driven investments.
- Once prospective locations have been determined using the small generic investments, modelling of realistically sized investments would be undertaken in an iterative approach whereby the most prospective new entrants are evaluated first to determine whether they are financial viable considering any curtailment due to network congestion and lack of demand (economic curtailment).
- We expect that under priority access new entrant investments will be installed in areas with a low risk of curtailment from existing investments and, also, priority access will in turn reduce the risks of new investments being cannibalised by subsequent investments.

Testing the hypothesized benefits of priority access

- To inform our opinion on the questions that AEMC asked regarding priority access we embarked on developing a simple prototype model.
- The aim of the model was to compare the outcomes for the status quo and the priority access arrangements for:
  - Congestion and network curtailment of existing and new generators, in particular cannibalisation of existing generators by new entrants
  - Total renewable and thermal generation given the same capacity incentives for VRE generation
  - Impact on variability of annual generation and cash flows
- We designed the simple prototype model to highlight the differences between the priority access model and the status quo but not to introduce other complexities that muddy or confound the simulation experiment.

Prototype Model

- The model compares the generation development plans based on generators making profit-maximising investments over a 15-year horizon with (a) status quo arrangements and (b) priority access.
- We developed a model that is as simple as possible to understand the dynamics of the hybrid model compared to the status quo but complex enough to capture the important issues of multiple constraints binding with a range of coefficients, multiple loop flows and a loop flow involving a regional reference node.
- In a full NEM model, it is too hard to understand what is going on when comparing two regimes like the status quo and priority access. There are potentially too many complexities and confounding factors to clearly see what is the impact of the different regimes.

Prototype Model

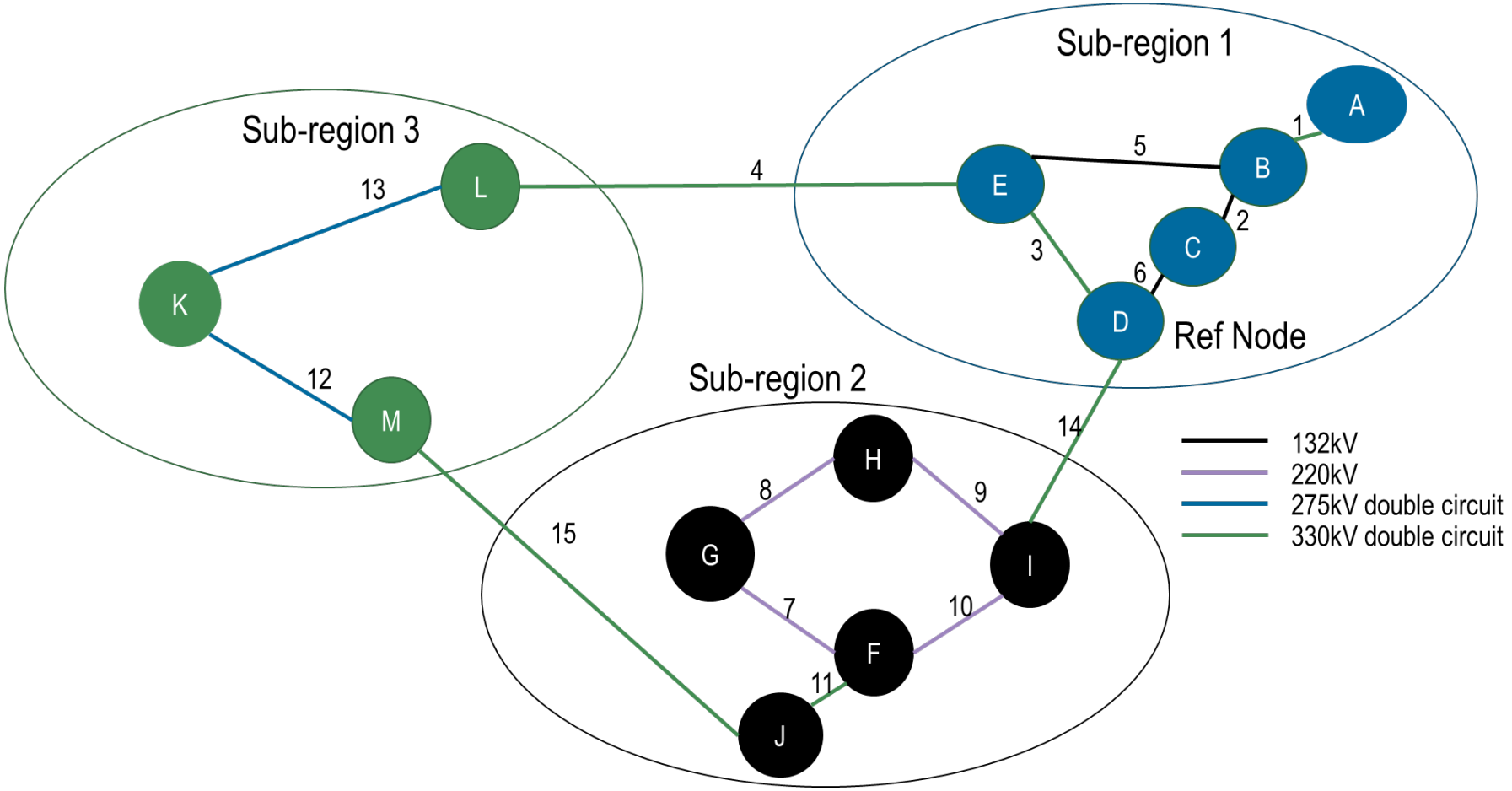
To simplify the model, we made the following assumptions:

1. All dispatchable resources participate in the CRM (if generator is bid optimally it can always increase profitability or do no worse by participating in the CRM)
2. Single region using a network of three sub-regions with the option to model two regions by moving existing nodes to a second region
3. Ignore Federal Government's Capacity Investment Scheme (CIS) and other government schemes but have annual new renewable capacity targets which are the same for the status quo and hybrid options
4. No REZs or other potential zones of priority access, priority access would be applied to individual dispatchable resources
5. Only allow market-based entry of wind, solar and gas (sufficient to maintain equivalent reliability between status quo and priority access + CRM) and meet the renewable capacity targets
6. Start with a relatively unconstrained generation fleet
7. Gradually decommission thermal generation
8. We extracted the following results at hourly resolution and annual summary :
    1. Regional data: demand, RRPs, frequency of negative prices
    2. Generation data: dispatch, availability, bid price, economic and network curtailment, net revenue (profit), net revenue per MW
    3. Constraints data: marginal value of binding constraints and summary statistics such as binding frequency

Prototype Model – N and N-1 Network Constraints

N and N-1 Network Constraints:

Constraint ID	Description	RHS Limit (MW)
1	Out=10, Monitor 7	360
2	Out=12, Monitor 13	325
3	Out=13, Monitor 12	325
4	Out=14, Monitor 4	380
5	Out=2, Monitor 3	359
6	Out=3, Monitor 2	184
7	Out=3, Monitor 6	143
8	Out=4, Monitor 14	340
9	Out=5, Monitor 10	400
10	Out=5, Monitor 3	359
11	Out=5, Monitor 4	420
12	Out=5, Monitor 7	440
13	Out=7, Monitor 10	450
14	Out=8, Monitor 9	292
15	Out=9, Monitor 8	347
16	Out=NIL, Monitor 11	460
17	Out=NIL, Monitor 15	500

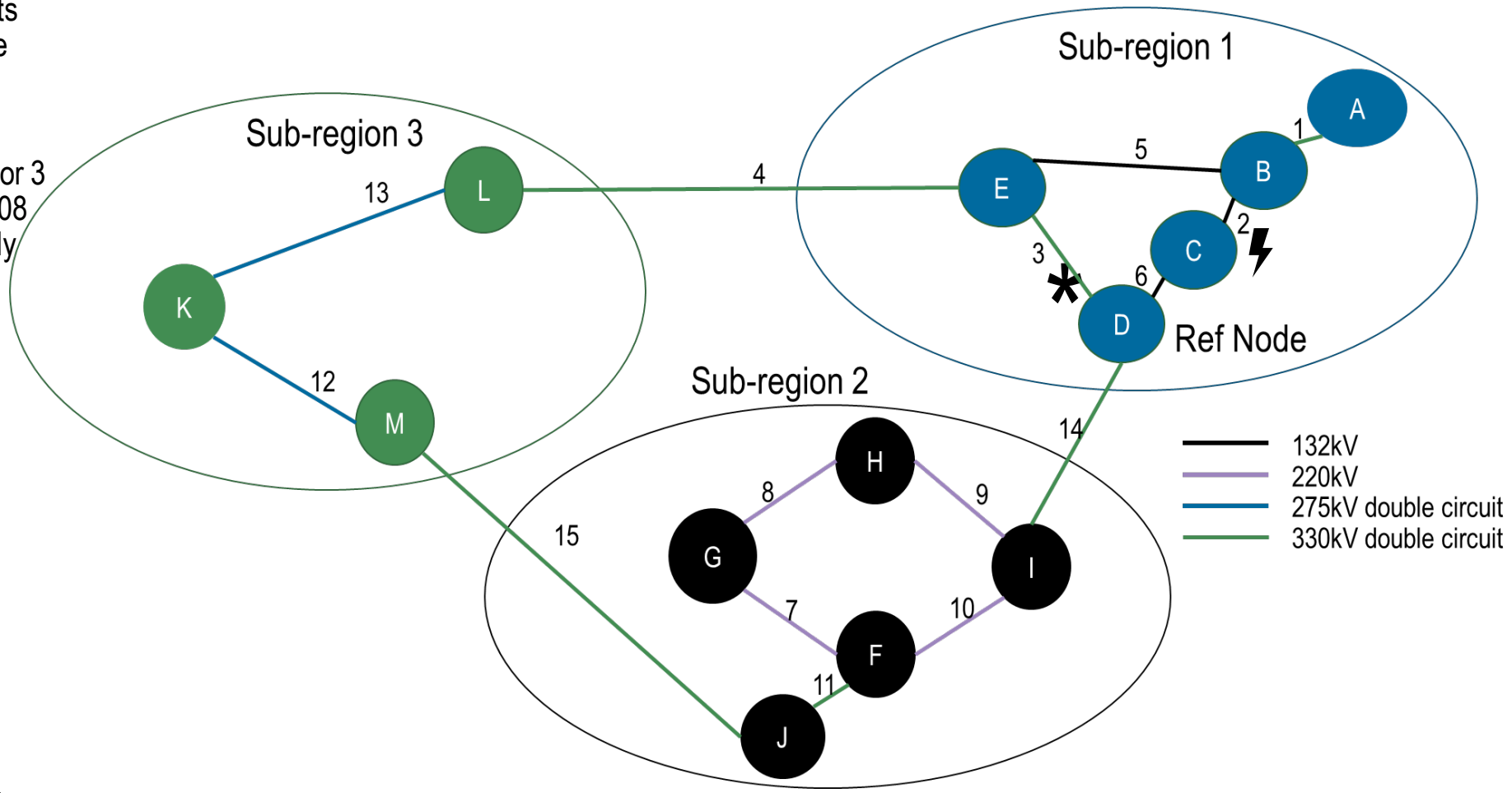


Prototype Model – N and N-1 Network Constraints

- The network constraints include constraints with a wide range of coefficients to test the impact of Priority Access on generation electrically close and far from congestion.
- For example, the constraint “Out=2, Monitor 3 (D To E)” has coefficients ranging from 0.08 to 1 on the LHS. The RHS is approximately equal to the line limit of 360MW:

Generator	LHS Coeff
Gen_E	1
Gen_L	0.86
Gen_K	0.7
Gen_B	0.63
Gen_M	0.47
Gen_F	0.25
Gen_G	0.19
Gen_H	014
Gen_I	0.08

- Generator at I contributes only 8% power from D to E because its power flows mainly from L to E

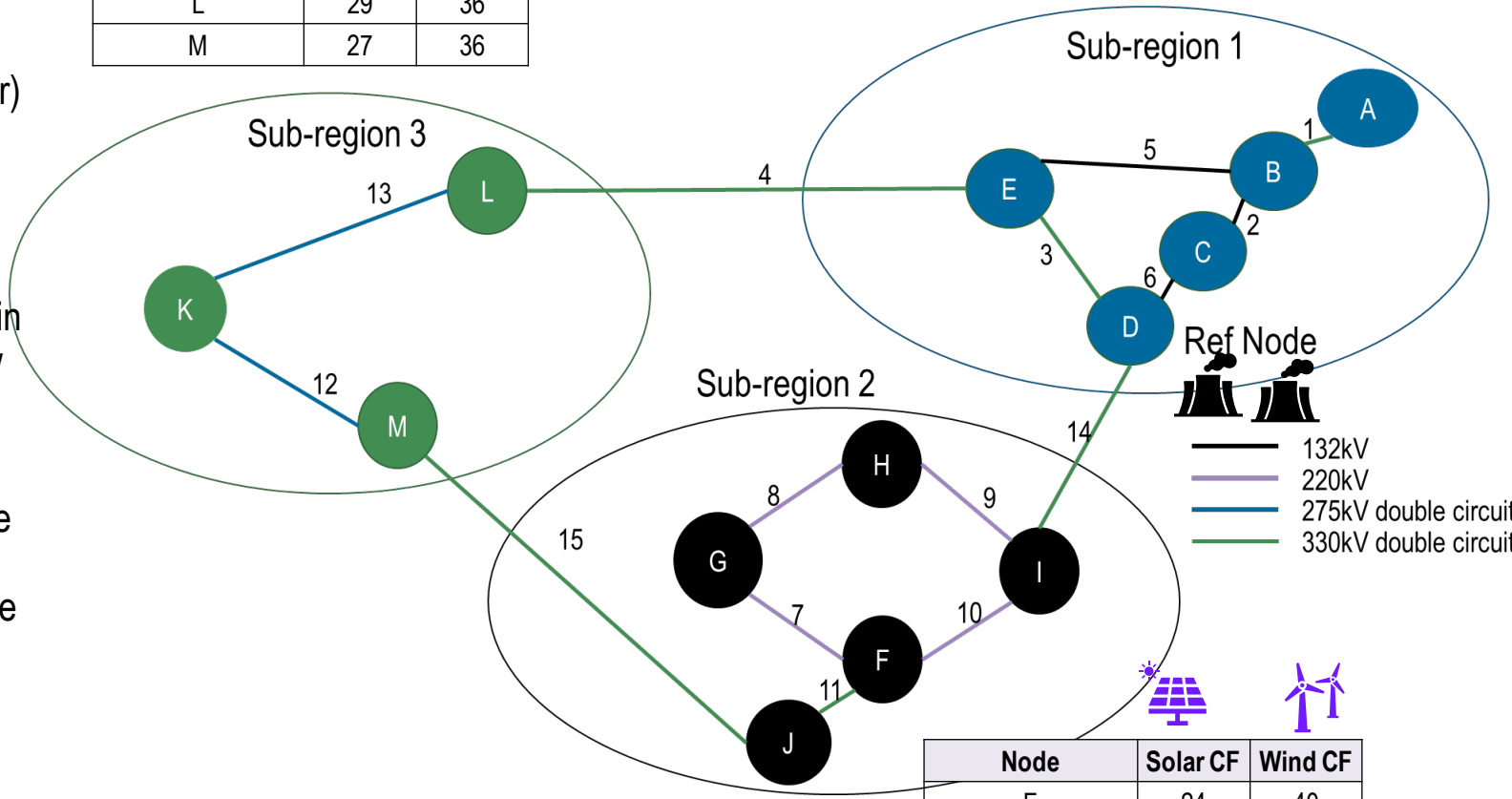


Prototype Model – Model Assumptions

- 13 nodes (substations) from A to M
- D is the regional reference node
- The projection period is 15 years, from 2025 to 2039 at hourly simulation resolution (8760 periods per year)
- To encourage new investment we have an annual VRE capacity target
- 25MW increments of new entrant wind/solar projects are installed in nodes B to M when financially viable in the year. In nodes A and J, it is assumed that no new capacity can be installed, forcing capacity into more areas subject to network constraints.
- Each sub-region has a different wind and solar profile to simulate the geographical variance in wind and solar resources in the NEM. Under the status quo, we expect more capacity to be installed in the best solar and wind resources even if they have congestion because they can cannibalise existing generators

Node	Solar CF	Wind CF
K	29	35
L	29	36
M	27	36

Node	Solar CF	Wind CF
B	28	35
C	28	35
D	29	27
E	32	31



Node	Solar CF	Wind CF
F	24	40
G	24	38
H	26	31
I	21	38

Modelling results– Priority Access vs. Status Quo

Modelling result	Priority Access Compared to Status Quo
Total curtailment	Overall lower curtailment of existing and new entrant investments. Under Priority Access, new entrants entering the market in the same year may incur some curtailment from cannibalisation. In addition, under the proposed BPF table, some new entrants may incur curtailment after a few years if subsequent new entrants with a lower constraint coefficient in a regularly binding constraint enter the market. This is because when the priority access order is softer, generators with lower coefficients in binding constraints can cannibalise existing generators.
New entrant investment certainty	Better returns for existing and new entrants due to reduced curtailment. There is a lower likelihood of new investments being heavily constrained from later investments causing high levels of curtailment
New entrant investment decisions	Less investment in congested areas.
Thermal generation and emissions	Lower thermal generation and lower emissions due to more efficient investment given the same new capacity of renewable generation
Annual average load-weighted RRP	Mildly lower RRP under Priority Access due to lower levels of curtailment of VRE generation

Modelling results– Priority Access vs. Status Quo

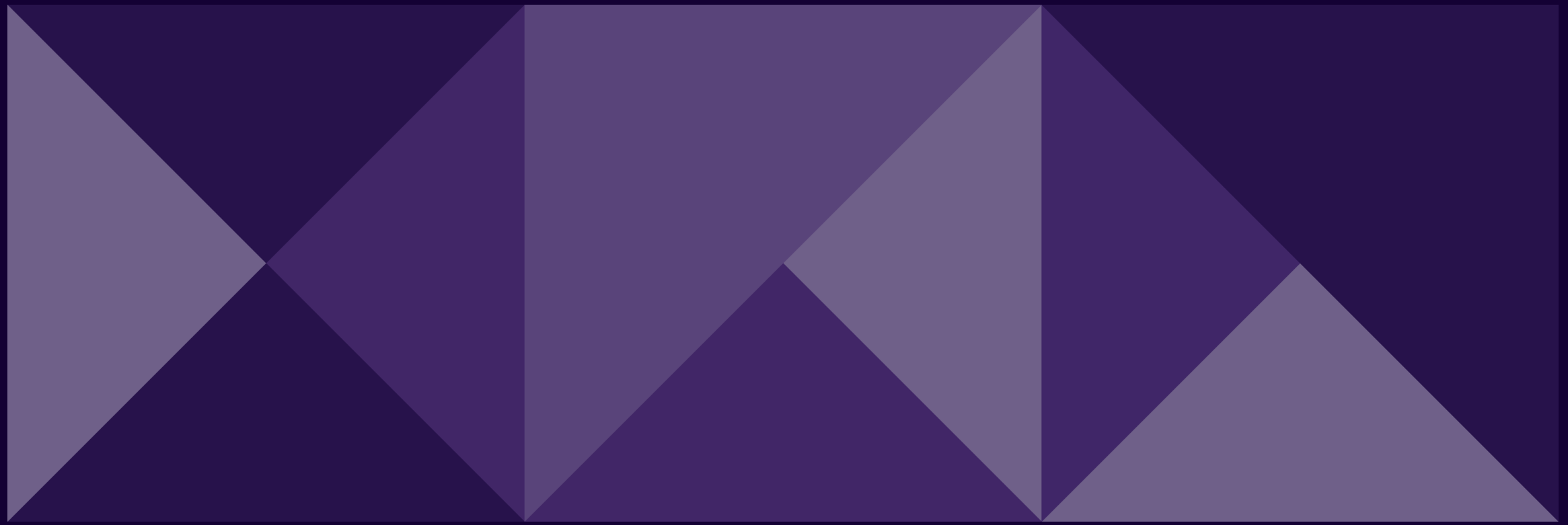
Result	Priority access	Status quo	Difference (PA-SQ)
Total Installed Renewable Capacity (GW)	1,725	1,725	0
Total Renewable Generation (GWh)	44,318	43,212	1,106
Total Thermal Generation (GWh)	31,568	32,675	-1,106
Total Renewable Curtailment (GWh)	4,166	5,433	-1,267
Average Existing Solar Network Curtailment	9.8%	18.5%	-8.7%
Average Existing Wind Network Curtailment	0.0%	7.3%	-7.3%
Average N.E. Solar Network Curtailment	4.9%	7.3%	-2.3%
Average N.E. Wind Network Curtailment	8.5%	8.3%	0.2%
Total New Entrant Renewable Net Revenue ($m)	3,650	4,097	-448
Total Existing Renewable Net Revenue ($m)	1,400	1,063	338
Total Renewable Net Revenue ($m)	5,050	5,160	-110
Total Thermal Net Revenue ($m)	863	935	-72
Total Negative Price Periods	1.5%	0.9%	0.6%
Average RRP $/MWh	134.37	138.95	-4.59

Conclusions

- Based on our a priori thoughts and the prototype modelling we have undertaken, ACIL Allen think that priority access, as currently designed using bid price floors, can be meaningfully modelled by intending participants to support investment cases.
- In particular we think that
  1. priority access can be included in the usual modelling undertaken for investors in generation
     - a generator could model the cash flow effects of priority access relative to the status quo and its impacts on congestion caused by new entrants
     - a generator could anticipate where its access would be limited/reduced by higher priority generators at certain points on the grid provided that appropriate network information is provided by AEMO and the TNSPs
  2. priority access could provide more certainty (relative to the status quo) to intending investors about a project's:
     - access to the RRP and associated ability to contract and
     - revenue streams that it would earn over its lifetime.
  3. modelling of priority access + CRM would improve over time.

Questions?

Are there any comments on our modelling approach or results?



Frequently Asked Questions

Why aren't you modelling the full NEM?

- We are planning to use a simple prototype model to inform us on whether
  a) introducing a hybrid priority access and CRM regime will make the NEM operations and investment decisions more efficient and
  b) reduce the risks of incumbents and new-generation investments' access being cannibalised by later investments wanting to locate in similar electrical locations.
- If the prototype priority access and CRM produce more efficient investments and more certain cash flows for investors, then we would think that priority access combined with the CRM can achieve the goal of providing more certainty (relative to the status quo) to intending investors about the revenues a project would earn over its lifetime.
- To answer the above questions, we want a model that is as simple as possible to understand the dynamics of the hybrid model compared to the status quo but complex enough to capture the important issues of multiple constraints binding with a range of coefficients, multiple loop flows and a loop flow involving a regional reference node. Doing a full NEM model makes it too hard to understand what is going on.
- The simple prototype model will be designed to remove many additional complications (confounding factors in an experimental design). Thus, we are trying to design a market simulation experiment that will highlight the differences between the status quo but not introduce other complexities that will confound the simulation experiment.

Why do you assume 100% participation in the CRM? Can you model with a lower CRM participation rate?

- It can be shown that a generator that has any of a wide variety of contracts (swaps, caps, whole of meter, LGC, etc.) is usually better off and certainly no worse off if it participates in the CRM and bids optimally. Thus, smart spot traders will want to participate in the CRM to increase an organisation's profitability. Consequently, a reasonable assumption for our modelling is that spot traders want to profit maximise for their organisations and therefore there would be 100% participation in the CRM in the longer term.

How do investment decisions account for the CRM?

- Investment decisions will take into account the cash flows and profitability over a range of scenarios. These cash flows will include spot and contract payments. In the case of spot payments there will be a mixture of access dispatch revenue and physical dispatch (CRM) revenue. The access dispatch revenues will be a key determinant of how much contracting referenced to the RRP can be undertaken. In the case of storage located in constrained areas the CRM may provide a substantial component of a resource's profitability.

Frequently Asked Questions

Are you including impacts on emissions in your modelling?

– We are directly modelling emissions via the amounts of thermal generation and their associated emissions. We are indirectly modelling government policies which aim to reduce emissions via support of renewable generation via annual renewable capacity constraints.

Do you incorporate consideration of contracts in investment decisions?

– In general, yes, but for this modelling exercise we are just looking at the spot market.

How will you assess and compare investment certainty?

– Normally for an investor we would look at scenarios or take a stochastic approach and look at expected outcomes, variance of outcomes, worst case outcomes etc. For this modelling we are just looking at expected profitability.

Can/could you include REZs in the modelling?

– We could include REZs but we wanted to make it easier to get clear inferences from our stylised model, so we have only allocated priorities to individual resources based on the time of their commitment to proceed. It would be easy to incorporate a REZ priority scheme into our model by allocating REZ entrants in a particular year the same priority number or allocating them the highest priority.

How is the new renewable generation annual capacity target representative of government schemes?

– The target is just a proxy for government schemes and is the same for status quo and the hybrid model, thus removing one external source of potential variation between the models.

Why is the cost of capital constant between the status quo and the hybrid model the same?

– Theoretically, based on the capital asset pricing model, the cost of capital should be based on a project's correlation with market returns. In reality, this is not usually done. For our modelling we have kept the fixed and variable costs for new entrant generation the same for both the status quo and the hybrid model in order to not introduce a confounding factor that would favour one over the other. This implies that they have the same cost of capital. If one of them produces higher and more certain profits than the other then its cost of capital may end up being lower but to not prejudice our modelling we have kept them the same.

Frequently Asked Questions

How does your modelling approach compare to the AEMO ISP?

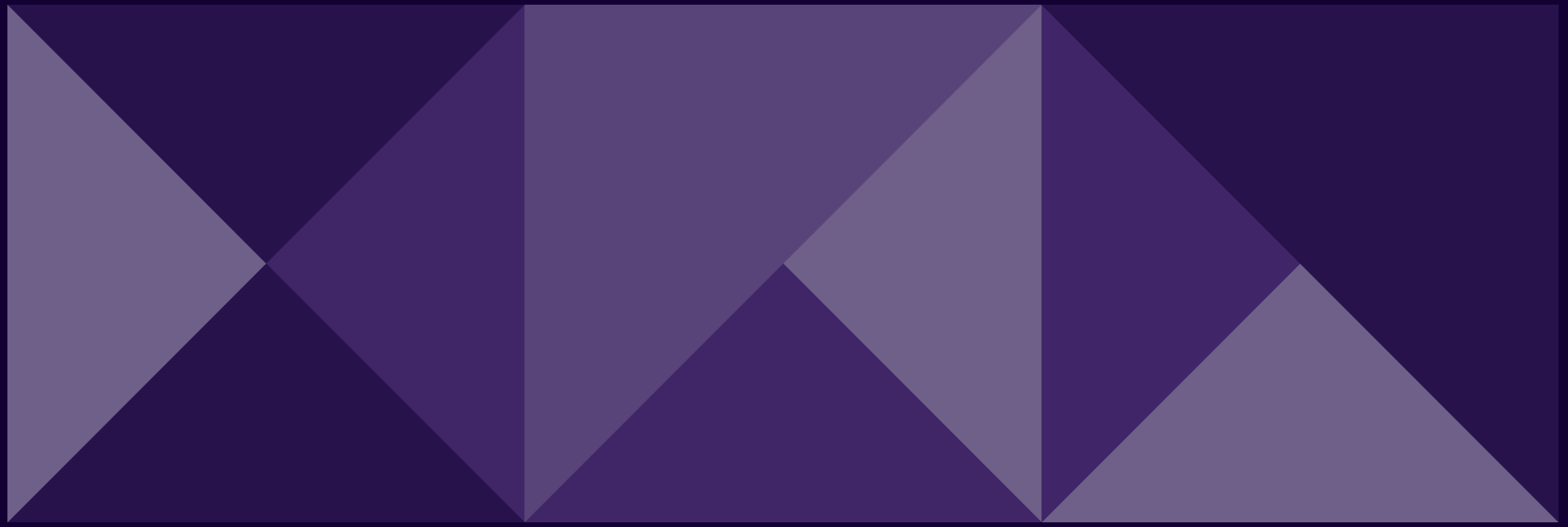
- Our approach represents how a renewable developer conducts investment modelling and differs from a resource planning approach like the AEMO ISP, which optimises the whole electricity system to minimise total system cost and represents a central planner's approach to generation and transmission planning rather than a market-driven generator investment approach.

Why are you not modelling storage?

- We want to remove additional complications because we are trying to design a market simulation experiment that will highlight the differences between the status quo but not introduce other complexities that will confound the simulation experiment.

Appendix

Additional information on the prototype model



Model Methodology

- For each node (B to M), check if a dummy 0.1MW generator is financially viable in each forecast year in order from most viable to least viable.

  For each dummy generator, if it is financially viable, create a 25MW new entrant:

  - Check new entrant revenue to see if it is financially viable.
  - If not, remove 25MW

  Repeat all of the above:

  - If a dummy generator is financially viable where the new entrant has been installed, increase the new entrant capacity by 25MW
  - Repeat until the capacity target is met. If there are no more financially viable new entrants, then install the next most viable entrant

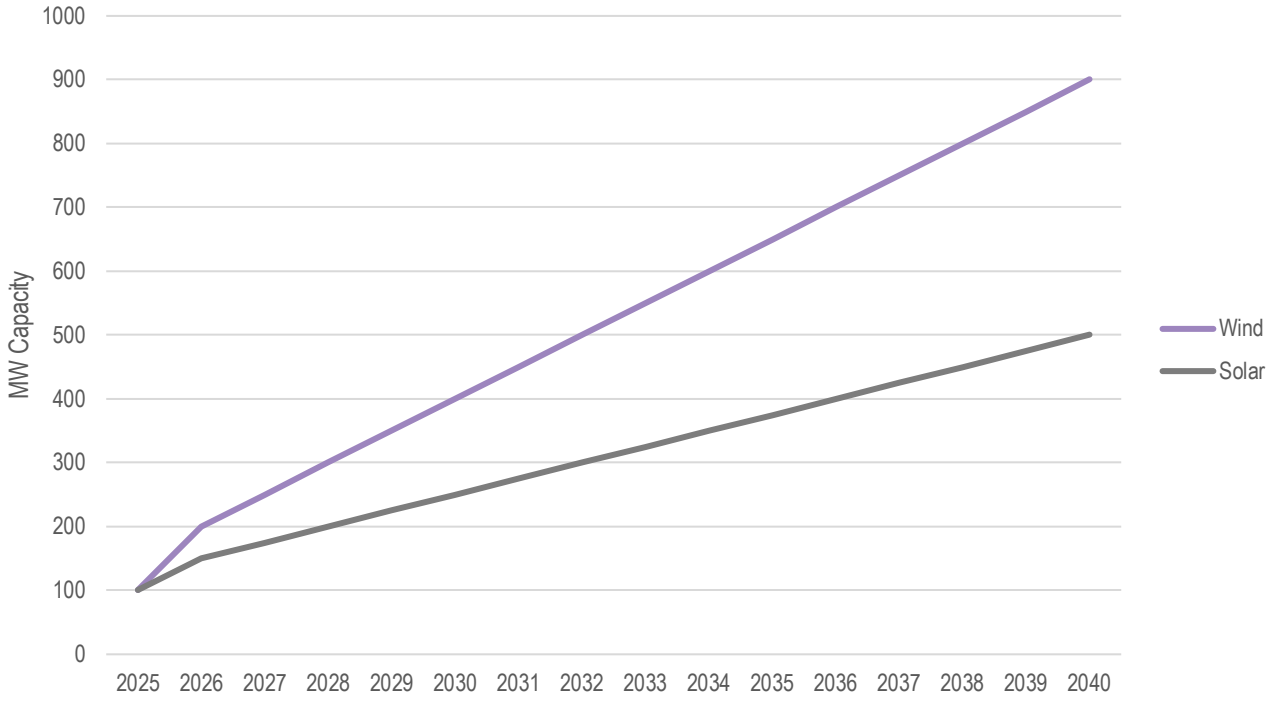
- The model above was tested on a small system and will be used to simulate priority access and the status quo to compare investment decisions and financial performance.

  The same assumptions and methodology will apply to both models.

  The only difference in this approach to our normal approach to modelling new entrants is that Bid Price Floors (BPFs) are used to floor new entrant bids in the priority access simulations

Annual Capacity Targets

Capacity Target (MW)		
Calendar Year	Wind	Solar
2025	100	100
2026	200	150
2027	250	175
2028	300	200
2029	350	225
2030	400	250
2031	450	275
2032	500	300
2033	550	325
2034	600	350
2035	650	375
2036	700	400
2037	750	425
2038	800	450
2039	850	475
2040	900	500



Generator bidding – access dispatch

- For each period, two iterations are run to simulate how participants are likely to adjust their bids to maximise revenue and gain access to the RRP:
  - In iteration 1, generators are assumed to bid at opportunity cost
  - In iteration 2, if a generator is constrained in iteration 1 and the RRP is positive and higher than their opportunity cost, they bid to the floor

Generator	Opportunity Cost Bid Price
GT_A	$150
Coal_B	$70
Solar/Wind: B to M	-$20 to -$-35

Hard Bid Price Floors under Priority Access

Hard BPF	Priority																	
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-1000	-200																
2	-1000	-600	-200															
3	-1000	-733	-467	-200														
4	-1000	-800	-600	-400	-200													
5	-1000	-840	-680	-520	-360	-200												
6	-1000	-867	-733	-600	-467	-333	-200											
7	-1000	-886	-771	-657	-543	-429	-314	-200										
8	-1000	-900	-800	-700	-600	-500	-400	-300	-200									
9	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200								
10	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200							
11	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200						
12	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200					
13	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200				
14	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200			
15	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200		
16	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200	
17	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200

Soft Bid Price Floors under Priority Access

Soft BPF	Priority																	
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-1000	-911																
2	-1000	-911	-822															
3	-1000	-911	-822	-733														
4	-1000	-911	-822	-733	-644													
5	-1000	-911	-822	-733	-644	-556												
6	-1000	-911	-822	-733	-644	-556	-467											
7	-1000	-911	-822	-733	-644	-556	-467	-378										
8	-1000	-911	-822	-733	-644	-556	-467	-378	-289									
9	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200								
10	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200							
11	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200						
12	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200					
13	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200				
14	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200			
15	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200		
16	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200	
17	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-911	-822	-733	-644	-556	-467	-378	-289	-200

Q&A: Modelling access reform to inform investment decisions

Victor Stollmann – Senior Adviser, Economics and System Security

Introduction to the stylised network model

Phillip Munro-Laylim – Adviser, Consumer, Markets and Analytics

Endgame Economics (Oliver Nunn, Franklin Liu, Justin Xiao)

Introduction to the stylised network model

A stylised model for stakeholder interaction, that also informs wider discussion about the reform

- As part of our project plan agreed by Energy Ministers, we are publishing a stylised network model for stakeholders to interact with.
- The objective of this model, which incorporates priority access and the CRM, is to allow you to interact and see how the hybrid model might work with dispatch and settlement.
- To best meet the aim of this model, it has been developed with a focus on simplicity and does not include some of the more detailed features of the hybrid model.

We engaged Endgame Economics to develop this stylised model.

They will be presenting on the stylised model and how to use it.

Oliver Nunn
Managing Director

Franklin Liu
Director

Justin Xiao
Consultant

The stylised model and user's guide will be published on our project page for you to download and use.

Stylised network model – Q & A

Phillip Munro-Laylim – Adviser, Consumer, Markets and Analytics

Open Q & A

Jessie Foran – Principal Adviser, Economics and System Security

Q&A

Reminder: you are currently all in ‘listen-only’ mode.

- Please use the chat as our main tool for questions.
- Use the Q&A button at the bottom of your screen to ask questions. We may bring you off mute to speak to your question if we need a bit more information.
- We will prioritise questions with the most ‘upvotes’ first.
- If we do not get to your question today, we will aim to address them either:
  - in our meeting summary that will be published on our website in due course, or
  - by reaching out to you directly.

Next steps

Jessie Foran – Principal Adviser, Economics and System Security

Next steps

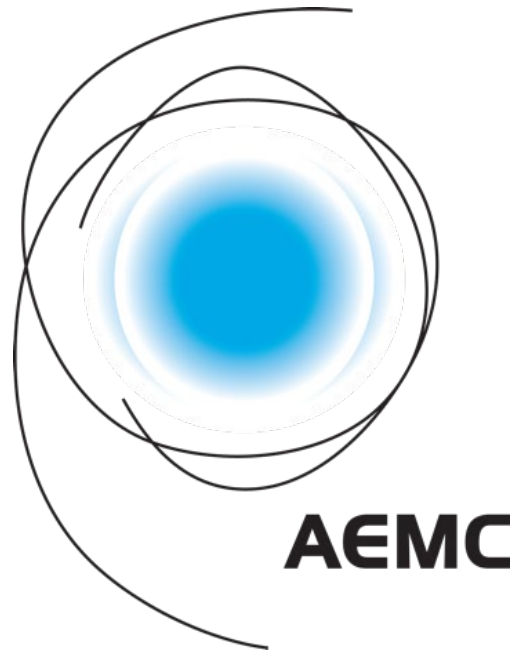
Material from this public forum, will be published on our project page shortly.

We will continue to use our technical working group (TWG) and other meetings for input to policy consideration and design – this includes any alternative options.

We appreciate all the feedback provided to us by stakeholders. We aim to engage more broadly than the TWG in September, to ensure we are reflecting stakeholder views to Ministers about matters in our final advice.

Closing Remarks

Anna Collyer – Chair


AEMC