Network of Illawarra Consumers of Energy

NICE Draft 2022 ISP submission

February 2022

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Contents

Glossary

AEMA	Australian Energy Market Agreement
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
Collective	The collective of energy ministers that has previously gone by the names of the Ministerial Council on Energy, the Standing Committee on Energy and Resources, and the COAG Energy Council but now apparently is the National Cabinet Energy Committee and the Energy Ministers Meeting (See Appendix 1)
DER	Distributed Energy Resources which includes generation, storage and loads that can respond to price or non-price signals.
DNSP	Distribution Network Service Provider
Draft Plan	AEMO's *Draft 2022 Integrated System Plan*
EC	COAG Energy Council
ECA	Energy Consumers Australia
ECSS	The Energy Consumer Sentiment Survey conducted by Energy Consumers Australia
ESB	Energy Security Board
Guideline	*Cost Benefit Analysis Guidelines* required under NER 5.22.5
IASR	Inputs Assumptions and Scenarios Report prepared by AEMO
ISP	Integrated System Plan – a recommendation of the Finkel Review designed to be more than a transmission plan on steroids.
NEM	The (misnamed) National Electricity Market. The term is used both to refer to the bulk power market operated by AEMO and to the integrated electricity system including regulated networks and competitive retail markets.
NEO	National Electricity Objective
NER	National Electricity Rules
NEPP	National Energy Productivity Plan
NICE	Network of Illawarra Consumers of Energy
ODP	Optimal Development Path
PV	Photovoltaic – a shorthand for solar panels located on consumer premises
REZ	Renewable Energy Zone – a concept introduced by the Finkel review, referred to in the ISP, subject of an ESB proposal but not consistently defined across the NEM.
VCR	Value of Customer Reliability

Introduction

NICE

The Network of Illawarra Consumers of Energy (NICE) is a recently formed informal network advocating for the energy transition to a net-zero carbon future to be managed with the interests of consumers at heart.[1] This necessary transition needs to occur at least cost to consumers while maintaining reliability and security of energy services, appropriate consumer protections for essential services and a just transition for affected workforces.

We believe there is a role for regionally based advocacy within the context of nationally consistent energy policy. The choice and options for energy supply do differ by geographic region regarding different climatic conditions affecting demand and supply options and different risk factors impacting resilience planning. David Havyatt is the sole author of this submission.[2]

We appreciate the opportunity to comment on the Australian Energy Market Operator's (AEMO) *Draft 2022 Integrated System Plan* (ISP) (the Draft Plan). This submission has been prepared following our submission in response to the *Draft 2022 Forecasting Assumptions Update*.[3] In that submission, we emphasised the importance of scenarios providing a wide span of possible futures covering significant uncertainties. A major uncertainty we addressed is policy uncertainty, and therefore the need to develop scenarios based on outcomes, not just forecasts ass forward projections of current trends.

We will avoid repeating the information contained in the earlier submission.

This Submission

This submission will focus on the questions posed in the Draft Plan, being:

- Do you consider that the Draft ODP appropriately reflects the consumer risk preferences? Is the reasoning for the ODP clear? Are there any other risks that should be quantified?
- Is the proposed staging for HumeLink and VNI West, with early works as the first stage and then proceeding to implementation subject to conditions, appropriate?
- Is the proposed treatment of Marinus Link as a single actionable ISP project appropriate?
- Do you consider that REZ Design Reports are warranted for the indicated REZs?
- Do you have any feedback on the Addendum to the 2021 Inputs, Assumptions and Scenarios Report (IASR)?

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[1] The network has not yet started actively recruiting participants.
[2] Mr Havyatt was employed as Senior Economist at Energy Consumers Australia from October 2015 to August 2020. For the avoidance of doubt, nothing in this submission is the position of Energy Consumers Australia.
[3] https://d3n8a8pro7vhmx.cloudfront.net/nice/pages/21/attachments/original/1644026732/NICE_Submission_on_2022_Forecasting_Assumptions_Update.docx?1644026732

In responding to these questions, we note the invocation included in the Draft Plan that "Submissions should not relate to inputs and assumptions or methodology which have been consulted on separately." However, as we will explain in considering whether the Optimal Development Path (ODP) appropriately reflects consumer risk preferences, it is essential to assess how well the Draft Plan models risk, which depends upon the inputs and assumptions.

This explanation forms the next section of the submission. In anticipation of that analysis, we simply note that between the development of the scenarios for the ISP and the Draft Plan changes to Commonwealth policy crystallised the intention of all governments to achieve net-zero emissions by 2050. This late policy change has resulted in what was historically a boundary case scenario, Step Change, becoming the most likely scenario. Consequently, the analysis around the most likely scenario is highly asymmetric and inherently biased.

As outlined in our submission on the *Draft 2022 Forecasting Assumptions Update, the Draft Plan* scenarios fail to address a future with much higher levels of distributed generation and localised storage.

In the following section, we will address the remaining four consultation questions. In general, however, our view is that biased analysis has created too much risk for consumers of transmission infrastructure overbuild. As will be explained, this risk is compounded by how the investment in these large single project investments will be recovered from consumers.

In our conclusion, we argue that without additional analysis, none of the projects identified as actionable ISP projects in this ISP meet the requirements of a satisfactory cost-benefit analysis.

Understanding consumer risk preferences

Defining risk

'Risk' is one of those words that looks simple but actually has complex meanings. We want to highlight the differences between two definitions of risk that are relevant to the consideration of consumer risk preferences. The first is from economics, while the second is from the ISO 31000 Risk Management Guidelines.

Frank Knight defined risk as uncertainty for which the probability distribution of potential outcomes was known.[4] Technically we never know probability distributions of real-world events; all we can do is estimate them. For example, even the simplest distribution that a coin toss will result in 50% heads and 50% tails is based on an estimate that the coin is 'fair.'

A consumer deciding on buying a Video Cassette Recorder back in the 1980s had to choose which format to select – Beta or VHS. The consumer faced uncertainty about the longevity of both formats and the size of the ecosystem each supported. The consumer ultimately assigned some probability distribution against the possible outcomes in making their choice.[5]

We know that real people aren't from the species *homo economicus*[6]. Members of *homo sapiens* make the assessment using all sorts of rules and heuristics and don't make an explicit assessment and calculation. But the more significant the consequence of the decision, the more explicit that process becomes. In this lineage, the field of Cost-Benefit Analysis expects the practitioner to assign probabilities to the different potential outcomes considered in the analysis.

In contrast, the *ISO 31000 Risk Management - Guideline*[7] defines risk as the 'effect of uncertainty on objectives'. This can be thought of as a production process where the uncertainty of inputs (and environment) results in uncertainty of outputs that are labelled risks. Risk management then involves identifying risk, analysing and evaluating risk, and then determining 'risk treatment.' Within this framework, the risk is analysed on two general dimensions of the degree of impact and degree of likelihood. Evaluation constitutes determining whether to treat the risk or bear it. Risk is seldom eliminated, and the entity decides to bear the level of risk remaining after any treatment (or to exit the project).

This managerial approach doesn't involve quantifying the distribution of possible outcomes across risk dimensions.

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[4] Knight, FH 1921, *Risk, Uncertainty and Profit,* Houghton Mifflin Company, Boston & New York.
[5] For just one of the tales of the format 'wars' see https://medium.com/swlh/vhs-vs-beta-the-story-of-the-original-format-war-a5fd84668748
[6] While John Stuat Mill came up with the description 'economic man' the earliest use of the Latin version appears to be Claudio Jannet in 1878 (https://www.mattzeunert.com/2021/05/01/homo-economicus-early-uses.html). It has become much more prevalent as a disparaging term for the approach of orthodox or neo-classical economics with the development of behavioural economics.
[7] ISO 31000:2018 Risk Management – Guideline https://www.iso.org/iso-31000-risk-management.html As an aside, for those who blather endlessly about the need for Australia to adopt 'international standards' ISO 31000 started its life as an Australian standard that was then taken to the world. https://riskandinsurance.com/a-brief-history-of-iso-31000-and-why-it-matters/

Risk, uncertainty and scenarios

In developing the actionable ISP rules, a distinction emerged between the use of scenarios preferred by AEMO and that required by the Australian Energy Regulator (AER) in the Cost Benefit Analysis Guidelines.

AEMO, quite rightly, noted that the precise likelihood of any one scenario is precisely zero. Therefore, they did not weight the scenarios but chose a 'least regrets' approach to choosing the ODP. On the other hand, the AER, following standard Cost-Benefit Analysis practice, wants an overall cost/benefit outcome by weighting the scenarios.[8]

These uses of scenarios neatly align with the alternative definition of risk. Weighting scenarios to develop an aggregate view is consistent with the economist's version, where the analyst is prepared to assign a probability distribution to future outcomes. The preferred AEMO approach of least regrets is more consistent with the managerial approach and recognition that we have chosen (or must) bear these risks.

The objectives of the energy system

Objectives for the energy system, as captured in the Australian Energy Market Agreement (AEMA) and the National Electricity Objective (NEO), can be summarised as '*current and future consumers pay no more than is necessary for the quality and reliability they are prepared to pay for*'.[9] In fact, 'Quality and reliability' is a vector of several variables, including time off supply, restoration time, and voltage and frequency stability.

There is increasing interest in the concept of 'resilience' in the energy system, which is generally understood as the system's capacity both to withstand extreme events and the capacity of the system to continue a level of operation through the event and recover after it. However, resilience can also be framed as community resilience, for which energy resilience is merely a component.[10]

As a simple example for the electricity system of a resilience characteristic, one of the core elements of resilience is achieving a system restart after a system black event. In the case of the 2016 incident in South Australia, both of the resources contracted for restart failed, and restart was achieved using the interconnector.

Another example of resilience has a more targeted load shedding regime at times of resource inadequacy. Having the consumers who can least afford a loss of supply shed last is a more

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[8] This is not always the case. For example, the Infrastructure Australia Assessment Framework adopts the economist's definition of risk https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/infrastructure_australia_assessment_framework_2018.pdf

[9] Havyatt, D 2018, 'Operationalising the Long Term Interests of Consumers'. Paper prepared for Energy Consumers Australia available at https://energyconsumersaustralia.com.au/wp-content/uploads/Operationalising-the-Long-Term-Interests-of-Consumers.pdf

[10] For a good introduction see https://knowledge.aidr.org.au/media/9000/155-what-is-community-electricity-resilience.pdf

resilient system.[11] A concern among consumer advocates is the extent to which the ISP prioritises reliability over resilience.

An inherent trade-off between price and quality is at the core of the objectives. In the ISP, this translates to the trade-off between increasing costs (from transmission investment) versus having periods without supply. Lack of supply may result from insufficient available generation resources, the inability to get energy to consumers because of network congestion, or the need to shed load to restore stability to the grid. Engineers and economists use the very blunt tool of the Value of Customer Reliability (VCR) to measure this trade-off.

There are two fundamental weaknesses in this approach. The first is that consumers value the other aspects of resilience. For example, if they are without supply, they are critically interested in the expected restoration time, as this determines other actions they might take. The second is that different consumers have different values, as is the case with the preferences of all consumers. This reflects differences in the capacity to pay and the utility derived from energy consumption; what do consumers use heat, light and power for, and what alternatives do they have? Additionally, there is a temporal dimension, are current consumers being asked to pay for increasing the reliability for future consumers?

What are consumers risk preferences?

Ultimately the outcome for consumers is a level of reliability at a price. Both over-investment and under-investment in transmission can result in increased costs to consumers; the former in paying for unused network assets, the latter in paying scarcity prices for electricity. As a result, there is a bias in evaluating risk towards ensuring there isn't under-investment. In other words, under-investment is seen as less preferable to over investment.

This is not an accurate description of risk preferences because it doesn't start with considering how relatively satisfied consumers are with the current level of prices and reliability. As we noted in a submission to the AER on the Rate of Return, for the 2018 instrument consumers drew on ECA's Energy Consumer Sentiment Survey (ECSS). The survey revealed that consumers were much more satisfied with reliability than price. We argued that, as a consequence, consumers were prepared to face an increased risk (chance) of reliability in return for lower prices.[12] However, recent evidence is that consumers are more equally satisfied in price and reliability.

We have included some comparisons of the growth rate of electricity consumption under the ISP scenarios against historic growth and recent forecasts in Appendix A. The forecasts inherent in the ISP are for a return to high growth rates in consumption. These high growth rates are coming after the system has seen little large-scale investment since the network building days following World War II.

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[11] Of course, the adoption of a market was meant to ensure this outcome because the price system would allocate scarce resource amongst consumers on willingness and capacity to pay. That this hasn't occurred underpins the single greatest criticism of market reform.

[12] See https://d3n8a8pro7vhmx.cloudfront.net/nice/pages/21/attachments/original/1626908084/NICE_Submission_on_Casflows_and_Term.pdf?1626908084

We have also included in Appendix A analysis of why energy consumption declined from about 2006, trends that were not recognised for some years by AEMO. Finally, we note that having no scenario that includes greater use of rooftop PV and distributed storage, together with even more efficiency programs, results in a set of scenarios biased towards a need for significant transmission investments.

Consumer reaction to these larger-scale investments has been very risk-averse; consumers are generally happier with a 'wait and see' approach.

The temporal dimension

The nature of these new investments to be significantly higher than ongoing levels of new capital expenditure raises a concern about the risk preference of current consumers compared to future consumers.

The cost of transmission assets is recovered from consumers through arrangements known as the building block model. Aside from its efficiency inducing incentive components, this is fundamentally a cost of service model that sets revenue equal to operating expense plus a return on and of capital. The latter is through depreciation. The AER uses an approach to depreciation that recovers the same real amount for each year of the asset's life. This is achieved by first using a diminishing value approach and then revaluing the asset by increasing it by the rate of inflation and decreasing allowed depreciation by the revaluation amount.

However, a new transmission asset built while the existing generating fleet remains in operation will be used less in the early years than in the later years. As a result, the approach to depreciations winds up being a lot higher as a price per unit of energy transferred in the early years compared to the latter.[13]

But the problem becomes more severe when we recognise that consumers in the first year of the asset are providing a return on capital of the entire capital cost. Then, as the asset depreciates, this amount becomes smaller.

Consequently, in the presence of large lumpy network investments, current (or near future) consumers pay far more than future consumers. While there are ways to rejig the return on and capital recovery to address this, these approaches create additional risk for the network operator should utilisation not increase to expected levels.

Managing risk

In risk management, the risk is best assigned to the person who can manage it. For example, electricity consumers assign price risk to their retailer, who manages the risk via hedging contracts.

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[13] See section 4.1A in Havyatt, D 2020*, Economic Regulation of Electricity Distribution: Theory and Practice in Australia*. Available at https://www.researchgate.net/publication/352800071_Economic_Regulation_of_Electricity_Distribution_Theory_and_Practice_in_Australia

But risk management includes bearing residual risk. In deciding how to assign a large residual risk, it is appropriate to consider who is best placed to bear that risk. The ISP calls for significant infrastructure investments for which there is great uncertainty about the appropriate timing. These risks cannot be treated; they have to be borne.

In privatising our electricity assets, it has been an implicit assumption that the private sector is a superior risk manager. This may or may not be true. However, the government is always better placed to bear risk by virtue of its taxation and coercion powers.

Overall, the deficiencies in the choice of scenarios not including a higher DER scenario result in an assessment of the ODP biased towards requiring excess transmission assets. Consumers are not well placed to manage (bear) this risk, and consequently, the 'actionable' ISP projects should not be regarded as actionable. The alternative is for the projects to proceed with government bearing the project risk.

Other Matters

General comments

Unfortunately, policy decisions have been made that have constrained AEMO from fully considering an optimal development path. For example, in principle, storage should be located close to load or generation, while instead, we have located our most significant resource, Snowy 2.0, near neither. Not only is this storage in the wrong place, but its sheer scale has also worked against developers of off-river hydroelectricity.

The Draft Plan also identifies a concern with social licence for new transmission and generation projects. Therefore, we find it odd that the proposed dates for offshore wind development are so far into the future. For example, the combination of increased rooftop solar PV, offshore wind development, and a pumped hydro facility on the Illawarra escarpment could result in an effectively islandable network in the Illawarra.

Actionable Projects

HumeLink and VNI West could probably both be further deferred if the Hunter and Illawarra Offshore hydro resources are advanced. However, it is unclear whether the early deployment of these two REZs and additional PV could prevent the need for these transmission paths.

We differ from many consumers on the effectiveness of Marinus link. We understand the modelling conclusions resulting in treating Marinus as a single project rather than two. Put simply, this is a consequence of the more rapid increase in demand flowing from the acceptance of electrification as a critical decarbonisation strategy.

However, we believe that due to the inadequacy of the scenarios detailed above, no work should commence on any of the actionable ISP projects until further analysis validates their need under a high DER scenario.

REZ Design Reports

The process of identifying and supporting Renewable Energy Zones is an important strategy for coordinating generation and transmission investment. In addition, they create an environment for effective regional economic development. AEMO seeks stakeholder views on whether REZ Design Reports are warranted for the indicated REZs.

On page 95 of the Draft Plan, AEMO notes that REZ Design Reports are not required for NSW REZs because 'similar activities are already progressing under the New South Wales Government's Electricity Infrastructure Roadmap.' AEMO then notes that it welcomes feedback on actions that can be taken to support the targeted and successful delivery of these REZs. Suggested topics are:

> *1. How to build community support – early activities might include environmental and community impact assessments, a review of benefit sharing schemes, uplifted engagement approaches and a review of landuse planning.*

> *2. How to coordinate investment decisions – approaches that can deliver "hub-and-spoke" infrastructure rather than "spaghetti infrastructure" (which can be the result of individual investors acting incrementally).*
>
> *3. How to grow local expertise – regional jobs, establishing skilled work forces and supporting local industries will be important.*
>
> *4. How to expand existing industries and attract new ones – supporting both local and national economies by providing access to low-cost electricity. This might include energy intensive industries such as manufacturing, aluminium smelting, hydrogen production or datacentres.*

These are all benefits from the REZ approach that the NSW Government approach has embraced, and our disappointment is that it is not national.[14] We support the proposal on REZ Design Reports being prepared for the REZs shown in Figure 32 of the Draft Plan. However, we would include the Offshore wing REZs in Figure 14.

Offshore wind is an established technology already used extensively in countries with less available landmass (as an example, it is heavily utilised in the UK). Offshore wind is also less subject to community objections than land-based wind generators. Two of these REZs (O1 Hunter Coast and O3 Gippsland Coast) are relatively close to existing major transmission infrastructure that is already losing some of its connected coal generators. O4 North West Tasmania Coast is a significant adjunct to the Marinus transmission project and should be developed co-incident with it. The O2 REZ is close to plentiful off-river pumped hydro storage options in the Illawarra and Shoalhaven regions and is well connected to Southern Sydney.

Addendum to the IASR

In general, the questions raised by the AER transparency review arise from using scenarios in forecasting instead of scenario planning. We covered this relationship in our earlier submission on the *Draft 2022 Forecasting Assumptions Update* referred to in the Introduction.

The issues relating to multisectoral modelling and DER projections relate to the choice of scenarios as different forward projections, rather than different end-states reached via different development progressions. We express empathy with AEMO because the approach of scenarios as part of forecasting is a consequence of the Rules and Guidelines that the AER either influenced or wrote.

The AER's concern about 'separately derived' forecasts for energy efficiency, DER uptake and EV adoption is a consequence of this forecast oriented approach. Separate derivation of the technology development paths isn't an issue so long as the derivations are consistent with the scenario narrative. The concern about always using an average of DER projections has arisen because AEMO has not separately modelled a high DER penetration scenario. As noted above, this was driven by the lack of differentiation between the High DER and other scenarios in the 2020 ISP. This lack of distinction was embedded in the scenario development process that chose

[14] NICE acknowledged the NSW approach here https://nice.nationbuilder.com/nsw_plan,, and our disappointment here https://nice.nationbuilder.com/the_devil_is_in_the_detail.

the same high DER path for two scenarios. The correct solution was further revising the high DER model to make it more distinct.

We note the AER's concern about AEMO not including the specifics of the Victorian REZ policy and AEMO's response that the policy was not sufficiently detailed for inclusion. We submit that this is precisely the problem concerning policy that we outlined in our submission on the *Draft 2022 Forecasting Assumptions Update*. AEMO should incorporate in the plan some level of detailed consequence of the policy that it assesses (ideally being their view of the optimal contribution of the policy) into the plan and subject it to variation under scenario and sensitivity analysis. Put simply, it is better to assume some impact from an announced policy than it is to assume none. Equally, it is better to assume there may be different future policies in developing scenarios than in assuming none.

We believe AEMO has adequately responded to the question on forced outage rates. That forced outage rates have been increasing for coal-fired power plants is a trend that warrants further analysis on an ongoing basis by the AER and AEMO. With planned closure dates advancing, it would be a rational strategy for investors to reduce maintenance and suffer an increased risk of forced outages.

Conclusion

Energy ministers have presented AEMO with a difficult task. The desire to make the ISP actionable, and hence projects able to pass a cost-benefit analysis, has increased the tension between scenarios as a planning tool to deal with genuine uncertainty and scenarios as a forecasting tool to deal with quantified risk.

This desire for quantified forecasting results in AEMO's approach to modelling policy outcomes. It is manifested in AEMO's unwillingness to model policy outcomes other than policy which is sufficiently detailed to provide AEMO with a set of forecastable outcomes. This same issue has resulted in AEMO not modelling a scenario with far higher distributed PV generation and associated storage. Consequently, the set of scenarios modelled is biased by including two less rapid change scenarios than the step change scenario and only the hydrogen superpower as an alternative path.

Many stakeholders are sceptical of the hydrogen superpower scenario. Given the extent of global investment in hydrogen as an energy carrier, we are not among those sceptics. However, we note that the higher PV generation included in the hydrogen superpower, or higher, should feature as a scenario matched with lower overall consumption, including the more rapid development of further energy efficiency.

We conclude that AEMO has correctly followed the instructions given by the ESB and energy ministers but conclude that there is insufficient basis to determine any additional actionable ISP projects based on the Draft Plan.

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Appendices

Appendix A – Growth rates and forecasts old and new

The transition to a zero-emissions energy system (renewable generation plus electrification) returns Australia to growth levels in annual electricity consumption not seen since the start of the millennium. Figure 1 charts historic consumption for the NEM jurisdictions drawn from the annual statistics prepared by the Electricity Supply Association of Australia.[15] The forecasts are our best attempt to emulate pathways for future generation using the AEMO forecasting data.[16]

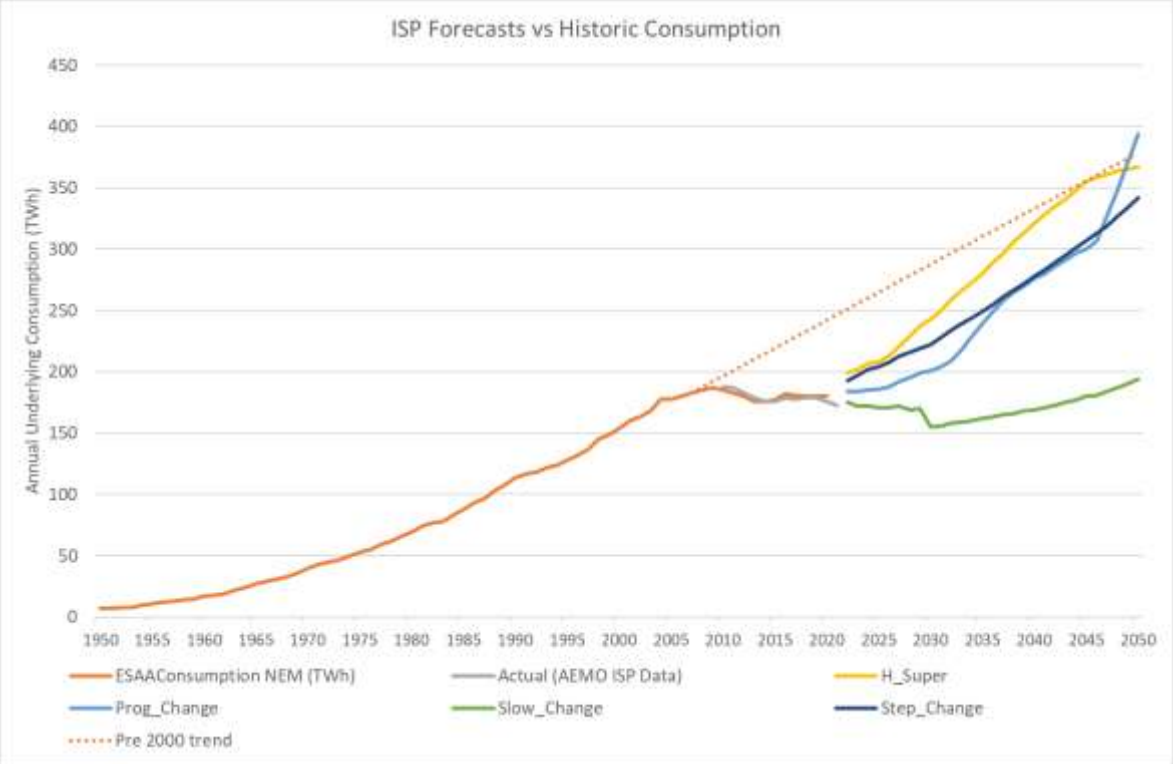

Figure 1: ISP Forecasts versus Historic Consumption

We acknowledge that there may be errors in our representation of the forecasts. The point of the analysis is to put the high electricity consumption growth rates into context. These are a return to what was a 50-year trend.

The scenario forecasts can also be compared to forecasts earlier in the millennium. Figure 2 shows the actual and forecast consumption from 1990 when the reform process commenced in the face of significant oversupply of generation.[17] (Note the actual and earlier forecasts are for NEM generation rather than consumption.)

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[15] Since the demise of the ESAA the data has been published by the Australian Energy Council
[16] We note that hydrogen superpower seems to be lower than in the actual ISP.
[17] See Havyatt, D 2020, *'A History of Electricity Reform in Australia'*.
https://www.researchgate.net/publication/344803470_A_History_of_Electricity_Reform_in_Australia

We can draw two conclusions from this comparison. The first is that the growth rates in consumption implied by the ISP scenarios are not radically different from recent forecasts. The second is that the same factors that resulted in a difference between the earlier forecasts and the actuals could be in play.

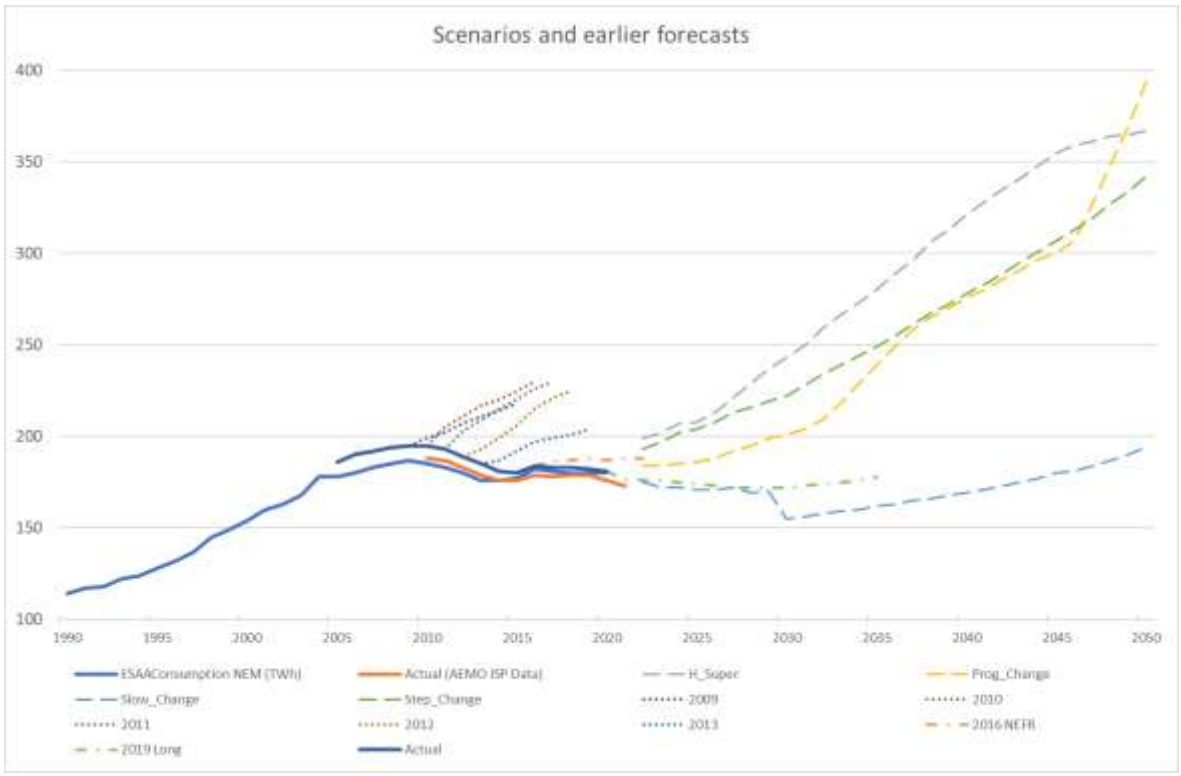

Figure 2: Scenario and historic forecasts

In the 2013 report *Power Down* for the Australia Institute, Hugh Saddler estimated the causes of the downturn in electricity demand up till 2013[18]. Figure 3 reproduces his chart summarising the explanation.

The interesting characteristic remains that more than half of the decline in demand resulted from efficiency programs. A key topic among consumer advocates continues to be the opportunity to reduce household energy costs through housing stock improvements to improve thermal efficiency. Saddler identified a lesser role of Rooftop PV, though this was very early days of solar PV take-up.

The Commonwealth Government (and the Collective of Energy Ministers) continue to commit to the National Energy Productivity Plan (NEPP). The Collective adopted the NEPP at the same December 2015 meeting at which Ministers agreed to 'a national, cooperative effort to

[18] See Saddler, Hugh 2014 *Power Down* https://australiainstitute.org.au/wp-content/uploads/2020/12/IP-14-Power-down_0.pdf

better integrate energy and climate policy.'[19] While there has been no annual report since 2018,[20] addressing housing remains among the commitments made by the Collective.

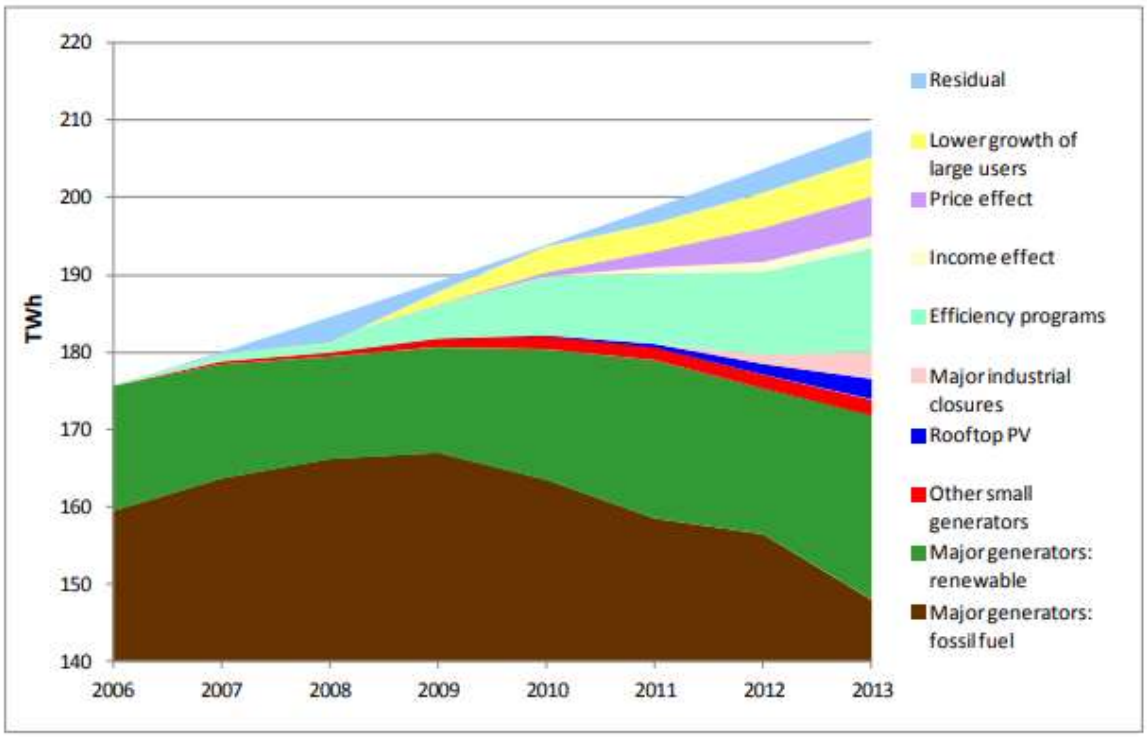

Figure 3:Saddler's explanation of consumption decline

Consumers paid extensively for the overestimation of future demand in these earlier periods. As an example, DNSPs invested to meet demand that didn't eventuate.[21] Today consumers are being asked to be prepared to pay more for sizeable lumpy investment in transmission networks that hinge upon high forecasts of underlying demand that we believe may be over-estimated (when allowing for PV and further efficiency).

[19] https://www.energy.gov.au/government-priorities/energy-ministers/energy-ministers-publications/national-energy-productivity-plan-2015-2030
[20] See https://www.energy.gov.au/government-priorities/australias-energy-strategies-and-frameworks/national-energy-productivity-plan
[21] See the ACCC's Retail Electricity Price Inquiry report.