A Consumer Perspective

Introduction

My thanks to AEMC for the opportunity to comment on "DRAFT RULE DETERMINATION NATIONAL ELECTRICITY AMENDMENT (ACCESS, PRICING AND INCENTIVE ARRANGEMENTS FOR DISTRIBUTED ENERGY RESOURCES) RULE 2021"

Summary

The following is an abstracted systems view of a very detailed draft determination from a consumer perspective.

- The general principle of removing a redundant technical requirement within the regulations that accounting for electricity flow is unidirectional is sound.
- A review of regulations in search of redundant technical requirements for change action before the network collides with resulting problems is required.
- "Robin Hood" and "Change Behaviour" approaches to pricing introduce distortions with unintended behavioural consequences. Particularly, undesirable increased reluctance to invest in more rooftop solar and batteries, and self-curtailment due to cost and regulatory risk.
- Price signals to consumers with only on/off control may breed frustration and resentment rather than extensive desired behavioural change.
- The progressive change from variable ($/kWh) to fixed pricing ($/kW, $/day) is part of regulatory risk to investment in home solar, storage and energy management.
- If it doesn't already exist there is a need for a regulated minimum domestic export price for symmetry with the regulated maximum import price.
- The modelling conclusion that "export revenue provides the majority of the annual return for a solar PV installation" is possibly flawed and misleading.
- Curtailment of a zero marginal cost, use or lose, more tomorrow (renewable) zero operating emissions commodity is ultimately economically and environmentally flawed.
- Bodies involved in electricity network operation, management, and regulation should include the concept of inventory held in storage in system design for management, reliability, and price discovery.
- Bodies involved in electricity network operation, management, and regulation should consider design of a "balanced network" involving supply, inventory, conventional demand, and variable demand, as an alternative to inflexible "generator dispatch".
- Arbitrage between off-peak and peak prices will reduce as inventory in storage increases. A different market mechanism is required to pay for storage.
- In addition to tariff structures requiring an explanation in plain language of inter-relationships a plain language explanation of meter to bill is also required.
- Direct measurement of peak kW may not be feasible without "smart meter" and system modification.
- I'm a consumer not a customer.

General Principle

In a general "Systems" sense any management requirement that electricity only flow in one direction in the network is a redundant technical requirement.

Removal of the regulatory constraint on export pricing is in everyone's best interests.

One hopes that physical network development of export capacity has not been significantly inhibited by regulation.

Perhaps a review of regulations to identify other redundant technical requirements may be appropriate as a more efficient alternative to waiting until they become a problem with a long lead time to fix.

Pricing

The draft determination has recognised that allowing the flow of electricity to be costed and priced in both directions may lead to any or all of the following consumer price strategies while (correctly) advocating none:-

- prices reflective of cost
- prices reflective of perceived ability to pay
- coercive price signals attempting to influence consumer behaviour

While laudable in intent the "Robin Hood" approach may act as a disincentive to new rooftop solar installs as much as an incentive to increase the total investment by installing batteries alongside existing rooftop solar. The "$100/year price signal" suggested indirectly states "if you are perceived to have an advantage we will reduce it". It is doubtful if a "$100/year price signal" will be sufficient to influence the uptake of batteries in households.

The "Change Behaviour" approach is also suspect. Coercive price signals are a very poor form of control. For historical reasons we have defined the interface between the network and the household as the meter. The "smart meter" provides data to the service provider but is not designed to assist the household in real time energy management. Neither are appliances. Real time energy management requires further household investment and is in its infancy.

A simple example. My air conditioner controls temperature by varying power. I can indirectly control power with temperature setting but that is not predictable. I cannot directly control power consumption beyond on/off. An ARENA approach to integration was to add a "minimise power consumption" switch controlled by the service provider rather than the appliance owner.

Another simple example. My solar inverter curtails export and only knows part of the possible excess solar harvest to divert to hot water. My solar ready heat pump only turns on when the thermostat requires and doesn't show water temperature for energy requirement calculation. A $15 timer is a superior outcome to attempting interfacing the two devices.

A typical human behaviour when deprived of control is to abdicate responsibility.

Coercive price signals without effective means for individuals to control power have to be very strong to have a significant effect. Electricity demand is inelastic due both the willingness of people to pay for convenience and the lack of control beyond on/off.

In the context of the draft determination to allow introduction of an export capacity price, patently my solar inverter is capable of curtailing export at 5kW. As currently designed there is no consumer configuration of the inverter to set time of day export limits. The consumer is a price taker. A first behavioural response to the prospect of a price signal to manage export may be to ask the inverter provider to modify the firmware to give the consumer some measure of control. The "take my bat and ball" behavioural response that finds the optimum between the cost of export and the price.

Some consumers may opt to accept increased cost in order to reduce emissions from fossil fuel generators. While perhaps feeling exploited.

Modelling

The following conclusion appears on page 247 of the draft determination:-

"……. export revenue provides the majority of the annual return for a solar PV installation."

Below is a table of prices from a South East Queensland electricity retailer.

If I have understood correctly the capacity demand charge is a recent addition due to a new default tariff from when meters are replaced or July 1st 2021. A direct additional cost of having a "smart meter". Not yet visible on comparison or retail web sites.

Source	Price Item	Base	Base + Solar	Premium Solar
Retail Website	Connection $/day	$0.9470	$0.9470	$1.1150
	Solar Meter $/day		$0.0698	$0.0698
	Consumption $/kWh	$0.1987	$0.1987	$0.2394
	Export $/kWh		$0.0600	$0.1400
Electricity Bill	Capacity Demand Charge $/kW/day	$0.25971	$0.25971	$0.25971

The untrained eye could be forgiven for thinking the prices are not cost reflective and struggle to identify price signals.

While there are no doubt better deals available I am having some difficulty reconciling the table with the model conclusion that "export revenue provides the majority of the annual return for a solar PV installation".

The model used in the draft determination may be incomplete and not reflect reality.

For some consumers the cost is reduced by the Queensland Government Electricity Rebate ($0.93 /day) regardless of the presence of solar.

Retail Price Trends – From Variable to Fixed

There is an inevitable trend in retail electricity prices from variable ($/kWh) to fixed ($/day, $/kW/day).

The underlying reason is that renewables are zero marginal operating cost, are use or lose, and there is more tomorrow (they are renewable). This creates an imperative to produce, to fully utilise available wind and sun, which is not present with fossil fuel generators that have operated at average about 60% utilisation of nameplate capacity since Adam was a boy.

This is reflected in falling $/kWh prices. Perhaps tending towards (but maybe never getting there) all fixed price with unlimited supply. The promise that nuclear once held but failed to deliver, of "too cheap to meter", may yet, at least partly, be realised.

Consumers are price takers. Import tariffs are falling slowly. Export tariffs are falling more rapidly. Simply because consumers are willing to pay for convenience while retailers know that the cost of rooftop solar is a sunk cost and excess solar for export has zero marginal cost – any revenue is good revenue.

However, if/when the fixed export cost provided for in the draft determination exceeds the export value of excess solar the consumer will self-curtail.

From a consumer perspective the result of the draft determination will be an additional fixed cost for rooftop solar installations while export prices continue to fall.

If it doesn't already exist there is a need for a regulated minimum export price for symmetry with the regulated maximum import price.

From the retailer's perspective revenue is more guaranteed with fixed charges than with variable.

Ultimately, consumers question their attachment to the network as off-grid becomes more attractive.

The progressive change in electricity from variable to fixed prices is a regulatory (sovereign) risk for investments in home solar, batteries, and energy management.

Curtailment

Curtailing a zero marginal cost zero emissions commodity is in no-one's interests. In any capital intensive industry the pathway to efficiency and lower prices is to increase utilisation. To reduce $/kWh by increasing kWh.

This is typically achieved by investing relatively small amounts of capital to successively remove bottlenecks and incrementally increase utilisation of the whole network.

Historically the bottleneck in electricity networks has been demand. By design. If we look far enough ahead the bottleneck will probably be supply due to the fundamental characteristics of renewables. A very different network operating paradigm.

It is as if we are currently attempting to make renewables behave like fossil whereas at some time in the future it will become glaringly obvious that approach is flawed. Renewables present a different paradigm.

At the extreme, with more than 100% (of current annual energy demand) renewables, it will be more economic across the whole network to operate a hydrogen electrolyser, desalination plant, or new variable electricity demand, at 99% utilisation, than a peaking generator at 1% utilisation. The rule change that allowed big loads to bid reduction of demand to the wholesale market as if it were increased supply is a very small step. One trusts that engineering, market, and management systems design will evolve appropriately and coherently.

I am confused over the intent of Customer Export Curtailment Values (CECV) in the draft determination. I have searched for clarity both within the draft determination and elsewhere. Which makes it difficult to comment. I infer it is a planning mechanism with indirect consequences for consumer prices.

Presumably curtailment is dynamic in consideration of real time geographic differences in availability of sun and wind and managed coherently with variable demand where curtailment is the last option – balanced network management with supply, inventory, conventional demand and variable demand rather than the existing limiting, asymmetrical, inflexible, dispatch management paradigm.

In general, throwing away otherwise cost free energy, increasing the overall price for everyone, does not make long term economic sense.

I am reasonably certain that on some days weather across the nation will be inconsistent, creating geographic differences in renewables output. A price mechanism that doesn't recognise this, where consumers with rooftop solar have no mechanism for real time control, is potentially flawed.

One hopes that if customer exports are to be curtailed there is a balancing requirement for the network to reduce the bottleneck constraint that causes it.

I suspect that when there is no economic justification for increasing CECV there is no justification for an export price as there is no change to pay for.

Alternative Energy

For some consumers it makes sense to move from other sources of energy to zero emissions electricity.

Thus a change from gas hot water to electric hot water. Despite government subsidy for replacing gas with gas and the lack of integration of "solar ready heat pump" with solar inverter for energy management. Return on investment may never occur.

An interesting conundrum when considering a change from gas cooking to electric induction cooking is that simple avoidance of fixed costs for gas vs potential increased fixed cost from electricity capacity charges has become more relevant than the unit cost of gas and electricity. Including the "game the system" absurdity of starting cooking at quarter to the half hour and stopping for a half hour a quarter after the half hour.

It is in the interests of the electricity network to increase MWh to reduce $/MWh and remain competitive with other sources of energy.

Inventory in Storage

Inventory decouples supply and demand. Utilisation of both supply and demand can be optimised. Also reliability of supply may be improved. Most supply chains minimise inventory. Electricity is adding inventory, held in storage.

At present batteries, pumped storage, and other storage technologies recover costs through the arbitrage between off-peak and peak prices. As the amount of inventory in the system increases the arbitrage will decrease, rendering storage less economic. Currently it is in the interests of storage owners to hide inventory levels.

AEMO will manage energy as well as power, inventory levels will be visible to the wholesale market. Household aggregators will make aggregate inventory in household batteries visible to the market. One hopes that the boundary that is the meter can be easily crossed.

In the last AEMC Reliability Review reliability was expressed in terms of excess supply capacity. The role of storage in reliability, and the potential introduction of "safety stock" as an alternative to excess supply capacity, has not yet been seriously considered. In my terms, we will pay Snowy 2.0 to hopefully never have to use all the 7 days of inventory the system will contain.

I have an unfortunate nightmare that is the storage equivalent of "Pelican Point" (lack of a gas supply when needed). It goes "please regenerate", with the unfortunate response "sorry, the battery's empty".

At some stage the effect of storage on network reliability may be considered in a similar way to excess supply capacity and be paid for appropriately. Until that happens the economics of storage in general, and household batteries in particular, will degrade as arbitrage decreases.

Ultimately there will be sufficient storage to maintain close to a constant price through 24 hours. Whether the market allows that is up to market design and regulation.

Capacity Demand Charge, Tariff Structure, and Measurement

This example of tariff structure is included to provide an insight into what may happen with the proposed export capacity tariff in reality.

In SE Queensland there seems to be a new default tariff including a capacity demand charge. Introduced either at meter change to "smart meter" or 1st July 2021.

From the “pricing proposal” document:-

Charge	Charging Parameter
Demand Charge	Represented as either a rate ($) per kW or a rate ($) per kVA. Different parameters apply to this charge for different tariffs. Within a tariff structure, demand charge rates can be:- - Applied year round (with different peak window rates) - Calculated based on: • A single period in the month, or • The maximum demand within a peak demand window

From the “residential tariffs and prices” document:-

Charging Parameter	Unit
Peak Demand (Peak charging timeframe: weekdays* and weekends 4pm - 9pm)	$ per kW per month

From last year’s “Network Tariff Guide”

Tariff Structure	Charging Parameter
Demand Charge	Unit: $/kW/month. Quantity: Maximum kilowatt demand measured as a single peak over a 30 minute period during peak charging window.

From the bill:-

Tariff Description	Total Usage (kWh)	Charge (inc GST)	Total (inc GST)
Capacity Demand Charge (KW/Day)	1.300	$0.25971	$7.09

After much bother, a few phone calls, a letter to the relevant CEOs, the charge was unpacked to my satisfaction.

Peak Demand is the network peak demand, not the consumer peak. The “peak demand window” is 4pm to 9pm for all days.

Actual measurement seems to be kWh for each 30 minute period (4:00-4:30, 4:30-5:00 windows). A calculation based on kWh per 30 minutes as kWh/0.5 hours renders average kW for each 30 minute period. From which the maximum average kW can be selected and a $/kW/day rendered.

An important distinction between consumer's peak demand and maximum average demand in a 30 minute period. Maximum average demand in a 30 minute period means there is no difference in consumer cost outcome between boiling the kettle and making toast at the same time or different times within the same half hour.

Without consumer options for control beyond "on/off" there is the potential for considerable consumer frustration and push back to build.

I assume the maximum average kW demand derived from kWh over a half hour is used due to difficulty in extracting peak kW from the "smart meter". Perhaps also an intuitive realisation that peak kW is not a good indication of network utilisation.

Apart from the demonstrated difficulty of tracing the charge backwards through the tariff structure and two organisations, the above suggests that "Demand charges ($/Kw) based on maximum output" in section F.1.4 of the draft determination may require further assessment.

The following from paragraph 51 of the executive summary of the draft determination:- "Networks must also explain the interrelationships between different aspects of their regulatory and tariff structure proposals in a plain language overview" should include "explanation of meter to bill".

Customer or Consumer

"Customer" and "Consumer" appear to be used interchangeably. Customer 1293 times. Consumer 290 times. The terms should be defined, or only use one.

A consumer is at the end of a supply chain with no option to pass on costs.

A customer has choice. While it may be observed that in the context of electricity a customer has choice of retailer there is little real choice in whether to be connected to the grid or not.

I'm a consumer.

There is an obvious imbalance in market power between consumer and electricity supplier.

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