Distributed Energy Resources Register (DERR)

Submission by Dr Martin Gill

The Distributed Energy Resources (DER) Register is supposed to allow the Australian Energy Market Operator to incorporate the effects of domestic battery storage systems in their load forecasts. A better outcome is delivered by measuring the effect of consumer DER (as requested by overseas market operators). This submission discusses several methods delivering this data with no additional metering.

Summary of Submission

The Australian Energy Market Operator (AEMO) is suggesting their traditional load forecasting methods, based on predictable static consumer loads, are becoming increasingly inaccurate as consumers install Distributed Energy Resources (DER). Inaccurate load forecasts negatively impact electricity prices and network reliability.

AEMO have suggested the problem is caused by the lack of metering. While commercial installations of the same DER technologies must be individually measured, this is not the case for domestic installations. The ideal solution involves consumers installing additional metering giving AEMO visibility of consumer DER. Modern electricity meters, able to support individual measurement, are readily available, at minimal incremental cost.

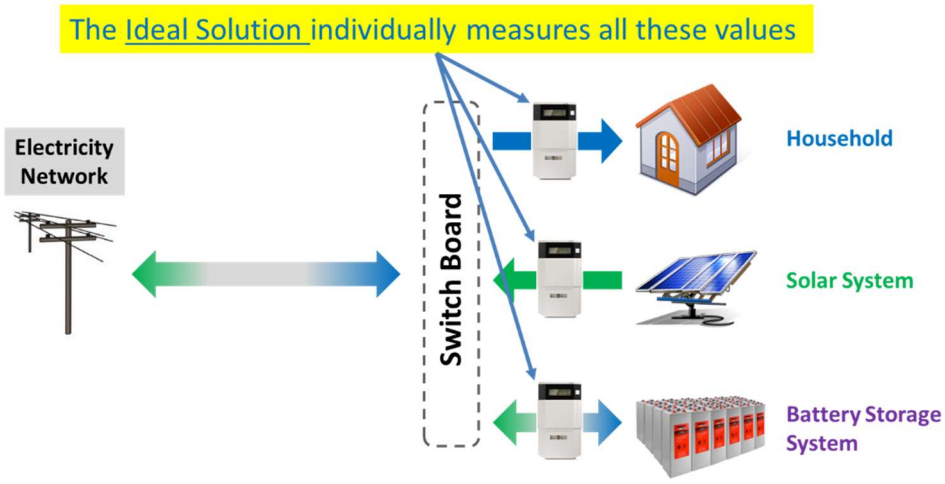
In fact there is no need to install additional metering. Reliable estimates of individual DER can be made using modern estimation techniques applied to single measurements of the net energy flow. These estimates provide similar benefits to the installation of additional metering, while avoiding the incremental cost. It is suggested the estimates are significantly more accurate than those provided by the proposed static DER Register (DERR).

In summary

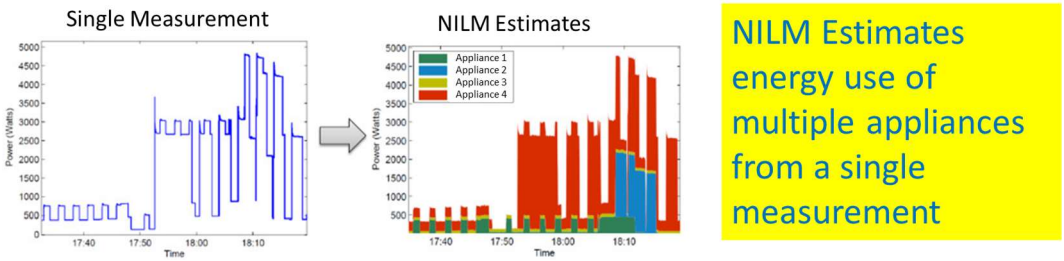
- AEMO relies on direct measurement of existing large scale DER, the same should apply to small scale
- Overseas market operators suggest measurements of DER are required (not provided by the DERR)
- Modern estimation techniques can deliver both reliable and timely ‘measurements’ of consumer DER
- The static system details will not significantly improve forecasts
- The financial assessment supporting the rule change underestimates costs and overestimates benefits

‘Measure’ Consumer Actions affecting Network Stability

The DERR is supposed to improve load forecasts by allowing AEMO to estimate the effects of consumer installed battery storage and solar systems. The ideal solution involves individual measurement of all energy flows.

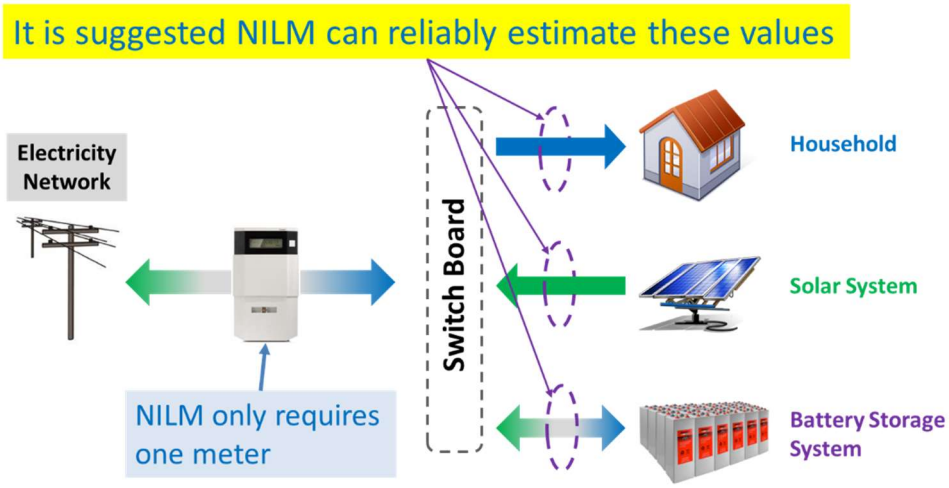


While individual measurements support AEMO's desired outcome the barrier is the perceived cost. Recent developments in estimation techniques can avoid the cost of additional metering. Non-Intrusive Load Monitoring (NILM) can estimate the individual energy flows from a single measurement.



NILM uses a single measurement to estimate electricity use/electricity generation of individual appliances. Even at a basic level it could provide market operators with far better estimates of how installed DERs are operating than the static data provided by the DERR. It is also noted AEMO is primarily interested large energy flows affecting the accuracy of load forecasts. This is a far simpler estimation problem than current uses of NILM, which is typically attempting to estimate the energy use of many small appliances.

NILM is available today and could either be added to new smart meters or applied to the 5 minute data provided by smart meters. Both solutions are available at minimal cost. Existing market rules require smart meter data is provided to AEMO daily. The application of NILM estimation to this data allows AEMO forecasts to be based on up-to-date estimates of energy flows both to and from consumer DER. This is a far better outcome than supported by the proposed static DERR.



NILM also automatically captures all changes. For example battery storage systems remain very expensive, suggesting some consumers will remove their battery system when they move. Some earlier studies estimated at any given time 10% of domestic solar systems are non-operational. No mechanism has been described to ensure the removal or failure of a consumer DER is recorded in the register. This suggests over time the data stored in the DERR will become increasingly inaccurate. This is not a problem for NILM, since it constantly provides daily estimates of the outputs of DER.

Workshop discussions highlighted data collection for the DERR will be manually based. Manual systems are expensive, inaccurate and slow. NILM supports fully automated updating of relevant DER data into AEMO systems for inclusion in their load forecasts. NILM avoids the significant costs to maintain the static DERR. It is asserted NILM supports a better outcome at a lower cost.

The workshop raised concerns about the likelihood of low levels of DERR reporting. NILM totally avoids this problem. Without incentives it was suggested only 5% of consumer battery systems would be included in the DERR. While

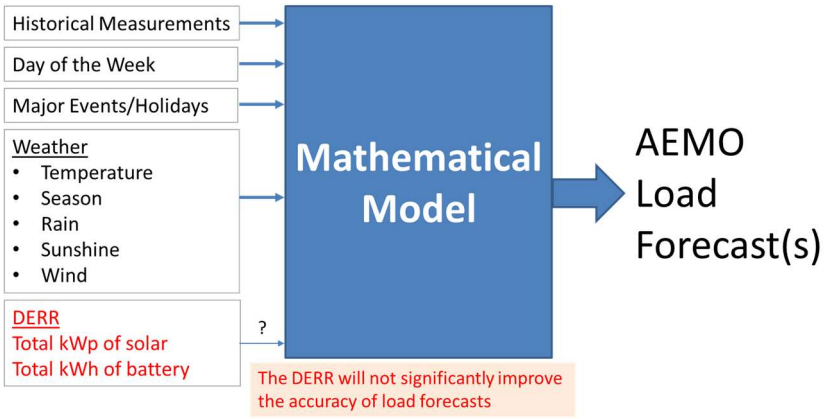
financial incentives could be used to increase reporting levels, these incentive payments were not included in the financial analysis supporting the rule change.

Answering the potential criticism "not all customers have smart meters". A solution was discussed during the workshop. "Scale the results provided by NILM to account for the actual percentage of monitored systems". The number of smart meters and total number of properties is accurately known (and available to AEMO). These figures are far more accurate than the proposed idea of scaling DERR load forecasts based on "guesstimates" of the level of compliance with DERR reporting requirements (and further guesstimates associated the increasing lack of accuracy of information stored in the register).

Summary of AEMC's Proposal

The AEMC's proposal creates a static register of consumer installed DER. The DERR *hopes* to list all domestic solar and battery storage systems. AEMO intend to use the list to improve the accuracy of their load forecasts.

AEMO load forecasts are based on a long history of previous load measurements. These historical measurements are adjusted based on numerous factors including season, weather forecasts, the day of the week and major holidays/events.



AEMO continuously improves the mathematical model they use to create the forecasts. In theory after creating the DERR, AEMO's mathematical forecasting model will be upgraded to include the new input. It is suggested the DERR will not significantly improve load forecasting accuracy.

AEMO is not the only market operator struggling to efficiently manage the integration of DER, however AEMO's proposal to use a static register is unique. Overseas market operators continue to suggest direct measurement. Quoting from the article "Utilities, Grid Operators Tell FERC They Need Real-Time Data to Better Manage DERs" appearing in GreenTechMedia:

> Utilities and grid operators stressed the need for real-time information on distributed energy resources to a Federal Energy Regulatory Commission [FERC] panel in Washington, D.C. FERC organized the conference to gather information on the challenges of integrating DERs into the wholesale power market […]
>
> "Not having live data on the amount of electricity DERs are feeding into the grid can lead to unnecessarily high prices, because utilities may end up running power plants when the energy isn't needed", explained Bekkedahl.

AEMO, like other market operators, are struggling to accurately incorporate consumer installed DER in their load forecasts. While they want actual measurements they are instead proposing a static register. As engineers they appear to have immediately jumped into "solutions mode" and are already discussing how to modify MSATS to store details of customer DER. No one appears to be questioning if a static register can actually be used in place of the measurements they actually want.

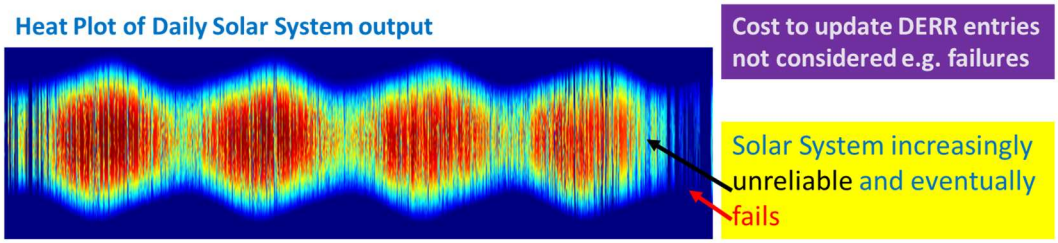
In the near future AEMO will be provided daily updates of the 5 minute interval data measurements from Australian electricity users. Applying NILM estimation techniques to this data provides estimates of the amount of solar and battery storage at customer premises. Significantly this NILM processing is fully autonomous thereby avoiding the high cost to collect and maintain the DERR. NILM is certainly worth further investigation.

A quick summary of other problems with the DERR

The financial analysis fails to accurately present the long term costs and benefits of the DERR. The DERR only considers solar and battery storage, overlooking the major impact of other technologies. These technologies include solar diverters (storing energy in hot water systems) and behind the meter voltage conservation devices. More significantly it fails to consider other near future consumer installed DER, including demand response and plug in electric vehicles (especially those supporting vehicle-to-grid).

The financial assessment used to support the rule change appears to significantly overstate the benefits, including use of the register by first responders and including benefits for solar (where a detailed register already exists which AEMO have shown no interest in utilising). Since both benefits can already be delivered the financial assessment should not attribute these same benefits to the DERR.

The analysis also underestimated the cost and complexity of collecting the data. Manually collating details of battery systems will be slow, inaccurate and ultimately expensive. Several workshop participants expressed concern about the level of reporting (in the absence of financial incentives). While it will be cost effective to copy details from the existing solar system register to the new DERR it raises the obvious question "Why not use the existing register directly?"



Finally little thought seems to have been applied to how to maintain details stored in the DERR. The financial assessment and workshop only consider adding new DER installations to the static register, it does not consider how to remove DER if they are uninstalled or fail. The increasingly unreliable list of historical DER installations suggests the DERR will not significantly improve the accuracy of load forecasts.

Background to the rule change?

The DERR provides two main benefits (i) address safety issues with Lithium Ion storage batteries and (ii) improve AEMO load forecasts. Arguments are presented showing the static DERR is unlikely to make a significant contribution in either area.

Lithium ion battery fires are both intense and self-sustaining. The DERR intends to warn first responders these batteries are on the premises. It is noted this is a very poor fit with the AEMC's rule making test with consumer safety issues typically handled by other regulators. The financial assessment used to support the rule change claims benefits, but this is incorrect. Compulsory signage installed on the front gate of the premises has already delivered these benefits. These signs are cost effective (unlike the DERR), easily accessed (unlike the DERR) and the cost is borne directly by the consumer installing the battery (the cost of the DERR will be borne by all consumers).

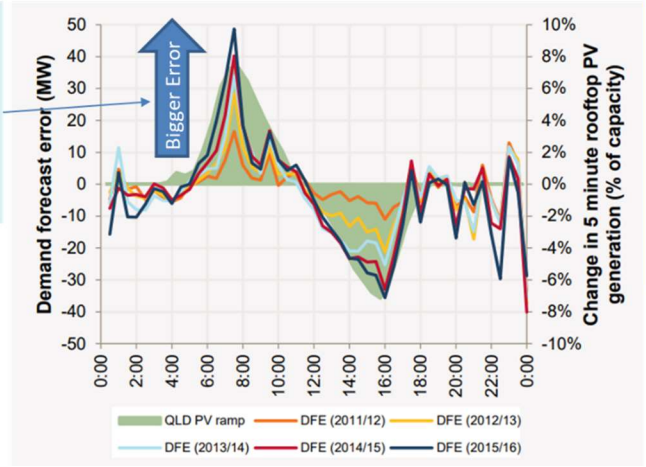
It is then assumed a static register of consumer installed battery storage can be used to improve AEMO load forecasts. This is a better fit with the AEMC rule making test falling under reliability of supply. While storage batteries are likely to play a role in balancing both supply and demand the DERR does not support better load forecasts. The static battery information does not provide reliable information about how the battery affects

network loads. Specifically battery storage systems can be used in many different ways, from arbitrage to back-up power. Each method affects network loads totally differently. This information is not stored in the DERR suggesting benefits claimed in the financial assessment used to support the rule change are overstated.

Having assumed the DERR improves the reliability of supply the flood gates are opened to add more features. It is suggested the DERR list all solar systems. Detailed information on the number and size of solar systems is already available. Solar installers willingly provide this information to regulators to collect Government solar subsidies (no such incentives exist for battery systems). Unfortunately the financial modelling supporting the rule change should not claim additional benefits from the inclusion of solar because AEMO could cost effectively choose to access this information from existing registers. This also provides an opportunity to perform a "sanity check". AEMO has shown absolutely no interest in utilising the existing information. It suggests storing exactly the same information in the DERR will not result a better outcome. Adding solar systems to the DERR does not deliver additional benefits but does increase costs.

For example during the workshop AEMO presented the following figure:

AEMO Claim
As more domestic solar systems are installed AEMO's forecasts are less accurate



What this shows
AEMO's current load forecasting model does not include sufficiently accurate solar forecasts
The DERR does not fix this problem

AEMO claimed the above figure shows the need for the DERR. In fact all it shows is their current load forecasting model is not using readily available data on solar installations. AEMO could easily access this information from existing registers without the need to create the DERR.

The proposed static DERR does not, and cannot, adequately capture the effects of emerging new technologies. For example the effects of non-battery energy storage systems (e.g. solar diverters) and energy conservation devices (e.g. behind the meter voltage controllers). As more consumers install these, and other DER, the accuracy of AEMO load forecasts again decreases. Either the financial benefits assigned to the DERR should decrease or ongoing costs to maintain the register are significantly higher than proposed (needed to upgrade the DERR to capture relevant information about these new systems). Both indicate the financial assessment overstates the long term benefits of the DERR.

At the workshop AEMO stated the problem was they are unable to see what DER systems are doing. Rather than address the issue directly, that is require separate measurement, they support the static register. If the static register works so well why do they require direct measurement of large scale DER? Why are overseas market operators saying they need real time measurements? The truth is the static register will not provide the visibility they require. This is delivered by directly measurement of the DER. Modern estimation techniques allow this to be delivered far more cost effectively than the proposed static DERR.

NILM using existing market data

Current smart meters collect 30 minute measurements of energy use at domestic premises. It is generally assumed 30 minute interval data does not support accurate NILM. This assumption is questioned. While 30 minute measurements do not allow reliable estimates of the electricity use/generation of multiple small appliances it does support estimates of large scale energy flows continuing for several hours at a time (e.g. solar).

As evidence note AGL currently offers to notify consumers if the performance of their solar system falls below an acceptable threshold. This service uses analysis of 30 minute meter data to estimate solar system output. (Clarification: this is not AGL's Solar Command service which requires additional metering).

From the 1st December 2018 smart meters are required to support 5 minute interval data recording. The availability of 5 minute interval data will significantly improve the accuracy of NILM techniques.

AEMO systems are already being upgraded to support 5 minute interval data. Applying NILM techniques to this 5 minute data supports estimated DER energy flows. These estimates include all DER technologies (not just batteries and solar), are provided only one day after the measurements were taken (so are up-to-date) and the whole process can be automated making it more reliable and lower cost than the proposed DERR.

Finally NILM offers a method to autonomously collect relevant DER details for use in AEMO load forecasts. This is not the same manually collected data proposed for the DERR. For example it is irrelevant a site has a 10kWp solar system installed if shading reduces its output to that of a 2kWp system. NILM would only store the effective size (2kWp). While this information is "static" it is directly relevant to AEMO load forecasts.

Also note NILM estimation techniques do not have to be applied to every meter every day. A schedule can be used to periodically check each site. Even if this is only done once a month it still provides relevant and up-to-date information for use in AEMO load forecasts.

NILM using existing real time feeds

AEMO continuously monitor the accuracy of their forecasts using real time measurements of data flows at significant points across Australia's National Electricity Network. Differences between the load forecasts and the real time measurements are then used to improve future load forecasts. This suggests another approach to improving load forecasting accuracy.

NILM analysis techniques are typically applied to real time energy flows. AEMO already have access to real time energy flows. By applying NILM analysis techniques to the real time data feeds they already collect provides far more accurate and timely information than supported by the DERR. For example NILM analysis will give the contribution of solar generation at each location. In contrast the DERR only provides a single static figure giving the total installed solar size. AEMO must then try to estimate how this single static relates to solar generation at each location. Using NILM to estimate solar generation directly provides a far better outcome.

Fit with Finkel

The DERR attempts to deliver recommendations made in the Finkel review:

> "The COAG Energy Council, in addition to its project on energy storage systems, should develop a data collection framework (or other mechanism) to provide static and real-time data for all forms of distributed energy resources at a suitable level of aggregation."

While Finkel suggests static data is required, this is qualified with "at a suitable level of aggregation". It does not suggest a register attempting to store details of every consumer installed DER. As already discussed without financial incentives the DERR will only store a small percentage of consumer installed battery systems. The proposed DERR is

slow, expensive to populate and even more expensive to maintain. Significant questions remain about its ability to support improved load forecasts. It is a poor fit with the Finkel recommendation.

NILM is a far better fit to Finkel's recommendation. Specifically it represents 'another mechanism providing both static and direct measurement of all forms of DERR'. As a point of clarification it is not intended the NILM solution provide "real time" data. That said NILM estimates can be updated daily making them significantly more up-to-date than the static DERR.

Does NILM fit with the AEMC's Rule Making Test

All rule changes made by the AEMC must pass the AEMC's rule making test. The assessment areas include Price, Quality, Safety, Reliability and Security of Supply.

The static DERR is a data collection exercise. This allows a simple assessment criteria to be defined:

> The decision-making value of the information collected must outweigh the cost to collect the information

The financial assessment of the DERR significantly over-estimate benefits. The static data cannot improve the accuracy of load forecasts because the effect of consumer installed DER depend so heavily on how they are used. For example using a battery system to store excess solar generation for use during peak times, charging the battery storage system at off-peak rates for use during peak-periods (arbitrage) or selling battery capacity to augment network supplies. All these solutions could use exactly the same battery, but each has a vastly different effect on network load forecasts.

The financial assessment of the DERR significantly under-estimates costs. Data required for the DERR is manually collected. The assessment ignored consumer incentive payments needed to increase reporting levels. As consumers start to install new DER solutions including demand response systems, plug in electric vehicles, solar diverters and voltage conservation devices the DERR will have to be upgraded (this cost was also not included in the financial assessment).

It would be very interesting to see a financial assessment comparing the proposed DERR against NILM. NILM provides AEMO with the data they require to improve their load forecasts. The benefits are higher since NILM outputs are timely, accurate and adapt to changing market conditions. NILM uses existing fully autonomous data collection techniques so costs are significantly lower.

Why the DERR fails to predict the effect of batteries

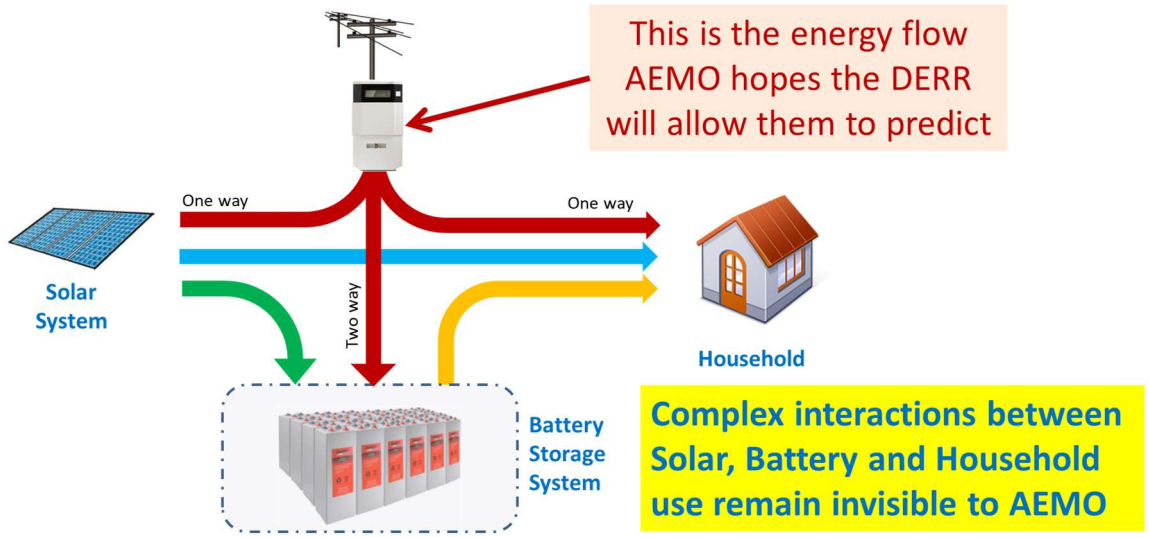
Not all battery storage will be used in the same way. While the DER can attempt to capture how the consumer initially intends to use their battery, this is likely to change over time. As battery use changes it affects the accuracy of load forecasts.

It is anticipated the most common use of a battery storage system is to increase self-consumption of solar generation. In this application the battery is used to store excess solar generation in the battery system for later use. This affects AEMO load forecasts in two ways. Firstly the excess solar generation originally flowing to the network is

now unavailable since it is being used to charge the battery. Secondly at a later time, domestic load originally supplied by the network is now supplied by the battery.

Immediately it is clear there are problems. On bright sunny summer days the solar system is likely to produce more electricity than can be stored in the battery. Once the battery is full, excess solar electricity suddenly flows to the network (if connection agreements allow). The point at which excess solar generation starts flowing to the network is determined by a complex interaction of several factors, the capacity of the battery, the state of charge of the battery at the start of the day, solar generation and household electricity use. Note the DERR only stores the battery capacity and solar system size so cannot be used to estimate the point at which excess solar generated electricity flows to the network.

During the winter months total solar generation is likely to be less than the battery capacity. In the evening, when the battery reaches its maximum depth of discharge, the premises will suddenly increase network load, on cloudy days this could occur during the system peak. This is also determined by a complex interaction of factors, the state of charge of the battery at the end of the day and household electricity use. The DERR cannot be used to estimate the point at which the household stops using its battery and starts drawing power from the network.



Unscrupulous battery installers continue to tell consumers the installation of a battery will mean they never have to pay another electricity bill. These consumers are therefore not selecting the right retail tariffs to maximise the value of their battery system. The right tariff is a time of use tariff. This introduces another problem not captured by the DERR. During winter months rather than fully discharge the battery consumers should switch to mains power at the start of cheaper shoulder or off-peak periods (during summer months they can fully discharge the battery confident it will be recharged the next day). This information is not captured in the DERR but is measured by NILM.

To increase the value of the expensive battery system some consumers will choose to partially charge the battery using cheap off-peak electricity. The next day the battery is more likely to be able to supply household electricity use during expensive peak periods. Note the battery is only partially charged using off-peak electricity so it can still store forecast solar generation the next day. The amount of electricity used during off-peak periods depends on the state of charge of the battery, estimates of solar generation and household electricity use. None of this information is stored in the DERR.

The DERR stores if the battery is capable of providing back-up power. Why? If there is an outage then AEMO's load forecast is wrong – end of story. Outages are an extreme event which are not included in load forecasts! They have only included this application so they can claim more unrealistic financial benefits supporting the rule change.

The impact of tariffs

Households unable to install a solar system can still install a battery system. First they should choose a time of use tariff and charge the battery during cheap off peak periods using it to supply their energy needs during expensive peak periods. Network load forecasts depend on household electricity use, which is not stored in the DERR.

Battery storage systems can also be used to reduce mandated network demand charges. This battery application differs from typical applications because it uses the power available in the battery (not the energy) to reduce monthly maximum demand. When household demand exceeds the specified threshold the battery supplies just enough power to reduce network demand. This application has a positive effect on distribution networks (which is why demand tariffs have been mandated) but an indeterminate effect on load forecasts.

This suggests a significant complication for the DERR. Load forecasts must factor in the changing effect of consumer tariffs. This is increasingly difficult as retailers put consumers on cost reflective network tariffs, but then hide this fact from the consumer (by charging fixed fees).

The wide variety of different uses highlights why measurement of consumer battery systems is required. NILM provides similar data while avoiding the cost of additional metering. The DERR does not capture the wide variety of different battery uses.

Bidding battery supplied energy into the pool

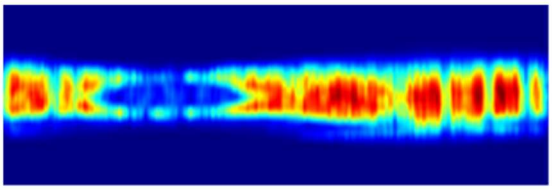
One battery application which has not been discussed is selling energy to the NEM pool to augment supply. Why? Because it risks counting the benefits twice. Aggregators bid this battery supplied energy into the energy market. AEMO then include this energy in the *generation capacity* supplying their load forecast. In this application the battery details should not be included in load forecast.

Why the DERR fails to predict the effect of solar systems

The impact of solar systems on the electricity grid are far more predictable than battery storage systems. The accuracy of solar generation estimates continues to improve using better forward weather forecasts (in particular estimates of cloud cover) and cost effective access to real time satellite imagery. (Why AEMO choose to show they are not using this information in their load forecasts is an interesting question?)

The DERR does not support accurate forecasts of solar system generation. Analysis of Sydney solar system outputs shows the yearly average daily output varies from 0kWh/kWp (10% failed) all the way to 8kWh/kWp (details entered incorrectly). The typical yearly average is a little over 3kWh/day.

Heat Plot of Daily Solar System output



Heat Plot showing effect of shade falling on the solar panels during winter months (output falls to almost zero)

Unfortunately the yearly average fails to pick up seasonal variations. In particular shade falling on some or all of the panels. This problem is more noticeable during the winter months when the sun is lower in sky. So two solar systems with the exactly the same yearly average output can have very different winter/summer outputs.

The analysis discussed above was performed by Dr Gill using individual measurements of solar system output. During the workshop AEMO noted the value of the individual measurements, in particular those made for the NSW Solar Bonus Scheme. The end of the scheme means individual measurements are no longer available. A suitable substitute could be provided using NILM techniques.

The conclusion is the DERR must rely on assumed average solar system outputs, which will result in inaccurate load forecasts. NILM provides estimates of the values required by AEMO improving the accuracy of their load forecasts.

Other consumer equipment affecting load forecasts not included in the DERR

It is not only batteries and solar systems which can adversely impact the accuracy of AEMO load forecasts, for example solar diverters and voltage controllers.

Solar Diverters

Companies are currently offering devices promising to increase the value of domestic solar systems by storing excess solar generation as heat in the existing hot water system. These systems are available for less than $1000 making them attractive compared to domestic battery storage systems costing over $10,000. Solar diverters basically offer cheap battery storage and yet there was no suggestion they be included in the DERR.

What is the effective capacity of a solar diverter? It is related to the size of the hot water system, the thermostat setting of the hot water system, the amount of hot water used by the household and to a lesser extent, when the household uses their hot water. None of these values can be sensibly stored in the DERR.

Hot water systems are not the only way to utilise excess solar generation. The cheapest solution Dr Gill has seen uses a switch controlled by a small solar panel (so the panel can be located in an unshaded position). When the output of the small solar panel is higher than the programmable threshold the switch is turned on. The advertised application of the switch was to control a pool pump.

The installation of these devices changes the amount of electricity the solar system sends to the network. Direct measurement would correctly interpret this as less kWh/kWp, as would NILM. The DERR provides no way to include these factors in its load forecasts.

Behind the Meter Voltage Controllers

Companies are currently offering devices promising to decrease domestic electricity bills by isolating the premises from “the typically high voltage on Australian distribution networks”. The claim is these high voltages increase domestic electricity consumption.

These devices also claim to increase the amount of electricity solar systems can export to the grid. A solar inverter installed behind one of these devices will not stop exporting electricity to the network even when the network voltage goes above voltage limits specified in network connection agreements and associated Australian Standards. It is proposed the DERR store inverter trip settings, if an inverter is installed behind one of these voltage controllers the trip settings of the solar inverter become totally irrelevant.

Why benefits assigned to first responders are invalid

The DERR will not significantly change how first responders approach the premises. There are many, arguably equally hazardous, materials commonly stored at domestic premises. These include LP gas tanks, stored petrol and in the near future Plug In and Hybrid Electric Vehicles with Lithium Ion batteries up to 10 times bigger than offered by domestic battery storage systems.

First responders cannot rely on the DERR as a reliable source of information. The lack of incentives to provide the information was mentioned during the workshop. It was suggested compliance with reporting requirements would be low. Manual processing also introduces delays and invariably data entry errors. It highlights first responders cannot rely on information provided by the DERR.

Not all domestic storage batteries present the same fire risk. Batteries using Lithium Ion chemistries present a significant fire risk, however other battery chemistries present different risks. For example while batteries using salt

water chemistries (developed by Australian researchers) do not present a fire risk they are significantly heavier than Lithium Ion batteries. This information is proposed for inclusion in the DERR but practical problems associated with how to present the relevant information while rushing to the emergency needs to be considered.

First responders need to be made aware the danger is present, and ***where*** that danger is located. There is currently no suggestion the DERR will store the battery location. Missing this critical information further reduces the value of the DERR.

First responders need to know how to electrically isolate the battery to avoid electric shock. Electrical shock is a genuine hazard for batteries intended to provide back-up power to the premises in case of a grid outage. A battery system capable of supplying back-up power continues to present an electrical shock hazard even if the premises are disconnected from the mains. The DERR does not store details of how to isolate the battery system (not should it).

There is a far cheaper method of warning first responders of the presence of batteries. It is shown on hazard and warning signs required at the premises. These warning signs include the battery type, location and how to isolate it. In addition to providing far more reliable information than the DERR the signs are also much cheaper than the DERR.

The proposal also overlooks significant complications of providing first responders with simple secure remote access to consumer information. Most consumers would consider detailed information about equipment installed at their premises to be private. They would want controlled access to this information. This is not provided by “an app on a tablet”. If the tablet is lost or stolen then its access to the data must be immediately removed. Solutions exist, but the cost to implement them has not been included in the financial assessment.

It is important to consider if other solutions will deliver the desired outcome before the DERR is ready. The draft Australian domestic battery installation standard (AS5139) suggests solutions to the numerous hazards presented by domestic storage batteries. For example ensuring ventilation for lead-acid battery systems (which can release highly explosive hydrogen gas during charging) and providing fire retardant barriers between domestic premises and Lithium Ion batteries (it did not suggest all Lithium Ion batteries be installed in a ‘concrete bunker separate from the house’ as many opponents of the standard suggested).

While AS5139 is currently being revised in response to significant feedback it does suggest the industry is working to address the many acknowledged dangers posed by battery storage systems. Adoption of these installation standards reduces benefits being claimed for the DERR (since they would still be delivered even without the DERR).

The conclusion is the DERR does not significantly improve the safety of domestic battery storage systems compared to cheaper alternatives. Adding missing information in an attempt to make the DERR more relevant to first responders only increases the cost of the final solution.

Conclusion

Complex interactions between household electricity use, solar system output and battery storage result in dynamic loads. The proposed DERR only stores static information. This static information does not support accurate load forecasts. For example two households with exactly the same solar system and battery storage system will often present totally different network loads.

Measurement is the only way to accurately determine the impact of consumer installed DER on network load forecasts. AEMO requires separate measurement for all commercial DER, but this requirement does not exist when consumers install exactly the same DER. Overseas market operators support separate measurement, not expensive static registers.

This submission has discussed how the application of modern estimation techniques would allow AEMO to determine relevant parameters. These estimation techniques can be fully automated and applied to data already being collected by AEMO. The relevant parameters would directly support improved AEMO load forecasts.

The financial assessment used to support the DERR is deeply flawed. It overestimates benefits and significantly underestimates costs.

About Dr Martin Gill

Dr Martin Gill is an independent consultant specialising in the provision of consumer advice based on a deep understanding of the Australian energy industry and strong analytical skills. As a consultant he has prepared advice for consumer advocates, government regulators, electricity distributors, electricity retailers, asset operators and equipment vendors.

He currently represents the interests of consumers on a range of Standards Australia committees including metering, renewable power systems, battery storage, electric vehicles and demand management.

Dr Gill is a metering expert. During the National Smart Metering Program he facilitated the development of a specification for Australian smart meters. Innovative metering products developed by his teams have been externally recognised with the Green Globe Award, NSW Government's Premier's Award and Best New Product by the Australian Electrical and Electronics Manufacturers Association.

Comments or Questions?

The author is happy to receive comments or questions about this submission. He can be contacted at
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Citation

Please accurately attribute all quotes and references to this submission. It would be appreciated if references also included the author's website drmartingill.com.au.