ENERGY STORAGE WORLD FORUM 2020 HIGHLIGHTS

By Dan Bielich, B.Sc. – Climate Science, M.S. Env, completing B. Ren-Eng

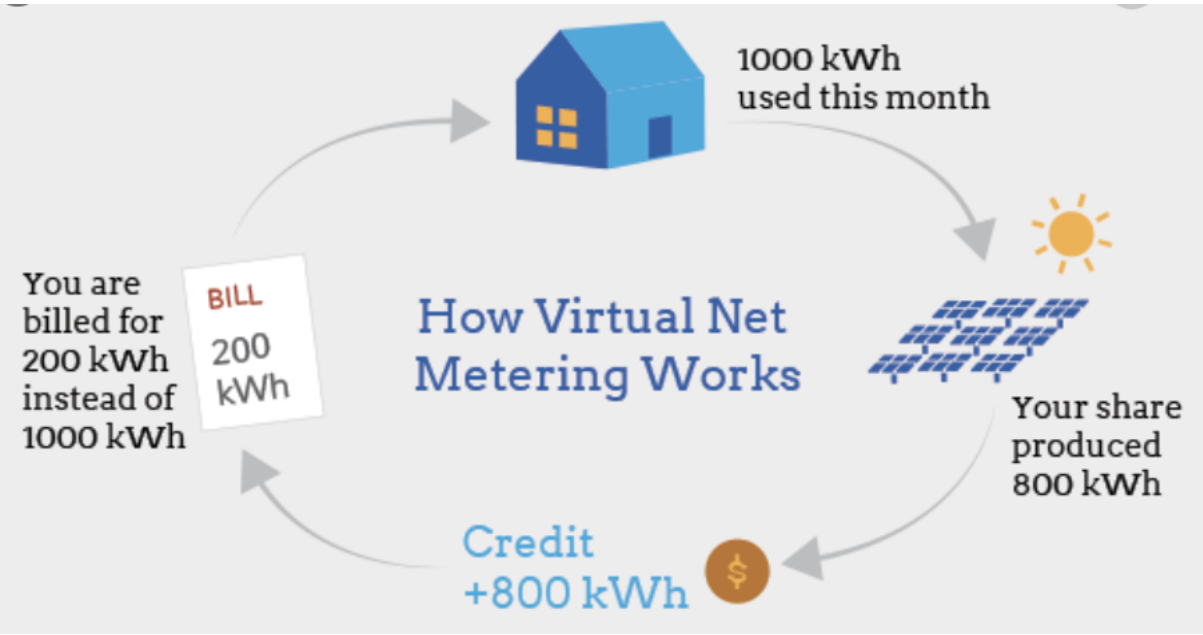
The main company behind the Energy Storage World Forum is Dufresne who specialises in high quality market driven conferences and training. The company primarily forces on energy storage that are applied in residential and industrial industries, and can be integrated in systems such as microgrids. The following summary will include definitions, facts and information that are relevant to residential properties and storage systems that were discussed throughout the 13th Energy Storage World Forum 2020. This paper aims at clarifying industry jargon, simplify technical concepts and provide a brief overview of the developments and viable options of residential storage systems.

DEFINITIONS:

Usually when talking about residential storage, certain terms such as “grid scale” or “community battery" or “ residential energy storage” come up. The difference between these terms are as follows: “**Grid Scale/Community Battery**” is a shared common battery which is connected to the local network. Whilst a “**Residential Energy Storage**” is a suburban solar energy storage system.

What is Virtual Net Metering?

Virtual Net Metering is a concept that uses energy credits as a form of currency, which is traded in the units of kWh that are generated by the residentially installed renewable energy systems. These credits can be utilised to credit your energy bill or can be shared and traded between community members. Even though renewable energy prices have fallen over the last few years, to many family’s renewable energy systems is still not an economically viable option. However, the options are becoming available such as the renting of infrastructure from retailers which allows access to solar generated electricity. This suggests that an energy retailer installs the renewable infrastructure on a consumer’s propers, and rent is paid monthly or yearly, and the quantity of energy generated is utilised to pay the consumers electric bills.



(Energysage, 2020)

How much do you actually save?

The amount of money saved through the use of renewable energy systems on residential properties are calculated utilising the following equation:

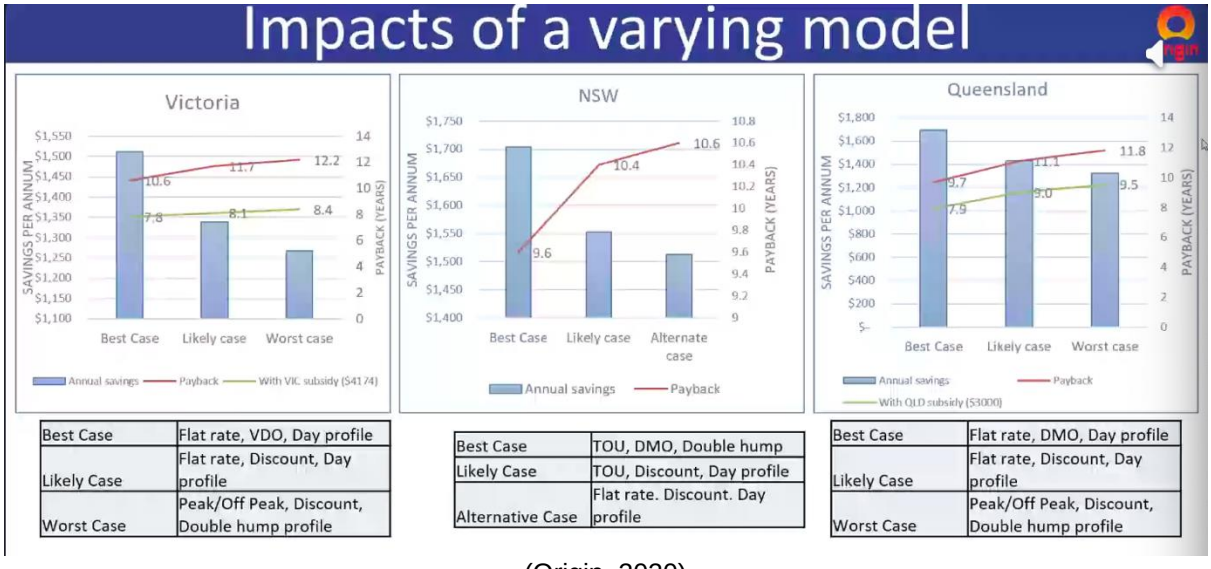
Savings = **Avoided grid usage** (solar consumption + battery consumption) + **feed in credits**

There are, however, many factors that affect this savings quantity. For example:

1. **Customer Usage** – The energy usage of a household is the primary factor that determines the size of the renewable energy system required for the property. Values of energy use tends to increase as the quantities of members in the households increases.
2. **Customer Tariff (E.G. Flat rate, peak rates)** – according to an industry study a major issue identified as to why consumers have no adopted renewable energy is their lack of understanding on renewable energy and the tariff system (as tariff rates change when adopting renewable technology).
3. **Network Location** – At this current point in time, renewable energy is adopted on residential properties as a hybrid system that adjusts between the national grid and renewables as energy needs change throughout the day. Therefore, if adopting renewable energy in rural areas, it may be difficult to implement this infrastructure.
4. **Feed in Tariff** - what many people do not know about renewable energy systems, is that their feed in tariff rates change depending on their customer energy usage and energy requirements (for example whether the energy is to be feed in to the grid or utilise the energy directly).

Payback Period for a Renewable Energy Storage System:

One of the most asked questions when contemplating whether or not to invest into a renewable technology is the payback period. Over the last 15 years the payback period for solar systems have dramatically decreased with the help of government subsidies. However, when it comes to storage systems the investment becomes a little more unstable with the latest projections. According to Origin, the following graphs show the approximate payback period of storage systems in residential areas. These figures are heavily dependent on each state's monthly and yearly solar irradiation values. With the current irradiation values, and high cost of storage systems the payback period in Victoria is between 10.6 and 12.2 years, in NSW it's between 9.6 and 10.6 years and in Queensland is between 9.7 and 11.8. Since irradiation levels are quite stable from year to year, the only way for the payback period to fall to more competitive values is by decreasing the infrastructure cost.



Best Case	Flat rate, VDO, Day profile
Likely Case	Flat rate, Discount, Day profile
Worst Case	Peak/Off Peak, Discount, Double hump profile

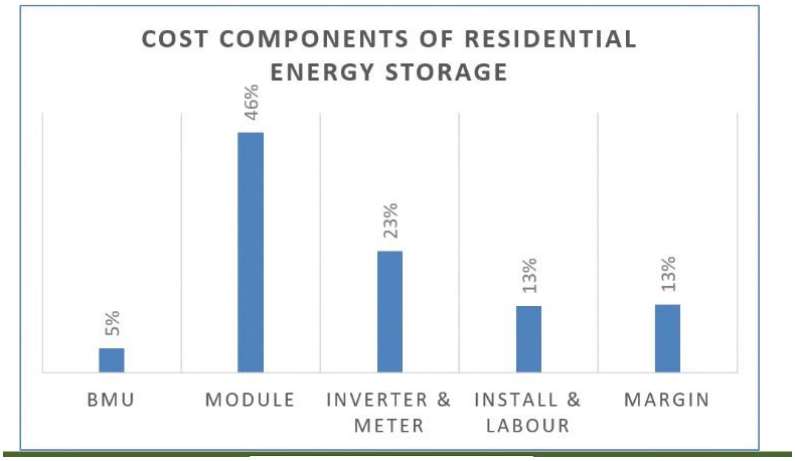
Best Case	TOU, DMO, Double hump
Likely Case	TOU, Discount, Day profile
Alternative Case	Flat rate. Discount. Day profile

Best Case	Flat rate, DMO, Day profile
Likely Case	Flat rate, Discount, Day profile
Worst Case	Peak/Off Peak, Discount, Double hump profile

(Origin, 2020)

COST

Costs were projected to fall over the last 5 years, the same way that renewable have. However, this has not been in the case. Instead, we have seen a stabilisation of market prices for renewable energy storage systems. From the graph below it is clear that the technology itself is still the most expensive, which is driving prices to soar. In the current market, you still need to have a minimum sized system of 5MW or more to change any behaviour of wholesale traders. What is needed is for the state departments to bring together the value between networks, retailers and customers, and support it with incentives to assist the technology on a residential scale. However, there is a still a number of issues that are limiting the market development of battery storage systems. A prominent one is the effect of temperature on battery systems. For example, if a residential battery system is outside and exposed to temperatures above 35 degrees, it would heavily affect battery performance. Studies were conducted to find alternative locations within the household that would keep temperatures below 35 degrees. One location tested was the laundry, however results concluded that even the lint found in the air was found to be imbedded in the battery systems ducts causing performance to decrease. Currently, the most preferred option is an isolated air-conditioned casing in which the battery system itself is contained. However, the energy usage from the air-conditioned box alone can consumer over 500W.



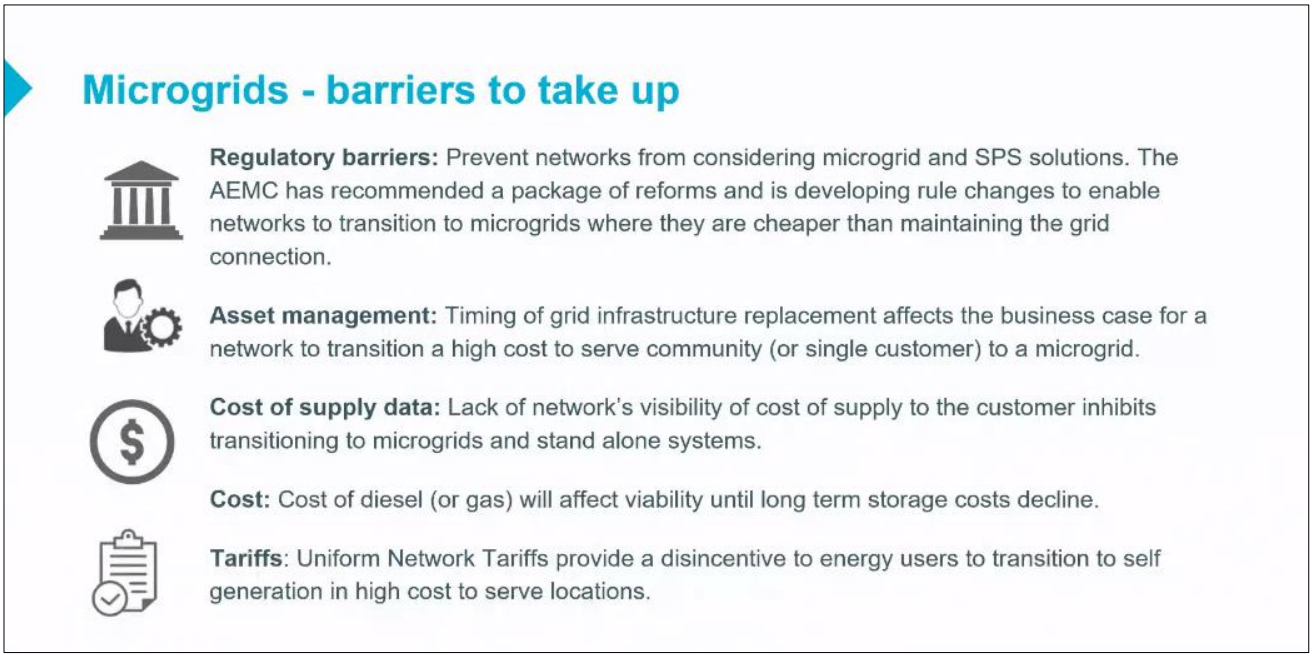
(Origin, 2020)

ISSUES AND CHALLENGES

The air-conditioned enclosure is not the only issues that arise from renewable storage systems, other common issues include voltage rises, distributional issues, pricing and access. All of these issues make storage a complicated and uncertain investment at the moment. On top of this, the current regulatory framework is still set up in its traditional ways and is seriously outdated to allow this technology to develop in this market. The legislative framework must adapt to the changing needs of the renewable electricity system user.

The technology and current legislative infrastructure may not yet be at a stage for a wide scale adoption on a residential scale, hence, why the implementation of microgrid systems may be an appropriate alternative. The implementation of a small scale microgrid system may assist in developing the technology further, and to lubricate its development in the market to further decrease costs to a competitive stage. However, even when it comes to microgrids there are still a number of challenges that are limiting its development. These challenges are summarised in the figure below.

Another obstacle is the poor customer understanding of renewable energy technology which is a major barrier that energy retailers have when connecting with customers, and assisting in making a decision.



Majority of retailers are focussing on questions such as – what are our customers future energy needs, what is the most efficient way to service those needs and what is the most efficient pathway to the Future Grid? After a public survey it was concluded that what the public is looking or is a "plug in and play" concept, which is simple, consistent, and effortless, that is what people want for their energy. Based on this the energy retailers are looking on a marketing strategy that focuses on a simple, clear, consistent communication method, through the use of friendly channels to educate the customer and assisting in power system fundamentals, transparency in contract technical terms, and matching the customer with the appropriate renewable system.

One of the largest issues is the export from residential systems back to the grid which can overload the grid. As a result, there must be legislation implemented to guide the industry and limit the quantity of energy being exported back into the grid. More specifically, a flexible export limit is needed to relieve pressure on the grid during critical times throughout the day. In the graph below we see the daily profile of energy use in an average suburban household. The light blue shaded area is the impact of a residential battery, whilst the thick blue line is the energy usage throughout the day. The negative troughs correspond to the energy sold back to the grid. The shaded red is the high-cost peak times, and the export limit/day. This infrastructure was created to allow the implementation of supporting renewable energies, including Tesla technology onto the grid.

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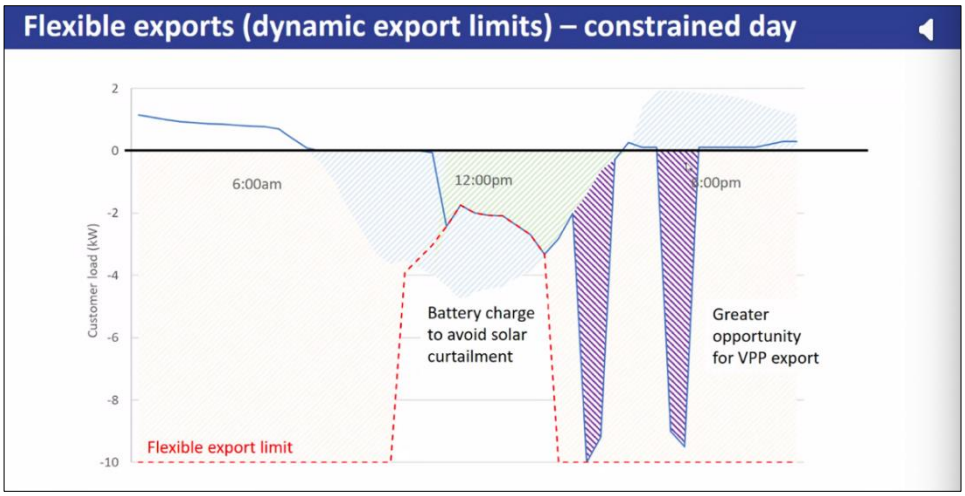
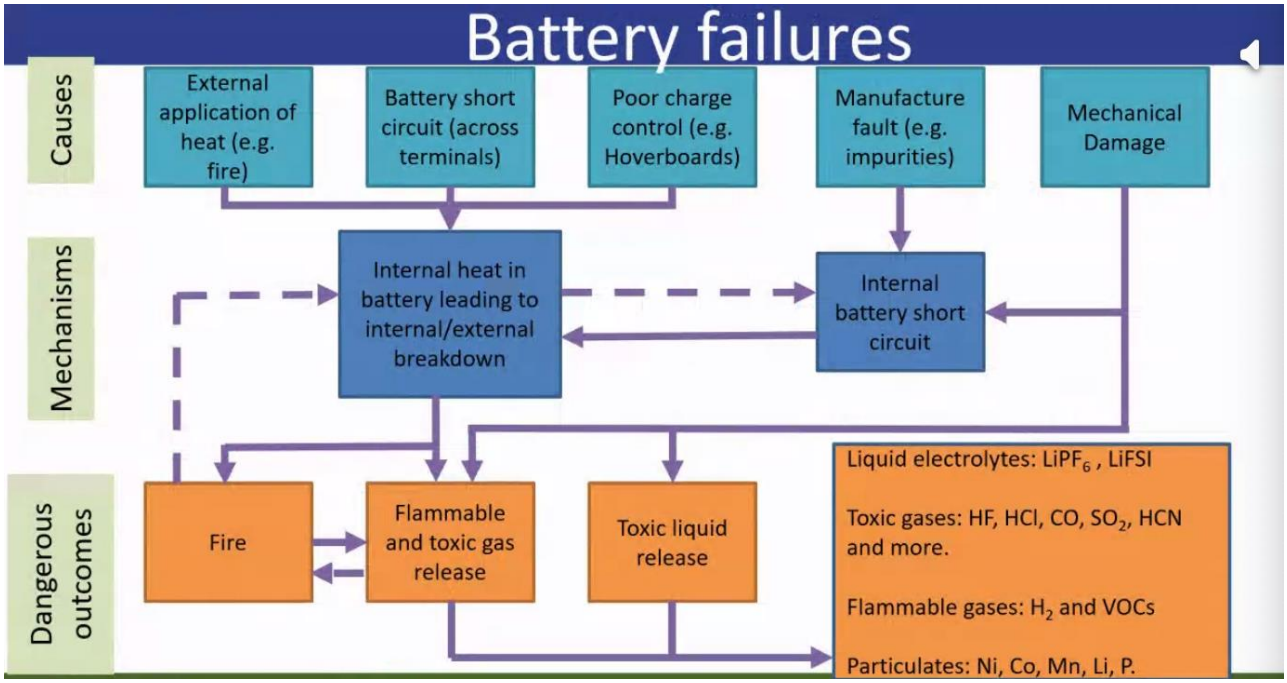


(Brown, 2020)

BATTERY WARNING

Battery failure doesn't occur often, but it when it does the consequences can be quite destructive and dangerous. The figure below summaries the causes, mechanisms and dangerous consequences from said causes that may occur whilst owning a battery system. The industry standard for safety is held as a priority when it comes to battery system, meaning a variety of failsafe mechanisms and precautions are installed onto the systems to reduce the chances of fire or toxic gas release. However, there is always a small chance that a malfunction occurs.



(Moore, 2020)

SUMMARY OF RECOMMENDATIONS

- Flexible export limits of PV generations to allow customers to connect but limit the export to grid.
- Promote and install smart inverter in jurisdiction that expect PV growth to limit voltage rise problems.
- Consider other mitigation measures to complement smart inverters – smart inverters are not perfect; hence an alternative should be established to relief pressure, and compliment the smart inverters.
- Upgrade transformers during replacement activities to improve network efficiency that are more suited to new renewable energy infrastructure.
- Build power flow models for a wide range of IV networks
- Explore the potential of behind the meter batteries – storage may not help, but to further explore the viable options of battery systems to support the grid on a utility and residential scale.

CONCLUSION

The Energy Storage World Forum provided a renewed and up to date outlook on the current technologies available on the market for renewable energy and storage systems. On top of this, this year's conference provided an insight into the industries mechanisms that drives the renewable energy market and the much-needed adjustments in legislation to efficiently develop the technology, and assist in market development. Over the next few years Energy Storage World Forum will continue to update the world in the storage technologies innovations that play a significant part in the renewable revolution.

REFERENCES:

- https://news.energysage.com/virtual-net-metering-what-is-it-how-does-it-work/
- 13th Energy Storage World Forum Virtual Conference