Professional Development for the Energy Storage Industry: Who needs it?

The ever increasing publicity and media surrounding 'Energy Storage' is promulgated by all sectors of the energy market: industry journalists, network operators, energy retailers, equipment retailers, wholesalers, system designers and installers.

What training is currently available for the energy storage industry?

From GSES' perspective, as an engineering consultancy and training company, the additional knowledge and skills to competently address the energy storage market are extensive, and are often glossed over with glib advertising generalities. This rush towards a new technology raises the question: 'what base knowledge and skills would be considered necessary for this market?'

Qualifications have been developed to ensure the appropriate knowledge and skills are developed in the industry. The qualifications pathways currently available are:

1. Electrician's license
2. Accreditation for design/install grid connected PV systems
3. Accreditation endorsement for design/install grid connected PV systems with energy storage

Or:

1. Electrician's license
2. Accreditation for design/install Stand-alone Power Systems
3. Engineering qualification
4. Accreditation for design of grid connected PV systems
5. Accreditation endorsement for design of grid connected PV systems with energy storage

Or:

1. Engineering qualification
2. Accreditation for design of Stand-alone systems

These qualifications represent the minimum level of knowledge and skills for anyone working in this market, and similar expertise should underpin any products and solutions offered by wholesalers and retailers.

What can we learn from our experience with the PV industry?

It is likely that the energy storage industry will experience the same explosive growth that we have seen with grid connected PV. The experience of the grid connected (GC) PV revolution in Australia has shown that there are several facets that have the potential to pose a threat to the energy storage industry's successful evolution:

1. The compliance regime (i.e. The Australian Standards, industry guidelines, and network regulations) failed to keep pace with the changing market, the products and the installation practices.
2. Training institutions were unprepared for the industry's training demands and initially did not have sufficient numbers of educated and prepared trainers for this market.
3. The cost of PV was driven downwards as the manufacturing competition and volumes increased. This created a positive feedback effect and resulted in rapid growth in the market which compounded the above two issues.

4. Fluctuation in government policy in relation to schemes that were designed to help the industry. (Although there is no need for government schemes to further accelerate the energy storage market, there is uncertainty in the wider regulatory environment for electricity supply.)

Why is the energy storage market demanding so much hype?

The continuous price decrease relative to shipped quantities of lithium ion batteries creates a market catalyst for energy storage. Bloomberg New Energy Finance has been monitoring the comparative experience curves of PV compared to lithium ion batteries, as shown in Figure 1 below. The cost reduction for lithium ion technology in relation to production anticipates rapid market demand for this technology similar to what has been experienced in the PV market.

Figure 1: *Experience curves of PV and lithium ion batteries*

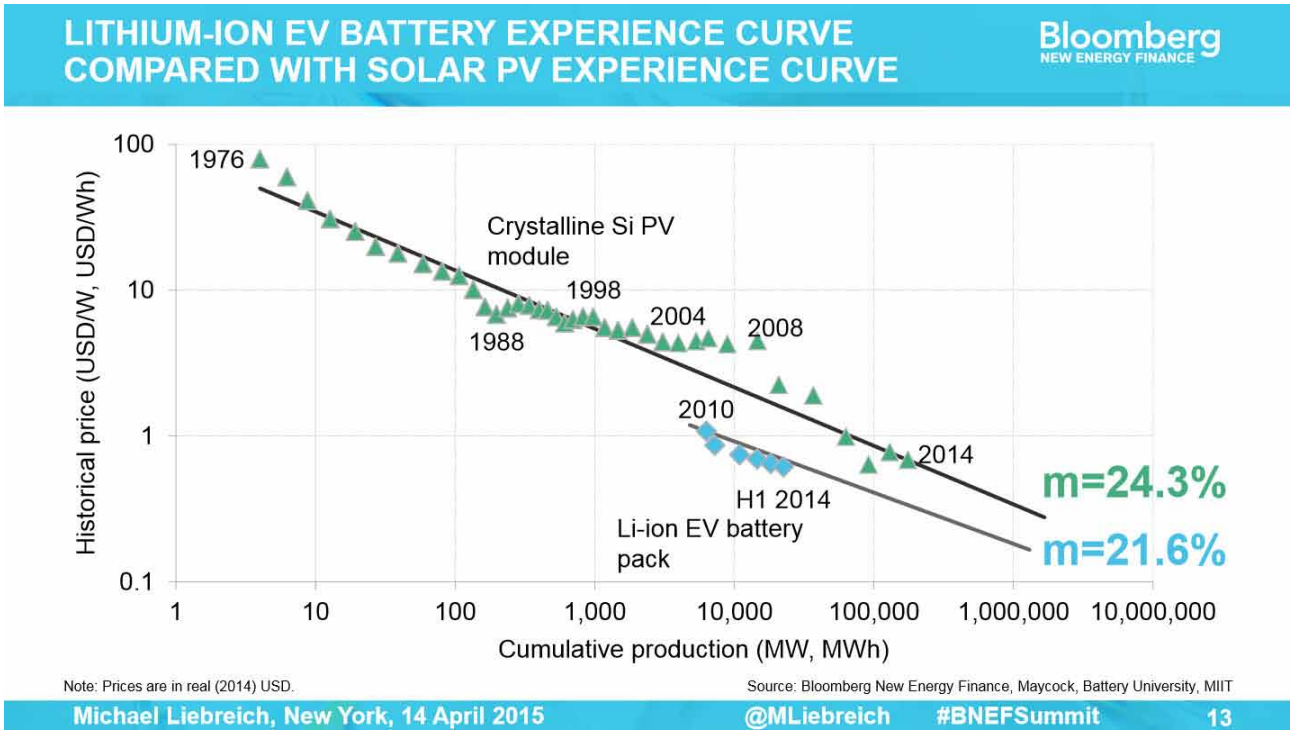
The PV industry worldwide has struggled to manage technical and performance compliance in this rapidly evolving market. For PV industries in emerging economies this continues to be an issue. New standards have evolved to address this; being internationally cross-referenced to avoid countries' having to spend time and resources developing this material on an individual basis. The need for technician-level training however is still identified as noticeably absent and a high priority in some of these developing markets.

GC PV is now on a clearer growth path. The technical and compliance implications are more manageable as experience, training regimes and trained personnel permeate all levels of the industry.

Will the energy storage market experience the same explosive growth seen for GC PV?

The industry consensus is that the energy storage market will match, if not exceed the historical growth of the GC PV market.

One very important point to note is that this market's growth cannot be necessarily viewed as an extension of the GC PV market. Industry, households and governments will all investigate installing energy storage and this will involve product and



service providers with little or no experience in the GC PV market. These service providers must develop an underpinning knowledge of the technology and the market to service these enquiries.

What are the possible pitfalls for participants rushing to enter this emerging market?

Lack of adequate training and understanding

The knowledge and experience requirement for the design and installation of energy storage in the current market consists of:

- Electrical work;
- GC PV theory, product and installation knowledge;
- GC PV Energy Storage theory, product and installation;
- Network interconnection;
- Financial assessments, etc.

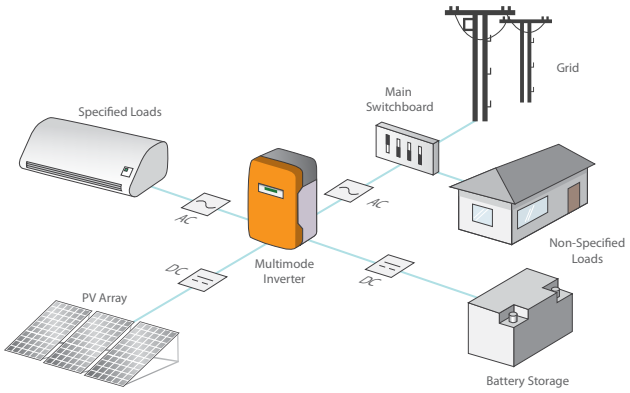
Without an adequate understanding of the above topics and issues systems will be installed that are not appropriate and potentially unsafe. Currently, it is only possible to complete the required units of competency that address battery installation if the student has first completed the units for GC PV. Given that battery systems do not necessarily need to be installed alongside a PV system, how will these installers gain the required technical information and training?

In addition to this, the performance and product data quoted for equipment and storage units currently available on the market are often inadequate and misleading. Training is therefore required to ensure that installers have a thorough understanding of the technologies they are installing, what their limitations are and how to properly assess the information in a datasheet.

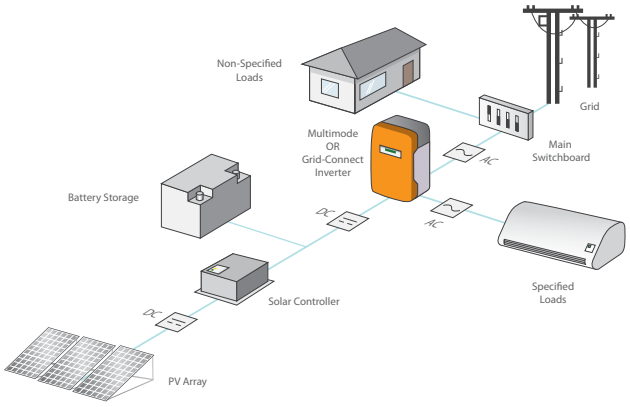
Misunderstanding of system configuration and the impacts they have on functionality and design

There are several ways that an energy storage system can be configured, which in turn will depend on several factors. Is the energy storage system in addition to a new or pre-existing GC PV system? Is the intended storage system stand-alone or grid-connected? The system's designer, installer and equipment supplier all have to understand, quote and install the correct solution.

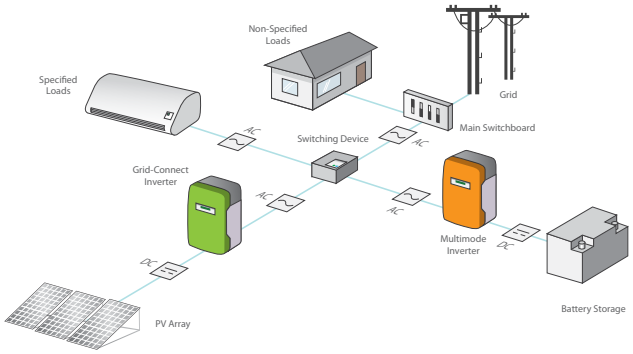
GSES has identified the following possible system configurations:



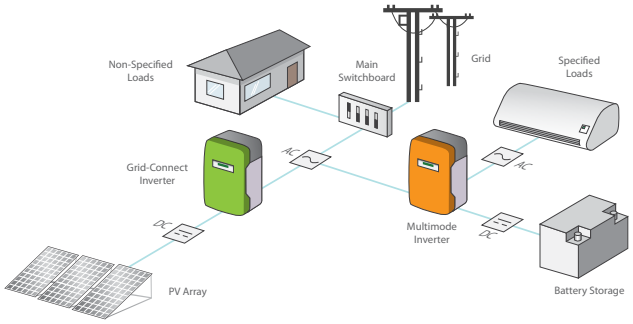
1. Single Hybrid Inverter - provides functionality of GC PV and regulates the battery charge and discharge. Is capable of providing some backup for selected AC loads.



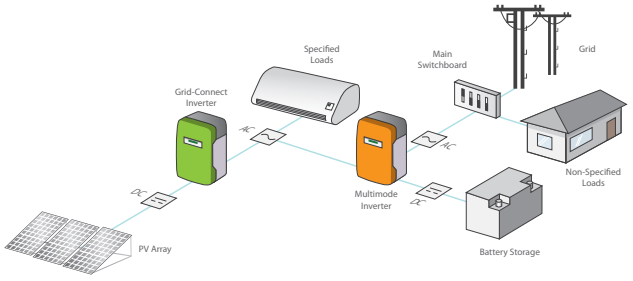
2. Single inverter with Separate Solar Controller – provides functionality of GC PV as well as providing some backup for selected AC loads.



3. Two inverters with interconnecting Switching Device – this configuration has both inverters, the specified loads and the grid all interconnected.

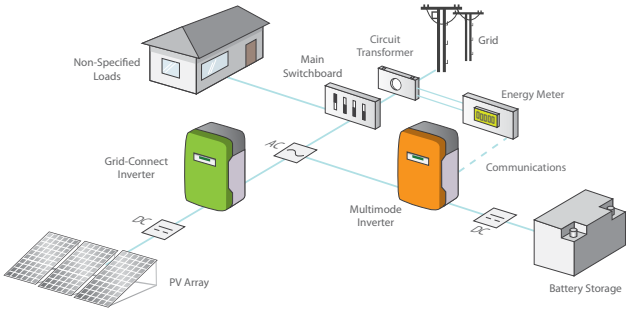


4. Multimode and GC PV inverter - this is a simple configuration with a standard GC PV system operating as normal, and a battery system essentially operating independently supplying specified loads.



5. Multimode and GC PV inverter – both inverters are able to supply the specified loads independently of the grid.

In addition to any of the configurations outlined above, systems can be set up to optimize self-consumption of solar generation. An external current sensor monitors the customer's mains to detect when power is being exported to the grid. This allows the multimode inverter to seamlessly switch between import/export to the batteries in order to minimise exporting PV to the grid.



Accurate economic assessment

The economic rationales and assessments that surround energy storage systems are varied, and in many cases not defined by current practices, regulations and standards. There is much uncertainty about the performance of the technology, its capabilities and longevity. The pricing of electricity and its supply in the marketplace is also subject to continual variations and performance stipulations. Therefore any proposed business models of energy storage companies could be inaccurate over time.

Lack of Australian standards and guidelines

There are currently no Australian Standards or guidelines that apply to energy storage as currently promoted in the market. Standards do exist for stand-alone systems power systems and stationary batteries; however these only deal with lead acid technology, not lithium ion (which is the vast majority of grid connected battery products). Revisions are underway but in the interim, energy storage systems are being sold and installed according to the current Standards and laws, which in many cases are imprecise and not technology specific.

Without this, how will the industry monitor the state of health, performance and financial viability of energy storage systems? PV can be very forgiving; however energy storage does not provide this same comfort.

Conclusions

Until the regulations catch up with the energy storage market and the products offered for sale have stabilized in the market, there needs to be technically appropriate continuous professional development available for all levels of the industry. The industry and its members must be equipped to quote, supply and install acceptable and safe storage systems in the absence of specific standards and guidelines.

GSES welcomes feedback on technical papers and other resources available on www.gses.com.au, please contact GSES by email at info@gses.com.au or by telephone on 1300 265 525.