

## FAQs regarding the RESU 6.4EX Storage Unit

### 1. What are LG Chem's plans for Australia?

Initially we plan to launch RESU 6.4EX EX, a residential storage solution, which is an expandable unit and which has had a great market response in Japan and Europe. As awareness of our products and overall interest increases we will also release the high capacity and high energy residential as well as commercial storage solutions, together with MhW Grid connection type storage. These additional products are ready to come in the market late in 2015 and in 2016.

### 2. When are the LG Chem products for residential storage due for release in Australia?

Our RESU 6.4EX product will be available in Australia in late July/early August. We are currently trialing some units and these trials will determine the final launch date. The initial units of the RESU 6.4EX will be shipped to Solar Juice and should arrive in late July/early August. The expansion units of 3.3kWh will be shipped in August and will be available September. We are looking to introduce commercial ESS (42kWh, 84kWh) and Grid connection products (MWh Scale). While we expect Solar Juice to be a solid distribution channel, other distribution channels will be become also available. It is planned that all storage units will go via distributors, other than special large scale orders for specific commercial or new residential development customers.

### 3. What is the expected cost for the RESU 6.4EX?

Obviously the distributors will set the price point, but we will be very competitive with other products like Samsung or Tesla now and in the future. The RESU 6.4EX will be paired with the SMA Sunny Island range. Therefore total price will depend on a number of factors from installation price to SMA costs and out unit. We are still working out bulk purchase pricing discounts with SMA. We expect that the product will appear in a kit form from Solar Juice for example with the SMA product together. Therefore for kit pricing enquiries please for now ask Solar Juice on 02/9725 1111. Overall right now we would expect the units to have a retail price of around \$1000 per kW/h ex GST plus inverter solution. The cost curve will come down over time. The 3.2kWh expansion units will be slightly more than 50% of the RESU 6.4Ex price.

### 4. What maintenance do the RESU 6.4 EX require?

The battery management system (BMS) maintains and monitors the health of the battery cell, temp, voltage, current etc, and this information is send to the inverter and the customer's energy management system. The Sunny Island inverter controls the battery operation automatically via CAN communication, so there is no specific maintenance required. For more information please have a look at the user manual.



**5. What additional training will be required, for example if Bosch systems are installed, previous Bosch training is essential.**

A well trained solar installer with some overall understanding regarding batteries and off grid knowledge will be able to install the unit following the installation instruction. We consider to producing a video regarding installation and also on 9<sup>th</sup> of June starting at 10 am there will be a webinar in conjunction with SMA as a start to introduce the product. For more information please see the news section of [lgenergy.com.au](http://lgenergy.com.au)

In the future there will be some road shows/presentations in partnership with the distributor like Solar Juice and of course we would love to see SMA involved due to the close working relationship between RESU 6.4 and the Sunny Island range. You do not have to have an LG Chem training certificate to install the unit, normal off grid qualifications will be sufficient.

**6. Is nominal energy equivalent to "usable" energy or is usable energy Depth of Discharge x Nominal Energy?**

Usable discharge energy is calculated as nameplate 6.4kWh \* Depth of Discharge being 90% maximum. Please note, according to the set operation range via the inverter the Usable DoD can be changed – for example to 80%. The lower the DoD, the longer the battery life.

**7. Can you connect multiple units together to provide customers with 10kWh, 15kWh options?**

If you add two 3.6kWh expansion units to RESU 6.4EX, it will be expanded to 12.8kWh. But it is not possible to exceed on one phase the 12.8kWh. In the range of 15kWh to 40kWh storage LG Chem will supply only the battery to our partners and they design and offer the full systems.

**8. Does the unit have an internal Battery Management System?**

Yes, it has internal BMS.

**9. Would these units be considered dangerous goods and therefore need specialist freight?**

Yes, it is considered dangerous goods. So the freight company has to be informed of the dangerous category. The transport arrangements require an additional document to be completed, but otherwise it is not too onerous.

**10. Some information in the previous RESU 5 brochure says the unit will be fine for 5000 cycles = 15 years. How is a cycle determined? I've been lead to believe that one cycle is one charge and discharge. Therefore 365 cycles per year = 13.7 years not 15 years?**

One cycle is a charge and discharge. But battery degradation is based on cycle life plus calendar life. Under 10yrs warranty condition, 1day 1cycle is recommended.

Our new RESU 6.4EX storage battery will last as much as 10,000 plus cycles, and yes one cycle is one charge and one discharge. But the key to a long battery life is the frequency of cycles, % of discharge and age of battery. When it comes to the warranty we are currently conservative, as is usual for a new product. We give you a 10 year warranty if total cycles per year are 300, so the overall warranty cycle is 3000. Nevertheless we are certain that even with 600 cycles per year the battery will last for more than 10 years. We expect the battery to have reached a limit of 70% capacity by 6000 cycles and 60% by 10,000 cycles under the following conditions. (Temp 25C, Current 0.33C)

### 11. How long is the warranty and what are other associated conditions?

While LG Chem expects the battery to last 6000 cycles minimum if not discharged regularly below 90%, overall warranty conditions are understandable with a new product, much more conservative.

In general the LGC's warranty for the RESU 6.4EX is 10 years. There are detailed warranty conditions available and we recommend studying the warranty document in detail. Some key warranty benchmarks are:

- LGC warrants at least 80% of Nominal Energy of the 6.4EXkWh for 7 years after the date of invoice;
- LGC warrants at least 60% of Nominal Energy 6.4EXkWh for 10 years after the date of invoice;
- The ambient temperature during the operation of the Subject of the Warranty must not fall below 0°C and not exceed 40°C;
- Battery average state of charge should be maintained within 5~95% at all time;
- The accumulated discharge energy should not be more than the nameplate energy per day eg 6.4kW; 9,6kWh or 12.8kWh to have a long battery life;
- The unit must never be exposed to a temperature exceeding 50°C;
- Also in order to take advantage of the 10 year warranty the accumulated discharge energy should not be more than 300 times of Nominal Energy per year.
- The warranted usable energy will be adjusted every year if the Customer fails to fulfil such requirements according to the following calculations:

Yearly Use Rate to obtain full warranty period in nameplate energy x 300, meaning (6.4kWh x 300) = 1920kWh. So the full ten years gives you a warranted 19,200kWh of use even though our testing indicates that with 6000 cycles at 90% discharge the storage battery actually will be able to deliver 34,560kWh. Nevertheless if the battery is "pushed" to obtain more cycles and a higher than recommended annual use rate of 1920kWh than the following warranty formula applies:

If the additional use rate is 1% to less than 10% more than recommended number of kWh then the warranted usable energy will be reduced by Additional Use Rate in per cent x 0.3.

For example if the yearly accumulated discharged energy was 2000kWh, then the warranted total usable energy would be reduced by 1.26% as the following calculation would apply: 2000kWh (used) – 1920kWh(warranty maximum per annum) = 80kWh more = 4.2% more than warranted use rate. 4.2% x 0.3= 1.26% reduction

- If more than 10% Warranted Use Rate and less than 20%, then the warranted usable energy will be reduced by Use Rate x 0.6;
- If more than 20% Warranted Use Rate and less than 30%, then the warranted usable energy will be reduced by Use Rate x 1.2;
- If more than 30% Warranted Use Rate then the warranted usable energy will be reduced by Use Rate x 1.8. Using this condition as another sample if the annual discharge energy was 2,592 kWh then this would be 35% more than the Warranted Use Rate. 35% x 1.8 = 63% reduction.

It is therefore important not to undersize the battery and to size the battery storage size appropriately, so that the likely discharged kWh required stay close to the Warranted Use Rate.

**Charge/Discharge current management:**

- Using less than 70A is recommended for longer battery life;
- Using current region between 70A~110A should be limited to 10 minutes per day
- The warranted usable energy will be adjusted downward every day the client fails to fulfill such requirements.

**12. How will the warranty work? Will the warranty be handled in Australia?**

There are still a few issues to be finalized. We are working with SMA as a partner for this product as the battery works in a kit with the SMA Sunny Island range. We will be working with SMA to have service calls and warranty calls go to the SMA service line and then will be screened and passed onto the appropriate direction. If there are some faults and customer calls, installers potentially from the LG dealer network will visit and deal with the issue (after they have obtained appropriate training and qualifications). If the fault is not able to be fixed on the spot and it is a warranty matter the unit will be replaced and sent back to LGC. If the unit failed because of abuse, then repair work which includes charges will occur. In case of warranty the end user will take back a new unit or a refurbished one or could be refunded, depending on the circumstances.

**13. How will the performance and warranty be affected if the temperature in the RESU 6.4EX rises above 40 °C?**

Above 40°C, degradation of the battery is accelerated. If the ambient temperature during the operation of the product exceeds 40°C a number of times or if the product is exposed to a temperature over 50 °C the warranty will become void.

**14. Will time shifting and peak shaving be controlled from the energy storage system?**

If the inverter can undertake these functions then the batteries will be able to support this option. We understand that the SMA Sunny Island range has this function available. (More info from SMA to come on this).

**15. Can the unit be used without renewable energy?**

If the inverter can be charged through the grid, it is possible to use batteries without renewable energy.

**16. What range of capacity will be available?**

RESU 6.4EX has 128Ah capacity. If you add an expansion Unit (up to two units, each one has 64Ah), it can be expanded to 256Ah. One RESU 6.4 EX will be able to be connected to one phase. If there is a three phase property, then actually one RESU 6.4EX could be connected to each phase. Please consider maximum size with two expansion units will be 12.8kWh per phase.

**17. What clearances does it require from a wall for ventilation?**

There is a detailed installation manual available. In regards to wall ventilation a minimum of 20mm is required.

**18. How can the 6.4kWh be extended?**

RESU 6.4EX was developed to be expandable. It can be discharged to 90%. If the customer requires a larger unit then two expansion units of 3.6kW/h each will be available. Maximum 2 units will be available. Each unit, price wise will be slightly more than 50% of the actual RESU 6.4EX unit. It is recommended to buy the expansion units not too many years apart from the initial RESU 6.4 EX unit, because if after many years the RESU 6.4 EX finally reaches end of life, then as RESU 6.4 has the battery management system embedded, the expansion units, if there are much newer, will still be ok, but the system as a whole will stop working. So for maximum, financial return it important that the unit is sized correctly initially. It is recommended that the expansion units are purchased with the RESU 6.4EX initially or within 12 month of the RESU 6.4 EX purchase.

**19. Is RESU 6.4 considered an UPS?**

If the inverter can undertake the UPS function than it is possible to back up the load up to maximum output of the battery (please note the appropriate charge time and discharge times have to be considered).

**20. What licenses do you require for install?**

There will shortly be a CEC accreditation developed for on grid storage. This will be the appropriate qualification. Obviously off grid qualifications will be suitable as well to understand the key installation issues for the product. We understand nevertheless that even off grid licence holders will have to do some additional course in the future. At this point there is a policy and regulatory gap and while we need to check one more time, it appears that a CEC accreditation or electrical licence might at this point all that is required to be able to install the unit.

**21. The unit is currently only IP 21 – therefore only suitable for indoor use. Will there be a weatherproof version for storage outside? While the storage system have inbuilt temperature control?**

LGC currently don't have any specific development plan for such an enclosure. But if customer inquiries for such an addition become very high, we will consider development of a weatherproof version/ accessory. In regards to temperature control, there is no inbuilt temperature control system. We are considering these improvements for the next generation system.

**22. Can the battery status be checked via the inverter?**

Yes the Sunny Island and the associated monitoring equipment will let the user control many battery related functions as well as monitor the battery status. There is also currently a smart phone app being developed to monitor the battery. A test version of the final APP is available in the google playstore. Search for "RESU 64".

**23. What type of battery inverters will the energy storage solution work with?**

We have done matching tests of RESU 6.4 EX with SMA Sunny Island range. In Europe the unit also works with NEDAP inverters. The BMS uses the CAN communication language, so theoretically other hybrid inverter with this language capability could work with our battery. We recommend to

distributors to sell the RESU 6.4EX with Sunny Island inverters and monitoring as a kit. In regards to Sunny Island the new smaller inverter range will work perfectly with RESU 6.4EX.

**24. Will there be systems for large commercial applications to use for peak shaving? If so, what is the expected release date for that and what procedure do we need to follow to do this?**

We have another ESS products 19inch rack mounted systems for commercial peak shaving and it is already deployed in many countries. The system is ready to come to Australia and need to have engineering discussion for designing capacity and selecting inverters in advance.

**25. What other storage products/ batteries does LG Chem consider bringing into Australia?**

- Grid (Frequency Regulation, Spinning Reserve, Load Levelling, Ancillary Service ) /Commercial ESS high Voltage system (800 ~ 1000V);
- Telecommunication base station;
- UPS for Mega data centers and similar;

**26. Will the RESU 6.4EX work during blackout?**

Currently the RESU 6.4EX works with the Sunny Island. In case of blackout the Sunny Island powers down for safety reasons. So the answer is NO at the moment, but we understand the attraction of such a feature. We are committed to have RESU 6.4EX work closely in Australia with the SMA Sunny Island range. (further information from SMA on this will be coming shortly)

**27. Will there be special packages so that trained LG installers can install to see how it works?**

Yes, LGC will in conjunction with Solar Juice create a short term trial package price for qualified LG network installers interested in trialing the unit. The units will arrive in limited numbers in late July/early August 2015. The expansion units will only be available late August 2015. The price for 1 to 5 units from Solar Juice for the LG dealers will be \$3900US, plus freight from Solar Juice plus GST. For the expansion pack please allow please allow \$US 2,100 plus transport and GST. Please email [solar.sales@lge.com.au](mailto:solar.sales@lge.com.au) expressing your interest in purchasing such a unit or multiple units of the RESU 6.4EX plus the expansion pack. . For Sunny Island pricing to get the kit please also contact Solar Juice on 02/9725 1111.

**28. Which Sunny Island unit is the best to work with the RESU 6.4EX range?**

We think the 3.0 and 4.3 are fully sufficient and will make the kit cheaper. The 6 kW will be working as well, but the 8kW plus will not work with the RESU 6.4EX.

**29. What other SMA products are required to go with the RESU6.4 and Sunny Island kit and what functions do these products perform?**

There are monitor products which form part of the kit. Please contact Solar Juice for the full kit description at 02/9725 1111 or email [info@solarjuice.com.au](mailto:info@solarjuice.com.au)

**30. How will the goods be delivered? Do you have a photo of the inside of the container?**

Please see the picture as attached. There are 4 units per pallet.



**31. Tell me the how is the best way to handle the product:**

The 6.4kW unit weighs 60kg, and cannot be manually handled by a single person - so there will need to be space between units to go in with a forklift or pallet jack. Can you let us know how the unpacking can be done easily?

As you can see there are 4 units per pallet, they can be moved onto separate small pallets and strapped down individual distribution. With a small trolley units can be handled by one person in the box. If they need to be lifted then it is a 2 person job . In regards to getting them out of the box the box opened looks like below. There is plenty of space on the side to lift product with two persons out of the box. Compared to other battery product the battery is actually comparably light.



for

**32. How many high can they be stacked?**

Product can be stack and stored up to 2 Pallets of 2 pallets of 4 units each. You will see how to stack from the pictures on the previous page.

**33. What is the required temperature, humidity to watch out for etc. any other issue to watch.**

Temp and humidity for storage is below

**Environmental requirements**

Available operating temperature	0°C to 40°C
Optimal operating temperature	15°C to 30°C
Operating relative humidity	25% to 95%
Storage temperature	-30°C to 50°C
Storage relative humidity	25% to 95%

**34. Anything to tell the transport company or receiving party how to unpack or what to watch out for?**

There is no specific information to tell transport company other the usual dangerous goods declaration.

**35. How does the product discharge – what is the shelf life a product can be sold – before it might change in quality?**

According to warranty, product should not be in shelf more than one year. Technically, battery is de-grade less than 1% of energy per year.

**36. What are the safety precautions that need to be taken for handling and storage of the units?**

A detailed safety precautions document is available and has been supplied to the distributor.

**38.Any special transportation requirements?**

Must be shipped in the original package, the package is certified as per UN transportation regulation.

**39. Has LG Chem got product planned for customer to see what battery is doing in an App with information coming out of BMS? eg charge status, how many cycles, hottest temperature unit has been exposed to?**

Yes, customer is able to see battery status from the new coming App - charge status, how many cycles, hottest temperature unit will be show.

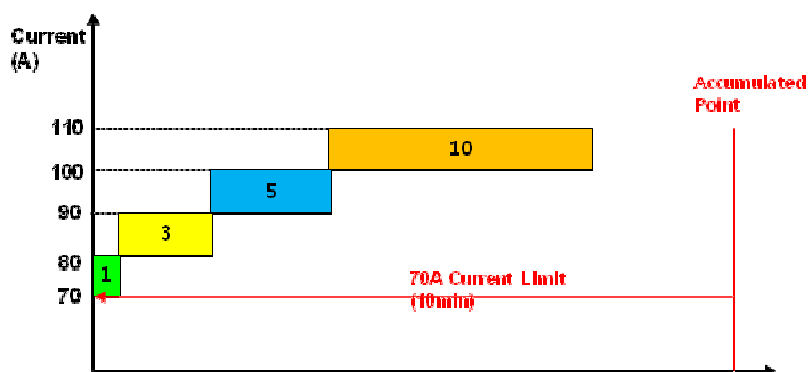
**40. Is LG battery product useable for load shifting , meaning get load from grid at non peak time and then release in peak charge time.**

We are awaiting SMA's input to this question.

**41. What can you tell me about the nominal discharge?**

The nominal discharge current is 0.3C which we recommend, but the system is allowed to use continuous 70A which is approx 3.5kW.

If over 70A is continuously going through for certain duration (duration is different above 70A at each current level) the battery then BMS commends to inverter to reduce current to 70A for 10min.



	Point	Max Duration
110~100	10	18 sec
100~90	5	36 sec
90~80	3	60 sec
80~70	1	180 sec
70	Continues Max. Current	

- Example  
: 95 A @10sec , 105A @13sec  
(5 point\*10) + (10 point \*13) = 180 point  
⇒ Then current down to 70 A. for 10min

Considering 9.6kWh and 12.8kWh, those systems have the same control system and current limitation with 6.4kWh because 6.4kWh has main controller and 3.2kWh is just battery pack to increase capacity. 3.2kWh cannot be used without 6.4kWh main system.

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