

Investor Briefing: Solving The Puzzle of an Emissions Free Grid

Our Long Duration Thermal Energy Storage Solution

Solving the Puzzle

The Quantum Sunlands Partnership is the exclusive manufacturer of the flake graphite storage media critical to Sunlands Co.'s long duration energy storage (LDES)

The Political and Media Fog... crisis, transition, winners and losers

OPINION ENERGY

Why it's hard to join the dots in Australia's energy puzzle

Jennifer Hewett
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Anthony Albanese and the Energy Security Board are determined to get the states' agreement on a capacity mechanism to provide backup power. But that requires allowing Victoria to exclude coal and gas from any payment.

Germany's decision to pass emergency laws to reopen mothballed coal mines is "bitter but essential", according to its economic minister, Robert Habeck.

That Habeck is a member of the Green Party in coalition with the Social Democrats demonstrates the political contortions in a global energy transformation suddenly desperately short of fossil fuels.

Even Australia's recent energy woes are only a mild version of the trauma threatening to cripple the German economy as Vladimir Putin further reduces supplies of Russian gas to a needy Europe. The price of Angela Merkel's deadline for shutting Germany's nuclear power and coal generation to rely on Russian gas and renewables is now stark.

The Albanese government is determined to avoid imposing such direct costs on Australian consumers and businesses despite supporting a much faster shift to more renewable energy as part of its 2030 emissions reduction target.



That balancing act is more difficult at a time of soaring global prices for coal and gas, and with no relief likely this year.

But as the past few weeks have proven, the practicalities of Australia's national energy transition and timetable are more complicated than suggested by the embrace of renewables. Energy security has become a much more important focus of public debate.

- The problem is not the shortage of fossil fuels but an increasingly unstable grid short of dispatchable baseload generation
- This problem is not new, grid operators have been aware of the instability caused by increasing intermittent generation without storage for more than a decade

The puzzle of an emissions free grid... summing up the challenges

- Current renewables generation numbers
 - 20% of NEM load
 - 35% of generation capacity
 - 2.4 million solar PV systems delivering 10.7GW

BUT

- Continued penetration of renewables limited by:
 - Operational and regulatory hurdles due to intermittency
 - Low marginal value of despatch

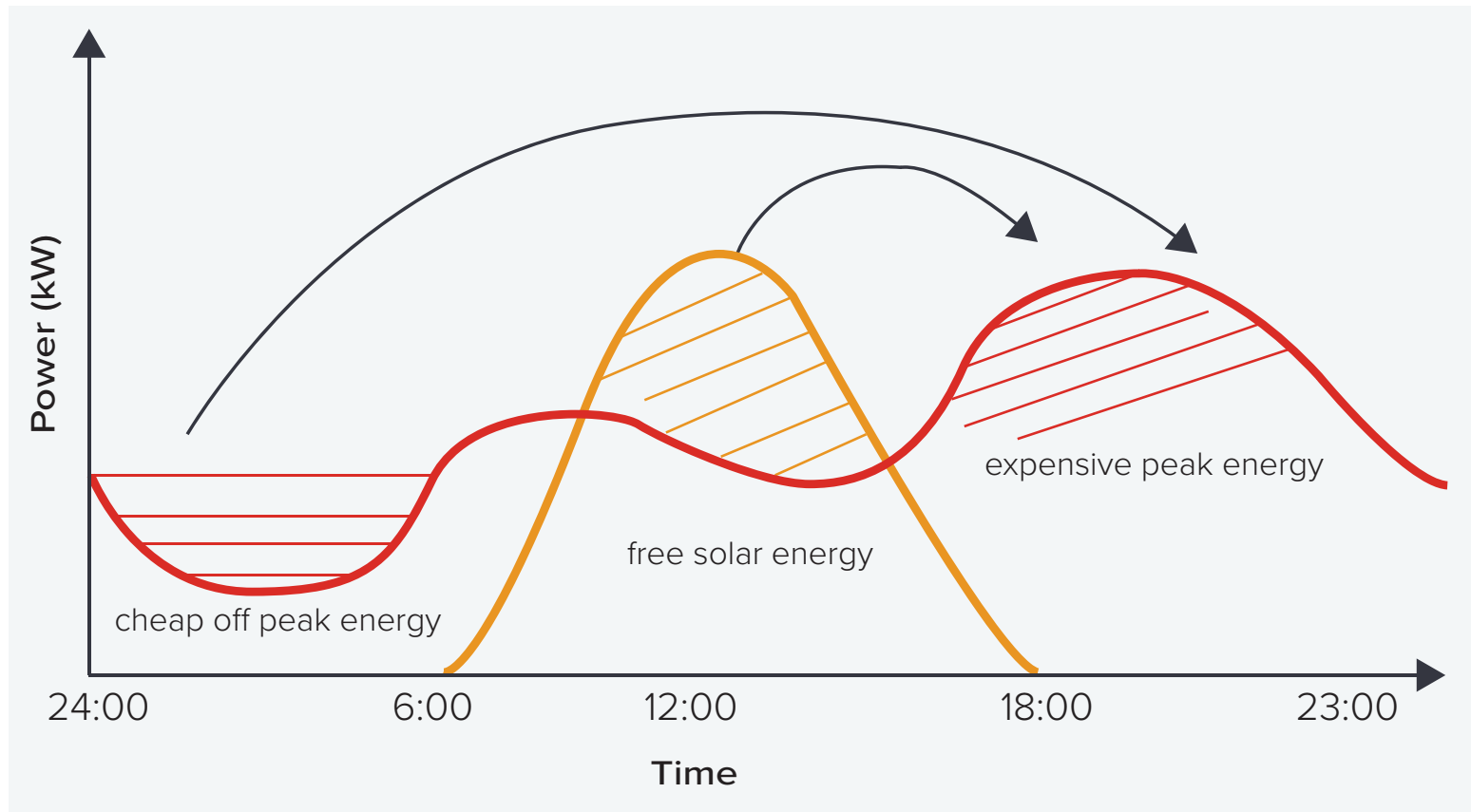
- Coal fired generators provide >40% of the NEM's base load and substantially all its inertia.

BUT

- Most of these facilities are scheduled to close within the next 7-15 years and solutions to replace the loss of inertia and dispatchability remain illusive.

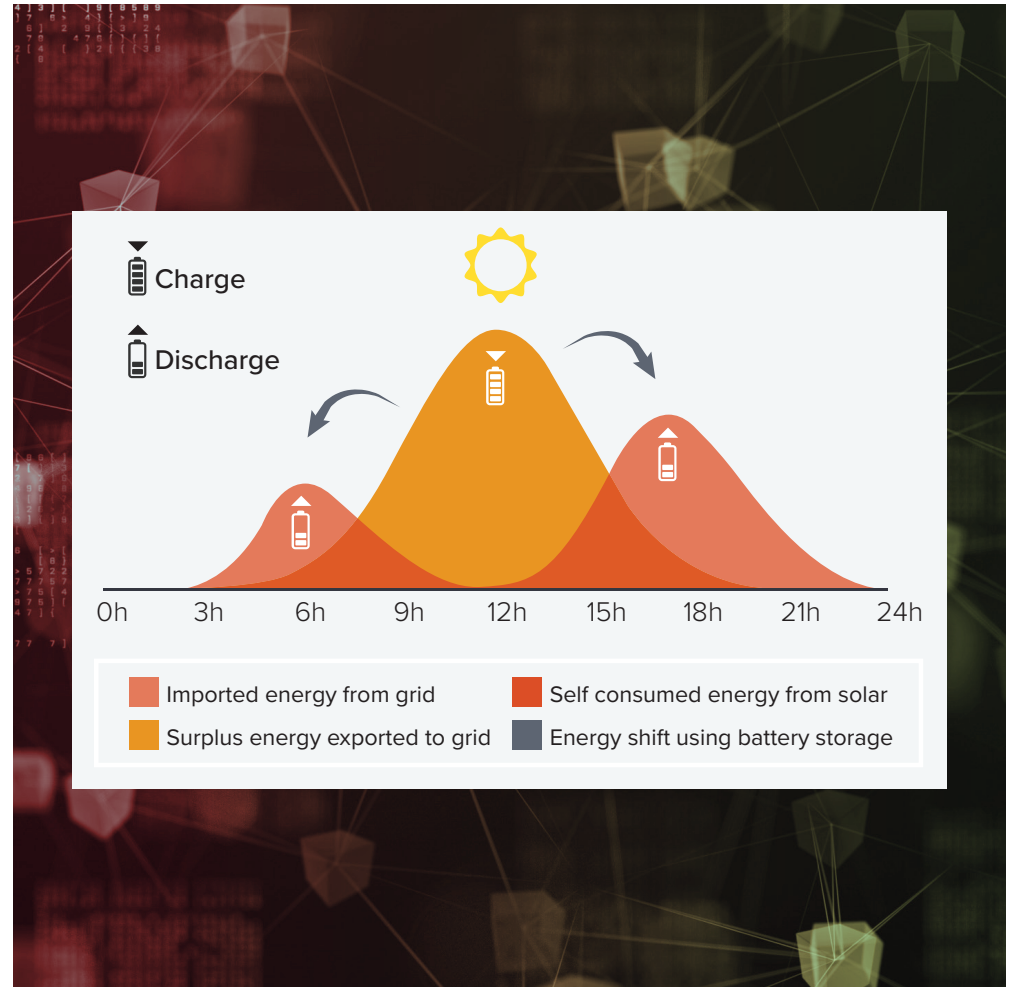
The Solution... long duration energy storage and the magic of time shifting

- Practically this is how the Sunlands Co. long duration energy storage (LDES) works

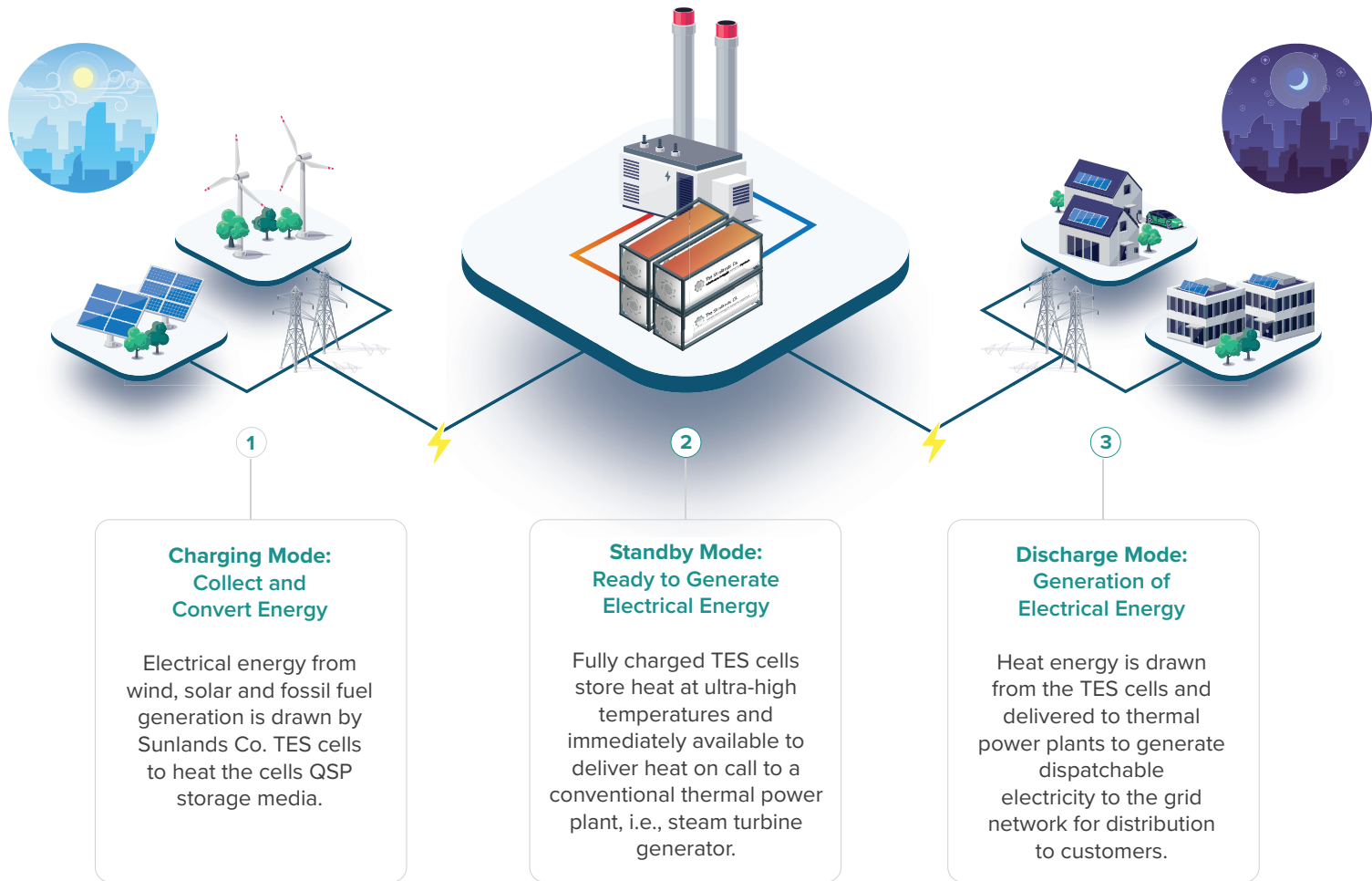


Sunlands Co.'s Technology... unique capabilities, ticks all boxes

- Our LDES delivers dispatchable generation, maintains grid stability and enables the acceleration of renewables penetration within the grid
- Sunlands Co.'s LDES technology uniquely positions it as a leading technology:
 - **capable of driving utility scale steam turbines (eg. retrofitting of coal fired power stations)**
 - **has an effective life measured in the decades**
 - **can be charged and discharged simultaneously**
 - **negligible carbon footprint**
- The key to the technology is the flake storage media to be manufactured by the Quantum Sunlands Partnership

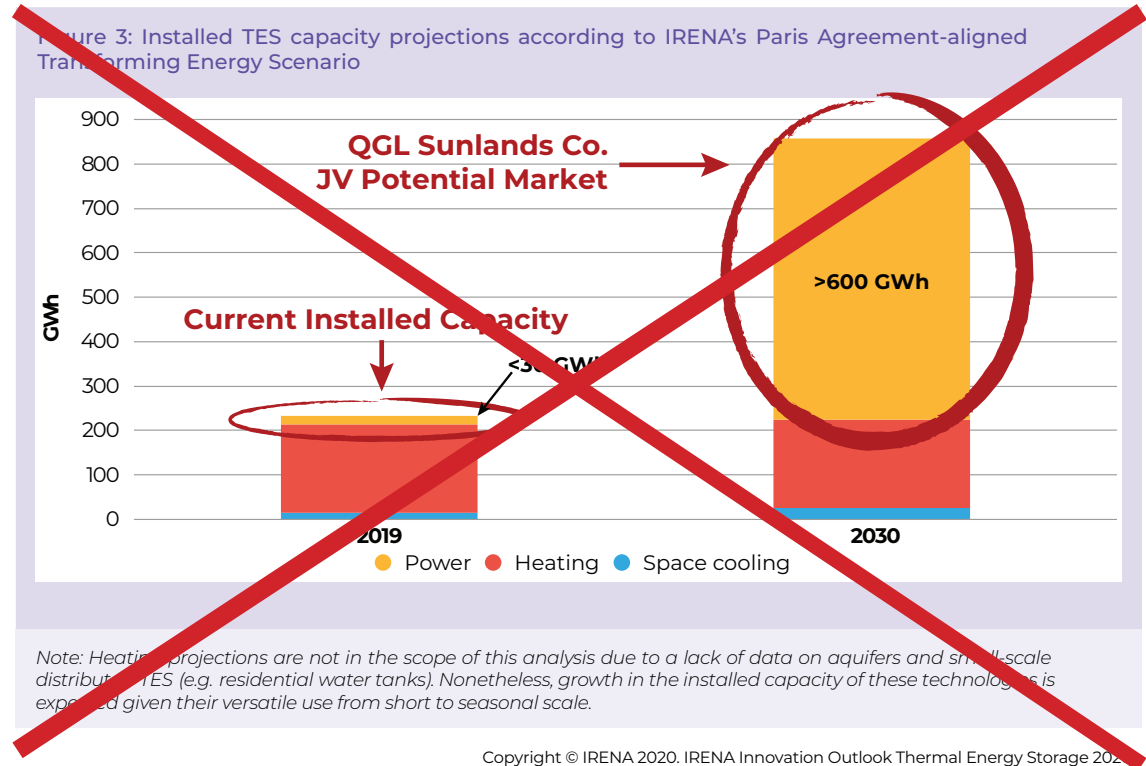


Our Solution... LDES + grid integration = grid transformation



LDES... size of the market is big and getting bigger

- In 2020 IRENA estimated LDES market growth at 20x current installed capacity within the decade
- Following Glasgow (COP 26) this estimated growth has increased significantly
- [The Quantum Sunlands Partnership independent Australian electricity market study](#) concluded that:
 - [Australia alone will require in excess of 10 GWh of storage](#)
 - [At least 100,000 tonnes \(equivalent to 1 GWh\) of natural flake graphite will be required annually to meet Australia's Net Zero by 2050 Plan](#)



Quantum Sunlands Partnership... economics

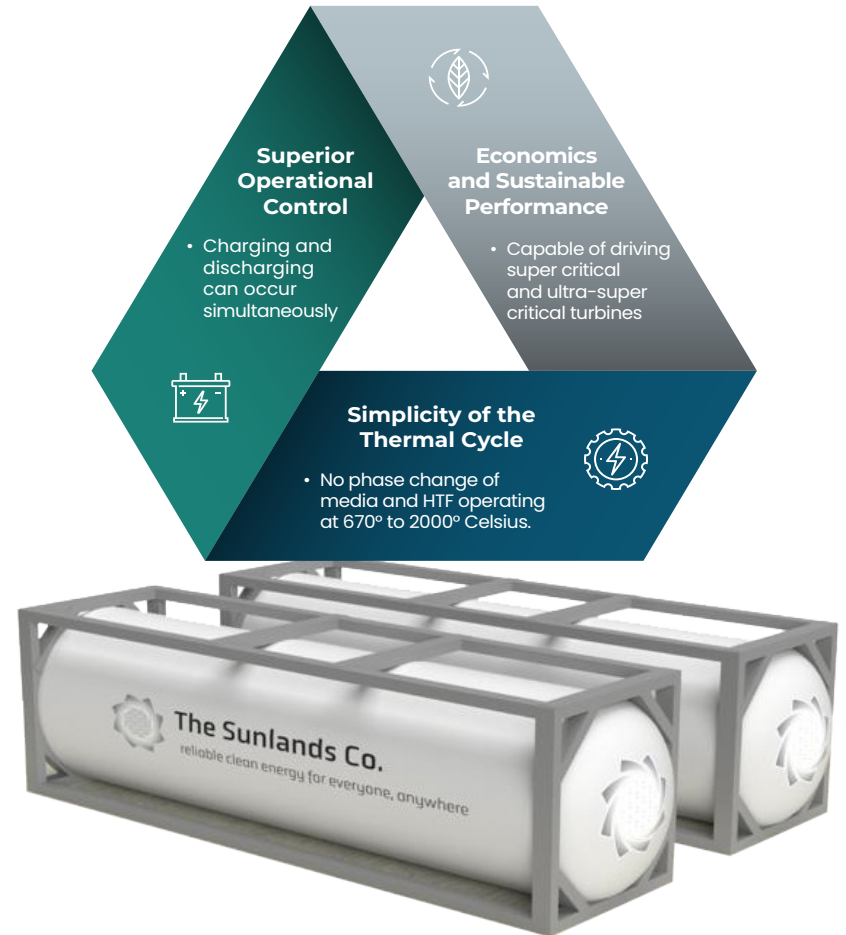
- QSP is the exclusive manufacturer of the natural flake thermal storage media required by Sunlands Co.'s energy storage cells

- This is big business – comparison of sheer tonnage requirements relative to EV

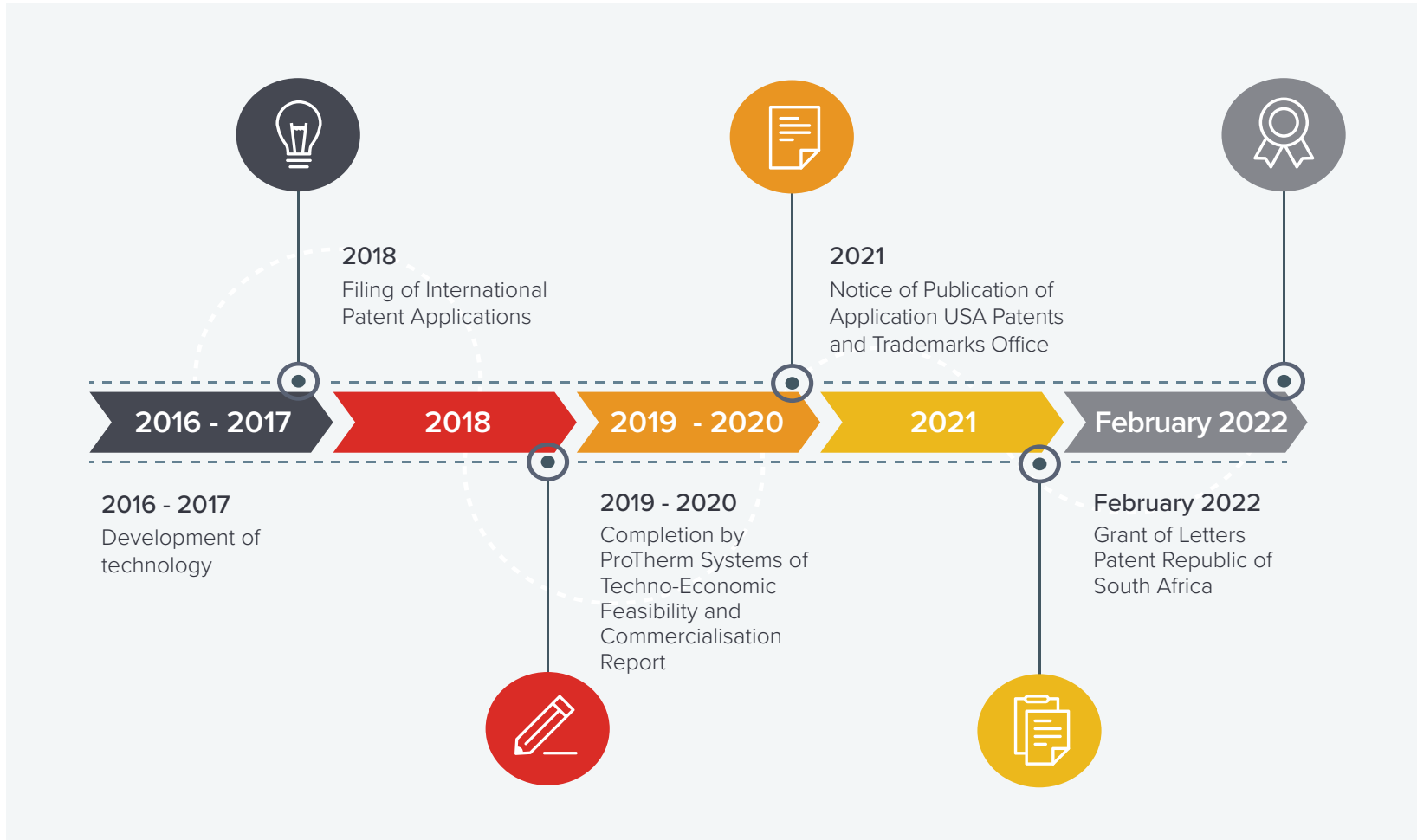
<u>EV Anode</u>	<u>1.2kg per kWh</u>
<u>Thermal Media</u>	<u>5.0 kg per kWh</u>

- QGL - QSP transfer price assumptions based on sale of natural flake at the basket price of US\$919 and sale of manufactured media at a price of US\$3,500 to US\$4,000 which represents the range of market pricing for similar media

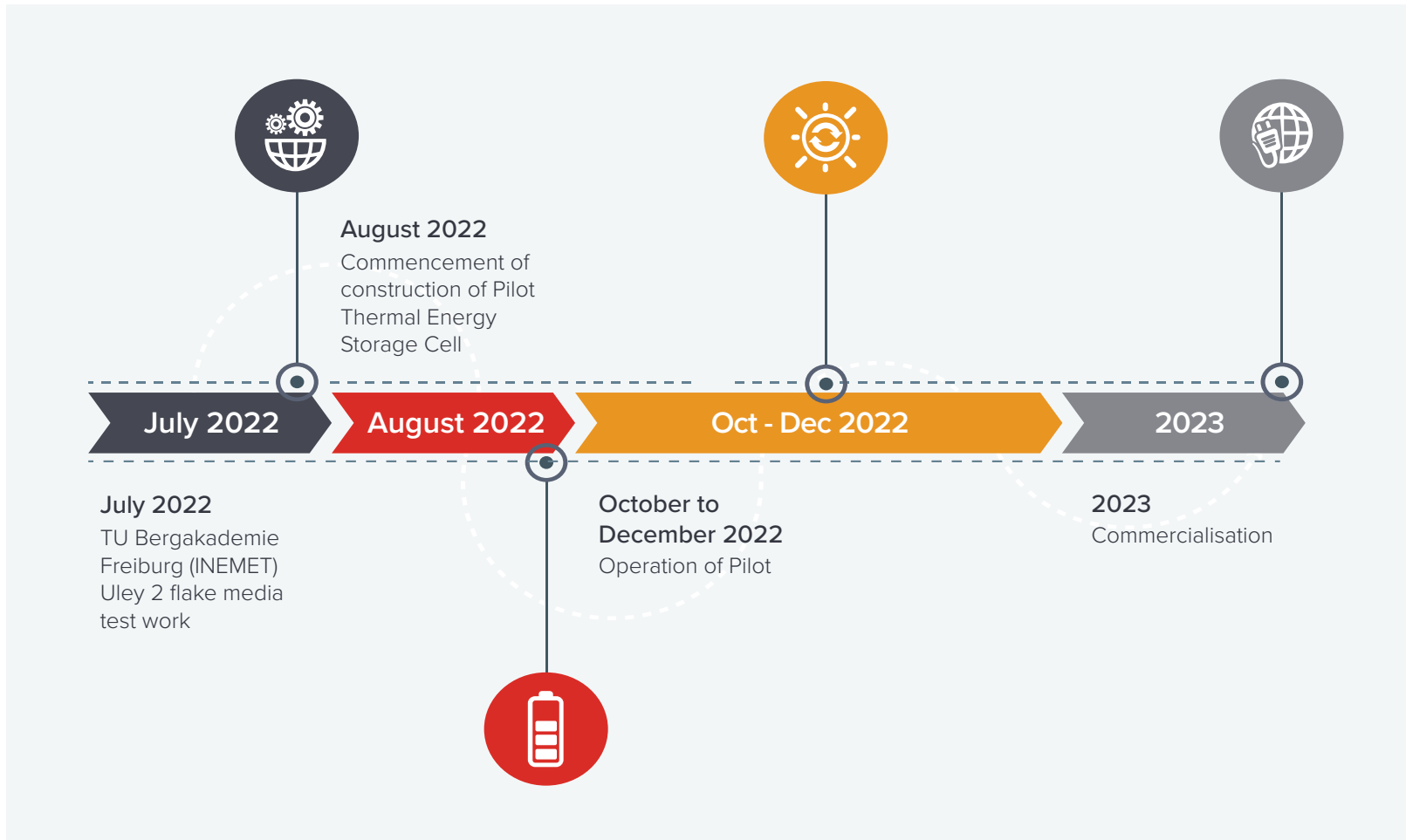
- QGL's estimated EBIT margin on every tonne sold to QSP is estimated at US\$1,650 subject to completion of TU Freiburg (INEMET) final test work program



Technology Development... completed, ready for the next phase



Technology Commercialisation... pilot plant is the final step



QUESTIONS...

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