

# IEA recommends China's smelters modulate energy

The International Energy Agency (IEA) in its February 2019 paper 'China Energy System Transformation', recommends that China's primary aluminium smelters modulate energy consumption to provide the grid with demand side response (DSR) energy flexibility.

The paper, which 'assesses the benefit of optimised operations and advanced flexibility options', sets out the significant operational value that DSR programmes can potentially deliver to a largely decarbonised Chinese power system in 2035.

China is adopting renewable energy generation faster than any other country and since 2017 Chinese policy makers have recognised DSR as a key system flexibility measure.

The IEA report includes an entire chapter on understanding the value of DSR deployment in a sustainable development scenario (SDS), and the role the EnPot modulation technology for aluminium smelters can play in it.

The report goes on to recommend; "specific government interventions may be necessary to enroll particular larger-scale load resources (e.g. aluminium smelters), including the design of financial incentives for retrofits and/or participation requirements."

## What does this mean for the rest of the world?

It could be argued that the word 'China' be dropped out of the IEA report so it reads 'Energy System Transformation', as apart from a few countries blessed with large amounts of Hydro Generation e.g. New Zealand, Norway and Iceland, the rest of the world's energy systems are similar to China's mixed generation grid.

Aluminium International Today first covered energy modulation in the September 2016 issue (Opening the Window of Opportunity), followed it up in September 2017 with 'A balancing Act', and in October 2018 published the 'The role of aluminium smelters in decarbonising our future'. It was the later article that apparently caught the attention of the IEA.

There are compelling arguments for why



aluminium smelters will both need and want to modulate energy consumption in the future.

## Exponential curve

Under all SDS's; the amount of energy storage required to maintain grid security and stability, increases exponentially the closer a grid gets to 100% renewable, until it's a 1:1 ratio or greater, depending on how much hydro storage there is in any particular grid.

Some experts argue that even with a 1:1 ratio of energy storage to generation, we still won't be able to reach 100% renewable electricity in certain grids. They point to the steepness of the renewable-penetration-to-storage-curve as it gets closer to 100%, and say it will make it impossible for some grids to decommission all thermal coal generation. Especially if they want to avoid curtailments in a deep winter scenario, where there can be periods of up to three weeks with little sun and no wind.

While battery storage may be good for four hours, it can't bridge the gap up to three weeks. Currently the only storage mechanism we have that can achieve this is pump-hydro. Pump-hydro requires building more dams and flooding more valleys, which is an expensive and unpopular proposition, especially when you consider much of it may only be required on an intermittent basis.

## DSR becomes more valuable

Large industrial users who can turn down, rather than turn off, will be in the ideal

position to liberate and sell high-value power back to the grid during times of low generation.

There will be additional benefits to those who can also increase their energy consumption at times when there is an excess of low cost or negatively priced electricity in the grid, which is also an inherent feature of renewable energy grids.

As some of the largest energy users in any grid, Al smelters are in an ideal position to capitalise on the need for grid flexibility. Retro-fitting an Al smelter with modulation technology is estimated to be at least 1/10th of the capital cost of building either new generation or new energy storage.

Significantly, modulating Al smelters are able to bridge the three-week gap that batteries cannot. Grids will increasingly need the type of DSR that modulating Al smelters can offer.

## Beyond baseload

There is now almost universal consensus that rapid response, dynamic power sources are the future of power generation and that baseload is now the "dinosaur of the energy debate".

This brings us back to the IEA China recommendations. Their prediction is that large scale DSR will be necessary under any Sustainable Development Scenarios.

Is it time for aluminium smelting to embrace the future and move beyond providing baseload, to providing something proving to be far more valuable – flexibility? ■