Change is with us – Industry and Manufacturers as part of the solution

2018 Asia Pacific Energy Leaders' Summit

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Disruption, vertical adoption curves, batteries, micro grids, smart homes, autonomous EV’s, IoT ...and?
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...you haven’t seen anything yet...
When industry moves, the world moves

Decarbonisation can’t be achieved without it

• the electrification of industry is critical to meeting decarbonisation targets
• “Electrification of industrial processes, if based on renewable technologies, may offer greater potential for $\text{CO}_2$ emissions reductions” – IEA, Energy for Industry 2017
• This includes the continued electrification of energy for motion and force, and electrification of heat and steam production.
The problem

- Industry progressively become the primary source of CO₂ emissions.
- 75% of all global direct industrial CO₂ emissions today are from five industries making basic materials; cement, iron & steel, chemicals, aluminium and pulp & paper.

Under the 2DS, industry's share of CO₂ emissions grow from 24% in 2014 to 44% in 2050

Note: these projections also rely on huge gains in energy efficiency.

Key message • In the 2DS, the power and refining sectors should achieve zero and even negative emission levels to compensate for CO₂ emissions from industry and transport.
Heat represents 74% of industrial energy demand worldwide (only 10% is currently electrified).

Source: Solar Payback (2017), based on IEA statistics and calculations by IRENA.
The ‘other’ energy transition

Electrifying industry may be the greatest challenge we face in decarbonising our existence

- What sort of technologies are required to enable this transition?
- Do they exist today?
- How much energy is required?
- Where will it come from?
- What sort of grids will be required?
- How do we get industry to move?
“Give me a place to stand and with a lever I will move the whole world”

One of the fundamentals of business is that without threats, there is no change

What will drive change?
- Carbon tax?
- Regulation?
- Consumers driving change?
- Technological progress?
- The fear of competitors gaining competitive advantage?
Opportunity becomes the lever

Renewable energy opens the window of opportunity for industry

- For low cost self-generation
- Even lower or negatively priced generation from the grid
- Leveraging the opportunity requires flexibility of consumption
- There is real opportunity for industrial users who can shift energy use from peak price times, to times of high generation.
Renewables are not linear

Installed capacity graphs are impressively reassuring, actual generation not so much

Intermittency comes hand in hand with renewable generation
High renewables week 2035 - Germany

Source: Bloomberg NEF
Low renewables week 2035-Germany

Source: Bloomberg NEF
The balance of power has to change

Energy consumers will be required to adopt new technologies and change their behaviours

- We will all have to fundamentally change the way we all consume energy
- Or some might say, our devices and ‘things’ must fundamentally change the way they consume energy, i.e. IoT
- It means changes to processes, as well as the deployment of capital that has underpinned some industries since the industrial age.
Energy storage will come in many different guises

Energy use and storage will change capital deployment

- Entire value chains will need to be re-examined
- 24x7 may not be the answer
- What you can switch off and for how long, maybe the question
- Buying and selling energy will become an important new business unit of every major manufacturer and industrial
- Creativity is the only barrier to creating ‘batteries’, especially for low grade process heat uses
- Any thermal mass you can store heat energy into becomes fair game.
The process of making aluminum has essentially remained unchanged for 125 years.

**Becoming part of the solution**

*Primary aluminum smelting consumes the same amount of power as 1.2 billion people use domestically.*

Dr. Martin Iffert, CEO of TRIMET Aluminium SE believes that the NZ developed EnPot modulation technology could be used like a virtual battery to buffer demand against supply in Germany.

“TRIMET’s trials of the EnPot technology indicate that by being able to dynamically increase or decrease our energy use by 25%, TRIMET could in fact become the energy bridge buffering supply and demand in Germany.”
Demand response becomes king

Disruption to our energy systems means end-consumers will need to play a greater role in helping balance the grid.

The Energy Tree

- Dispatchable Power (harder to obtain)
  - $$$$$
- Variable Power
  - $$
- Renewable Variable Power (low hanging fruit)

Enpot Enabled Aluminium Smelter

- Dispatchable Power
  - 60%
- Variable Power
  - 40%
- 100% Useable Power

Modulation of up to +/- 30% means large amounts of cheaper variable power becomes usable power for the aluminium smelter as well as helps balance the grid.
Change is with us

Are you going to be ready when opportunity comes?

- UK has gone from 49% coal fired power to 2% in the last seven years
- Germany has to replace 80% of its generation in the next 30 years
- Opportunity lies ahead but it will require a new way of thinking
- Technology enables solutions, only people solve problems.

The scale of change required for industry and manufacturing is simply staggering