Whole energy systems and net zero for Kernow

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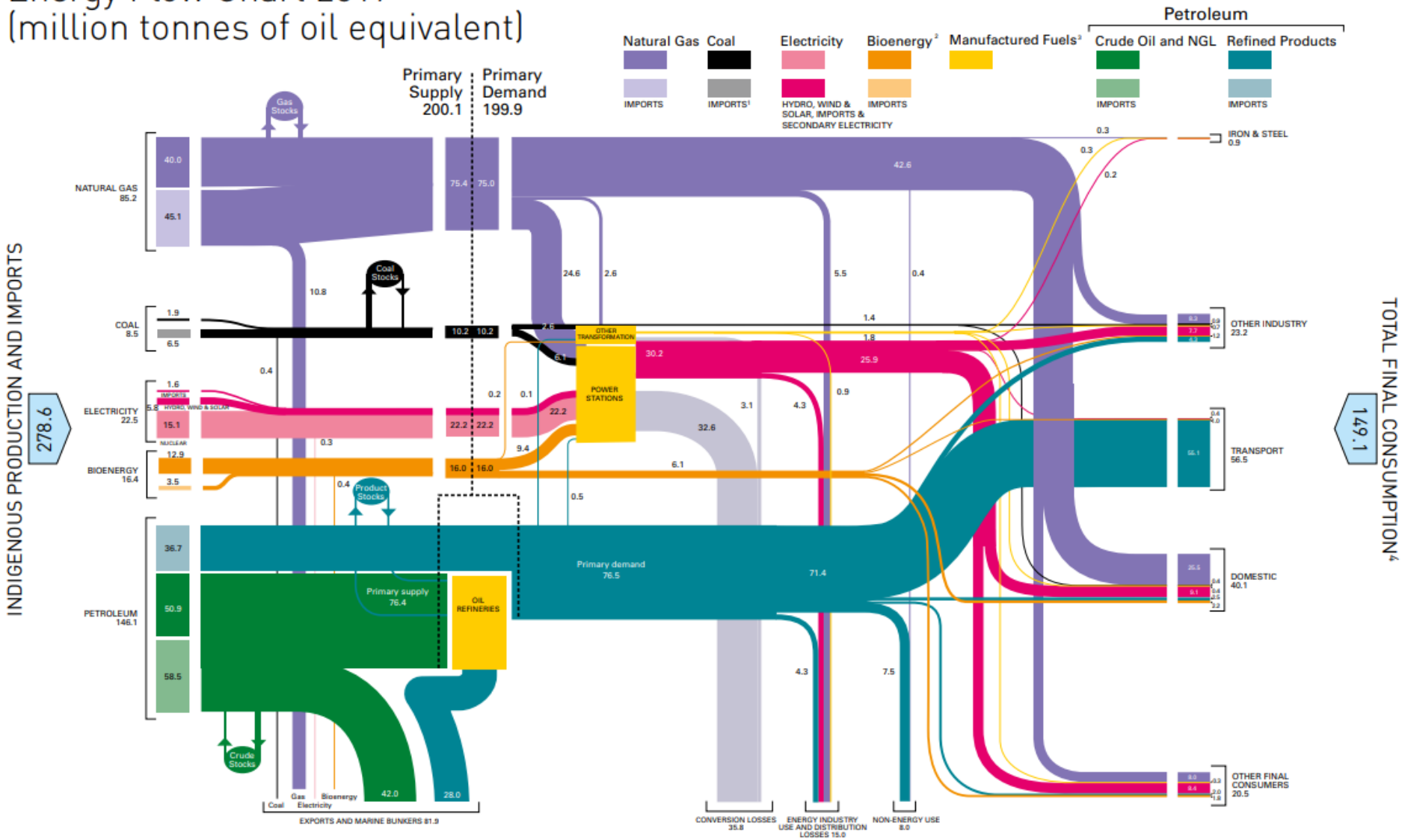
What is whole energy systems thinking?

- Considering different elements of the energy system together?
  - Heat, transport, industry, electricity?
- Considering different vectors together?
  - Gas, electricity, solid fuels,
- Considering non-technology elements too?
  - Politics, democracy/citizens, environment, consumption, industry

Energy Flow Chart 2017
(million tonnes of oil equivalent)



FOOTNOTES:
1. Coal imports and exports include manufactured fuels.
2. Bioenergy is renewable energy made from material of recent biological origin derived from plant or animal matter.
3. Includes heat sold.
4. Includes non-energy use.

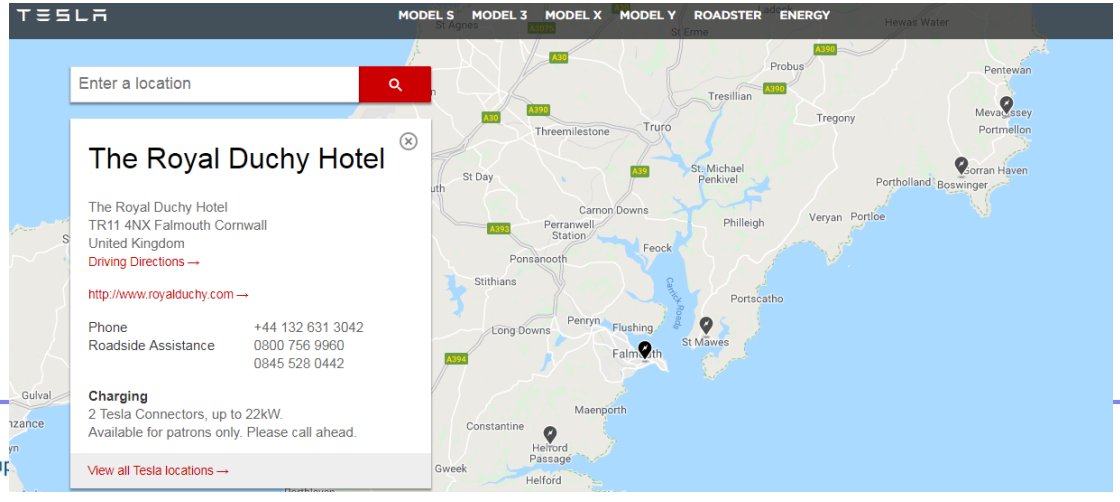
This flowchart has been produced using the style of balance and figures in the 2018 Digest of UK Energy Statistics, Table 1.1. (gross calorific values basis)

Department for Business, Energy & Industrial Strategy

NATIONAL STATISTICS

Thinking about elements of the energy system in isolation *already* no longer works

- Transport is becoming electrified
- Some heating is already electric
- Electricity is becoming an increasingly important energy vector
  - Can be very low carbon
  - Renewable electricity potential for Cornwall is very high
- Whole systems thinking becomes even more true when we think about fully sustainable energy systems



#electrifyeverything ?

- Electricity must become the key energy vector
  - Electric vehicles and electrified heating are the major changes
- Zero carbon implies no fossil fuels are combusted
  - Unless carbon capture can work
- Only the most sustainable bio-energy passes
  - Wastes e.g. from farms and kitchens
  - But some industries need this (maybe HGVs and industry

The key to tackling climate change: electrify everything

By David Roberts | @drvox | david@vox.com | Updated Oct 27, 2017, 8:48am EDT

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Tackling climate change is a complicated undertaking, to say the least. But here's a good rule of thumb for how to get started:

Electrify everything.

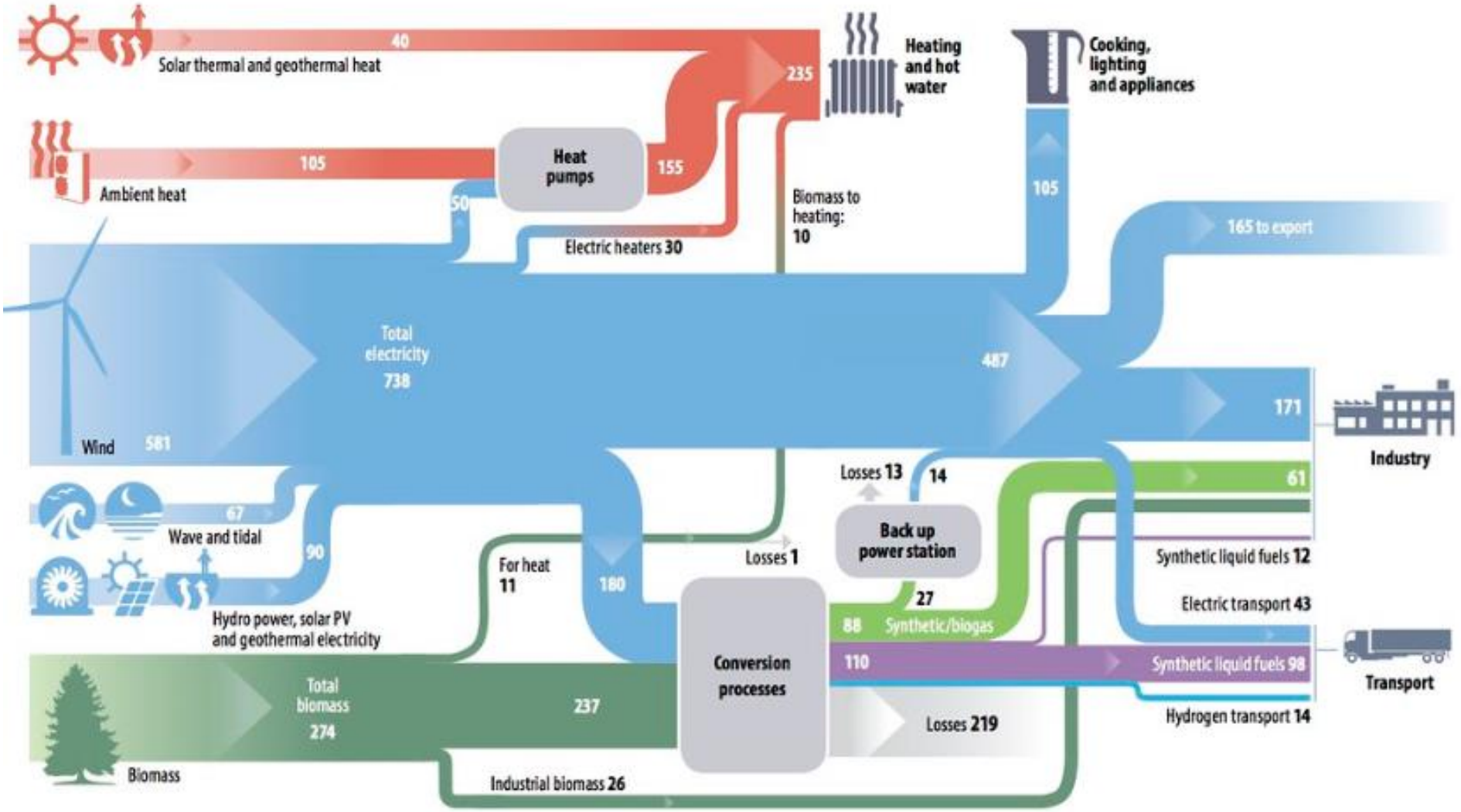

Figure 3.18: Energy flows in our scenario – from supply to demand. Numbers used here are rounded up or down to the nearest TWh and so inputs and outputs may not add up exactly.

Key technology unknowns

- Energy storage and the need for additional electricity capacity is a big unknown
  - Cheap storage facilitates renewables and electrified heat (peaky) and transport better
- How does the gas grid fit in?
  - No fossil fuels mean it can transport only sustainable biogas or clean hydrogen
  - Is it used for peaking only? Or is it stranded?
- How much cheaper will offshore wind and solar photovoltaic go?
  - Further price drops makes #electrifyeverything make even more sense

Demand reduction and response

- The most efficient sustainable energy system will be a flexible one (see Ovo, 2018)
  - All sectors of demand need to talk to each other
    - My fridge shouldn't be on when my heat pump is
    - My car should only be charging when power is cheaply available
    - My car should power my house when power is expensive (V2G)
- Long term reductions in demand make the system a lot easier to manage
  - Reducing thermal demand of buildings is also highly important for this flexibility and enhances heat electrification
  - Don't even attempt to decarbonise without also supporting people to travel less in vehicles

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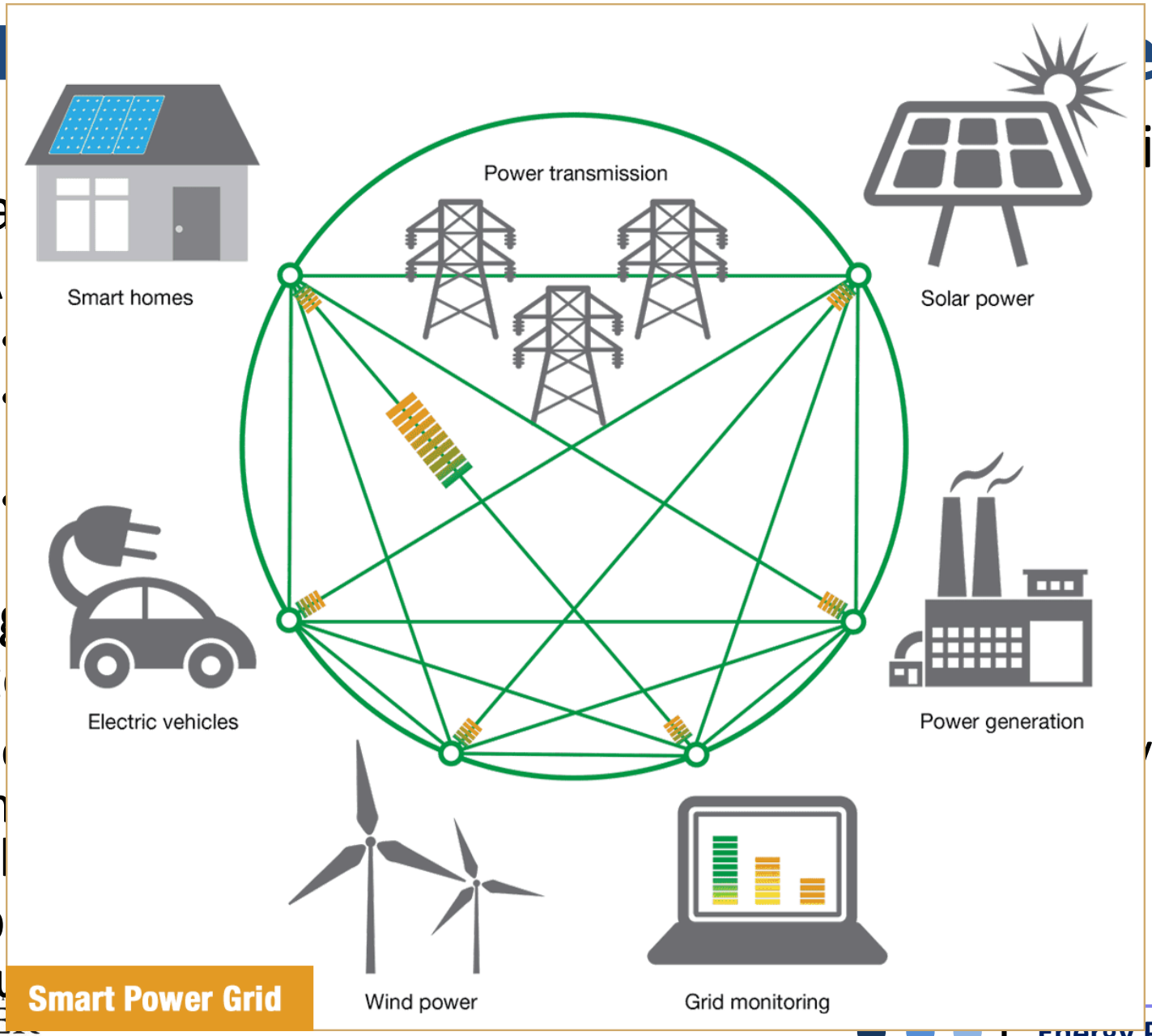
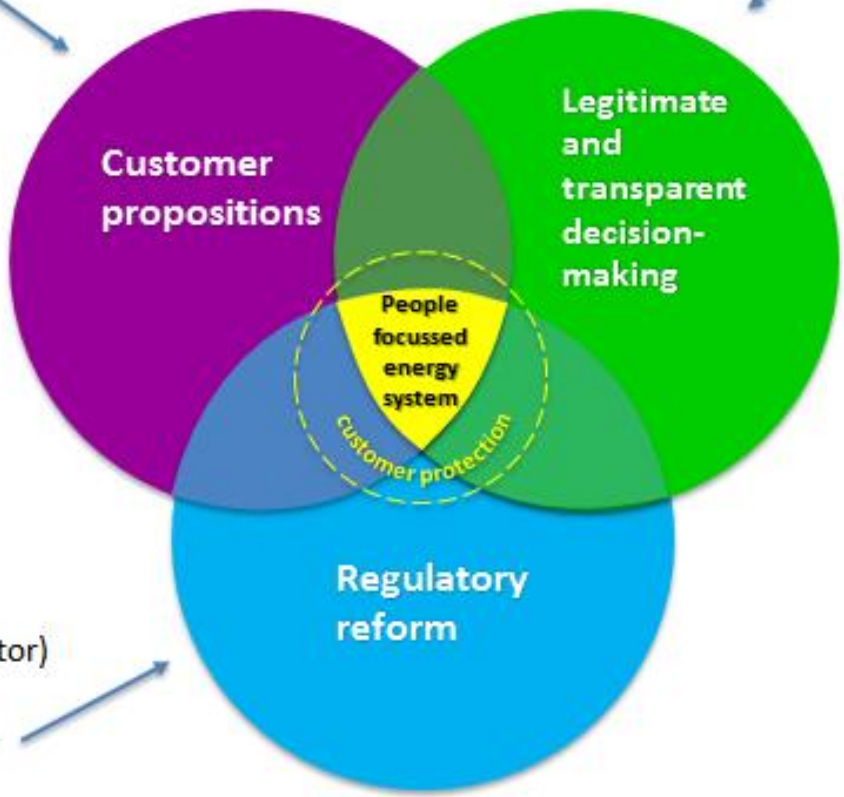


Governance overhaul needed!

- A move to energy services
- New business models
- P2P buying & selling
- EV roll out
- Storage

- Clear Government commitment to transformation
- An new Energy Transformation Committee
- Committee on Climate Change



- An IISO (integrated, independent system operator)
- A codes manager Transformation Committee
- Ofgem reform
- Data body & market monitor
- DSPs (Distribution Service Providers)

Zero carbon is (in part) possible already

- Getting someone to cycle/walk rather than driving is a big step in decarbonisation – that journey is zero carbon
- Dramatic price drops have created optimism
- But, the rate of change needed for 2030 is dramatic
  - It involves the ‘stranding’ of working cars and heating systems
- But, stranding is not necessarily a bad thing
- Finally, there is a local coordination role required to ensure that all of the whole system elements come together and work properly. Perhaps that role (or part of it) is for Cornwall Council.

References

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