Consumer participation and market design issues

OIES Electricity Day

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7 November 2018

IGov New Thinking For Energy

University of Exeter

EPSRC Engineering and Physical Sciences Research Council

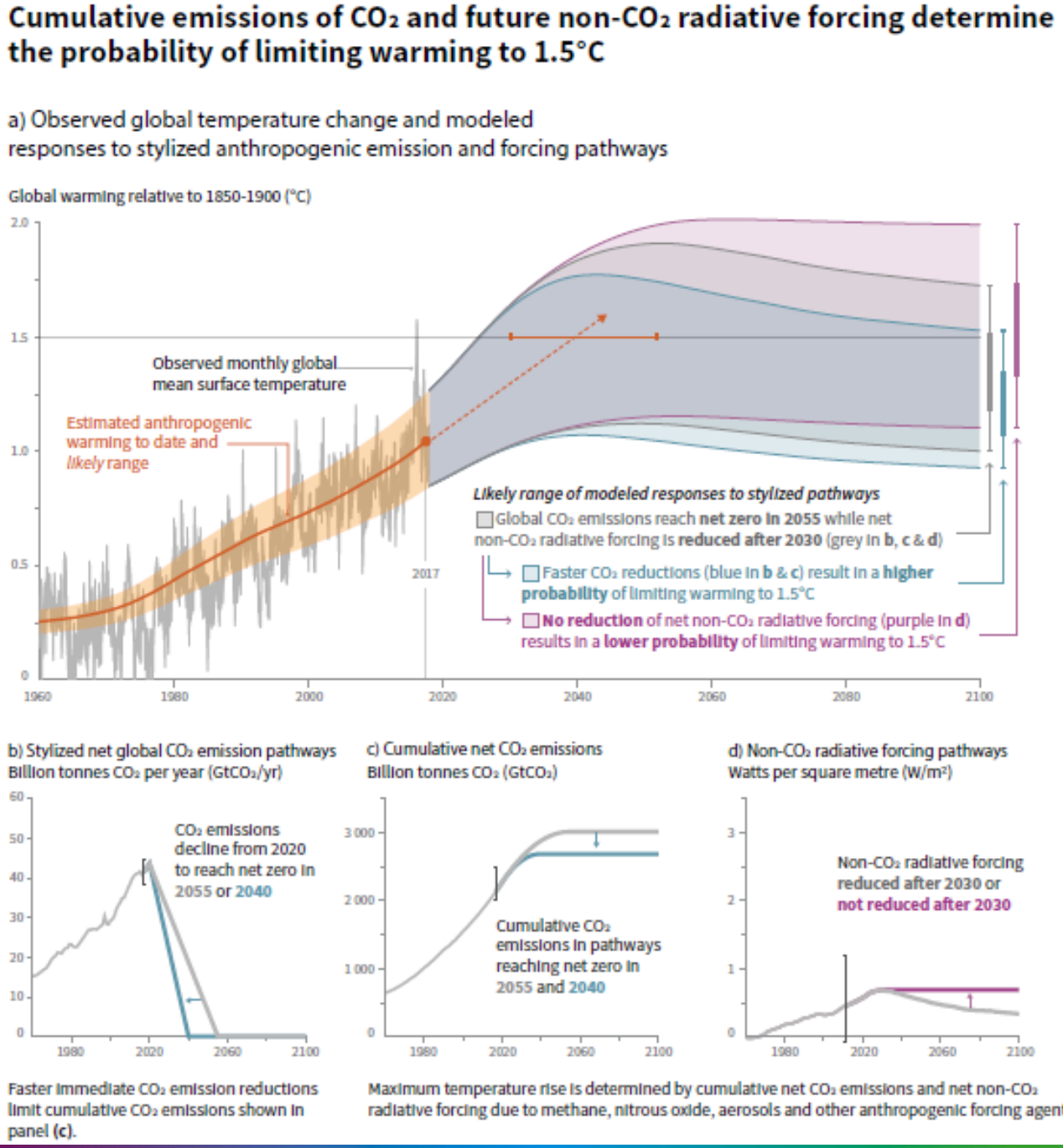
Overview

- Why this matters?
  - Latest IPCC 1.5 degree report.
- Changing electricity system characteristics and needs
- GB Governance not fit-for-purpose
- Key issues for consumer participation and market design issues
- Is a local balancing and coordinating market helpful or unhelpful ?

The Globe has to reach net zero CO2 emissions by 2050 – IPCC Special Report

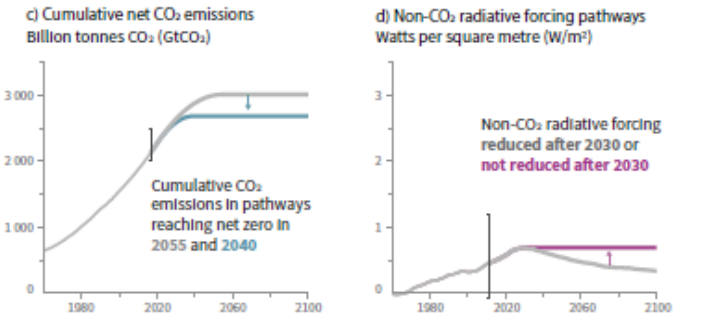
http://report.ipcc.ch/sr15/pdf/sr15_spm_fig1.pdf

IPCC AR6 will be 2019-2021



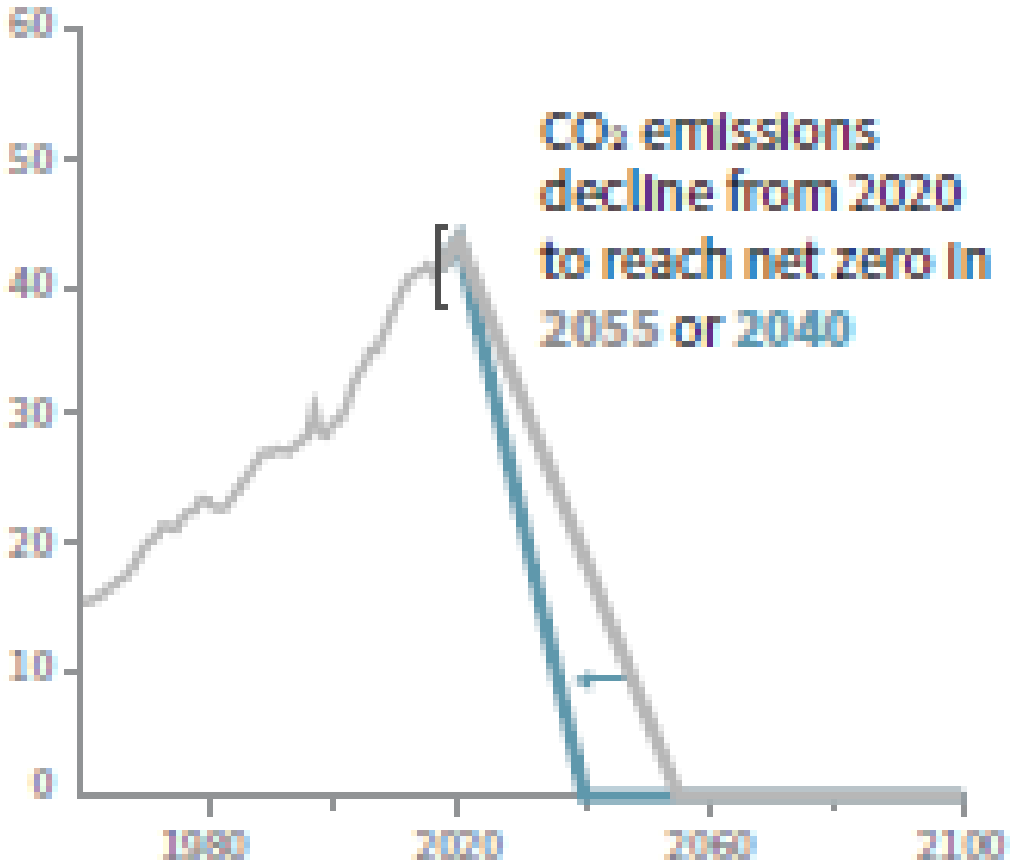
Reaching Net Zero by 2050 is a major challenge – but not impossible. The Globe has to 'step up' immediately.

http://report.ipcc.ch/sr15/pdf/sr15_spm_fig1.pdf

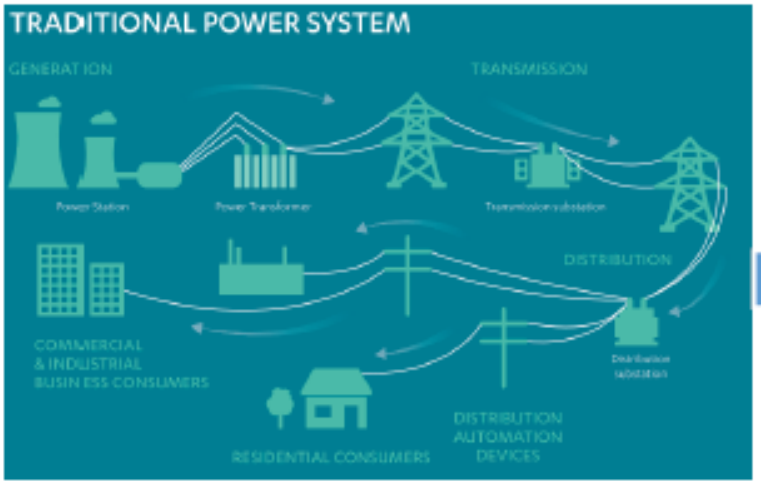


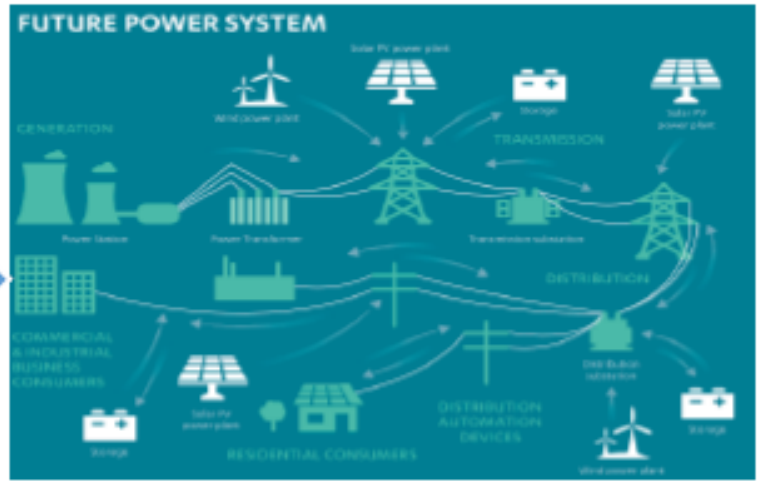
Maximum temperature rise is determined by cumulative net CO_2 emissions and net non-CO_2 radiative forcing due to methane, nitrous oxide, aerosols and other anthropogenic forcing agents.

b) Stylized net global CO_2 emission pathways
Billion tonnes CO_2 per year ($GtCO_2/yr$)



Faster Immediate CO_2 emission reductions limit cumulative CO_2 emissions shown in panel (c).



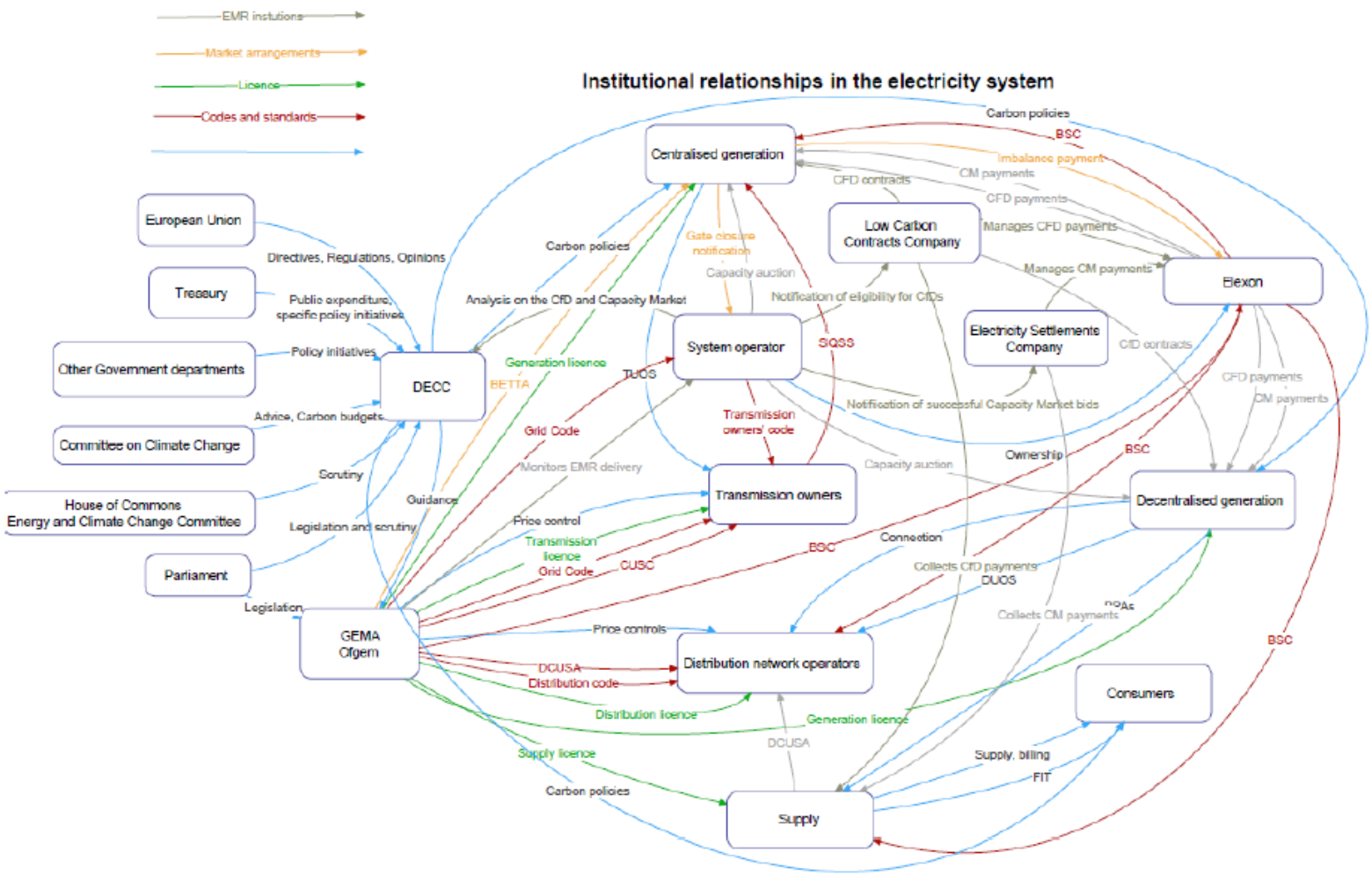


Traditional Electricity System Characteristics		Emerging Electricity System Characteristics
Centralised		More Decentralised
Fossil and nuclear based, large scale		Decarbonised, multiple scales
Supply based, load following		Supply and demand
Firm power		Smart and flexible
Linear, top-down system operation		Two way, dynamic, digitalised system operation
Passive consumers		Spectrum of consumer behaviour
Clear lines between power, heat and mobility sectors, supply chain activities and business models		Breaking down of demarcation lines and coalescing at distribution level, and particularly domestic level
Distant from use		Often local
Energy focused stakeholders		Multiple stakeholders – data / IT, car manufacturers etc

Energy system momentum

- Coalescing in the distribution level, and often ‘behind the meter’
  - Smaller scale generation
  - Smart grid / digitalisation
  - EVs
  - Storage
  - Demand side response
  - Decarbonised heat options
  - Sectors coming together (electricity / mobility / heat)
- People increasingly important – they have to pay for energy system; live with it; maybe use it more; possibly gain from it; possibly be excluded from it
  - Onsite distributed energy resources (generation / heat /mobility / flexibility etc, prosumers, P2P)

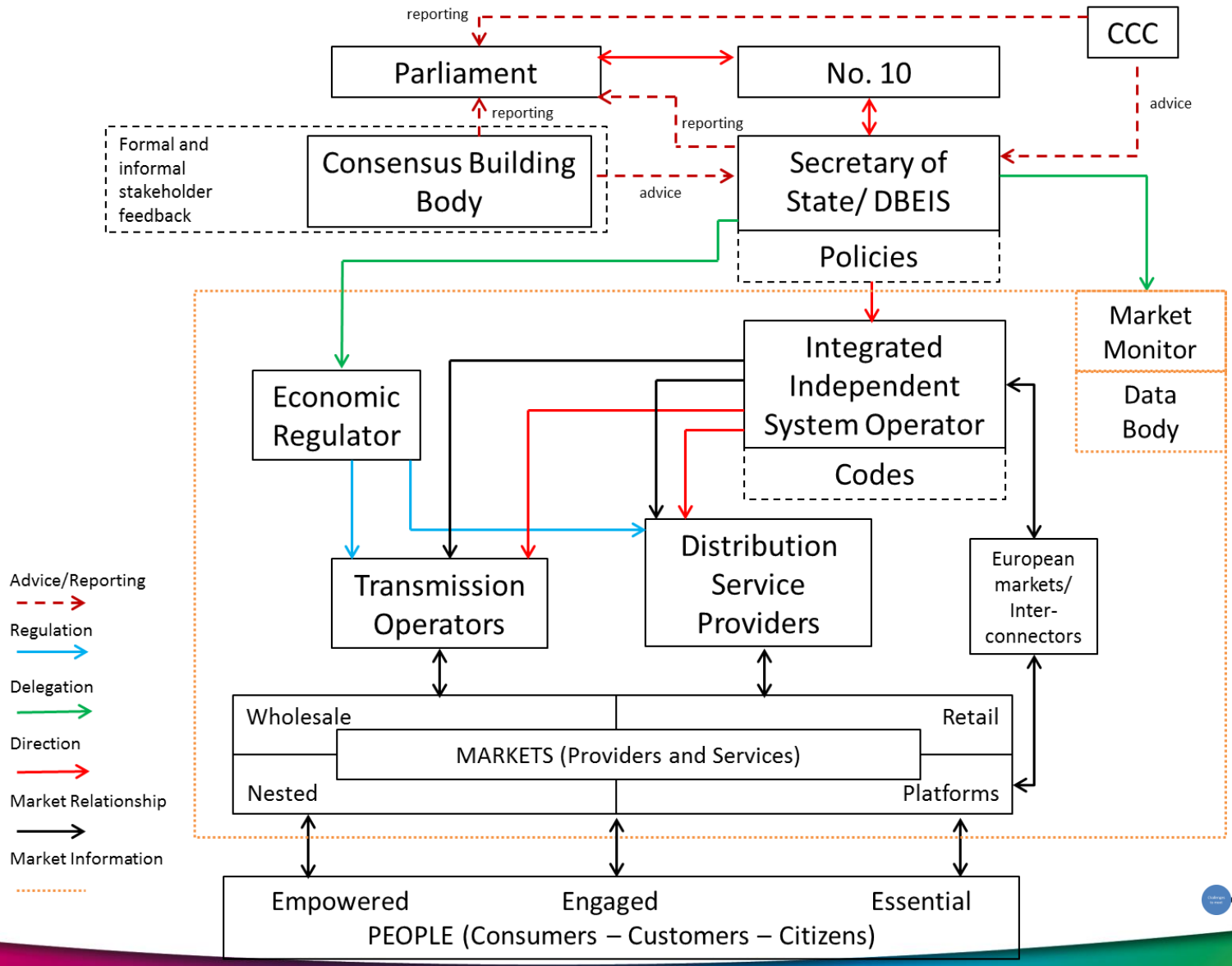
Current GB Energy Governance System Not Suited to Emerging Energy System Characteristics



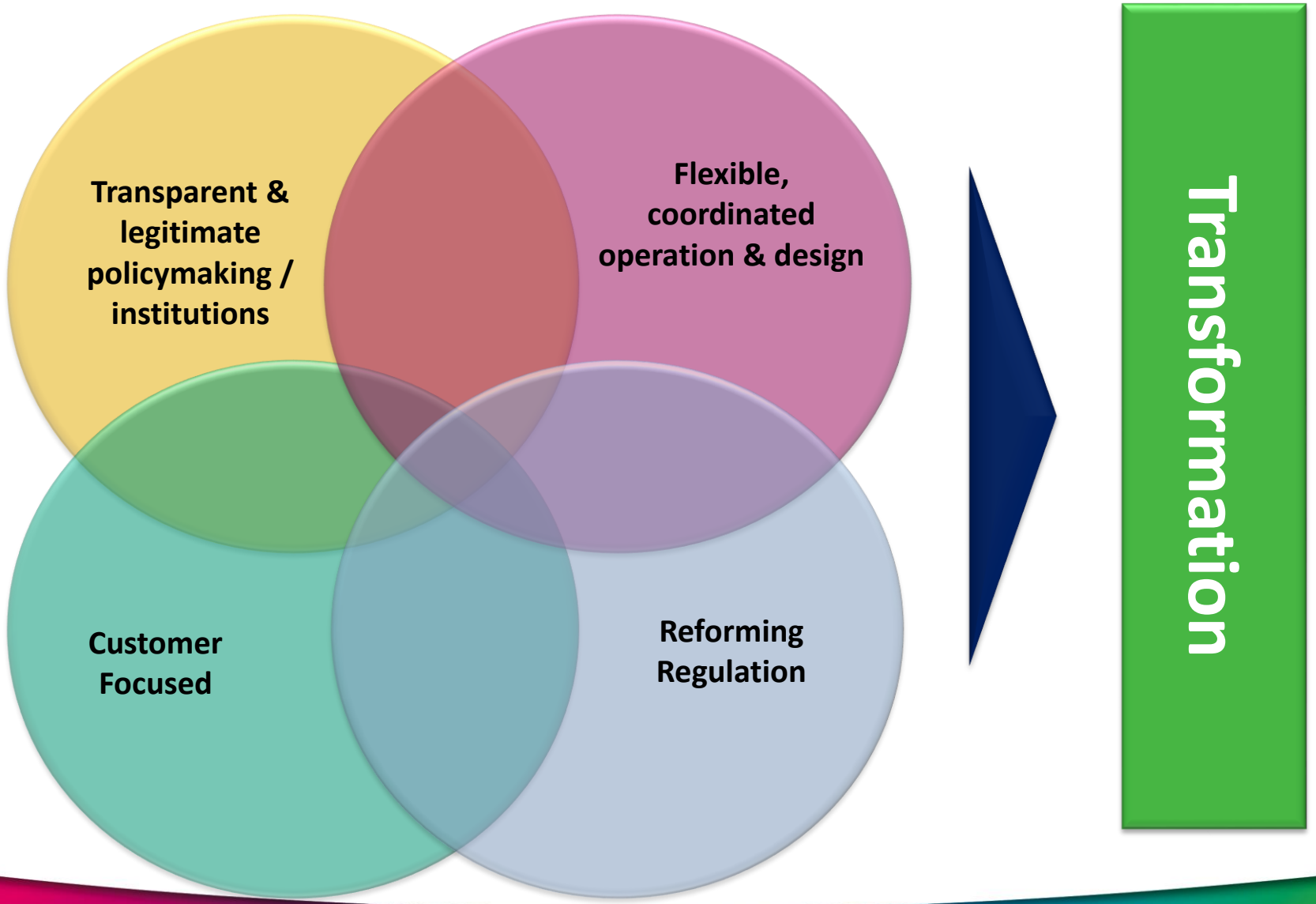
Source: Woodman, 2015 https://blogs.exeter.ac.uk/energy/2014/11/12/mapping-the-power-in-the-electricity-system/

IGov Fit-for-Purpose GB Energy Governance Framework

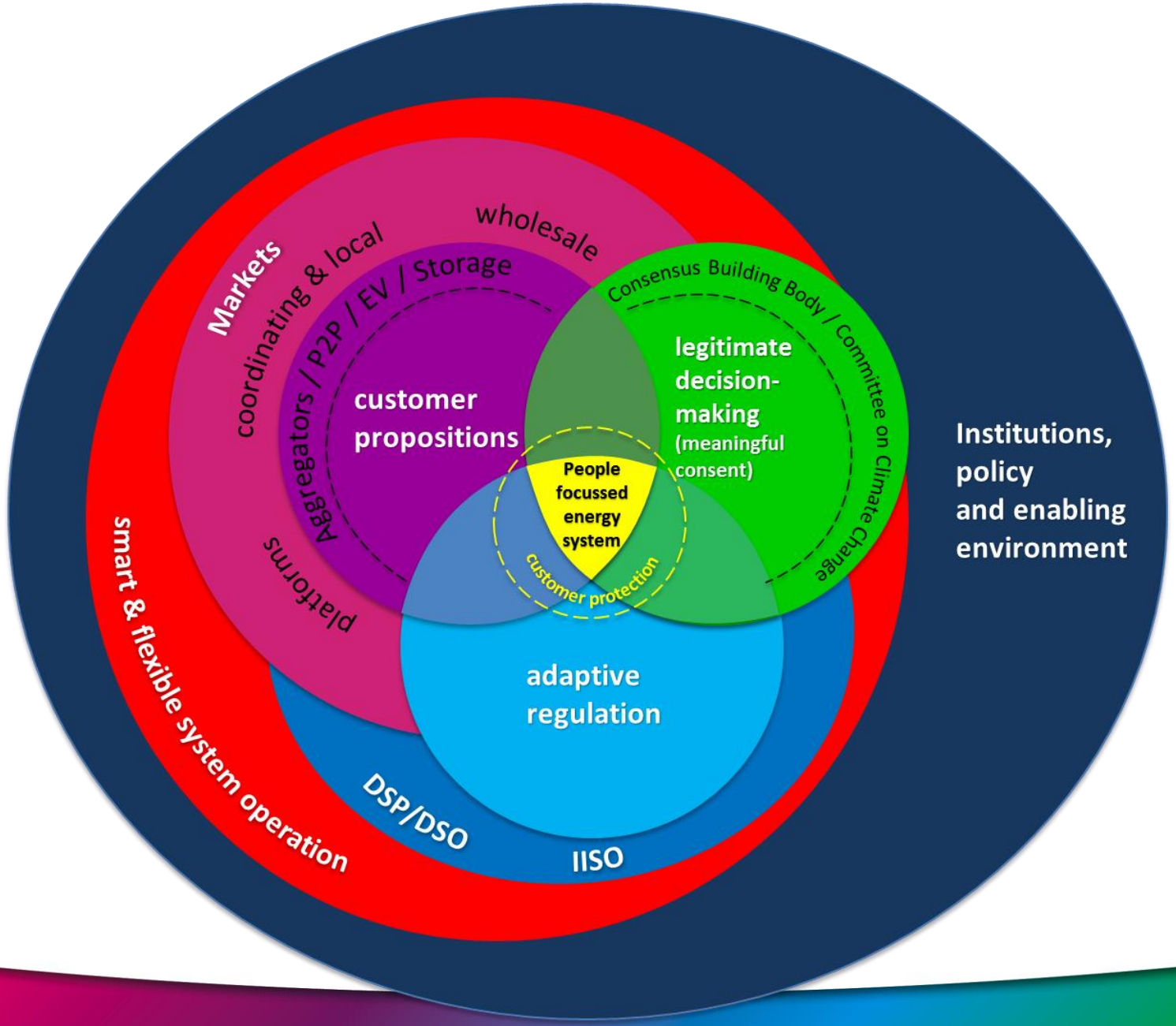
http://projects.exeter.ac.uk/igov/wp-content/uploads/2017/10/SYS-Copenhagen-27-October-2017.pdf and
http://projects.exeter.ac.uk/igov/paper-gb-energy-governance-for-innovation-sustainability-and-affordability-2/



Overview Findings of IGov1 – 4 central dimensions required for energy system transformation



IGov2 Updated (DRAFT) GB Energy Governance Framework



Governance with respect to market design

- The move to a
  - ❖ Decarbonised, decentralising and digitalised energy system
  - ❖ with higher proportions of both variable power and distributed energy resources
  - ❖ AND one which needs to engage people

  creates certain particular market design issues:
  - a need for more flexibility (and in-market value)
  - a need to reveal more granular value (particularly in the distribution network, including domestic homes), helped by more data transparency
  - displacement of marginal cost (MC) resources (not good for MC resources but good for environment) and price suppression
  - price cannibalisation for renewables
  - the need to enable popular customer propositions
  - needs to enable system operate / coordinate for overall cost minimisation for customers (DER / Infrastructure etc)
  - Needs to ensure ‘vulnerable’ not left to pick up the costs

Various market designs put forward

(Source: Tom Pownall, Upgrade Document)

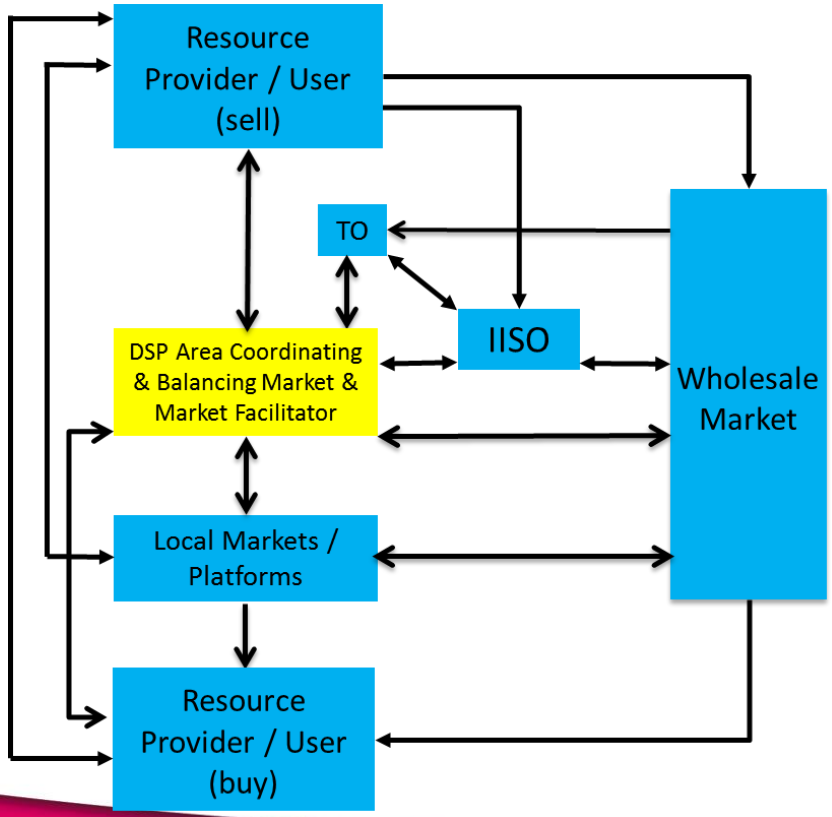
Feature	The Two Tier Market. Keay and Robsinson	Smart Energy Service Proviser (SESP). Rosell	Energy and Delivery Market. Nelson and Pierpont	The Future Proof Model. De Wit	Two Visions: Grand Central. Kristov, Martini, Traft	Two Visions: Layered Decentrralised Kristov, Martini, Traft
Wholesale Market	✓	✓	✓	✓	✓	✓
Capacity Market	?	✓	✓	?	X	X
Ancillary Market	✓	?	✓	X	✓	✓
Balancing Market	✓ X	✓	✓	X	✓	✓
Futures Market	?	✓	✓	X	✓	✓
Bilateral Trading	✓	✓	?	✓	✓	✓
Exchange (Merit Order)	?	✓	?	X	✓	✓
Day-ahead Market	?	?	✓	X	✓	✓
Intraday Market	?	✓	✓	X	✓	✓
Two-tier Market	✓	?	✓	X	X	✓
Discrimination by Operating Costs	✓ ?	?	?	?	?	?
Power Purchase Agreements	?	?	?	?	✓	?
Aggregation	✓	✓	?	?	✓	✓
Settlement Periods	?	?	?	?	?	?
Clip Size Entry Requirements	?	?	?	?	?	?
Gate Closure	✓ ?	?	?	?	?	?
Imbalance Charge	✓ ?	✓	?	?	?	?
Local Energy Market	X	✓	X	X	X	✓

With respect to market design and engaging people: would local markets help and if so, how should they be set up?

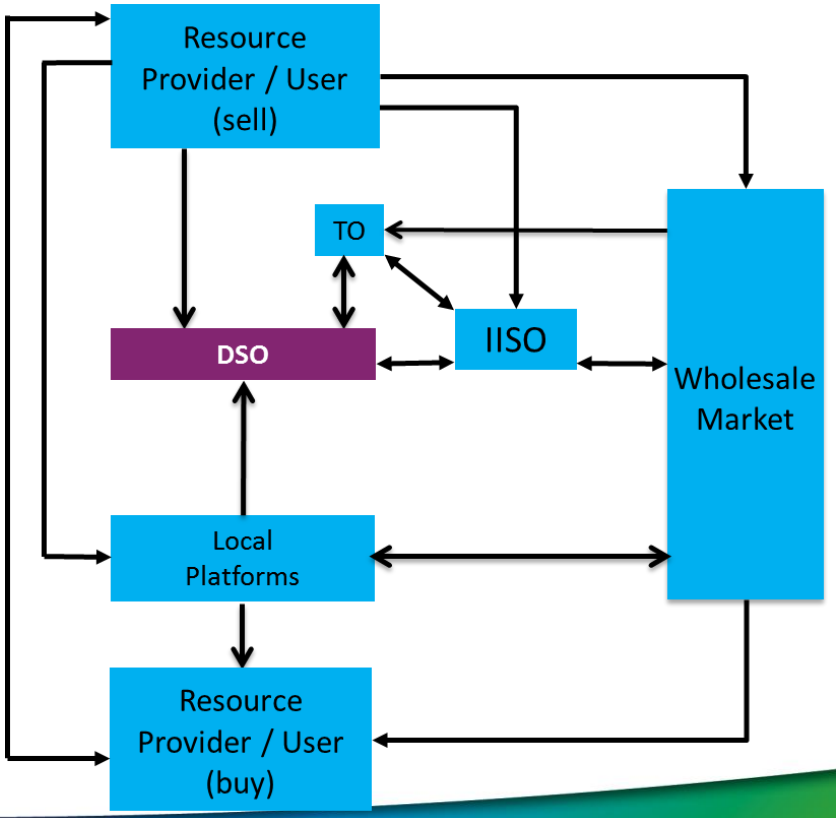
- What institutional framework should there be at the D level?
  - Transform the DNO (ie combined wires and SO) into D market facilitator (a DSP)?
  - Transform the DNO to DSO and separated D wires company?
  - A whole system SO (ie T and D) + separated D wires companies
  - A new platform which market facilitates and system operates, with DNO transfering to wires company
- What local market structure is appropriate?
  - Stand-alone, local platforms of any size & including P2P (within a D area or cross D areas) which are private interest (even if social innovation) and effectively net (if necessary) into a wholesale market at national level; or
  - Should there be a local area (under a GSP) balancer and coordinator that 'nests' up into a wholesale market, and which enables platforms (of any size including P2P) to sell wherever they wish?

Is a local coordination and balancing market necessary / more efficient or unnecessary – and would it better help customer engagement / deep democracy ?

Distribution area balancing & coordinating market



Local platforms



Conclusion

- We can expect more customer involvement – particularly when 2nd hand EV market gets going
- We should be seeing emerging DER as an opportunity and valuable resource
- As characteristics of energy system changes, and digitalisation allows / enables new system operation, we should be open to running the system differently and – hopefully – most cost effectively
- Local balancing and coordinating markets seem to offer a new way to reveal granular value, engage customers, operate system differently, coordinate for public interest, regulate for what we, as society and customers, want

Market design literature

- Keay, M. and Robinson, D., 2017. The Decarbonised Electricity System of the Future: The 'Two Market' Approach Part 1 Overall concept. [online]. Available from: https://www.oxfordenergy.org/wpcms/wp-content/uploads/2017/06/The-Decarbonised-Electricity-Sysytem-of-the-Future-The-Two-Market-Approach-OIES-Energy-Insight.pdf [Accessed 13 Dec 2017].
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- Pierpont, B. and Nelson, D., 2017. A CPI Working Paper Markets for low carbon, low cost electricity systems. [online]. Available from: https://climatepolicyinitiative.org/wp-content/uploads/2017/10/CPI-Markets-for-low-carbon-low-cost-electricity-systems-October-2017.pdf [Accessed 3 Jul 2018].
- Rosell, P., Lloret-Gallego, P., Munné-Collado, Í., Villafafila-Robles, R., Sumper, A., Ottessen, S., Rajasekharan, J., and Bremdal, B., 2018. Local Flexibility Market Design for Aggregators Providing Multiple Flexibility Services at Distribution Network Level. *Energies* [online], 11 (4), 822. Available from: http://www.mdpi.com/1996-1073/11/4/822.
- De Wit, P., 2017. The Future Proof Model, In: Florence School of regulation: Design of the future electricity markets. [online], 11–13. Available from: http://fsr.eui.eu/publications/design-electricity-markets-future/.

THANKYOU

http://projects.exeter.ac.uk/igov/

ANNEX

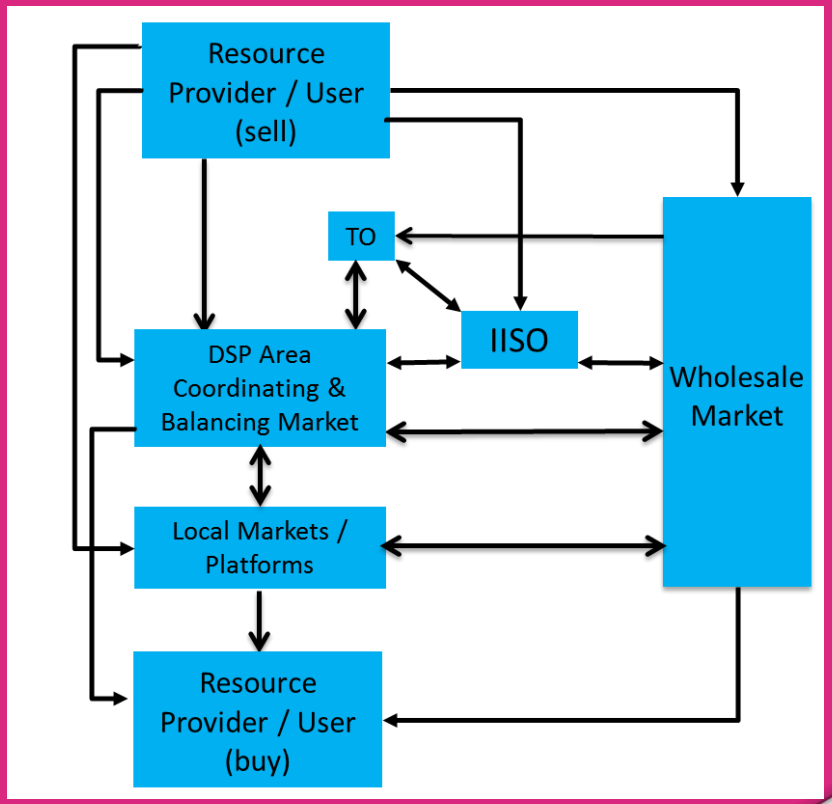
Customer Focused

- Customer wishes at center, and policies built around customer proposition
- Meaningful consent
- Engagement
- Trust, equity, legitimacy and democracy
- Tariffs, prices and bills
- PSO

Transparent & legitimate policymaking/institutions

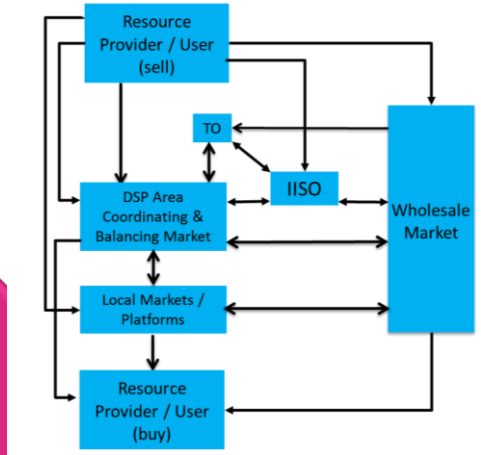
- Coherent, legitimate , coordinated decision making (including incorporating CCC Advice via institutions)
- Less BEIS delegation, more SoS Direction (ie IISO v Ofgem)
- Consensus Building Body (or a body which coordinates intellectual, political and social debate)
- Market Monitor and Data Body

Flexible, coordinated operation & design



Flexible, coordinated operation & design

- Service should be able to sell to whom they want (national or local)
- Customer should be able to buy from whom they want (national or local)
- IISO has responsibility to develop / balance infrastructure and markets to meet CCC targets, and to coordinate and integrate across heat and electricity
- DSP are coordinators, balancers and integrators of local areas and markets, regulated through PBR
- Bottom-up / Area system optimisation with TO increasingly balancer
- IISO DSP coordination
- Governance dimensions all need to encourage this, not least for cost benefits



Reforming Regulation

- New Ofgem duty to meet CCC carbon budgets; stripped back to economic regulator
- More performance based regulation (ie more output focused)
- DNO to DSP; SO to IISO
- Restructured RIIO2, enabling decarb of electricity by 2030 and progressive ISSO
- Closer link between network operation, market design, data and public policy goals
- Access to, and transparency of, data