Jacobs Challenging today. Reinventing tomorrow.

Delivering the Roadmaps for Carbon-Free Energy Driven by Technology & Industrial Innovation

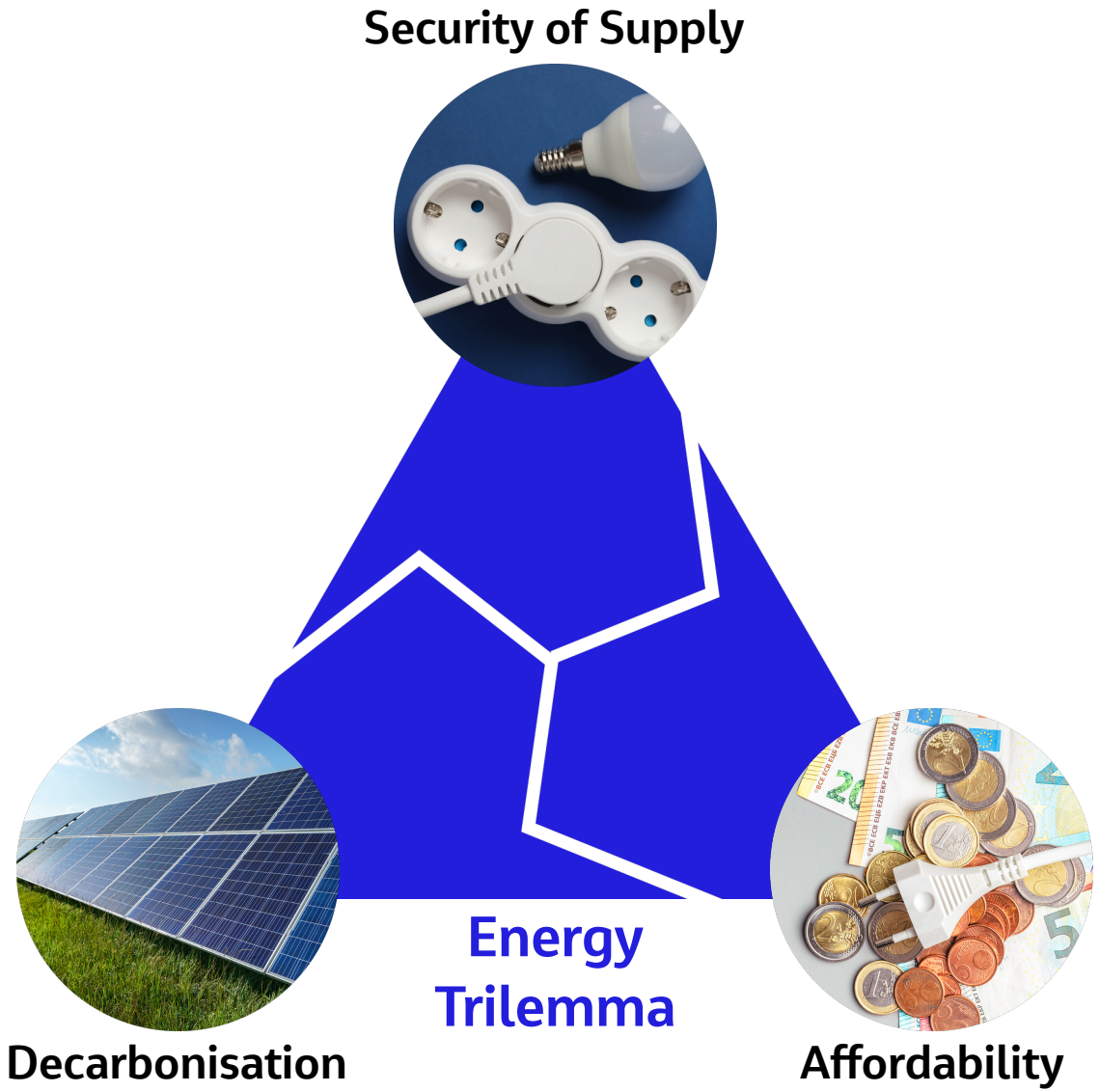
James Wiseman, Director - Strategic Consulting, Jacobs

Overview

- The case for change
- Value (necessity) of a comprehensive energy mix
- Technical and industrial innovation
- Developing an implementable roadmap
- External impacts on plans

Case for Change

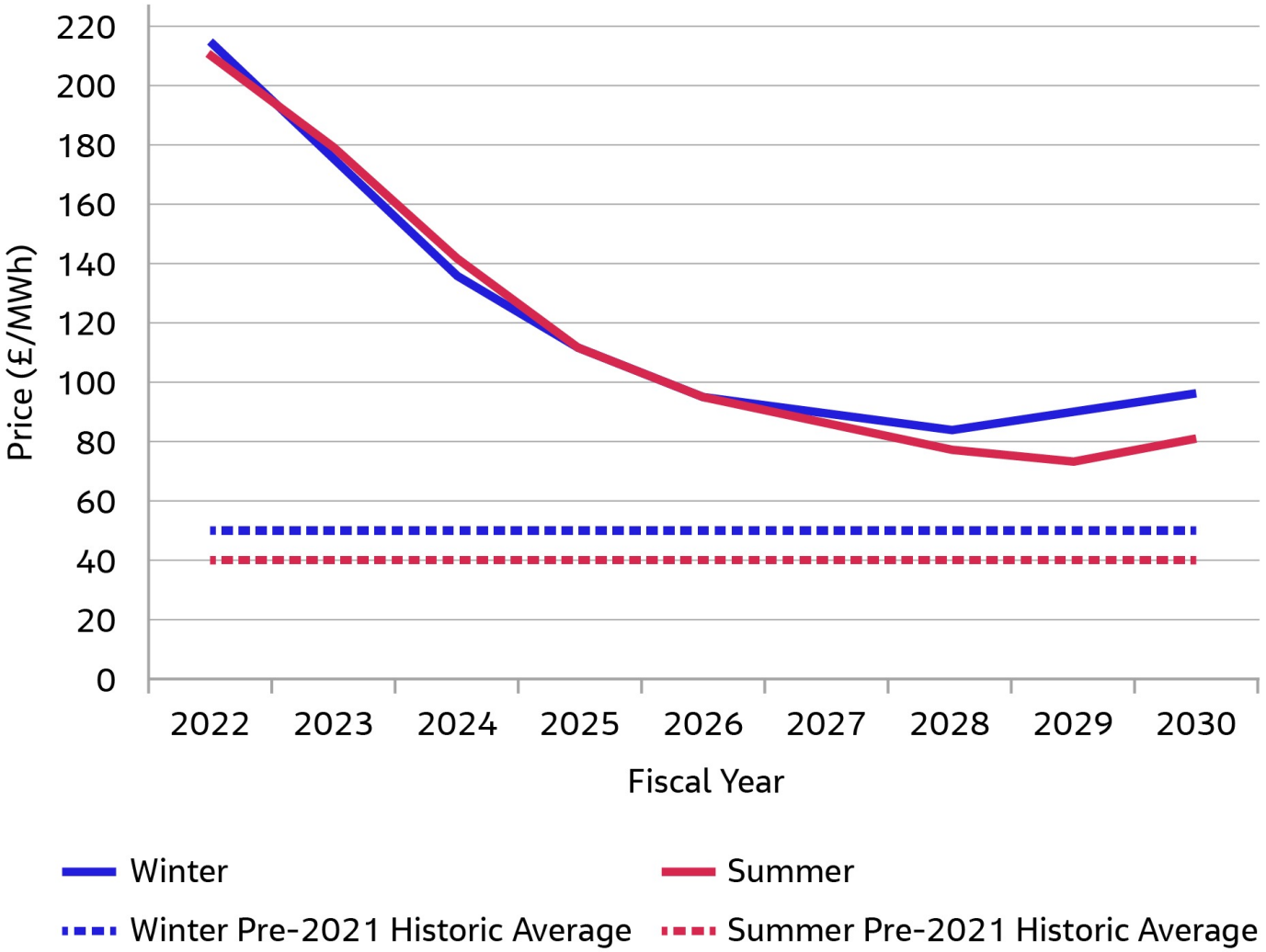
- Unprecedented global energy challenge
- Changing focus of the energy Trilemma
  - Surge in fossil fuels (affordable / secure)
  - Decarbonisation
    (2015 COP 21 Paris climate agreement)
  - Security of supply / affordability



Case for Change - continued

- Energy costs projected to fall (to 2030) but not to previous levels
- Over the last quarter prices fluctuated between c£200-£500/MWh
- Notably, the societal change creates fluctuations in demand as well as known risks in supply, further increasing uncertainty

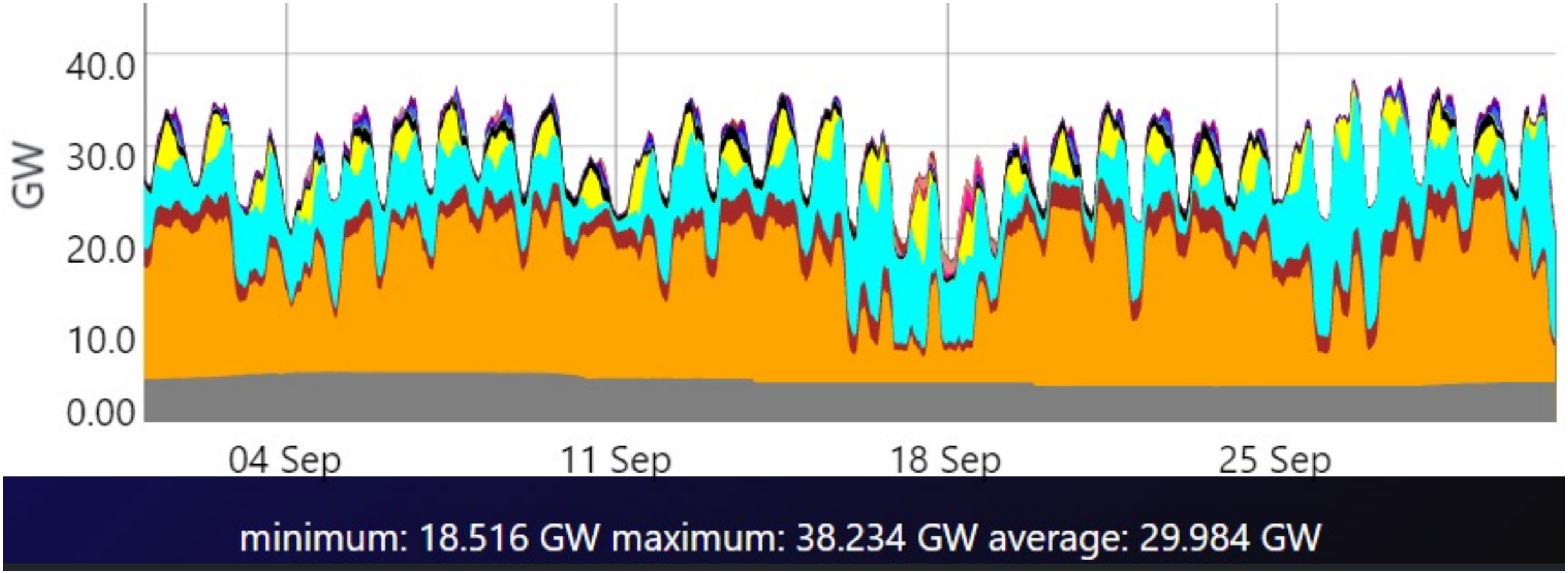
Source – Cornwall Insight



Comprehensive Energy Mix

- Over reliance on any energy generating technology creates intolerable risk
- Mitigations available but insufficient – interconnectors, energy storage
- Need to build robust, complimentary energy system:
  - International Energy Agency (IEA) 'Nuclear Power and Secure Energy Transitions' - nuclear can reduce reliance on fossil fuels as well as facilitating greater renewable penetration
  - Technology innovation has created options to manage short term grid stability
  - Energy storage options required for medium / long term stability

September hourly electricity averages



Solar	Wind	Biomass	CCGT	Nuclear

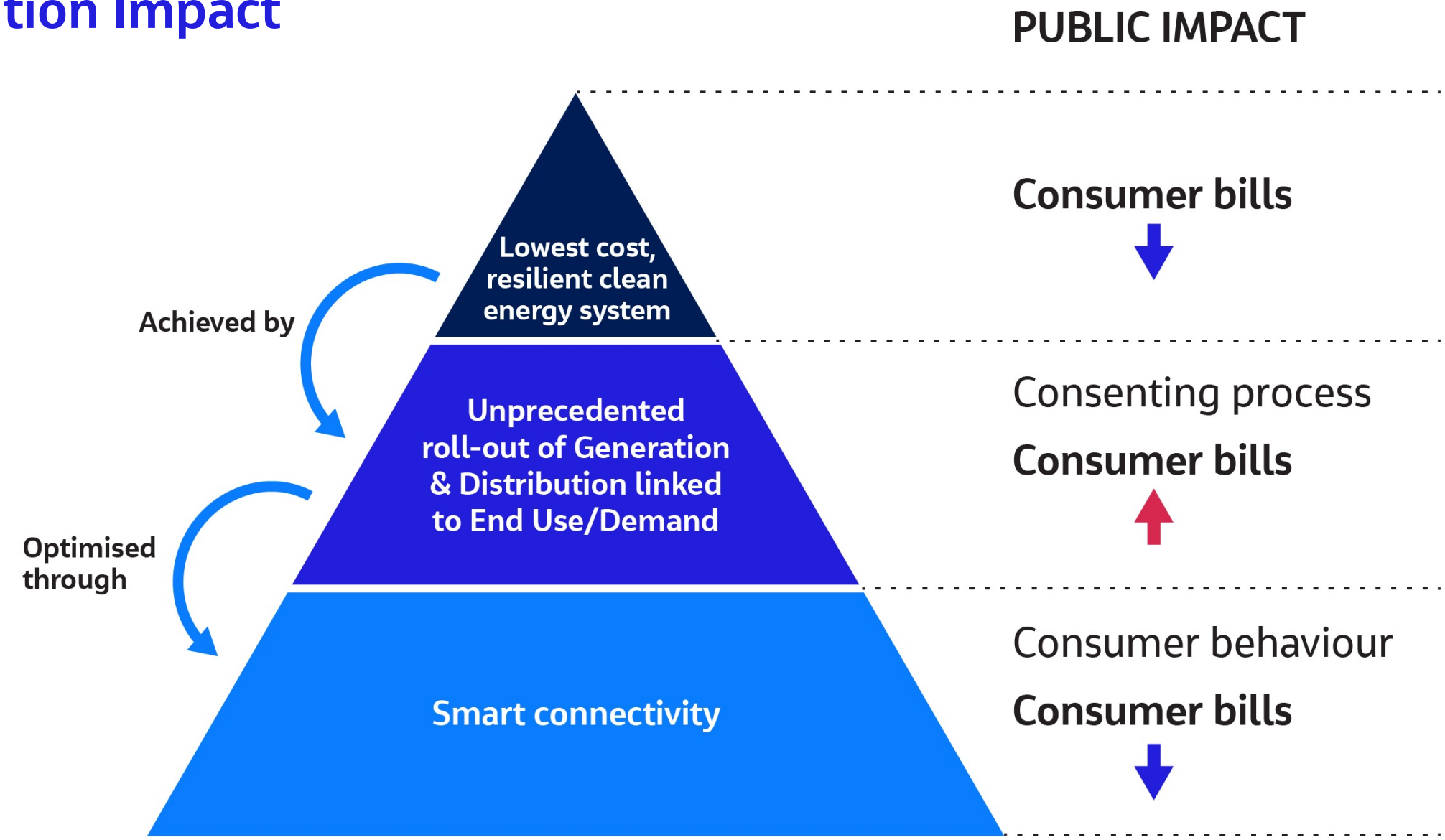
- Source: Gridwatch.co.uk

Likely energy mix transition

- Established electricity grid
- Minimal energy storage
- Unabated fossil fuel

- Integrated electricity, heat and hydrogen system
- Large scale energy storage
- Abated fossil fuel

Transition Impact



Programmatic commitment and approach (behavioural innovation?)

- Cross party, cross parliamentary term support
- Cross sectoral integration
- Avoiding information asymmetry (government, industry, investors, communities)
- Appropriate regulation – risks of energy deployment vs risks of inactivity
- Long term planning for future resource needs (investment, materials, skills, land)

- Societal Buy-In

Industrial and Technical Innovation

Enablers

- Industry confidence – to encourage investment
- Societal backing – influences planning, changing consumer behaviours and 3rd party investment

Innovation Spectrum

- Evolutionary ⟷ Revolutionary

Likely innovation areas

- Consenting / licensing reform
- Energy storage (battery efficiency, heat, hydrogen)
- Financial Vehicles
- Manufacturing optimisation / scale
- Smart technology - enhancement and deployment

SG 14-222 DD offshore prototype – 359MWh in 24hr period, 10/10/22

Smart Systems

- Smart Systems and Flexibility Plan 2021 jointly released by BEIS and OFGEM in 2021
- Modelling as part of this report suggested a flexible energy system could deliver £10bn annual savings to the UK – cost of energy has significantly gone up since this modelling!
- Truly smart systems and integration will optimise grid
- Dinorwig Power Station (Electric Mountain) in North Wales
  - c1700 MW peak (in 16s)
  - c9GWh energy storage (released over 6hrs)
- Short duration (Smart) household curtailment (car charging, white goods)

Roadmap deployment

Enterprise Planning

- Domestic / international energy modelling
- Objective transition assessment (UK and globally)
- Stakeholder engagement (HMG / Industry / Communities)

Energy Taskforce Established

- Government / industry taskforce
- Covering all aspects of energy trilemma

Action

- Communication & societal understanding / acceptance
- Expanded and new investment vehicles
- Energy efficiency programme
- Fit for purpose licensing / consenting
- New asset deployment (generation & distribution) / asset extension

Future impacts to consider / manage

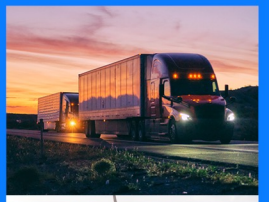
Geopolitical instability

Future national investment imperatives (ie akin to COVID)

Available resources (skills, materials, public/ private investment)

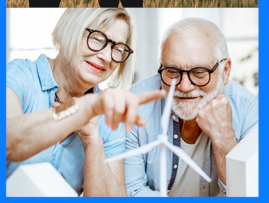
Change or uncertainty around long term demand profile – volume, timing and energy forms (electricity, heat, synthetic fuel, hydrogen)

Technological advances or lack of expected progress



UK export of energy products / services

High value long term employment



Societal behaviour

Copyright notice

Important

The material in this presentation has been prepared by Jacobs®.