Prospering from the Energy Revolution

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Baringa
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The Industrial Strategy Challenge Fund

Industrial Strategy

HM Government

Building a Britain fit for the future

November 2017

INDUSTRIAL STRATEGY

Our five foundations

Ideas
the world's most innovative economy

People
good jobs and greater earning power for all

Infrastructure
a major upgrade to the UK's infrastructure

Business Environment
the best place to start and grow a business

Places
prosperous communities across the UK

AI & Data Economy
We will put the UK at the forefront of the artificial intelligence and data revolution

Future of Mobility
We will become a world leader in the way people, goods and services move

Clean Growth
We will maximise the advantages for UK industry from the global shift to clean growth

Ageing Society
We will harness the power of innovation to help meet the needs of an ageing society

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Energy Revolution:
The Macro-challenge context
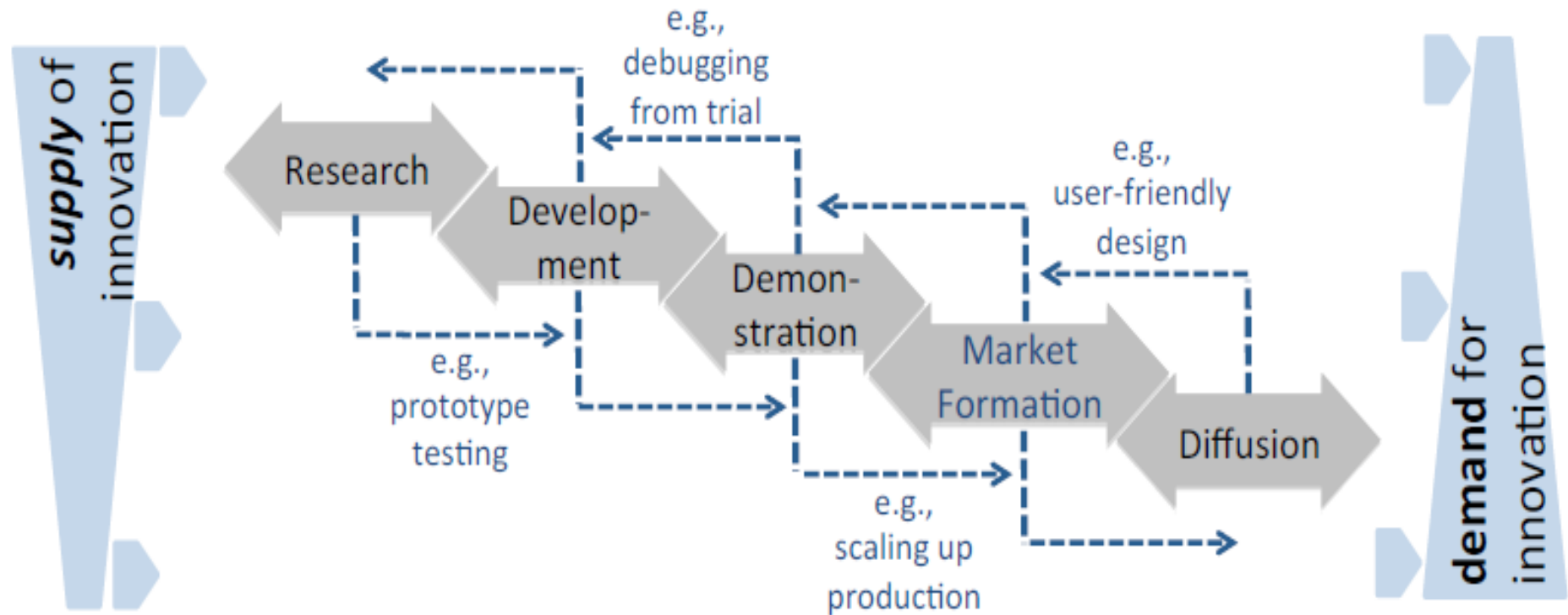
Energy Revolution: The Opportunity

Hypothesis: smarter and local energy systems can accelerate solutions to multiple challenges.

- Clean Air
- Greenhouse Gas Emissions
- Comfort
- Mobility
- Cost competitiveness
- Fuel poverty
- Energy security
- Changing consumer preferences
- Environmental and social changes
- Economic growth & investment
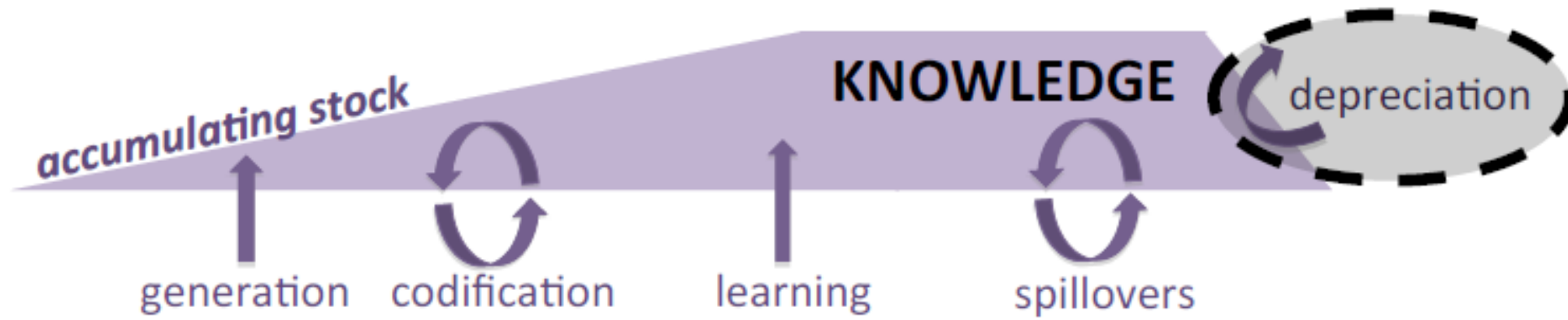- Supply chain and skills development

At a time when our energy system itself is changing rapidly

- Decommissioning of older fossil and nuclear power stations.
- Rise of wind and solar power generation and novel energy storage
- Adoption of electric vehicles
- Smart meter roll-out and convergence with new digital platforms and consumer-based control systems
- Evolving demand-side, energy storage and peer-to-peer markets
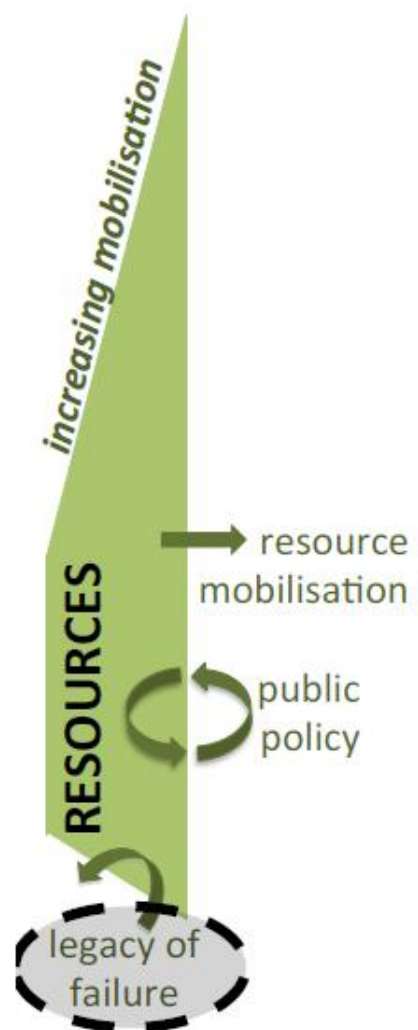- Emergence of hydrogen and bio-energy value chains
- Changing workforce

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Single grants technology push + market pull works best for incremental improvements, single issues or single technologies.

e.g., debugging from trial
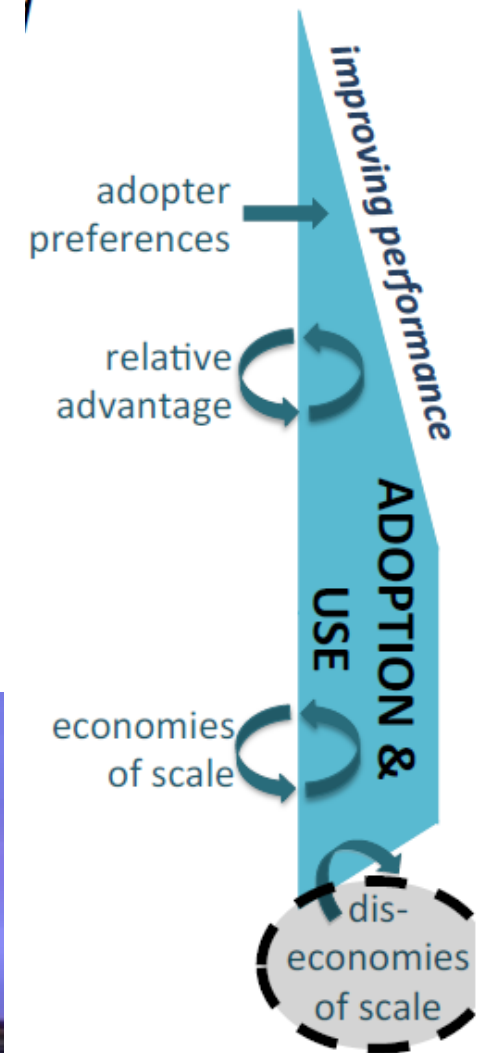
Research

Develop-ment

Demon-stration

Market Formation

Diffusion

e.g., prototype testing

e.g., scaling up production

e.g., user-friendly design

supply of innovation

demand for innovation

Grubler et al. (2012). Policies for the Energy Technology Innovation System. *Global Energy Assessment.*

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accumulating stock

KNOWLEDGE

depreciation

generation   codification   learning   spillovers

entrepreneurs & risk taking   exchange & interaction   shared expectations   advocacy coalitions

strengthening capacity   ACTORS & INSTITUTIONS   resistance

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increasing mobilisation

RESOURCES

resource mobilisation

public policy

legacy of failure

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THE CUSTOMER SERVICE

improving performance

adopter preferences

relative advantage

ADOPTION & USE

economies of scale

dis-economies of scale

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Energy Revolution:
Programme Objectives

Prove investable, scalable local business models by 2022, that
- deliver cleaner, cheaper energy services
- build more prosperous and resilient communities
- benefit the whole energy system
- use integrated, intelligent approaches

Unlock 10x future private investment
in local integrated energy systems in 2020s (vs business as usual)

Accelerate new products and services to commercialisation
creating real world proving grounds

Build UK leadership in integrated energy services provision

Prospering from the Energy Revolution:

Committing >£100m in public funding (ca. £100m private match)
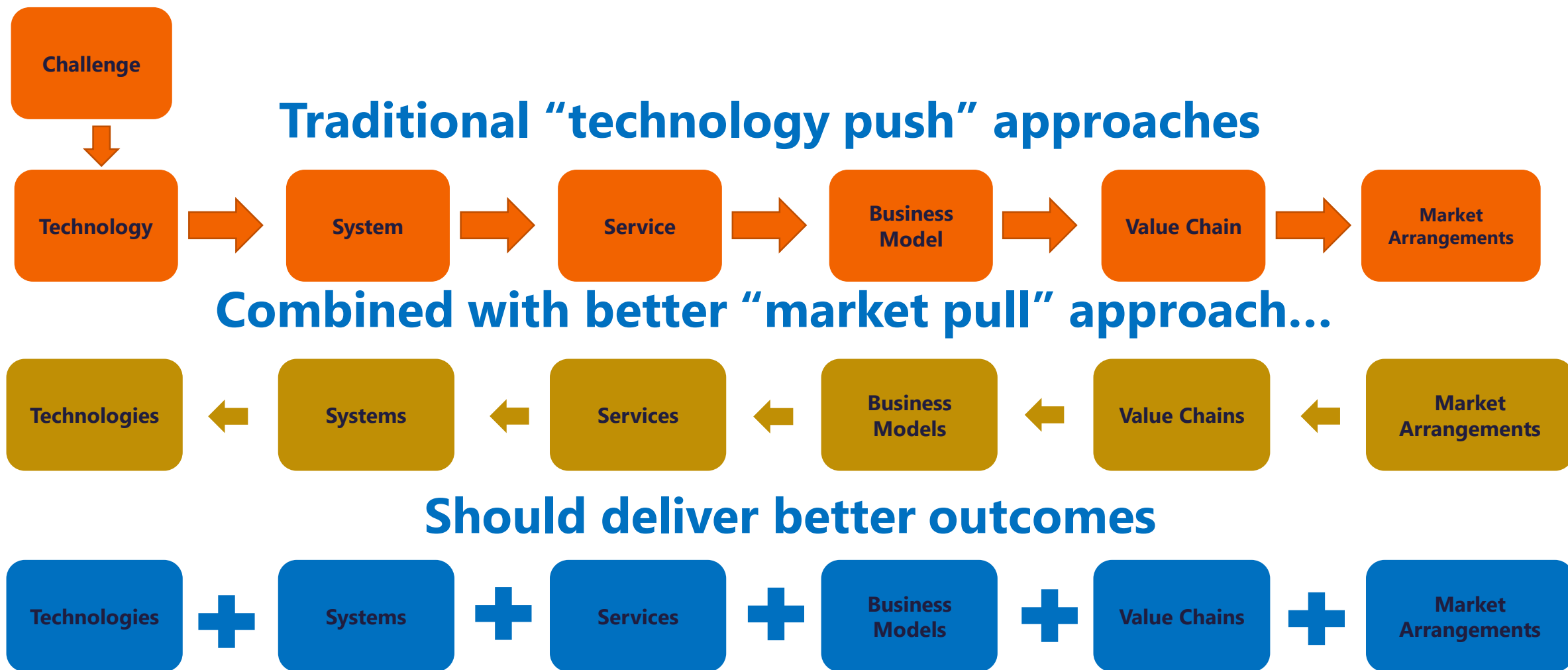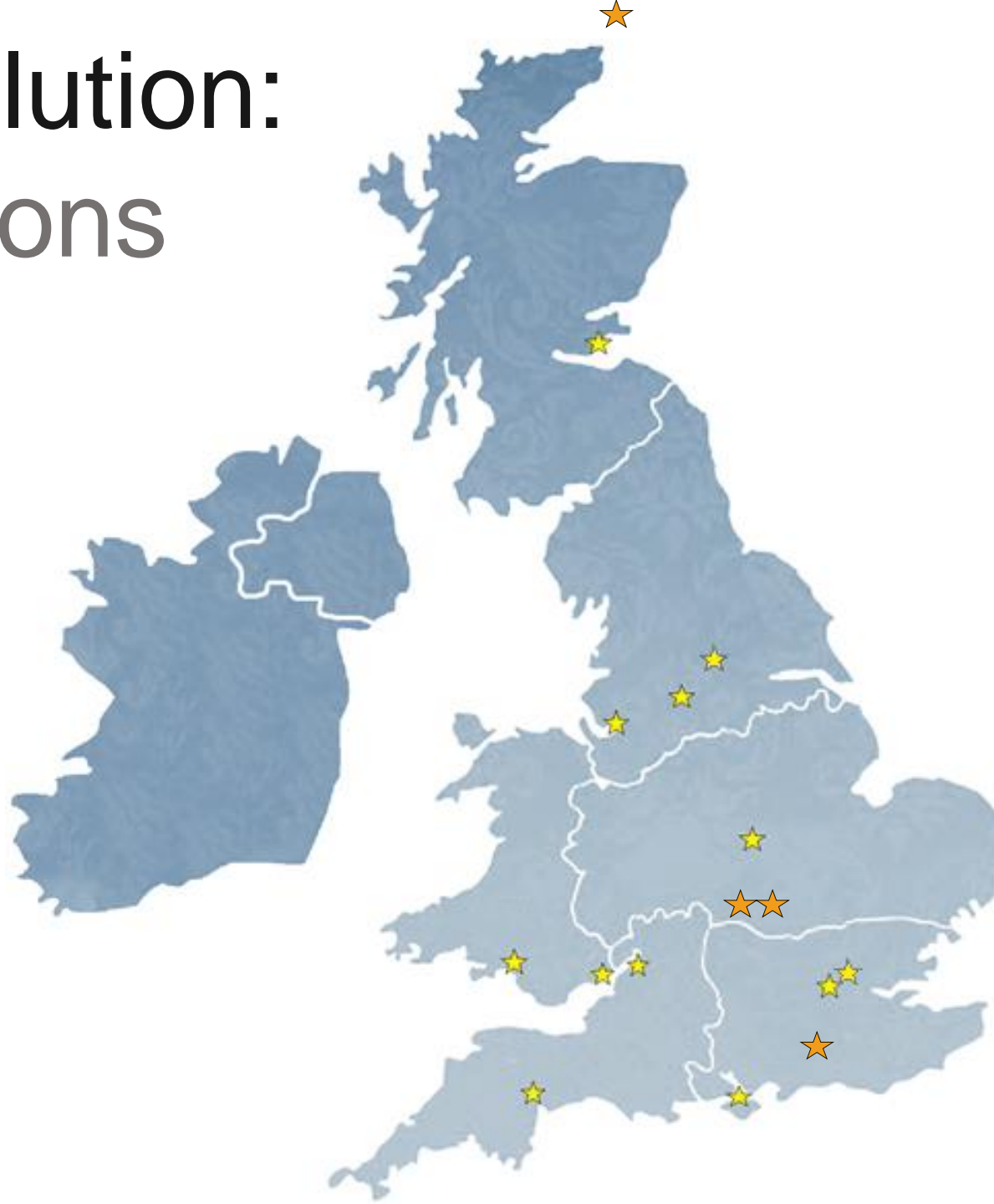
Future energy model proving

Practical demonstrators

£51m

Future designs

£32m

Innovation Accelerator

£9m

Research, Expertise, Capability, Coordination

£16m

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Hypothesis:

Traditional "technology push" approaches

Challenge → Technology → System → Service → Business Model → Value Chain → Market Arrangements

Combined with better "market pull" approach...

Technologies ← Systems ← Services ← Business Models ← Value Chains ← Market Arrangements

Should deliver better outcomes

Technologies + Systems + Services + Business Models + Value Chains + Market Arrangements

Energy Revolution:
Project locations

Project archetypes

Industrial cluster (x2)

Island (x3)

Medium-sized town with rural metropolitan area (x4)

Urban, mixed residential and small non-domestic (x3)


Urban, commercial premises (x1)

Rural with small town (x2)

What have we learnt in the past year….?

- There is increasingly high demand from Industry & Local conveners to rise to this challenge.

- Complex groups of actors needed who don't naturally work together.

- Next generation data management / AI systems for energy a common theme.

- Financing ecosystem emerging rapidly alongside projects.

- And potential for multiple societal benefits from successful platform soltions: emissions, costs, engagement, prosperity, resilience across the UK.

- Our focus now shifting from stimulating activity to measuring outputs and mapping to longer term outcomes
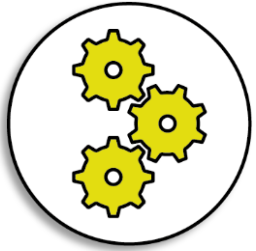
Project Reflex
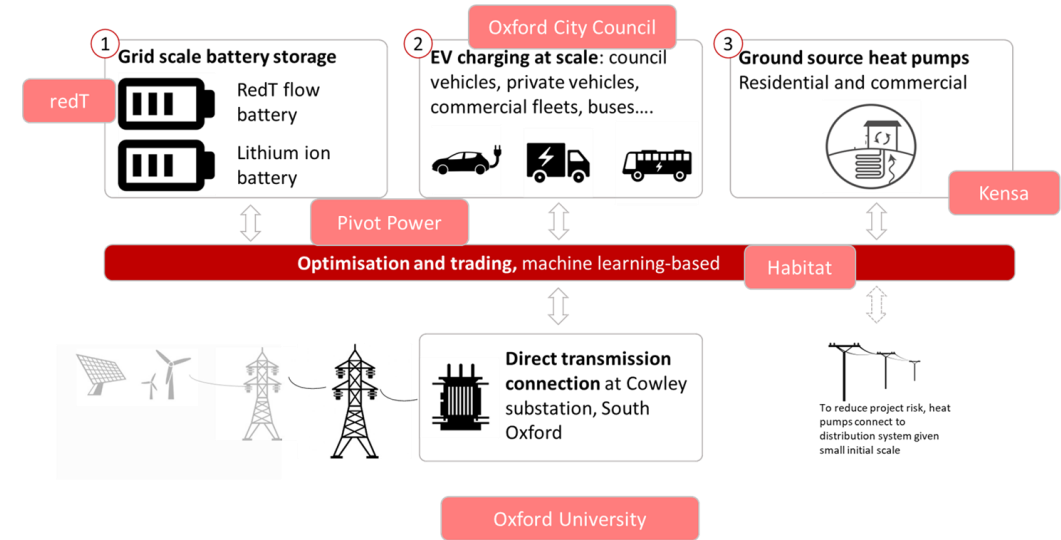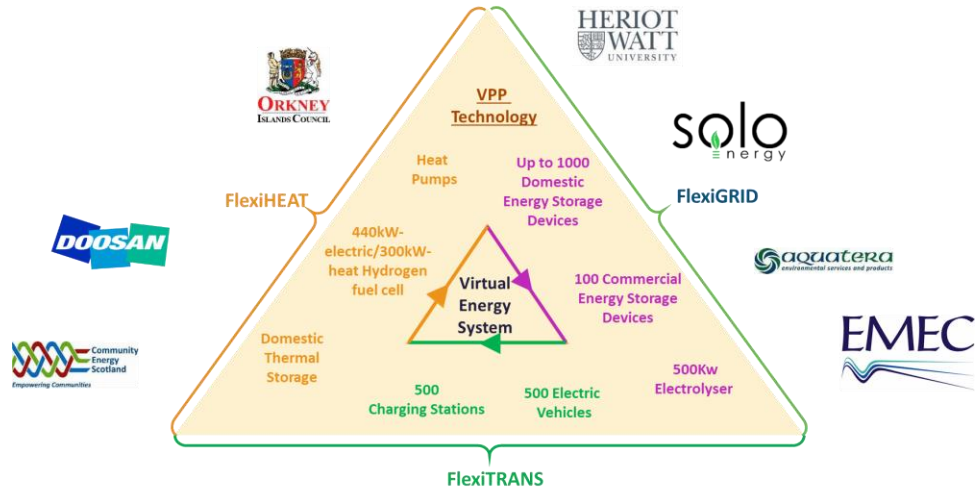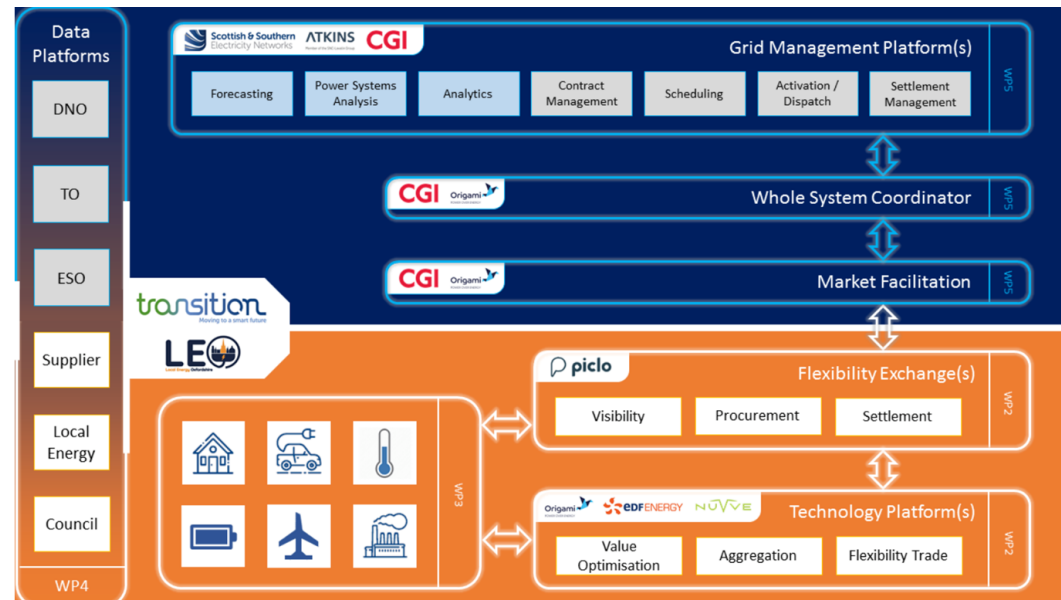
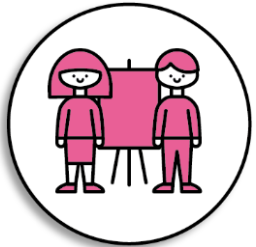# Role of Energy Systems Catapult (Energy Revolution Integration Service – ERIS)

Helping the industry transform by
de-risking and improving projects:

Better business models: innovators taking a whole systems perspective

Building momentum: combining forces; delivering synergies

Enabling commercialisation: Identifying what needs to change (policy, regulation, standards)

Evaluating alignment between programme objectives and projects

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The EnergyREV Consortium

Consortium of 32 co-investigators exploring challenges around smart local energy systems from an interdisciplinary and whole-systems viewpoint. Expertise and detailed knowledge in:

Institutions
Policy, regulation, markets and governance issues around local energy systems

Business and finance
Local energy businesses practices and industry engagement

Data and AI
Expertise across wide ranging cyber-physical issues
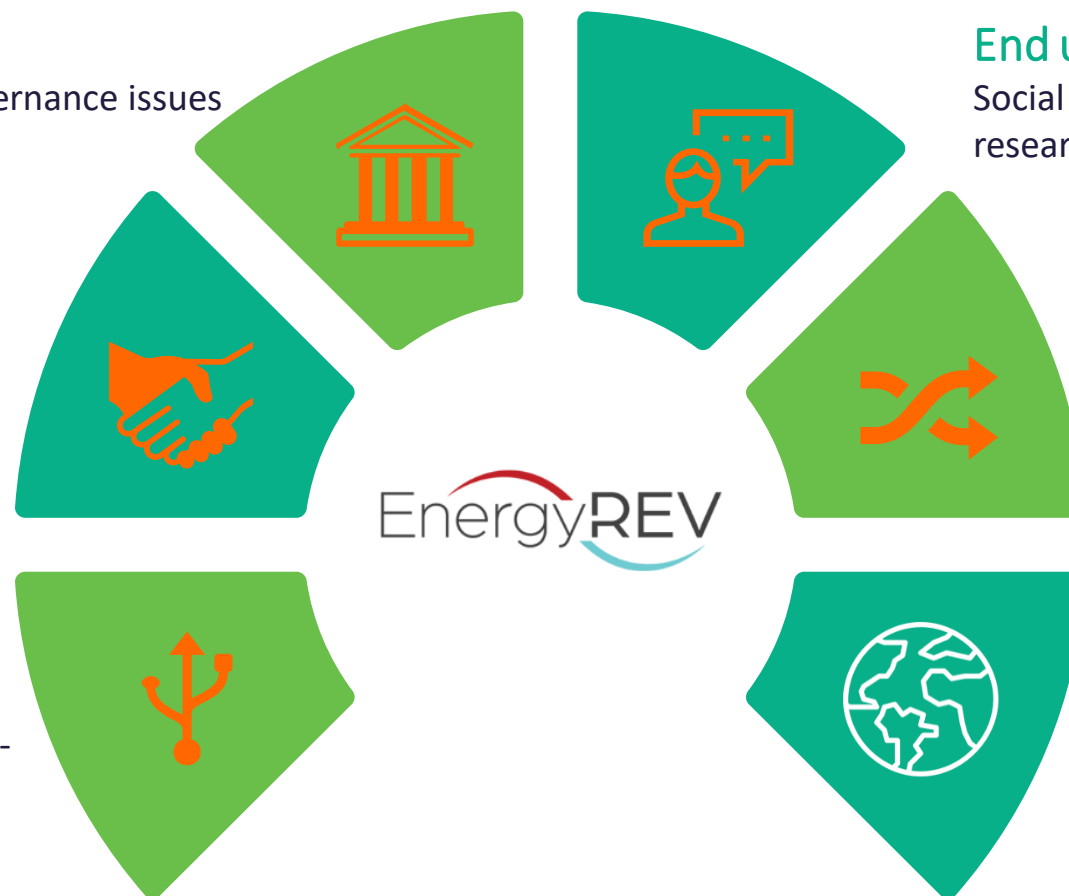
End users and consumers
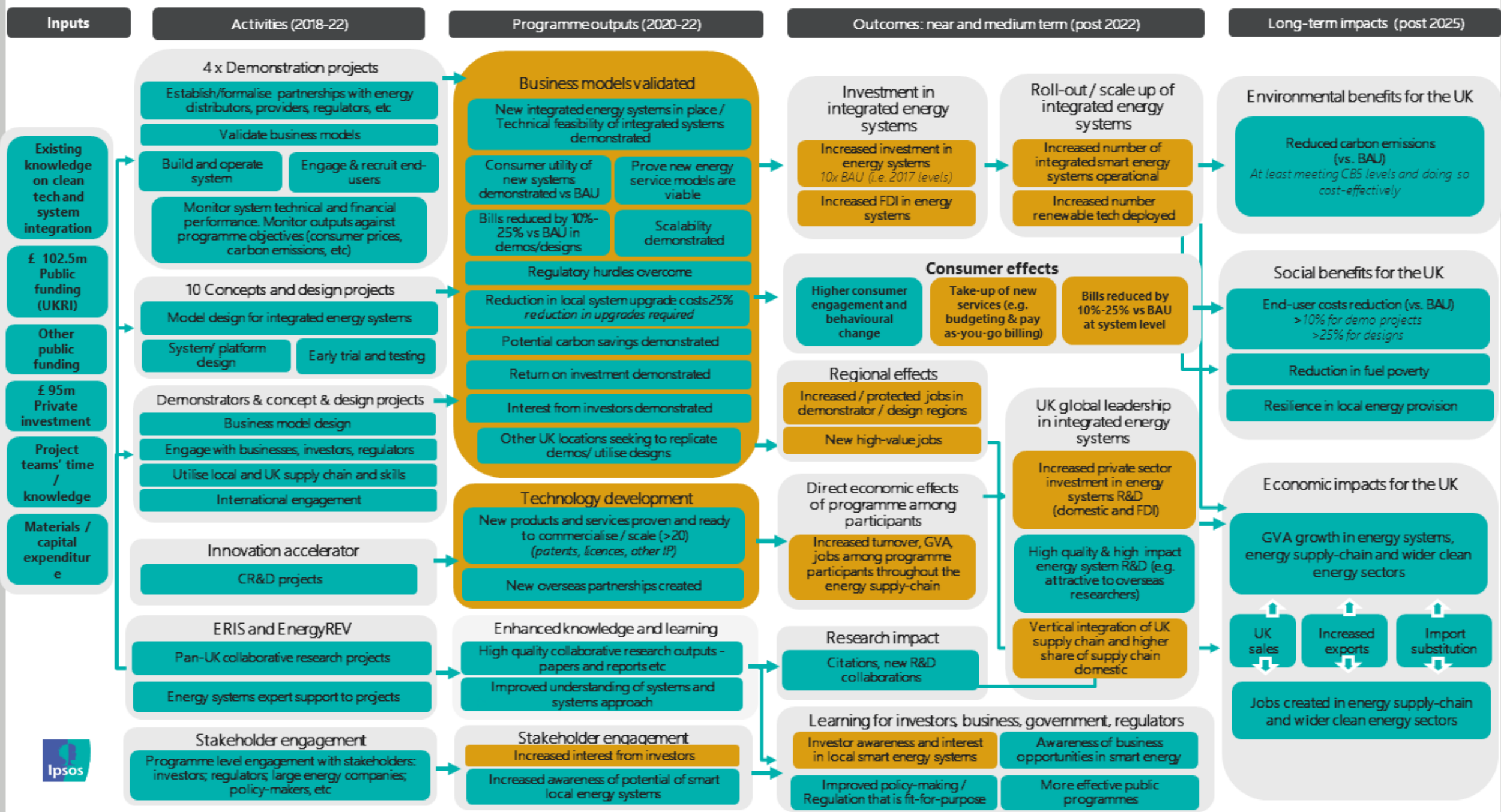Social science understanding of end user research and engagement

Multi-vector "whole" systems
Electricity, heat and transport, and system integration

Energy and environment
Interactions between energy and environmental systems

KPI	Current Q3 2019 (Actual/target)	Expected by March 2022	Notes
Progress vs. Milestones	90% of milestones passed on time	Expect >95% milestones complete	Some projects may require a no-cost extension (up to 1 yr)
Spend vs. Forecast	Committed £103m; Spent £11m	Forecast £103m	
Programme RAG Status	Green	Green	
No of smart local energy systems (SLES)	11 Concepts 3-4 x Demos in development	4 Demos Commissioned 10-11 Detailed Designs + scale up and replication locations	Focus on enablers for scale up and replication. Methodology & targets under development
Scale of Smart Local Energy Systems	10-100 MW Designs (Methodology in development)	Operational 10-100 MW connected 100s-1000s MW Designs	Methodology & targets under development
Private Investment /£	£136m committed (vs £95m target)	>£136m defrayed 10 x Business as Usual investment (tbd)	Target £billions investment commitments in early 2020s
New or improved products or services	At least 5	Expect >10-20	Business case target 10-20
Stakeholder influence (No of key groups x RAG status)	4/13 critical stakeholder groups are fully engaged	At least 13 critical stakeholder groups engaged	Improve policy, regulatory, investor, consumer alignment
CO_2 savings	Methodology in development	Target is earlier/on track for Carbon Budget 5	Complexity, interdependences & attribution; data likely to come "late"
Reduced consumer bills	Methodology in development	Target > 10-25% reduction in bills cf. Business as Usual	Includes electrification of transport and revenues e.g. from solar PV.
Jobs (Full-time equivalents FTEs)	Est. >50 high value	Target 100 - 1,000s FTEs	Targets: 10,000 by late-2020s 100,000 in 2030s; Also (Re)-Training + Apprenticeships

Economic benefits from industry growth

From 2019	And from 2020	And from 2021	And annually from 2022
• # attending PFER events • # discrete project applicants and organisations applying for PFER competitions • % of fast moving LAs bidding • #SMEs, large cos, RTO, multinational etc. • # of UK smart integrated local energy systems stage of development (new and cumulative) • Projected scale and participation of systems (# of households, EVs, MW renewables, storage etc.) • Funding Commitments for PFER Demos & Designs (public & private)	• #SLES under construction • Forecast business R&D and investment in Smart Local Energy Systems (£/yr) • # of businesses and investors interested in supporting implementation, scale-up and replication (incl. businesses attracted/retained in UK or Foreign Direct Investment) • Target # of new or improved products, services or markets • Data sharing protocols and trials	• #SLES commissioning • £ investment (public + private + consumer + foreign) • # and size of businesses created/ attracted/retained in UK • # of proven new or improved products, services, or markets • # of Reports, Papers, Patents, licenses etc. • Availability of open data platform	• #SLES operational • £SLES Revenues • Gross Value Add (£ in year, direct and supply chain) • Jobs (New, retained, upskilled in year, direct and supply chain) • Wage premium • Avoided imports (£) • Exports (£) • Unlocked wider clean growth GVA (e.g. renewables, EVs) • Distribution of economic benefits (by location, ED&I) & avoided environmental or social costs • Use of data platforms

From 2019	And from 2020	And from 2021	And annually from 2022
• # of UK smart integrated local energy systems stage of development (new and cumulative) with projected costs, cost savings and energy system economic benefits • Projected scale and participation of systems (# of households, EVs, MW renewables, storage etc.)	• # of locations interested in supporting implementation, scale-up and replication • Target energy system economic of new or improved products, services or markets • Methodologies for energy system economic benefits (whole system costs, cost savings, avoided infrastructure, avoided imports, and wider Clean Growth unlocked)	• Estimates for economic benefits (whole system costs, cost savings, avoided infrastructure, imports, and wider Clean Growth unlocked), local and national	• UK energy system cost savings (links to efficiency & productivity cf. BAU) • Avoided imports (£) • Unlocked wider energy system benefits (e.g. growth of renewables, Evs, heat pumps) • Distribution of economic benefits (by location, ED&I) & avoided environmental or social costs • [Total economic value of SLES]

Thank you

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