

**Virtual
Energy
System**

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DECARBONISING THE ENERGY SECTOR WITH CONNECTED DIGITAL TWINS



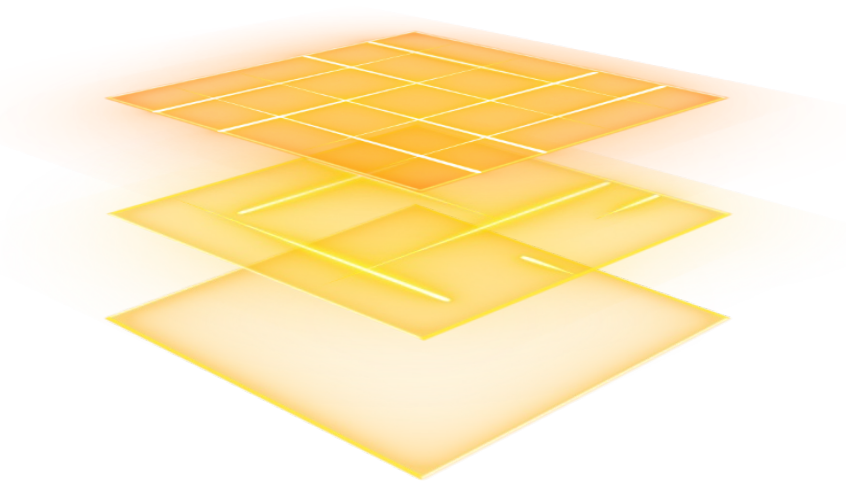
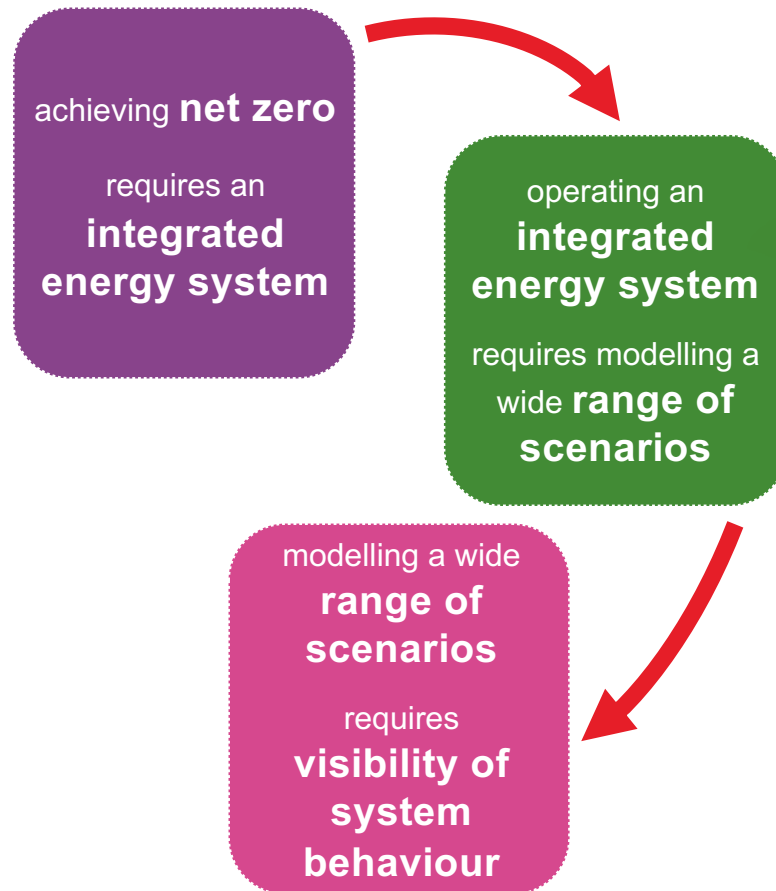
Jonathan Barcroft
Workstream Lead, ESO



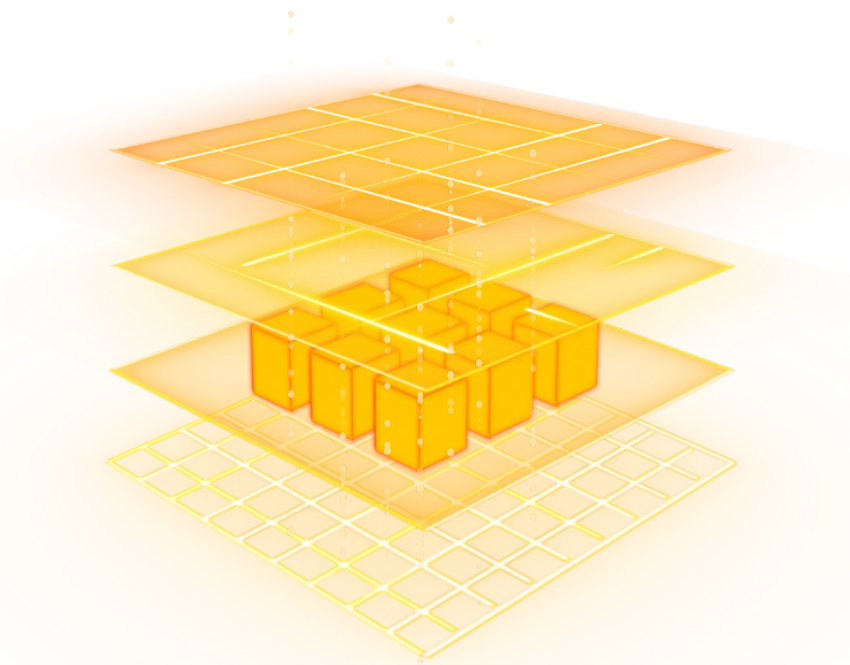
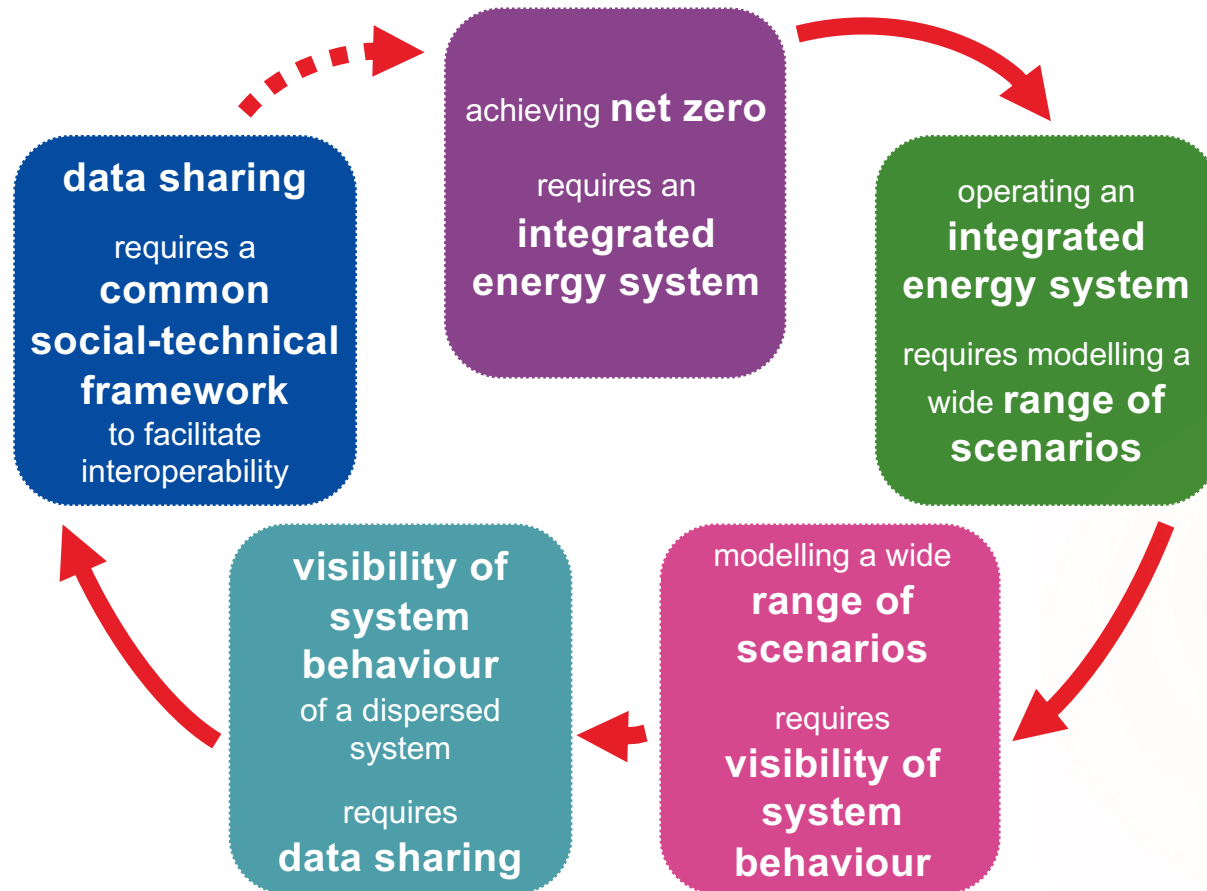
Simon Evans
Global Digital Energy Leader, Arup

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THE CHALLENGE: THE ENERGY SYSTEM IS CHANGING



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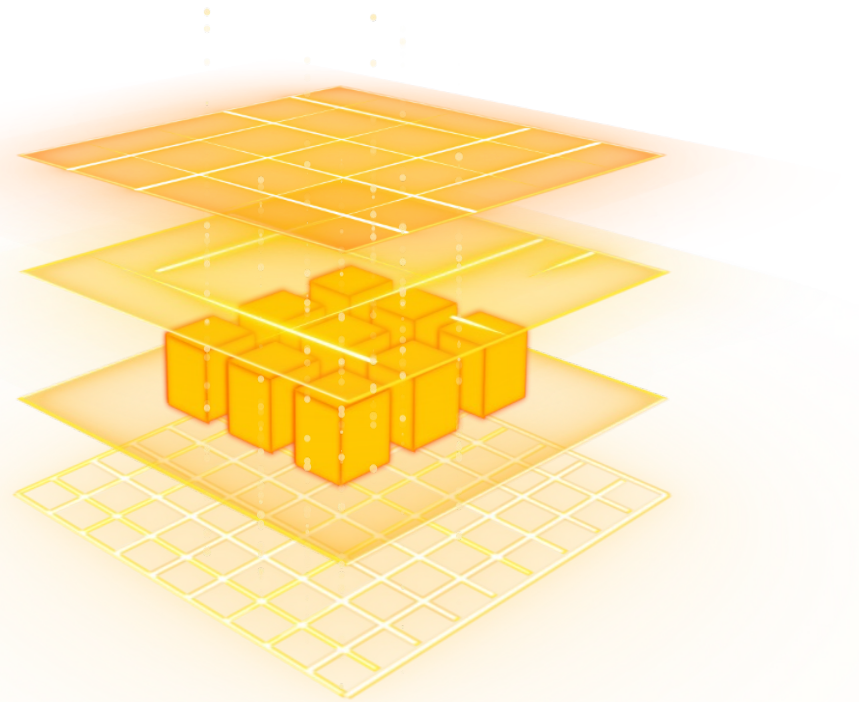
THE SOLUTION: VIRTUAL ENERGY SYSTEM

Ambitious objective:

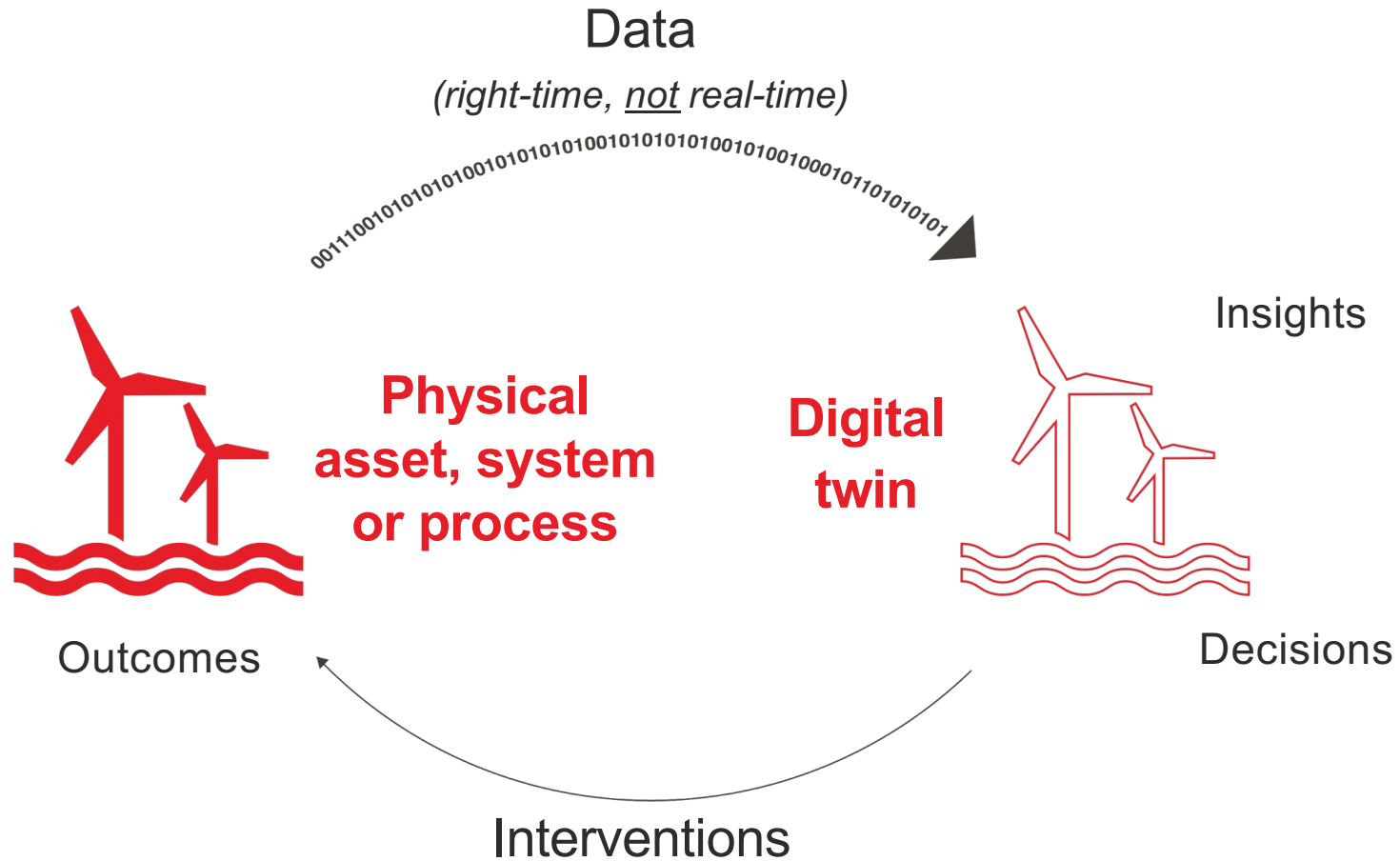
Enable the development of an ecosystem of **connected digital twins**

For the **entire GB energy system** to solve wider system challenges

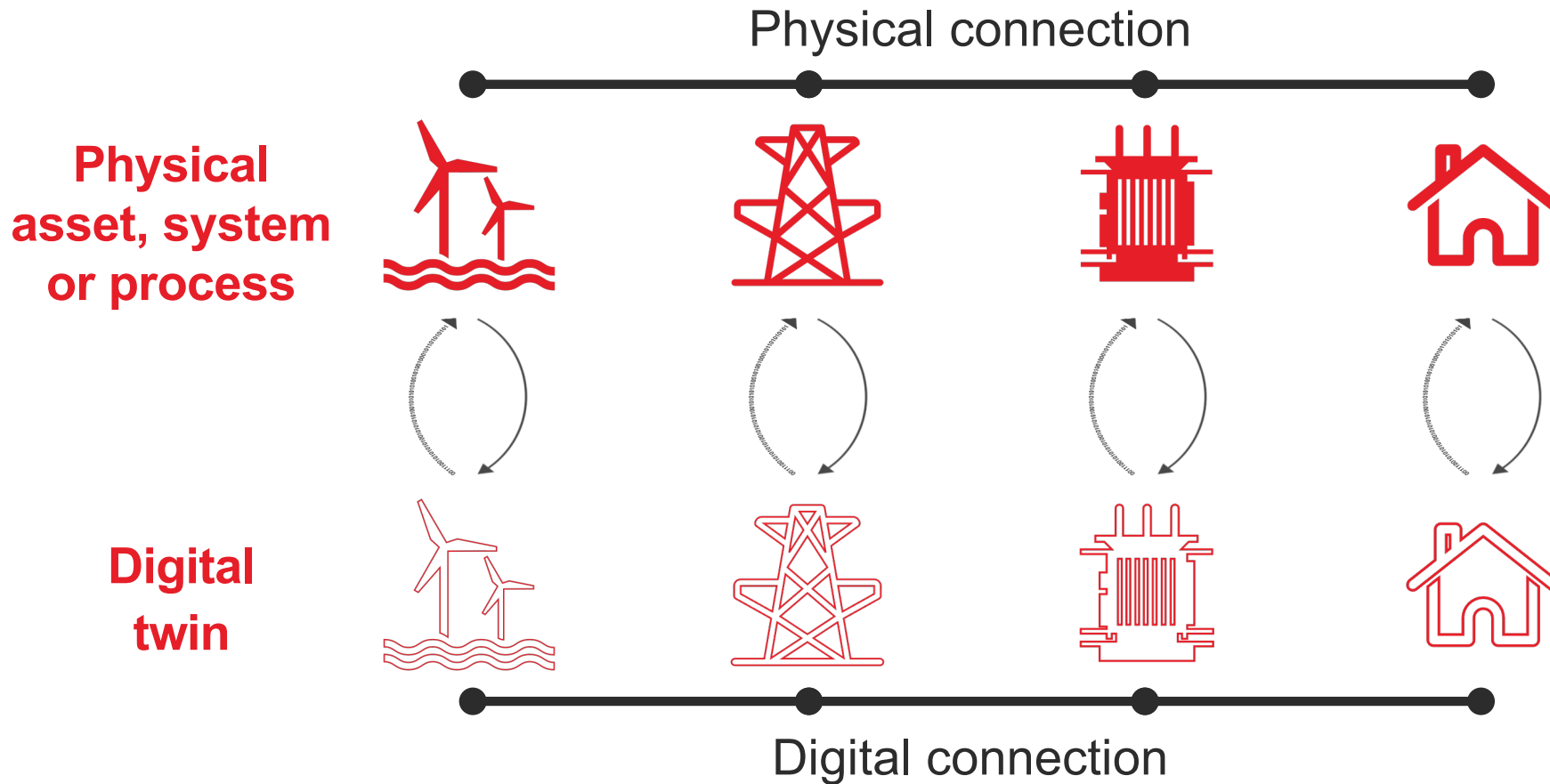
(e.g. energy optimisation, carbon reporting, investment planning, ...net zero energy transition)



AN ECOSYSTEM OF CONNECTED DIGITAL TWINS



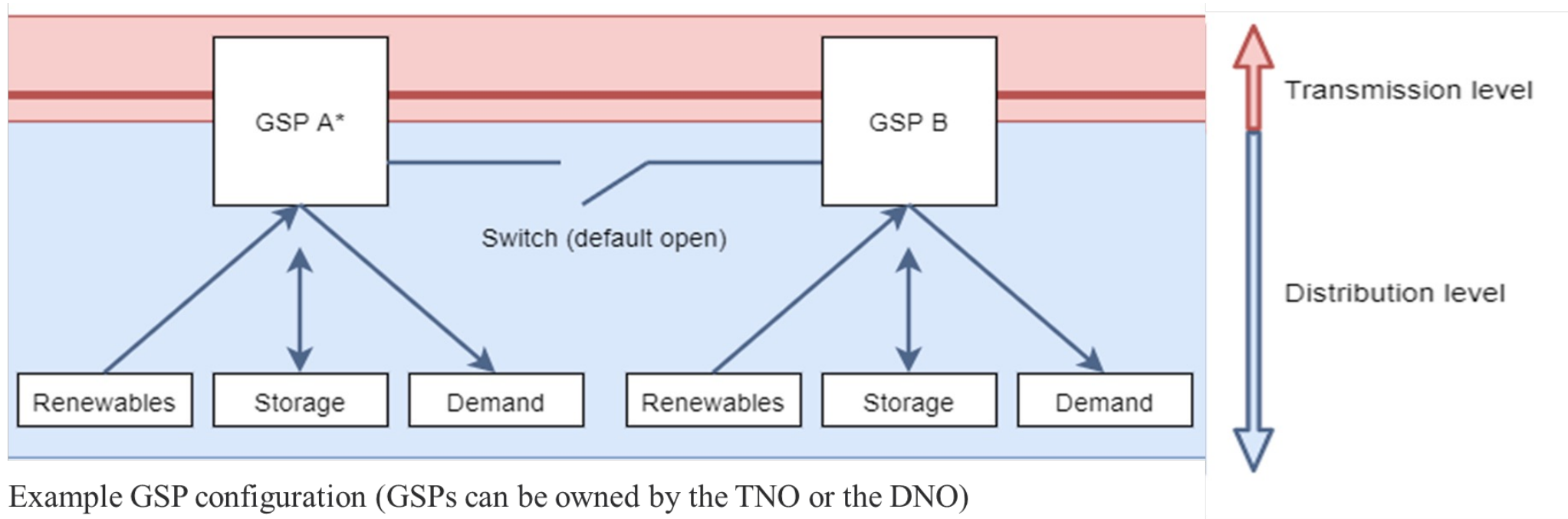
AN ECOSYSTEM OF CONNECTED DIGITAL TWINS



WHAT NEEDS TO HAPPEN: COMMON FRAMEWORK

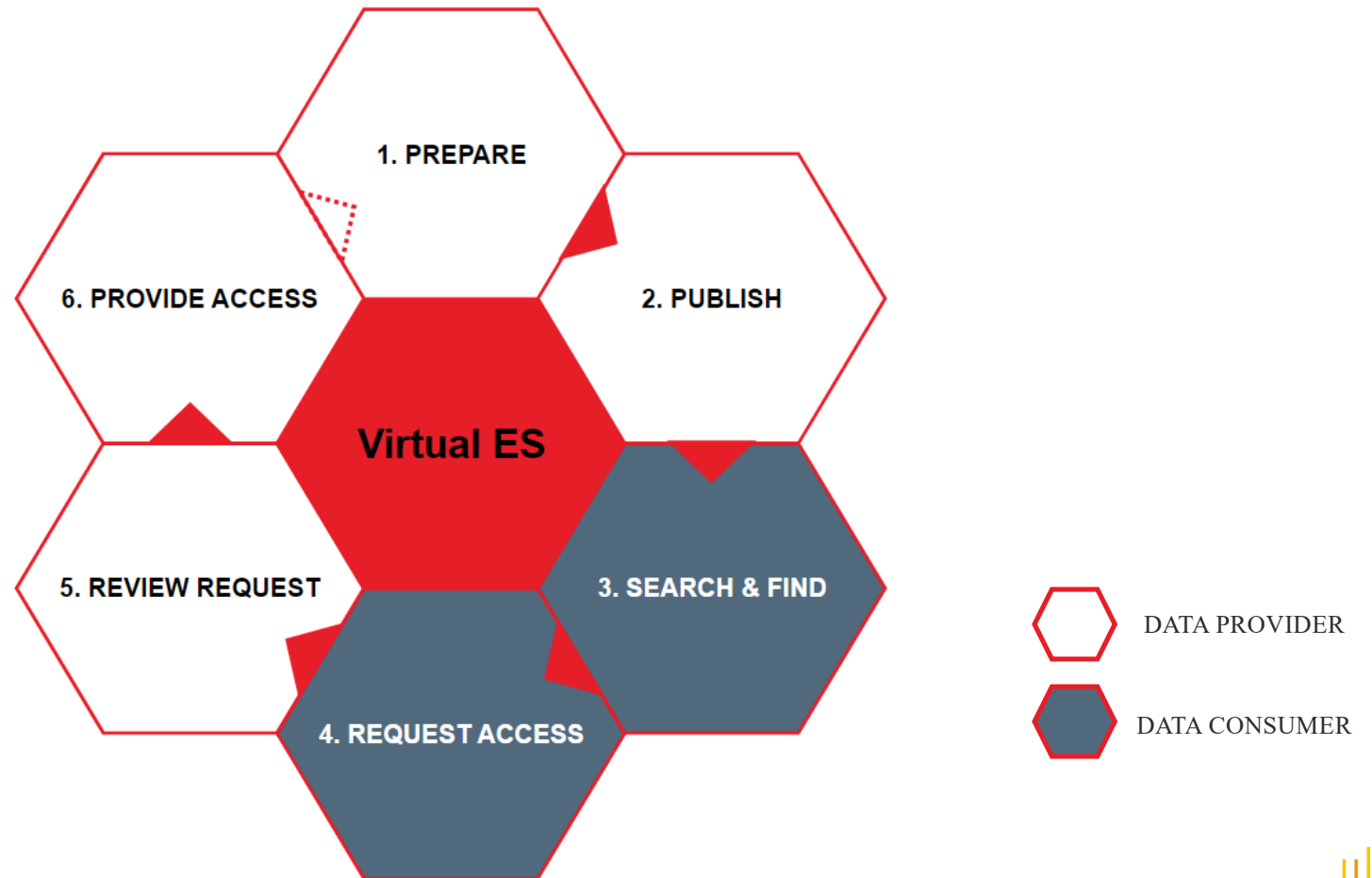
People	Defining roles & responsibilities	Raising awareness & fostering culture	Building capabilities & skills	PRIORITY FACTOR
Process	Aligning around industry codes & standards	Engaging stakeholders	Creating a governance framework	Determining the operating environment
Data	Aligning models & taxonomies	Establishing management & governance	Increasing visibility & enabling sharing	Managing security
Technology	Connecting physical infrastructure	Enhancing modelling and analysis	Creating an interoperable 'tech-stack'	

DEMONSTRATOR USE CASE



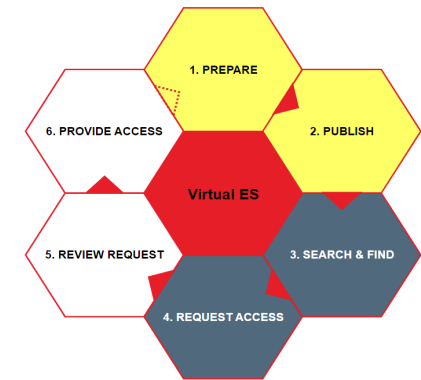
Example GSP configuration (GSPs can be owned by the TNO or the DNO)

KEY STEPS FOR USING THE VIRTUAL ENERGY SYSTEM

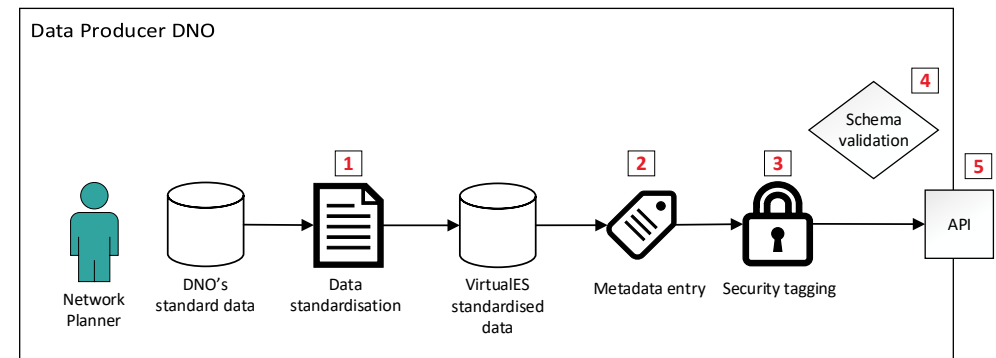


(1) PREPARE & (2) PUBLISH

Task Lead: Data Producer



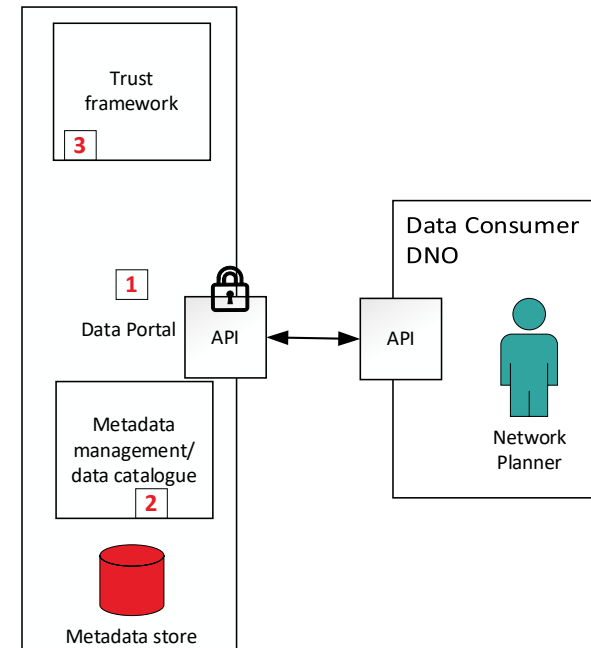
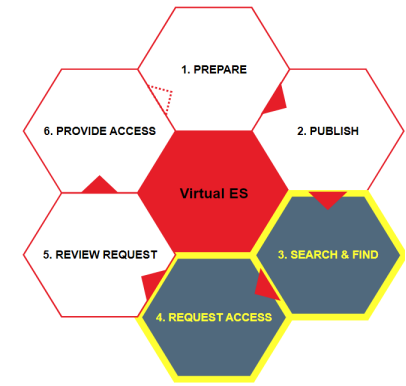
#	Activity	Importance
1	Data is standardised data into agreed sector format	Enables interoperability across sector
2	Metadata is populated	Enables search, discovery and understanding of the data
3	Data is security tagged	Enables secure sharing of data with the correct consumers
4	Data schema is validated	Checks that the data being shared conforms to agreed standards
5	Data is published using APIs	Ensures that the data is securely shared using approved protocols



(3) SEARCH & (4) REQUEST ACCESS

Task Lead: Data Consumer

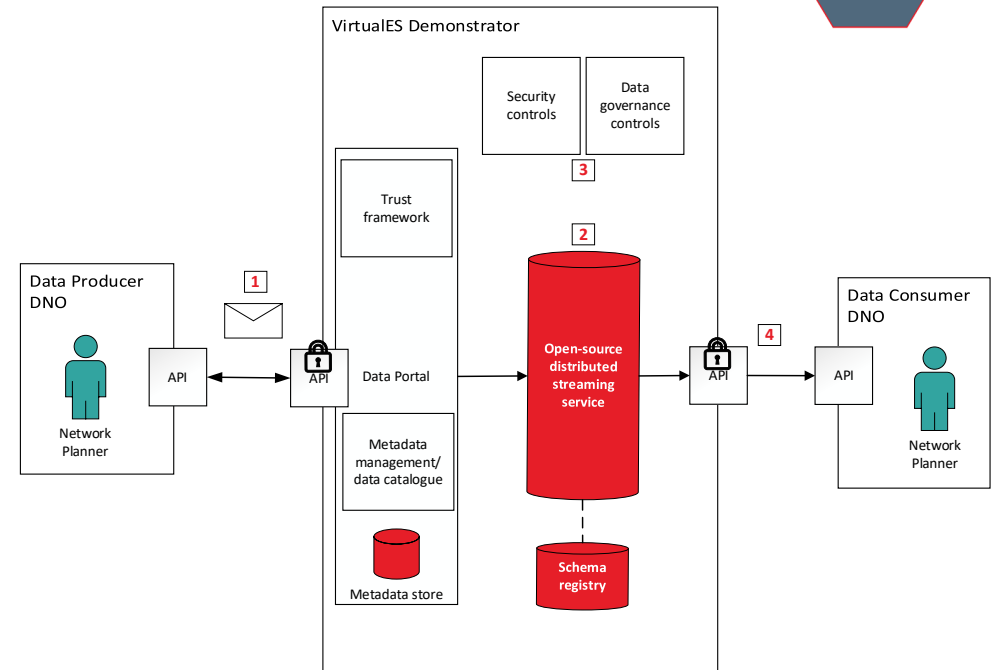
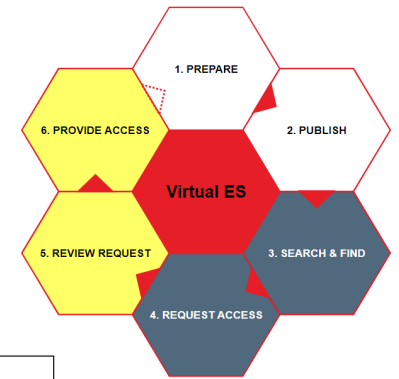
#	Activity	Importance
1	Consumer accesses data portal	Front entrance/user interface for the VirtualES that can be accessed as a web link.
2	Data is searched using a data catalogue	Search and discovery relevant data using search filters and metadata.
3	Access to data is requested using a trust framework <ul style="list-style-type: none"> 1. Consumer is pre-approved 2. Consumer not pre-approved and must request access 	Provides the mechanism to enable sharing by ensuring permission policies are met



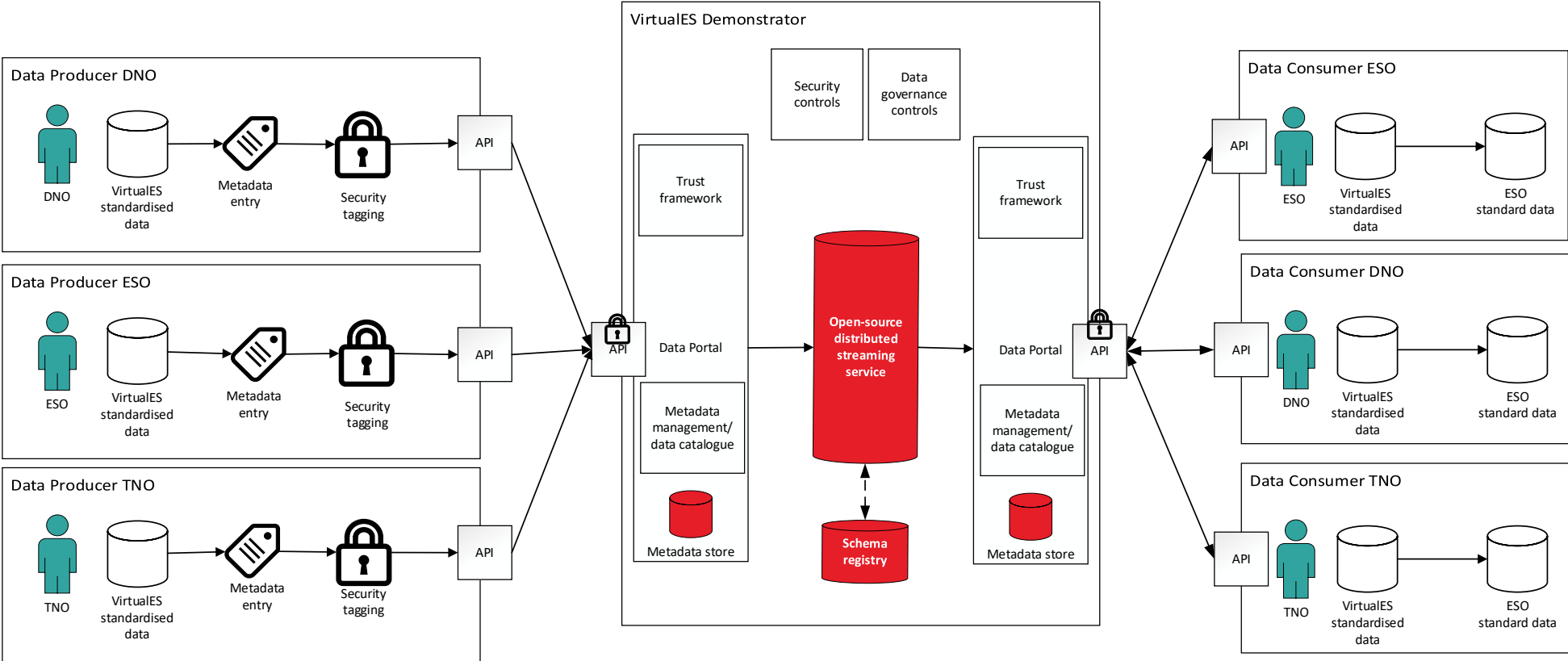
(5) REVIEW & (6) PROVIDE ACCESS

Task Lead: Data Producer

#	Activity	Importance
1	Producer is notified of access request	Producer can see who is requesting access and why
2	Data is streamed using a distributed streaming service	Data is streamed in 'right-time' using a performant streaming technology
3	Security & governance controls are applied	Security, governance and other policies are applied to the data
4	Data is accessed using APIs	Data is securely accessed using approved protocols



DEMONSTRATOR HIGH LEVEL DESIGN



CREATING A GOVERNANCE MODEL

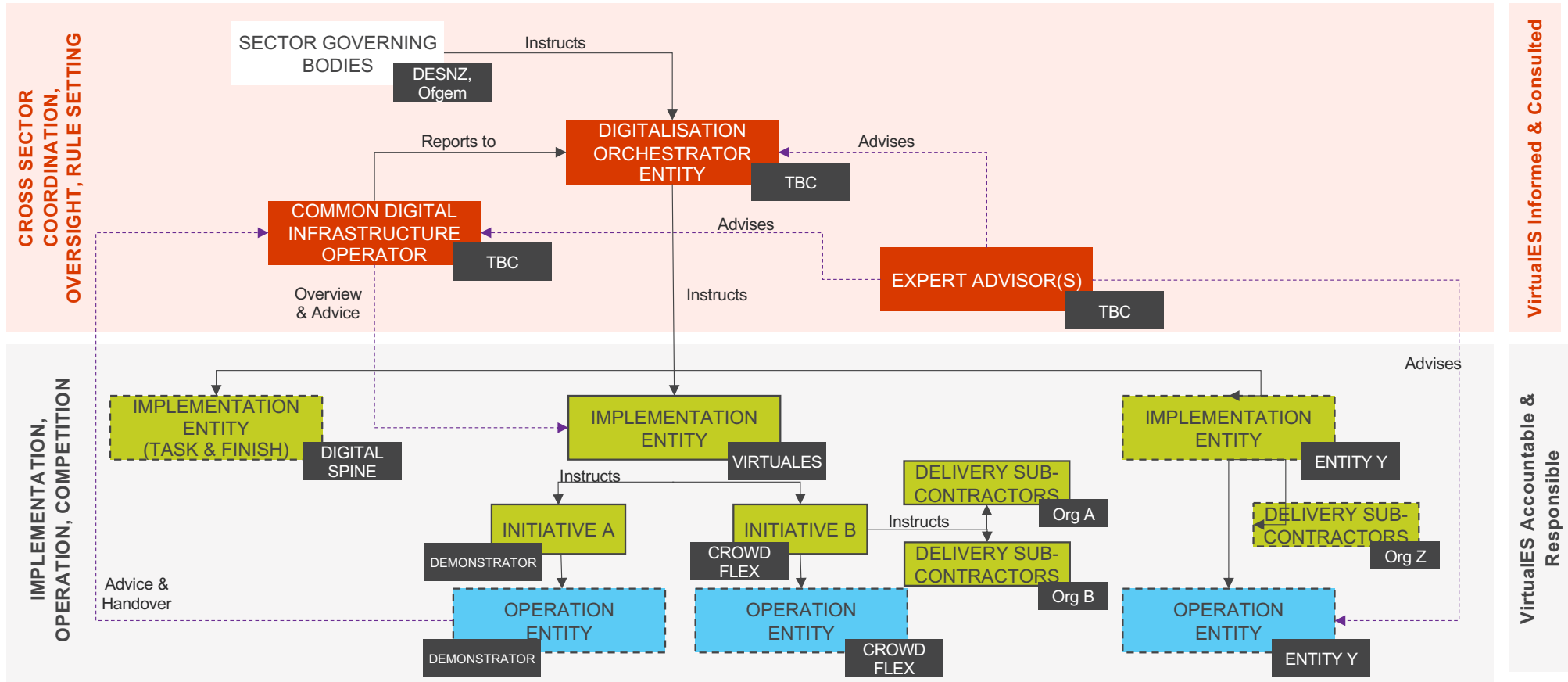
Why we need a governance model?

- Enable participation & decision making
- Unclear and Overlapping governance mechanisms
- Invite discussion and drive conversations with key stakeholders across the sector
- Build a sense of shared endeavour

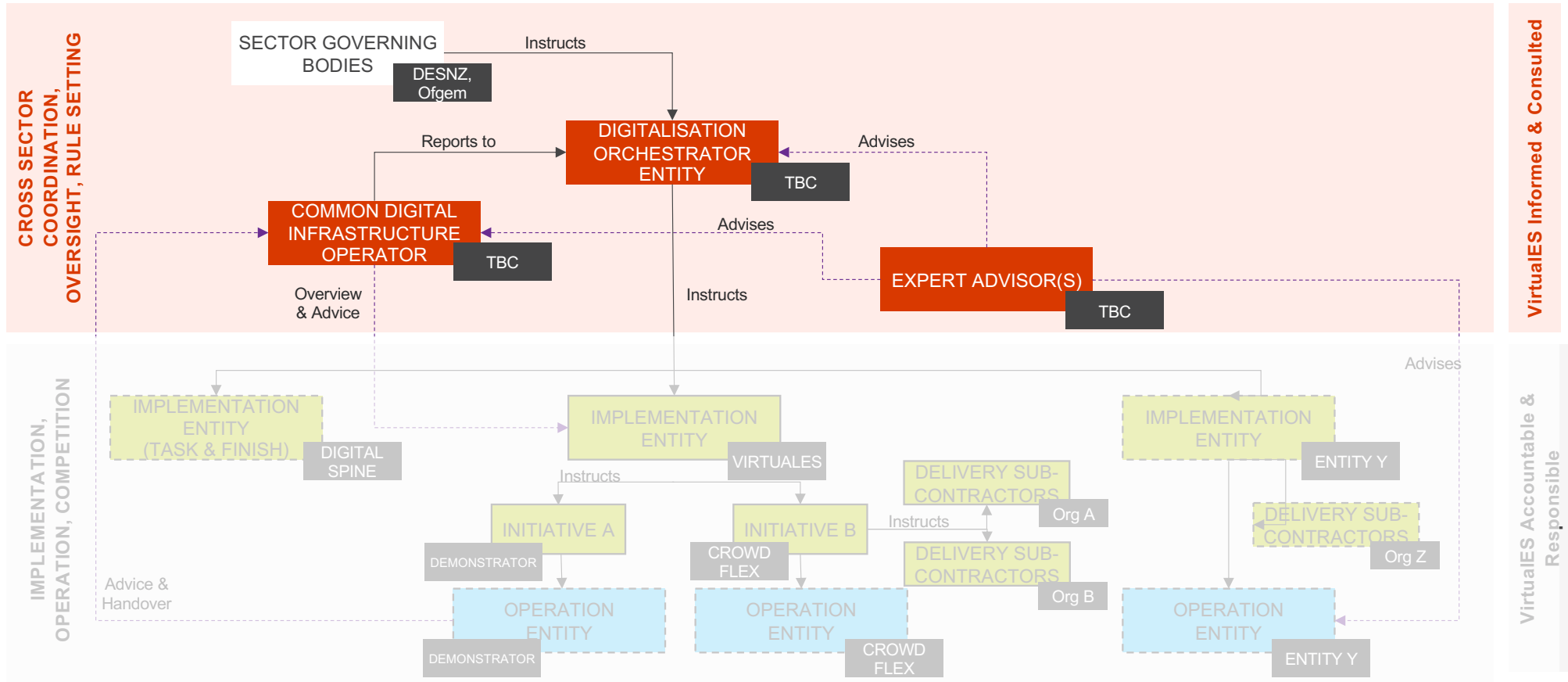
Governance design principles

1. Transparent competition
2. Accountability
3. Stakeholder engagement
4. Responsiveness
5. Participation
6. Empowerment
7. Legitimacy

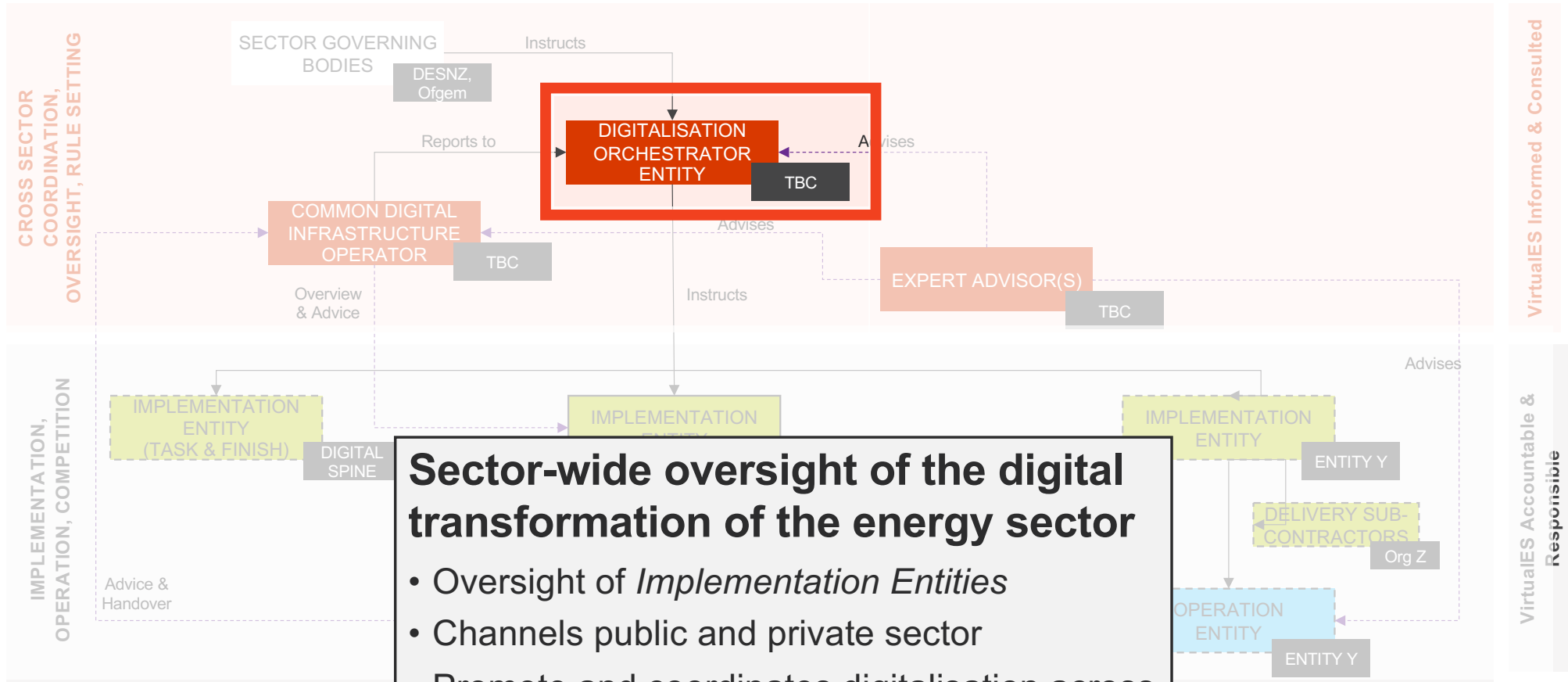
POTENTIAL GOVERNANCE MODEL D – CO-LEAD



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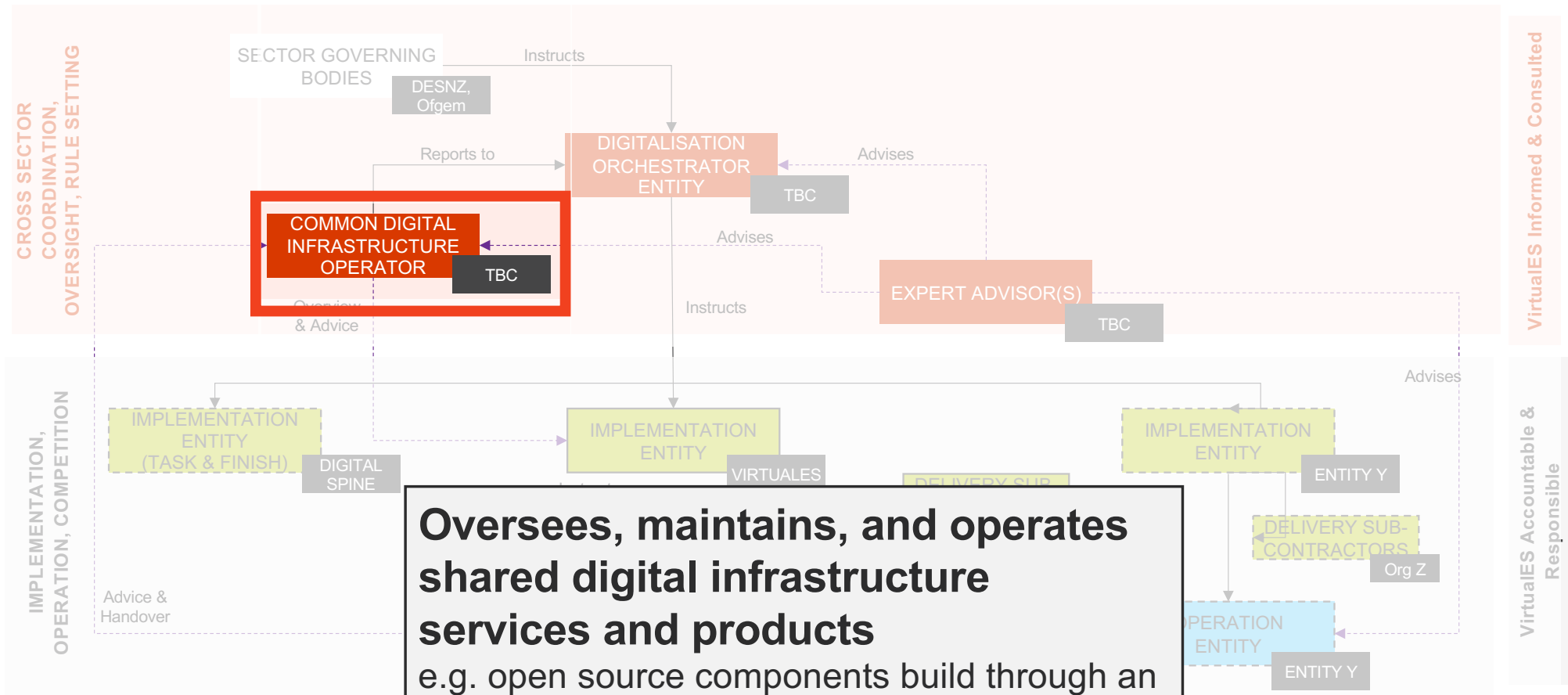
POTENTIAL GOVERNANCE MODEL D – CO-LEAD



Sector-wide oversight of the digital transformation of the energy sector

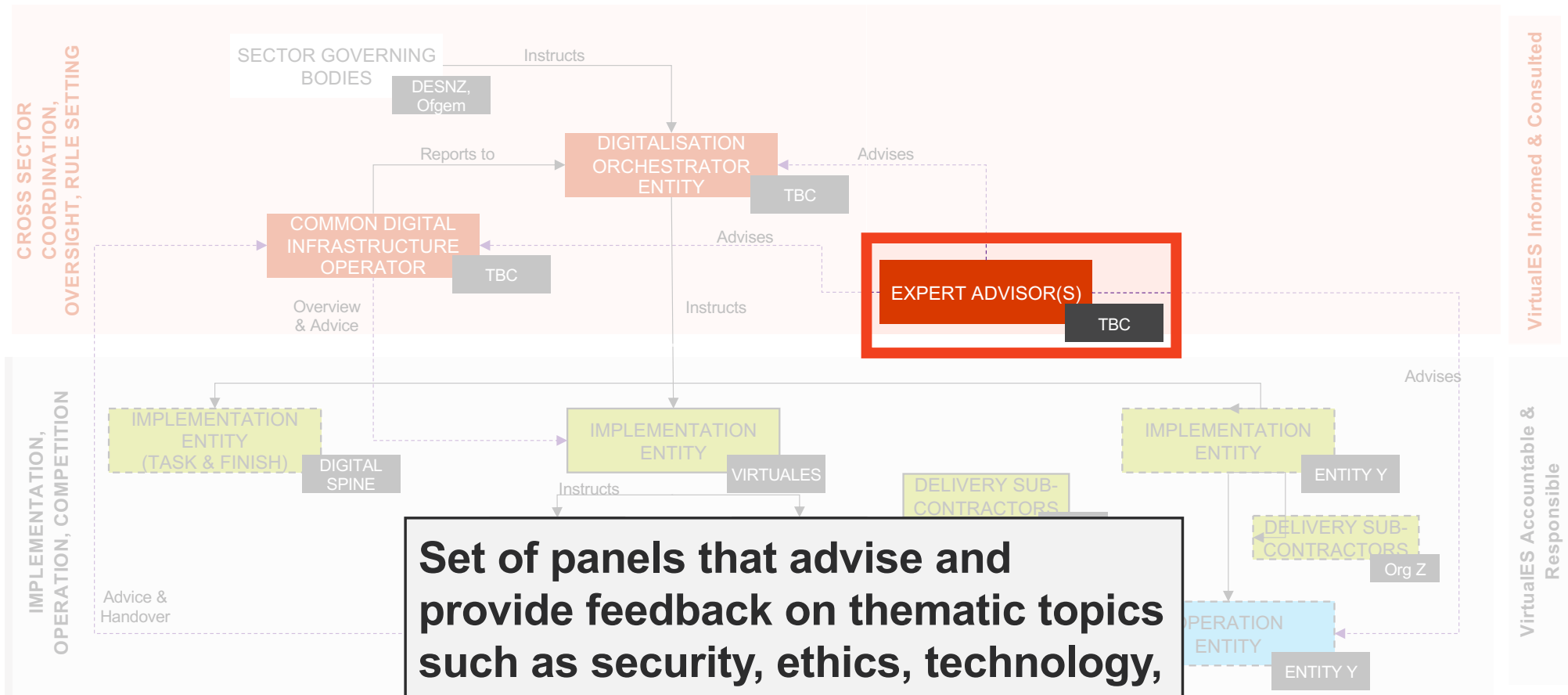
- Oversight of *Implementation Entities*
- Channels public and private sector
- Promote and coordinates digitalisation across the sector and shares knowledge

POTENTIAL GOVERNANCE MODEL D – CO-LEAD

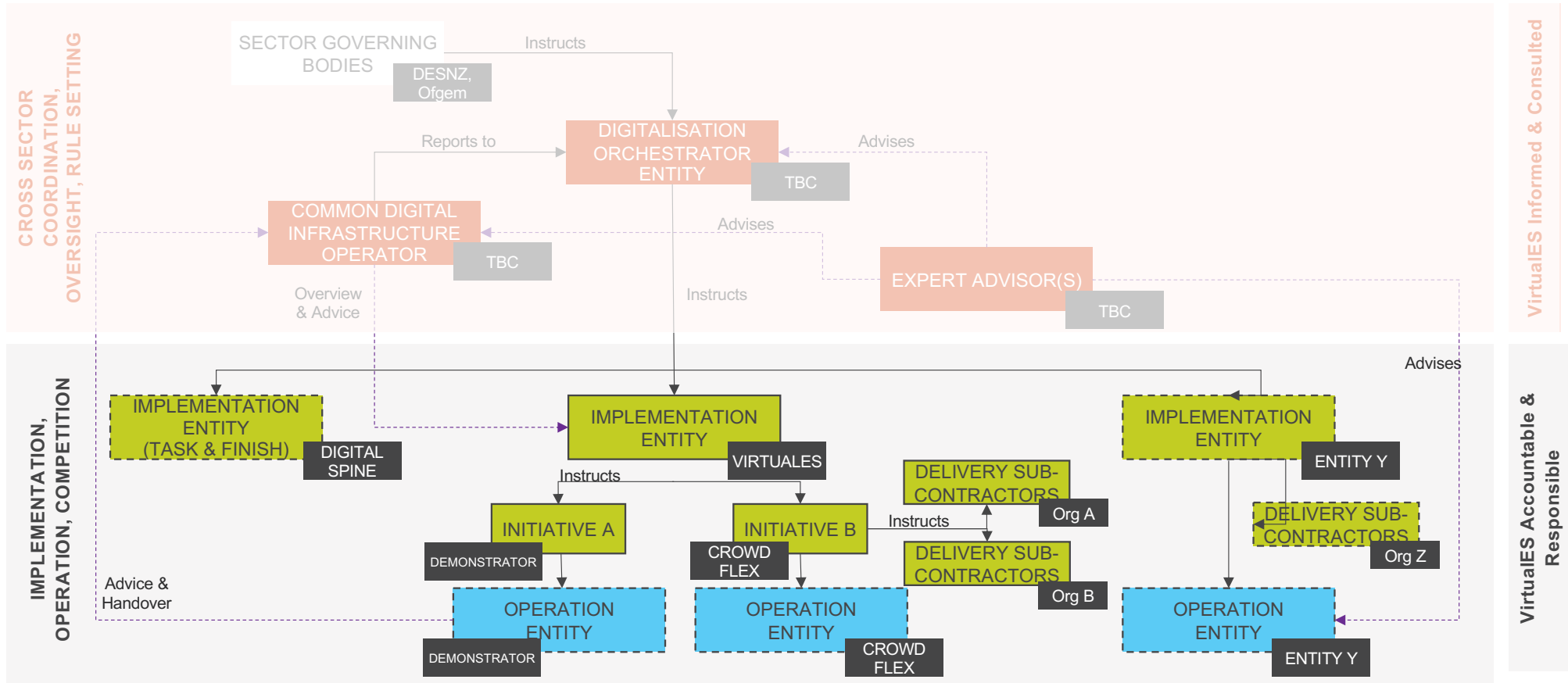


Oversees, maintains, and operates shared digital infrastructure services and products
 e.g. open source components build through an Implementation Entity.

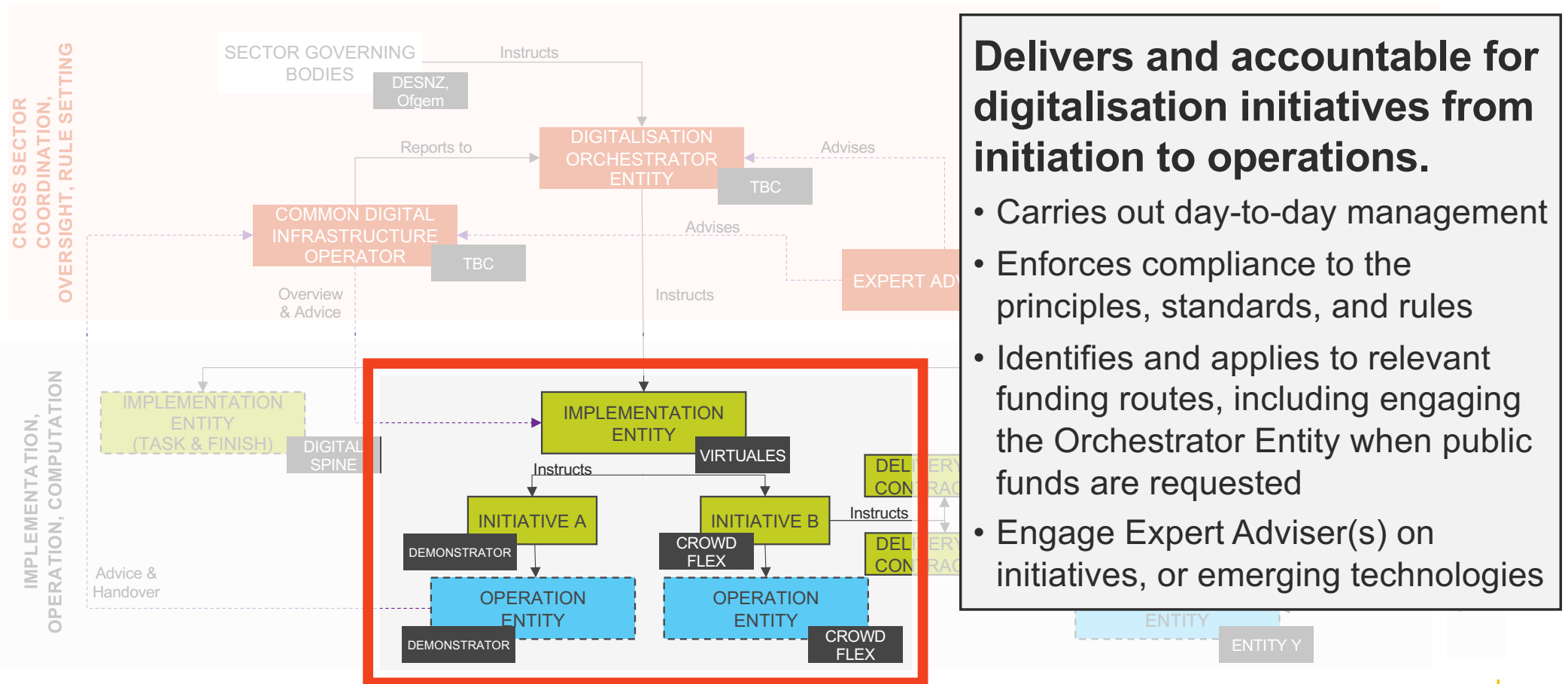
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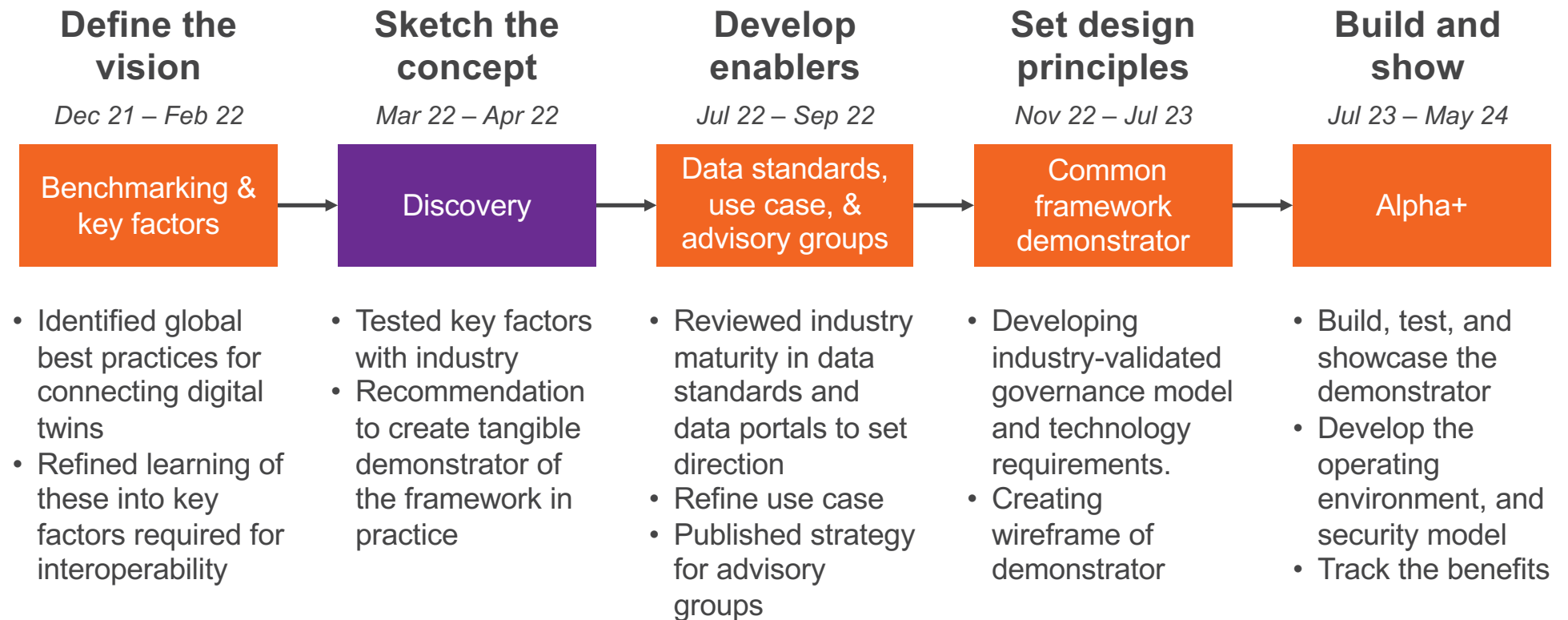
POTENTIAL GOVERNANCE MODEL D – CO-LEAD



Delivers and accountable for digitalisation initiatives from initiation to operations.

- Carries out day-to-day management
- Enforces compliance to the principles, standards, and rules
- Identifies and applies to relevant funding routes, including engaging the Orchestrator Entity when public funds are requested
- Engage Expert Adviser(s) on initiatives, or emerging technologies

PROJECT TIMELINE



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VirtualES@nationalgrideso.com



Jonathan Barcroft
Workstream Lead, ESO



Simon Evans
Global Digital Energy Leader, Arup

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