Virtual Energy System

Common framework

Creating a governance framework

August 2023

Contents & Foreword

Foreword

Digitalisation is vital to reaching the UK's climate change targets. Continuing to innovate and adapt the energy system requires a range of new tools and a reimagining of how the entire industry can come together.

That is why ESO is today presenting this ambitious call to action for an Industry-wide mission to super charge digital twins across our energy system.

This Virtual Energy System common framework will create the common language, recommend infrastructure and processes to connect and federate individual digital twins from across the energy sector.

This open framework can proactively contribute to help meet today's energy mission to decarbonise the energy system and bridge the gap to net zero.

I am delighted to launch this shared framework and together as an industry, we can turn this vision into a reality.

Anna Carolina Tortora
Head of Digital Transformation & Innovation Strategy
ESO

Executive summary

A blueprint to create the VirtualES

Overview

ESO have launched the Virtual Energy System (VirtualES) programme to enable the creation of an ecosystem of connected digital twins of the entire energy system of Great Britain. This will operate in synchronisation with the physical system to support the transition to net zero. It will include representations of electricity and gas assets and link up to other sectors.

Through research, expert interviews and industry-wide engagement, 14 key socio-technical factors were identified which are considered necessary for the development and delivery of the VirtualES.

This report will explore the ***creating a governance model*** socio-technical factor, one of four factors that is part of the process pillar, and one of six factors initially explored to support the VirtualES roadmap.

The other two socio-factors ***engaging stakeholders***, and ***raising awareness and fostering culture***, were chosen along with this key factor to be developed first because they in turn will support the development of other factors.

Creating a ***governance model*** aims to set strategy and operational governance of the VirtualES.

Purpose of this document

The purpose of this report is to outline a blueprint to create a governance model through industry engagement, review of related governance models, and theoretical research.

The report sets out the methodology used to define the governance model, the guiding governance principles, the details of four proposed governance models, and an outline of roles and responsibilities needed to realise a sector wide governance.

The four governance approaches and their benefits and risks are discussed in relation to the design principles used to evaluate the models.

This provides transparency into the decision-making process and a rationale for the chosen governance model.

Key findings

In addition to a blueprint for creating a governance model for the VirtualES, this report provides tangible actions for future stakeholders to engage with the programme.

The key takeaways from this report are:

- The governance model needs to ensure a collaborative environment between government and regulators, and the industry members supporting the development of a connected ecosystem of digital twins.
- Stakeholders' engagement will support further iterations of the governance model; therefore, evaluating different option should be based on the seven guiding principles, based on the programme's culture and values.
- A proposal to create three new entities in the sector to support the implementation of a VirtualES.

The proposed co-led governance model will be further refined, including deeper definition of the roles and responsibilities, aligning around industry codes and standards, and determining an operating environment.

1

What is the Virtual Energy System?

What is the Virtual Energy System?

A data sharing mechanism for the entire energy sector

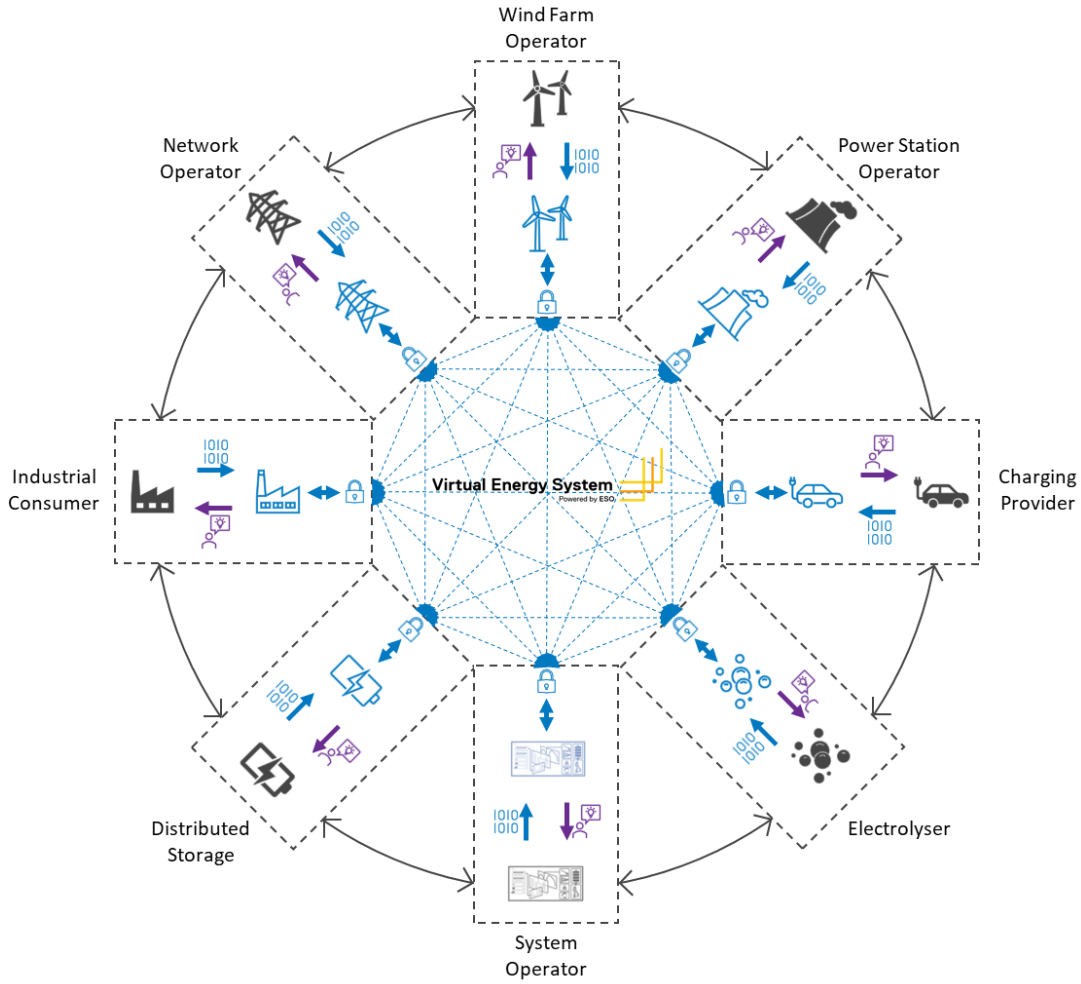
Overview

The ambition of the Virtual Energy System (VirtualES) programme is to enable the creation of an ecosystem of connected digital twins of the entire energy system of Great Britain, that will operate in synchronisation to the physical system. It will include representations of electricity and gas assets and link up to other sectors.

This ecosystem of connected digital twins will enable the secure and resilient sharing of energy data across organisational and sector boundaries, facilitating more complex scenario modelling to deliver optimal whole-system decision making.

These whole-system decisions will result in better outcomes for society, the economy, and environment by balancing the needs of users, electricity and gas systems and other sectors.

Creating the VirtualES is a socio-technical challenge that requires a collaborative and principled approach, aligned with the National Digital Twin Programme, and other energy sector digitalisation programmes.



How to enable a VirtualES?

A socio-technical challenge that requires a socio-technical solution

Overview

Enabling the VirtualES requires a common social-technical framework that outlines the agreed access, operation, and security protocols.

Through research, expert interviews, and industry-wide engagement, 14 key socio-technical factors were identified which are considered necessary for the development and delivery of the VirtualES today.

These 14 identified key factors are grouped by the categories of People, Process, Data, and Technology.

Six of these factors, the first among equals, were prioritised for immediate consideration

Priority socio factors:
- Raising awareness & fostering culture
- Engaging stakeholders
- Creating a governance framework

Priority technical factors :
- Aligning models & taxonomies
- Increasing visibility & enabling sharing
- Creating an interoperable tech-stack

Descriptions of the six priority key factors

A socio-technical challenge that requires a socio-technical solution

Raising awareness & fostering culture

Raising awareness and fostering culture has been prioritised as it is critical the industry accepts and begins to advocate for the creation of data sharing infrastructure for the energy sector. Organisations must broaden their thinking beyond traditional business models and individualistic organisational objectives to understand the opportunities available through greater data-sharing across the energy sector.

This factor outlines the baseline requirements and recommended change management principles that will support an organisation to participate in the VirtualES.

Engaging stakeholders

This was prioritised as participating in the VirtualES will require input, collaboration and trust from numerous stakeholders across an organisation, including those that may not come from a technical background. guidance on how to approach this would therefore be valuable.

The engaging stakeholder's guidance note provides organisations with a methodology for identifying, engaging and evaluating the success of their stakeholder engagement plan.

Creating a governance framework

The design of the governance model was prioritised as it will define the core players that will establish the foundations of the VirtualES. An effective governance model is a key requirement to make informed decisions regarding national critical digital infrastructure and will also act as an enabler of the culture we want to foster within the VirtualES.

The proposed model seeks to legitimise a responsible orchestrator for coordination and conflict resolution with clear government backing.

Aligning models and taxonomies

There is broad range of terminologies for the energy sector, covering different aspects of both gas and electricity. Therefore, to achieve a successful, interoperable, standardised VirtualES, common ontologies need to be defined and specified that can enable alignment of models within the VirtualES.

This can be done through facilitating common vocabularies, outlining well-formed structures of definitions and relationships, and building on and using already existing vocabularies, ontologies, and domain knowledge.

Increasing data visibility & enabling sharing

Increasing data visibility starts with a distributed approach, allowing for data owners to retain control of their datasets, decide with whom to share their data, and have trust their data is secure from manipulation, or misuse.

For organisations to share their data or consume datasets from the VirtualES they will be required to meet a set of minimum characteristics. This standardised approach ensures an increase in visibility, searchability and accessibility of data for use.

Creating an interoperable technology stack

The goal of creating an interoperable technology stack is to enable smooth communication between organisations and systems, regardless of their underlying technologies or protocols. To enable interoperability in the sector, there needs to be a distributed network of digital spine nodes which can prepare and standardise data into a minimal operable standard. Through trusted protocols, the data can then be shared via the VirtualES by linking the digital spine nodes to enable the exchange of standardised data across the sector in a reliable, secure and governed way.

Six priority key factors

The relationship between the six priority key factors

These ‘first among equal’ socio-technical factors should be considered simultaneously together, along with the remaining eight key factors that will be explored next.

Raising awareness and fostering culture, creating a ***governance framework***, and ***engaging stakeholders*** were prioritised out of the socio factors as they act as the foundation of the common framework from a social perspective and will set the tone of the programme.

Culture is defined as a combination of the artefacts (e.g., organisational vision, assumptions, beliefs and values) that characterise the programme. Fostering an appropriate culture is crucial for success, particularly considering VirtualES is a first-of-a-kind programme that will involve sector-wide collaboration and involvement.

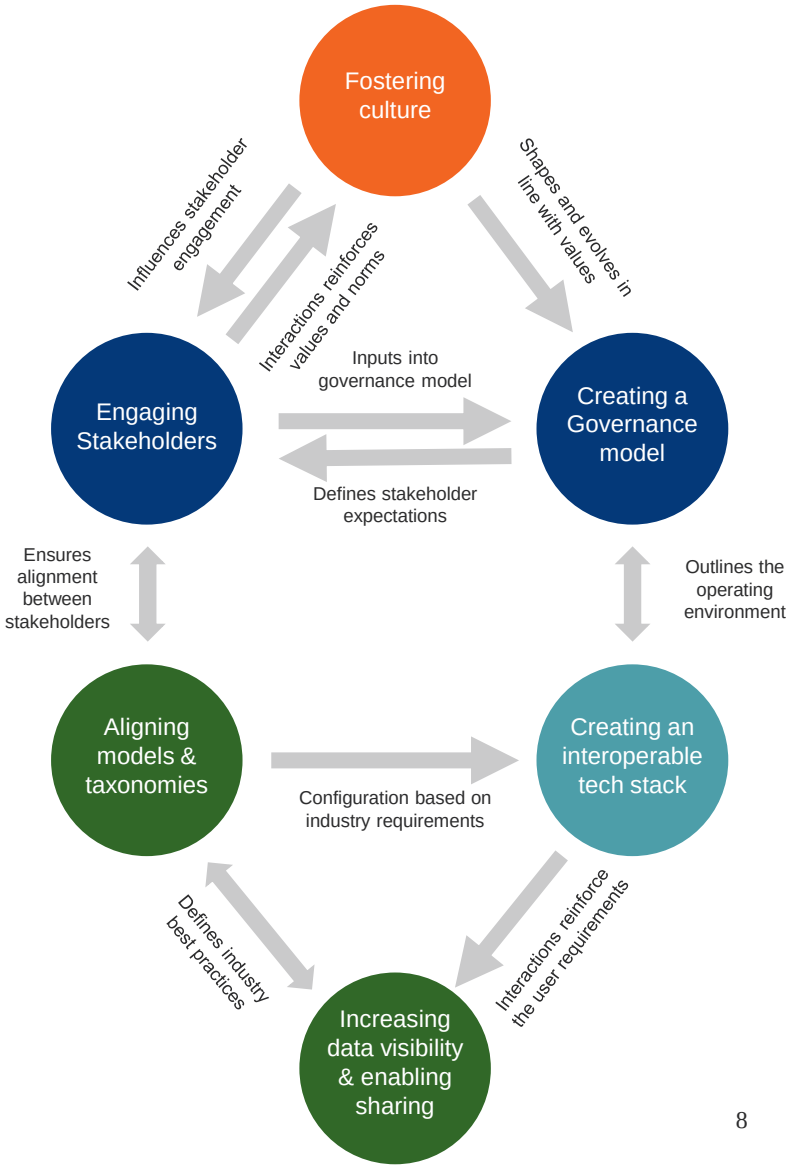
The governance model plays a significant role in reinforcing the cultural values, principles and norms that guide the behaviours and actions of individuals. When designing the governance model, it must be considered how it can reinforce and embed the cultural values, while meeting the needs of the sector.

The inherent purpose for the VirtualES is to enable sharing and visibility of data through an interoperable technology stack that ensures models and taxonomies are aligned, whilst providing trust and interoperability between actors.

Interoperability plays a critical role in enabling data sharing, ensuring standardised data formats, and an overarching governance framework. Aligning models and taxonomies ensures consistency in data interpretation.

Underpinning the other factors is engaging stakeholders. As interactions between stakeholders increase during the programme, they will influence the culture of the VirtualES. Therefore, ensuring that stakeholders who interact with the VirtualES are aware of the values of the programme and act in line with those, is important to ensure a positive culture persists over time

These six factors support the development of an energy sector data sharing infrastructure. By addressing these factors together, actors can create a harmonised data architecture that will support the VirtualES.



Delivering the VirtualES

An overview of the development timeline of the VIrtualES

Project timelines

Throughout the development of the common framework, the approach has been industry-led, consultative, and collaborative.

This approach, coupled with explicit and proactive engagement within the energy sector and with cross-sector stakeholders, is necessary for the successful development of the common framework, delivery of the VirtualES, and ultimately in achieving sector-wide adoption.

All work has been conducted openly, with all the outputs to date published online.

Defined the vision
(Dec 21 – Feb 22)

Benchmark & key factors

- Defined the cross-sector and global best practice for connecting assets, systems, and digital twins.

  Read the report
- Outlined the key socio-technical factors that need to be considered for the VirtualES to succeed.

  Read the report

Sketched the concept
(Mar 22 – Apr 22)

Discovery phase (SIF)

- Collaboratively proved and demonstrates, with industry, how the socio-technical principles work to enable the VirtualES.
- Recommended a tangible demonstrator use case to put the framework in practice.

  Read the report

Developed enablers
(Jul 22 – Sep 22)

Data standards, use cases & advisory groups

- Identified data standards and outlined data licensing considerations applicable to the use case.

  Read the report
- Defined a delivery plan, governance structure, and collaborative approach, for the successful delivery of the demonstrator.

  Read the report

Set design principles
(Nov 22 – Jul 23)

Common framework demonstrator (Alpha)

- Developed industry-validated governance model and technical architecture.
- Created wireframes of VirtualES based on the demonstrator use case.
- Defined a cost-benefit analysis methodology to assess potential use cases.

Showcase benefit
(Expected Oct 23 – Sep 24)

Development (Beta)

- Initiate the development and testing of the demonstrator.
- Further explore the security, operating model, and technical aspects.
- Continue on-going engagement with stakeholders across the sector.

Project team

Supporting the development of the social-technical common framework

The development of the common framework has been delivered by Arup and supported by the Energy Systems Catapult and Icebreaker One. It has been sponsored by the Electricity System Operator (ESO) and National Gas Transmission (NGT) through the Network Innovation Allowance (NIA).

The purpose of the RIIO-2 NIA is to provide funding to Gas Transporter and Electricity Transmission Licensees to allow them to carry out innovative projects, that focus on the energy system transition or addressing consumer vulnerability, which are outside of business-as-usual activities.

- **Electricity System Operator (ESO):** ESO is responsible to ensure a reliable, secure system operation to deliver electricity when customers need it. ESO balances the supply and demand on the system day to day, second by second, and coordinates with networks to transfer electricity from where it is generated to where it is needed.
- **National Gas (NGT):** National Gas own and operate the national gas network in addition to maintaining and managing the 7,000,000 domestic industrial and commercial combined gas assets around the UK.
- **Arup:** An employee owned, multinational organisation with more than 15,000 specialists, working across 90+ disciplines, with projects in over 140 countries and the mission to ‘shape a better world’. Arup have extensive energy and cross-sector digital twin expertise, actively contributed to the National Digital Twin programme, and are members of the Digital Twin Hub.
- **Energy Systems Catapult (ESC):** An independent, not-for-profit centre of excellence that bridges the gap between industry, government, academia, and research. Set up to accelerate the transformation of the UK’s energy system and ensure businesses and consumers capture the opportunities of clean growth. ESC are responsible for the Energy Data Task Force (EDTF) & Energy Digitalisation Task Force (EDiT).
- **Icebreaker One (IB1):** An independent, non-partisan, non-profit organisation with a mission to ‘make data work harder to deliver Net Zero’ by creating open standards for data sharing across agriculture, energy, transport, water, and the built world.

Together the five organisations assembled a delivery team to effectively collaborate and deliver the objectives of this workstream.

2

Creating a governance framework

Creating a governance framework

Approach to determining the governance framework for the VirtualES

Overview

A governance framework is a structured and comprehensive set of processes, and mechanisms that guide the decision-making, oversight, and transparency for a programme, or a broader context.

Therefore, creating a governance framework needs to be guided by a set of aims, values, and design principles, and corroborated by the programme stakeholders.

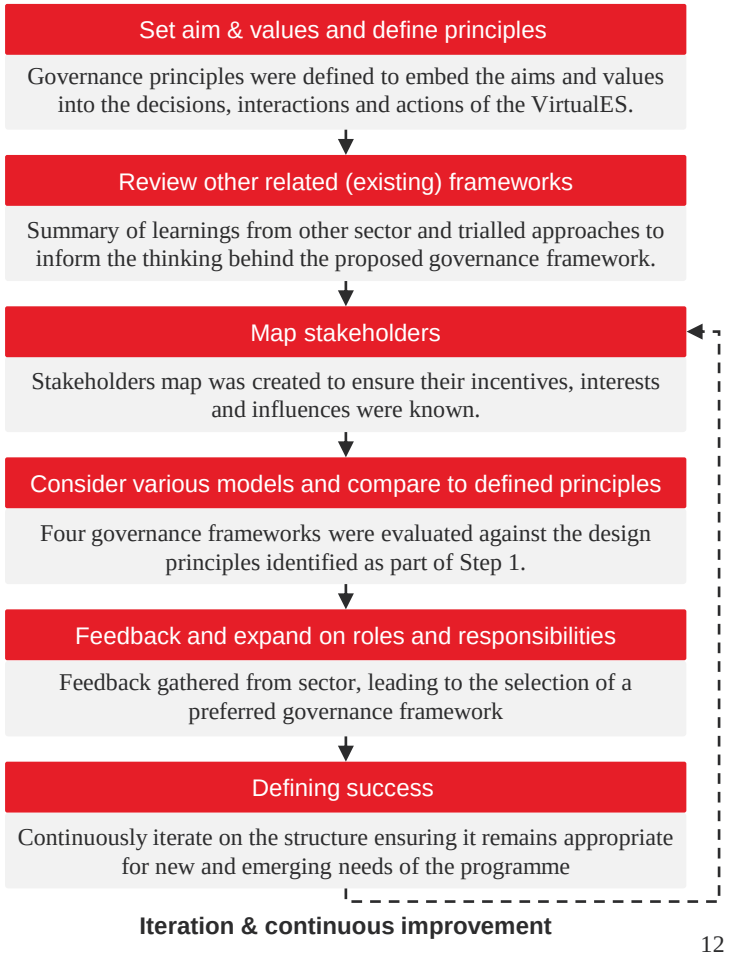
The purpose of this priority key factor guidance note is to provide the programme with a methodology and a blueprint to guide the initial definition of the framework and identify key stakeholders that can support further iterations.

This methodology is summarised in the adjacent diagram and is detailed over the following pages of this document.

Aims of a governance framework

In the context of the VirtualES, the aim of the creating a governance framework is to:

- **Encourage participation in the programme by wider stakeholders:** Involving stakeholders in the definition process for the governance model allows for the users of said model to provide input into its development.
- **Increase trust among the programme team, and the wider stakeholders engaging with the programme**: Providing transparency into the model allows the stakeholders to clearly understand accountability, and responsibility of actors engaging with the programme.
- **Outline the key principles that were used to assess and recommend a governance model**: The seven principles helped evaluate and set the tone for the programme and represented its culture.
- **Propose a set of new roles to take on key responsibilities for a sector-wide transformation programme**: The three new proposed entities will guide and help set the rules of the game to enable the market to compete.



2.1

Why is governance needed?

Why is governance needed?

Establishing the need for a governance model to support the development of the social-technical common framework

Introduction

It is critical that the VirtualES operates effectively and cohesively with the wider governance framework present in the energy ecosystem. This refers to those policies, institutions, rules and incentives related to the energy system, and the underlying decision-making process.

Specifically, VirtualES must align to and promote the institution of a sector wide overarching decision and accountability framework that coordinates and promotes the appropriate behaviours in the creation and delivery of digitalisation and data initiative across the energy sector.

As the delivery and operation of the VirtualES will require data to be shared across multiple actors to fulfil a variety of needs, the governance of the VirtualES must provide a robust process for engagement with all stakeholders, and accountability to the sector.

Identifying, proposing, agreeing and implementing a governance framework will be critical for the timely implementation of the VirtualES if this is to enable the large scale of data connectivity needed to release the 2050 net-zero ambition.

The ‘no governance’ scenario

Implementing the VirtualES is feasible from a technical perspective, but its successful implementation can only be realised with an effective governance model.

Currently there is a lack of clear digital governance across the energy sector, with no clear actors with the mandate and capability to provide the necessary coordination and direction around digitalisation and data initiatives for the sector.

This has led to uncoordinated initiatives and slower identification of the data exchange challenges that need addressing to drive the sector towards decarbonisation.

A no governance scenario will likely result in:

- Lack of unity across the sector and ability to address key digitalisation data challenges.
- Lack of transparency on how decisions are made, and funding is allocated leading to mistrust and impacting competition and fairness negatively.
- No integration across digitalisation and data initiatives and solutions that are not interoperable.
- Lack of coordination and collaboration across actors reducing the ability to innovate at pace and increased duplication of effort.
- Insufficient diversity of actors in the VirtualES.

The Need for a VirtualES governance model

The current governance mechanisms are not providing the overarching governance needed for sector wide digitalisation. Therefore, the implementation of an overarching governance model is a key requirement for the VirtualES to operate effectively.

A clearly articulated governance model will allow the VirtualES to invite discussion and drive conversations with key stakeholders across the sector, enabling the VirtualES to steer the sector towards a common goal, and champion best practice principles. The governance model will unite multiple actors with competing priorities and interests behind a single unified vision.

It will also act as a key enabler of the culture we want to create within the VirtualES by explicitly defining how stakeholders interact and engage with each other.

The lack of clear digital governance across the energy sector was also identified as a critical gap across use cases.

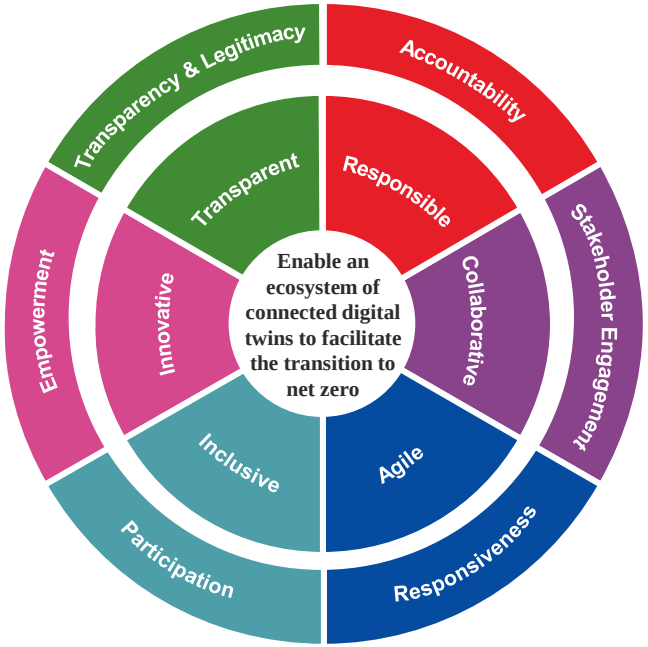
Currently there are no clear actors with the mandate and capability to provide appropriate governance and strategic direction for the multiple industry-led digital initiatives currently underway.

Governance design principles

Governance design principles aligned to the values of the VirtualES

Seven design principles were derived from research, expert interviews, industry-wide engagement, and validation through the People and Process Advisory Group.

These principles align with the cultural values of the VirtualES, as summarised in the ***raising awareness & fostering culture*** priority key factor.



Governance design principles

1. **Transparency and legitimacy:** all development and actions should be visible and accessible to energy sector stakeholders and the public. The mutual benefit incurred by actions should be made clear to all actors participating in the VirtualES. Additionally, it is crucial to legitimise the VirtualES to ensure it is recognised across the sector more broadly.
2. **Accountability:** clarity is provided about the extent to which decision-makers are responsible for the outcomes of their decisions and are held accountable for their actions.
3. **Stakeholder Engagement:** stakeholders are empowered to work together to achieve common goals and objectives and create collective value.
4. **Responsiveness:** the governance model should adapt to changing circumstances, including new challenges, opportunities and stakeholder needs.
5. **Participation:** stakeholders should have the opportunity to participate in decision-making and have their voices heard.
6. **Empowerment:** the governance model should empower new development and innovation.

Values of the VirtualES

The values of the VirtualES were defined in the ***raising awareness & fostering culture*** priority key factor:

- **Transparent:** participants in the VirtualES are willing to share information, data, and knowledge openly with other members. Decisions are unbiased and ethical with a clear rationale.
- **Responsible:** participants in the VirtualES take ownership and responsibility for their actions and decisions, taking a whole-system perspective and creating collective value.
- **Collaborative:** participants in the VirtualES work together to achieve the shared goals and vision of the VirtualES including leveraging technology, data, and knowledge-sharing.
- **Agile:** the VirtualES should respond and adapt quickly to changes and challenges to take advantage of opportunities as they arise.
- **Inclusive:** participants are respected and treated fairly with equal opportunities for participation, creating a sense of belonging and fostering open communication.
- **Innovative:** the VirtualES fosters creativity, supports the generation of new ideas, and adopts a mindset of continuous improvement.

What needs governance?

The functions of governance for VirtualES

Remit of governance

A governance model for the VirtualES needs to provide a management framework that will enable its delivery and operation over time. Therefore, it needs to consider the management of the VirtualES technology component in addition to the management of the other systems, processes, initiatives and interactions that enable it to run successfully.

Based on our research and engagement with industry, we have identified a series of critical functions that a future governance model should be looking to fulfil to support the VirtualES.

These functions were then used to formulate different governance models exploring how different actors could contribute or fulfil these functions.

Understanding stakeholders across the sector

There are several actors and overlapping governance mechanisms within the energy sector bringing a lack of clarity around governance and coordination of digitalisation initiatives. The investigation and design of a governance model that fill these gaps and supports the delivery of the VirtualES must be pragmatic and rooted in understanding of how key stakeholders within the industry can play a crucial role in the VirtualES.

Key governance functions for VirtualES

The following key governance functions were identified for VirtualES:

- **Regulation –** overseeing the rules of participation, steering of codes and legislation needed to enable effective participation in the VirtualES. In turn it should enable actors' participation in VirtualES and provide endorsement.
- **Viability** – assessing and selecting funding structure, reviewing use of existing & new incentives, setting and managing the VirtualES commercial viability and benefit delivery.
- **Technology** – oversight of technology decisions, selection and steering of technology principles, best practices and requirements, monitoring and assurance of technical delivery (e.g., ***interoperability tech-stack*** priority key factor).
- **Data** – definition and oversight of data governance and sharing best practices, steering and creating alignment and consensus around data taxonomies standards, driving data interoperability, and assuring adoption of good practices across the sector.
- **Security and ethics** – advising and directing on topics covering security and assurance requirements, policies and controls, and supervising implementation in order to facilitate secure and ethical use of the VirtualES.
- **Sector needs** – engaging with the sector, overseeing and prioritising of VirtualES use cases, and evaluating emerging needs and feedback from the sector.
- **Delivery** – steering and managing the delivery of VirtualES including technical implementation, data management, use cases and the supporting common framework.
- **Operations** – steering, managing and maintaining the VirtualES post-delivery including supporting successful adoption and issue resolution.
- **Coordination** – coordinating, steering and aligning digitalisation and data initiatives across the sector.

Commonly referenced governance models

Summary of the review of existing governance models

Overview

There are many different approaches to developing and maintaining governance mechanisms and a variety of different regulatory, sociological and legal structures that can be utilised to enable and then maintain them.

The energy sector is not unique in its digital transformation and can learn from other sectors experiences, as well as the approaches trialled or suggested by the sector in other contexts.

The digital transformation of the sector, and in particular the interdependencies and complexity that will emerge from the use of the VirtualES will need to be carefully considered.

Feedback loops and mechanisms will need to be in place for identifying and resolving challenges in the use of the tooling, to manage and set expectations of and on users, as well as directing the continued development of the VirtualES.

Several governance models were reviewed during development of the VirtualES governance framework. Two more regularly referenced ones are summarised here.

EDiT

During the development of the Energy Digitalisation Taskforce (EDiT), a new governance approach for the development of digital products and services was developed and proposed. This resulted in recommendations to government in how to develop digital functions using an 'energy digitalisation delivery body'. A detailed appendix was created, detailing this new approach for how a digitally enabled future energy system could be created.

This approach can be best summed requiring three key components: 1) a delivery body; 2) a panel by and for stakeholders and; 3) an underpinning shared knowledge base.

The EDiT approach can be characterised as different to existing governance approaches in its focus on stakeholders being very central to its proposition as well as the concept of a shared knowledge base.

Conceptually, neither of these aspects are new, but the focus on stakeholder directed work, along with the focus on maintaining an open, collaborative and evolving knowledge base set it apart as being a departure from established practices which place less emphasis on both.

Open Banking

The Competition and Markets Authority (CMA) gave mandate to nine institutions to fund and adopt open banking and formed the Open Banking Implementation Entity (OBIE)

The OBIE is a private body; its governance, composition and budget is determined by the CMA. It is funded by the UK’s nine largest current account providers and overseen by the CMA, the Financial Conduct Authority and His Majesty’s Treasury. The nine mandated institutions (referred to as the “CMA9”) are: AIBG, Bank of Ireland, Barclays, Danske, HSBC, Lloyds Banking Group, Nationwide, RBS and Santander.

Its core responsibilities are to agree, consult upon, implement, maintain and make widely available, without charge, open and common banking standards. This approach has created a successful Open Banking standard, with other jurisdictions across the world having creating their own implementation entities to replicate what has been achieved in the UK.

2.2

Potential and preferred VirtualES governance models

Potential and preferred VirtualES governance models

Potential and preferred governance models for the VirtualES

Overview

Through research, expert interviews, industry-wide engagement, and validation through the Advisory Groups, four different governance models for the VirtualES were developed and tested against the design principles.

Based on this input and feedback, **Model A: Co-led** was selected as the recommended governance model for the VirtualES.

In line with the governance design principles, all models have a separation of responsibilities and powers across the roles, with a clear split between coordination, oversight, rule setting, and implementation, operation, and competition.

The models identify the need for a series of new independent entities that can provide the coordination, rule setting, steer, and oversight of digitalisation efforts and a common digital infrastructure for the energy sector. These roles will be critical in enabling the VirtualES and the creation of an ecosystem of connected digital twin for the GB energy system.

Summaries of each of the models are given in the subsequent pages of this section, with the roles and responsibilities given in Section 2.3.

RECOMMENDED

Model A: Co-led

Co-led

This model sees a new independent Orchestrator entity for coordination and conflict resolution with clear government backing. The entity can engage the industry to ensure sector needs are actioned, and standards are defined quickly, through structured feedback, and oversight from Expert Advisors. A Common Infrastructure Operator Entity will help manage and improve common energy digital tools or services created for the public good.

Model B: Centrally-led

Centrally-led

This governance model is steered centrally with an Orchestrator body that provides overarching coordination, accountability, and representation of the sector's needs. This model does not provide a formal mechanism for wider industry to provide advice, feedback and oversight.

Model C: Industry-led

Industry-led

This model places the wider energy industry in the driving seat independently from government oversight. Therefore, the Digitalisation Orchestrator entity, Infrastructure Operator, or Expert Advisors, do not have to be instructed by government, aside from meeting existing regulatory requirements.

Model D: Minimum change

Minimum change

This model brings the minimum set of changes needed to the current status quo to enable the VirtualES. Specifically, it only looks at resolving one of the key gaps currently present, i.e., the inability to govern, manage and maintain a common energy digital infrastructure. This governance model incorporates a common energy digital infrastructure operator into the current ‘AS IS’ governance model for the sector.

Governance model A: Co-led RECOMMENDED

Assessment of the model against the governance design principles

Summary

This model sees the creation of a new independent ***Digitalisation Orchestrator Entity*** for coordination and conflict resolution with clear government backing.

The entity can engage the industry to ensure sector needs are actioned, and standards are defined quickly, through structured feedback, and oversight from ***Expert Advisors***.

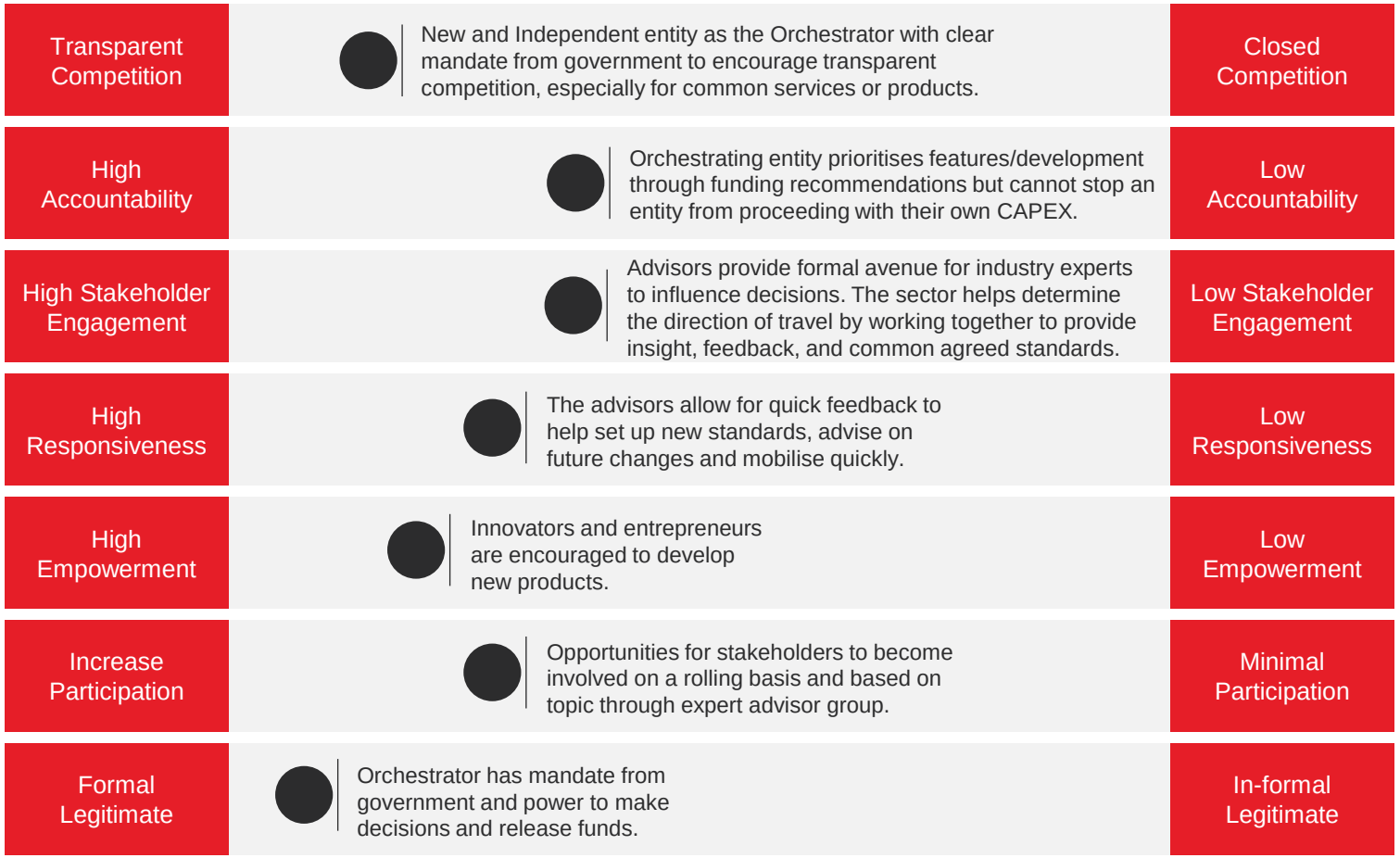
A ***Common Infrastructure Operator*** entity will help manage and improve common energy digital tools or services created for the public good.

Benefit

- High level of transparency, accountability and public oversight through a fully independent ***Orchestrator*** and public oversight and guidance through ***Expert Advisors***.
- Higher and more responsive industry engagement.

Risk

- Government and sector alignment required to form a ***Digitalisation Orchestrator Entity***.



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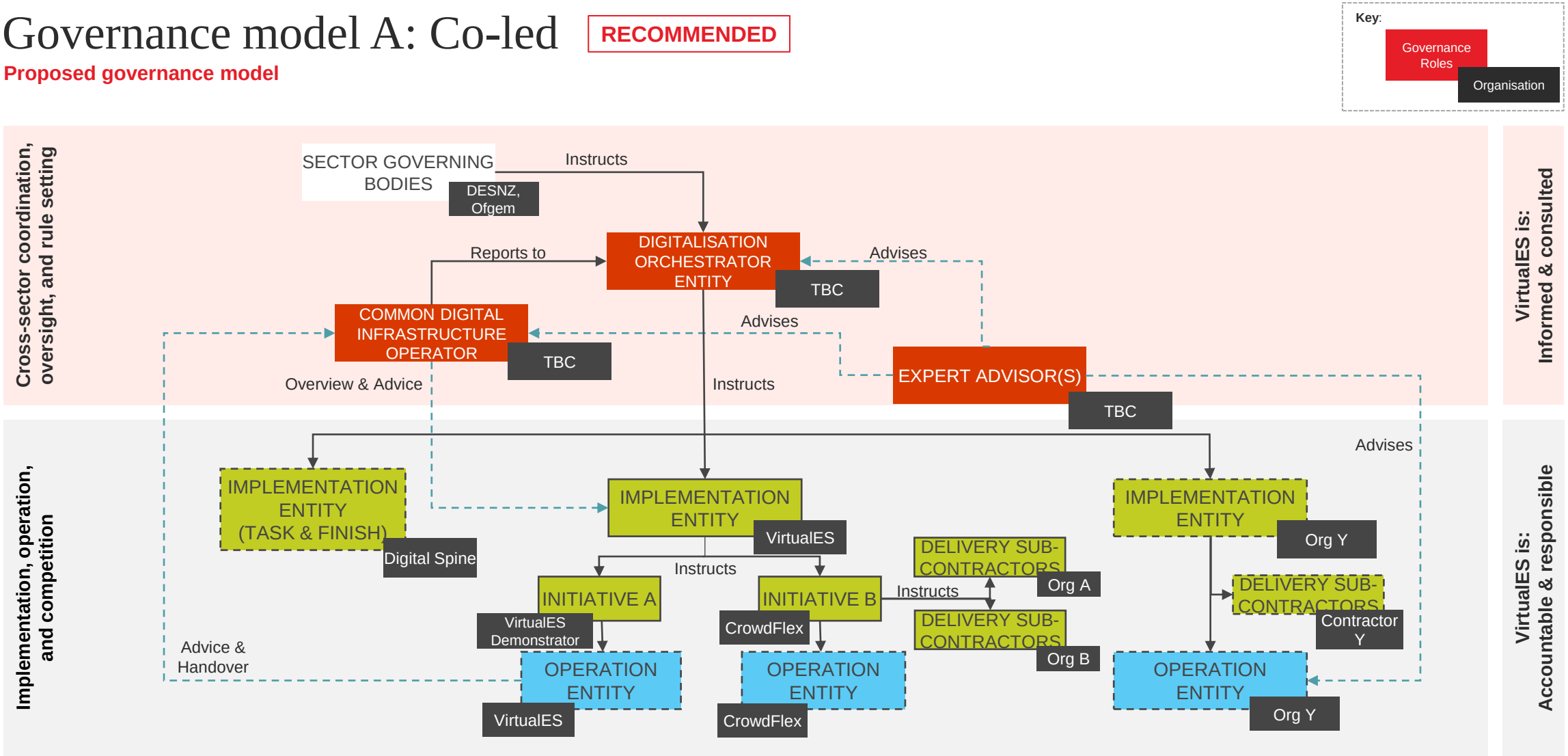
Governance model A: Co-led

RECOMMENDED

Proposed governance model



Governance model B: Centrally-led NOT RECOMMENDED

Assessment of the model against the governance design principles

Summary

This governance model is steered centrally with an Orchestrator body that provides overarching coordination, accountability, and representation of the sector's needs.

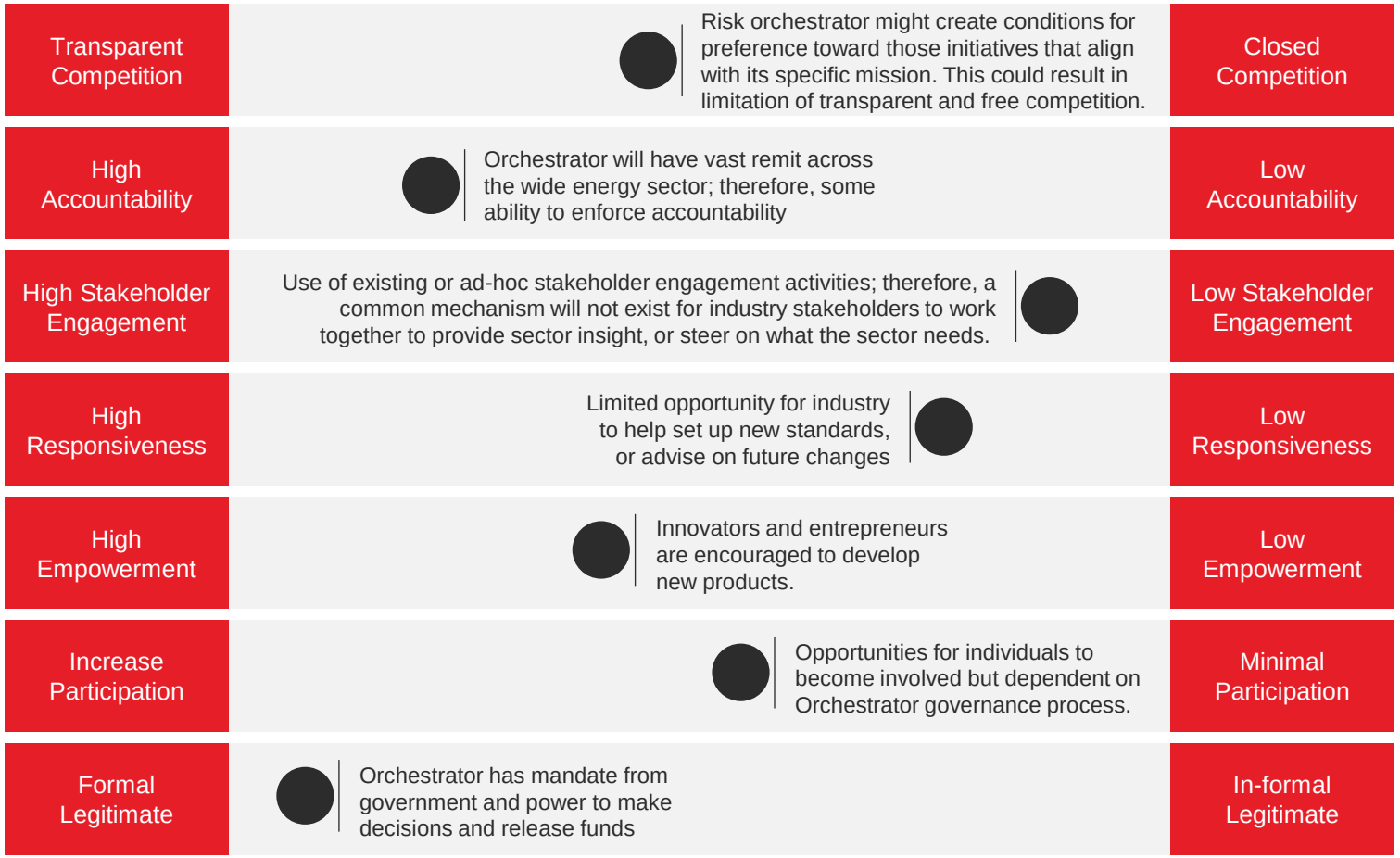
This model does not provide a formal mechanism for wider industry to provide advice, feedback and oversight.

Benefit

- Clear accountability enabling decision making and conflict resolution.
- A new entity is not required.

Risk

- Potential lower involvement and participation from the wider sector
- Less responsive to changing market conditions, technology improvements, or external threats.
- More effort required in getting common standards and ways of working adopted across the sector.



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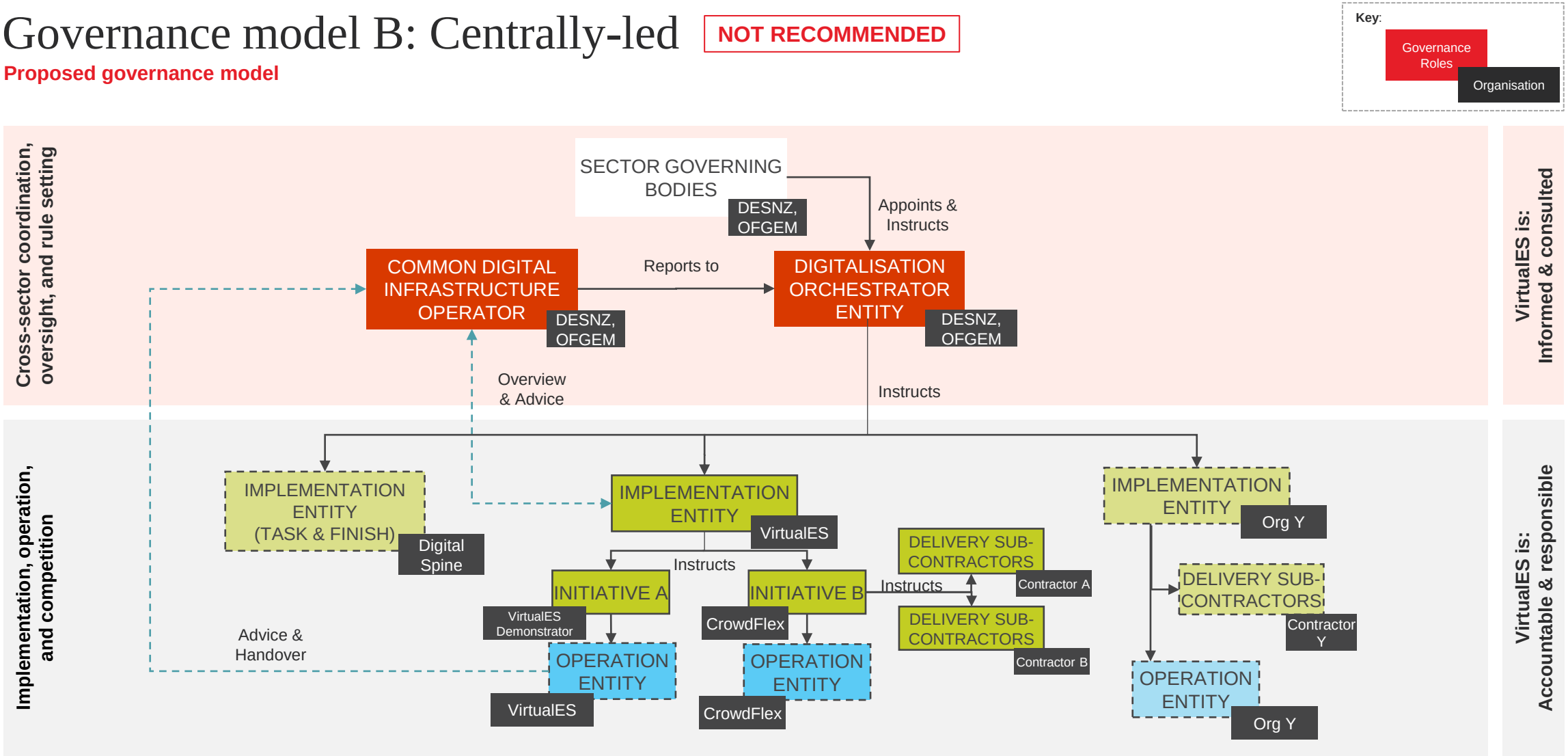
Governance model B: Centrally-led

NOT RECOMMENDED

Proposed governance model



Governance model C: Industry-led

NOT RECOMMENDED

Assessment of the model against the governance design principles

Summary

This model places the wider energy industry in the driving seat independently from government oversight.

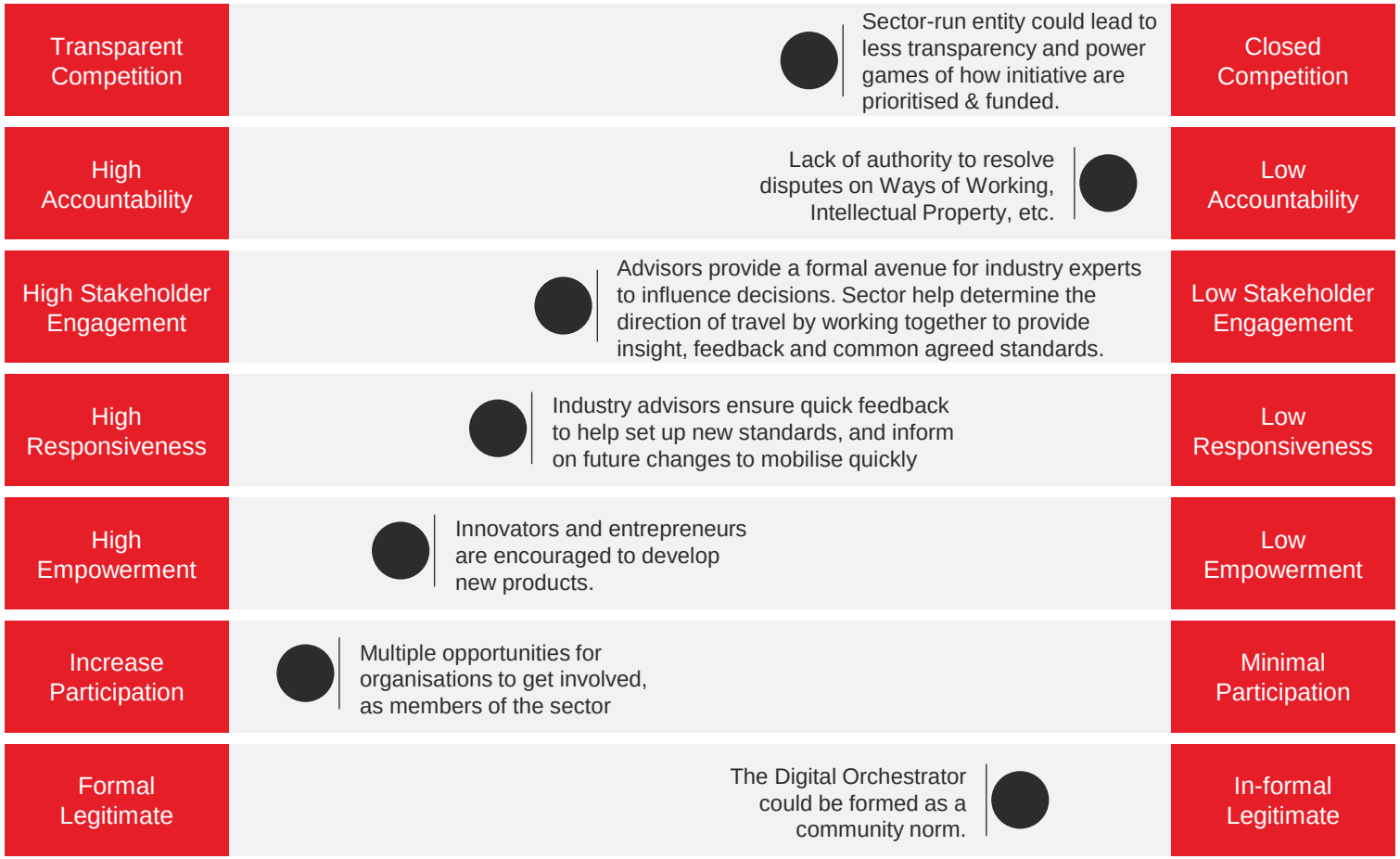
Therefore, the Digitalisation Orchestrator entity, Infrastructure Operator, or Expert Advisors, do not have to be instructed by government, aside from meeting existing regulatory requirements.

Benefit

- Potential for high and active industry involvement and participation.

Risk

- Could lead to de-prioritisation of common good work/components.
- Consumer needs and societal challenges may not be represented.
- Conflict resolution potentially not possible due to lack of overarching independent referee.
- Potential conflict of interest with the same parties across multiple bodies.

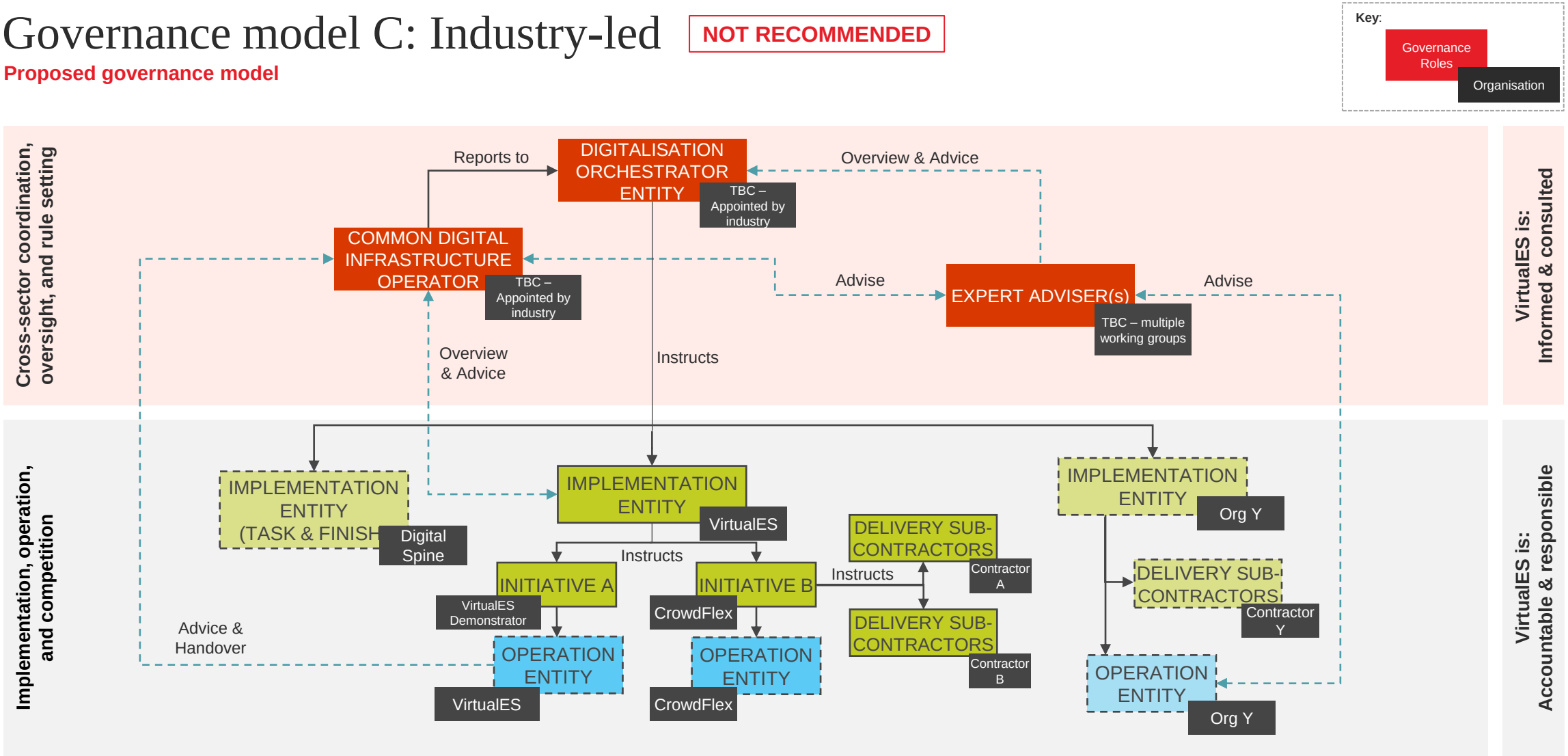


ARUP

Governance model C: Industry-led

NOT RECOMMENDED

Proposed governance model



ARUP

Governance model D: Minimum change

NOT RECOMMENDED

Assessment of the model against the governance design principles

Summary

This model brings the minimum set of changes needed to the current status quo to enable the VirtualES.

Specifically, it only looks at resolving one of the key gaps currently present, i.e., the inability to govern, manage and maintain a common energy digital infrastructure.

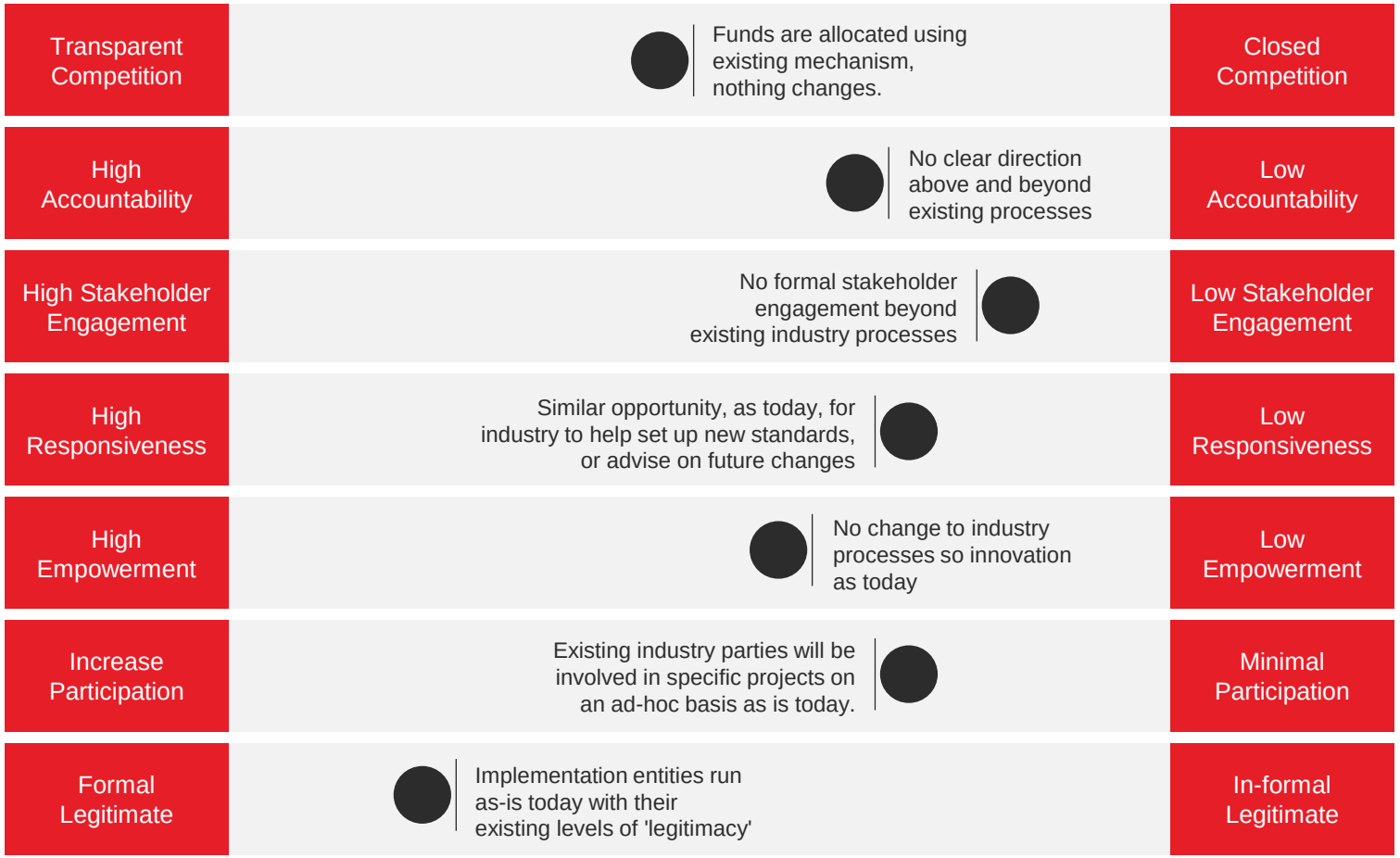
This governance model incorporates a ***Common Energy Digital Infrastructure Operator*** into the current 'as-is' governance model for the sector.

Benefit

- Small change to the status-quo requiring only one new body to take ownership of the role.

Risk

- It does not embed the governance design principles identified as key to VirtualES success.
- Implementation entities require endorsement from regulator and/or government department.

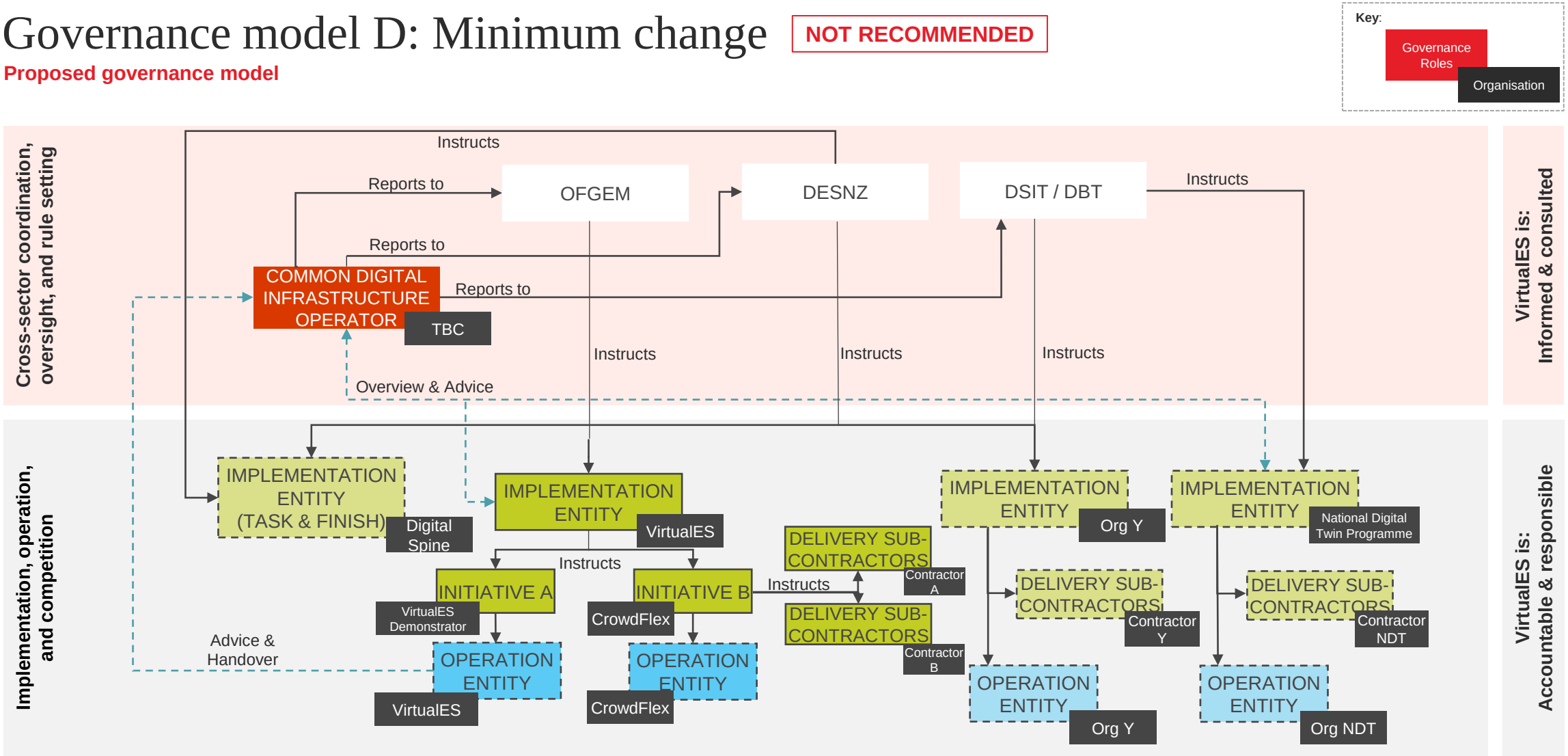


ARUP

Governance model D: Minimum change

NOT RECOMMENDED

Proposed governance model



2.3 — Governance roles and responsibilities

Governance roles and responsibilities (1 of 3)

Summary of the identified roles and responsibilities to support the VirtualES

Overview

The roles and responsibilities and clear Terms of Reference for each of the entities within the VirtualES governance model will need to be further defined as the programme matures.

However, a high-level view of who should be responsible and accountable for key aspects of the VirtualES are subsequently outlined.

During these early stages the focus has been on roles and responsibilities as opposed to at the organisational level.

As outlined, a pragmatic approach that accounts for the multiple actors and overlapping governance mechanisms has been taken. This means that the new governance model includes a combination of new and existing entities. These entities and a rationale for their establishment where relevant is outlined below.

Whether there are entities or actors within the sector who current fulfil this role has been highlighted with "**does not exist**" and "**exists**" against each of the roles. This assessment is based on whether an existing entity or actor 100% matches this role rather than whether an existing entity has the skills or capabilities to deliver this role.

Digitalisation Orchestrator Entity

DOES NOT EXIST

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

- Reviews and prioritises the digitalisation use cases of both private/partisan origin and of public/non-partisan origin coming via the Stakeholder Council.
- Promotes digitalisation across sector & shares knowledge
- Channels public and private sector needs into recommendations for the programme back to the Sector Governing Bodies.
- Reviews funding resources, promotes pooling to enable delivery and raises funding recommendation to Sector Governing Bodies.
- Coordinates and manages dependencies across digitalisation initiatives in the sector.
- Links into other cross-sectors digitalisation initiatives.
- Codifies and manages certification, licences, data sharing frameworks and flow down conditions
- Oversees the Common Digital Infrastructure Operator.
- Oversees the Delivery Implementation Entities..

Applies to: Co-led | Centrally-led | Industry-led

Why is it needed?

There is no single entity that is accountable for the digital transformation efforts of the energy sector, resulting in a fragmented approach, with different organisations pursuing independent agendas, often at cross purposes.

Expert Advisor(s)

DOES NOT EXIST

A set of panels that advise and provide feedback on thematic topics such as security, ethics, technology, data, social value, public/non-partisan use cases, and others

- By representing all interests, it sets direction by placing principles & constraints on the sector digitalisation roadmap.
- Understands private and public sector needs around a specific set of themes.
- Gives digitalisation initiatives a platform to engage/test their work across the industry.
- Defines public good/non-partisan use cases for digitalisation for the Digitalisation Orchestrator Entity to review.
- Holds and shares digitalisation knowledge gathered from other initiatives.
- Brokers common/industry wide recommendations, principles, standards and constraints for the specific thematic areas.
- Provides feedback to Orchestrator Entity and Infrastructure Operator on digitalisation initiatives.
- Audits work undertaken by Orchestrator Entity and Infrastructure Operator.

Applies to: Co-led | Industry-led

Why is it needed?

There are multiple organisations and individuals providing advice on digitisation programmes without common cross-sector collaboration to ensure a shared consensus and links across thematic areas.

Governance roles and responsibilities (2 of 3)

Summary of the identified roles and responsibilities to support the VirtualES

Common Infrastructure Operator

DOES NOT EXIST

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

- Enforces compliance to the principles, standards and rules set through the Sector Governing Bodies, Expert Adviser and Orchestrator Entity.
- Raises emerging needs to the Expert Advisers and Orchestrator Entity.
- Oversees management of tickets, patching, updates, code revisions, and other tasks related to maintaining and operating a system created by the implementation entity
- Responsible for ensuring secure and reliable operations of the system.

Applies to: Co-led | Centrally-led | Industry-led | Minimum change

Why is it needed?

There is no unified entity to manage publicly developed products or services. Also, there is a lack of clarity in the sector on who should be liable and responsible for managing digital critical infrastructure.

Implementation Entity

EXISTS

Delivers and accountable for digitalisation initiatives from initiation to operations.

- Oversees the definition of the technology stack for the initiative and delivers related data management.
- Identifies and applies to relevant funding routes, including engaging the Orchestrator Entity when public funds are requested.
- Defines the close out requirements for initiatives i.e., creates an Operations Entity, or moves product or service under Common Digital Infrastructure Operator.
- Manages handover over to Operations Entity.
- Engages Expert Adviser(s) on initiatives, or emerging technologies.
- Defines a delivery plan for use cases.
- Carries out day-to-day management.
- Enforces compliance to the principles, standards and rules.
- Brings emerging uses cases to the Orchestrating Body for review.

Applies to: Co-led | Centrally-led | Industry-led | Minimum change

Why is it needed?

This entity already exists in the energy sector

Initiative(s)

EXISTS

A defined programme of work led by a dedicated team reporting to the Implementation Entity.

- Takes responsibility for a specific programme of work pursued by an implementation entity.
- Defines the technology stack for the initiative and delivers related data management.
- Responsible for developing and delivering to the project execution plan, including defining the requirements for sub-contractors and other stakeholders.
- Reports to and is controlled and directed directly by the implementation entity.

Applies to: Co-led | Centrally-led | Industry-led | Minimum change

Why is it needed?

This entity already exists in the energy sector

Governance roles and responsibilities (3 of 3)

Summary of the identified roles and responsibilities to support the VirtualES

Delivery Sub-Contractors

EXISTS

Third parties that deliver a service or a component part on behalf of an Implementation Entity or a specific digitalisation initiative.

- Informed and consulted, as required, on pertinent aspects of the Initiative.
- Reports to the respective Implementation Entity or Initiative.

Applies to: Co-led | Centrally-led | Industry-led | Minimum change

Why is it needed?

This entity already exists in the energy sector

Operation Entity

EXISTS

Operates and maintains the service and/or product developed by the Implementation Entity or a specific digitalisation initiative that is not part of the Sector Common Digital Infrastructure

- Enforces compliance to the principles, standards and rules set through the Sector Governing Bodies, Stakeholder Council and Orchestrator Entity.
- Raises emerging needs to the Expert Advisors.

Applies to: Co-led | Centrally-led | Industry-led | Minimum change

Why is it needed?

This entity already exists in the energy sector

Sector Governing Bodies

EXISTS

Government entities responsible for setting regulations.

- Holds overall Audit responsibility.
- Mandates participations rules.
- Manages all existing responsibilities relating to energy strategy/policy, regulation, and monitoring of licensed activities.
- Mandates and oversee the Digitalisation Orchestrator Entity.

Applies to: Co-led | Industry-led | Minimum change

Why is it needed?

This entity already exists in the energy sector

3 — Call to action

Your input into the governance framework

Progress the governance framework for the VirtualES

Overview

The current lack of clear governance for sector wide digital transformation poses key risks to the successful implementation of the VirtualES.

Creating an ecosystem of connected digital twins of the entire energy system of Great Britain will require clear coordination and oversight, including the legitimacy to set rules to support the sector wide coordination required to enable VirtualES.

This sector wide governance is owned and set by the government and regulators who need to engage with the programme to provide feedback on the proposed governance model.

As the first-of-its-kind programme, VirtualES will provide an opportunity to develop and test the proposed governance arrangement and measure its effectiveness to allow for continuous improvement.

Further engagement

In line with the culture of the programme, VirtualES will continue to promote industry engagement, collaborate through advisory groups, offer support to regulator & government in their future considerations, and work with related programmes.

There will be further engagement with the sector to refine and develop the governance model.

Topics that need further engagement:

- The appetite for government and regulators to form three new entities to support the sector-wide digital transformation.
- Wider discussion and analysis on how the proposed model can inform the evolving energy governance landscape (e.g., FSO, Review of Electricity Market Arrangements (REMA), Future of Local Energy Institutions and Governance, The Future of Distributed Flexibility).
- Wider sector wide alignment on the process for prioritising new use cases, selecting a solution, and transferring developed solutions to steady state operations.

Proposed future work

The next factors to be explored to further define the governance model are *defining roles and responsibilities* and *determining operating environment.* These factors will form part of the next steps in detailing

- **Defining roles and responsibilities**: Collaboratively define roles & responsibilities required to deliver the VirtualES demonstrator and the long-term programme. Once defined, engage the sector, government, and regulators to anoint legitimacy
- **Determining operating environment**: Determine the outline operational governance environment, including potential policy / regulatory implications, business model, ways of working, & trust framework.

Please share your feedback:
VirtualES@nationalgrideso.com

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Virtual Energy System

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