

Challenge 1 – Use Cases for Virtual Energy System (VirtualES)

In late 2021, National Grid ESO launched an ambitious, industry-wide mission to digitise our energy system developing an asset called the [VirtualES](#). The VirtualES will be a digital ecosystem of connected digital twins representing the entire GB energy system. This asset will be a shared tool, for improving simulation and forecasting abilities across the energy industry and to realise our GB decarbonisation targets. Read more about the VirtualES on our [website](#).

Applications to this Open Innovation Event challenge will propose a potential Use Case for the VirtualES and demonstrate its benefits, taking into consideration the following:

- A VirtualES Use Case is an approach to address a complex energy system problem, covering:
 - Input data: utilising real-world data (possibly including data gathering/aggregating/cleaning)
 - Digital Twin methodologies: manipulating, processing or modelling the input data to generate useful output data
 - Output data: making outputs accessible (possibly including data exchange between two entities)
- Suggested Use Cases should consider the VirtualES Common Framework socio-technical factors (report downloadable on the [Smarter Networks Portal](#)) developed to ensure digital twins are interoperable and can interact with the VirtualES

Challenge 1 – Use Cases for VirtualES

If successful, proposed Use Case projects will:

- Undertake a feasibility study to quantify value of the data manipulating, processing or modelling and data sharing. Through the feasibility study the project will plan a minimum viable product digital twin model and a data exchange or availability test, in addition to identifying possible approaches to the Common Framework socio-technical factors.
- Subsequently (pending further funding approval) build a minimum viable product digital twin model, demonstrate the data exchange or availability and test the approaches against Common Framework socio-technical factors.

When answering the proposal questions, use case proposals should consider where possible:

- What external interfaces might exist? (to which actors, for what data, for what purpose)
- The data/model scope e.g. data standards, spatial resolution, temporal resolution, aggregation level
- Any initial ideas for approaches to the Common Framework socio-technical factors

Challenge 1 – Use Cases for VirtualES

Related work and useful links:

- [VirtualES webpage](#)
- [VirtualES video](#)
- [VirtualES page on ENA Smarter Networks Portal](#) – documents listed below are downloadable from this page
 - Show & Tell documents
 - SIF Project Registration Document
- [A Common Framework for a Virtual Energy System page on ENA Smarter Networks Portal](#) – documents listed below are downloadable from this page
 - VirtualES – Key Socio-Technical Factors Report
 - Energy System Digital twin – Benchmarking Report
 - Show & Tell documents
 - NIA Project Registration & PEA Document

Challenge 2 – Network Modelling 2.0

The ESO currently uses Power Factory as the main simulation tool for network analysis studies. With more operational challenges (e.g. virtual powerplants, power electronics, probabilistic modelling, multi scenario analysis, integrated offshore grid, new energy source models and user-developed models) we will have to research and explore next generation offline network modelling tools and ensure we have an enhanced and sufficient power system analysis capability under future 'zero carbon' operations.

Applications to this Open Innovation Event challenge will propose an innovation project investigating the following:

- World-leading modelling technology and the potential benefits for future system analysis
- An overall architecture and design for a future offline modelling tool for zero carbon operation
- Development of an open built version, available to all network users
- A solution suitable for existing data sources, which will be compatible with and benefit from the [VirtualES](#) in the future

Challenge 2 – Network Modelling 2.0

Related work and useful links:

- [GC0137: Minimum Specification Required for Provision of GB Grid Forming \(GBGF\) Capability \(formerly Virtual Synchronous Machine/VSM Capability\)](#)
- [Year-round Thermal Probabilistic Assessment](#)
- [Guidance Notes for Model Exchange for Interaction Studies](#)

Challenge 3 – Strategic Innovation Fund (SIF)

The [Strategic Innovation Fund](#) (SIF) is a new mechanism from Ofgem and InnovateUK to fund "*ambitious, innovative projects with potential to accelerate the transition to net zero*". Projects are funded through three stages: Discovery, Alpha and Beta.

The next Discovery round for SIF will open later this year, we are inviting proposals for the following net zero challenge areas:

- **supporting a just energy transition:** new ways to identify and support vulnerable customers and help those who are disadvantaged, fuel poor or off the gas grid to reduce heat and mobility carbon emissions
- **preparing for a net zero power system:** new ways to support low-stability systems and to use new sources of energy supply and demand to help manage grids
- **improving energy system resilience and robustness:** ways to develop multi-energy systems and make them more resilient, and strengthening energy system robustness so that new infrastructure can be rolled out efficiently
- **accelerating decarbonisation of major energy demands:** ways to manage and integrate large-scale demands from heat and transport, integrating heat networks for wider energy network management and improving energy efficiency at all levels in the system.

Challenge 3 – Strategic Innovation Fund (SIF)

Applications to this Open Innovation Event challenge will propose projects relating to the net zero challenge areas that could be developed for application to the next SIF Discovery round.

Find out more about the net zero challenges and the conditions of the SIF Discovery phase on the Ofgem website - [Net zero challenge areas for energy network innovation funding – UKRI](#)

Related work and useful links:

- [Introduction to the Strategic Innovation Fund](#)
- [Ofgem Strategic Innovation Fund: Competition Launch \(recorded webinar\)](#)
- [Strategic Innovation Fund – Round Two Innovation Challenges](#)
- [Strategic Innovation Fund Governance Document](#)