Strategic Spatial Energy Planning Developers Workshop September 2025

Please note: These slides reflect discussions from three workshops held over September and October 2025, which aimed to provide the latest updates on the SSEP and pathway development.

Following this, we received updated energy generation cost data from DESNZ. In response, both NESO and DESNZ decided to re-run the SSEP modelling to ensure our analysis and recommendations are based on the most robust and current information.

This has extended the timeline for developing the SSEP by several months, but we believe this step is essential to strengthen the quality and resilience of the plan.

You can read our open letter to industry on this update here: neso.energy/document/372416/download.

Please be aware these slides do not incorporate the refreshed data and may not reflect our current position or timings.

We are expecting to engage on the updated pathway development, based on the latest data, in early 2026.

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Public

Strategic Spatial Energy Planning Developers Workshops

September / October 2025

Leamington Spa, Glasgow, Cardiff

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1. Overview of Strategic Energy Planning

2. Developing the SSEP

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4. Discussion session

Public

Overview of Strategic Energy Planning

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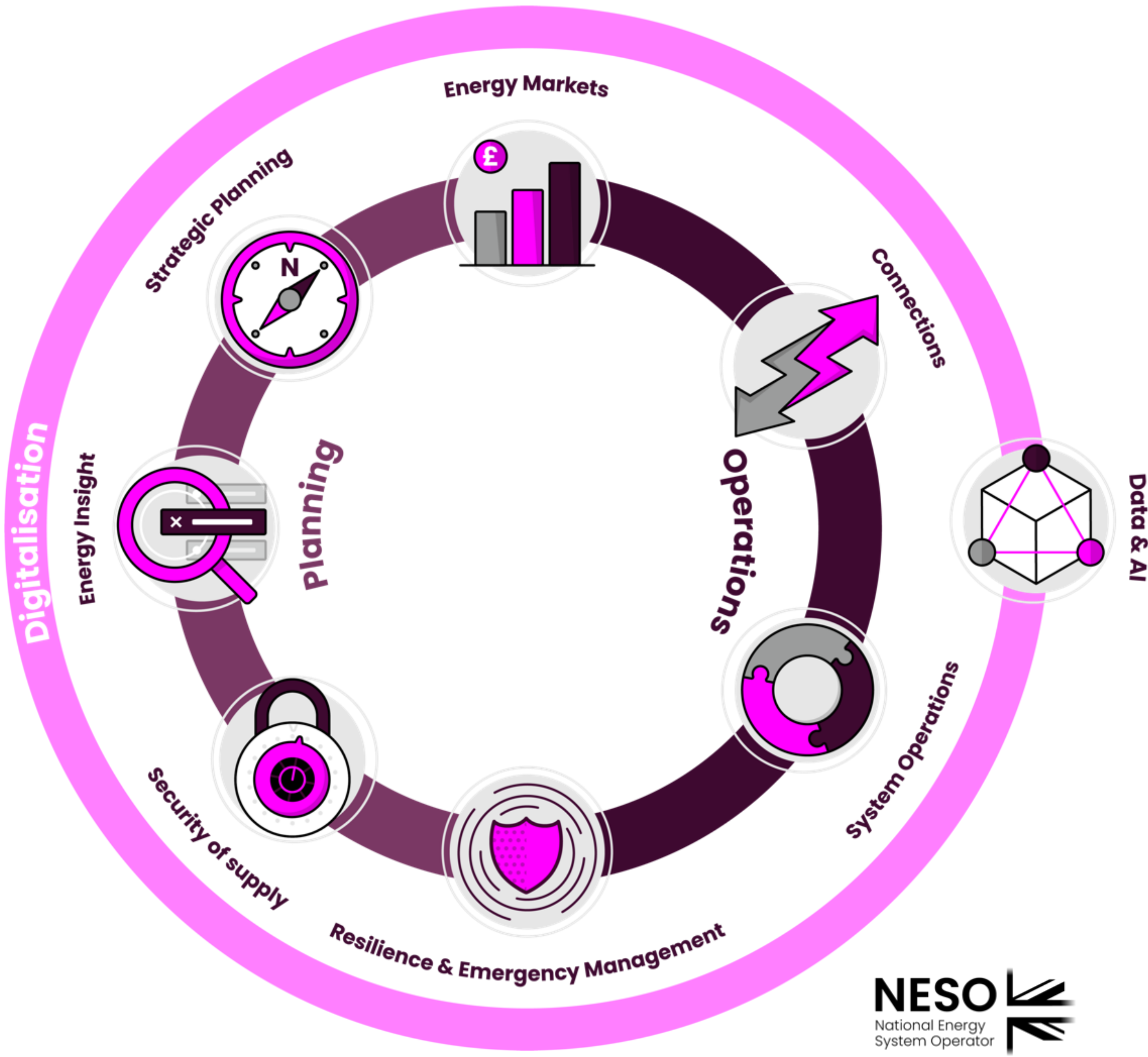
What we do

We bring together eight activities required to deliver the plans, markets and operations of the energy system of today and the future.

Bringing these activities together in one organisation encourages holistic thinking on the most cost-efficient and sustainable solutions to the needs of our customers.



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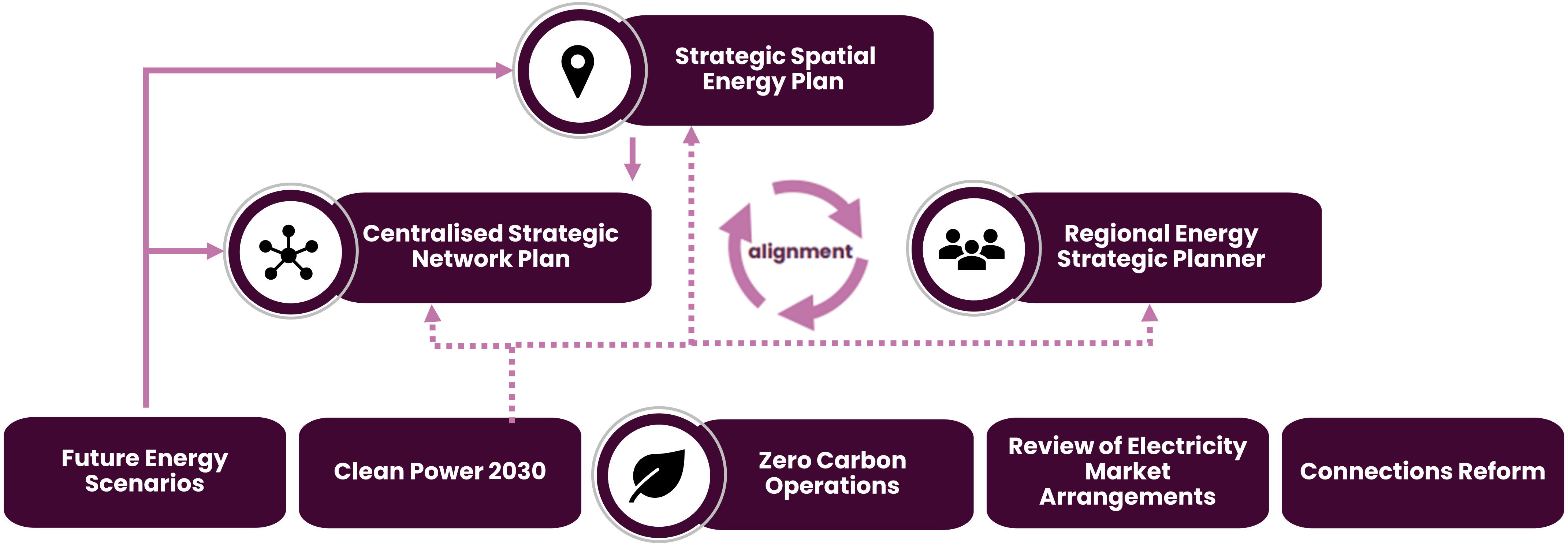
Strategic Energy Planning

For the first time, we will coordinate system design and planning across the entire energy sector, enabling planning and investment decisions to be optimised in support of Great Britain's net zero goals, while ensuring the most equitable cost to consumers.

The Wider Context



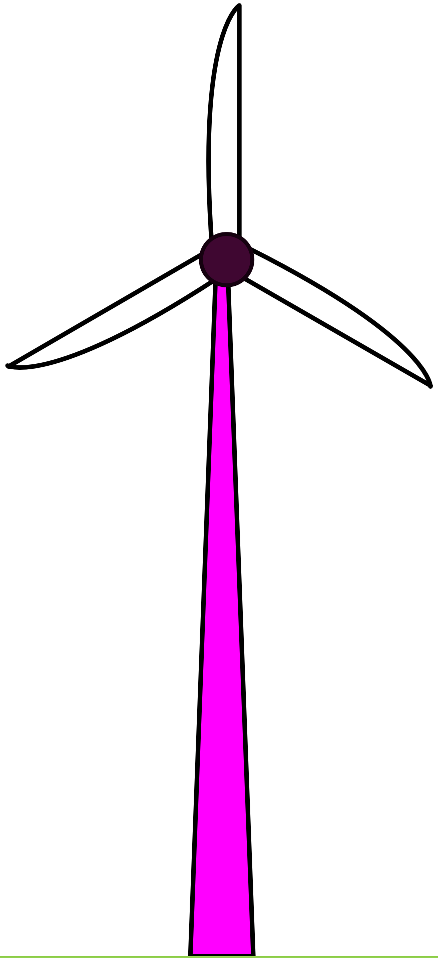
Developing the SSEP

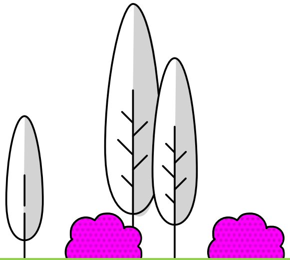
Strategic Spatial Energy Plan (SSEP)

The SSEP will accelerate clean, affordable and secure energy through greater certainty.

The plan will assess the locations for electricity generation, and storage of electricity and hydrogen on a zonal basis.

This will provide a government and Ofgem-endorsed plan that firmly sets the context for the nation’s energy requirement.





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Delivery

Q2 2025	Q3 2025	Q4 2025	2026	2026	tbc
Prepare	**Model**	**Appraise**	**Consult**	**Refine**	**Publish**

Stakeholder engagement

Environment

Assurance

Governance

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Prepare

Baseline
UK Government's Clean Power 2030 Action Plan and projects with regulatory funding

Policy framework
- Agree key questions to explore
- Model options to optimise

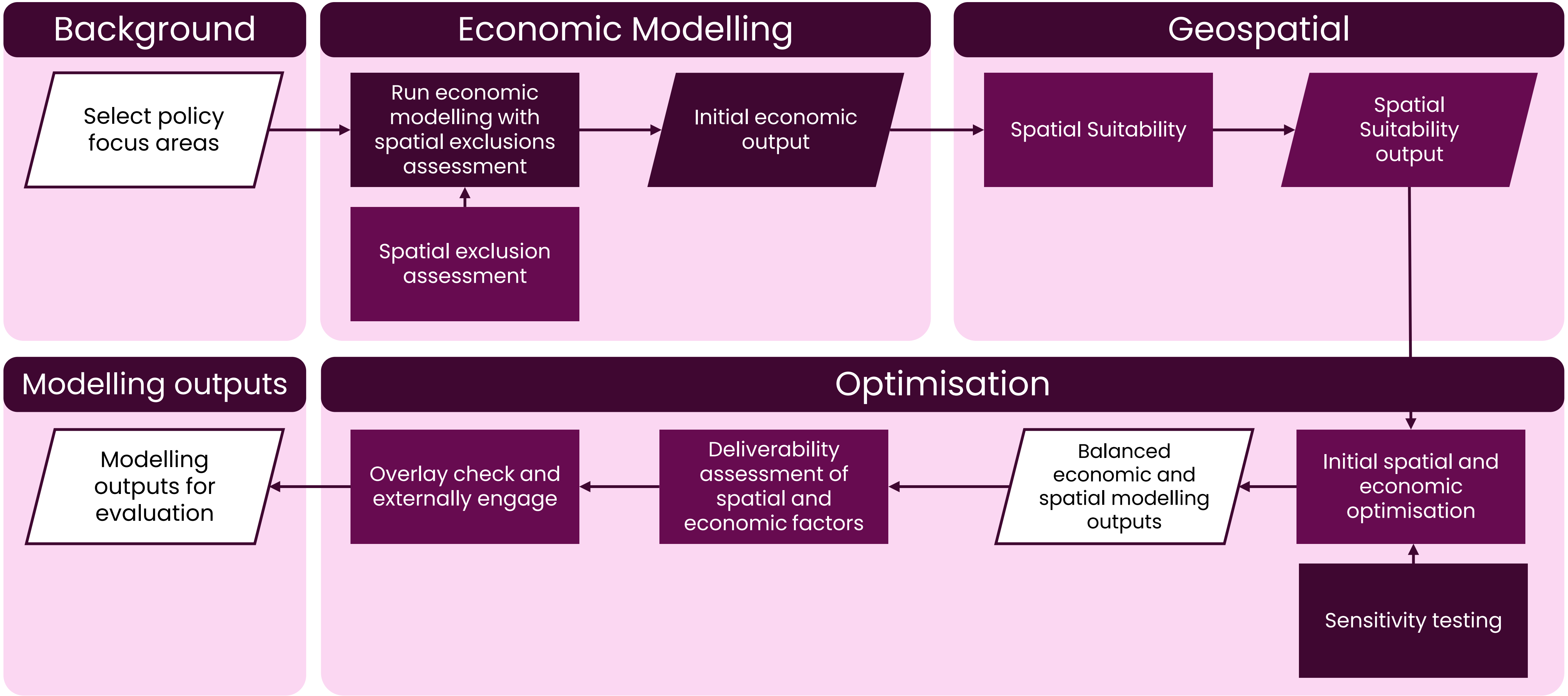
Data
- Determine datasets to use
- Decide use of technologies

Economic modelling and spatial suitability assessments

- Develop the spatial evaluation approach
- Stakeholder engagement
- Environmental assessments
- Policy scenarios and data inputs
- Testing and sensitivity analysis

Prepare → Model → Appraise → Consult → Refine → Publish

Model



Prepare | **Model** | Appraise | Consult | Refine | Publish

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Appraise

Principles and process guiding the SSEP pathway options

Modelling output → **Assess results** → **Strategic direction by Governance Committees** → **Evaluation and refinement** → **Subset of Pathways for final decision**

Prepare | Model | **Appraise** | Consult | Refine | Publish

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Consult

Developing the SSEP through conversations

Industry Engagement

Industry Working Group, Workshops, Webinars, Surgeries & Bilaterals

Societal engagement

Opinion survey, focus groups, society-based 1:1s and topic-based forums

Host areas

Conversations with political, developer and community stakeholders

Environmental assessment

Scoping, evidence gathering, consulting on and reporting the HRA and SEA

Formal consultation

Overview of the chosen pathway development, and what it means for GB

Prepare → Model → Appraise → **Consult** → Refine → Publish

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Refine and Publish

Refine

- Evaluate options
- Evaluate changes
- Stakeholder feedback
- Governance forums
- Lessons learned

Publish

Submission to:

- UK Energy Secretary
- Scottish Government
- Welsh Government
- Ofgem

Prepare → Model → Appraise → Consult → **Refine** → **Publish**

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SSEP key dates and milestones

9 December 2024
Launched SSEP draft methodology consultation

17 January 2025
Close of draft methodology consultation

Q2 2025
Final methodology published

Q1 2026
4-6 pathway options submitted to Energy Secretary

tbc
Draft SSEP consultation period

tbc
First SSEP published for GB

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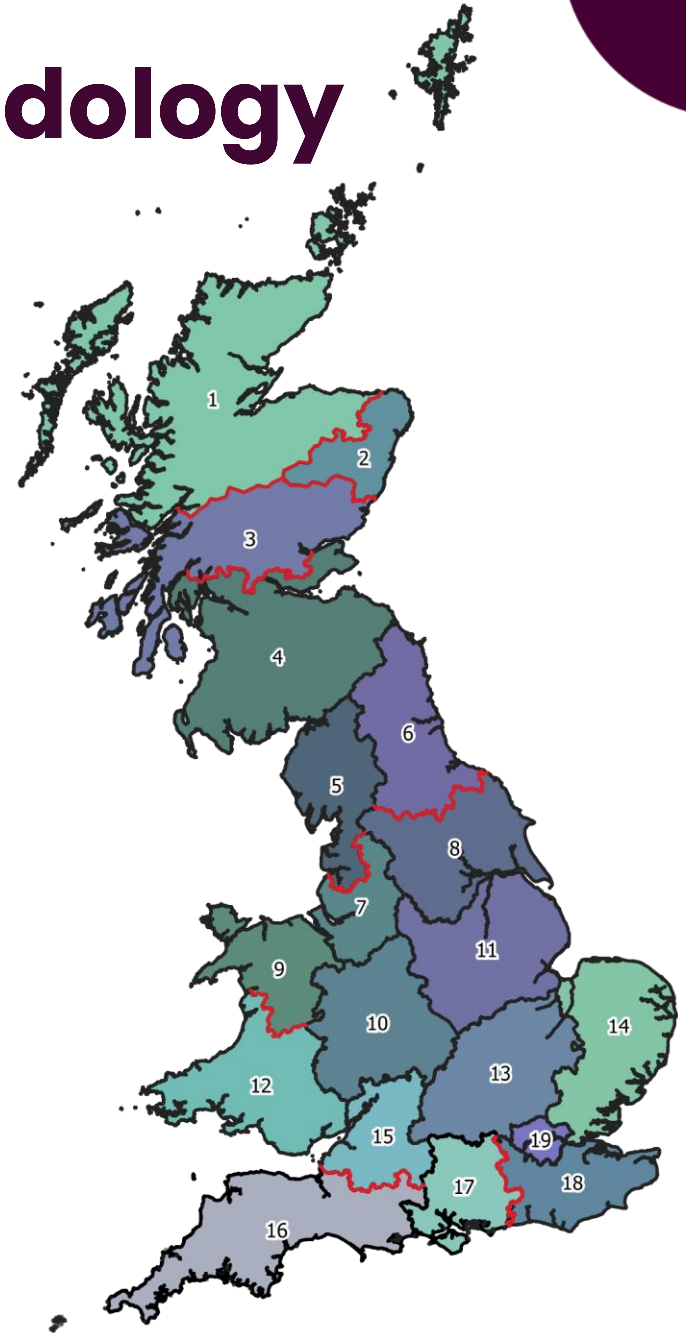
Decisions since the methodology

1) Onshore Publication Zones

The SSEP will be split into 19 zones for publication

This takes a balanced view of the planning principles and energy system principles



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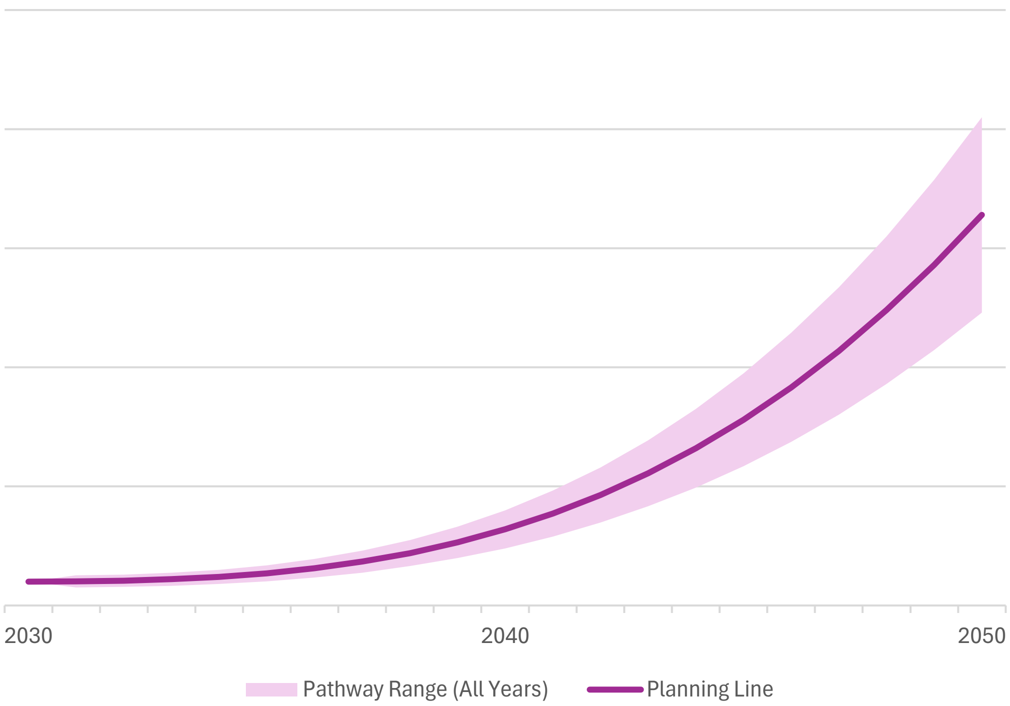
Decisions since the methodology

2) Ranges

SSEP will have a single CSNP planning line for all technologies for all zones, with a range over the time period.

CSNP Planning Line: Provides certainty for network planning.

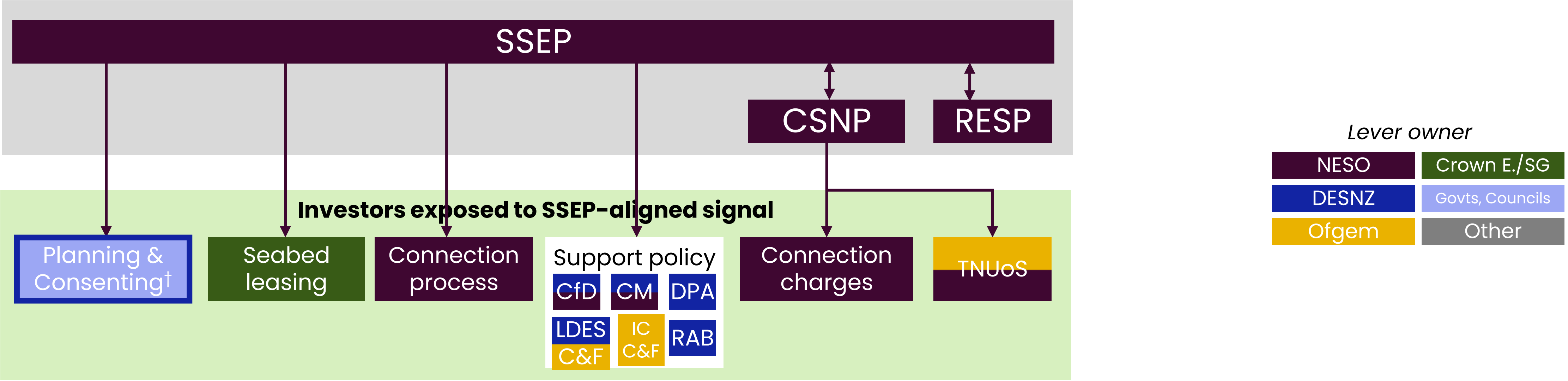
Pathway Range: Clear direction for industry and planning authorities and allows flexibility for future changes.



Reformed National Pricing puts the SSEP at the heart of investment decisions

Government intends a range of levers aligned to the SSEP create an electricity system that sends the right locational signals for investment to lead to a more efficient and cost-effective system.

All of these are from the Government REMA decision, and final decision on Reformed National Pricing package sits within UK Government and Devolved Administrations.



† Planning is a devolved responsibility

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Modelling the SSEP

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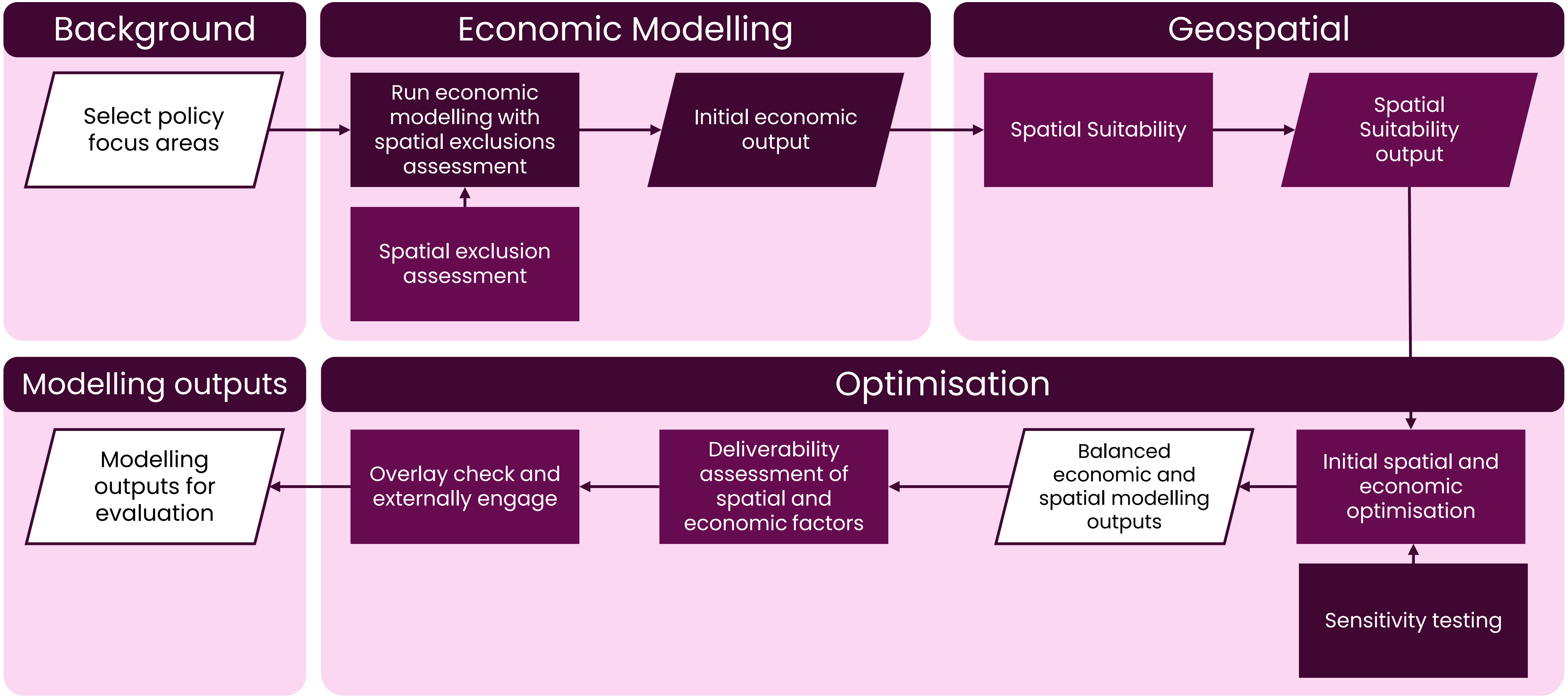
Model


Background
Select policy focus areas
Economic Modelling
Run economic modelling with spatial exclusions assessment
Spatial exclusion assessment
Initial economic output
Geospatial
Spatial Suitability
Spatial Suitability output
Optimisation
Initial spatial and economic optimisation
Sensitivity testing
Balanced economic and spatial modelling outputs
Deliverability assessment of spatial and economic factors
Overlay check and externally engage
Modelling outputs
Modelling outputs for evaluation

Model Setup

Inputs and dependencies

Geospatial inputs
What can be built where?

Baseline
What is our starting point?

Deliverability constraints
How quickly can we build?

Demand projections

Economic modelling

Macroeconomic inputs
Commodity prices, interest rates, …

Techno-economic inputs
Build costs, efficiencies…

Policy levers
UK/Scottish/Welsh government ambitions

Other SSEP pillars & workstreams
Spatial suitability

Model Setup

Building the framework

17 economic zones

Chosen to represent major electricity network bottlenecks and potential hydrogen clusters

Existing supply

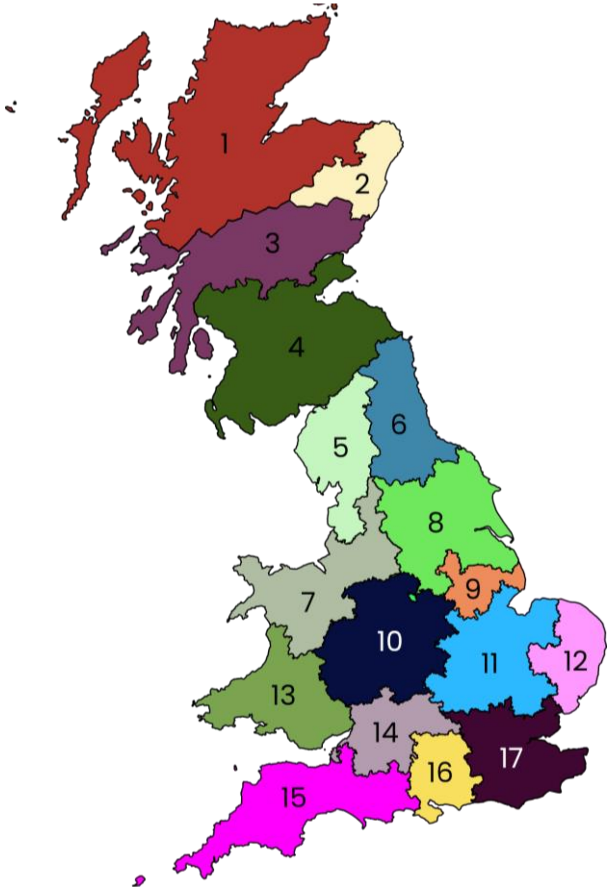
A digital replica of the energy system today with planned closures and connections out to 2030*

Hourly forecasts

50 years of historical weather data, forecast demand growth with hourly profiles

Existing network

Existing network capability with planned investments out to 2030*



NB: these zones are for modelling purposes only, and do not represent final SSEP publication zones

**to align with Clean Power 2030 recommendations*

Economic Modelling Inputs

Data Sources

Department for Energy Security & Net Zero

Macroeconomic assumptions and technology costs

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Technical data

Energy Exemplar

Baringa

Weather and European data

SSEP

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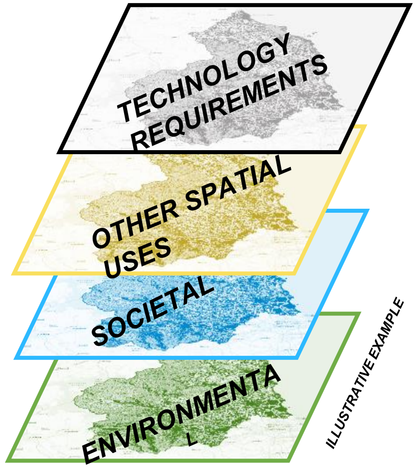
Geospatial Modelling Inputs
Exclusions

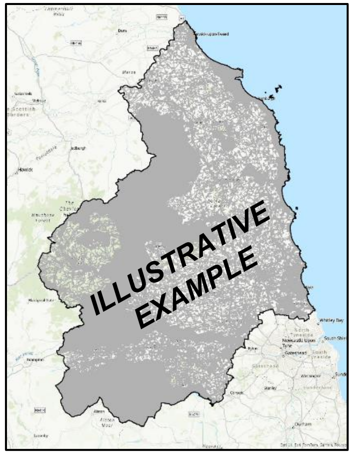
Identify relevant indicators within four spatial "Pillars"

- Environmental
- Societal
- Other Spatial Uses
- Technical Design Engineering Requirements

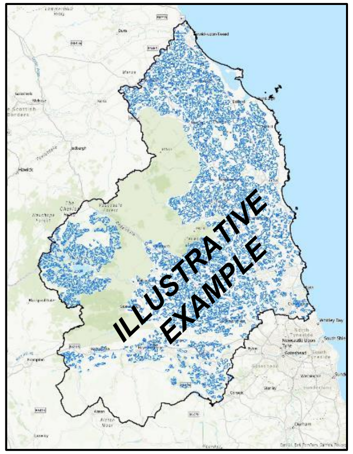
Gather spatial data representing indicators



Map spatial exclusions for each technology



Calculate potential developable area



Output maximum generation per zone as input to economic modelling

Convert "potential developable area" to inputs for Economic Modelling

(Calculation to convert area into generation yield in GW for each technology using a power density in MW/km²)

Prepare → **Model** → Appraise → Consult → Refine → Publish

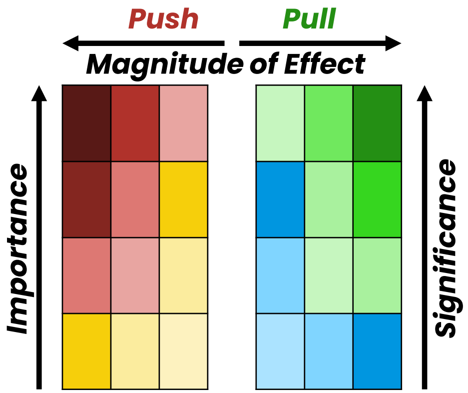
Geospatial Modelling Inputs

Suitability

Identify relevant indicators within four spatial "Pillars"

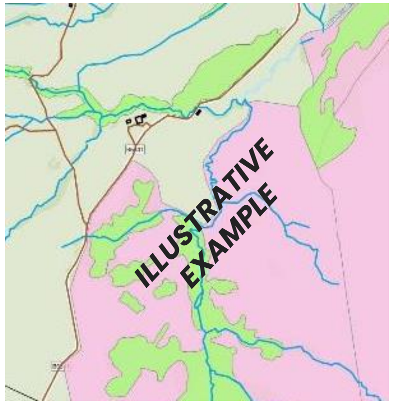
- Technical Design Engineering Requirements
- Other Spatial Uses
- Societal
- Environmental

Score indicators as constraints (push) or opportunities (pull)

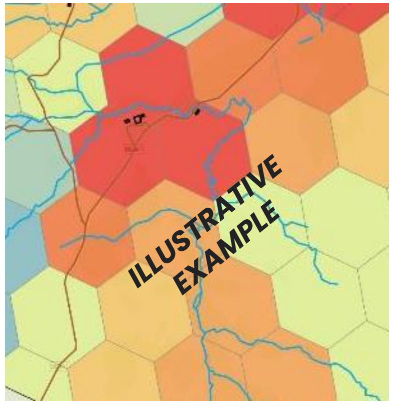


Multi-criteria analysis scoring approach

Gather spatial data representing constraints and opportunities



Apply and aggregate scores into spatial suitability heat maps



Integrate spatial exclusion economic modelling outputs and heatmaps to identify a balanced spatial constraint cut-off

Convert "spatially optimised developable area" to inputs for next iteration of Economic Modelling.

Prepare | **Model** | Appraise | Consult | Refine | Publish

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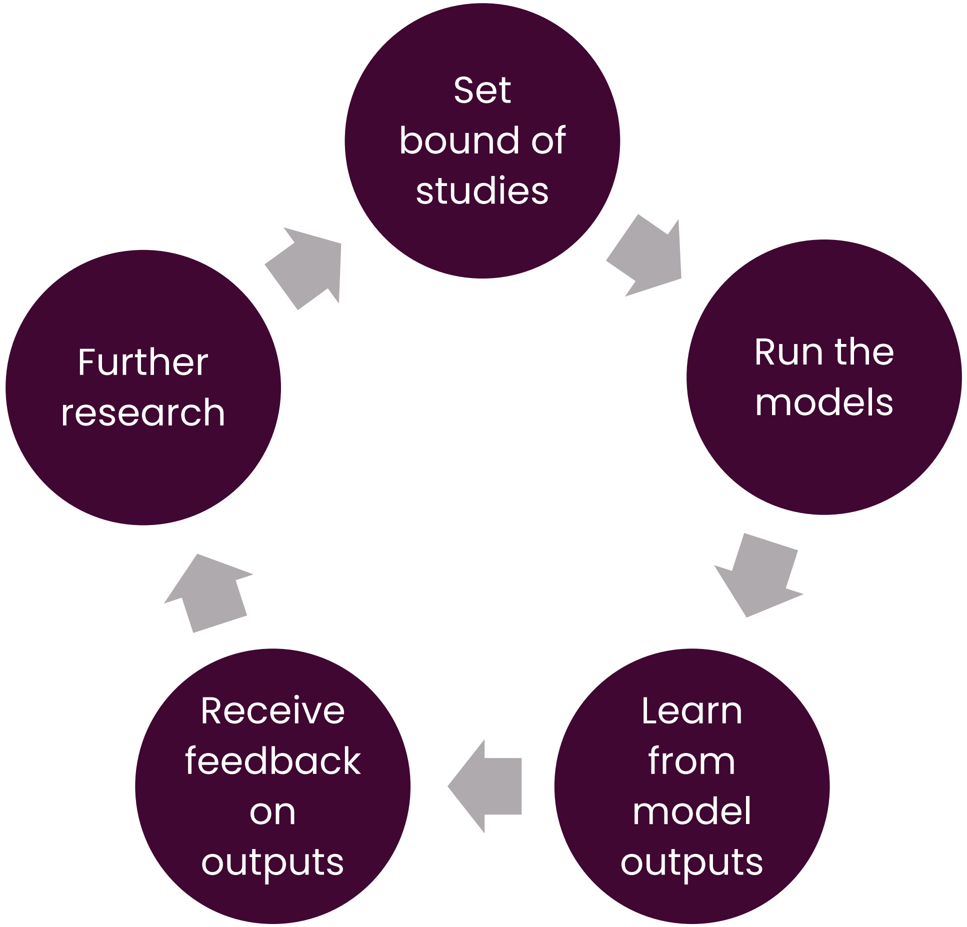
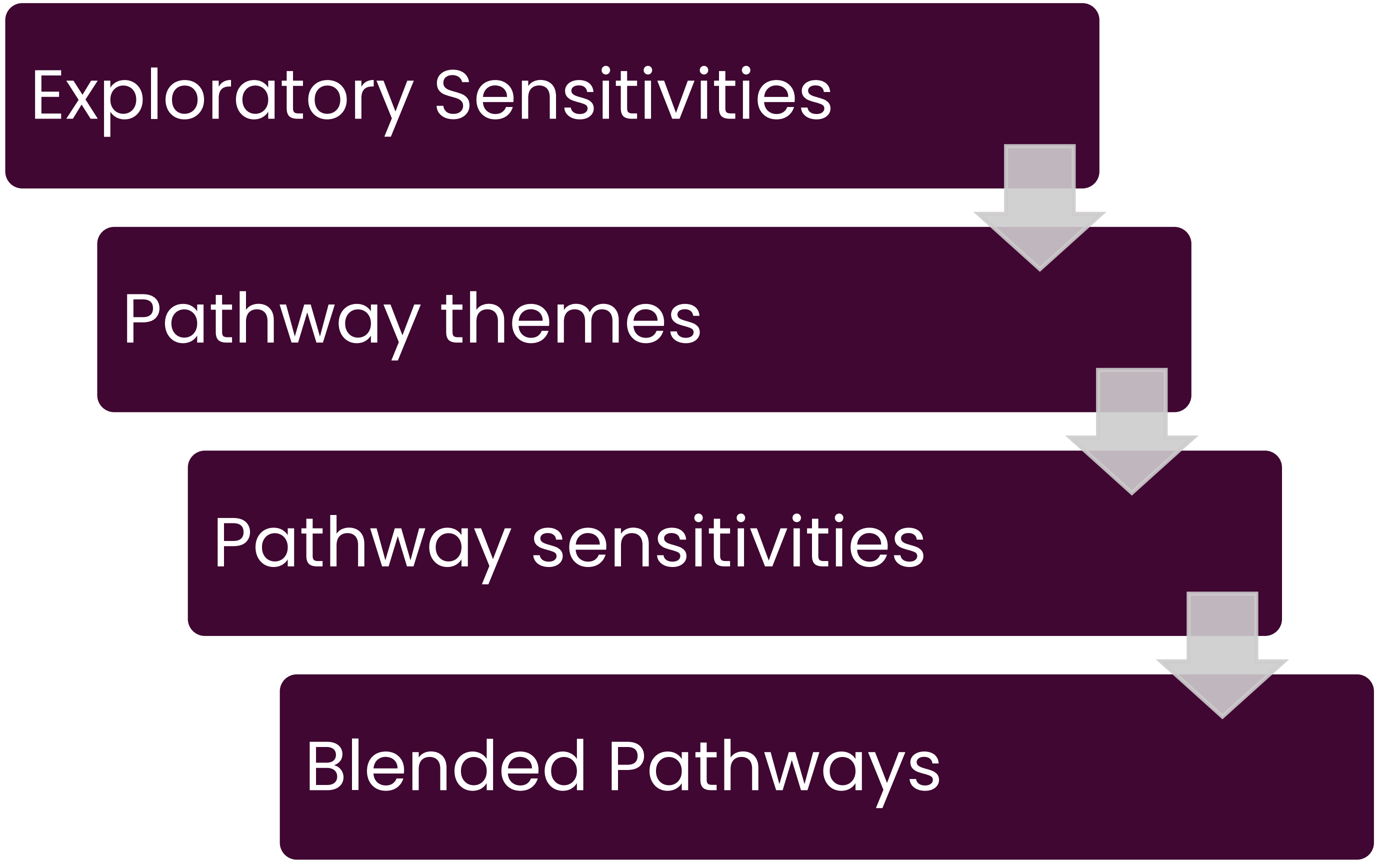
Pathways development process

We have gone through multiple modelling loops to enable us to create a range of pathway themes that we can develop to our 4-6 pathways for the SoS





Initial pathway themes

These were the initial themes used to shape the pathways development.

1. **No additional policy considerations**
2. **Reduced reliance on fuel and electricity imports**
3. **Reduced impact on land.**
4. **Diversifying the energy portfolio**
5. **Green gas**
6. **Known projects with existing investment.**
7. **Reducing initial dependence on nascent technologies.**

Further developing pathway themes

Following feedback and reflections on the initial pathway themes, we have explored more moderate policy choices that 'blend' themes:

Further development:

- 2 **Further Energy Independence**
- 3 **High Energy Density**
- 4 **Diversifying the energy portfolio**

Additional:

- 8 **Resilience with LCDP**
- 9 **Resilience with Renewables**
- 10 **Resilience with a H_2 System**

What the modelling is showing us

Please note that modelling is ongoing and therefore themes may change

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Key Trade Offs

We have observed several trade offs in our modelling as it has developed...

If **Nuclear** generation is reduced, we see an increase in offshore wind and storage. Should nuclear development be delayed we would need Offshore Wind to fill the gap.

When **Offshore Wind** increases, we see an increase in the network and storage required, and a corresponding decrease in Onshore Wind.

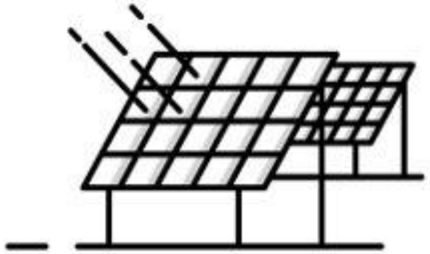
If **Solar** is constrained, there is less battery storage and a switch to higher load factor generation types such as Offshore Wind and Nuclear.

Limiting **Interconnectors** reduces the viability of large-scale renewables as they lack access to export markets. Long duration energy storage (LDES) is increased alongside a requirement for more dispatchable generation

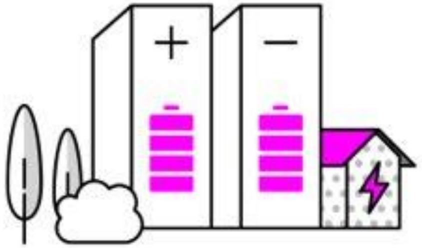
We often see requirements for **Green Gas**, biomethane is often seen as the cheaper solution when allowed.

2

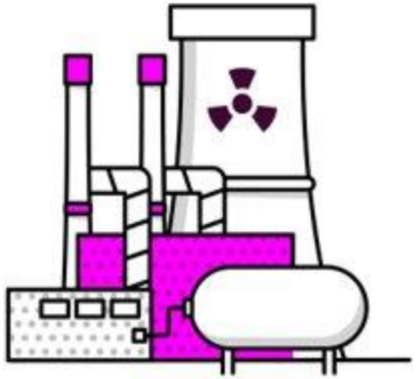
Further Energy Independence



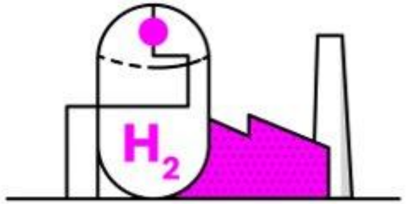
When we reduce nuclear and solar, the model chooses to build floating offshore wind, rather than other low carbon dispatchable technologies, and later in the horizon.



With the increase in offshore wind, there is an increase in LDES and batteries.



In the early horizon, demand is being met by the use of nuclear small modular reactors (SMRs).

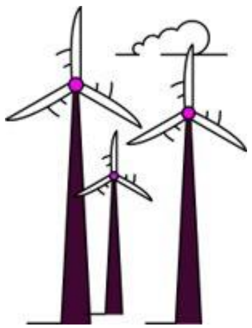


Unabated gas phased out by 2050 brings Proton Exchange Membrane (PEM) electrolysers as the technology of choice and increased capacity in other hydrogen ecosystem assets, such as salt caverns and hydrogen pipelines.

3

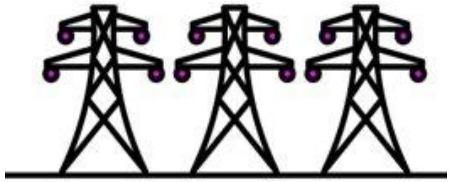
High Energy Density

When solar, onshore wind and nuclear SMR are restricted, the model relies primarily on offshore wind and flexible assets.



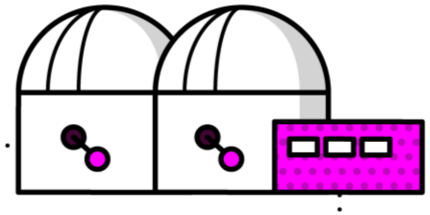
Onshore wind generally builds up to the maximum allowed by geospatial constraints.

As more offshore wind is added into the system, it displaces onshore wind.

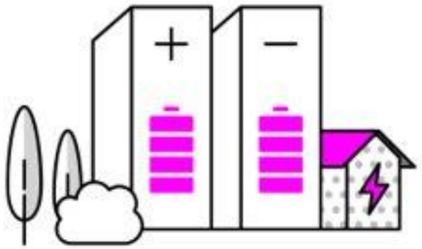


Slightly lower levels of network reinforcement compared to the runs with no additional policy considerations.

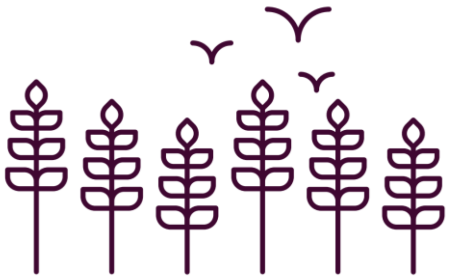
Diversifying low carbon dispatch



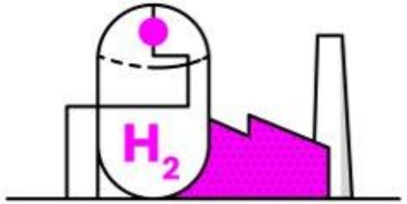
The presence of hydrogen to power capacity reduces unabated gas, battery, and LDES buildout, and increases underground hydrogen storage capacity.



The shift to hydrogen storage from LDES slightly reduces electricity network requirements.



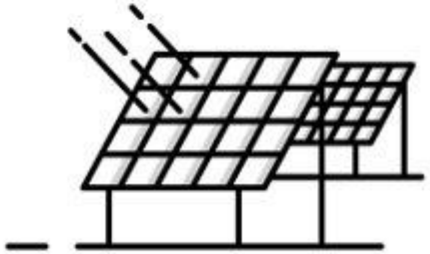
The introduction of biomethane reduces the role of LDES and unabated gas more than hydrogen to power.



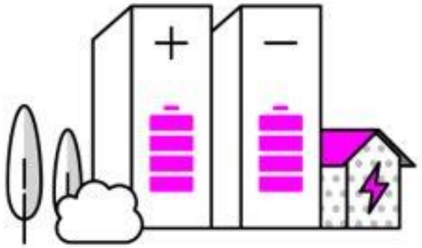
A reduction in nuclear capacity increases the role of hydrogen, biomethane and offshore wind.

9

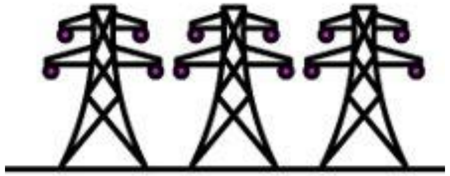
Additional Pathway - Resilience with Renewables



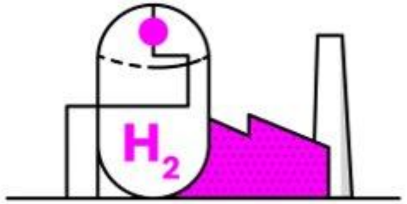
As has been seen in other modelling, solar is the preferred technology, and builds to constraint limits in all pathway branches.



More renewables result in a higher need for flexible assets (storage and electrolysis).



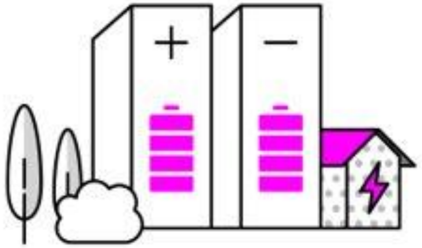
Significant network build out is needed to connect further away renewables to demand centres.



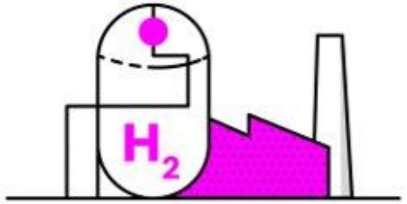
Some hydrogen peaking capacity is needed to support the system, with nuclear SMR capacity being reduced. Emission limits restrict unabated gas plants.

10

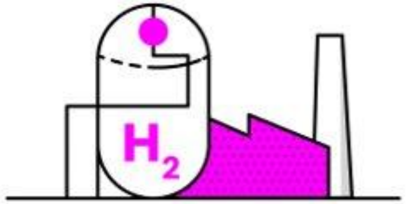
Additional - Resilience with a Hydrogen System



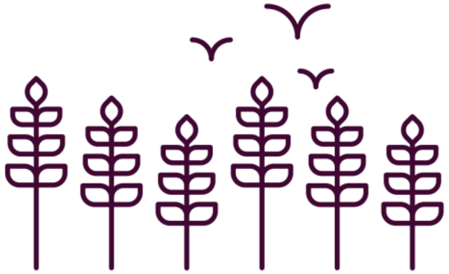
Offshore wind and LDES are typically built to support the energy system, but in this pathway the restriction on network build means H2P and batteries are built instead.



Hydrogen infrastructure forming a pipeline backbone down GB increases the role of hydrogen to power



Restricting imports increases the role of hydrogen to power, alongside other dispatchable technologies like LDES and batteries



If biomethane is available, hydrogen to power is not built.

Next steps

Listen to your feedback to understand if pathways align with expectations.

Refinement of our long list to develop the shortlist of 4-6 pathways

Geospatial iteration to gain a clearer understanding of the land impact associated with these pathway themes

Appraisal of the 4-6 pathways

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Discussion Session

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Where we need your input

In today's feedback session we'd like your opinion on:

- If the pathways align with expectations
- Technology specific insight and expertise
- Push and pull factors for projects
- Deliverability and investability
- Achievable ranges from 2030 – 2050

Solar

Assumptions

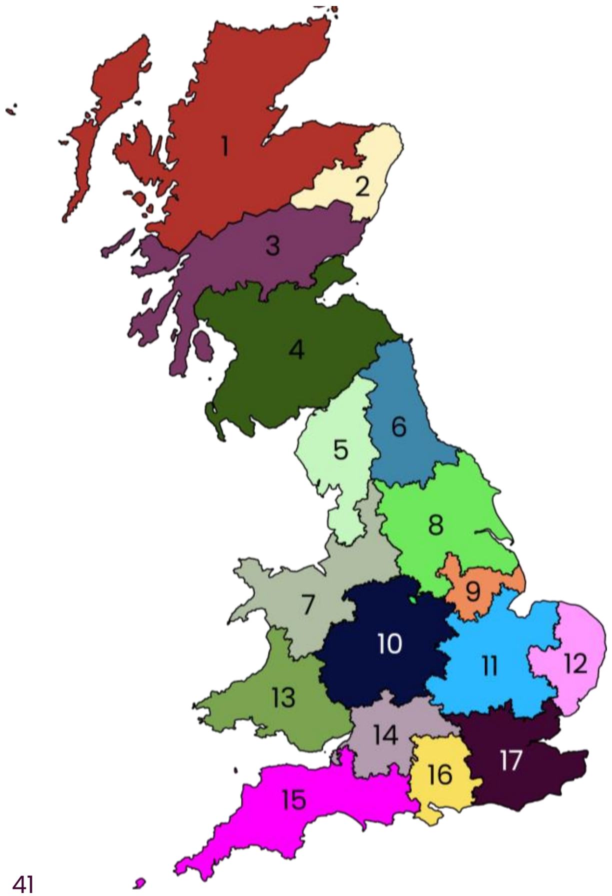
- Historical weather profiles
- Utility scale Tx and Dx Solar farms considered for expansion
- Baseline aligned with Clean Power 2030. Rooftop solar modelled using FES background projections
- 35-year lifetime
- GB wide build limit
- Each of the 17 SSEP economic modelling zones has a geospatial limit

Modelling

- Preferred generation technology due to its low cost
- Consistently binds to build rate or geospatial constraints
- Buildout can be saturated to zones with favourable load-factors unless geospatially restricted
- Levels of solar and storage capacity built are highly correlated
- Higher cost sensitivities have minimal impact on the solar buildout

Onshore Wind

12 onshore wind areas
17 SSEP economic land zones*



Onshore Profile	SSEP Zone
Scotland Highlands	1, 3
Scotland Northeast	2
Scotland South	4
England Northwest	5
England Northeast	6, 8
Wales North	7
England East Mid	9, 11, 12
England Mid	10
Wales South	13
England South Mid	14, 16
England Southwest	15
England Southeast	17

**NB: these zones are for modelling purposes only, and do not represent final SSEP publication zones*

Each of the 12 onshore wind areas have a distinct **wind profile**

Generation based off historic weather profiles. Future turbine technology/output taken into consideration.

Each of the 17 SSEP land zones has a defined **geospatial limit.**

Onshore Wind

Economic Preference and Build-Out Behaviour

Economically favourable

Network Implications

Onshore wind contributes to significant network reinforcement needs

Geospatial Constraints and Land Use

Exclusion Mapping
Opportunity Scoring

Generation

High variability in load factors across GB.

Trade-Offs with Other Technologies

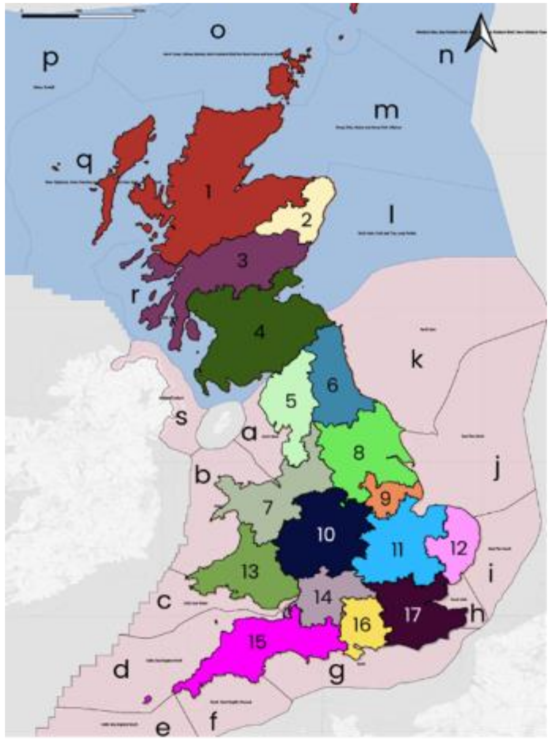
Offshore Wind
Nuclear SMR

Policy and Scenario Sensitivities

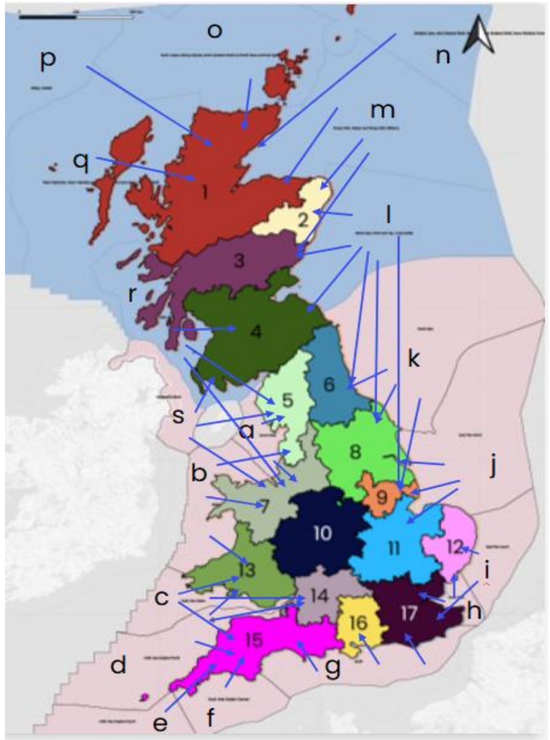
Policy Ambitions
Energy Independence
Reduced Land Impact

Offshore Wind

19 TCE marine regions
17 SSEP land zones



45 ways to connect from marine regions to SSEP land zones



Each of the 19 TCE marine regions has:

- A different **wind profile**
- A **geospatial limit** for floating/fixed OFW

Each of the 17 SSEP land zones has:

- A **landing point limit**, representing how many cables can land on beaches for that zone

**NB: these zones are for modelling purposes only, and do not represent final SSEP publication zones*

Offshore Wind

- The build out of offshore wind varies considerably across scenarios, dependent on the presence of other technologies, such as nuclear.

- The economic modelling prefers fixed offshore wind to floating due to lower costs. However, beyond 2040, the cost difference between fixed and floating offshore wind decreases, and the modelling starts to see floating offshore wind deployed.

- High levels of offshore wind build-out often require high levels of network expansion.

Storage

Technology	Durations
BESS	2h, 4h, 6h, 8h
CAES	10h, 20h
LAES	10h, 20h
PHES	10h, 24h

Micro-battery expansion is not optimised within SSEP but is modelled using FES background projections.

Salt caverns modelled for hydrogen storage – additional storage options can be configured (depleted gas fields, lined rock caverns, above-ground tanks).

- **Long duration batteries (6hr+)** are built in large quantities to manage the large quantities of variable generation on the system. They act as essential support during low renewable output periods. The build out of **LDES** varies across scenarios, dependent on the presence of other technologies such as nuclear.
- **Hydrogen storage** is always built to manage variability in hydrogen demand and production, but ranges depend greatly on overall demand levels as well as shape (e.g. materiality of heating and H2P loads).

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Dispatchable & strategic energy technologies

- Additional **gas CCS** capacity is only observed when required by model inputs, reflecting its comparatively higher cost compared to alternative technologies**.**
- **Biomass CCS** used as a source of negative emissions to help achieve carbon targets. Typically limited by the availability of biomass fuel.
- Some new **unabated gas** is observed in the later modelling years to cover low renewable output periods.
- **H2P** considered a relatively expensive technology for use as a dispatchable power source. Observed in some model runs when other reliable generation sources are restricted.
- **Nuclear SMRs** are built as soon as they are available and up to the imposed capacity limit. **Large nuclear** is only built when nuclear SMR is not available.

Dispatchable & strategic energy technologies

- **Interconnectors** - a favoured technology that almost always builds to constraint limits in order to export excess renewable power and act as an additional source of flexibility during tight demand periods.
- **Data centres** are built where renewable energy is most abundant.
- **Hydrogen electrolysers** are built primarily to supply hydrogen for underlying demand, rather than H2P. Where H2P is present additional electrolysers are required.

Discussion:

What do you think is an achievable capacity in GB by 2050 for the different technologies discussed?

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Deliverability & Investability

- What factors will influence deliverability?
- What strategic factors do we need to consider as the SSEP?
- What are the key risks?
- What factors will influence investability?

Consenting challenges

Supply chain

Cumulative impacts in a region

Balance of push vs pull factors

Market signals

Societal opinions

Economic viability

Government support schemes

Connections

Thank you

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