A Network fit for Net-Zero…

Future Networks and Strategic Offshore Planning

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ENERGY CORK

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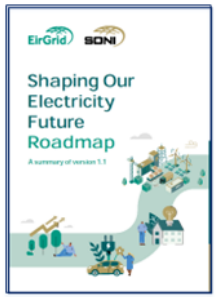
Planning Context

Medium term planning	Long term scenario planning	Strategic visions

All-Island Generation Capacity Statement

Tomorrows Energy Scenarios



Shaping Our Energy Future

All-Island Ten Year Transmission Forecast Statement

Tomorrows Energy Scenarios System Needs Assessment

Transmission Development Plan

A Network Fit for Net-Zero

Long-term strategic vision to deliver a holistic network design to support net zero

Today's focus

...Where does this fit in?..

Two key streams of work

Tomorrows Energy Scenarios System Needs Analysis

- Examines the impact of demand and installed generation assumptions on our network

Tomorrows Energy Scenarios System Needs Assessment

Assessment of the long term needs of the transmission system.

Net Zero Network Plan

- Holistic, both On-shore and Off-shore, for Net Zero including Distribution & Gas (ESBN & GNI)

Net-Zero Network Plan

Long term strategic vision to deliver a holistic network design to support net zero.

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Tomorrows Energy Scenarios…

…forms the framework to our analysis for Net Zero Network

Self-Sustaining is the baseline Scenario for the Net Zero Network Plan

- Least regret
- Full electrification
- Domestic Demand met

Higher industrial demand / High pace of transition

Self-Sustaining

- Domestic Focus
- Generation scaled to meet domestic demand
- High demand side flexibility
- Rapidly decarbonising Power System

Offshore Opportunity

- Domestic and international focus
- More interconnection strong electricity exports at times
- High demand side flexibility
- Rapidly decarbonising power system

Lower interconnection / less offshore development

More interconnection & electricity export / High offshore development

Constrained Growth

- Domestic Focus
- Falling relative disposable incomes
- Supply chain difficulties (RES-E)
- Slower decarbonising Power System

Gas Evolution

- Domestic and international focus
- Renewable gas (inc. hydrogen) economy develops
- Steadily decarbonising Power System

Lower demand / Slower societal transition

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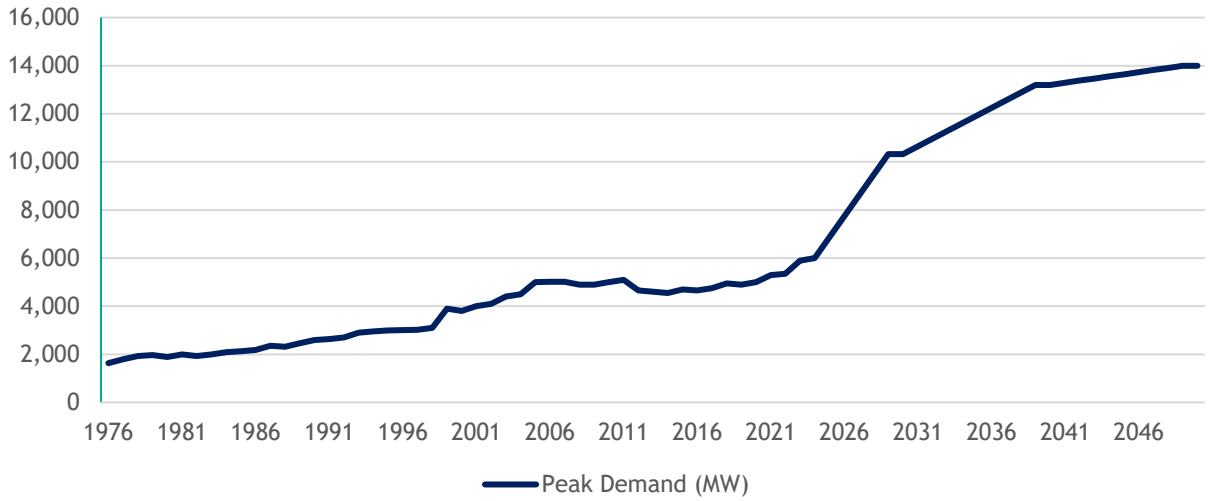
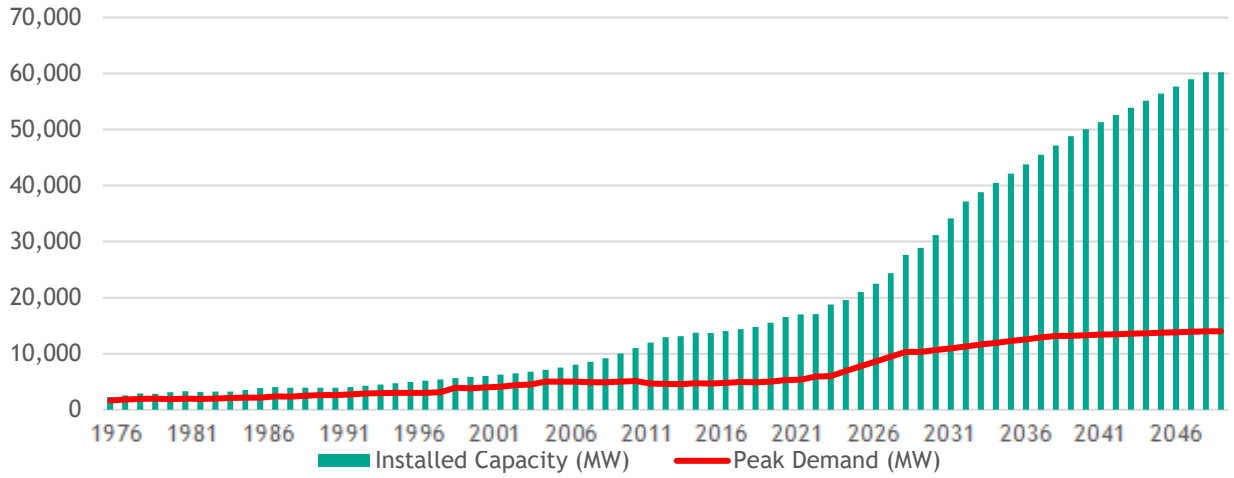
Main Challenge…

Peak Demand Growth



Peak Demand vs Installed Capacity



Peak electricity demand doubled to 5,600MW between 1992 and 2024

In TES, we are now forecasting Peak Demand doubling to 11,000MW in 11 years between 2024 and 2035

- Driven by electrification, economic & population growth

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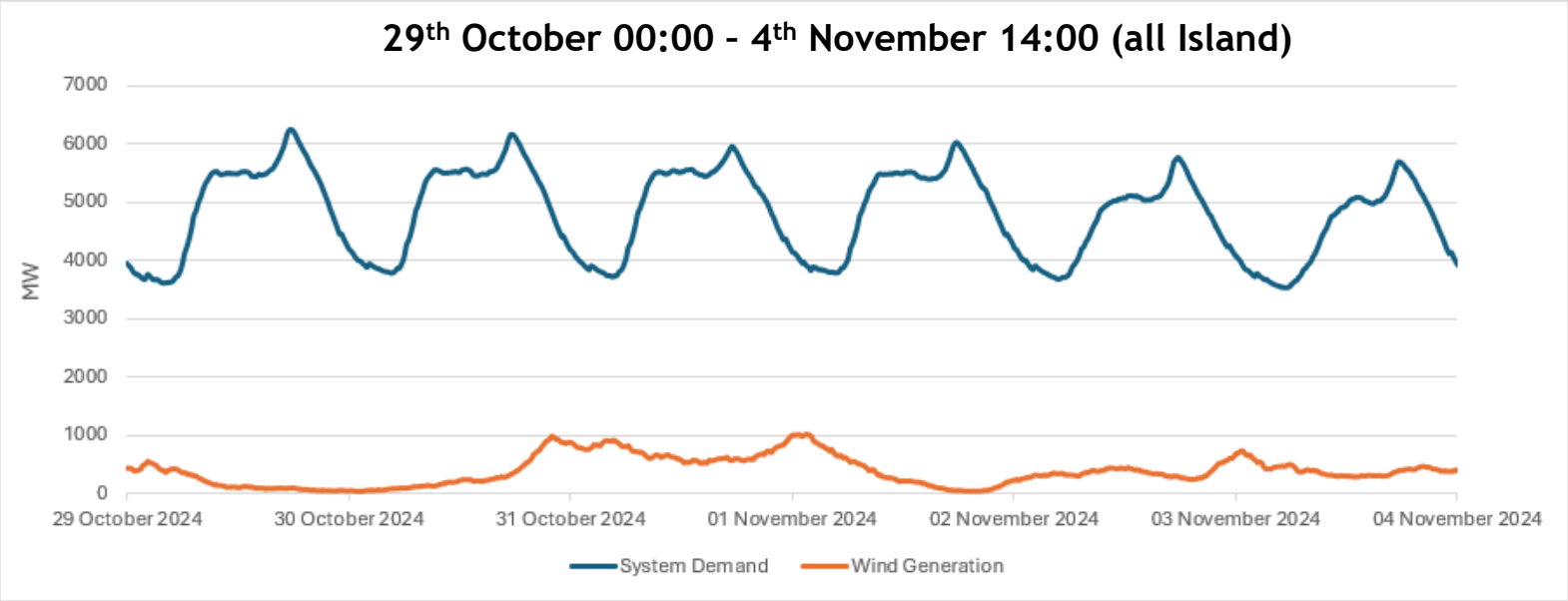
Designing for Net-Zero - what about a Dunkelflaute…



29th October - 4th November (All-Island)	
System Demand	759GWh
Wind Generation	61GWh
Missing Energy (Diff b/w Demand & Wind Gen.)	698GWh
% of Demand met by Wind	8%
Capacity of Turlough Hill	1.46GWh
No. of 'Turlough Hills' required	480

- In less than a 1-week period it drove a requirement for the equivalent of 480 Turlough Hills worth of energy to meet the shortfall in wind!
- This was primarily met by gas fired generation and a large chunk of interconnector imports.

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Tomorrows Energy Scenarios

System Needs Assessment

All work forecast in SOEF assumed to be completed

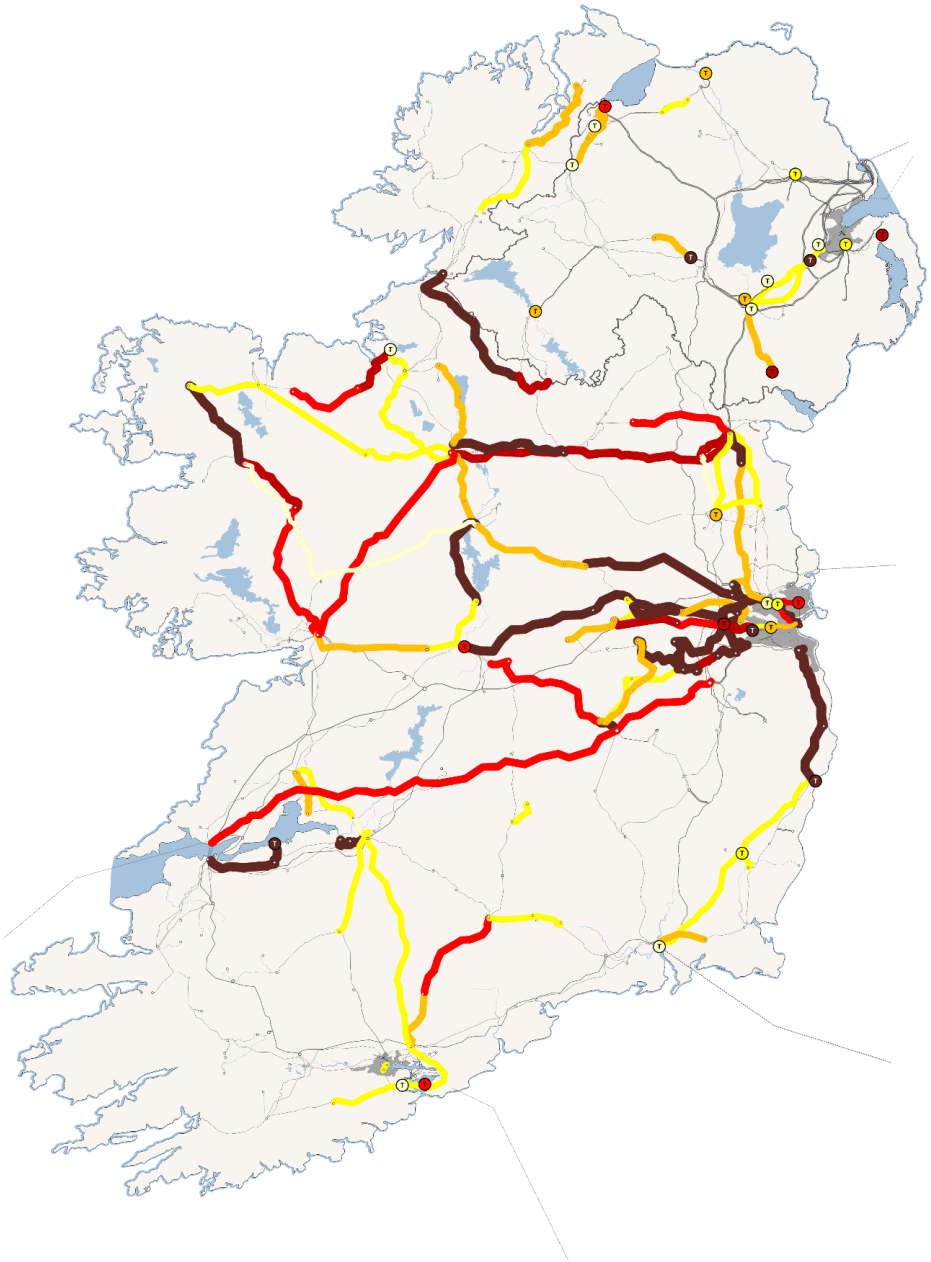
Examines the impact of demand and installed generation assumptions on our network

Two years - 2035 & 2040

Backdrop to the Net-Zero Network Analysis

As expected, many circuits are overloaded

Self-Sustaining - 2040



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Net Zero Networks

Objective

Define a holistic network masterplan to deliver on Net Zero

Identify least-regret network improvements

Identify transmission network development requirements for:

- Maximum Electrification
- Maximum Offshore Wind Potential

Identify potential for operations, markets, and engagement changes

Inform early investment in the energy ecosystem

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A Network plan fit for Net-Zero…

…a complex study requiring a Best-in-Class consortium

Methodology for Conceptual Network Design Variations

High-level, illustrative overview of conceptual network design process.

2030 Input Data

A base case using:

- Existing 2030 transmission network model;
- TES 2023 outcomes (supply and demand);
- ENTSO-E/G TYNDP 2024;
- Designated Maritime Area Plans (DMAPs)

Figure: Tomorrow's Energy Scenarios 2023 Report.

Figure: Anticipated 2030 transmission network showing 220kV and up.

2030 Nodal Model

Inputs will be developed into a simplified nodal 2030 base case model

Purpose: run a capacity expansion to assess how the All-Island system could optimally develop beyond 2030

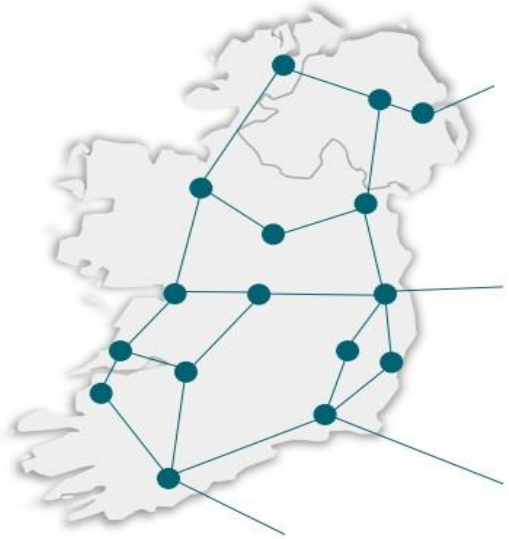


Figure: Illustrative nodal model showing transfer capacities between nodes based on the anticipated 2030 transmission network.

2050 Conceptual Network Designs

- Three variations will be modelled in Plexos.
- Identify potential low-regret electricity infrastructure investment options / capacity corridors.

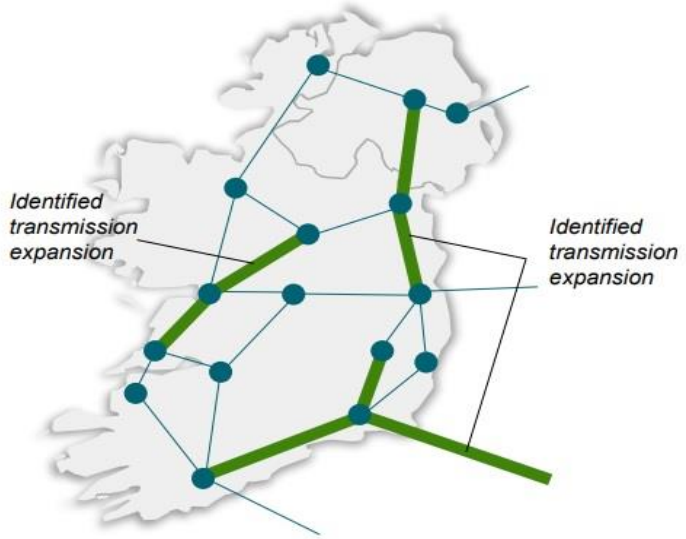


Figure: Illustrative 2050 conceptual network design showing identified transmission expansion.

Modelling Overview…

General:

- Uses Plexos to simulate capacity expansion and hourly optimisation of the all-island electricity system
- Electricity and hydrogen demand profiles are defined based on the demand values from TES 2023.

Configuration:

- Geographic Scope - IE/NI onshore nodes
- Aggregated to 220 kV and up
- Offshore regions,
- 3 GB nodes, FR, and remaining ENTSO-E system aggregated

Model Years: 2030 (Base), 2035, 2040, 2045, 2050

Energy Carrier: Electricity & Hydrogen

Modelling Overview…

Two Step Optimisation:

- Capacity expansion
- Production cost

Optimised Investment Types (IE / NI):

a. Offshore Wind (location)
b. On/offshore electricity transmission
c. Electrolysers
d. Hydrogen Storage
e. Hydrogen turbines

Key Model Outputs:

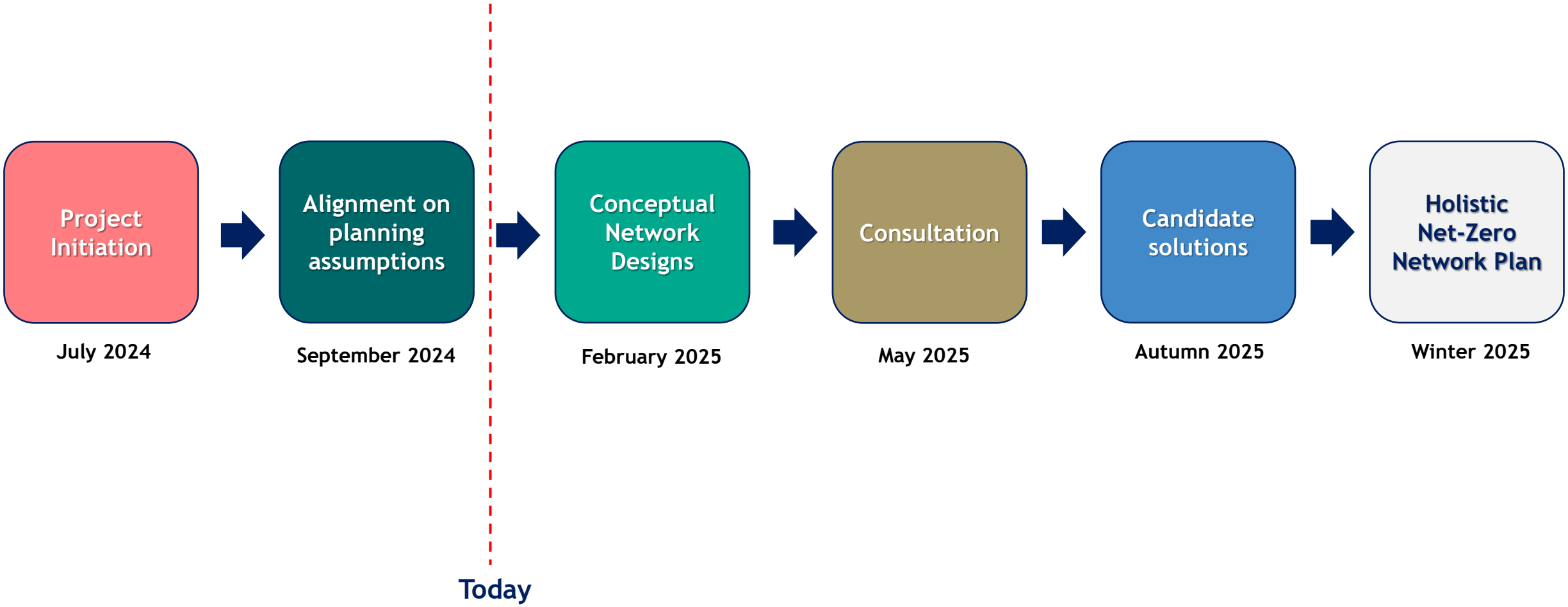
- Timeline of investments (2035, 2040, 2045, 2050)
- Optimised investment (as above)

- **Energy system costs:**
  - electricity network investments (e.g., supply capacity, transmission interconnections)
  - fuel, O&M, & CO2 emission costs for the system

- **System operation including:**
  - electricity flows
  - system dispatch
  - CO2 emissions
  - RES curtailment

Net Zero Networks…

…high level timelines



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