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Adaptation and Resilience of Coastal Energy Supply: **ARCoES**

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ARCoES aims to identify:

Challenges facing the future security of the nuclear energy sector (nationally) and coastal energy supply (regionally)... as a result of changing patterns of temperature and rainfall, sea-level rise and storms.

The research will determine the threats posed to future energy generation and the distribution network from:

- Flooding; • Erosion; • Coastal sedimentation; • Water temperature and quality;
- Distribution of plants and animals in the coastal zone.

Being complimentary to existing & ongoing work in the industry

Model distribution network resilience & economics of investment.

Develop a GIS decision-support tool for engaging sectors/communities in shaping future coastal energy generation to 2100, 2200 and 2500 AD.

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Modelling coastal change for:

Sizewell
(mixed beach)

Hinkley Point
(rock)

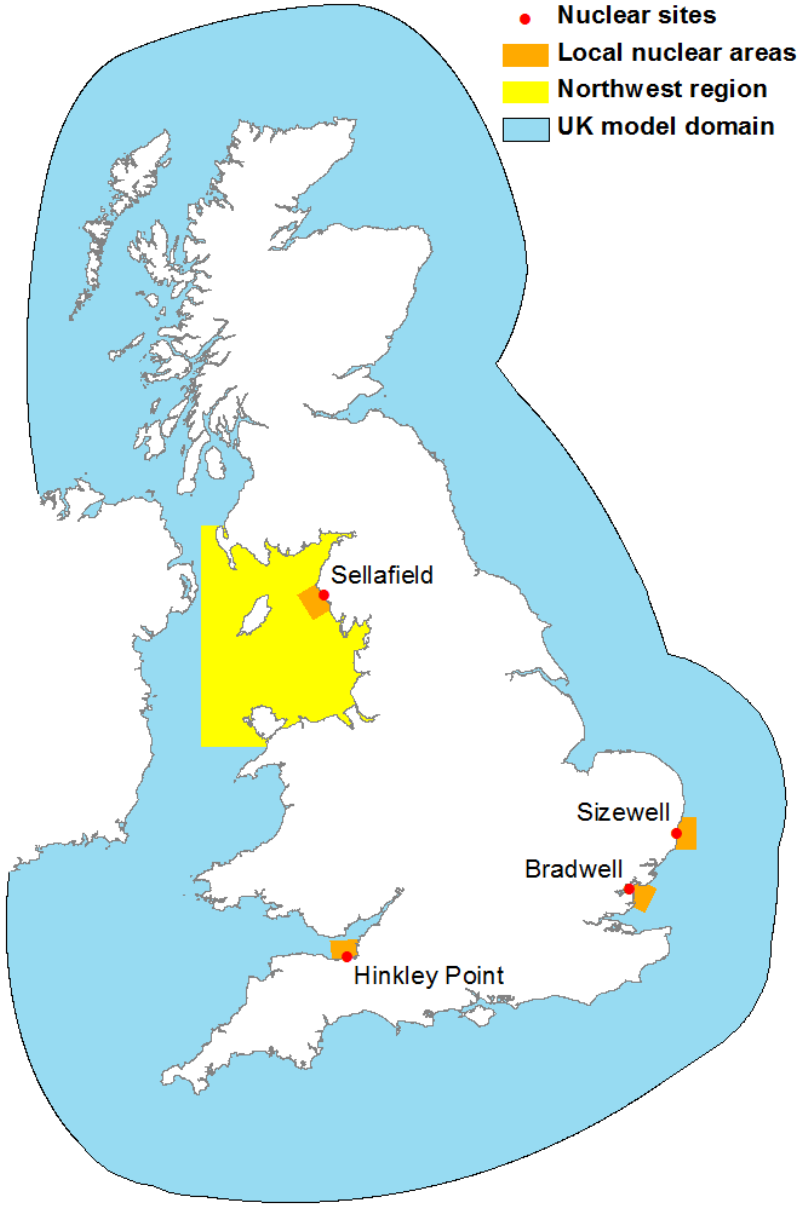
Bradwell
(estuary)

Sellafield
(sand beach/dune)

(Heysham)
(Oldbury)
(Wylfa)

UK unstructured-grid model

- FVCOM unstructured grid model
- Enables focus where it's needed
- UK-wide: coarse resolution
- Local areas: high resolution
- 2-yr simulations, present & future
- Insight into winter/summer conditions



- Nuclear reactor:
  - coast
  - site
  - operations
  - decommissioning (waste)

- Energy distribution infrastructure
  - physical location
  - age/design

- Neighbours:
  - People – towns, farms, leisure
  - Airport
  - Army Ranges
  - Nature Reserve

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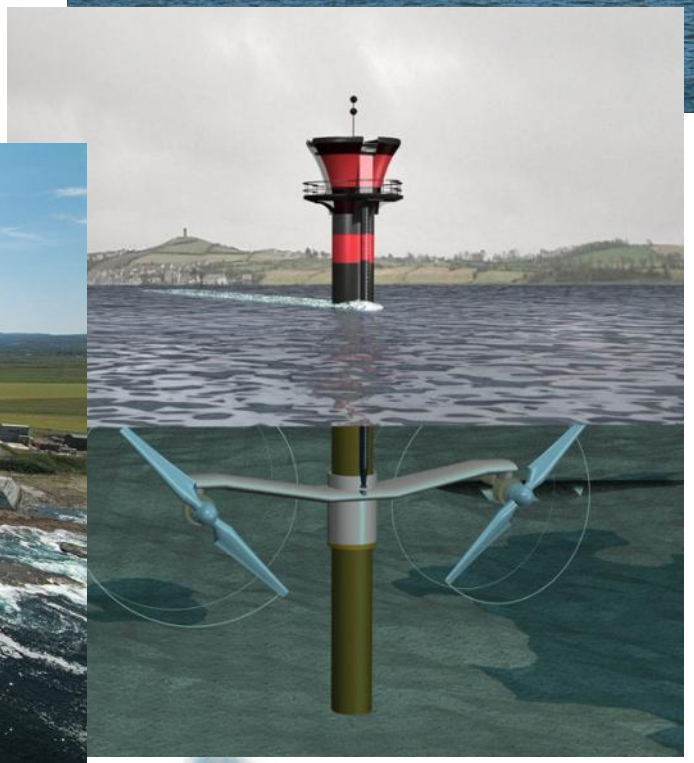
The aim is to identify how the coastal power stations, substations and distribution grid can adapt to future climate change impacts and become more resilient, thus securing our energy needs as we move into a low-carbon future.



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Project Steps

- **Step 1 – identify risks**
  - Coastal modelling (# scenarios @ # points in time, probabilistic)
- **Step 2 – identify impacts to service**
  - Primary (network model) location, age, failure rate, power flows, physical assets to service
  - Secondary (interdependencies)
- **Step 3 – identify benefits**
  - Willingness To Pay literature review/primary research
- **Step 4 – evaluation**
  - CBA model & wider stakeholder engagement via GIS

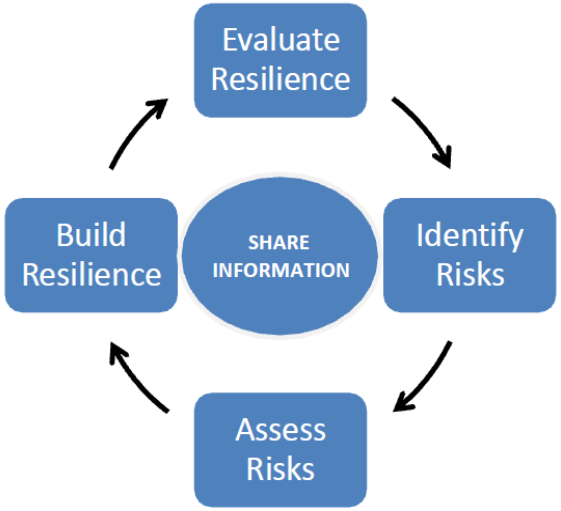

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Diagram from Keeping the Country Running: Natural Hazards and Infrastructure (Cabinet Office, 2011). © Crown copyright 2011

Current Programme

- Substations affected by sea flooding – risk rated RED
- ETR138 – 10 year substation programme – DCPR £110m

- ARCoES - Project partners & project stakeholders
- Vital for project to be complimentary to ongoing industry work to add value
  - e.g. standards or CBA;
  - resilience of assets or service;
  - engaging stakeholders

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Diagram from Keeping the Country Running: Natural Hazards and Infrastructure (Cabinet Office, 2011). © Crown copyright 2011

Key Reports

- ENA - ETR 138 (2009)
- ENA - Core Adaption Report (2011)
- Company's Adaptation Reports (2011)
- Defra – Adaption Report (March 2012)
- Cabinet Office, Keeping the country running (2011) & others
- Comparator sectors, e.g. water

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Key Questions

Feedback on current approaches to determine where ARCoES can add value:

- Risk:
  - Climate change scenarios
  - Low probability extreme events (grid & primary substations re network resilience)
- Impact:
  - Making the link to service
  - Data gaps
  - Move to smart networks
- Prioritisation:
  - CBA & Investment prioritisation
  - Monitoring effectiveness
- Stakeholder engagement:
  - including WTP, Local Resilience Forums & inclusion of societal aspects
- Barriers to implementation:
  - regulatory?

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Thank you

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