



Programme Area: Nuclear

Project: Power Plant Siting Study

Title: Project presentation

Context:

The aim of the Power Plant Siting Study project is to explore the different opportunities and constraints involved in developing sites in England and Wales for new low carbon power plants. The study will consider new nuclear as well as fossil fueled power stations using carbon capture and storage technologies. The study is important to understand the different features which could either make a potential site suitable or, alternatively, prevent its viability. This study is intended to inform whether there is likely to be competition for development sites between low carbon technologies, which could be a future constraint in the low carbon replacement of the UK's ageing power plants. It will help inform the ETI's technology strategy development work, which is looking at how to accelerate the development of new energy technologies for a UK transition to a low carbon economy.

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Power Plant Siting Study

Energy Technologies Institute



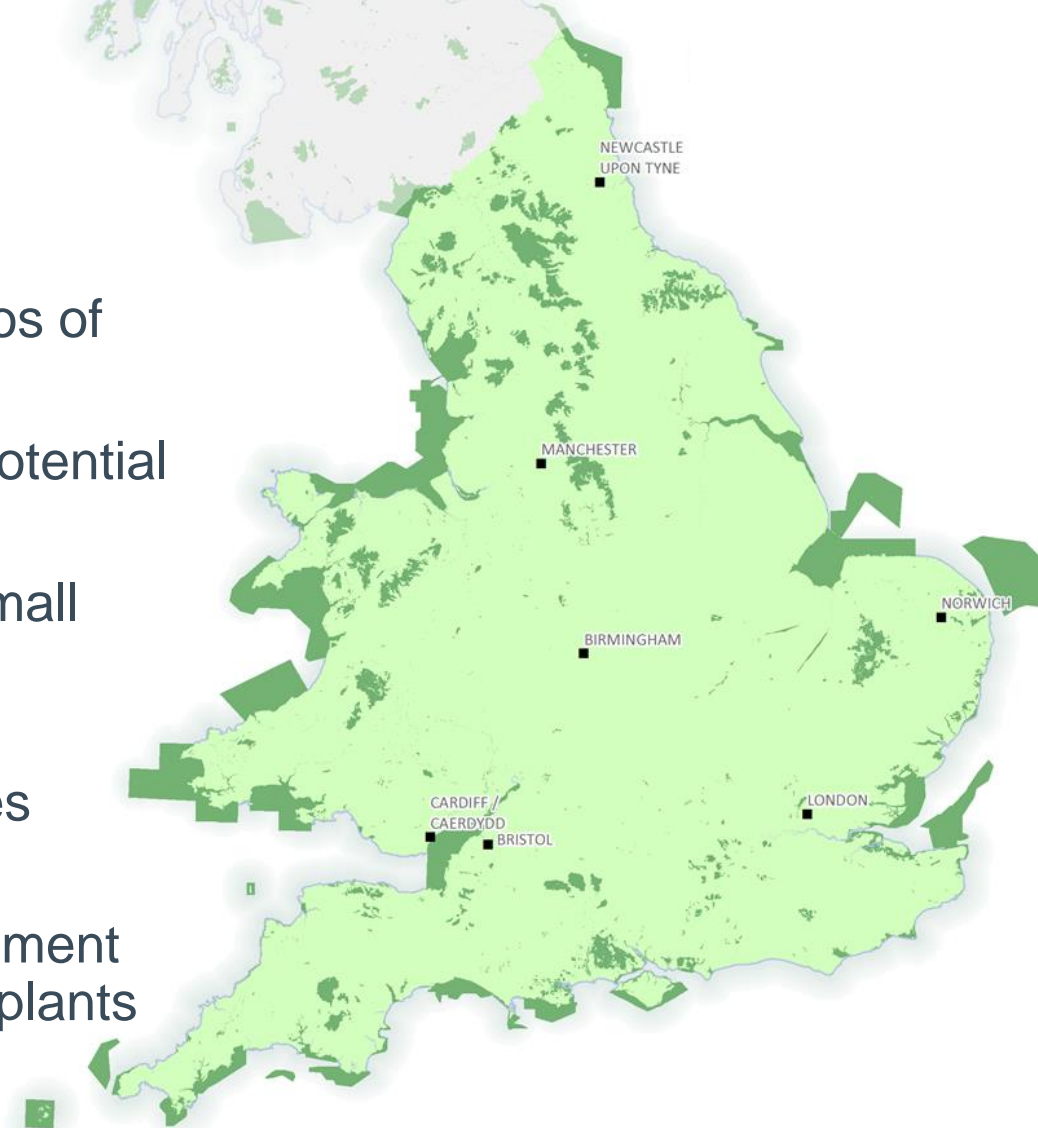
Project Presentation

6 October 2015

Plan Design Enable

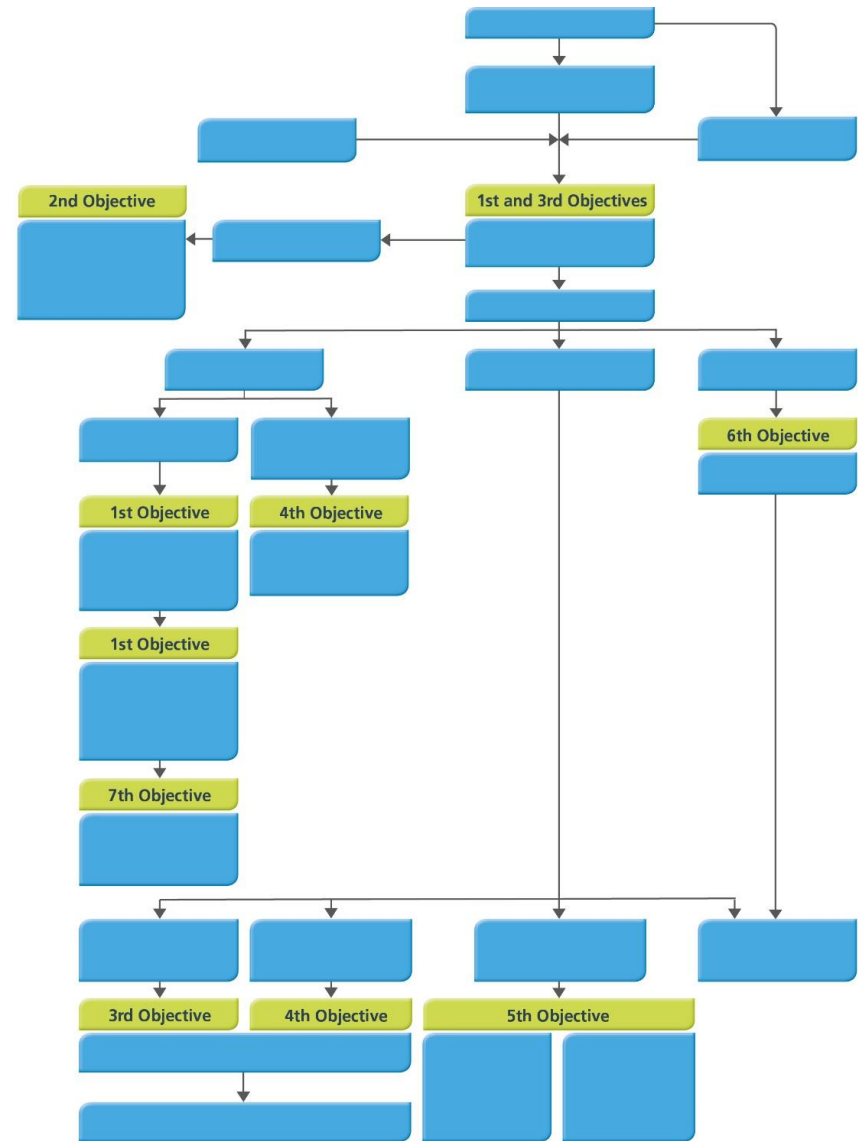
Introduction

- Two nuclear expansion scenarios of 40 GW_e or 75 GW_e by 2050
- Whether site availability limits potential nuclear capacity
- Large (up to 1,650 MW_e) and small (300 MW_e) units
- Satisfying heat networks from Alternative Nuclear Technologies project
- First stage of multistage assessment process for new nuclear power plants



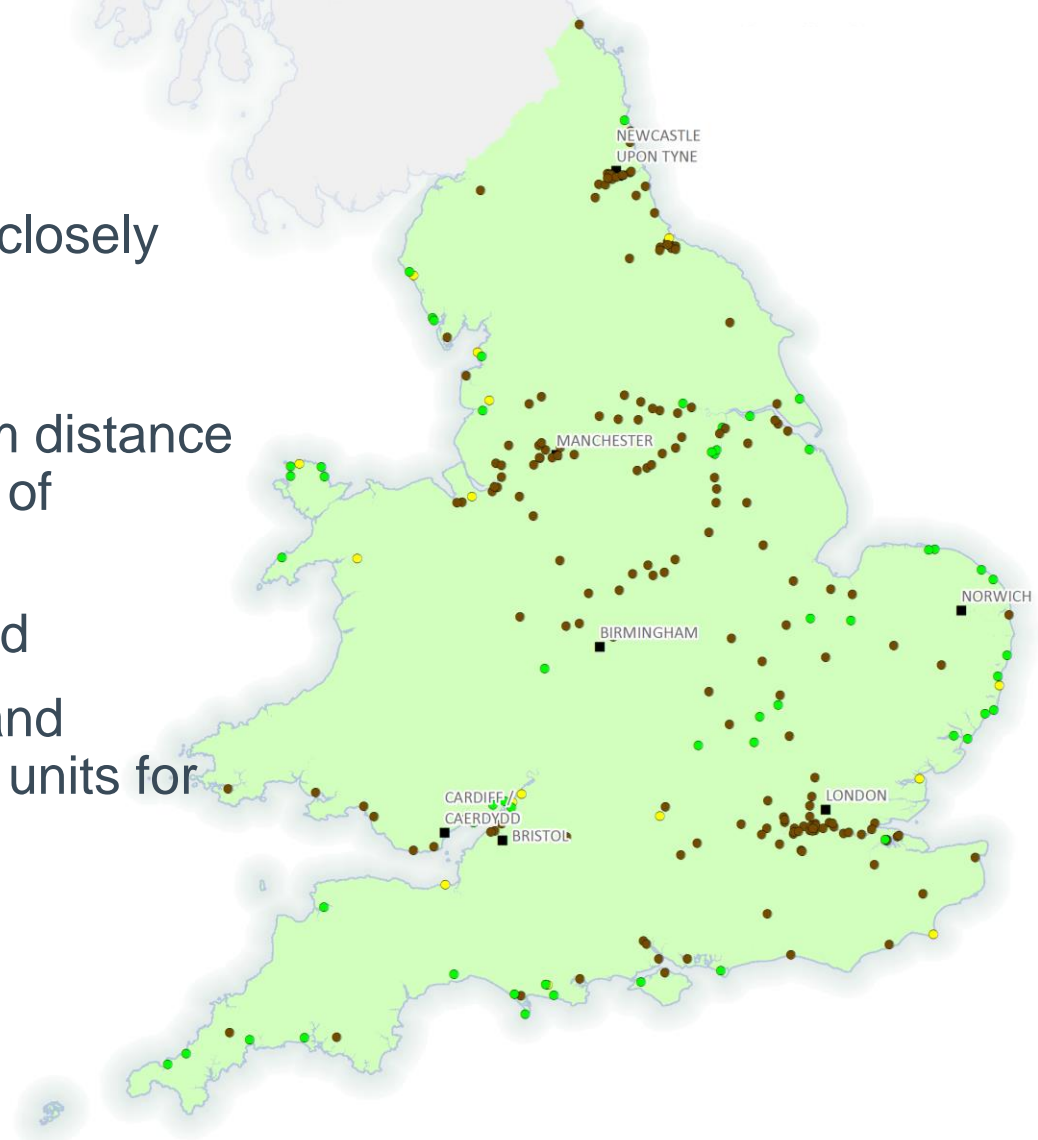
Project Objectives

1. Existing nuclear licensed sites, thermal power brownfield sites and new greenfield sites
2. Conflict between carbon capture and storage (CCS) and nuclear
3. Siting constraints having greatest impact
4. Potential changes in siting criteria to deliver sufficient sites
5. Siting characteristics of alternative smaller technologies
6. Other opportunities
7. Preferred locations for nuclear demonstrator sites



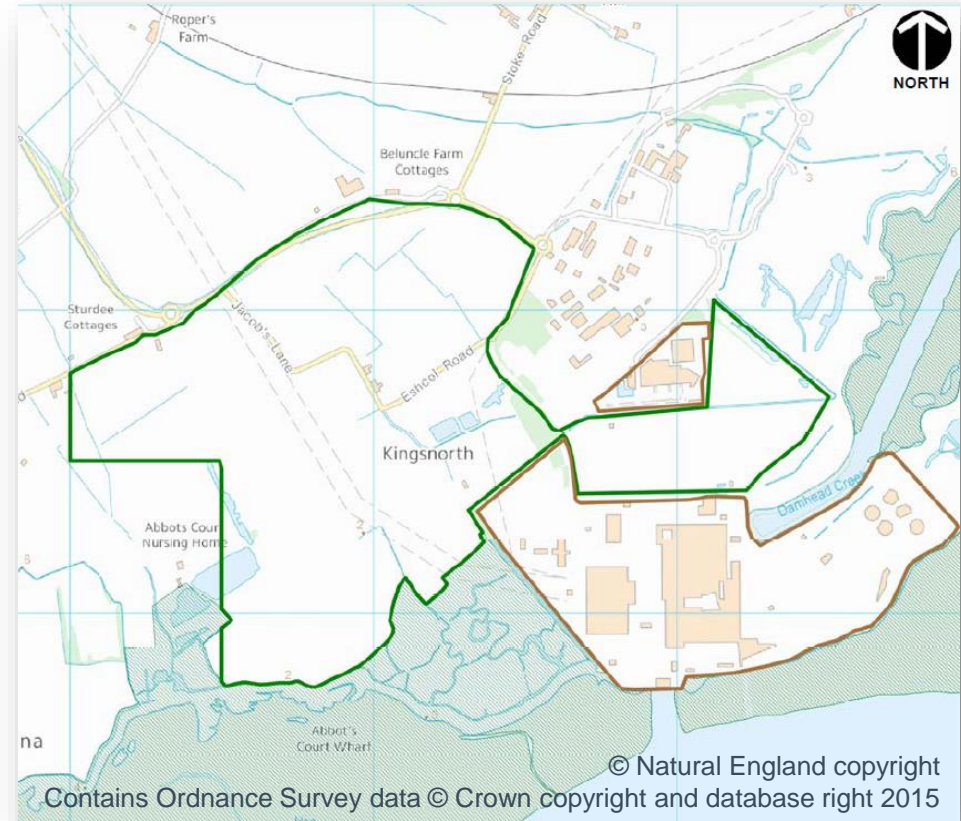
Approach: Overall

- Assessment methodology closely based on Strategic Siting Assessment criteria
- Assumptions included 2 km distance to cooling water, exclusion of economics and grid
- Long list of sites considered
- Twin large units for coast and estuaries, and single large units for inland



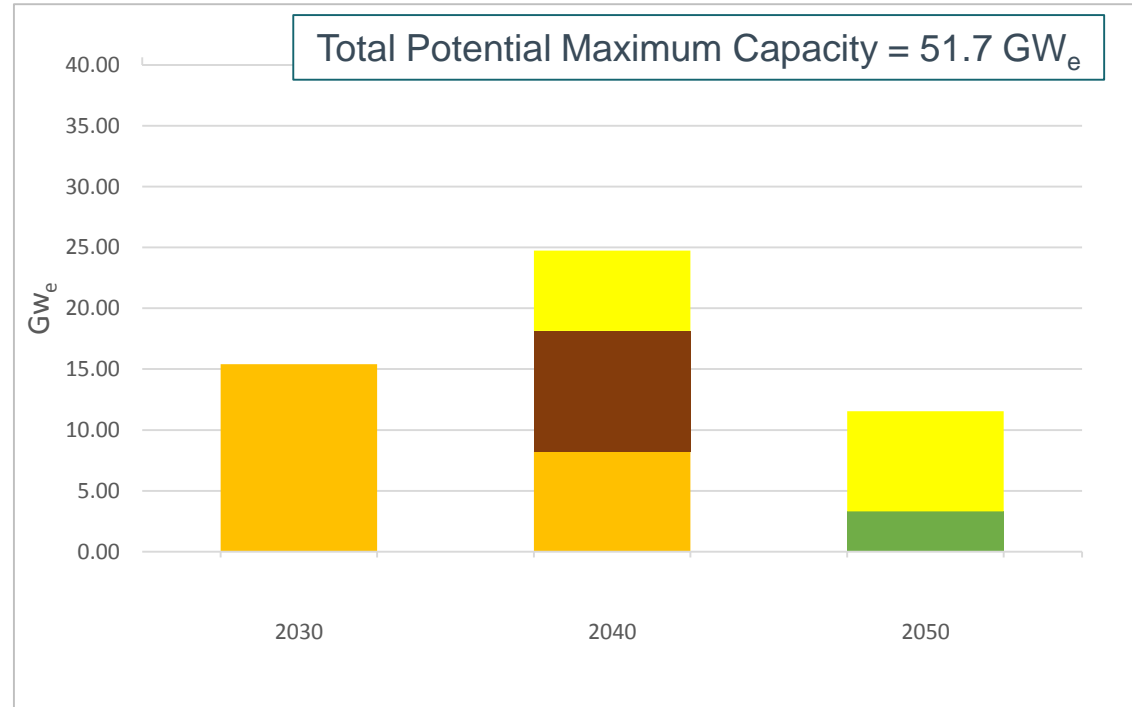
Approach: Designated Ecological Sites

- Methodology to address over-precautious screening:
 - considered generic mitigation / compensatory measures
 - applied to sites that failed standard assessment
- If measures accepted, sites brought back into consideration

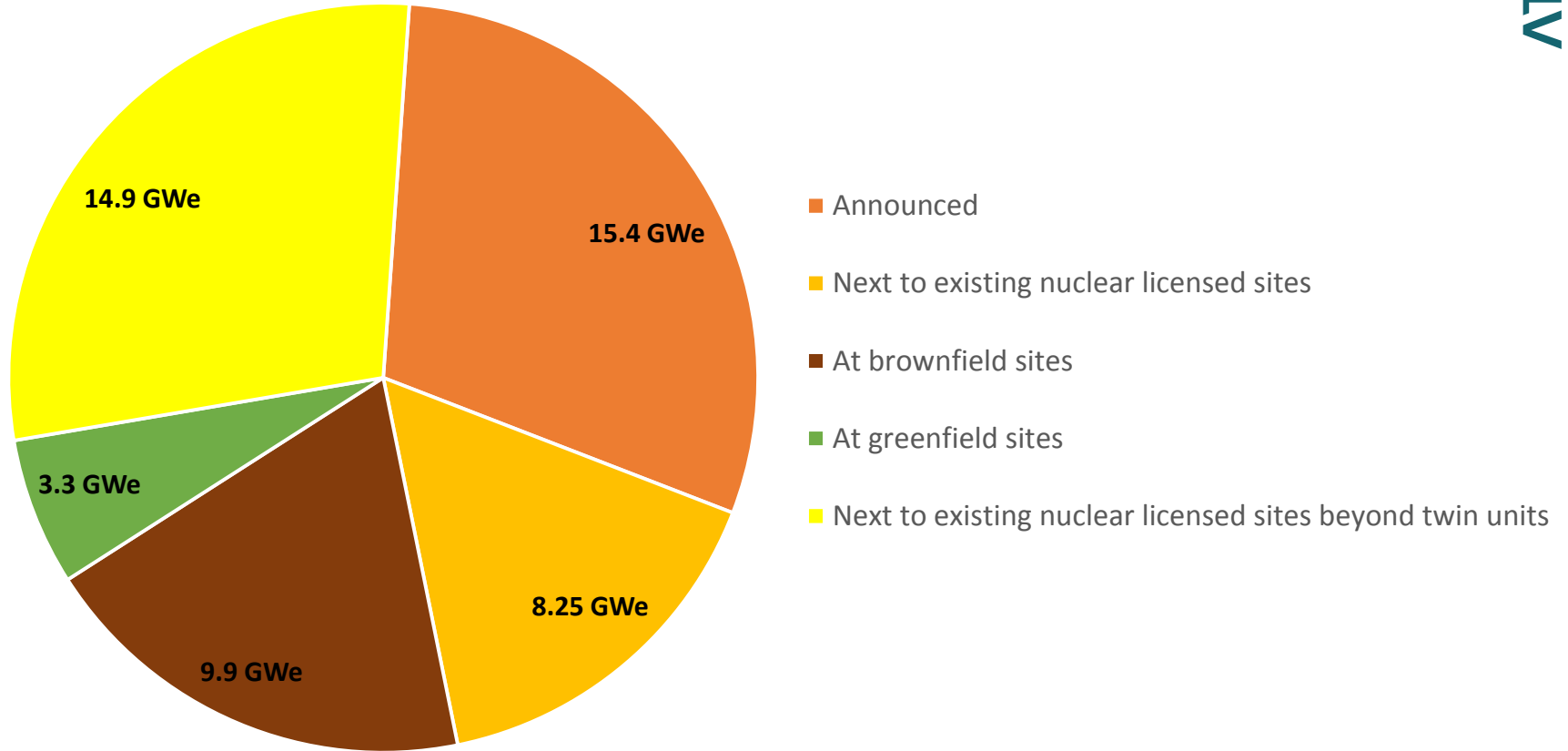


Approach: Large Units

- Considered direct and indirect cooling
- Sites on long list and extensions to existing nuclear licensed sites (both initial and further)
- Three inland sites used for CCS and three extensions reserved for Generation (Gen) IV
- Allocated assumed development dates

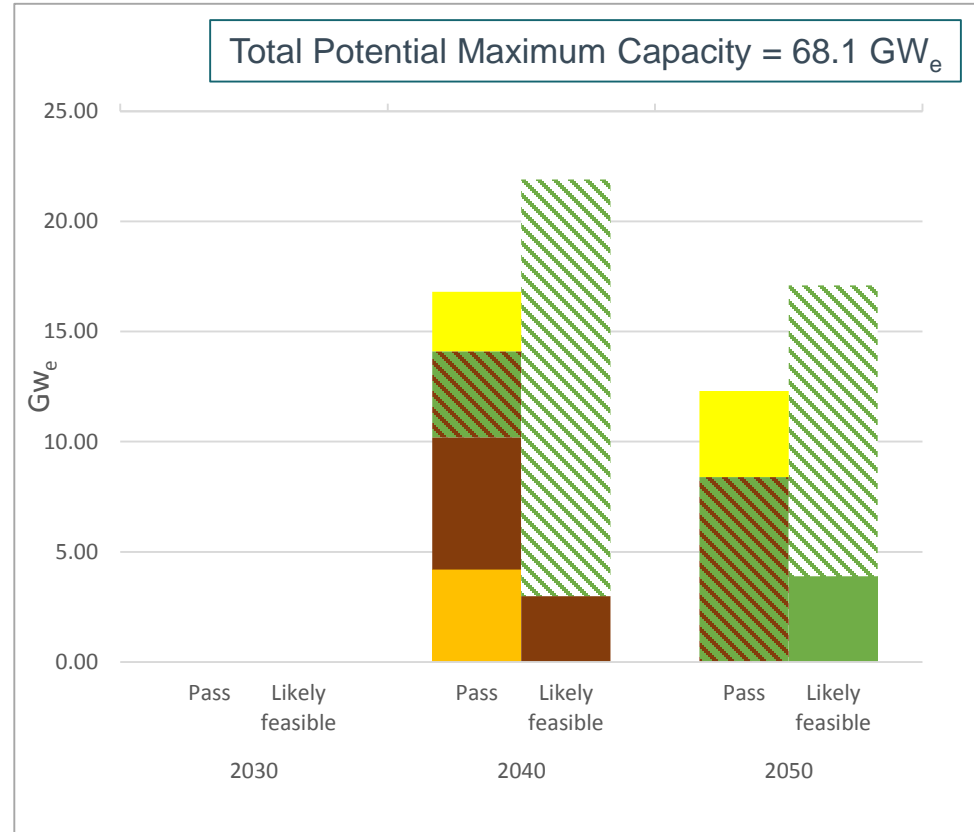


Conclusions: Large Units



Approach: Small Units

- Extensions to nuclear licensed sites and identified regions
- Sites on long list and identified additional sites
- Sufficient sites to satisfy heat networks twice over
- Heat networks once over using small units, in conjunction with significant programme of large units for baseload electricity

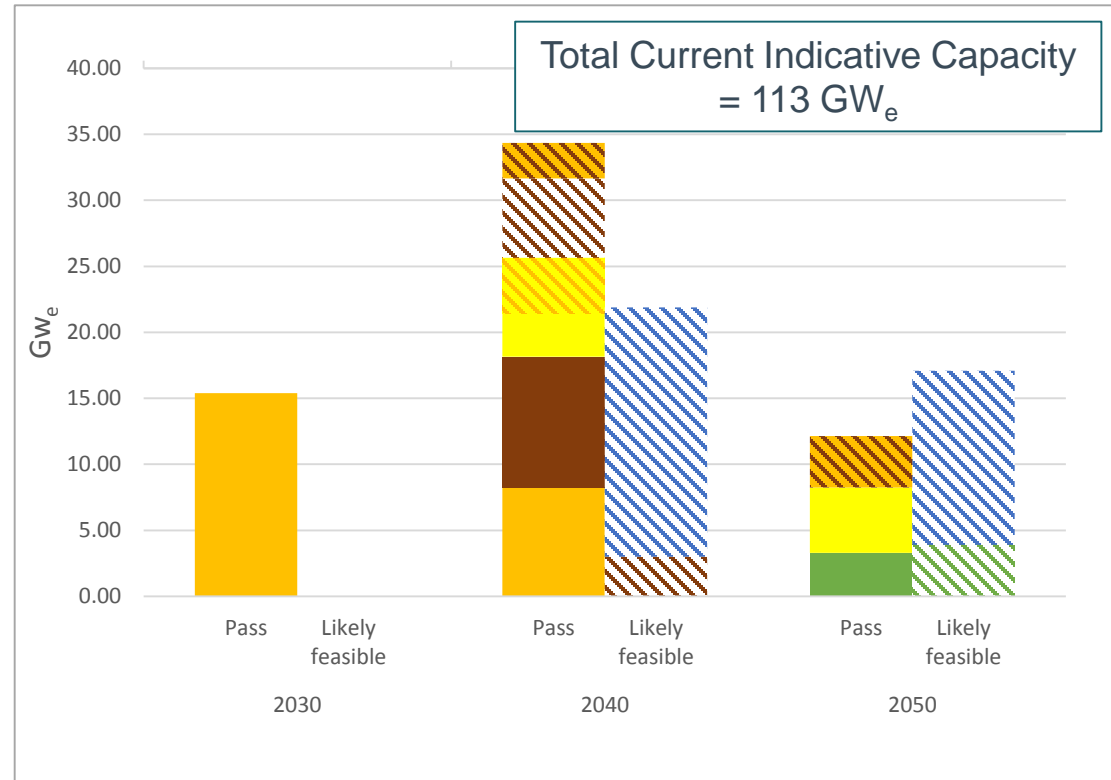


Approach: Total Potential Capacity

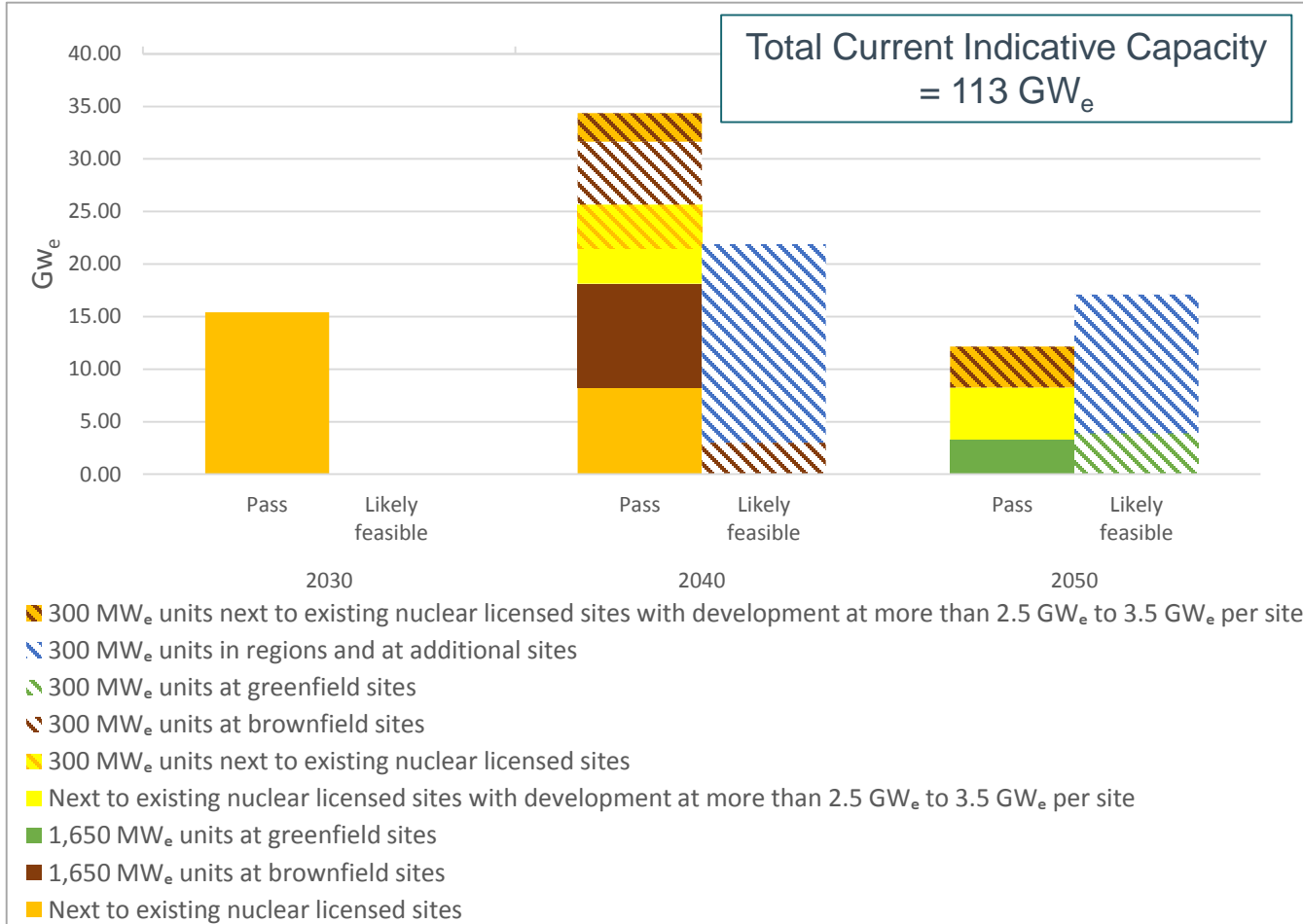
- Two sets of options:
 - by capacity build up from results for large and small units
 - from work to satisfy heat networks once over
- Three inland sites used for CCS plus three extensions reserved for Gen IV plants
- Qualitative consideration of uncertainties for assessment methodologies
- Likely effect on capacity during progress towards operational plants

Conclusions: Total Potential Capacity

- By capacity build up: 85.3 GW_e (51.7 GW_e for large and 33.6 GW_e for small units)
- From heat networks once over: 113 GW_e (45.1 GW_e for large and 68.1 GW_e for small units)
- Up to fourth extensions to existing nuclear licensed sites
- Main uncertainty for assessment methodologies: future availability of cooling water
- Capacity likely to reduce during progress towards operational plants

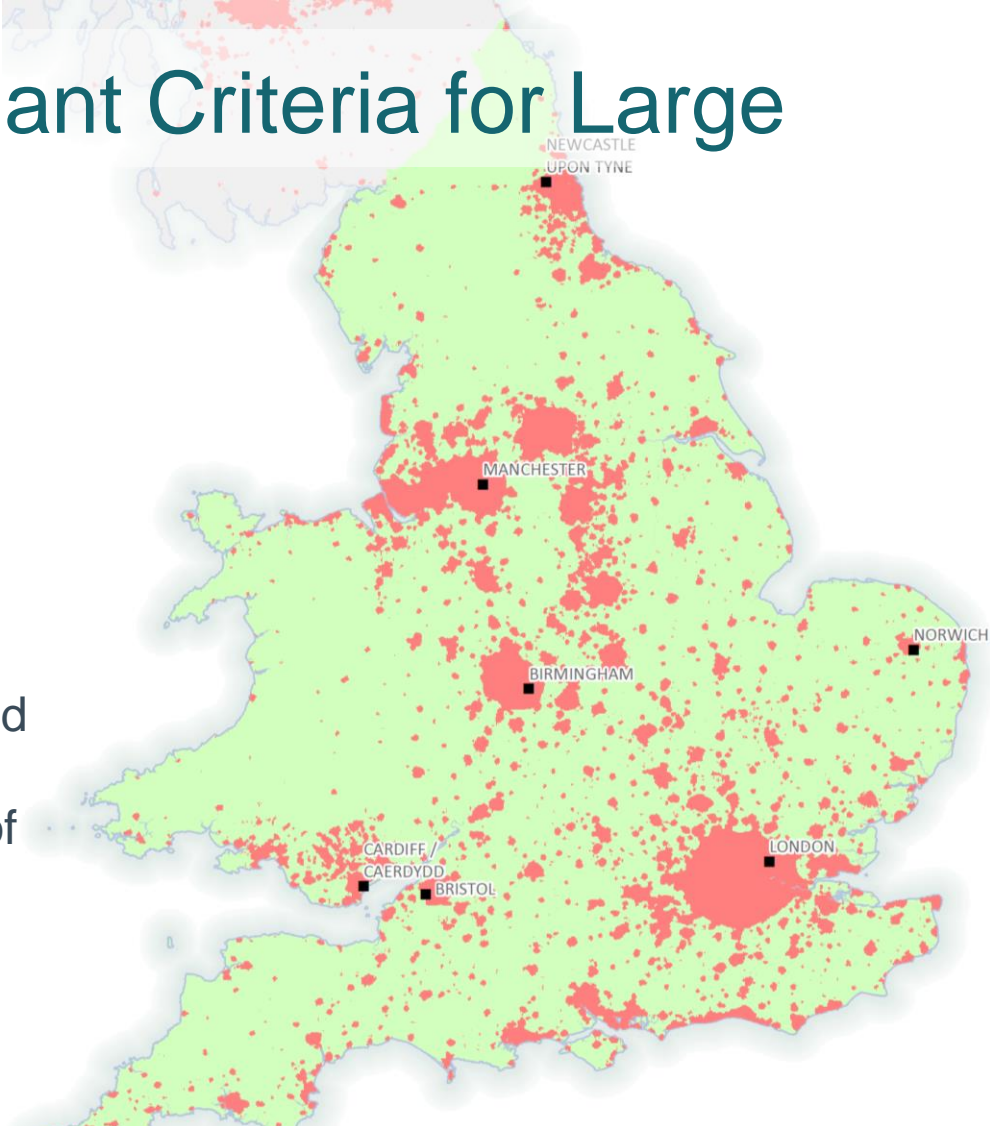


Conclusions: Heat Networks Once Over



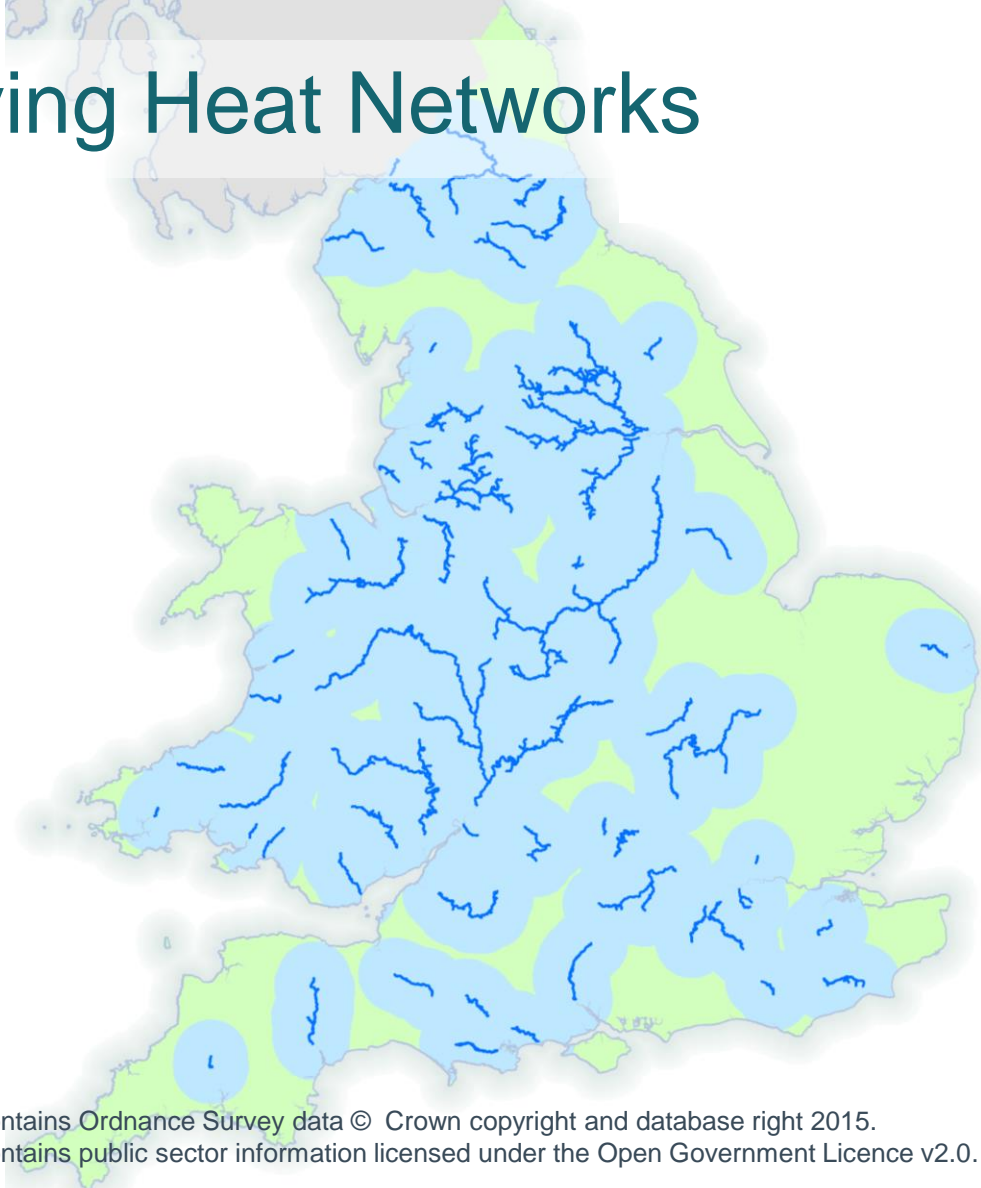
Conclusions: Dominant Criteria for Large Units

- Exclusionary criteria:
 - demographics
 - size of site
- Discretionary criteria:
 - proximity to internationally designated ecological sites
 - areas of amenity, cultural and heritage value
 - access to suitable sources of cooling water
- No significant change in constraints anticipated



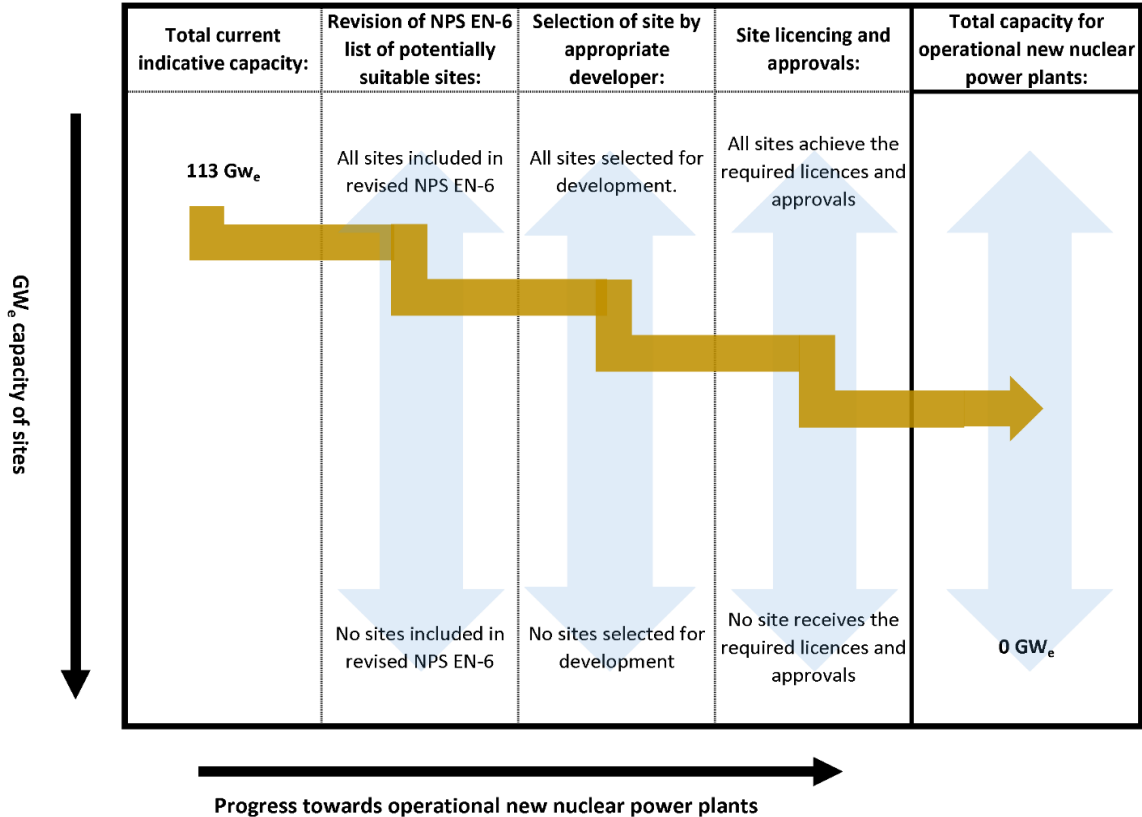
Conclusions: Satisfying Heat Networks

- Satisfied heat networks twice over
- Satisfied heat networks once over in conjunction with significant programme of baseload electricity
- Major factors:
 - extended distance of 20 km to cooling water
 - existing development and major waterbodies do not act as barrier
- Sites beyond long list and extensions to existing nuclear licensed sites

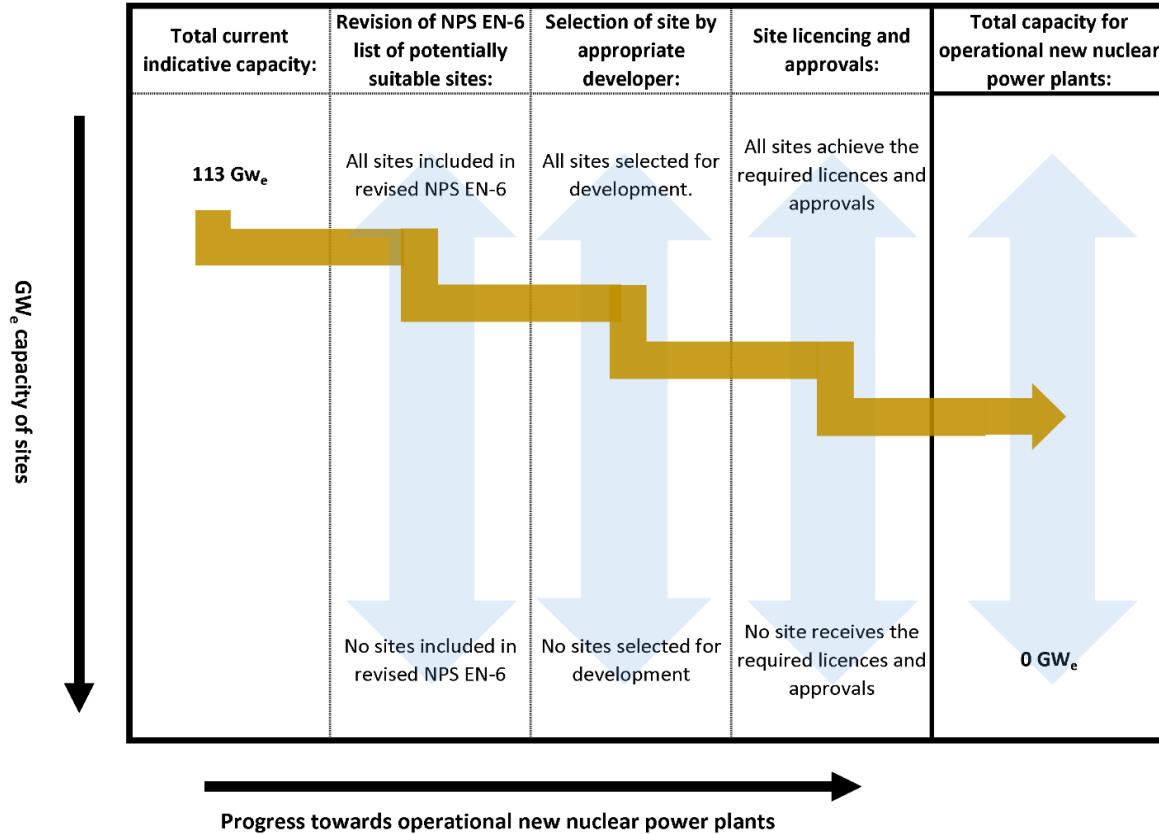


Conclusions: Progress Towards Operating Plants

- First stage of multistage assessment process
- Factors likely to reduce number of sites:
 - procedural and regulatory requirements
 - site specific characteristics
- Three main procedural and regulatory steps during progress

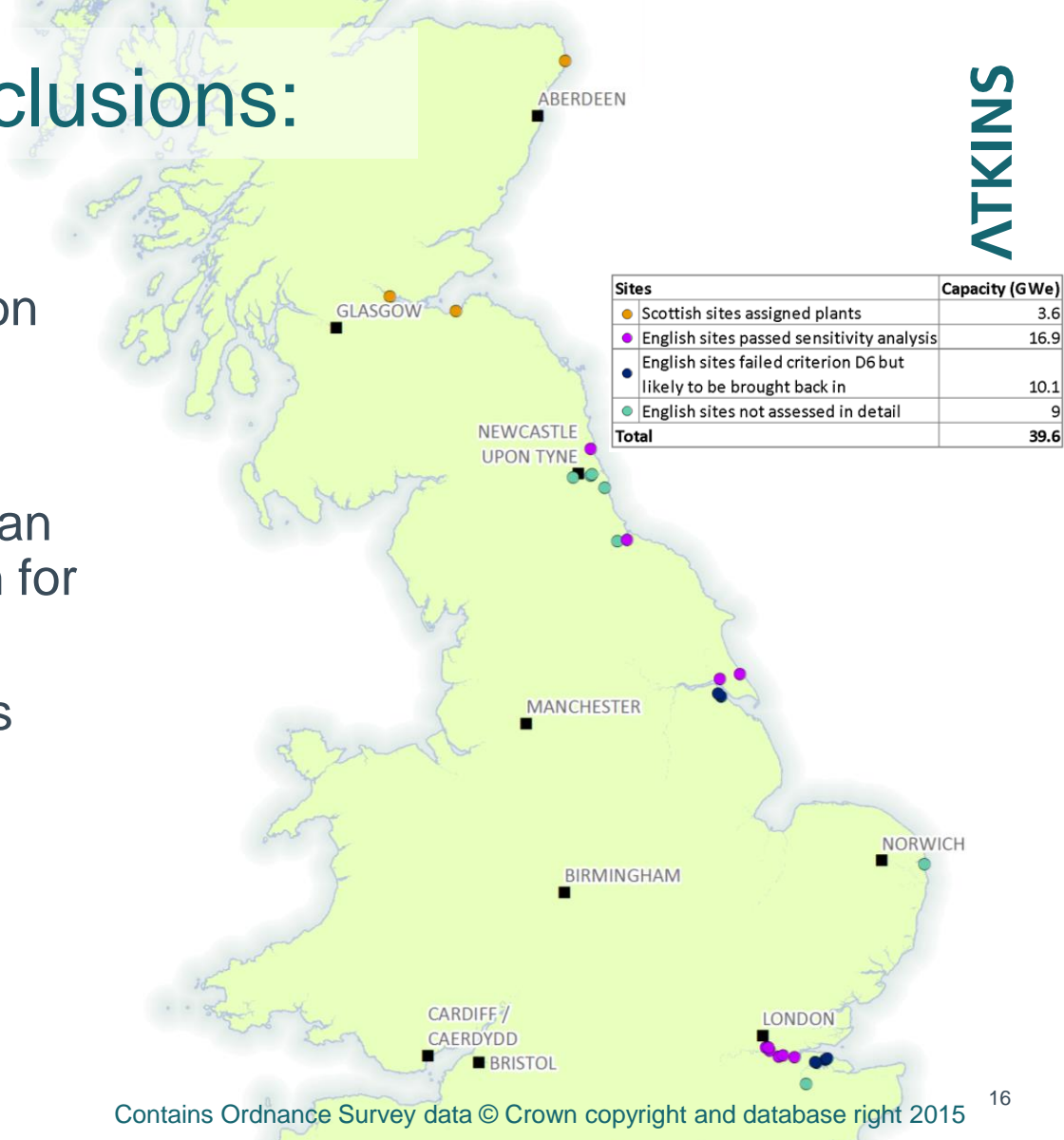


Conclusions: Progress Towards Operating Plants



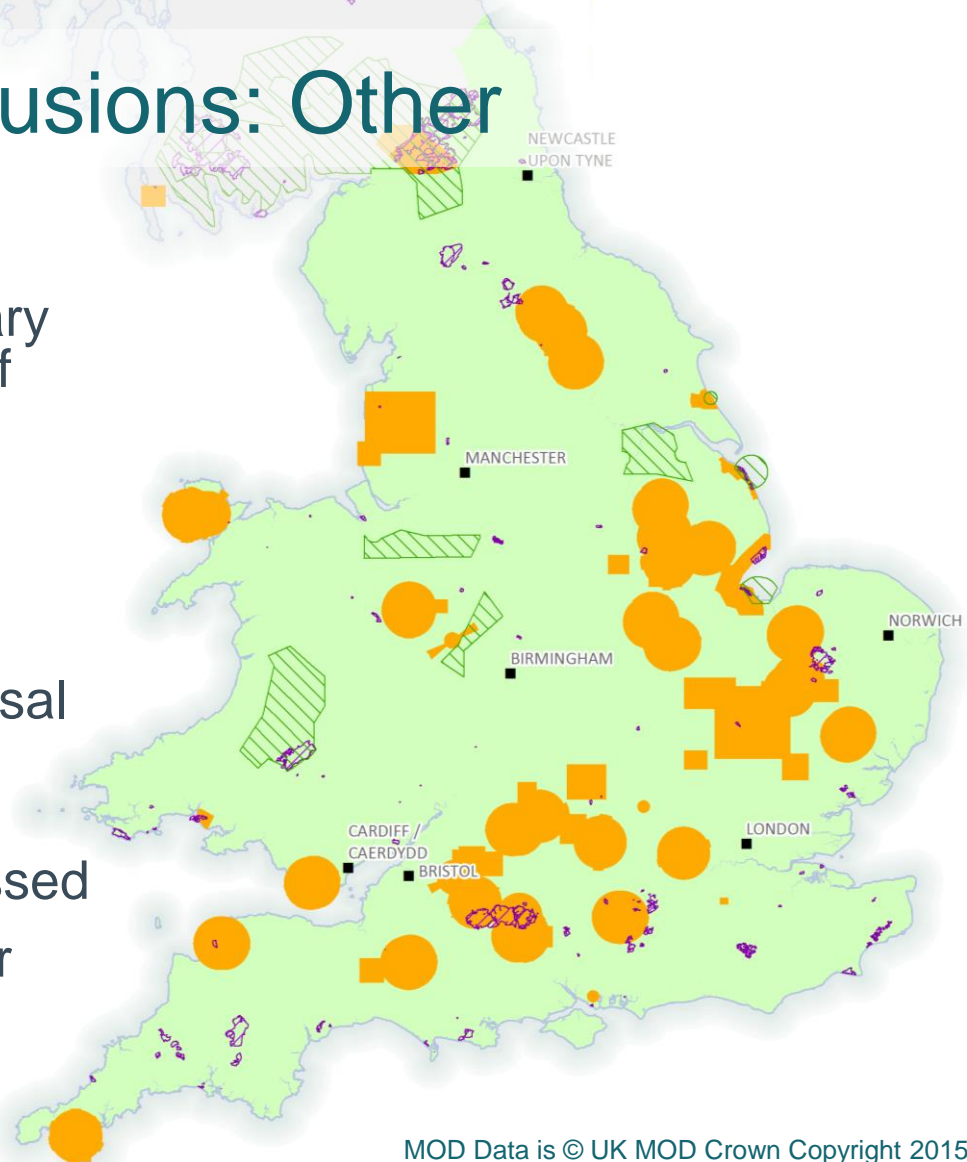
Approach and Conclusions: CCS and Nuclear

- Focused on English sites on east coast and estuaries
- 25 sites for CCS
- In principle, should not be an issue as far as competition for sites is concerned
- However, three inland sites used for CCS when determining total potential capacity



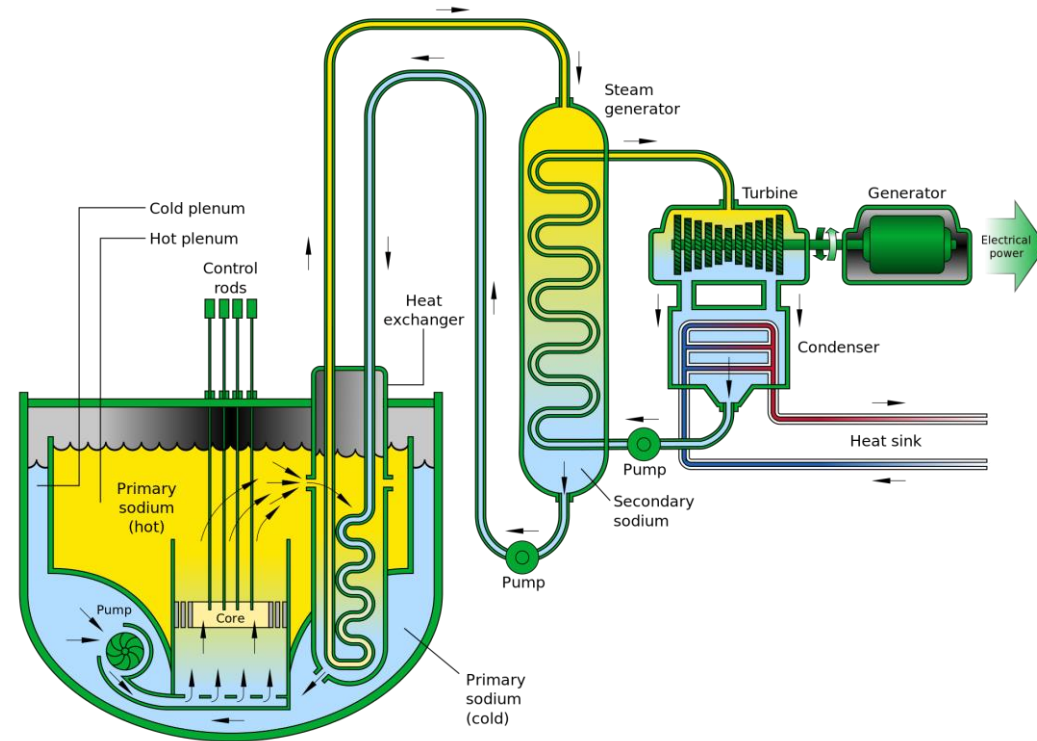
Approach and Conclusions: Other Opportunities

- Applied majority of exclusionary criteria to groups of Ministry of Defence (MOD) sites:
 - sites being rationalised
 - rest of MOD Estate
 - nuclear licensed sites
- Two sites scheduled for disposal passed
- 22 sites (on coast /estuaries) within rest of MOD Estate passed
- No access to cooling water for MOD nuclear licensed sites

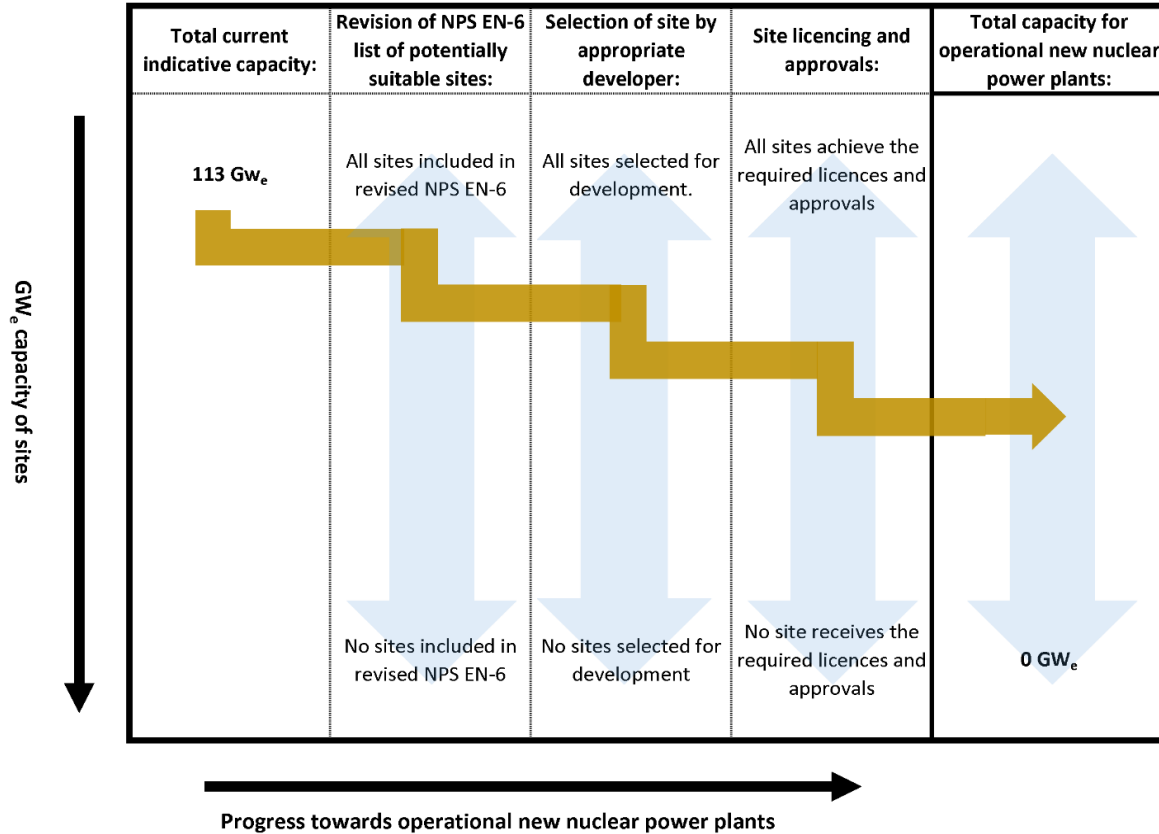


Approach and Conclusions: Technology Demonstrators

- Four considerations:
 - history of demonstrators at site
 - remoteness of site
 - access to suitable sources of cooling water
 - availability of required land at site
- Five nuclear licensed sites for siting Small Modular Reactors
- One nuclear licensed site for large Gen IV sodium cooled reactor



Conclusions: Overall



Questions?