

Frazer Nash

Suitable Nuclear technologies and Infrastructural Developments for Scotland

Keshav Krishnan 202358313

23rd June 2024

Image: Sky News

# Executive Summary

The project is to identify the most suitable nuclear technologies and infrastructural developments (NTIDs) for Scotland. The main challenge here is to find an effective method of establishing what is most suitable, given an overwhelming amount of data to consider. For this project, we will conduct research, utilize cognitive and competency mapping, and apply multi-criterion decision analysis (MCDA). The project, estimated at 360 hours, will provide Frazer Nash with a recommended combination of NTIDs alongside a robust framework for selecting them, adaptable for future updates and decision-making. deliverables include a presentation, infographic, and detailed report.

# Background

The theme of Frazer Nash’s RFP was the exploration of new pathways to establishing nuclear energy capabilities in Scotland, where its role has greatly diminished over the past decades. The scope of this proposal is to outline a methodology geared towards finding the most suitable NTIDs for Scotland’s landscape and specific energy needs. This proposal, and the project, will not consider political or social issues related to nuclear power, nor nuclear developments for purposes outside energy production.

# Challenges

The key challenge lies in optimizing the best possible NTIDs while considering Scotland’s landscape, energy needs, stakeholders, costs and many other possible factors to consider. This problem is rich with complexity and subjective elements, making a comprehensive ‘calculation’ for the optimal set of technologies and developments virtually impossible. The management science tools described in this proposal offer an effective method for making this problem tractable by reducing the factors to consider to only the most crucial, while taking a deliberate and quantified account of subjective preferences.

Further challenges include:

* Lack of experience in the nuclear power industry within our team. Addressing this challenge has been incorporated into our approach. Our research stage and planned re-alignment through discussion with Frazer Nash Consulting (FNC) helps mitigate the risks of a lack of experience.
* There is a risk that findings may become obsolete due to future developments. The deliverables are designed to allow modifications in the approach and provide Frazer Nash with the information necessary to repeat the project.

# Proposed Approach

As our consulting practice lacks extensive experience in this industry, our team will need time to become familiar with the climate, industry practices, and state of nuclear power technology. Individual research followed by discussions with FNC members will help us gain a deeper understanding of the current state of affairs.

In our research, we aim to employ techniques for stakeholder management and problem unpacking, such as cognitive mapping. This technique tracks backward from a stakeholder’s objectives to identify the cause-sequential series of actions that form a strategy for achieving those objectives. In this case, it will help distinguish the strategic objectives and directions of different stakeholders and understand them for later project phases. Using such techniques allows us to process and organize researched data, developing insights for subsequent project stages. For example, a key stakeholder that creates a roadblock for nuclear energy production is the general public. A cognitive map helps us understand the problem through their perspective, and take into account their priorities to be used further along in the project.

Our research will also aim to achieve a comprehensive understanding of Scotland’s energy landscape and relevant nuclear technologies. This will help identify potential NTIDs to consider, and establish criteria for determining the most suitable options.

Following research, a competency map will be developed, providing a structured inventory of Scotland’s relevant assets and competencies. To facilitate this, we will conduct a three-day workshop with Frazer Nash members to understand the distinct competencies and networks of competencies that support nuclear power in Scotland. We will also identify how Scotland can improve its position in the global energy market through nuclear power.

We will align these competencies with our options for nuclear technologies in Scotland, evaluating each technology based on its suitability. This will enable us to develop exclusionary criteria to narrow down potential technologies and developments to a promising few.

The final management science method of this project will be that of multi-criteria decision analysis (MCDA), a procedure that formally accounts for the subjective preferences of one technology or development option over another with respect to a set of weighted criteria. Criteria would be developed through discussion using insights from research and competency mapping (the extent to which a given technology can achieve a competitive priority might form one of the criteria). MCDA will be enriched by a workshop to incorporate the insights and preferences of Frazer Nash, refining and weighting the criteria. Additionally, a presentation will provide an opportunity for constructive critique from Frazer Nash, improving our methods and application for the final deliverables. Upon completing the MCDA, the highest-scoring combination of technologies and developments will be suggested to Frazer Nash through a final report. This may prompt further modification or discussion on the next steps. A sensitivity report will also be provided to show how the best-performing option might change given alterations to the criteria weights.

The report and infographic will be produced in a way that avoids technical language, making them accessible to interested stakeholders. This might be useful if this project forms part of a communication strategy to change the general public’s poor sentiments towards nuclear power.

## Continuous Development

A key characteristic our proposal is that the methods undergo planned stages of review and improvement to improve the benefits for FN. Furthermore, the detailed report and presentation provide FN the tools for continuous improvement of the framework to solve a similar problem under different circumstances.

# Deliverables

• A **brief presentation** followed by a Q&A session, allowing Frazer Nash consultants to understand and critique the methodologies employed. This will introduce the applied methods and foster constructive discussions for improvement. Furthermore, various input data in our MCDA (such as criteria weights) can be reviewed and finalised here.

• An **infographic** presenting the rationale and benefits of the selected NTIDs deemed most suitable. Accessibility is a priority here so that this may be shared with other stakeholders to present the case for the project’s conclusions.

• A **comprehensive report** detailing the process leading to our conclusions. The project’s methodology can be replicated and adjusted based on evolving information or preferences using the report as a foundation. Included in the report will be a sensitivity analysis to show how the best performing NTIDs behave given changes in criteria weightings.

# Schedule

## Phase I: Research

Our proposed schedule is structured so that research is conducted both before and during parts of our Phase II activities. Research will provide a strong foundation which will enrich the management science methods used in this project, and we have considered that further research may need to be conducted as and when it is deemed necessary while carrying out our proposed methods.

## Phase II: Management Science Methods

The second phase will begin as soon as the prerequisite research is over and our team is confident in their contextual knowledge of the problem. 2 workshops would be conducted (one for each method), with the competency map being prioritized so that the results and insights from our completion of it can feed into work on MCDA. Phase II would be completed following the presentation deliverable, to give us an opportunity to make any necessary changes.

## Phase III: Deliverables

Our presentation work would be conducted alongside Phase II, with the presentation being conducted before work is finished on MCDA (and possibly competency maps). This presentation not only provides benefit to FN through conveying insights and the process of our method, but it also provides an opportunity for us to adapt our method based on FN’s critiques and preferences.

Report writing would be conducted alongside some of Phase II and presentation writing. After the storyboard is decided upon, the infographic would be developed alongside the write-up in the report.

|  |
| --- |
| Sample Schedule (subject to substantial change) |
|  |

# Estimated Hours

Phase 1 could take any timeframe, given the enormous amount of data that can be relevant to the issue. To make this endeavour feasible, we believe that limiting this phase to 40 hours of research time.

Phase 2 and 3 would both take 3 days each with a diverse range of people that have a thorough understanding of the problem. The estimated time to completion is approximately 240 hours of work (5 people x 8 hour day x 3 days x 2 phases).

The creation of the deliverables would need dedicated time. This would require another 60 hours of time (20 hours x 3 people) for the report, 10 hours for the presentation (5 hours x 2 people), and 10 hours for the infographic (5 hours x 2 people). Much of this can be done simultaneously.

Overall, an estimated 360 hours of work are expected to complete this project. If further time is necessary, Frazer Nash will be contacted for approval.

Thank you for your consideration of our proposal and we would be open to any suggested changes to what we have outlined. We hope to hear from you.