Cabinet

Tuesday, 9 March 2021

Government call for STEP sites

Report of the Chief Executive

Cabinet Portfolio Holder for Strategic and Borough Wide Leadership, Councillor S J Robinson

1. Purpose of report

1.1. In October 2019, the Secretary of State for Business, Energy and Industrial Strategy announced £220m funding towards the conceptual design of a fusion power station – Spherical Tokamak for Energy Production (STEP). STEP is an innovative plan for a commercially viable fusion power station, offering the realistic prospect of constructing a powerplant by 2040.

1.2. In November 2020, the UK Government released an invitation for expressions of interest to identify sites in the UK that could accommodate a STEP power station.

1.3. This report is to seek Cabinet's endorsement for the expression of interest for the Ratcliffe on Soar site to be considered as a site for the STEP power station.

2. Recommendation

It is RECOMMENDED that Cabinet endorses, in principle, the submission of the expression of interest for the Ratcliffe on Soar site as one of several sites being put forward in the East Midlands to the STEP programme.

3. Reasons for Recommendation

3.1. The site chosen for STEP will have global visibility and will form the centre of a programme of activity supporting thousands of high-quality high-tech jobs. STEP will support economic growth, providing the opportunity to attract £1.5bn of inward investment, and the training of highly skilled engineers. It will also be an integral part of meeting the global net zero challenge.

3.2. The proposal complements other opportunities being progressed for the redevelopment of the Ratcliffe on Soar site including the proposals for a Development Corporation and the recently submitted Freeport bid. STEP is an additional option to be explored with potential to complement the decarbonisation and innovation objectives of the region and it is a none binding expression of interest at this stage.

3.3. The expression of interest stage for the STEP programme requires relevant local authority endorsement for sites which are being submitted.

4. Supporting Information

The site selection process

4.1. STEP is an ambitious programme to design and build a prototype fusion power plant. It is a Government programme, currently with £222 million funding to produce a concept design by 2024. It is hoped that the STEP prototype will demonstrate the commercial viability of fusion. The learning from this will enable the future development of a fleet of commercial fusion plants.

4.2. The programme is being run in three phases:

- Phase 1 – produce a concept design by 2024.
- Phase 2 – design to be developed through detailed engineering designs, while all consents and permissions to build the plant are sought.
- Phase 3 – construction of the prototype power plant will begin in phase 3, targeting completion around 2040.

4.3. The programme is still in design stage so it is not clear yet exactly what buildings and facilities will be needed on site, this will become clearer as the design develops over the next few years. Some of the requirements for STEP though are:

- Site footprint – this is not clear at this stage beyond a requirement for 100Ha minimum overall site area. This is required to accommodate power station infrastructure and to allow the opportunity to expand with associated future development and additional low carbon technology. On site developments will include the reactor itself, associated turbine hall, control facilities and auxiliary plant and development, design and construction facilities.
- Access to High Voltage Grid.
- Access to cooling water –access to a major water source is important.
- Access to a skilled workforce.
- Strong transport links to facilitate delivery of major components, workforce and international visitors to site (road, rail, air and port access of interest).
- Site environment – a number of criteria will be set out during site selection to ensure STEP is not impacting on a site of particular environmental or archaeological importance.
- Office accommodation – for research programmes and power station construction and operations.

4.4. The deadline for the submission of expressions of interest for sites is the end of March 2021. The Government will then carry out detailed site assessments to check all sites submitted against the criteria. These are: technical and operational suitability, socio-economic and community benefit implications and support for the commercial progress of the project. A recommendation will be presented to the Secretary of State with a decision expected by the end of 2022.

4.5. The expression of interest is being prepared by local partners including D2N2 Local Enterprise Partnership and Nottinghamshire County Council with the support of the landowner.

Fusion power

4.6. Fusion is the process that takes place in the heart of stars and provides the power that drives the universe. When light nuclei fuse to form a heavier nucleus, they release bursts of energy. This is the opposite of nuclear fission – the reaction that is used in nuclear power stations today, where energy is released when a nucleus splits apart. These reactions can provide a huge amount of energy from a very small amount of fuel.

4.7. It is an intrinsic property of the fusion process that it is inherently safe with low environmental impact. There is only a small amount of fuel in the plasma at any time, and over fuelling or overheating the plasma will lead to it being extinguished almost instantly. Extensive studies over the last two decades have shown that no plant failure or accident could result in the need to evacuate public from outside the site. A fusion reactor produces helium, which is an inert gas and no radioactive waste by-products therefore result from the process.

4.8. The benefits of fusion power include:

- No carbon emissions – Fusion does not emit harmful toxins like carbon dioxide or other greenhouse gases into the atmosphere. Its major by-product is helium: an inert, non-toxic gas.
- No other harmful environmental emissions – Fusion process does not result in NOx, SOx, particulate or other emissions deleterious to local air quality.
- Abundant fuel sources – Fusion fuels are widely available and nearly inexhaustible (deuterium can be extracted from water and tritium will be produced inside the power station from lithium, an element abundant in the earth's crust and seawater).
- Energy efficiency – 1 kg of fusion fuel could provide the same amount of energy as 10 million kg of fossil fuel.
- Safety – a large scale nuclear accident is not possible in a fusion reactor. It is difficult to reach and maintain the precise conditions necessary for fusion – if any disturbance occurs, the plasma cools within seconds and the reaction stops. The quantity of fuel present in the vessel at any one time is enough for a few seconds only and there is no risk of a chain reaction.

4.9. There will only be one site in the UK chosen and so it will be a very competitive process. The next stage of site selection will enable all partners to assess the additional criteria to see if the site meets the needs of Government but also of the Council and other key local stakeholders.

5. Alternative options considered and reasons for rejection

There is the option to not submit the expression of interest; however, this is a very early stage in the process and is a none binding expression of interest. The site meets the criteria for selection set out by Government. Ratcliffe-on-Soar power station will close in line with Government policy by 1 October 2025, which could provide a further opportunity for the site that complements others currently being progressed (Development Corporation and Freeport). In addition, the proposals meet with the Development Corporation's and Rushcliffe Borough Council's ambitions that this site has a focus on low carbon and clean energy.

6. Risks and Uncertainties

At this stage there are no risks associated with this report. This is only the expression of interest stage and it is expected that many other sites will be put forward, including others in Nottinghamshire.

7. Financial Implications

There are no financial implications associated with this report.

8. Legal Implications

There are no legal implications associated with this report.

9. Equalities Implications

There are no equalities implications associated with this report.

10. Section 17 of the Crime and Disorder Act 1998 Implications

There are no crime and disorder implications associated with this report.

11. Link to Corporate Priorities

Quality of Life	If the site was selected it would create a significant number of high skilled and high value jobs as well as training opportunities.
Efficient Services	
Sustainable Growth	If the site was selected this programme is of international significance and would attract additional new investment into the region. This programme complements other proposals for the site including the Development Corporation and Freeport which will bring significant benefits to Rushcliffe and the region.

The Environment	Fusion energy is an integral part of meeting the global net zero challenge. Fusion offers a secure and abundant source of supply for many thousands of years. Once commercialised, fusion will have a key role to play in the energy market of the future.

12. Recommendations

It is RECOMMENDED that Cabinet endorses, in principle, the submission of the expression of interest for the Ratcliffe on Soar site as one of several sites being put forward in the East Midlands to the STEP programme.

For more information contact:	Kath Marriott Chief Executive kmarriott@rushcliffe.gov.uk
Background papers available for Inspection:	None
List of appendices:	None