

## Sizewell C Project

# Expression of Interest – Sizewell C Direct Air Capture Demonstrator Project (DAC)

Invitation to interested parties to express interest in respect of the following aspects of a DAC Demonstrator Project (as defined below):

- 1) Supply and development of DAC technology
- 2) Design, engineer and construct DAC unit
- 3) Develop opportunities for scalability and cost reductions
- 4) Project management services

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## 1 PURPOSE

The purpose of this Sizewell C Direct Air Capture project Expression of Interest (the “EOI”) is to identify suitable parties interested in supporting NNB GenCo (SZC) (“SZC Co”) in designing, engineering, manufacturing and scaling a standalone demonstrator direct air capture (“DAC”) plant.

SZC Co welcomes proposals from suitable organisations interested in supporting SZC Co with the development and delivery of this project in accordance with the scope in Section 4.

## 2 BACKGROUND AND LONG-TERM VISION

### BACKGROUND

SZC Co proposes to construct a twin station European Pressurised Reactor at the Sizewell C site near Leiston, Suffolk (“SZC”). SZC Co is also exploring how SZC could be part of a wider hub of low-carbon energy technologies (the “Energy Hub”) which could support the UK Government’s binding target to reach net zero carbon emissions by 2050.

As part of the Energy Hub, DAC has been identified as an increasingly attractive and exciting prospect due to the role it can play in using the significant amounts of low-carbon heat generated by SZC to reduce carbon dioxide content (CO<sub>2</sub>) in the atmosphere (and achieving net zero). By diverting a very small amount of the plant’s thermal output for DAC, the project would have the potential to become carbon negative.

### LONG-TERM VISION

The SZC team are therefore exploring the wider role that nuclear can play in supporting DAC as part of an Energy Hub. In the longer-term, SZC Co is considering a low-temperature heat driven DAC system alongside the operational SZC project:

- the DAC would utilise steam of c. 280°C or lower tapped off from the turbine installation at the SZC power station when operational;
- it would remove carbon dioxide (CO<sub>2</sub>) from the ambient air where the concentration is c.400ppm by placing large volumes of air in contact with chemicals known as sorbents;
- the two methods being considered are: (i) absorption: CO<sub>2</sub> dissolves into liquid sorbent; and (ii) adsorption: CO<sub>2</sub> adheres to the solid surface of the sorbent material; and
- in both cases, the sorbents are treated so that the CO<sub>2</sub> is released from them and they can be re-used.

## 3 NEAR-TERM DEMONSTRATOR PROJECT

In the near-term SZC is considering participating in the BEIS Greenhouse Gas Removal competition launched on 9 November 2020 (the “BEIS Competition”) to develop and construct a DAC demonstrator project (the “Demonstrator Project”):

- the Demonstrator Project will be an opportunity to develop and test the DAC technology prior to a fully integrated solution at SZC;

- the Demonstrator Project will seek to simulate the heat generated by a nuclear power plant through alternative means (such as an electrical heat source); and
- this is in order for the Demonstrator Project to be able to utilise the same envisaged heat driven technology that would be connected to the SZC nuclear project.

The BEIS Competition is administered in two phases: (a) the first phase is a feasibility and design study (“Phase 1”); and (b) the second phase involves the construction of the Demonstrator Project (“Phase 2”). The timing of the BEIS Competition is as follows:

- **5 Feb 2021** – BEIS Competition application due;
- **April 2021** – Phase 1 (Design Study) start;
- **December 2021** – Completion of Phase 1 (Design Study);
- **February 2022** – Phase 2 (Demonstrator Project construction) applications due;
- **April 2022** – Phase 2 (Demonstrator Project construction) start; and
- **March 2025** – Completion of Phase 2 (Demonstrator Project construction).

## 4 SCOPE

The scope available for interested parties can be divided into four lots focussed on: (i) innovative DAC technology; (ii) engineering; (iii) design and manufacturing; and (iv) scalability.

### 4.1 LOT 1 – INNOVATIVE DAC TECHNOLOGY

SZC Co is looking to utilise heat-driven DAC technology that could in the future be driven by steam from the SZC nuclear power plant. Then, the plant could supply steam at a range of temperatures below c. 280°C and would not be required to be heated further to drive the DAC technology.

- currently and for the purposes of the BEIS Competition, we will look to simulate heat at the relevant range;
- the DAC technology should be capable of absorbing, or have the potential to be adapted to absorb, CO<sub>2</sub> from an atmospheric concentration of c. 400 ppm; and
- the maturity of the technology should be at least at Technical Readiness Level (TRL) 4.

**Interested parties for LOT 1 are invited to submit proposals for their technology, accompanied by details of prior relevant application(s) of such technology.**

### 4.2 LOT 2 – DESIGN, ENGINEERING AND MANUFACTURING

The first phase of the BEIS Competition involves designing and engineering a DAC plant that would utilise the DAC technology identified in LOT 1 to produce a stream of CO<sub>2</sub> of appropriate concentration and purity, which can then be permanently sequestered. In this regard, a typical specification for geological storage is provided in the table below:

Composition	Units	Value (normal case)	Value (turn down case)	Value (design case)
CO <sub>2</sub>	Mol %	98.0903	98.0903	98.0902
H <sub>2</sub> O	Mol %	1.9018	1.9018	1.9028

O <sub>2</sub>	ppmv	19	19	19
N <sub>2</sub>	ppmv	60	60	60
NH <sub>3</sub>	ppmv	<0.1	<0.1	<0.1

#### DESIGN AND HEAT SIMULATION

The LOT 2 contractor would include in the design a suitable source of heat that could replicate the future heat source from steam from the SZC power plant.

To this end, SZC Co is exploring potential usage of a private wire from SZB to provide electricity to drive the simulation heat source, but SZC Co is also open to alternative heat / energy sources that could drive the Demonstrator Project.

#### SITING AND SUITABILITY

The second phase of the BEIS Competition involves manufacturing, assembling and operating the Demonstrator Project.

The site upon which the Demonstrator Project is to be built will be decided by SZC Co taking into account factors such as land suitability, availability and proximity to any required infrastructure and will take into consideration advice given by the LOT 2 contractor on preferable sites.

#### CO<sub>2</sub> TRANSPORT AND STORAGE

As part of LOT 2, the contractor is required to indicate a path for transport and permanent storage. The storage location does not need to be identified, but the contractor is required to provide an explanation of how the CO<sub>2</sub> will be produced in a form suitable for geological storage.

**Interested parties for LOT 2 are invited to submit their proposals, along with details of prior relevant experience designing, engineering or manufacturing DAC units or other carbon capture facilities (where such experience is adaptable for DAC projects).**

### 4.3 LOT 3 – SCALABILITY

One of the aims of the BEIS Competition is to create a demonstrator plant that could be scaled up and SZC Co is interested in exploring scalability of the Demonstrator Project for the following two purposes:

- to comply with the BEIS Competition requirements by outlining a path to reaching 50k tCO<sub>2</sub>e per annum by 2030; and
- to establish a future large-scale integrated DAC plant at SZC, capable of delivering CO<sub>2</sub> removal solutions at scale.

The following parameters should be studied when assessing and designing the scalability of the DAC technology identified in LOT 1 (and designed as referred to in LOT 2):

- Opportunities for cost reductions at scale
- Land requirements
- Heat and electrical energy requirements
- Manufacturing capability and availability of components
- Maintenance requirements
- Lifetime of the asset, components and the consumables

**Interested parties for LOT 3 are invited to submit their proposals, along with details of prior relevant experience which will support scaling up of the DAC unit. For the avoidance of any doubt, interested parties can submit proposals for both LOTS 2 and 3.**

#### 4.4 LOT 4 – PROJECT MANAGEMENT SERVICES

To successfully deliver the Demonstrator Project in line with the BEIS Competition, SZC Co is looking to engage a party to provide project management services. The role of the interested party will include, but not be limited to:

- managing the interface between the parties selected under each of the identified LOTS 1 (Innovative DAC Technology), 2 (Design, Engineering and Manufacturing) and 3 (Scalability);
- reporting to the SZC Project Lead (see Section 7 below) to ensure successful delivery of the Demonstrator Project (including milestones leading to the final delivery); and
- liaising with BEIS in respect of the Demonstrator Project, as appropriate.

**Interested parties for LOT 4 are invited to submit proposals for providing project management services in respect of the Demonstrator Project, outlining prior relevant experience.**

**Interested parties (in respect of LOTS 1, 2 and 4) are asked to note that under the terms of the BEIS Competition, project costs will need to be provided to BEIS and such costs must reflect actual costs at fair market value.**

## 5 FUNDING AVAILABLE & OTHER GUIDELINES

### BUDGET

The funding available to design and construct the Demonstrator Project will be determined and allocated by BEIS under the BEIS Competition rules.

BEIS has indicated that the funding would be in the following ranges:

- Phase 1: up to £250k for designing a suitable demonstrator plant; and
- Phase 2: up to £3m for construction of the suitable demonstrator plant for technologies of early-stage maturity (technology readiness level 4-5) with a minimum capacity of 100 tCO<sub>2</sub>e per annum, or up to £5m for more mature technologies that have a minimum capacity of 1000 tCO<sub>2</sub>e per annum and a technology readiness level of 6 or higher.

### COSTS INCURRED DOMESTICALLY AND OVERSEAS

It is a requirement of the BEIS Competition that the competition must be conducted largely in the UK and the majority of eligible project costs must be incurred in the UK. Therefore, interested parties who plan to conduct their activities related to the LOTS set out above within the UK will be preferred.

#### PROCUREMENT CONDITIONS

BEIS has published supplier procurement conditions on the competition website (below) and respondents will need to confirm that they can comply with the conditions.

Competition website: <https://www.gov.uk/government/publications/direct-air-capture-and-other-greenhouse-gas-removal-technologies-competition>

#### PROJECT ENTITY

The respondent should be willing to enter into a consortium agreement, joint venture or create a separate legal entity for the purposes of submitting a bid under the BEIS Competition and if the bid is successful, administering the project.

## 6 OBJECTIVE

The objective of this EOI is to identify suitable organisations that wish to work with SZC to complete the required deliverable-based tasks. Interested parties can communicate their interest for individual or combined LOTS as detailed in Section 4, by no later than 17:00 BST on 18 December 2020 (the “Closing Date”) by email to [directaircapture@sizewellc.com](mailto:directaircapture@sizewellc.com) (and clearly identifying in the subject, the LOT(s) being applied for). Any questions or requests for clarification may be directed to the same email address.

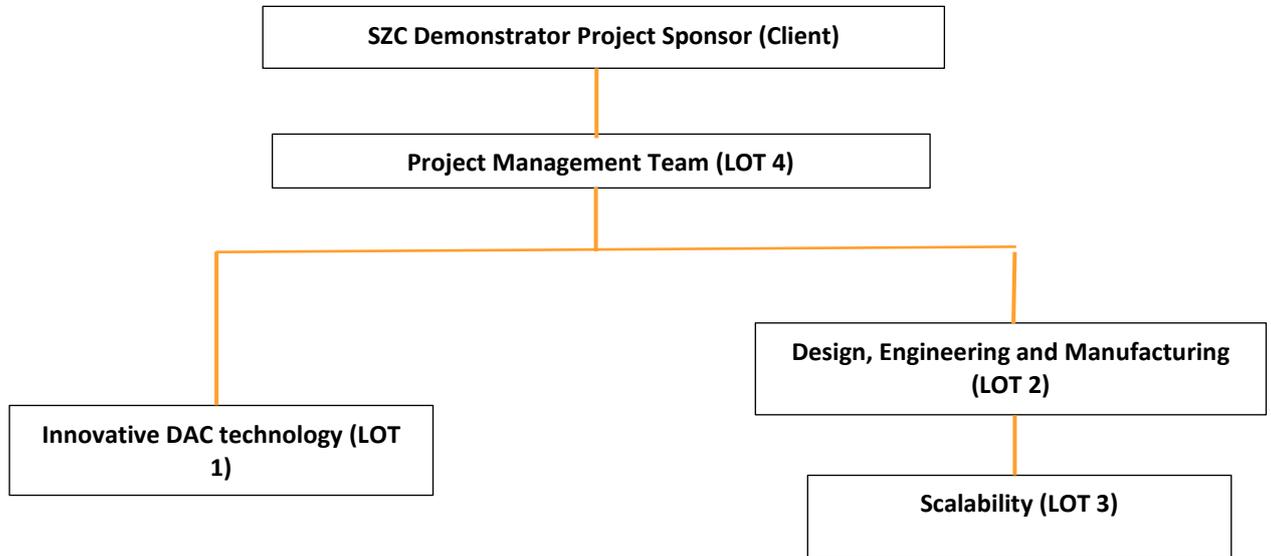
SZC will review each of the proposals received to ensure compliance against the requirements, with a view to finalising the specialists in January 2021 so that a proposal (with all relevant details) for the BEIS Competition can be submitted by the stipulated deadline of 5 February 2021.

## 7 RESPONSIBILITIES AND WORKING ARRANGEMENTS

SZC Co shall nominate a representative SZC Project Lead who shall be responsible for all matters relating to the execution of this Demonstrator Project.

Each of the specialists under the various LOTS will nominate a representative who will be responsible for all the matters relating to that LOT. Each specialist will be responsible for building a team and performing the tasks as described in this contract and providing results to SZC Co in the requested deadline. The specialist(s) shall ensure that all personnel forming part of the core team shall be suitably qualified and experienced to perform their work.

The current proposed organisational chart for the Demonstrator Project is shown below. This is indicative and could be subject to change. We would encourage specialists reviewing the scope to also propose where they would fit within this structure or advise on any alternative arrangement which would make the structure more suitable for the project.



## 8 REQUIRED SKILLS AND EXPERIENCE

The specialist(s) shall implement a team of personnel with the required experience and skills to be able to carry out the tasks described in Section 5.

## 9 SPECIFIC REQUIREMENTS AND CONDITIONS

Any sub-contracting, joint ventures etc shall be detailed within the proposals submitted by the interested parties. The reasons for this potential partnership or strategy should be detailed.

**NNB Generation Company (SZC) Ltd reserve the right to change the terms set out in this document at any time and without any prior notice. In case NNB Generation Company (SZC) Ltd does so, it will issue a revised version of the document.**

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