INSPIRE

PROJECT NUCLEAR ACTIVITY

Age: KS4

Lesson overview

How do you decide where to locate a new nuclear site or which reactor design is best for the job? In this activity, students consider four proposals for the construction of a new nuclear power plant before debating the most viable option.

To start, students work individually, considering how closely each proposal meets the project brief, taking into account that some criteria are more important than others and some information is hard to measure objectively. The project brief and four proposals are supplied in the accompanying **student handout**. Once each student has chosen their preferred option, they get into groups to decide which proposal will get the go-ahead.

Subjects

Science (Physics – energy resources)
Geography (human environments)
Maths (Arithmetic, grouping data, ratios)
English (Oral group work)

HPC Inspire

Inspire is Hinkley Point C's Education Programme in Somerset and the wider South West region. We offer a range of free and innovative activities – including hands-on STEM workshops, assemblies, events and resources – to help young people take advantage of the huge opportunities that the construction and operation of Hinkley Point C has to offer.
www.edfenergy.com/hpcinspire

Learning objectives

- Understand what influences the construction of a nuclear power station;
- Work mathematically and apply problem-solving skills in a practical way;
- Develop reasoning and deduction skills;
- Consolidate arithmetic learning;
- Work in teams and develop reasoning skills

EDF ENERGY HINKLEY POINT C CGN

Employability skills

▶ **Self-management** – Demonstrate time management, be willing to play an active role and take on responsibilities.

▶ **Team working** – Show willingness to cooperate with us and work together to achieve shared goals.

▶ **Business and customer awareness** – Understand the wants and needs of your audience and how you can help.

▶ **Problem solving** – Be proactive in coming up with solutions, willing to test new ideas and work to overcome challenges.

Gatsby Benchmarks

4: Linking curriculum learning to careers: The homework suggestions include an idea for researching jobs involved in constructing and operating a nuclear power station.
5: Encounters with employers and employees: This benchmark will be met if you use this activity to follow a tour of one of our power stations.

Timings

2 x 1-hour lesson blocks (see *How to run this activity*).

Materials and setup

The Resource Pack contains the following materials:

- **Student handout**: a summary of the challenge plus the project brief and details of the four proposals
- **Student worksheet:** a Word doc for students to work out how the four proposals compare and to write down reasons for their preferred option.
- These **Teachers' Notes**.

Students will need a calculator for some questions.

How to run this activity

Part 1 (1 hour): If time is tight, some of the questions can be omitted and the proposals amended accordingly. If time is not a problem, you could precede the activity with a discussion or quick-fire recap on the dangers posed by global warming and the build-up of greenhouse gases in the atmosphere.

Part 2 (1 hour): Ask each group to deliver a two-minute presentation about their preferred option before the whole class considers everyone's opinions and choses one for recommendation.

If the majority of the group chose the same option or only two options have been selected, the Breaking News! Resource on **page 10** can be used to stimulate further discussion and analysis within the group.

Here are some suggestions for which lessons or group activities the lesson plan might support:

- **In science, geography or maths lessons**: run over one or two lessons to support curriculum learning about energy, resources management and numbers;
- **During an Enrichment or Enterprise Week,** or as a **topic-based learning exercise**: it is a good activity for encouraging teamwork and has a competitive element;
- A **fun Eco Club activity**;
- As a **follow-up to a nuclear power station visit:** we have visitor centres at seven of our nuclear power stations and this activity would help to reinforce student learning from their tour.

Background

ABC Energy generates and supplies electricity to consumers throughout the UK. Its Chief Executive has tasked a young project team to investigate the construction of a new nuclear power station to help meet the Government's target of reducing carbon emissions by 57% below 1990 levels by 2032.

Four proposals for possible nuclear-site locations have been submitted – one of which the project team must recommend to the CEO.

ABC Energy has provided a project brief and each of the four proposals.

The following answers accompany the questions in the student worksheets

Q1. *See the table on* **page 9**.

Q2. The project won't get the green light if it's not profitable. This is a top priority that needs to be factored into the students' assessment.

The annual income from electricity sales minus running maintenance costs = future annual profit.

See the table on **page 9** *for the calculations.*

Q3. *See table on* **page 9** *for a summary of the impacts on wildlife and environment.*

Q4. Nuclear waste remains radioactive and is hazardous to health for thousands of years so it must be stored safely and its production limited.

Divide the total output (annual tonnage of radioactive waste) by the total input (MW of power) to get the amount of solid radioactive waste produced for every MW of nuclear power produced (assume no variation in output for the purposes of this question).

See the table on **page 9** *for the calculations.*

Q5. By this stage, students may find themselves weighing up criteria that is harder to quantify such as site risks, public response, geographical details, marine and wildlife concerns. Steers could include encouraging them to think about:

- Which sites the Nuclear Regulator might be most willing to approve;
- The risks that would least adversely affect operational efficiency and reliability;
- Ways of getting the anti-nuclear faction of the local population on board;
- Looking at the average age of the local populations and assessing which community would benefit most in 20 years' time from the jobs on offer at the power plant.

Q6 (and Part 2). *Teacher / group leader to decide on students' chosen response.*

Use the 'news flashes' on **page 10** if the majority of the group has chosen the same option or if only two of the options have been selected in this part of the activity. They are designed to stimulate further discussion and analysis within the group.

Homework suggestions

1. Imagine you live in the area chosen by ABC Energy for its new nuclear site. Research the pros and cons of nuclear power and write an article for the local newspaper about the coming of the nuclear plant, giving your opinion (with reasons). Be sure to grab readers' attention straightway, perhaps by starting with the details that affect people, rather than the facts

2. Design a full-page newspaper notice publicising ABC Energy's coming nuclear plant. The notice should include the company name and branding, and include as many persuasive writing techniques as seem sensible.

3. Research the jobs involved in constructing and running a nuclear power station. A good starting point would be to find out about the job roles that are available at Hinkley Point C: **https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c/jobs-and-training**

CURRICULUM LINKS

Completing the activities in this lesson plan will help students meet the following objectives / outcomes:

AQA GCSE Combined Science: Synergy

1. Development of scientific thinking

Students should be able to:

WS 1.4 Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

WS 1.5 Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences

3 Analysis and evaluation

WS 3.3 Carrying out and represent mathematical and statistical analysis.

WS 3.5 Interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions.

WS 3.8 Communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions through paper-based and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.

4.4. Explaining change

4.4.1 The Earth's atmosphere

4.4.1.5 Climate change: impacts and mitigation
Describe the potential effects of increased levels of carbon dioxide and methane on the Earth's climate and how these effects may be mitigated, including consideration of scale, risk and environmental implications

4.4.2.6 Negative human impacts on ecosystems
Describe negative human interactions within ecosystems and explain their impact on biodiversity.

4.4.2.7 Positive human impacts on ecosystems
Describe positive human interactions within ecosystems and explain their impact on biodiversity.

AQA GCSE Combined Science: Trilogy

As above and:

5.9 Chemistry of the atmosphere

5.9.2 Carbon dioxide and methane as greenhouse gases

5.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Some human activities increase the amounts of greenhouse gases in the atmosphere. These include:

- carbon dioxide
- methane

Students should be able to recall two human activities that increase the amounts of each of the greenhouse gases carbon dioxide and methane.

Based on peer-reviewed evidence, many scientists believe that human activities will cause the temperature of the Earth's atmosphere to increase at the surface and that this will result in global climate change.

However, it is difficult to model such complex systems as global climate change. This leads to simplified models, speculation and opinions presented in the media that may be based on only parts of the evidence and which may be biased.

5.10 Using resources

5.10.1 Using the Earth's resources and obtaining potable water

5.10.1.1 Using the Earth's resources and sustainable development

Humans use the Earth's resources to provide warmth, shelter, food and transport.

Natural resources, supplemented by agriculture, provide food, timber, clothing and fuels.

Finite resources from the Earth, oceans and atmosphere are processed to provide energy and materials.

Chemistry plays an important role in improving agricultural and industrial processes to provide new products and in sustainable development, which is development that meets the needs of current generations without compromising the ability of future generations to meet their own needs.

Students should be able to:

- state examples of natural products that are supplemented or replaced by agricultural and synthetic products
- distinguish between finite and renewable resources given appropriate information.

5.10.2.2 Ways of reducing the use of resources

The reduction in use, reuse and recycling of materials by end users reduces the use of limited resources, use of energy sources, waste and environmental impacts.

Metals, glass, building materials, clay ceramics and most plastics are produced from limited raw materials. Much of the energy for the processes comes from limited resources. Obtaining raw materials from the Earth by quarrying and mining causes environmental impacts.

6.1 Energy

6.1.3 National and global energy resources

The main energy resources available for use on Earth include: fossil fuels (coal, oil and gas), nuclear fuel, biofuel, wind, hydro-electricity, geothermal, the tides, the Sun and water waves.

A renewable energy resource is one that is being (or can be) replenished as it is used.

The uses of energy resources include: transport, electricity generation and heating.

Students should be able to:

- describe the main energy sources available
- distinguish between energy resources that are renewable and energy resources that are non-renewable
- compare ways that different energy resources are used, the uses to include transport, electricity generation and heating
- understand why some energy resources are more reliable than others
- describe the environmental impact arising from the use of different energy resources
- explain patterns and trends in the use of energy resources. Descriptions of how energy resources are used to generate electricity are not required

Students should be able to:

- consider the environmental issues that may arise from the use of different energy resources
- show that science has the ability to identify environmental issues arising from the use of energy resources but not always the power to deal with the issues because of political, social, ethical or economic considerations.

AQA GCSE Physics

As above and:

4.4.2 Atoms and nuclear radiation

4.4.2.4 Radioactive contamination

Radioactive contamination is the unwanted presence of materials containing radioactive atoms on other materials. The hazard from contamination is due to the decay of the contaminating atoms. The type of radiation emitted affects the level of hazard.

Irradiation is the process of exposing an object to nuclear radiation. The irradiated object does not become radioactive.

Students should be able to compare the hazards associated with contamination and irradiation.

Suitable precautions must be taken to protect against any hazard that the radioactive source used in the process of irradiation may present.

Students should understand that it is important for the findings of studies into the effects of radiation on humans to be published and shared with other scientists so that the findings can be checked by peer review.

WJEC Science (Double Award) GCSE and WJEC Physics GCSE

2.2 Unit 2

2.4 The ever-changing earth

Overview

This topic explores the structure of the Earth and the composition of the atmosphere, looking at changes in both over time. They gain an understanding of how a balance of processes maintains the composition of the atmosphere and the effects upon this of human activity.

Working Scientifically

This topic contributes to an understanding of how scientific methods and theories develop over time. Learners will be able to develop scientific explanations and understanding of familiar and unfamiliar facts.

Learners should be able to demonstrate and apply their knowledge and understanding of:
(g) the environmental effects and consequences of the emission of carbon dioxide and sulfur dioxide into the atmosphere through the combustion of fossil fuels
(h) the measures used to address the problems of global warming and acid rain

2.3 Unit 3

3.2 Generating electricity

Overview

This topic begins by looking at the advantages and disadvantages of renewable and non-renewable technologies for the generation of electrical power. It discusses the need for the National Grid as a nationwide electrical distribution system and the use of step-up and step-down transformers in the transmission of electricity from the power station to the home.

Working Scientifically

This unit contains opportunities for learners to explain every day and technological applications of science; to evaluate personal, social economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. Learners can be helped to understand how, through the ideas of physics, physical laws and models are expressed in mathematical form. Learners can apply the conservation of energy to many different situations, including investigating data to be able to compare the efficiency of power stations and explain why transmitting energy from power stations at high voltage is an efficient way of transferring energy.

Mathematical Skills

There are a number of opportunities for the development of mathematical skills in this topic. These include expressing in quantitative form the overall redistribution of energy within a system e.g. Sankey diagrams; applying the relationship between power, voltage and current to calculate the current flowing when electrical power is transmitted at different voltages. These topics afford learners the opportunity to recognise and use expressions in decimal form; to recognise expressions in standard form; to use ratios, fractions and percentages; to change the subject of an equation; to substitute numerical values into algebraic equations using appropriate units for physical quantities.

Learners should be able to demonstrate and apply their knowledge and understanding of:
(a) the advantages and disadvantages of renewable energy technologies (e.g. hydroelectric, wind power, wave power, tidal power, waste, crops, solar and wood) for generating electricity on a national scale using secondary information
(b) the advantages and disadvantages of non-renewable energy technologies (fossil fuels and nuclear) for generating electricity
(c) the processes involved in generating electricity in a fuel based power station
(h) efficiency, reliability, carbon footprint and output to compare different types of power stations in the UK including those fuelled by fossil fuels, nuclear fuel and renewable sources of energy

CCEA GCSE Double Award Science

3.5 Physics Unit P1: Motion, Force, Moments, Energy, Density, Kinetic Theory, Radioactivity, Nuclear Fission and Fusion

Energy

1.4 Energy

Non-renewable energy resources

Students should be able to:
1.4.8 explain that:
- a non-renewable energy resource is one that has a finite supply and it will run out some time; and
- fossil fuels such as oil, natural gas and coal are considered non-renewable because they cannot be replaced within a human lifetime;

1.4.9 demonstrate knowledge that nuclear energy based on fission is also non-renewable since supplies of uranium ore will not last forever;

AQA GCSE Geography

3.2.3 Section C: The challenge of resource management

3.2.3.1 Resource management
The changing demand and provision of resources in the UK create opportunities and challenges.

3.2.3.4 Energy
Different strategies can be used to increase energy supply.

WJEC GCSE Geography

Key Idea 5.4: Human activity and ecosystem processes
5.4.1 How do people use ecosystems and environments?

SQA National 4 Geography

Geography: Human Environments (National 4)
In this Unit, learners will develop geographical skills and techniques in the context of human environments. Learners will develop a straightforward knowledge and understanding of the processes and interactions at work within human environments. Learners will study and compare developed and developing countries drawn from a global context. Key topics include: contrasts in development; world population distribution and change; and issues in changing urban and rural landscapes. Personalisation and choice is possible through contexts chosen as case studies.

Geography: Global Issues (National 4)
In this Unit, learners will develop skills in the use of numerical and graphical information in the context of global issues. Learners will develop a straightforward knowledge and understanding of significant global geographical issues. Key topics include climate change; the impact of human activity on the natural environment; environmental hazards; trade and globalisation; tourism and health. Learners will study major global issues and the strategies adopted to manage these. Personalisation and choice is possible through the issues selected for study.

AQA GCSE Mathematics

3.1 Number

3.1.1 Structure and calculation

N2
Basic foundation content
- apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative
- understand and use place value (eg when working with very large or very small numbers, and when calculating with decimals)

3.3 Ratio, proportion and rates of change

R4
Basic foundation content
use ratio notation, including reduction to simplest form

R5
Basic foundation content
- divide a given quantity into two parts in a given part : part or part : whole ratio
- express the division of a quantity into two parts as a ratio
- apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)

R6
- express a multiplicative relationship between two quantities as a ratio or a fraction

Edexcel GCSE (9-1) Mathematics

Foundation tier

1. Number

Structure and calculation

N2 apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)

Fractions, decimals and percentages

N11 identify and work with fractions in ratio problems

3. Ratio, proportion and rates of change

R4 use ratio notation, including reduction to simplest form

R5 divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)

WJEC GCSE in Mathematics – Numeracy

2.1 Foundation tier

Number

Understanding number and place value

Reading and writing whole numbers of any magnitude expressed in figures or words. Rounding whole numbers to the nearest 10, 100, 1000, etc.

Understanding place value and decimal places.

Rounding decimals to the nearest whole number or a given number of decimal places.

Using the equivalences between decimals, fractions, ratios and percentages. Converting numbers from one form into another.

Ordering and comparing whole numbers, decimals, fractions and percentages.

Understanding number relationships and methods of calculation

Using addition, subtraction, multiplication, division, square and square root.
Reading a calculator display correct to a specified number of decimal places.

Addition, subtraction, multiplication and division of whole numbers, decimals, fractions and negative numbers.

Calculating using ratios in a variety of situations; proportional division.

The use of a non-calculator method to multiply and divide whole numbers up to and including the case of multiplication and division of a three-digit number by a two-digit number.

Solving numerical problems

Interpretation and use of mathematical information presented in written or visual form when solving problems, e.g. TV programme schedules, bus/rail timetables, distance charts, holiday booking information.

Profit and loss.

Giving solutions in the context of a problem, interpreting the display on a calculator.

Interpreting the display on a calculator.

Knowing whether to round up or down as appropriate.

CCEA GCSE in Mathematics

3.1 Unit M1: Foundation Tier

Number and algebra

Students should be able to:

- use the 4 operations applied to positive and negative integers, including efficient written methods;
- order positive and negative integers, decimals and fractions;
- use calculators effectively and efficiently;
- recognise and use relationships between operations, including inverse operations;
- understand place value and decimal places;
- read, write and compare decimals up to three decimal places;
- calculate with money and solve simple problems in the context of finance, for example profit and loss, discount, wages and salaries, bank accounts, simple interest, budgeting, debt, annual percentage rate (APR) and annual equivalent rate (AER);

3.2 Unit M5: Foundation Tier Completion Test

Number and algebra

Students should be able to:

- solve problems involving whole numbers, fractions, decimals and percentages without a calculator;
- use ratio notation, including reduction to its simplest form and its various links to fraction notation;
- divide a quantity in a given ratio;
- apply ratio and proportion to real-life contexts and problems such as conversion, best-buy, comparison, scaling, mixing, concentrations and exchange rates;

SQA National 4 Mathematics

Numeracy (National 4)

Outcome 1
The learner will:
1 Use numerical skills to solve straightforward, real-life problems involving money/time/ measurement by:
1.1 Selecting and using appropriate numerical notation and units
1.2 Selecting and carrying out calculations
1.4 Interpreting measurements and results of calculations to make decisions
1.5 Explaining decisions based on the results of measurements or calculations

Mathematics: Expressions and Formulae (National 4)

For Outcome 1: Learners will be required to provide evidence for each of the assessment standards linked to expressions and formulae by drawing on the following sub-skills:

Outcome 2
The learner will:
Use mathematical reasoning skills linked to expressions and formulae by:
2.1 Interpreting a situation where mathematics can be used and identifying a valid strategy 2.2 Explaining a solution and/or relating it to context
Mathematics: Relationships (National 4)

Outcome 2
The learner will:
2 Use mathematical reasoning skills linked to relationships by:
2.1 Interpreting a situation where mathematics can be used and identifying a valid strategy
2.2 Explaining a solution and/or relating it to context

	Project A	Project B	Project C	Project D
Q1.a) Does the project provide 3,000 MW – 4,000 MW of nuclear power?	4 x 660 = 2,640 MW **No**	1,600 x 2 = 3,200 MW **Yes**	1,100 x 3 = 3,300 MW **Yes**	1,300 x 3 = 3,900 MW **Yes**
Q1.b) Does the project keep within the construction budget?	£11.5 bn **Yes**	£12 bn **Yes**	£8.9 bn **Yes**	£15 bn **No**
Q1.c) Will the project be completed by the end of 2030?	2020 **Yes**	2020 **Yes**	2022 **Yes**	2020 **Yes**
Q1.d) Will all construction costs be recovered within 20 years from the project's start?	23 years **No**	17 years **Yes**	14 years **Yes**	20 years **Yes**
Q2. Which project will make the most profit a year?	**£500 million/year**	**£595 million/year**	**£620 million/year**	**£760 million/year**
Q3. Are there any environmental or wildlife issues to be concerned about?	**Rare sea cabbage present along the beach of the Kent site**	**Multiple badger sets on the construction land**	**No protected plant- or on-land wildlife** **A nearby major cod breeding area**	**No protected plant or wildlife**
Q4. Calculate the amount of solid radioactive waste produced for every MW of nuclear power generated (give your answer to 3 decimal places)	45 / 2,640 MW = **0.017 tonnes/year**	30 / 3,200 MW = **0.009 tonnes/year**	26 / 3,300 MW = **0.008 tonnes/year**	36 / 3,900 MW = **0.009 tonnes/year**

BREAKING NEWS!
PROJECT DEBATE

These 'news flashes' are useful if the majority of the group has chosen the same option or if only two of the options have been selected in **Part 2** of the activity. They are designed to stimulate further discussion and analysis.

	Project link:	Detail of new information
1	B (+)	The Government has made it possible for Project B to buy more construction land.
2	B (+)	ABC Energy has been bought by another company, which has more expertise and experience in constructing the Euro1600 reactor. This reduces the Project B timescale by two years and cuts construction costs by £1.5 billion.
3	B (-)	The Nuclear Regulator has a serious issue with the design of the Euro1600 reactor used in Project B.
4	B (-)	A survey shows the local roads around the Project B site are incapable of supporting the transportation of heavy machinery loads.
5	A(+) D (+)	A scientific breakthrough has revealed an environmentally-friendly way to recycle the waste produced by the reactors in Projects A and D.
6	A(-)	A meeting of the Infrastructure Planning Committee has raised an issue with Project A that will delay construction by a further one and a half years.
7	D (+)	The Government has pledged to financially cover the cost of improving the local grid infrastructure in Essex, which will reduce Project D's costs by £2billion.
8	C (+)	The major issues initially raised by the Nuclear Regulator on Project C have been overcome.
9	C (-)	There was a planning error on Project C; the capital costs have risen by 20%, which affects the payback timescale.
10	D (-)	The Nuclear Regulator has a problem with the Advanced Boiling reactor used in Project D. This will delay construction by three years.

PROJECT NUCLEAR ACTIVITY

ABC Energy's main goal

To provide between 3,000 MW – 4,000 MW of nuclear power in the UK by 2030.
Future profitability and operating ease is vital.

Budget	Construction costs should not exceed £12 billion.
Environmental	The chosen site or sites must have minimum negative impact on the surrounding environment and produce the minimum amount of nuclear waste.
Employment	The scale of employment (temporary and permanent) should be considered for each project.
Publicity	This is an ideal opportunity to promote the ABC Energy brand and maximum positive publicity should be sought.
Government support	Where possible, Government preference should be taken into account, to make the project run as smoothly as possible.
Regulator response	The Nuclear Regulator is a strict organisation that has the final say on whether a nuclear reactor can be built and operated in the UK. It is of utmost importance that the Nuclear Regulator is happy the design of the power station is safe enough to run.
Population	Minimum disruption to the local population is preferred.
Political	Views of local MPs (Members of Parliament) need to be considered.
Public opinion	In general, the public are starting to realise the benefits of nuclear power in the UK but not necessarily in their own area. The public can affect the approval process for construction.
Wildlife	Local marine life and wildlife need to be considered. Large land construction sites can potentially disturb the multiple habitats of many protected creatures. Also, due to the nature of the process for generating nuclear power, marine life will be affected.
Timescales	The entire project should be completed by the end of 2030.
Local area and performance	For optimum reliability and efficiency, the local sea and weather conditions need to be considered. Non-extreme weather conditions, cooler sea temperatures, and avoiding areas prone to large influxes (in-comings) of marine life are a preference.
Income generation	The ABC Energy Finance Director wants all project costs to be recovered (paidback) within 20 years of the start of the project.

Find more science and maths activities at
www.jointhepod.org/hpcinspire

Project A:
4x Advanced CO2-660 Reactors (one twin unit on the Kent coast and one twin unit on the Lancashire coast)

Technology	
Reactor design	Advanced CO2-660
Output (per reactor)	660MW
Overall Station Efficiency	42%
Running maintenance costs	£70 million/year
Income from electricity sales	£570 million/year
Benefits	Refuelling can take place with the reactor ON
Risks	A very complicated design
Project Details	
Project capital cost	£11.5 billion
Project completion date	2020
Payback timeframe	23 years
Solid radioactive waste	45 tonne/year
Site risks	Weather conditions rough on both sites
Employment	5,000 temporary staff 400 permanent staff
Public response	Built adjacent to multiple running nuclear power stations The local communities are very keen on the local development opportunities the power stations would produce
Government view	The local MPs fully support the sites and the benefits they would bring to local employment These are British Government new nuclear-approved sites
Geographic Details	
Population	The average age in the areas is 39 years Medium/High local population
Wildlife	Rare sea cabbage present along the beach of the Kent site

Project B:
2x Euro1600 nuclear reactors on the coast of Suffolk

Technology	
Reactor design	Euro1600
Output (per reactor)	1600MW
Overall Station Efficiency	36%
Running maintenance costs	£45 million/year
Income from electricity sales	£640 million/year
Benefits	An advanced development on a popular worldwide tried-and-tested technology
Risks/downsides	Needs to be shut down every 18 months (for one month) to be refuelled
Project Details	
Project capital cost	£12 billion
Project completion date	2020
Payback timeframe	17 years
Solid radioactive waste	30 tonne/year
Site risks	Extremely limited space for construction
Employment	4,000 temporary staff 350 permanent staff
Public response	Built adjacent to another running nuclear power station. There is a minor opposition to new stations
Government view	Local MPs are generally in favour of the project This is a British Government new nuclear-approved site
Geographic Details	
Population	The average age in the area is 46 years Medium/Low local population
Wildlife	Multiple badger sets on the construction land
Other	Marine activity can be quite extreme and has the possibility to affect operation

Project C:
3x Passive1000 nuclear reactors on the North Wales coast

Technology	
Reactor design	Passive1000
Output (per reactor)	1100MW
Overall Station Efficiency	36%
Running maintenance costs	£50 million/year
Income from electricity sales	£670 million/year
Benefits	Very simple design
Risks/downsides	The Nuclear Regulator currently does not accept some fundamental aspects of the design Needs to be shut down every 18 months (for one month) to be refuelled
Project Details	
Project capital cost	£8.9 billion
Project completion date	2022
Payback timeframe	14 years
Solid radioactive waste	26 tonne/year
Site risks	No significant site risks
Employment	5,000 temporary staff 450 permanent staff
Public response	Built adjacent to another running nuclear power station The local community are used to the presence of nuclear sites and are happy to accommodate new power stations
Government view	The Welsh Assembly is pro-nuclear This is a British Government new nuclear-approved site
Geographic Details	
Population	65% of people are over the age of 65 Very small local population
Wildlife	No protected plants or on-shore wildlife
Other	A nearby major cod breeding area

Project D:
3x Advanced Boiling nuclear reactors on the coast of Essex

Technology	
Reactor design	AB1350
Output (per reactor)	1300MW
Overall Station Efficiency	33%
Running maintenance costs	£40 million/year
Income from electricity sales	£800 million/year
Benefits	An advanced development of a popular reactor technology
Risks/downsides	Technology never used in the UK and as a result the Nuclear Regulatory approval process may be very troublesome Needs to be shut down every 24 months (for one month) to be refuelled
Project Details	
Project capital cost	£15 billion
Project completion date	2020
Payback timeframe	20 years
Solid radioactive waste	36 tonne/year
Site risks	Local electrical grid would need upgrading to accommodate the increased load
Employment	7,000 temporary staff 500 permanent staff
Public response	Built adjacent to two shutdown nuclear power stations The local community are split on the decision to host new nuclear power stations
Government view	Local and national government prefer this location due to the electrical and employment demand in the region This is a British Government new nuclear-approved site
Geographic Details	
Population	The average age in the area is 52 years Medium local population
Wildlife	Minimal. No protected plants or wildlife