GDF

Introduction to Geological Disposal

Nuclear Waste Services

Geological disposal is the right thing to do for today's society and future generations.

It is a significant environmental project with long-term economic benefits and community consent at the heart of the process.

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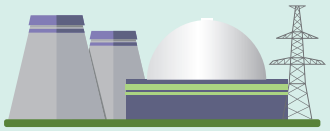
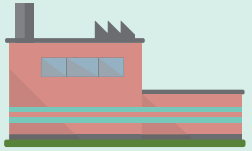
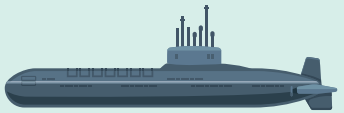


Power plant

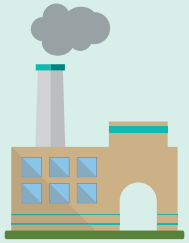


Reprocessing

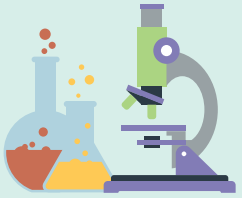
Medicine



Defence



Industry



Research

Why does the UK need geological disposal?

Nuclear power generates around one fifth of the UK's electricity. Radioactive waste is produced from electricity generation, medical, industrial, defence and research activities. We need to deliver innovative solutions for the management of this waste that meet today's safety standards and will protect us into the distant future.

There is international consensus that the safest permanent solution to manage higher activity radioactive waste is to isolate it deep underground in solid rock, via a network of vaults and tunnels. This is called geological disposal.

The United Kingdom is a pioneer of nuclear technologies. The world's first commercial nuclear power station was opened here. Since then, nuclear technology has delivered great benefits; supporting national defence and generating electricity for over 60 years.

Sizewell B nuclear power station

What do we need to do now?

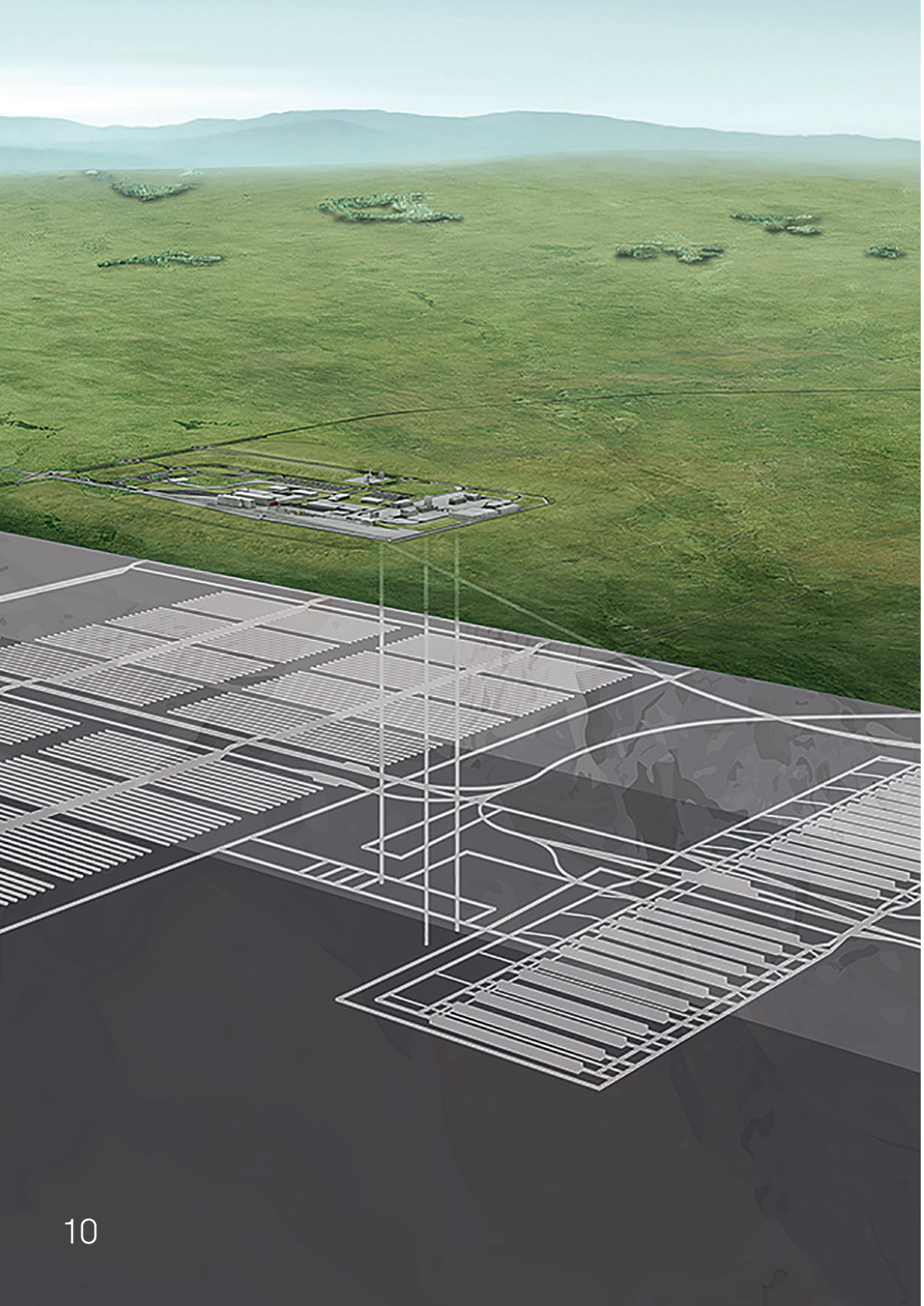
Existing waste is currently stored above ground at more than 30 sites across the UK. These surface stores can be kept safe for many decades, but require continuous maintenance to keep them secure and in good condition, as some of the waste remains radioactive for hundreds of thousands of years. A Geological Disposal Facility provides a permanent solution for such waste.

At Nuclear Waste Services (NWS), we want to work in partnership with communities to find a suitable site for a Geological Disposal Facility (GDF).

Sites in the UK where waste is currently stored and disposed of

- Spent fuel reprocessing
- Nuclear power reactors
- Nuclear energy R&D
- Defence
- Fuel fabrication & uranium enrichment
- Medical & industrial
- Waste disposal facility

Intermediate Level Waste store



What is a Geological Disposal Facility?

A Geological Disposal Facility (GDF) will be a significant piece of UK infrastructure where the majority of the facility is built between 200 and 1000 metres underground, with a surface area of approximately 1 square kilometre.

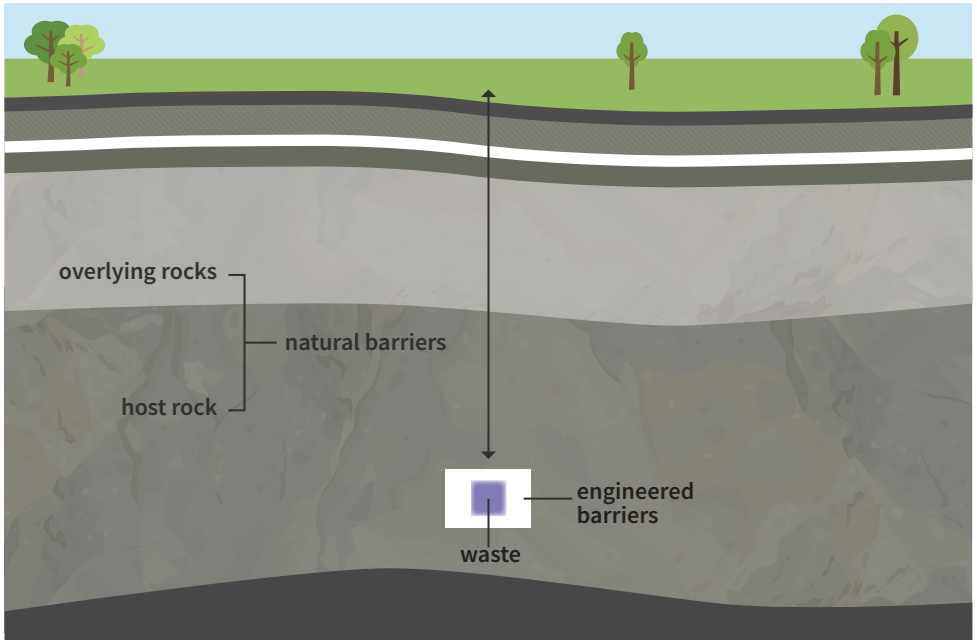
Geological disposal involves putting the waste in purpose built containers which are then placed in tunnels and vaults beneath several hundred metres of solid rock.

This is already the chosen approach in many other countries including Canada (www.nwmo.ca/), Finland (www.posiva.fi/en), France (www.andra.fr), Sweden (www.skb.com/) and Switzerland (www.nagra.ch/en). These countries are well on their way in developing their own GDFs.

Geological disposal is possible thanks to world-class engineering, science and technology. This involves:

- isolating the radioactive waste in sealed vaults and tunnels deep underground, between 200metres and 1000metres below the surface
- containing the radioactivity while it decays naturally over time
- preventing radioactivity from ever reaching the surface in levels that could cause harm.

Solid radioactive waste is packaged in secure engineered containers, typically made of metal or concrete, and then placed in a stable rock formation hundreds of metres below the surface, with the containers surrounded by clay or cement. This is called the **multi-barrier approach**.



In addition, in the very long term a GDF:

- requires no ongoing maintenance
- protects the waste from terrorism or war
- protects the waste from natural processes such as climate change.

Once operations have ceased, the GDF will be permanently sealed to provide safety without the need for further action.

Receipt of an empty 500 litre stainless steel waste container prior to loading and encapsulating Intermediate Level Waste (ILW)

The safest solution

There is international consensus that geological disposal is the safest permanent solution to dealing with radioactive waste.

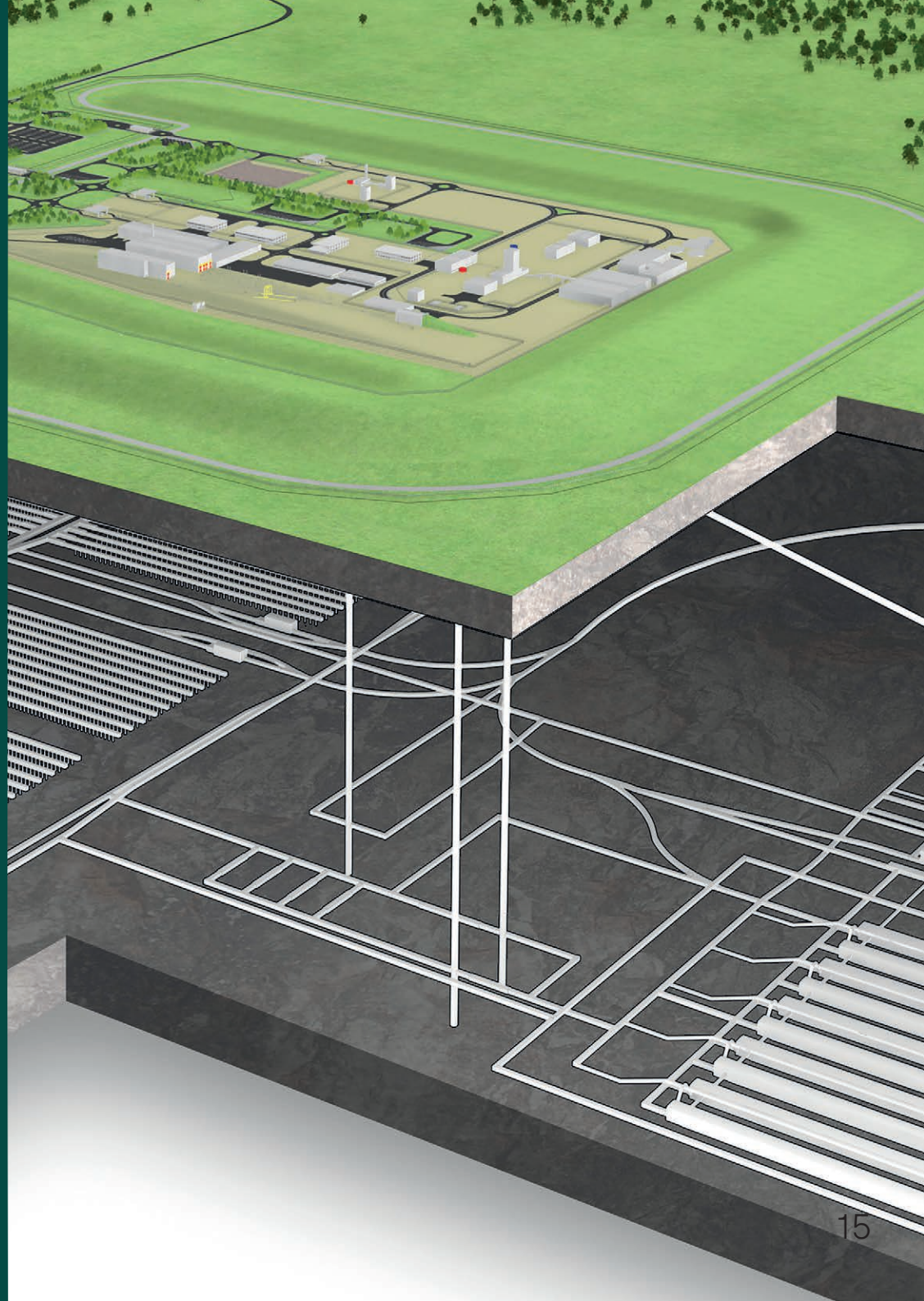
Safety assured through stringent regulations

The UK has stringent, independent and effective existing regulation for all aspects of radioactive waste management.

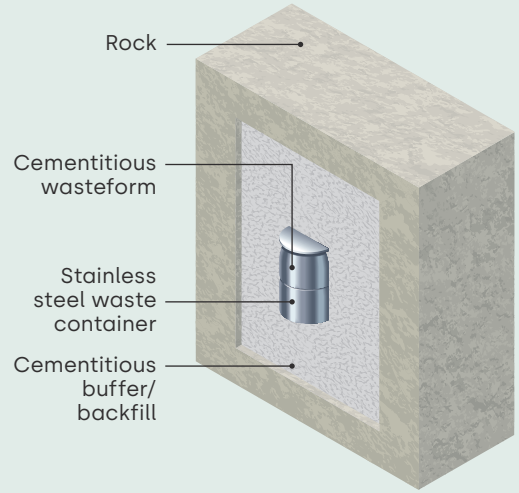
The environmental and nuclear regulators will ensure that a GDF will meet the rigorous standards required for environmental protection, safety and security at all stages of its lifecycle.

Put simply, if it can't be shown to be safe, it cannot be built.

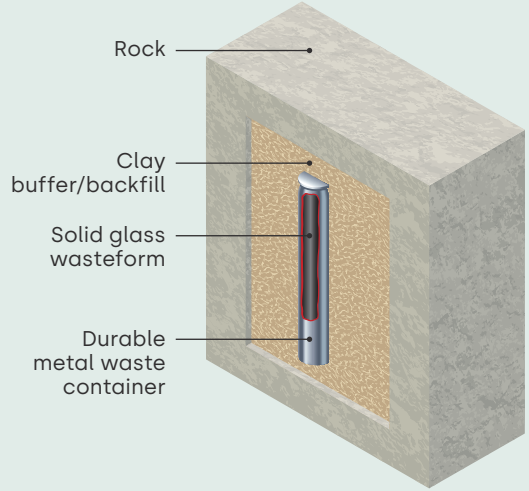
Waste is already being packaged for disposal. At Nuclear Waste Services, we are assessing proposals for packaging waste in specially engineered containers (known as waste packages) to conform to all the regulatory requirements for geological disposal.



Intermediate Level Waste



High Level Waste



The protection of people and the environment is our absolute priority

We will present safety arguments for all aspects of a proposed GDF – from transporting waste to the facility, to its design, construction and operation in the long term following closure.

Permits and licences

We will need to obtain the necessary permits from the regulators for all the relevant activities including drilling deep boreholes, construction, transport and operation and closure.

Independent regulators will only approve operation at a site if we can demonstrate that the GDF and transport system will be safe, secure and provide long-term environmental protection. If, for example, at any point a site was found to be unsuitable, then the operations at that site would stop.

What are the benefits of hosting a GDF?

Economic and community benefits

Investment will flow into a community that hosts a GDF. There will be hundreds of well-paid jobs every year for over a century. Local projects will benefit from Community Investment Funding and public facilities and infrastructure can be improved over the long term.

Jobs and skills

Hundreds of people will construct and operate a GDF. The vast majority of these people will be in skilled roles, and therefore higher paid than the average wage in the UK.

With support to establish a local skills base, many of those jobs could be drawn from the local community. These could be in areas such as safety and security, radiation protection, engineering design, scientific and technical support, construction and operations.

Infrastructure investment

The development, construction, operation and closure of a GDF will be a multi-billion pound undertaking, and there will be significant investment in local infrastructure.

Improvements could include developing road and rail networks, new housing, schools and libraries, improved internet access, developing community facilities like sports centres and village halls, and environmental spaces like parks, footpaths and cycle routes.

Community support

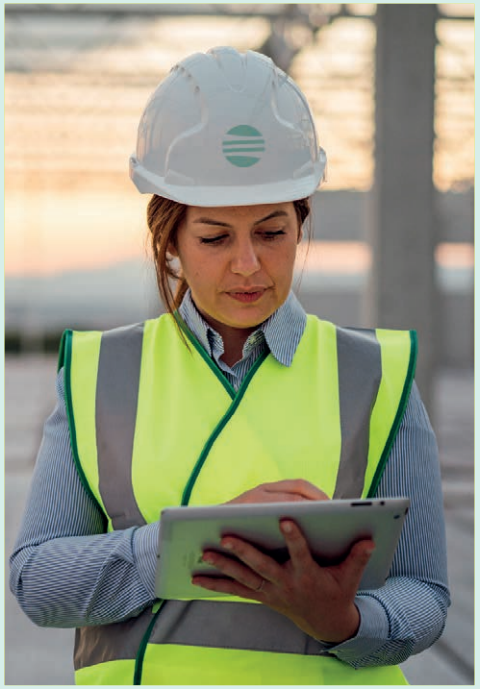
Opportunities for the community exist from the moment the siting process is launched, through to closure. Very few developments have this potential across such a long timeline.

We will work with the community that hosts a GDF, to help it achieve its own vision for social and economic wellbeing in recognition of the essential service it will be providing to the nation.

The siting process

Finding a site for a GDF will be the first community consent-based process to be undertaken in the UK for a project of this size.

A GDF cannot be built without the consent of a community. The siting process will be governed by the following principles:



Safety first

Safety, security and protection of people and the environment are paramount.

Put simply, if it cannot be shown to be safe it cannot be built.

Partnership

To deliver a GDF, we will work in partnership with communities. This means:

- there will be a fair and transparent process that meets the needs of communities
- a GDF can only be developed if the geology is suitable and a community is willing to host it
- anyone can come forward and express an interest in geological disposal. People do not need to own land or form liaison groups to do this
- individuals and organisations can be part of the process, and can benefit from community investment without having to commit to a GDF
- we will ensure that people have the opportunity to have their questions answered
- we will explore how a GDF can support the community's vision for their area
- we also know that a successful consent-based process needs a willing community with local authority support
- communities can withdraw from the process, and if they do, then a GDF cannot be built
- support will be provided to help people understand all the issues
- councils or individuals who take part in the project will have their agreed costs covered.

Flexibility

Communities will be at the heart of the siting process and of any decision-making. We will work with your community at a pace that reflects your needs and preferences. We will aim to reflect as many aspects of the community as possible, taking into consideration local social, economic, political and environmental interests and the diversity of the area.

The approach to selecting a site

When looking for a site, a range of factors will be taken into account including:

- **Safety and security**
- **Community**
- **Environment**
- **Transport**
- **Engineering feasibility**
- **Value for money**

The geological conditions at a potential site will make a significant contribution to a number of these factors, particularly in regard to long-term safety.

Working with Communities

	1 – 5yrs duration	10 – 15yrs duration	100+yrs duration
People	 Initial conversations, working group, establishing partnerships with communities, providing information	 Developing a vision, providing information, funding and support for each community Realising local plans for benefits and investment	 Continued investment in supply chain, skills, infrastructure, etc
Place	 Desktop research and site evaluation	 Site investigations, designing and planning Site selection and final decision	 Construction, operation and closure
Investment	 £1m Up to £1m per year per community	 £2.5m Up to £2.5m per year per community during borehole investigations	 tbc Significant investment package for the host community

Community Vision and Community Investment

We will work with communities that take part in the siting process to develop a positive and aspirational vision for the future.

Community Vision

The Community Vision will inform investment in the communities that engage with us.

Significant Additional Investment would be made in a community that hosts a GDF. This project could support local and regional visions as part of a community's plan for achieving the future it desires. The investment could unlock benefits for everyone.

Community Investment

As well as the Significant Additional Investment that will come with the development of the GDF, communities will have funding available whilst they participate in the siting process.

Initially there will be up to £1 million per community per year. This will rise to up to £2.5 million per community per year where detailed Site Characterisation takes place. Projects could include improvements to community wellbeing, opportunities to develop new skills and enhancements to the environment and public spaces.

We will help communities make the most of the opportunities provided by a GDF to develop skills, support local businesses, open up new markets and develop a balanced economy for the future.

A GDF will attract investment to their local area and surrounding region.

We will look to make bidding for contracts as easy as possible, especially for small and medium sized enterprises, who can win work and plan for a prosperous future.

Protecting the environment

Developing and constructing a GDF is one of the most important environmental projects of our generation. One of our objectives is to ensure that a GDF supports a community's aspirations to protect and improve their local environment.

Like any other large project, we recognise there may be some impacts on the local environment. There could be increased vehicle movements or noise and dust during construction for example. We understand that people may be concerned about the new developments and what it means for them.

We will work closely with communities to understand their concerns and to develop appropriate measures to address them.

Opportunities for better land quality by improving derelict or poor quality areas. Prospective benefits to biodiversity and landscape quality.

Potential for improvements to utility supplies, flood management and local drainage systems.

Environmental impact is significantly reduced as most of the facility will be hundreds of metres underground.

Helping to preserve local rights of way, conserving heritage.

We'll keep transport disruptions to a minimum.

Surface facilities at the underground laboratory, Aspo, Sweden - (picture from SKB)

Most of the facility will be hundreds of metres underground. However, we will ensure that the surface facilities of a GDF are properly integrated into the local landscape or townscape and transport disruption is minimised.

We will be open to opportunities to improve the local environment. Such opportunities could include: cleaning up an old industrial site, improving landscape quality and biodiversity, developing the local rights of way network, conserving local heritage assets, and improving social infrastructure (such as healthcare facilities and schools) to support the local population.

For instance, in Finland and France GDF projects have supported local initiatives beneficial to the environment. In Eurajoki, Finland, the Vuojoki Mansion has been restored, ensuring the long-term future of an important architectural and heritage asset. At Bure in France the Ecotheque has been built, providing an important long-term environmental research and sample storage facility.

Further reading on geological disposal

This document is part of a set we have prepared to give you more information about our plans for a GDF. If you wish to find out more about the process of finding a site for a Geological Disposal Facility, we have also published the following two documents:

Community Guidance

A guide for communities explaining in detail how we will work with a willing community and what the process entails.

Site Evaluation

A consultation document that explains and seeks views on how we will evaluate the suitability of sites.

You can find all three documents on our website:

www.nuclearwasteservices.uk

Nuclear Waste Services

www.nuclearwasteservices.uk

Nuclear Waste Services is a joint trading name of LLW Repository Limited (Company Registration No. 05608448) and Radioactive Waste Management Limited (Company Registration No. 08920190). Both of these companies are registered in England and Wales with their registered office located at Pelham House, Pelham Drive, Calderbridge, Cumbria CA20 1DB.

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