6 CONSIDERATION OF ALTERNATIVES

6.1.1 Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 sets out the information for inclusion in Environmental Statements and indicates that this should include:

"an outline of the main alternatives studied by the applicant… and an indication of the main reasons for the choice made, taking into account the environmental effects".

6.2 Background

6.2.1 The proposed ERP has been through an iterative design process which has been influenced by environmental issues, the EIA and consultation processes. This chapter discusses the alternative sites, technologies, and design and layout options that were considered during the design process and provides explanations for the choices made.

6.3 'Do Nothing' Scenario

6.3.1 The 'do nothing' scenario has also been considered, where the existing facility would continue to operate as Barr's head office and training centre without the addition of the proposed ERP.

6.3.2 According to a Scottish Parliament Information Centre (2013) Briefing on the 'Treatment options for residual waste' (13/41), in 2012 about 36% of the waste landfilled in Scotland originated from households. However, in accordance with the Zero Waste Plan, it will no longer be permissible to send residual waste to landfill and unsorted (residual) waste treatment with energy recovery represents an alternative option. This creates a requirement for further unsorted (residual) waste treatment plants in Scotland as current facilities are not of sufficient scale to process all of its unsorted (residual) waste. SEPA (2011) has estimated that the total additional operational waste management infrastructure capacity needed to manage unsorted residual waste and meet the Zero Waste Plan targets equates to approximately 930,000 tonnes; 27% of total waste to be diverted to an alternative management method.

6.3.3 Overall, in view of the demonstrable need for additional capacity to manage residual waste and the need to divert waste from landfill, it is considered that the 'do nothing' alternative can be discounted.

6.4 Alternative Sites

6.4.1 The application site is presently operated by Barr as a divisional head office, training centre and visitor centre.

6.4.2 Alternative sites for the proposed Energy Recovery Park were initially considered, including Barr's other facilities at Garlaff, Auchencarroch, Heathfield and Southhook. Alternative sites were discounted for a number of reasons, including size of the site, access arrangements, site availability and the location of the site in respect of the source of waste arisings.

6.4.3 Barr's Garlaff site does not benefit from being close to an existing substation or suitable highway infrastructure whilst the Killoch site has this supporting infrastructure. Barr leases a proportion of the Garlaff site, thus site availability constrains this site's suitability.

6.4.4 Barr's other sites; Auchencarroch, Heathfield and Southhook, have been discounted based on their size.

6.4.5 Based on their review of these factors, the Killoch site was identified by Barr as the most appropriate to accommodate the state-of-the-art ERP.

6.4.6 The Killoch site is of a suitable size to house the proposed ERP, the site is located within appropriate industrial surroundings and is a brownfield industrial site itself. The Killoch site is also located in East Ayrshire, where a significant proportion of the waste will arise. A primary substation is situated close to the site for ease of grid connection. In addition, the site is conveniently located along the A70, which was engineered to handle heavy industrial traffic. Other transport infrastructure, for example, a railhead is located adjacent to the north of the proposed site, whilst not part of the current proposal, will be considered by Barr in the future, if deemed to be a viable option.

6.4.7 The site will provide an Energy Recovery Park for residual municipal wastes generated within East Ayrshire, South Ayrshire, West Dunbartonshire and Argyll and Bute, and is consistent with planning policy that waste management takes place as close as possible to the source of the material and at pre-existing waste management facilities.

6.4.8 Barr employ 50 people across their business. The development of the proposed ERP will ensure the long term security of those positions and is expected to generate an additional 35 jobs.

6.4.9 The Killoch site is in a good location in terms of proximity to potential heat end users for the thermal energy produced by the gasification facility. The location, nature and heat demand of end users is discussed in detail within the Heat and Power Plan submitted as part of the Planning Application, as are the potential network distribution requirements and implementation timescales of providing heat to those potential end users.

6.4.10 The potential end users of heat comprise a variety of individual sites. The potential end users that currently have been identified include:

- Major coal mining operator in the UK
- Major timber processor
- Leading Scottish vegetable producer

6.5 Alternative Technologies

6.5.1 A detailed assessment of the technology choice and justification of the technology as employing Best Available Techniques will be made as part of the PPC Permit Application, as required under the Pollution Prevention and Control (Scotland) Regulations 2012.

6.5.2 The Zero Waste Plan sets a target of 70% reuse and recycling of all waste generated in Scotland by 2025. Significant progress has been made towards both this and the interim targets, with Scotland recycling over 41% of household waste in 2012.

6.5.3 While good progress continues to be made to recycle more, a proportion of the overall waste arisings cannot be recycled, either technically or economically. This is commonly referred to as 'residual waste'. Several million tonnes of this residual waste continues to be disposed of to landfill each year, which represents the lowest option in the waste hierarchy.

6.5.4 As recycling systems improve, more people will engage with them at home and at work and non-recyclable materials are progressively being designed out of products. Overall, this residual fraction will decrease but it is generally accepted that residual waste will persist for some time, and even with high levels of recycling there will still be a requirement to manage significant quantities of residual waste. As this residual

waste will continue to persist, Scotland must find ways of moving its management up the waste hierarchy.

6.5.5 The waste hierarchy is defined as:

(Source: http://www.gov.scot/Publications/2011/10/14112444/5)

6.5.6 Currently the residual municipal waste being considered for treatment by Barr is disposed of to landfill, or exported for treatment outside Scotland, and clearly a better option exists to recover value from this material. There are elements of the proposed input waste that may be suitable for recycling. A proportion of these will be recovered as part of the processing of the input waste in the proposed MRF plant at the Energy Recovery Park, but it is recognised by SEPA that the implementation of the Waste (Scotland) Regulations 2012 will improve the recycling of waste materials by the waste producers themselves.

6.5.7 With respect to the choice of technology to be used to treat the residual waste, the Scottish Government's policy on waste identifies energy recovery as an option and, although this is lower in the hierarchy than prevention, re-use and recycling, it is considered a better option than landfill, which is the current route of disposal for much of the residual waste arising in Scotland. Of the residual waste that is not sent to landfill currently, much is exported to plants in England or even in mainland Europe. This results in a loss of resource to the Scottish economy through lost jobs at Scottish plants and the generation of electricity and heat outside Scotland.

6.5.8 SEPA also recognise that there is a requirement to reduce the quantities of materials going to landfill and consider that "for residual and non-recyclable wastes which persist, appropriately located and well managed energy from waste facilities, that

meet modern requirements and the stringent emission standards contained in the Industrial Emission Directive (IED), should not cause significant pollution of the environment or harm to human health."

6.6 Alternative Technologies

6.6.1 The potential to use the energy contained in the RDF to generate heat and electricity means that thermal processing for energy recovery is more favourable than disposal to landfill or incineration without energy recovery. The technology to be utilised at the ERP to recover this energy needed to meet the following specifications:

- to have a proven and reliable capability to deliver effective thermal treatment as an end of life process;
- to minimise emissions, and as a minimum to comply with current UK and EU standards and have the ability to maintain compliance during the operational phase of the plant;
- to have the flexibility to use a wide range of refuse derived fuels with respect to the energy content, particle size and ash content; and
- to generate sufficient electrical power for export to the National Grid and heat for potential use by suitable heat offtakers.

6.6.2 Based on these requirements, attention was focussed upon the availability and suitability of various thermal treatment technologies. The key technologies considered included:

- Moving grate incineration of various types;
- Pyrolysis;
- Plasma arc gasification; and
- Gasification of various types.

6.6.3 More detail of the decision process for selecting gasification will be set out in a PPC Permit application but the key decisions are summarised in the following sections.

Moving Grate Incineration

6.6.4 Residual waste could be treated in a traditional moving grate incinerator with associated energy recovery. However there are a number of reasons why this was discounted in this case. Firstly, the typical scale of the facilities means that they are

rarely built with capacities of less than 90,000-100,000 tonnes per annum per line and efficiencies are adversely affected when operating at lower tonnages. As the ERP is intended to process up to 85,000 of RDF, the selection of a moving grate technology would reduce the flexibility to manage varying tonnages and/or outages in the facility.

6.6.5 Secondly, the closer control of the combustion process, which is achieved by a gasification process, generally produces lower emissions of CO and NO_x compared to moving grate incineration. Other emissions from the gasification plant also compare favourably with incineration.

Pyrolysis

6.6.6 Pyrolysis involves the thermal treatment of waste in the absence of oxygen to produce a syngas. This gas can then be utilised to raise steam or in a gas engine to generate electricity. Pyrolysis plants are generally small scale and have not been proven at a large scale for variable residual municipal derived wastes. This option was therefore discounted due to the uncertainty as to the performance of the plant in practice. This was also considered to be a more expensive technology with no clear benefit accrued as the result of the additional costs.

Plasma Arc

6.6.7 Plasma arc technology uses an electric or magnetic field to break down the wastes at high temperature and clean the resultant syngas. Plasma arc technology is again proven at the small scale but not proven at a large scale for the waste types proposed, leaving uncertainty as to how well it would perform at the ERP. A further disadvantage is that a large amount of energy must be utilised to form the electric arc. This will typically decrease energy efficiency and increase operating costs. For these reasons the technology was discounted.

Gasification

6.6.8 Waste gasification is the partial combustion of the material in a reduced oxygen environment to produce a synthetic gas (syngas), which predominantly comprises carbon monoxide, hydrogen and methane. The syngas can then be combusted with higher levels of oxygen, which allows complete combustion of the material. This produces hot gases for use in a steam boiler and turbine set or to be used directly in gas engines for electricity production. Gasification produces an ash which is in compliance with the IED requirement for Total Organic Carbon and can be recovered

for use as an aggregate. Gasification can be carried out with a range of technologies such as rotary kiln, fluidised bed, slag bath, entrained flow and fixed hearth.

Technology Selection

6.6.9 Each of these potential solutions was considered and evaluated on the basis of issues such as installation and/or operational costs, adaptability to waste composition and technical issues with operational facilities. The outcome of this evaluation was that a gasification system was selected. The key factors for this selection were:

- The technology is proven and robust with existing facilities having significant operational periods;
- The technology is modular allowing flexibility with respect to varying tonnages and the facility can remain operational during maintenance and/or lifecycle replacement of an individual gasification unit;
- The facility can meet the efficiency requirement set out in SEPA's Thermal Treatment of Waste Guidelines and will be enabled for the export of heat;
- Emissions are minimised during the syngas combustion process and the remaining emissions are managed in a robust flue gas treatment process using well proven technologies to meet the requirements of the IED; and
- Installation and operational costs compare favourably with other technologies delivering similar efficiency and environmental performance.

6.6.10 This combination of robust, deliverable technology, delivering the required project outcomes with reasonable installation and operational costs, led to the selection of a gasification technology with heat generation and generation of electricity. The installation of this form of technology along with a processing plant to recover recyclates from the input residual waste and prepare the RDF input, will deliver with the requirements of the Waste (Scotland) Regulations and the Thermal Treatment of Waste Guidelines 2014.

Alternative Design and Layout

6.6.11 The proposed development has been through an iterative design process in conjunction with the EIA, which has also been informed by discussions with statutory and non-statutory consultees. As far as possible, potential significant adverse environmental impacts have been 'designed out' of the scheme. However,

measures have also been incorporated into the proposals to mitigate any impacts that cannot be adequately addressed through design.

6.6.12 The alternatives considered as a result of the EIA process consist of the following:

- The effect of alternative stack heights on modelled concentrations of released substances was considered in order to identify an appropriate stack height (as shown in Appendix 8.1). A preliminary analysis demonstrated that at a stack height of 45 metres, levels of all released substances would comply with the relevant air quality standards and guidelines. However in order to achieve further reductions in process contributions, a stack height of 55 metres was found to result in an insignificant contribution to airborne concentrations of all substances and thus represents the preferred alternative.
- External plant components have been moved inside the energy recovery facility, where possible, or have been positioned such that they are further from the road in order to minimise visual impact. For example, the lime and carbon silos have been moved from the south west side of the building to the north west elevation. In addition, the two filters have been moved inside the building.
- The vehicle route around the facility is well screened as it aligns with the existing embankment, which provides a foundation to enhance landscaping along the west boundary of the site. An alternative route may not have lended itself to this level of screening.
- The facility was initially to be located on the north section of the site, however this section of the site is not an appropriate size to accommodate such a facility and would involve the demolition of the existing buildings. In addition, the initial position would have meant that the facility would be closer to the village of Ochiltree. The current proposed position of the facility enables the existing buildings located in the north part of the site to be retained.