

NINIAN NORTH PLATFORM DECOMMISSIONING PROJECT

Comparative Assessment
Independent Review Consultant
Report

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1 Introduction

1.1 The Project

The Ninian North Platform (NNP) is operated by CNR International (CNRI) and is one of three fixed platforms in the Ninian field, located in Block UKCS 3/3 and 3/8A in the East Shetland basin of the northern North Sea. The location of the field, along with the associated infrastructure is indicated in Figure 1.

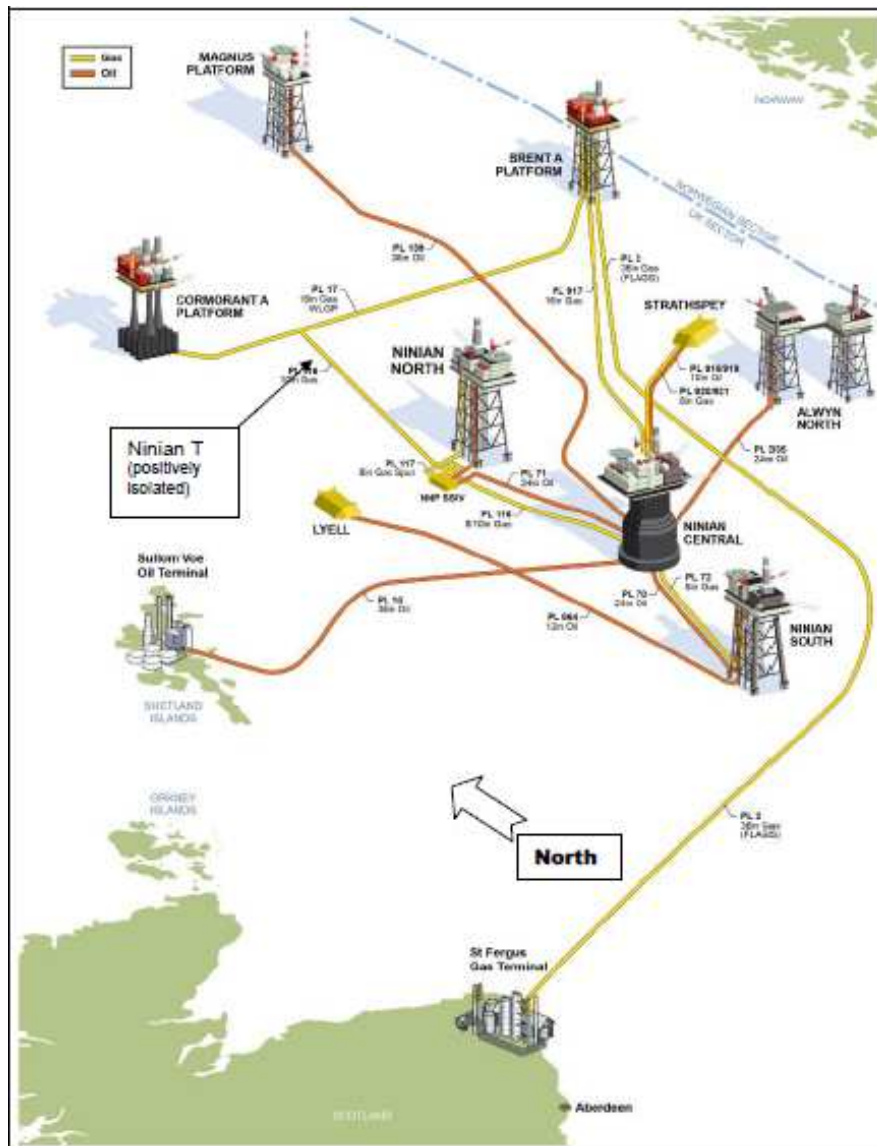


Figure 1 – Location of Ninian Field and Ninian North Platform

The platform consists of an eight legged steel jacket and a topsides structure comprised of 10 modules. The platform has 24 well spots and one spare slot, there are no subsea wells associated with NNP. The approximate weight of materials associated with the jacket is 17,570 tonnes.

During the drilling of the 24 wells, oil based mud (OBM) was used and discharged with the drill cuttings. The discharged drill cuttings have formed a mound on the seabed directly below the platform, covering the bottom of the jacket. The drill cuttings pile has

a maximum height of approximately 12 m, with the cuttings spread evenly across an area of 23,620 m².

The jacket is connected to the seabed by 26 structural piles, each penetrating approximately 50 m into the seabed. The jacket footings (the section of the jacket below the highest point of the seabed that connect the jacket to the seabed) extend to approximately 52.5 m above the seabed.

Production from NNP is routed via the platform separation facilities, where water is separated and gas is utilised as a fuel. Produced oil is fed to the Ninian Central Platform. Additional connections to Ninian Central include a supplementary fuel gas pipeline, and control and power facilities for a subsea production booster pump for the Lyell field. A water injection pipeline connecting the two platforms has previously been taken out of service and isolated. The NNP subsea isolation valve (SSIV) is located on the seabed approximately 128 m from the west side of the platform. The SSIV umbilical is connected to NNP.

NNP is reaching the end of its economic life, therefore CNRI is conducting a pre-planning programme for the decommissioning of the platform, to be submitted to the Oil and Gas Authority of the Department of Business, Energy and Industrial Strategy (BEIS) for approval. Alternative use of NNP has been considered, however no feasible options for its re-use have been identified.

The current decommissioning plans for NNP consider removal of the jacket and topsides only. Removal options for the subsea pipelines and SSIV will be considered under a separate decommissioning plan to be prepared at a later date.

The study principally considered the following decommissioning proposals:

- Full removal of the topsides
 - By single lift; and
 - By multiple lifts.
- Removal of the jacket
 - Full removal of the jacket and footings (including the cuttings pile); and
 - Partial removal of the jacket – jacket cut down to footings, leaving footings elevated a maximum of 52.5 m above the seabed. Drill cuttings pile would remain *in situ*.

1.2 Legislative and Policy Background

Decommissioning activities for offshore oil and gas installations and pipelines in the UK Continental Shelf (UKCS) are regulated under the Petroleum Act 1998, as amended by the Energy Act 2008. The 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention)¹, and subsequent meeting of the OSPAR convention in 1998 (and further meetings to 2006) sets out the UK's obligations on the decommissioning of offshore installations.

The OSPAR Decision 98/3, as agreed at the 1998 convention, prohibits the dumping and leaving, wholly or in part, of offshore installations. All topsides must be returned to shore and any jackets of weight less than 10,000 tonnes must be completely removed for re-use, recycling, or end disposal to land. The jacket piles should be cut below the natural sea bed level at a suitable depth to ensure they remain fully covered.

¹ Decision 98/3 on the Disposal of Disused Offshore Installations, Ministerial Meeting of the OSPAR Commission, July 1998

The Decision does, however, recognise the difficulty in removing the footings of large steel jackets weighing more than 10,000 tonnes and in removing concrete installations. Consequently, whilst there is a presumption that all topsides and steel jackets should be returned to shore for re-use, recycling or final disposal to land, there is facility for derogation from OSPAR to leave jackets of greater than 10,000 tonnes in weight in place, or adopt an alternative disposal option. The competent authority, BEIS, may issue a permit for the following installations to be left in place:

The 1998 Petroleum Act (as amended) places responsibility on the Department of Energy and Climate Change (DECC now BEIS) as the competent authority in the UK for ensuring the obligations of the Act and the OSPAR convention are complied with. Consequently, a series of Guidance Notes² were prepared by DECC in 2011 setting a framework for the decommissioning process. The notes indicate a staged decommissioning programme process, as follows:

- **Stage 1**, preliminary discussions with DECC (BEIS);
- **Stage 2**, detailed discussions and submission of a consultation draft programme to DECC (BEIS) and other interested parties and the public for consideration;
- **Stage 3**, formal submission of a programme and approval under the Petroleum Act;
- **Stage 4**, commence main works and undertake site surveys; and
- **Stage 5**, monitoring of site.

Stage 2 of the decommissioning programme process is the point at which the decommissioning options are considered and proposals developed for the final draft decommissioning plan. Any proposals for derogation under OSPAR for leaving a jacket of greater than 10,000 tonnes *in situ* should be considered and presented to BEIS during this stage. An application for such a derogation should include a comprehensive assessment of the effect of the differing disposal options to allow an authoritative comparative assessment evaluation. The intention of such an assessment is to provide transparency in the evaluation and in turn provide greater confidence in the derogation process.

The (former) DECC guidance notes further advise that the studies and the assessment process that support the chosen decommissioning option are subject to independent expert verification. The notes state that *'The purpose of this verification is to confirm that the assessments are reliable and there is no requirement to verify the final means of weighting and balancing the options but the process must be transparent. This may involve the establishment of an independent review process to evaluate the scope, quality and application of the work undertaken.'*

1.3 Background and Aims

ITP Energised (ITPE) were appointed by CNRI to act as Independent Review Consultant (IRC) to the NNP decommissioning assessment process. ITP Energised were supported by Aurelia Environment on appraisal of certain technical aspects of the report (principally related to the drill cuttings pile and marine environment). The aim of the IRC was to provide verification of the work undertaken by CNRI and the principal consultants undertaking the comparative assessment, environmental impact assessment (EIA) and developing the Decommissioning Plan.

² Guidance Notes on Decommissions of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998. Department of Energy and Climate Change, Version 6, March 2011.

The IRC review of the decommissioning programme comprised a number of key stages:

- Review of the supporting technical documents which informed the comparative assessment process and preliminary EIA;
- Review of stakeholder engagement feedback and how feedback was integrated into EIA and the decommissioning plan;
- Review of final comparative assessment and Environmental Statement.

The appraisal methods and key findings from each stage of the process are outlined in the following sections.

2 Review of Supporting Technical Documents

2.1 Approach to Technical Review

A review was undertaken of a series of technical reports, which were prepared to support the comparative assessment process and EIA. Each report was reviewed in the context of the robustness of the study and its findings. Comments were provided on each report, based on a risk based 'traffic light' system, as presented in Table 1.

Table 1 Technical assessment review comment criteria

Criteria	
Comment indicates agreement with an aspect of the assessment and no risks are identified.	
Comment indicates a minor risk associated with an aspect of the assessment. Indicates that additional explanation; or Clarification of a point is required with respect to assumption or method of assessment.	
Comment indicates a risk associated with an aspect of the assessment. Indicates that additional explanation; or Clarification of a point is required with respect to assumption or method of assessment, and that amendment to the report is required. Further review is required following receipt of amended report.	
Comment indicates significant risks associated with an aspect of assessment. Indicates a material error in the assessment; or Significant deviation from approved methods which will require correction before completion of report.	

Comments on each report were provided to CNRI for discussion and further action depending on the comment criteria. Where a comment was deemed to be amber or red, formal response was provided by CNRI and updated versions of reports provided where necessary. A second round of reviews were undertaken for amended reports and all comments closed out to the satisfaction of both CNRI and IRC.

2.2 Summary of Findings

Commercial Fisheries and Socio-economic Impact

A socio-economic study was undertaken by SFF Services Ltd and Brown & May Marine on behalf of CNRI. The study presented an assessment of the potential economic costs associated with interference on fishing activities during the decommissioning process and in the post decommissioning phase.

The report concluded that during the lifting of the topsides the potential effects will be; "no significant effects due to obstruction". There was no difference in anticipated effect between the evaluation of the single lift or multiple lift scenarios.

Once the 500 m safety zone is removed around the site of the installation it is anticipated that there will be an increase in fishing activities in the area. The partial removal of the jacket will leave the footings, which will present a snagging risk to fishing vessels, depending on the gear operated. No such risk is identified for the full removal option, although potential snagging risks were identified for pipelines and other infrastructure left *in situ*, however, this is outside of the scope of the current NNP decommissioning plan.

Overall, the findings of the study were considered to be robust. No significant risks were identified with the report, with a number of recommendations made on how the findings are presented in the final Environmental Statement (ES).

Drill Cuttings Environmental Assessment

The drill cuttings pile report was prepared by BMT Cordah, utilising survey data and cuttings pile modelling information from previous reports. The study provided information on baseline conditions and considered options for disposal of the cuttings pile.

The drill cuttings pile was established to comprise a coverage area of 23,620 m², with a calculated volume of 33,144 m³. The maximum height of the drill cuttings pile was determined to be 11.93 m, centred on the NNP jacket. Total hydrocarbon concentrations measured from the surface of the drill cuttings pile ranged from 24,700 - 96,300 µg/g, compared to a background sediment concentration in the range 8 - 1,390 µg/g.

The drill cuttings pile was identified to fall well below the OSPAR thresholds for oil release rate (10 tonnes/year) and area persistence (500 km² years), therefore would not require further consideration.

The assessment considered five potential scenario options for the drill cuttings pile, as follows:

- Option 1: Recovery of the whole pile to the platform or a vessel for separation, treatment and discharge of liquids offshore and transportation and treatment of solids onshore;
- Option 2: Recovery of the whole pile to a vessel for transportation of slurry onshore for separation and treatment;
- Option 3: Recovery of whole pile to the platform and for the injection of the slurry into part of the Ninian North rock formation;
- Option 4: Dispersion/redistribution offshore in the areas surrounding the NNP jacket; and
- Option 5: Leave *in situ* for natural degradation.

The environmental impacts associated with each of the options were analysed based on the energy and emissions associated with each option and the results of the drill cuttings modelling on the nature, extent and duration of impacts on the seabed and water column.

Whilst the energy use and emissions associated with each of the disposal option varied, the potential impacts for all options were considered to be of low significance.

The assessment of the potential impacts associated with Options 1-3 for disposal of the drill cuttings pile, indicated potential for frequent back-flush to clear blockages in the excavation system. The back-flush process would give rise to discharge of cuttings slurry into the water column, with the potential to cause short-term effects leading to a moderately significant effect.

Option 4, for the re-distribution of the drill cuttings pile offshore, also indicated potential effects on the water column as the redistributed cuttings pile settles. A potential significant impact was identified during the period until settling had occurred (579 days). Redistribution of the drill cuttings pile is predicted to lead to a surface area in which the THC concentration exceeds 50 mg/kg, similar to that of the existing surface area affected by the pile.

Option 5 was identified as being the best management option for the pile, as it presents the lowest level of physical disturbance and the greatest potential for recovery of the wider contaminated sediments of the pile. Option 5 would only be possible should derogation be granted to leave the jacket footing in situ. Other options will require the disturbance of the drill cutting pile during cutting of the footings below the seabed.

Overall, the findings of the study were considered to be robust. No significant risks were identified with the report, with a number of recommendations made on how the findings are presented in the final Environmental Statement (ES).

Energy and Emissions

An assessment of the energy use and associated emissions for the differing topsides and jacket decommissioning options was undertaken by BMT Cordah. The assessment was undertaken in accordance with Institute of Petroleum (IoP) guidelines³. The assessment considered the full project lifecycle for each decommissioning option, including the embedded energy and related emissions associated with structures (i.e. jacket footings) not recovered and recycled, as well as direct energy use and emissions.

The assessment was informed by an inventory of materials which form the topsides and jacket of the NNP prepared by CNRI. Equipment and vessel use, and the associated energy use for each option was determined through experience of the Murchison Decommissioning project and draft method statement plans. Energy and emissions were calculated based on these defined activity data and published energy and emissions factors in IoP guidelines and other sources where particular factors were unavailable.

The topsides decommissioning option with the lowest energy use and emissions was a single lift removal. Energy use and emissions associated with reverse installation and small piece deconstruction were approximately 25% higher than for the single lift scenario.

For jacket decommissioning the highest source of energy use (and emissions release) was determined to be the embedded energy in recyclable materials left *in situ* or

³ Guidelines for the calculation of Estimates of Energy Use and Gaseous Emissions in the Decommissioning of Offshore Structures, Institute of Petroleum 2000

landfilled, where partial removal options were considered. Accordingly, the least energy use and associated emissions were predicted for the full removal option.

The assessment also considered the energy use and emissions associated with the differing options for treatment of the drill cuttings pile. The onshore treatment and disposal of the drill cuttings was deemed to be the most energy intensive and would generate the highest emissions. Leaving the drill cuttings pile *in situ* will require no work and therefore will require no energy and generate no emissions.

The study was found to follow relevant technical guidance and the calculations were checked to confirm accuracy. Following minor corrections the study was considered to be robust and, through following a consistent approach between options, provided a clear comparison on the relative energy use and emissions associated with each option.

Environmental Description Report

An environmental description report was prepared by BMT Cordah to summarise the environmental and socio-economic baseline conditions for the NNP decommissioning project. The report considered the physical and chemical environment, biological environment and socioeconomic environment. The baseline characterisation was used to inform the differing assessment reports (e.g. underwater noise sensitive receptors, extent and current effects on the drill cuttings pile, and seabed chemistry).

The study was informed by published information, or historical survey data for the field. The most recent marine survey was undertaken in 2011⁴. It was recognised that the (former) DECC decommissioning guidance identifies that representative marine survey data would ideally be available from within the last five years (i.e. '*unlikely that a new survey would be required if a relevant survey has been undertaken in the last five years*'). Since the survey data dates from 2011 and no significant changes have taken place, that would have impacted the seabed since 2011, the data is still considered appropriate.

The report presented a comprehensive description of the baseline environment, based on survey data obtained following appropriate methods, or based on established published data. The study was considered appropriate to inform the differing assessments and the EIA.

Underwater Noise Report

The underwater noise assessment was undertaken by BMT Cordah. The assessment identified potential noise sensitive receptors, established appropriate noise evaluation criteria for each receptor and presented worst case predicted noise levels for assessment against the defined evaluation criteria.

The most sensitive species identified in the vicinity of the field, and with potential to be present during decommissioning activities were marine mammals, namely: harbour porpoise; killer whales; and long-finned pilot whales and Minke whales. Fish were also identified as a potential noise sensitive receptor. No potential presence of pinnipeds was identified within the study area, therefore these were not considered as noise sensitive receptors. Noise evaluation criteria were established for fish and identified marine mammals based on published thresholds for injury and disturbance at differing frequencies of noise.

⁴ ISS/Andrew Survey 2011 Pipeline Inspection and Environmental Survey Phase 2 Report, Reference PLS-ISS-SU-REP-15430, 2011

Source noise levels for differing decommissioning activities were established with reference to published data. The highest identified sound power level was for vessel noise. A cumulative noise level was identified, representative of a number of vessels operating in close proximity, and predictions of potential noise levels undertaken. Predictions did not indicate noise levels above the thresholds for injury. The predictions indicated potential for disturbance of marine mammals within a localised area (up to 100 m from source).

Overall, the findings of the study were considered to be robust. No significant risks were identified with the report, with a number of recommendations made on how the findings are presented in the final Environmental Statement (ES).

3 Stakeholder Consultation

Stakeholder engagement was identified by CNRI as fundamental to developing a well-structured and robust decommissioning programme. Engagement comprised two distinct elements; general consultation and engagement in relation to the decommissioning proposals, and specific consultation with statutory bodies on the scope of the Environmental Impact Assessment. These processes are summarised in the following sections.

3.1 Stakeholder Engagement

A stakeholder engagement plan was developed by CNRI. The plan was developed based on experience gained during the Murchison decommissioning project. Key aspects of the stakeholder engagement included:

- A designated stakeholder engagement lead, to facilitate the planning and implementation of the engagement process;
- A dedicated project website, regularly updated and with access to latest published project information;
- Regular engagement with BEIS Offshore Decommissioning Unit and Oil and Gas Authority;
- Meetings and direct discussions with key stakeholders, including
 - Scottish Fishermen's Federation (also representing the UK Fisheries Offshore Oil and Gas Legacy Trust Fund (FLTC) and National Federation of Fishing Organisations (NFFO));
 - Joint Nature Conservation Committee (JNCC); and
 - Marine Scotland.

A stakeholder workshop was held on 7th December 2016 at Aberdeen Science Centre. Invitation to the workshop were sent to a comprehensive group of Governmental stakeholders, statutory agencies, non-Governmental bodies and some academic and commercial parties, identified based on experience from the Murchison decommissioning project.

The workshop was facilitated by BMT Cordah and included a series of presentations by CNRI on the decommissioning proposals and the technical challenges involved in the project; the safety and environmental considerations in the project; and the societal considerations based on identified socio-economic effects. The method and preliminary outcomes of the Comparative Assessment process (Section 4) were outlined as part of the presentations. Presentations were followed by a series of question and answer sessions, and additional time was provided during break-out sessions for stakeholder feedback on particular aspects.

The workshop was attended by key members of the CNRI project team, including the Decommissioning Project manager and engineer, senior project engineers for pipelines, structures and technical safety, installation management and members of the Safety, Health and Environment (SHE) team.

Key issues raised at the event, included:

- Proposals for derogation application to BEIS under OSPAR for jacket decommissioning;
- Effect on the cuttings pile of jacket removal options and how this was considered in the comparative assessment;
- Requirement for safe marking and lighting of jacket location, post-decommissioning; and
- Localised onshore effects of decommissioning activities, including process by which onshore decommissioning yards would be selected.

The issues raised were fed back into the Comparative Assessment process, although no specific requirements to revisit the findings of the preliminary comparative assessment were identified.

In delivering the workshop and other direct statutory consultation, CNRI were open and transparent on the process which had been used to identify the preliminary decommissioning proposals and how the differing options were scored on technical feasibility, safety and environmental effects through the assessment process. Opportunities were provided, both in open forum and for one-to-one sessions during the workshop to clarify matters or for feedback on the process. The workshop and stakeholder engagement process to date is considered to have been in line with CNRI's commitment to transparency and to making available to stakeholders, in a timely manner, all information and data that can reasonably be provided.

Following submission of the draft Decommissioning Programme, a further round of statutory consultation will be undertaken. The findings will inform the Stage 2 Decommissioning Programme, which will include results of the statutory consultation and stakeholder engagement.

3.2 EIA Scoping

An EIA Scoping report⁵ was prepared in advance of the EIA and draft Environmental Statement for the project. The EIA Scoping report provided an overview of the project, a summary of the baseline environment, and an identification of the potential impacts associated with the project. The aim of the EIA Scoping was to identify the potentially significant effects associated with the project which would require further consideration in the EIA. Potential effects identified as not potentially significant were scoped out of the final EIA and not considered further.

The EIA determined the following potentially significant effects, which would require further consideration in the EIA:

- Physical presence of vessels causing potential interference with other users of the sea;
- Effects of seabed disturbance during decommissioning operations – vessel anchoring;
- Effects of drill cutting disturbance;

⁵ Ninian North Platform EIA Scoping Report, Document reference P0005-BMT-EN-REP-00001, BMT Cordah, August 2016

- Effects associated with cuttings pile management;
- Effects of energy use and atmospheric emissions;
- Effects of underwater noise during decommissioning activities;
- Effects associated with near-shore and onshore dismantling of structures – noise and dust;
- Cleaning of marine growth from jacket;
- Landfill disposal and associated impacts; and
- Socio-economic impact and safety risk to fisherman from derogated footings.

The scoping report provided a comprehensive overview of the project and the potential effects identified by the project team (Chapter 4). The report was issued to statutory consultees, and some non-statutory bodies identified through the stakeholder engagement process, for consideration, with scoping responses received from BEIS Environmental Management Team (EMT), Greenpeace, JNCC, Marine Scotland and Northern Lighthouse Board (NLB). Principal comments received, specific to the EIA scope (i.e. excluding general response to the proposals – incorporated under stakeholder engagement above) were:

- Review of impact assessment, to ensure all receptors have been considered and to provide clarity on basis for determining whether an impact is significant and therefore scoped in/out of assessment (with or without mitigation);
- Advice that *Lopelia pertusa*, whilst an Annex I habitat species, should only be considered where natural, with marine growth on the jacket not considered natural;
- Requirement to document consideration of alternatives, including options for complete or partial removal of the jacket;
- Requirement to document details of the drill cuttings pile, e.g. findings of sampling, volumes, and how it will be managed during decommissioning;
- Recommendation to undertake a complete cumulative assessment as part of the EIA;
- Identification of omitted Marine Protected Areas from scoping;
- Requirement that where explosive use is proposed that the effects are considered as part of underwater noise assessment; and
- Clarification of how the phased decommissioning works will be considered as part of any cumulative assessment.

A response from Greenpeace to the scoping report was focussed on the wider context of OSPAR and the collation of data from differing drill cuttings piles for further consideration and assessment. No specific comments relating to the EIA Scoping were provided.

Where specific points or questions were raised by statutory consultees on the scope of the EIA a response was provided by CNRI clarifying points or providing commitment to incorporate requirements into the final EIA.

4 Comparative Assessment

4.1 Overview of Comparative Assessment Options

Jacket Decommissioning

The Comparative Assessment initially considered the following options in relation to the jacket decommissioning:

- Full removal, single lift;

- Full removal by multiple lifts;
- Partial removal by single lift;
- Partial removal by multiple lifts; and
- Buoyancy tank assemblies (BTA).

Following appraisal of the technical feasibility of each option, only two options were carried forward for full assessment, namely the full removal by multiple lifts and partial removal by multiple lifts. It was deemed that current technology and vessel scale would not allow for the single lift of either full or partial jacket removal. The use of BTA was deemed inappropriate due to the risk of grounding during transport and the requirement to traverse live infrastructure *en route* onshore (with the associated consenting requirements).

The methods associated with each of the decommissioning options considered are summarised in Table 2.

Table 2 Decommissioning options for jacket removal considered in comparative assessment

Decommissioning option	Method
Full removal (multiple lifts)	Jacket top section members cut into sections and lifted by Heavy Lift Vessel (HLV). Drill cuttings pile removed to allow access to jacket footing. The piles in the seabed would be cut 3 m below the seabed.
Partial removal (multiple lifts)	Jacket top sections cut into smaller sections down to the top of the footings and removed in multiple lifts.

Drill Cuttings Pile Decommissioning Options

The Comparative Assessment initially considered the options in Table 3 in relation to the drill cuttings pile decommissioning.

Table 3 Decommissioning options for drill cuttings pile management

Drill cuttings option	Method
Option 1 (recover to surface, separation of cuttings offshore, liquids treated and released offshore, solids transported onshore)	Recover drill cuttings to the surface (either to platform or a vessel) using the Remotely Operated Vehicle (ROV) dredge system; separate solids from fluids offshore, discharge the treated oily fluids under permit to the offshore environment and transport the solids for onshore treatment and landfill disposal.
Option 2 (recover to surface, slurry to shore)	Recover drill cuttings to the surface using the ROV dredge system to a vessel for direct transport to shore for separation and treatment; oily water to be discharged under permit in a coastal environment and the dry cuttings disposed of to landfill.
Option 3 (recover to surface, offshore re-injection)	Recover drill cuttings to the surface using the ROV dredge system to the platform for slurrification and disposal through a Cuttings Re-Injection (CRI) system to an existing well, which would be converted to a disposal well.
Option 4 (redistribution of drill cuttings on the seabed)	An ROV dredge system collects the cuttings and an exhaust pipe distributes them from a number of discharge locations 70 m from the current position.
Option 5 (leave in situ)	No removal.

4.2 Comparative Assessment Method

The Comparative Assessment considered each of the potential decommissioning options against a series of assessment criteria. The criteria were broadly consistent with the assessment criteria for OSPAR derogation set out in Annex A of (former) DECC decommissioning guidance and were as follows:

- Safety
 - Quantitative assessment of safety impacts for jacket decommissioning options;
 - Qualitative assessment of safety impacts for drill cuttings pile decommissioning options;
- Environmental
 - Qualitative assessment of environmental risk;
 - Quantitative assessment of energy use;
 - Quantitative assessment of emissions;
- Technical feasibility
 - Qualitative assessment of technical feasibility;
 - Qualitative assessment of ease of recovery of excursion;
 - Qualitative assessment of use of proven technology and equipment;
- Societal impact
 - Qualitative and quantitative assessments of commercial and socio-economic impacts
- Economic
 - Quantitative assessment of capital expenditure, ongoing monitoring and liability.

All options were considered with specified mitigation in place (where necessary). In each case a number of sub-criteria were applied to the assessment as detailed in Table 4.

Table 4 Description of criteria and sub-criteria used in the comparative assessment

Main criteria	Sub-criteria	Description of sub-criteria	Assessment of sub-criteria
Safety	Risk to project personnel offshore	Safety risk to project personnel working offshore.	Quantitative estimate of total Potential Loss of Life (PLL) for project personnel.
	Residual risk to other users of the sea	The combined safety risk to the crews of commercial fishing vessels, the crews of military vessels and the crew and passengers of commercial shipping vessels.	Independent quantitative assessment of PLL to fishermen of snagging risk posed by residual infrastructure, and a quantitative assessment of consequent risk to life and limb, as a result of the option's end-points for other users of the sea
Environment	Impacts of operations	The impacts of offshore and nearshore operations on any aspect of the marine environment. The impacts of onshore operations (e.g. dismantling, transporting, treating, recycling) on any ecological aspect of the terrestrial environment.	Qualitative assessment where impacts are assessed and the significance categorised according to a pre-defined Risk Assessment Matrix.
	Impacts of end-points	Impacts of offshore and nearshore end-points on any aspect of the marine environment. The impacts of onshore end-points (e.g. landfilling, secondary use) on terrestrial environment.	
	Total energy consumption	Total energy consumption (GJ).	Estimated energy consumption (GJ) and CO2 emissions (tonnes) attributable to the defined option. Total includes embedded energy of materials not recycled (i.e. jacket left in situ). Scores averaged to provide an overall score for energy and emissions.
	CO2 emissions	CO2 emissions (tonnes).	
Technical	Technical feasibility	Assessment of the technical feasibility of each option.	Expert judgement based on the range of engineering and technical studies carried out by the CNRI decommissioning team and their independent consultants.
	Ease of recovery from excursion	Assessment of the ability to recover from unplanned excursions and complete the planned decommissioning option.	
	Use of proven technology and equipment	Assessment of the extent to which the option requires the use of proven technology.	
Societal	Commercial impact on fisheries	Impact of operations and end-points on the commercial fisheries in and around the field. (NB Safety risks were considered under "safety" above).	Qualitative assessment based on the level of fishing activity in the area, the type of gear used, the value of the fishery, and the value of the ground that may or may not be available for fishing on completion of the options.

Main criteria	Sub-criteria	Description of sub-criteria	Assessment of sub-criteria
	Socio-economic impacts to amenities	The risks from any near-shore and onshore operations and end-points (dismantling, transporting, treating, recycling, land filling) on any aspect of the amenity or infrastructure of the environment.	Qualitative assessment based on the results of the Environmental Impact Assessment (EIA) process, where impacts are assessed and the significance categorised according to a pre-defined Risk Assessment Matrix. Also informed by feedback from stakeholder dialogue.
	Socio-economic impacts on communities	The risks from any near-shore and onshore operations and end-points (dismantling, transporting, treating, recycling, land filling) on the health, well-being, standard of living, structure or coherence of communities.	Qualitative assessment based on the results of the EIA process, where impacts are assessed and the significance categorised according to a pre-defined Risk Assessment Matrix. Also informed by feedback from stakeholder dialogue.
Economic	Economic	Total project cost. The estimated total Capital Expenditure (CAPEX) cost plus a Net Present Value (NPV) estimate of the cost of any ongoing liability.	Quantitative estimate by CNRI based on the programmes and schedules being prepared for the "Select" phase of the project.

For each of the options considered a score was determined based on the assessment of the sub-criteria. Where quantitative assessment was undertaken the directly calculated values were used in the assessment. Where a qualitative assessment was undertaken a score for each option was determined using CNRI risk assessment criteria, based on the likelihood of occurrence and the severity of effect.

The best scoring option in each category (lowest or highest, depending on the mechanism) was given a score of 100% of the weighting percentage outlined in Table 5. A normalised weighting score for each of the other options was calculated on a proportional basis against the best score for that option.

Table 5 Comparative assessment criteria weightings

Criteria/ sub-criteria	Weighting (percentage)
Safety – quantitative (PLL)	30.0
Environmental - Environmental Risk	13.3
Environmental - Energy Use	3.35
Environmental – Emissions	3.35
Technical Feasibility	20.0
Societal	10.0
Commercial	20.0
Total	100

An overall assessment value was determined for each option based on the sum of the weighted scores for each category. The scorings were used to provide a quantified comparison of the differing options to identify the preferred option.

The assessment method provided a balanced approach, with safety deemed the most important consideration, environmental, technical feasibility and commercial considerations each weighted equally (20% weighting) and societal impacts given a

lesser weighting. The consistent approach applied across all options meant that each was evaluated on a consistent basis, and direct comparison could be made between them.

4.3 Comparative Assessment Workshops

The comparative assessment was undertaken through a series of workshops to evaluate the effects of each differing aspect of decommissioning on each of the defined assessment criteria. Two workshops were held, on 4th and 7th October 2016 respectively, to undertake the assessments, with a feedback workshop held on 25th October 2016 to review the preliminary findings of the comparative assessment.

The workshops were independently facilitated by BMT Cordah and attended by various CNRI personnel with differing specialisms, as well as a representative of the Scottish Fishermen’s Federation. The attendees at each workshop are listed in Table 6. The CNRI team were experienced in decommissioning, with most of the team previously involved in developing the decommissioning programme for Murchison and currently delivering the programme. The Murchison project provided invaluable industry experience in evaluating potential risks and effects.

Table 6 Comparative assessment workshop attendees

Name	Role	Company	Workshop Attended	
			4th Oct 2016	7th Oct 2016
Ceri Wheaton	SHE Advisor/ CA Process Lead	CNRI	√	√
Murdo MacRitchie	Decommissioning Project Lead	CNRI	√	√
Gabriel Neves	Project Controller	CNRI	√	
Mark Raistrick	Project Engineer	CNRI	√	√
Alan Minty	Operations - OIM	CNRI	√	√
Roy Aspden	Decommissioning Manager	CNRI	√	√
Jonathan Hoare	Pipeline Engineer	CNRI	√	
Peter Ronnie	Operational SHE Team Leader	CNRI	√	
Olivia Robertson	SHE Advisor	CNRI		√
Chris Cook	Operations - OIM	CNRI	√	
Caroline Lawford	Structural Engineer	CNRI	√	
Mike Corcoran	Decommissioning Strategy Consultant	CNRI	√	
Paul Johnson	Technical Safety Engineer	CNRI	√	√
Peter West	Industry Advisor	SFF	√	
Stuart McGowan	Independent Review Consultant	Energised Environments	√	
Jonas Beaugas	Independent Review Consultant	Energised Environments		√
Claire Hinton	Principal Environmental Consultant / Facilitator	BMT Cordah	√	√
Gareth Jones	Principal Environmental Consultant / Facilitator	BMT Cordah	√	√
Faron McLellan	Environmental Consultant/ Scribe	BMT Cordah	√	√
Dorota Bastrikin	Senior Environmental Consultant	BMT Cordah	√	

The initial workshop considered the options for the jacket decommissioning, whilst the second workshop considered the options for drill cuttings pile management. The consideration of each option was informed by the legislative framework, including OSPAR and (former) DECC guidance notes, the technical assessments undertaken in support of the comparative assessment and CNRI's internal safety, health and environment policies.

4.4 Comparative Assessment Appraisal and Recommendations

The assessment of the decommissioning options for the jacket identified the following:

- Safety
 - The reduced complexity and reduced number of lifts required for the partial jacket removal option resulted in a lower risk score for operational personnel than for the full jacket removal.
 - Conversely, leaving the jacket footings *in situ* will present a snagging risk to fishermen, whereas no risk is posed for the full removal option.
 - The summed scores indicated a lower overall safety risk for the partial jacket removal and therefore a higher weighted score for safety considerations.
- Environmental
 - The main differentiator between the two options is the treatment of the jacket footings. Full removal will require disturbance of the drill cuttings pile, with the differing management options requiring additional energy use, generating emissions or leading to marine impacts. Leaving the cuttings pile *in situ* and allowing it to degrade over time was deemed to present a lower environmental risk.
 - The full removal of the jacket will necessitate additional requirement for handling and disposal of marine growth offshore and the dismantling and disposal of material onshore.
 - Conversely the energy and emissions required to manufacture steel equivalent to that which will be left *in situ* for the partial removal option means that the full removal option scored higher on energy and emissions.
 - Overall, the summed scores indicated a higher weighted score for partial removal than for full removal.
- Technical feasibility
 - The partial removal option was considered to present the lower likelihood of failure and therefore achieved a higher weighted score.
 - The complexity of removing the jacket footings (requiring treatment of the drill cuttings pile) required the use of more complicated equipment and procedures, therefore the partial removal option also scored higher on the use of proven technology and ease of recovery from excursion.
 - Overall, the summed scores indicated a higher weighted score for partial removal than for full removal.
- Societal impact
 - The societal impact scorings were similar for both options. The full removal option was deemed to have a slightly greater impact due to the longer time period over which onshore activities, and therefore localised nuisance, would occur, due to the increased number of jacket sections being handled in the full removal option.
- Cost
 - Jacket decommissioning by partial removal had a lower cost due to the reduced decommissioning time and lesser complexity of activities. The vessel, equipment and personnel requirements would therefore be less. Accordingly the partial removal option had a lower estimated cost.

- The ongoing liability costs related to snagging risks for the fishing industry are a consideration for the partial jacket removal. No ongoing liability costs were determined for the full removal option.
- Overall, the summed scores indicated a lower cost and therefore higher weighted score for partial removal than for full removal.

The assessment of the decommissioning options for the drill cuttings pile was considered separately. The findings are summarised below:

- Safety: leaving the drill cuttings pile *in situ* had the lowest safety risk and therefore highest weighted score. The increased time periods for personnel offshore for Options 1-4 resulted in higher risk scores.
- Environmental: movement and treatment of the drill cuttings pile identified potential risks associated with the offshore discharge of oil waters offshore (Options 1 and 2); accidental release of cuttings during movement, transport or injection (Options 1, 2 and 3) and onshore disposal effects (Options 1 and 2). Interaction with fishing gear (Options 4 and 5) and allowing natural degradation (Options 4 and 5) were also identified. Energy use and emissions were typically higher for options requiring the highest levels of transport (Options 1 and 2). Overall, leaving the cuttings pile *in situ* was identified as presenting the lowest environmental risk and therefore had the highest weighted score.
- Technical feasibility: A number of risks were identified around the pumping of cuttings pile slurry to the surface due to its viscous nature (Options 1-3). Re-injection of the cuttings (Option 3) was deemed to present the highest technical risk. Leaving the cuttings pile *in situ* was identified as presenting the lowest environmental risk and therefore had the highest weighted score.
- Societal impacts: treating the cuttings or residual solids onshore (Options 1 and 2) were identified as having the potential for the highest societal impact and therefore had the lowest weighted scores. Options for offshore management scored lower on societal impact, with leaving the cuttings pile *in situ* identified as the lowest societal risk and therefore highest weighted score.
- Cost: the costs for the differing cuttings pile options directly related to the personnel time and vessel/equipment requirements. Leaving the cuttings pile *in situ* required an ongoing liability cost, but no direct costs and accordingly was estimated to be the lowest cost and therefore the highest weighted score.

When the weighted scores were combined, the highest scoring option was the partial jacket removal option (multiple lifts) combined with leaving the drill cuttings *in situ*.

To verify the findings of the Comparative Assessment, an additional scenario was considered whereby cost was excluded from the assessment to ensure that commercial considerations were not over-riding any safety, environmental, technical feasibility or societal concerns. The weighted scores for each decommissioning option were reassessed, however, the ranking of options remained unchanged, and with the highest scoring option still the partial jacket removal option (multiple lifts) combined with leaving the drill cuttings *in situ*.

Further sensitivity analysis of the assessment process was undertaken using a Monte-Carlo simulation analysis to test whether the result of the assessment would change were different criteria weightings utilised. The sensitivity analysis confirmed that the results of the assessment would not change were different weightings applied.

Overall, it was considered that the Comparative Assessment process provided a robust analysis of the differing decommissioning options for both the jacket and drilling cuttings pile and that a reasoned conclusion was reached, in which the recommended option for

decommissioning was partial jacket removal by multiple lifts, and to leave the drill cuttings pile *in situ*.

5 Environmental Impact Assessment

5.1 Overview and Findings

An EIA of the recommended decommissioning option of partial jacket removal by multiple lifts and to leave the drill cuttings pile *in situ* was undertaken. The EIA also considered the two methods for removal of the topsides, as the final method for topsides removal will be determined during the contracting phase. The final EIA was undertaken by BMT Cordah, in line with the EIA Scoping report and the findings reported in an Environmental Statement⁶.

The EIA was undertaken in line with good practice and identified the relevant policy and guidance which inform the assessment requirements, baseline conditions and particular environmental sensitivities, and impact assessment of those effects deemed to be potentially significant. The assessment specifically considered:

- Energy use and atmospheric emissions;
- Underwater noise;
- Seabed disturbance;
- Socio-economic impacts;
- Waste; and
- The potential effects of an accidental event.

The EIA concluded that there would be no potential for significant adverse effects, with mitigation proposed in line with industry good practice, where appropriate.

A review of the EIA was undertaken, following the same process described for the Technical Assessments (Section 2.1). Comments on the EIA and draft Environmental Statement were provided, with particular consideration given to ensuring comments from the round of reviews for the technical assessment reports had been incorporated in the final Environmental Statement. Particular consideration was also given to ensuring the comments from stakeholder consultation, and in particular scoping responses from statutory consultees, had been addressed in the final assessment.

Overall, the EIA was considered to present a robust assessment of the potential environmental impacts associated with the decommissioning programme. All potential effects were identified and those deemed potentially significant were considered in detail. The assessment of impacts was undertaken based on the findings of the technical assessments prepared to inform the decommissioning proposals. The assessments were undertaken in line with industry guidance and by experienced consultants. The conclusions of the EIA, as reported in the Environmental Statement are considered appropriate.

5.2 Applicability to Decommissioning Plan

No significant environmental or socio-economic impacts were determined as a consequence of the proposed decommissioning activities. The proposed mitigation measures and environmental management measures identified as part of the EIA will

⁶ Ninian Northern Platform Late Life & Decommissioning Project, Report – Environmental Statement, Report Reference P0005-BMT-EN-REP-00006, January 2017.

require to be adopted as part of the decommissioning plan procedures, however no changes to the decommissioning programme are required as a consequence of the EIA.

6 IRC Report Conclusions

Following appointment by CNRI the Independent Review Consultants, Energised Environments (and supporting specialists) have worked closely with CNRI to oversee the process undertaken to develop the draft decommissioning programme. That process entailed:

- Technical review and risk based appraisal of a series of technical reports (and earlier reports which in turn informed the technical assessments);
- Review of project descriptions and decommissioning proposals to ensure consistent project brief was being considered across all assessments;
- Review of proposed methods of evaluation for the Comparative Assessment;
- Attendance at Comparative Assessment workshops in a review capacity;
- Review and constructive input to stakeholder engagement strategy and EIA Scoping Report consultation;
- Attendance at stakeholder consultation workshop in a review capacity;
- Multiple project feedback meetings and regular communication with project team; and
- Review of draft Environmental Statement and Decommissioning Programme.

Through each stage of the IRC review process the risk based comments provided in response to each document, assessment or strategy were documented, with response provided by CNRI, and additional rounds of comments and response documented as appropriate. The process was undertaken in accordance with CNRI quality assurance and document control procedures, ensuring final sign-off and close out of any issue raised throughout the process.

The CNRI decommissioning team is experienced, with most having previously worked on preparing the decommissioning programme for Murchison and currently engaged in the decommissioning activities. The lessons learned during the development of the Murchison decommissioning programme were applied in the NNP planning process and real life experiences from the ongoing decommissioning activities informed the assessment process.

The process of identifying the potential decommissioning options for the topsides, jacket and drill cuttings pile followed a clear and structured process, whereby all options were initially considered and then particular options eliminated on the basis of technical feasibility, where necessary. All options deemed technically feasible (even if difficult) were carried through to the Comparative Assessment process.

The Comparative Assessment process considered each potential decommissioning option on the basis of defined criteria, as outlined in the appropriate (former) DECC guidance notes. The weightings applied to the differing criteria were deemed appropriate, with greatest weight given to safety concerns. Technical feasibility, environmental risk and cost were given equal weighting, and societal impacts given a lesser weighting.

The assessment of each of the criteria were informed by studies commissioned by CNRI into the baseline environment and potential environmental impacts, technical safety risk and socio-economic impacts on fisheries. The studies were each commissioned from experienced consultants in each field and found to be robust and in line with good

practice (the technical safety risk assessments were not reviewed by IRC, however the reports were internally reviewed by CNRI).

The Comparative Assessment workshops involved an experienced team of CNRI personnel, covering a range of disciplines and specialisms. The workshops were facilitated and chaired by BMT Cordah, however discussion and assessment on the potential effects associated with each aspect of the decommissioning programme, and for each decommissioning option considered, were undertaken by CNRI. Reasoned debate was undertaken around each aspect to ensure balanced scoring was achieved through consensus from the group on each aspect considered. The process of scoring was transparent and followed the method agreed in advance of the workshop, and in line with CNRI corporate SHE standards.

A consistent approach was adopted across the evaluation of each option, allowing direct comparison of option scoring to be undertaken. This approach provides confidence in the process and the preferred options determined. The sensitivity analysis undertaken of the scoring, and the re-evaluation of the scoring without costs consideration, provided an additional level of confidence in the findings of the Comparative Assessment process.

Stakeholder engagement was deemed to be an important consideration by CNRI throughout the process. A targeted consultation approach was observed, with direct communication with key statutory stakeholders identified as the principal engagement, but with information available for other interested parties through the website and news updates. A wide number of statutory and non-statutory consultees were invited to the stakeholder workshop, and the informal nature of proceedings provided opportunity for stakeholders to raise issues or queries in open forum or in direct conversation with relevant CNRI personnel. Feedback received through this process was observed to be documented and fed back to the project team for consideration in finalising the draft decommissioning programme.

The final EIA of the decommissioning programme proposals for a preferred option of partial jacket decommissioning with multiple lifts and to leave the drill cuttings pile *in situ* was technically reviewed. The assessments were consistent with earlier reports, and in line with industry guidance and good practice. The conclusions of the EIA, that no significant impacts are predicted, providing identified mitigation is employed and environmental management adopted, is considered robust.

Overall, the development of the draft decommissioning programme for NNP has followed a structured approach, which has been documented at each stage of the process. The quality assessments of potential safety, environmental and socio-economic effects, which, coupled with CNRI's decommissioning experience and review of technical feasibility of differing options, provide a strong technical base for the decision making process. The decision making process was observed to be transparent and conducted by an experienced team following a consistent approach. The IRC therefore considers that the decommissioning programme proposals are robust and supporting information should allow any application for derogation from OSPAR Decision 98/3 to be determined.



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