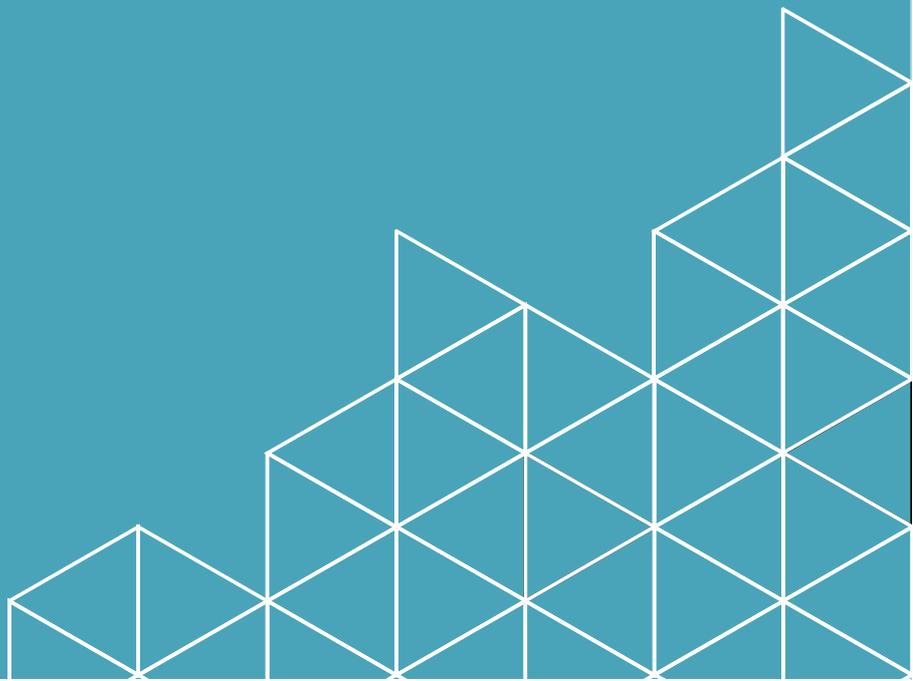




NIRAB Working group overview

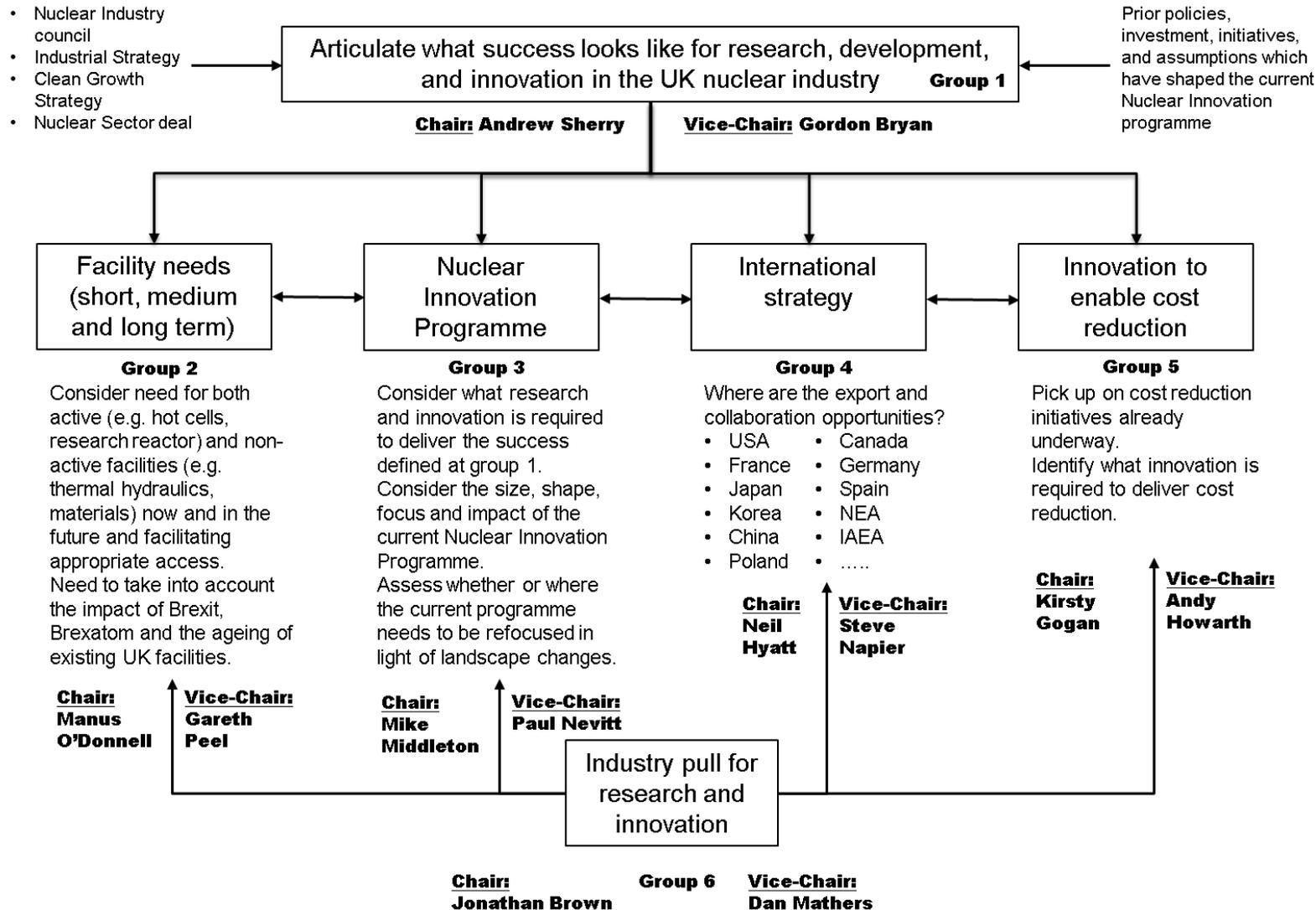
NIRAB-187-4



Introduction

1. The need for a series of NIRAB working groups was identified at the inaugural meeting of NIRAB held on April 10th 2018. The initial 6 priority topics for NIRAB and the structure of a series of working groups required to address these priorities are shown in the diagram overleaf. This document brings together the terms of reference for the corresponding six working groups of NIRAB, along with their membership. These terms of reference supplement the main NIRAB terms of reference (NIRAB-151-1).

Working group structure



Working group membership

	Working Group 1 (What does success look like)	Working Group 2 (Facility needs)	Working Group 3 (Nuclear Innovation Programme)	Working Group 4 (International strategy)	Working Group 5 (Cost reduction)	Working Group 6 (Industry pull)
NIRAB Chair	Andrew Sherry	Manus O'Donnell	Mike Middleton	Neil Hyatt	Kirsty Gogan	Jonathan Brown
NIRO Vice-chair	Gordon Bryan	Gareth Peel	Paul Nevitt	Steve Napier	Andy Howarth	Dan Mathers
Members	Tim Abram	David Boath	Tim Abram	Tim Abram	David Boath	Tim Abram
	Gregg Butler	Grace Burke	David Boath	Stuart Broadley	Maggie Brown	Paul Brown
	Ian Chapman	Stephen Garwood	Stuart Broadley	Mamdouh El-Shanawany	Paul Brown	Grace Burke
	Miranda Kirschel	Monica Jong	Maggie Brown	Robin Grimes	Miranda Kirschel	Chris Moore
	John Molyneux	Francis Livens	Hector Iacovides	Malcolm Joyce	Mike Lewis	Bob McKenzie
	Chris Moore	Tom Scott	Phil Litherland	Ralf Kaiser	Phil Litherland	Lee Peck
	Andrew Randewich	Stephen Smith	Tom Scott	Mike Lewis	James Marrow	Stephen Smith
	Tom Scott	Ashley Townes	Eugene Shwageraus	James Marrow	Mike Middleton	Andy Storer
	Stephen Smith	Rick Short (NDA)	Stephen Smith	Tom Scott	Eugene Shwageraus	
	Andy Storer		Chris White	Eugene Shwageraus	Stephen Smith	
	Melanie Brownridge (NDA)		Victoria Mico (EPSRC)	Stephen Smith	Alan Hutchison (NDA)	
			Darrell Morris (NDA)	Chris White		
				Paul Woollin		
			Neil Bateman (EPSRC)			
			John Mathieson (NDA)			

Working group 1 (What does success look like) – Terms of Reference

This section covers the scope and objectives for Working Group 1 – What does success look like.

BEIS Officials have tasked NIRAB with advising Government on how public investment in nuclear research and innovation should be prioritised to meet near and long term objectives. In order to be able to carry out this role NIRAB needs to be able to clearly articulate those near and long term objectives.

Purpose

The purpose of Working Group 1 is to clearly articulate the near, medium and long term objectives for the nuclear sector which public investment in research and innovation is required to underpin.

Scope of work

The working group **will** draw on and, where necessary, interpret

- Existing Government policy statements (for example the Industrial Policy and the Clean Growth Strategy)
- Official documents which are anticipated to become policy (for example the draft Nuclear Sector Deal)
- The outputs from wide ranging consultations (for example the Big Tech workshops facilitated by NNL)

The working group **will not**:

- Seek to independently develop objectives which it believes Government or Industry should espouse
- Focus simply on short term objectives

Outputs

The output from Working Group 1 will be an important input to other NIRAB Working Groups, as follows:

- Working Group 2 will need to consider what facilities will be required to underpin the objectives identified by Working Group 1
- Working Group 3 will need to consider
 - What programme is required to underpin the objectives
 - Whether the current programme is delivering appropriate outputs
- Working Group 4 will need to consider how international collaboration could help meet the objectives

Given the reliance that other Working Groups will have on the output from Working Group 1 the target should be to prioritise producing a draft output to share with other Working Groups.

Links with Other Working Groups

The following links are applicable dependant on the reporting timescales of other Working Groups:

WG1 – Context view



Working group 2 (Facility Needs) – Terms of Reference

This section covers the scope and objectives for Working Group 2 – Facility Needs.

BEIS Officials have tasked NIRAB with advising Government on how public investment in nuclear research and innovation should be prioritised to meet near and long term objectives. In order to be able to carry out this role NIRAB needs to be able to clearly articulate those near and long term objectives.

Purpose

The purpose of Facility Needs Working Group (WG2) is to clearly articulate the facility needs of the UK Nuclear Sector required to meet the future strategic direction and goals of the industry.

The objective is to propose an efficient and substantially sustainable suite of nuclear development facilities which align with the strategic objectives of the UK nuclear strategy / sector deal.

Scope of work

The scope of work of the group will follow clear phases of work:

- Review and update the UK Nuclear Facilities landscape map including active and non-active facilities:
 - Identify the current facilities (public and private) available in the UK which could be employed to undertake nuclear research and development (fission only).
 - Identify the capabilities which will be lost through Brexit
 - Identify capabilities which will be lost through the passage of time
 - UK and/or International
 - Eg aging infrastructure, loss of skills/knowledge
 - Identify the funding routes and sustainability of these capabilities/ facilities
- Identify the Capabilities needed to underpin the UKs future strategic nuclear power objectives:
 - Based on the Nuclear Sector Deal and other policy documentation
 - Understand the costs of access to these capabilities and whether they are a barrier to access
- Compare and contrast the current suite of UK nuclear development facilities with the capabilities required to meet the strategic goals:
 - Identify the gaps in capability – including the potential for demonstrators if applicable.
 - If the UK had a research reactor, what would it be used for?
 - Identify the extant capabilities which are not currently required or have excess capacity (taking the landscape as a whole).

- Recommend how access to capabilities required to fill the capability gap can be achieved:
 - Eg access to overseas facilities (bilateral agreements), collaborations (industrial, academic incl international), new build
 - Identify how the sustainability / strategic important any newly proposed facility/capability would be achieved including proposed government funding.
- Review nuclear research access arrangements and how these could be overcome:
 - Assess access arrangements for nuclear research facilities in the UK
 - Assess the cost of accessing nuclear research facilities and whether these pose a barrier to research and innovation
 - Learn from other countries and industries on how to maximise use and value for money from research facilities and capabilities
- Recommend actions for any excess capabilities:
 - Eg mothball, closure, mergers/collaborations, use in other sectors.

The working group **will** draw on and, where necessary, interpret:

- The output of other Working Groups – if available
- Existing Government policy statements (for example the Industrial Policy and the Clean Growth Strategy)
- Official documents which are anticipated to become policy (for example the draft Nuclear Sector Deal)
- The outputs from wide ranging consultations (for example the Big Tech workshops facilitated by NNL)

The working group **will not**:

- Review or include or recommendations concerning facilities which are privately (not BEIS) funded, but which are relevant to future nuclear innovation unless there is the potential of a loss of capability which is important to the strategic UK strategy.

Outputs

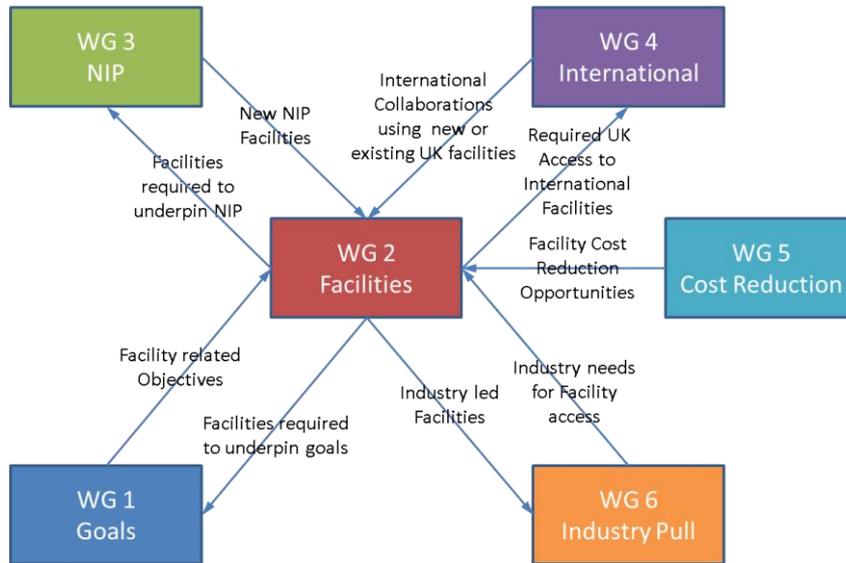
The output from Working Group 2 will be of short term strategic importance to BEIS to underpin the direction and evidence base required for the forthcoming strategic review. This will require the following:

- An initial review. The output will be a high level report outlining the current facilities, the future needs and the correlation between current capability and the required capability.
- An underpinned report and recommendations. The report will detail all aspects identified in the scope.

Links with Other Working Groups

The following links are applicable dependant on the reporting timescales of other Working Groups:

WG2 – Context view



Working group 3 (Nuclear Innovation Programme) – Terms of Reference

This section covers the scope and objectives for Working Group 3 – Nuclear Innovation Programme.

BEIS Officials have tasked NIRAB with advising Government on how public investment in nuclear research and innovation should be prioritised to meet near and long term objectives.

Within the BEIS Energy Innovation Programme, BEIS expects to invest around £180 million in nuclear innovation between 2016 and 2021 – the Nuclear Innovation Programme (NIP). In order to provide advice on the prioritisation of this, and any future (post-2021), Government investment in nuclear innovation and research NIRAB needs to assess the completeness and efficacy of the NIP against near and long term objectives (articulated by Working Group 1); this is the role of Working Group 3.

Purpose

The purpose of Working Group 3 is to assess the completeness and efficacy of the current BEIS Nuclear Innovation Programme, and advise on the structure and content of a post-2021 programme, in line with the near and long term objectives for the nuclear sector.

Scope of work

The Working Group **should** use the outputs of Working Group 1 as the near and long term objectives for the BEIS Nuclear Innovation Programme;

The Working Group **should** take into account (from the outputs of WG1):

- What did the various elements of the programme set out to achieve / what were the objectives?
- Have circumstances changed since NIRAB made its original recommendations in a way that means the content of the programme needs to change?

The Working Group **should** consider:

- Are the current six Nuclear Innovation Programme areas appropriately focussed to meet the objectives?
- Are the existing contracted components of the programme delivering what they were expected to deliver?
- Is the programme structure and delivery mechanism effective in delivering the targeted outcomes?
- Is the prioritisation that was carried out to align the original NIRAB recommendations to the available budget still appropriate?
- Are there any gaps or unnecessary elements in the programme?
- Is the current anticipated funding for the Nuclear Innovation Programme appropriate to facilitate achieving the near and long term objectives?
- How should the programme evolve post-2021 to best achieve the objectives?

The Working Group **will not**:

- Undertake a detailed technical peer review of the programme areas that have already been contracted.
- Develop new detailed programme content for any gaps identified in the current programme.
- Advise on the detailed content of any post-2021 programme recommendations.

Outputs

The Working Group will produce a report and supporting presentation slides addressing the areas outlined in the Scope. The Working Group will fully justify and provide prioritisation of any recommendations.

The Working Group will need to engage with other Working Groups, see diagram below for example interactions. The output from Working Group 3 will be an important input to other NIRAB Working Groups, as follows:

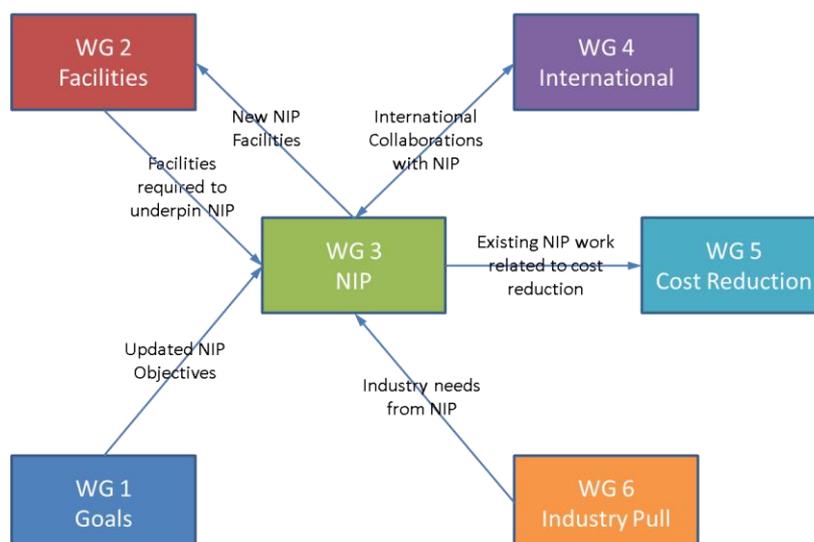
- Working Group 2 will need to consider what facilities will be required to deliver the Nuclear Innovation Programme
- Working Group 4 will need to consider how international collaboration could help leverage the investment in the Nuclear Innovation Programme and deliver increased impact
- Working Group 5 will need to consider how the Nuclear Innovation Programme can contribute to driving cost reduction in the sector

The Working Group will aim to meet (up to) three times, before sharing initial draft outputs with NIRAB. Meetings will be arranged to enable appropriate sharing of information with Working Groups 2, 4 and 5. Requirements for ongoing work will be determined by NIRAB.

Links with Other Working Groups

The following links are applicable dependant on the reporting timescales of other Working Groups:

WG3 – Context view



Working group 4 (International Strategy) – Terms of Reference

This section covers the scope and objectives for Working Group 4 – International Strategy.

BEIS Officials have tasked NIRAB with advising Government on how public investment in nuclear research and innovation should be prioritised to meet near and long term objectives. In order to be able to carry out this role NIRAB needs to be able to clearly articulate those near and long term objectives.

Within the BEIS Energy Innovation Programme, BEIS expects to invest around £180 million in nuclear innovation between 2016 and 2021 – the Nuclear Innovation Programme (NIP). International collaboration will be key to achieving these near and long term objectives

Purpose

The purpose of Working Group 4 is to clearly articulate the International Strategy to support the delivery of the near and long term objectives for the nuclear sector which public investment in research and innovation is required to underpin. The International fission research community offers the opportunity to access programmes, capability and facilities to deliver the programmes with leverage of the BEIS Energy Innovation Programme funding available.

Scope of work

The working group **will** review existing and future relevant International programmes and the opportunities these present and their alignment with:

- Existing Government policy statements (for example the Industrial Policy and the Clean Growth Strategy)
- Official documents which are anticipated to become policy (for example the draft Nuclear Sector Deal)
- The current six Nuclear Innovation Programme areas
- The outputs from wide ranging consultations (for example the Big Tech workshops facilitated by NNL)

The working group **will not**:

- Seek to establish any relationships with International organisations

Outputs

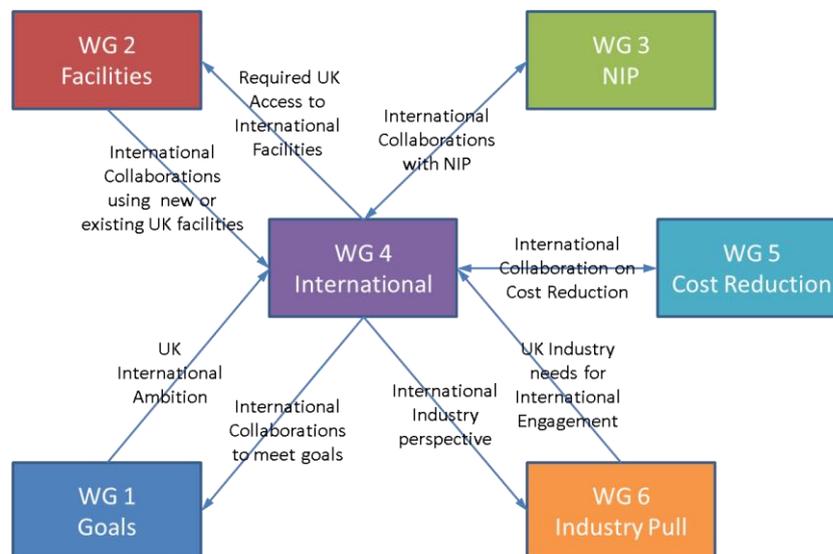
The output from Working Group 4 will be an important input to other NIRAB Working Groups, as follows:

- Working Group 1 will need to consider how international collaboration could help meet the objectives
- Working Group 2 will need to consider what International facilities could be required to underpin the objectives identified by Working Group 1
- Working Group 3 will need to consider
 - What programme is required to underpin the objectives
 - Whether the current programme is delivering appropriate outputs
 - How International collaboration will help deliver programmes
- Working Group 5 will need to understand how research and innovation can be delivered in an affordable way through collaboration

Links with Other Working Groups

The following links are applicable dependant on the reporting timescales of other Working Groups:

WG4 – Context view



Working group 5 (Innovation to Enable Cost Reduction) - Terms of Reference

This section sets out the scope and objectives for working group 5 – Innovation to Enable Cost Reduction.

Purpose

The purpose of the NIRAB cost reduction Working Group is to advise Government and industry on where research and innovation can reduce the cost of the Nuclear Lifecycle.

Much work has been done recently within the UK and globally related to cost-reduction and so the Working Group should consider and build on a range of recently published studies in these topic areas, in addition to the expertise of the group members, to provide tangible actions for Government and/or industry which aim to achieve set of short and long term recommendations.

Scope of work

The scope of the working group is to:

- Evaluate strategic initiatives that can be taken to reduce costs and determine in what areas, if any, Government could and should develop an enabling framework to drive this change.
- To develop recommendations for specific innovation areas/programmes for NIRAB to consider where:
 - Existing Government funding may be redirected within the current Spending Review period to better meet the cost reduction ambition set out in the Nuclear Sector Deal objectives – close communication with Working Group 3 will be necessary
 - new Government funding may be required as part of the next spending review period to better meet cost reduction objectives

Key Activities

In formulating its recommendations the working group should consider and interpret:

- Outputs from other NIRAB Working Groups where relevant;
- Existing Government policy statements (for example the Nuclear Sector Deal, Industrial Strategy and the Clean Growth Strategy);
- The outputs from wide ranging consultations;
- Recent and, where possible, anticipated publications directly linked to Nuclear cost reduction efforts including:
 - Expert Finance Working Group report
 - ETI Nuclear Cost Drivers Project: Summary Report
 - Output from the Nuclear Innovation Programme
 - Output from the series of Big Tech workshops led by NNL
 - Other cross-sector initiatives (e.g. Project 13 / Transforming Infrastructure Performance)

Outputs

The output from Working Group 5 will be a set of tangible recommendations for NIRAB to consider in delivering its recommendations to Government related to cost reduction across the nuclear lifecycle. The recommendations should include near term priority actions/intervention for Government with a clear line of sight to long-term ambitions set out in the Nuclear Sector Deal and Clean Growth Strategy.

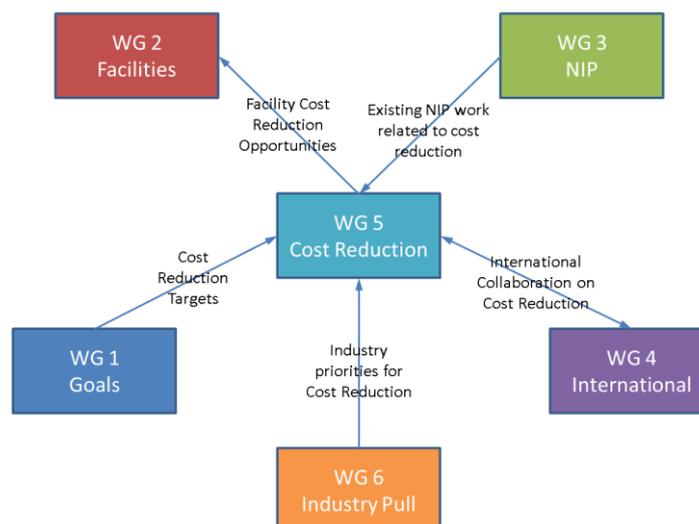
The output of the Working Group will be an important input to other NIRAB Working Groups and vice versa, as follows:

- Working Group 1 output (i.e. clarity of near, medium and long term objectives) will need to align with the cost reduction targets and recommendations from Working Group 5. Prior to Working Group 1 output being formulated, Working Group 5 will be steered by the higher level objectives/vision in the Nuclear Sector Deal, Industrial Strategy and Clean Growth Plan.
- Working Group 2 will need to consider what UK facilities could support any of the cost reduction activities identified by Working Group 5
- Working Group 3 will need to consider whether there is a rationale and scope for the NIP to implement innovative cost reduction approaches as part of the current or potential future programmes.
- Working Group 4 will need to consider what International facilities could support any of the cost reduction activities identified by Working Group 5
- Working Group 6 will need to consider input from Working Group 5 to develop an understanding of how industry may drive/support specific cost reduction activities and the role other groups such as Academia and Government may play in this.

Links with Other Working Groups

The following links are applicable dependant on the reporting timescales of other Working Groups:

WG5 – Context view



Working group 6 (Industry pull) – Terms of Reference

This section sets out the scope and objectives for working group 6 – Industry Pull.

BEIS Officials have tasked NIRAB with advising Government on how public investment in nuclear research and innovation should be prioritised to meet near and long term objectives. In order to be able to carry out this role NIRAB needs to be able to clearly articulate the industrial pull for nuclear research and innovation.

Purpose

The purpose of Working Group 6 is to clearly articulate the areas for research, development and innovation required by the UK nuclear industry if it is to meet the objectives set out by UK Government and identify the outcomes that the industrial sector would welcome.

Scope of work

The working group **will** draw on the mid to long term objectives articulated by Government, as summarised by Working Group 1.

In addition the working group will

- Identify those areas of publicly funded research and innovation which would be particularly valuable to industry and that industry would anticipate taking forward to full commercialisation. This will include programmes which are already underway, programmes which are currently planned and identify any additional programmes which are not currently planned
- Review the current and planned scope of the Nuclear Innovation Programme (NIP) with a focus on research and innovation required by the UK nuclear industry, to progress through the low Technology Readiness Levels (TRLs) to the point where industry would invest in further development through to industrialisation.

Relationships with other working groups are illustrated in the figure below and will include:

- A strong link to the working group set up to address cost reduction (WG5). Working Group 6 may provide an input to WG5 and may be asked to review the output of WG5.
- Information from WG2 regarding facilities led by industry or organisations affiliated to UK government, with a view to understanding how/what is required to support both development programmes and operational nuclear facilities..
- An international industrial perspective from WG4 will facilitate the groups understanding of international competing and complementary capabilities.

The working group **will not**:

- Seek to recommend research, development and innovation for government support that could, should and would be otherwise undertaken by UK industry on the basis of reasonable business case for industrial investment, increasing capacity, demonstrating capability, and availability of investment funds.

Outputs

The output from Working Group 6 will be an important input to other NIRAB Working Groups, as follows:

- Working Group 1 will need to consider Industry needs in formulating their output.
- Working Group 2 will need to consider what facilities will be required to support industry in progressing technology from low to high TRLs.
- Working Group 3 will need to consider industrial requirements for the NIP.
- Working Group 4 will need to consider industrial requirements for international engagement.
- Working group 5 will need to consider industrial priorities for cost reduction.

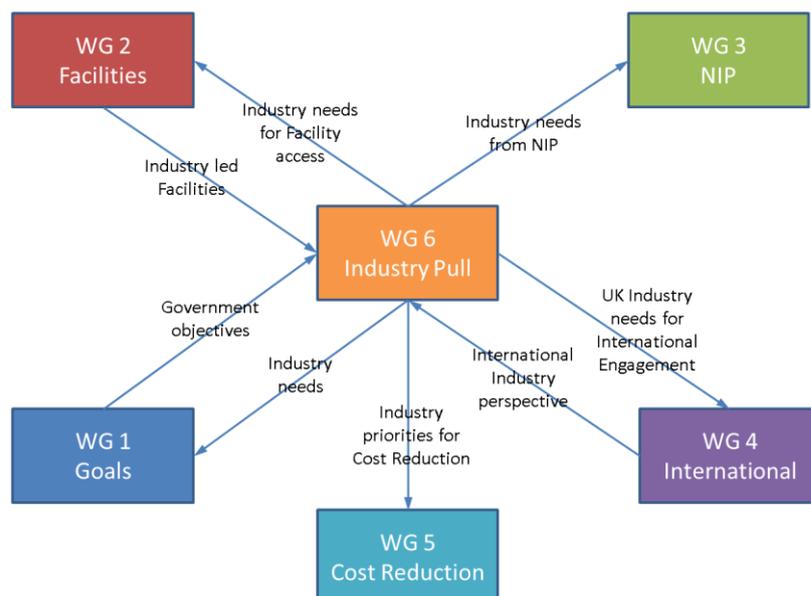
The output from Working Group 6 will be:

- An initial review resulting in a high level report outlining the publicly funded research, development and innovation that would be particularly valuable to industry.
- A view on the industrial relevance of publicly funded research and innovation currently underway.
- An underpinned report and recommendations. The report will detail all aspects identified in the scope.

Links with Other Working Groups

The following links are applicable dependant on the reporting timescales of other Working Groups:

WG6 – Context view



Working groups – Ways of working

The NIRAB way of working is set out in NIRAB-151-1. The need for a series of working groups has been identified. This note expands on the general ways of working to support the operation of the working groups.

Working Group Chairs

Each working group will be chaired by a NIRAB member. A member of the NIRO team will act as vice-chair and will take responsibility for organising meetings.

Membership of Working Groups

NIRAB members will be invited to identify which Working Group(s) they would like to participate in and to prioritise between groups, where necessary. The Chair may request the participation of additional members if this is necessary to ensure access to relevant skills or knowledge. If necessary the Chair may approve the involvement of specialists who are not members of NIRAB.

Role of NIRO

NIRO staff will support the Working Groups by:

- Acting as vice-chair for the Working Group
- Arranging meetings and recording the output of meetings
- Compiling information, where necessary

Drafting any reports or recommendations for considerations by the working groups, if requested