NC2I-R

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Summary

This document presents results of task 4.6 of the NC2I-R project. The objective of this task is to report on the status of the NC2I Business Group of industrial companies and associations which have demonstrated interested in nuclear cogeneration, since the constituion of the EUROPAIRS Industry Advisory Group. This work is part of Work Package 4 of the NC2I-R project titled "End-users focus & Deployment scenarios". This document contains introduction to the concept of Business Group, description of the base for formation of the Business Group, communication tools, selected communication outcomes and recommendation for further development of the Business Group.

Approval

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1 Introduction

The development of any new industrial scale technology is a challenging process and cannot be accomplished without commitment and support from a wide range of stakeholders. This is particularly true in the case of nuclear-based industrial cogeneration, which requires an established dialogue between several stakeholders with very different operating modes and constraints. The Business Group (BG) is established to facilitate this dialogue. The BG is meant to be a formation of industrial companies, associations, investors, utilities and technology vendors potentially interested in nuclear cogeneration of steam and electricity. The following industrial sectors have been identified as being potentially suitable for high-temperature nuclear cogeneration: oil refineries, chemical companies (fertilizer and amonia producers), steel and aluminium plants.

The purpose of the Business Group is to facilitate the dialogue, in particular:

- To advance the development status the NC2I Task Force informs the BG on the status of the technology, licensability and demonstration programme
- On the other hand the BG provides strategic and operational guidance to the NC2I Task Force, mainly on heat and electricity consumption, operational conditions, financing schemes and other aspects.

2 Fundamentals for creation of the NC2I Business Group

The general objective of the NC2I Business Group is to get closer to the market and gather interest parties to facilitate the collaboration. The potential members include end-users of steam such as heat-driven industries (chemical industry, steel industry, refineries, etc.), nuclear industry, engineering companies, investors and utilities. More specifically, end-users are asked to provide information on market needs, technical requirements and current energy solutions. Nuclear industry, utilities and engineering companies bring their technical knowledge to the Group while investors provide recommendations on financing schemes and legal aspects. Generally, all members of the Business Group give general feedback and strategic guidance.

The collaboration scheme between the NC2I Task Force and the Business Group is presented below.

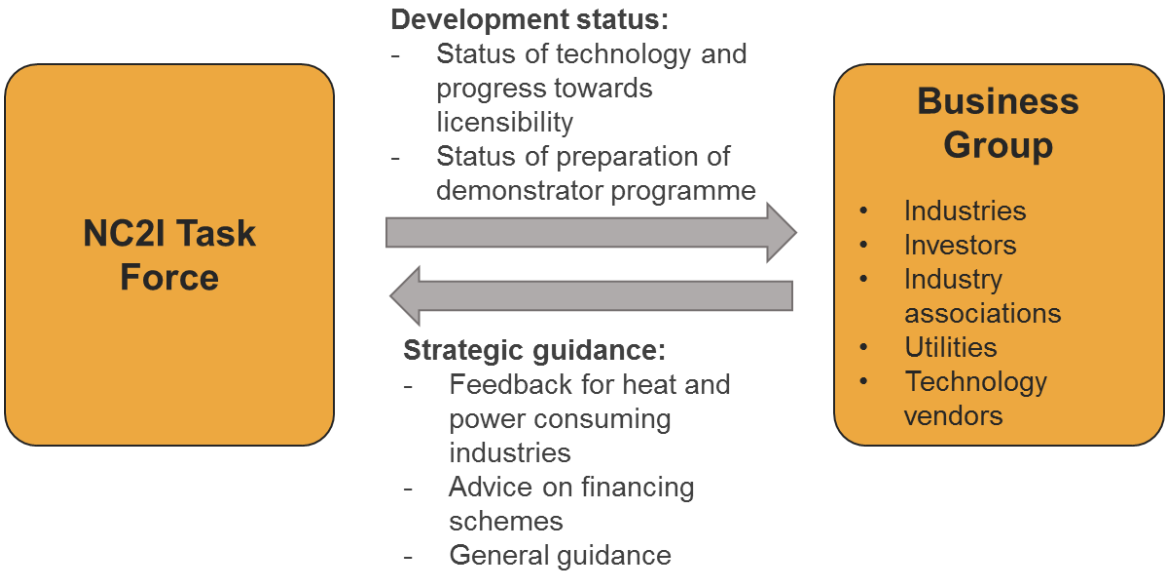


Figure 1: Collaboraton between the NC2I Task Force and its Business Group

Terms of Reference were written to define the scope of the Business Group (appendix 1). It should be noted that given the early-stage nature of the dialogue established in this framework, participation in the Business Group does not require any commitment regarding the future demonstration programme. BG members are only asked to provide some information from areas of their expertise and general feedback.

Commitment is expected to be required in subsequent steps, when an ad hoc structure will be formed for the demonstration project implementation.

3 Communication

3.1 Generalities

The NC2I Business Group builds on a number of previous and parallel networks including:

- European HTR Technology Network (HTR-TN)
- EUROPAIRS Industrial Users Advisory Group (IUAG)
- Polish HTR-PL network

The BG also aims at enlarging the larger scope of stakeholders beyond those present in the above-mentioned networks, in particular by including investors and the financial industry. The list of potential members was enriched with NC2I-R partners' professional networks and their recommendations, and stakeholders contacted for other deliverables (e.g. the chemical companies contacted for the deliverable D4.21)

The Chair and Vice-Chairs of the NC2I Task Force officially announced the constitution of the Business Group with an invitation letter (Appendix 2). The concept of the BG was introduced in the attached Terms of Reference (Appendix 1) and clarified in a PowerPoint presentation (Appendix 4).In cases where the contacted stakeholders were not knowledgeable about nuclear cogeneration, a briefing was presented.

Some of the contacted entities showed interest and invited NC2I representatives to present the high-temperature cogeneration concept at their headquarters. However, in some cases, stakeholders discovering the concept were reluctant for a number of reasons:

- *The benefits of the implementation of a HTR do not fit into their short-term energy strategy*
- *They are afraid of having a nuclear facility close to their industry*
- *They do not have time to be engaged in such group*
- *They fear the image risk of being associated to nuclear power*
- *They perceive a lack of long-term commitment from European or national government support*
- *NC2I was established only a few years ago but is not known by the industries; NC2I does not have an established position and interactions with industrial partners. The industrial members of NC2I should be more visible.*
- *They perceive the NC2I Task Force as an intermediate party and not a decision-maker*
- *There is no confirmed demonstration programme in Europe right now*

3.2 Highlight: recent discussions in Poland

As a result of the communication actions in Poland, face-to-face meetings were set up with two Polish industries: the paper company Rokita located in Brzeg Dolny and the refinery LOTOS SA in Gdanask. Specific presentations were prepared for each company to fit their profile and technical requirements (amount of heat and electricity required, heat specifications, etc.).

Figure 2: Locations of PCC Rokita and LOTOS SA

The NC2I representatives included Polish participants: Marek Tarka and Zdzislaw Rokita from Prochem, Ludwik Pienkowski from AGH and Kajetan Rozycki, Tomasz Lotz and Tomasz Jackowski from NCBJ. Both meetings followed the same agenda. First, the NC2I organization was presented. Then, the concept of coupling a HTR to an industrial facility was described. NC2I partners introduced a first draft of potential demonstration according to company technical requirements and presented possible benefits. Then, the companies introduced themselves and gave information related to their heat and electricity consumption. The detailed description of their power consumption are included in the deliverable D4.21.

The first feedback was positive and the benefits were understood.

A number of questions were raised, among which:

- What is the timeline of the project?
- What is the national government support of such initiatives?
- Is there long-term tax policy for such nuclear facility?
- Who is going to invest for the HTR and the coupling system?
- What are the NC2I's next steps?

One limitation expressed by the industry is that nuclear cogeneration is not as flexible as gas cogeneration which can just be operated at the level of the demand.

The meetings concluded with confirmation of interest from both sides. Before making further steps, the answers of the questions above must be known.

4 Conclusions and recommendations

Based on the consolidation work achieved in the NC2I-R project, the NC2I Business Group can be activated when the prototype programme is being structured, in order to provide guidance and conditions for a successful demonstration, and ultimately to lead to involvement by some actors in the programme. The organisations and contact persons identified in Appendix 3 constitute a basis for activating the Business Group.

Additionally the work performed in task 6 in WP4 led to a set of recommendations:

- To further enlarge the Business Group, NC2I partners will be invited to contact directly their own professional network and set up face-to-face meetings
- When NC2I is not yet recognized among potential BG members, well-known NC2I partners especially from industry (vendors, utilities) should be visible.
- The Business Group activation should take place when the conditions for initiating a successful demonstration programme are met begin (government commitment, reference design selection, visible long-term strategy).
- During the discussions, key figures were missing such as the cost of electricity and steam as well as financing schemes. The WP4 (deliverable D4.11) and WP1 (deliverable 1.12) now provide such information. It should be incorporated into further communication materials.
- It is suggested to invite professional or sectoral associations to take part in the Business Group.

The contacts established with the different companies enabled NC2I to further learn on businesses conditions and technical requirements. The main outcomes of this task are recommendations for future action and a database of potential Business Group members. This task should be activated once a reference demonstrator is planned.

The NC2I Business Group list of stakeholders will be used in all future communications about the progress achieved in the initiative, in order to maintain a continuously updated level of information in the community of stakeholders. The management of this communication, including the maintenance of the contact list, is a duty of the NC2I Task Force.

Appendix 1 Terms of Reference

1. Mandate

The Business Group is established to provide strategic guidance to the European Nuclear Cogeneration Industrial Initiative (NC2I), including:

- Feedback from heat & power consuming industries and engineering firms
- Advice on financing schemes
- General guidance on the elaboration of a roadmap

To this end, Business Group members are given the opportunity to review NC2I reports and provide input on technical aspects, marketing, project development and financing options. They are invited to contribute individually or collectively.
These terms of reference may be subject to revision and amendment if so agreed upon by the members of the Business Group and the NC2I Task Force.

2. Membership

The Business Group is composed of executives acting in personal capacity and being appointed by their organization. Relevant entities are, but not limited to:

- Heat-consuming industries
    - Chemical companies
    - Oil refiners
    - Fertilizer and ammonia producers
    - Soda ash producers
    - Metal makers
    - Glass makers
    - Industrial gases producers
    - Other energy-consuming industries
- Utilities
- Technology vendors and engineering companies
- Banks & other investors
- Other organizations such as industry associations

3. Governance

The Business Group appoints a Chairperson and a Vice-Chairperson from within its members, for a mandate of two years. The NC2I Task Force Chair and Vice-Chairs act as contact between the Business Group and the NC2I Task Force.
Individual Business Group members sign a confidentiality agreement. The participation in the Business Group does not imply any legal or financial commitment whatsoever from its member organisations, other than the individual confidentiality agreement.
The Business Group members agree that the name and logo of their organization are used for NC2I Business Group communication, unless otherwise agreed. EUROPEAN NUCLEAR

4. Terms of Office and Meeting

The Business Group is established as of [DATE] for an initial duration of six years. The Business Group normally meets twice a year, at a place to be proposed by the Chairperson. In 2014 and 2015, travel expenses for Business Group members can be supported by the European “NC2I-R” project.

Appendix 2 Invitation

Paris, 15th December 2014

Subject: Invitation to join the NC2I Business Group
Attachment: Terms of Reference

The **European Nuclear Cogeneration Industrial Initiative (NC2I)** aims at demonstrating an innovative and competitive energy solution for the low-carbon cogeneration of heat and electricity based on nuclear energy. The targeted outcome is the commissioning within 10 years of a nuclear cogeneration prototype to deploy this low-carbon energy technology for providing heat and power to several energy-intensive industries.

To set the grounds for this initiative, a European Task Force has been set up, bringing together technology developers, utilities, engineering companies and research institutions.

To assist and advise the NC2I Task Force on crucial issues such as energy requirements or financing solutions, a **Business Group** is being created. Its purpose is to gather industrial actors from energy-intensive industries, utilities, engineering companies, banks and investors, and more generally any company potentially interested in the future prospects of nuclear cogeneration technology. Typical contributions from the Business Group would be to advise on energetic consumption data, market inputs, financing models, etc. The Terms of Reference of the Business Group are attached to this letter.

We believe that your organization may be interested in the potential of this low-carbon energy solution and we would be pleased to count you among the Business Group members.

To know more about NC2I or the Business Group, please visit the NC2I website (www.nc2i.eu).

We remain at your disposal for any questions, and look forward to your answer.

Sincerely,

Kajetan ROZYCKI	Marek TARKA	Harri TUOMISTO
Chairman of the NC2I Task Force	*Vice-Chairman of the NC2I Task Force*	*Vice-Chairman of the NC2I Task Force*

Appendix 3 List of companies

The list below presents the companies with which NC2I has established a dialogue. This occurred in several ways, for instance by the participation in previous or parallel projects, or by direct contact between members. This list is the basis for activating the Business Group, upon requirement by the demonstration programme.

The complete file, along with contact information, is provided in a separate Excel spreadsheet.

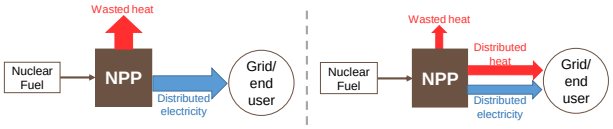
Country	Company	Sector
FR	Air Liquide	Gas industry
UK	Air Products UK	Gas industry
FR	Alstom	Engineering
UK	AMEC	Engineering
FR	ArcelorMittal	Steel industry
FR/DE	AREVA	Nuclear industry
NL	Association of the Dutch Chemical Industry	Chemical industry
NL	Baaten Energy Consulting (BEC)	Chemical industry
DE	BASF	Chemical industry
UK	BP - Saltend Chemicals Park	Chemical industry
NL	Chemical Cluster Delfzijl	Chemical industry
FR	Chemparc, Lacq-Mourenx	Chemical industry
DE	Chempark Leverkusen Currenta	Chemical industry
DE	Deutsche Bank	Finance
CH	Dow Europe	Chemical industry
NL	DSM	Chemical industry
UK	EDF Energy	Utility
NL	EMMTEC Industry & Business Park	Chemical industry
ES	Empresarios Agrupados	Engineering
BE	ENGIE (Tractebel Engineering)	Engineering
DE	E.ON	Utility
EU	European Investment Bank	Finance
FI	Fortum	Utility
NL	HAPUNA	Finance
DE	InfraLeuna GmbH	Chemical industry
PL	IZBA ENERGETYKI PRZEMYSLOWEJ I ODBIORCOW ENERGII	Chemical industry
PL	KGHM Polska Miedź	Copper industry
FI	Kobbola Industrial Park	Industry
PL	LOTOS S.A.	Chemical industry
UK	North-East Process Industry Cluster	Industry
PL	PCC Rokita	Chemical industry
PL	Polska Izba Przemysłu chemicznego	Chemical industry
BE	Port of Antwerp	Chemical industry
CH	PQ Energy	Finance
PL	Pulawy	Chemical industry

FR	SAIPEM SA	Petrochemical industry
DE	SGL Group	Industry
FR	Société Générale Corporate and Investment Banking	Finance
IT	SOL	Gas industry
BE	Solvay	Chemical industry
PL	Tauron	Utility
IT	Technip KTI	Engineering
FR	TOTAL	Petrochemical industry
PL	Warmus Investment	Finance
DE	Westinghouse	Industry
PL	ZAK	Chemical industry

Appendix 4: Presentation of the Business Group

1- What is nuclear cogeneration?

- Nuclear cogeneration consists in the **simultaneous generation of electricity and useful heat** by a nuclear power plant (NPP).
- Today, cogeneration based on coal and gas is already used to power heat-intensive industries.



- Low-temperature nuclear cogeneration is already a reality in various countries for several applications including district heating, water desalination or to power paper industries.

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1- What is nuclear cogeneration?

- One of the objectives of NC2I (Nuclear Cogeneration Industrial Initiative) is to develop the **High Temperature** (HT) nuclear cogeneration:

	Conventional cogeneration	HT nuclear cogeneration
Reactor outlet temperature	Max. 200°C	750-800°C
Applications	- District heating - Water desalination - Paper mill	- Chemical industry - Hydrogen production - Steel industry - Etc.
International context	- LWR[1] widely used - Low temperature cogeneration already used in Europe and Asia	- HTGR[2] technology developed in Germany in the 1980s - One demonstrator is being built in China

[1] Light Water Reactor
[2] High Temperature Gas-cooled Reactor

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1- What is nuclear cogeneration?

Advantages of HT nuclear cogeneration

Cogeneration
- Flexible technique, enables to adapt to the market demand, reduces fluctuation in energy prices
- Local power source enabling energy cost savings (no transmission fees)

Nuclear reactors
- Low-carbon
- Security of supply
- Independence from unstable countries with fossil fuel resources

HTGR
- Intrinsic safety
- High-Temperature nuclear cogeneration opens new market for the nuclear industry.
- Small, modular reactors facilitates investment decisions

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2- Who are we?

- NC2I was set up in 2011 as Europe's initiative for **nuclear cogeneration**, under the Sustainable Nuclear Energy Technology Platform (SNETP).
- High Temperature Gas-Cooled Reactor (HTGR) was selected as the reference technology in order to reach **higher temperatures** for industrial applications.
- NC2I builds on the German legacy and 15 years of EU R&D programmes.
- A **Task Force** gathers the nuclear developers, and a **Business Group** is currently being set up to structure a dialogue with end-users and investors.

Members of the NC2I Task Force

AREVA, iet, NRG, e·on, Fortum, Centrum výzkumu Řež s.r.o. Research Centre Rez, BrIVaTech, PROCHEM, AGH

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2- Who are we?

- Achievements in past projects

1960 | 1970 | 1980 | 1990 | 2000 | 2010 | TODAY

German legacy:
The HTGR[1] technology was developed and demonstrated

European projects:
- R&D was conducted in different areas such as fuel, materials, components, etc.
- Design and market studies are ongoing work.
- The current European project on HTGR is the NC2I-R project.

Implementation of conventional nuclear cogeneration

- **HTGR[1] technology is mature**
- **General design needs to be finalised.**
- **Work is ongoing on marketing and financing solutions.**

[1] High Temperature Gas-cooled Reactor

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2- Who are we?

- Organisation of NC2I

NC2I Task Force

Development status:
- Status of technology and progress towards licensibility
- Status of preparation of demonstrator programme

Strategic guidance:
- Feedback for heat and power consuming industries
- Advice on financing schemes
- General guidance

Business Group
- Industries
- Investors
- Industry associations
- Utilities
- Technology vendors

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2- Who are we?

- Current activities

NC2I is setting-up the **GEMINI initiative**[1] with the US Next Generation Nuclear Plant Industry Alliance (NGNP-IA).

This initiative is based on the **convergence of designs** between Europe and the US to:

- reduce each partner's cost by sharing tasks and time
- combine the best engineering and research talents and means as well as the industrial capabilities both for the US and EU, including past experience and ongoing activities.

Some residual differences may persist in order to address different market needs or regulatory requirements on both sides.

[1] http://gemini-initiative.com/

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3- Why join the Business Group?

- Advantages to join the Business Group

- Discover the **advantages of another energy source**
- **Meet, share and exchange** with other professionals on common energy issues
- Help finding solutions to **stop carbon leakage** and to **maintain Europe's industrial competitiveness**
- Participate in a **worldwide initiative** which includes partners from the US, Asia (Japan, China and South-Korea) and South Africa
- Take part in an **innovative project** without any precedent in the world

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3- How to join the Business Group?
NC2I
To join the Business Group:
The Terms of Reference are available here.
Membership in the Business Group is free of charge and the travel costs to participate in the meetings can be reimbursed by NC2I.
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SNETP


NC2I
Nuclear Cogeneration Industrial Initiative
NC2I
Contact: secretariat@snetp.eu
www.nc2i.eu
NC2I is one of SNETP's strategic technological pillars, mandated to coordinate the European nuclear cogeneration roadmap.
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