The Research Council of Norway

Evaluation of Mathematics, ICT and Technology 2023-2024

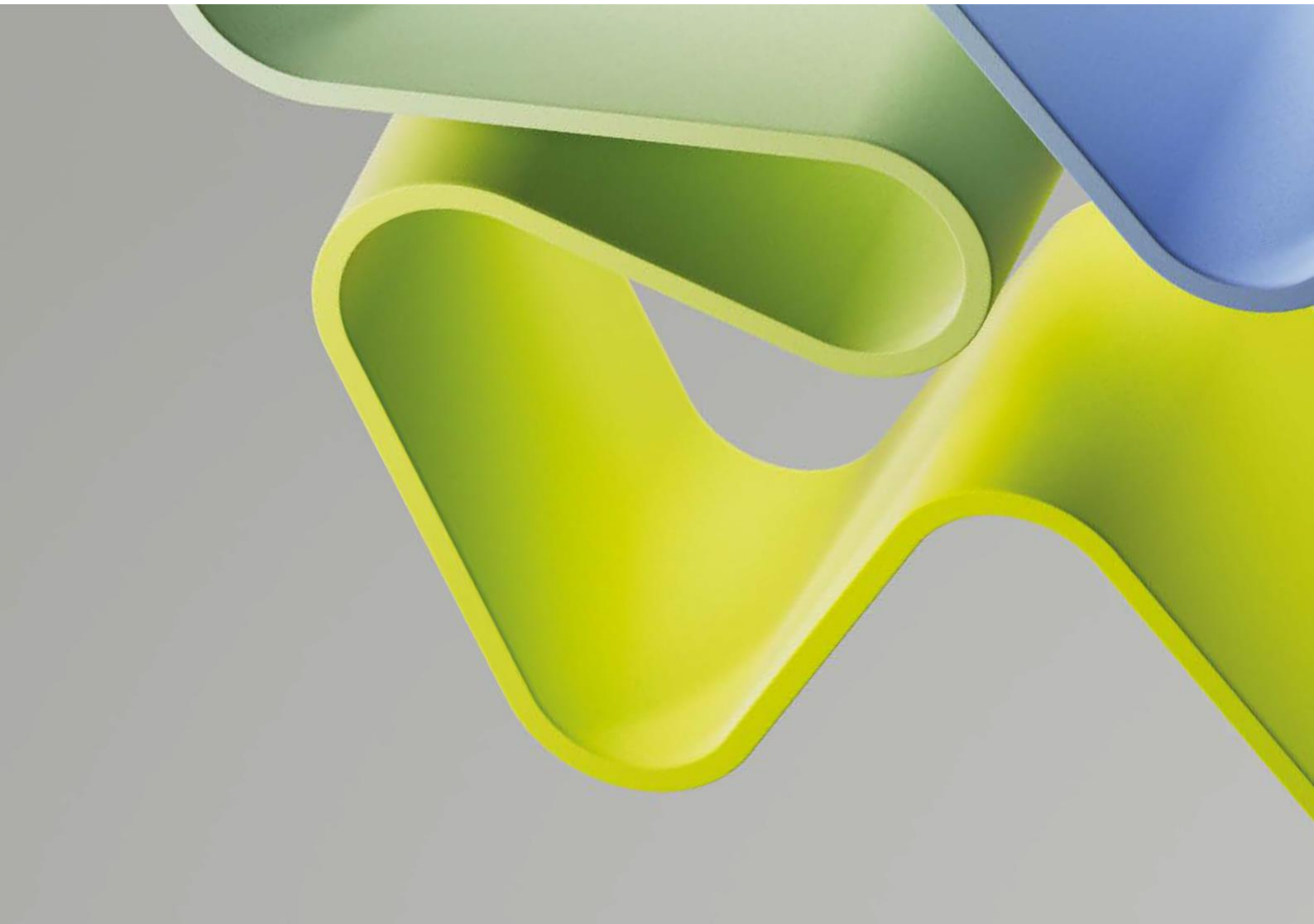
Evaluation Report for Administrative Unit

Administrative Unit: **Human and organisational factors (HOF)**

Institution: **Institute for Energy Technology (IFE)**

Evaluation Committee Institutes

December 2024



Contents

Statement from Evaluation Committee Institutes

The members of this Evaluation Committee have evaluated the following administrative units at the research institutes within Mathematics, ICT and Technology 2023-2024 and has submitted a report for each administrative units:

- NORCE Energy and Technology, NORCE Norwegian Research Center (NORCE)
- SINTEF Community, SINTEF Community
- SINTEF Digital, SINTEF Digital
- SINTEF Industry, SINTEF Industry
- SINTEF Energy, SINTEF Energy
- SINTEF Ocean, SINTEF Ocean
- SINTEF Manufacturing, SINTEF Manufacturing
- Norwegian Computing Center (NR), Norwegian Computing Center (NR)
- Energy and Energy Technology (ENET), Institute for Energy Technology (IFE)
- Simula Research Laboratory (SIMULA), Simula Research Laboratory (SIMULA)
- Human and organisational factors (HOF), Institute for Energy Technology (IFE)

The conclusions and recommendations in this report are based on information from the administrative units (self-assessment), digital meetings with representatives from the administrative units, bibliometric analysis and personnel statistics from the Nordic Institute for Studies of Innovation, Research, and Education (NIFU) and Statistics Norway (SSB), and selected data from the National survey for academic staff in Norwegian higher education and the National student survey (NOKUT). The digital interviews took place in the autumn 2024.

The members of the Evaluation Committee are in collective agreement with the assessments, conclusions and recommendations presented in this report. None of the committee members has declared any conflict of interest.

The Evaluation Committee consisted of the following members:

Professor Krikor Ozanyan (Chair),
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Professor Kari Mäki,
VTT Technical Research Centre of Finland

Professor Camilla Hollanti,
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Professor Deborah Greaves,
University of Plymouth

Professor Angele Reinders,
Eindhoven Institute of Technology

Description of the Administrative Unit

The Institute for Energy's (IFE) Human Organisational Factors (HOF) admin unit is comprised of a single research group of 22 researchers. The unit is comprised of three teams, Human-Centred Digitalisation, Control room & Interaction Design and Humans & Automation.

IFE-HOF state that they research human factors – focusing on the human aspect of the digital transformation. Their research goals include strengthening and extending their Human Technology Organisation (HTO) project as the world-leading nuclear safety project, be the preferred partner for human-factors in control centres, be a recognised partner for Safety HTO in intelligent and autonomous transport systems and be a leading partner in human-centred digital sovereignty. These goals fit within the overall strategy of IFE.

IFE-HOF state that their research is primarily meant to contribute to the knowledge base of human factors. They are responsible for providing research that informs the nuclear safety regulations and policies for most of the world's nuclear sector. The largest successful international collaborative area for IFE-HOF is the OECD NEA Halden HTO Project, hosted by IFE/Norway. IFE-HOF collaborates closely with member countries, defining research content and industry relevance. They also collaborate in bilaterally industry projects and research collaborations, e.g. with Swedish and Finnish nuclear power plants, conducting research on human-machine interaction challenges. IFE-HOF also has a track record of successful projects within the oil & gas industry, with control room design and evaluation, alarm design, situation analysis etc.

IFE-HOF identify several strengths and opportunities that better position them for the future. For example, they state that their position as a world-leader in human-machine interaction safety coupled with expertise in nuclear operation, make them very rare and sought after outside of Norway. They also note that they plan to apply their expertise further beyond the nuclear industry and further engage in cross-disciplinary research with other units within IFE. In terms of weaknesses and threats, they note there is only a small degree of Norwegian funding towards human factors research. In addition, the special capabilities required of their researchers make it difficult to recruit, especially as capabilities are developed through projects, and Norway does not provide educational programs in the field of human factors.

Overall Assessment

It is clear that this unit are very strong in many ways. The research conducted is highly unique and a clear national strength. They are world leading in some areas.

While it is clear that the unit are doing very good work, it was very difficult for the evaluation committee to assess due to a lot of ambiguity or absence of information in some sections of the self-assessment report~~. A lot of work the unit are delivering was omitted and in some cases, links provided were not working.~~ Therefore, the evaluation committee struggled to determine whether the unit was not carrying out certain activities, or were simply not reporting them, or providing significant detail. As the reader will see, this lack of clarity affected many aspects of the evaluation. The committee acknowledges that the units size and limited resources are contributing factors to these challenges. It was also unclear to the evaluation committee why HOF was presented as a separative administrative unit for the evaluation rather than as a research group alongside IFE's other research groups and departments.

As is common in such institutions, there is a mix of a top down and bottom up approach. Overall, there seemed to be a disconnect between a top-down strategy informed by what the market and clients are asking for, and a bottom-up strategy informed by capabilities, legacy and reference projects. However, it was unclear if this works well and what happens when there is a conflict between a bottom up opportunity and the top down direction. In the context of top down, this is challenging because Norway has not taken a decision on yes/no to nuclear power, and so the unit must look abroad for certainty in terms of nuclear strategy. There were good examples of bottom up approaches. For example, simulator studies for assessing human performance being applied to the maritime industry, resulting in an RCN innovation project, all from proactive, and opportunistic contact with stakeholders in the maritime industry.

Another overall point concerns the reliance on the Halden Research Project (HRP), which accounts for 50% of research income for the unit. This was acknowledged by the unit as a risk factor and while there is no identified 'plan B', the unit members feel they will find alternatives sources of funding if needed. Interestingly, the unit made no reference to some recent negative publicity in the media regarding the Haldon project. The evaluation committee do not expect the unit to fully solve these issues, but it was notable that it did not feature at all in the self-assessment report or interviews.

The Terms of Reference for the administrative unit is attached to the report.

Recommendations

1. State strategic goals in terms of specific measurable aims that are within the control of the unit.
2. The admin unit should ~~better prepare for future assessments, including:~~
    i) Provided details of the tangible implementation of the strategy and the details of the structures in place to do this.
    ii) Articulate the formal and tangible examples of mentoring that exist and implement some clear mechanisms if they do not.
3. Review and improve the recruitment processes and career development routes for existing staff, including:
    i) Examine the process of recruitment to reduce significantly below two years.

ii) Consider tailoring existing practices to enhance diversity, e.g. headhunting could begin with minorities when developing a pool of potential applicants.

iii) Continue the unit's strategy to be active in headhunting through networks over LinkedIn, conferences and workshops.

iv) Put in place some review or evaluation of the mentoring and support mechanisms for junior staff, and in particular how effective these are.

4. Continue to ensure there is a wide spread of staff involved in proposal writing and the management of successful grants and projects.
5. Diversify and increase the percentage of income from alternate sources rather than rely so heavily on one.
6. Consider incorporating a trainee programme aimed at upskilling new staff.
7. Evaluate the portfolio of national and international collaborators, and areas of expertise where there are current gaps. This could be used when considering funding or initiatives to grow new collaborations and reduce or eliminate others.
8. Explore opportunities for commercialisation going beyond Technology Readiness Level (TRL) 4-6. Engage with other research units nationally or internationally who have managed to successfully commercialise this type of research.
9. Disseminate the unit's work on their strategy to use digital technology to do more with less effort and get it done quicker, safer, and cheaper. This could be very distinctive and (possibly) commercialisable.
10. Develop skills within the unit to provide tangible examples of research quality and impact and to develop and build impact cases to sell their work. This should be possible regardless of sensitive/classified content.
11. Explore ways that potential but resource-constrained partners can collaborate with IFE HOF on funding proposals.

1. Strategy, Resources, and Organisation of Research

IFE consist of 2 research divisions (one in Kjeller and one in Halden). The division in Halden is called IFE Digital System and consist of 12 departments. The administrative unit concerned in this report is the group of 3 departments, this unit is called Human and Organisational Factors (HOF). HOF consists of the following three departments, namely (i) Human-Centred Digitalization, (ii) Control room & Interaction Design, and (iii) Humans & Automation.

They mainly focus on applied research and, aside from a general contribution to the knowledge base, they have a very specific and admirable strategic focus on outreach activities including school visits, career talks, community research projects, and public lectures.

1.1 Research Strategy

The aim of the group is to deal with the 'human-centric aspects of technology. This is a very admirable aim compared to some groups which focus largely or completely on hardware and software issues. The group focus on issues such as organisational culture, structure and processes.

The self-assessment report states that the 3-year strategy is revisited and adjusted once every year. This strategic plan is used when making decisions such as new positions, competence building etc. The self-assessment report did not give a lot of detail on how the strategy develops the research environment and promotes high quality and productivity in research and how it contributes to innovation.

In terms of the strategic goals, these are clearly stated. However, the majority seem to orient toward being a 'preferred' or 'recognised' partner, rather than reflecting objectives which are tangible and within the unit's control:

1. *Strengthen and extend the Halden HTO Project as the world-leading nuclear safety project.*
2. *Preferred partner for human & organizational factors and safety in control centres*
3. *Recognized partner for Safety HTO in intelligent & autonomous transport systems.*
4. *Leading partner for applied human-centred digital sovereignty*

The unit did elaborate on this at interview and stated that there are action plans in each department that are used to achieve the strategic goals. There was emphasis on how actions plans are followed up. As an example, to achieve the goal to become a leading partner for safe and efficient HTO principles in digital systems, there was a sub-goal of increasing project portfolio income from industry with one project per year and to have income at a certain level by 2029.

The self-assessment report also stated that, "for us, digitalisation is "How we can use digital technology to do more with less effort and get it done quicker, safer, and cheaper". Whilst this seems really interesting and possibly a very valuable source of recognition for the unit, this was not elaborated on in the self-assessment report. As a result, the evaluation committee cannot make any assessment on the extent to which the unit is delivering against this intention and realising these goals.

Recommendations to the administrative unit.

- State strategic goals in terms of specific measurable aims that are within the control of the unit. Being a recognised partner is certainly admirable and the result of a strong strategy but is somewhat outside the control of the unit. Instead, focus strategic goals on things within the unit's control that it can achieve.
- Although there is little detail, the unit have a strategy to use digital technology to do more with less effort and get it done quicker, safer, and cheaper. The unit could reflect on this and if this is genuinely a distinctive feature of the group that they are leading national/international practice, then the evaluation committee suggest they aim to publish or in some way disseminate the novel aspects of this work.

1.2 Organisation of Research

The unit is structured into three departments, namely Human-Centred Digitalization HCD, Control room & Interaction Design CRI, Humans & Automation HA. The self-assessment report provided little information on the structure and composition of the unit. Outreach activities are very clearly stated and seem admirable - school visits, public lectures etc. However, the day to day research organisation is not clearly stated. The self-assessment report also tends to focus more on what is not done, e.g. education and patient treatment.

In terms of the structures, the unit seems to take guidance from top down strategy but also bottom up, informed by capabilities, legacy and reference projects. This is not unusual across units who often balance top down versus bottom up approaches. However, with little information provided it was difficult to see how these are implemented and how tensions between top down and bottom up are addressed.

The self-assessment report draws attention to the fact that senior researchers are tasked with the role of mentoring junior staff, and that in order to be promoted, staff need to demonstrate that they have helped and mentored others. However, in the self-assessment

report, there was very little detail on the formal mechanisms for supporting and mentoring staff, nor any info on if these mechanisms have been effective to date. In the interviews, the evaluation committee learned that some base funding from RCN is used to publish research, as funding within industry projects does not always allow this. This results in some feedback and quality assurance from academics.

More base funding is used on internal projects, such as Human-Centred AI. A review of external research community showed that not much empirical research done on Human-Centred AI, so the aim of the unit is now to develop competence in this area.

Recommendations to the administrative unit.

In the absence of detailed information, it was hard to develop recommendations beyond the need to provide clarity in future assessments.

- In future assessments, provide detail of the tangible implementation of strategy and the detail of the structures in place to do this.
- In future assessments, it would be good to articulate the formal and tangible examples of mentoring that exist, and to implement some clear mechanisms if they do not.
- Put in place some review or evaluation of the mentoring and support mechanisms for junior staff, and in particular how effective these are.

1.3 Research Funding

Funding income is 33 MNOK per year. This seems appropriate although there was no comparative information nor information regarding funding trajectory to determine if this is rising, in decline or sufficient to fund the unit's current aims.

It was clear the unit are very conscious about putting junior staff in projects along with research staff, and having junior staff part of proposal writing, especially with the Halden project. It is very positive that funding activity is distributed widely rather than being very reliant on one or a small number of people. For example, the Human-Centred AI project is split into 3 sub-projects, each of which have participants from at least 2 departments. Publications are generally distributed equally according to the NIFU bibliometric analysis of the unit's publication outputs. Discretionary funding is then used to fund each department.

Half of the unit's total income is from the Halden Research Project (HRP). Such large dependence on one project seems risky (particularly given some negative press attention mentioned earlier). However, the evaluation committee do understand that research in this industry is often based on a small number of large-scale projects rather than many small ones.

Recommendations to the administrative unit.

- Continue to ensure there is a wide spread of staff involved in proposal writing and the management of successful grants and projects.
- Diversify and increase the percentage income from alternate sources.

1.4 Research Infrastructures

Technical infrastructure is not as relevant to this unit, where they are dealing with human and social aspects of technology.

1.5 National and international collaboration

The HOF research area conducts applied research and has a wide array of collaborations in different industries. They have built and are involved in strong consortiums and networks with industry partners and public organisations. In terms of public sector collaborations, they are involved with many municipalities also. Certainly, the administrative unit facilitates cross-sectoral and interdisciplinary collaboration as well as collaborations with non-academic/public partners.

It also seems the collaboration profile meets the aspirations/visions of the unit. It was not clear however how the collaborations represented added value to the research quality in the unit. Undoubtedly some do, but as noted elsewhere, there is little to no detail on the benefits realised and as such the evaluation committee cannot judge the extent to which this working well.

In terms of formal or informal reviews for evaluating collaborations, there are half-year status reports and yearly achievement reports conducted. These are used to get feedback from members of collaboration where members vote on subtopics. These can result in the changing, but not the ending of subtopics. After industry projects have been completed, evaluation forms are sent to client to measure whether they were happy with the collaboration.

Recommendations to administrative unit.

- Consider an evaluation of the portfolio of national and international collaborators, and areas of expertise where there are current gaps. This could be used when considering funding or initiatives to grow new collaborations and reduce or eliminate others.

1.6 Research staff

In terms of gender balance there are 22 researchers of which 8 are female. This gives an overall percentage of 36% female. Of course this is a challenge across the industry but is something the unit should seek to improve in future. Gender and diversity in senior management could be also improved, but the unit do have incentives to get more females involved in particularly male-dominated topics e.g. cyber and AI. Two representatives from IFE HOF part of Women in AI collaboration, which is good.

As an international research institute, there are a large number of nationalities present in the admin unit. There is a good balance of senior, junior and PhD staff across the areas.

No particular group is prioritised above others, but motivation given to minorities to publish/talk at conference etc. Internal positions are announced to all staff, with no restrictive criteria for application.

In the self-assessment report, it is mentioned that it is difficult to recruit people with the specific capabilities required at the institute as there is no suitable education in Norway- with both human factor and nuclear field competence.

International candidates often have geographical/logistical problems with working in Norway. In the interview it was noted that a recruitment process can take two years from first application to candidate being employed.

Recommendations to the administrative unit

- Continue the good practices for ensuring diversity of gender and nationality.

- As human-factors are linked with social sciences/psychology, it can be easier to recruit females and other minorities. The committee suggest that the unit advertise and try to recruit from areas of social science beyond those already considered.
- Consider tailoring existing practices to enhance diversity, e.g. headhunting could begin with minorities when developing a pool of potential applicants.
- While recruitment processes are often slow in research units, two years seems excessive. The committee recommend the unit examines the process of recruitment to see where there can be time savings between advertising and the staff member being offered a position. Ensure that there is enough material available about the unit as well as about Norway that make it clear that the unit and Norway at large form an attractive working environment with a lot of support e.g. for families.
- Consider strategies to better hire intelligent/capable people and train them, e.g. incorporate a trainee programme for new staff.
- Continue the unit's strategy to be active in headhunting through networks over LinkedIn, conferences and workshops.
- Continue to encourage master's students to write a more tailored master's thesis.

1.7 Open Science

This aspect was very clearly addressed in the self-assessment report. The admin unit´s policies, approaches and activities to open sciences are very clear. This is important for IFE at the institutional level, and they therefore have an internal policy document. It is essential for IFE that research results are utilised by the surroundings, and it is therefore desirable that publications are as openly available as possible. IFE's main principle is that researchers should choose the publishing channels that provide the freest access to the publications. All peer-reviewed articles must be deposited and available in IFE's open knowledge archive.

In terms of the section on most important contributions and impact towards the different open science areas, this was quite general. The report stated that If the researcher has published in a journal that is not an approved scientific channel, they should consider whether it is relevant to submit a proposal for approval in the registry: https://dbh.nsd.uib.no/publiseringskanaler/Forside.

In terms of the policy regarding ownership of research data, data management, and confidentiality, there are data management plans in place for every project and piece of research.

2. Research production, quality and integrity

The main areas of research for the group are in Control Room & Interaction Design, Human & Automation and Human Centered Digitilization. The unit has a range of research capacities that then align with these main areas, but the self-assessment report gives no indication of the quality of productivity of the unit in these areas. The evaluation of the HOF research group (presented below) notes that whilst the research group has specialised expertise that is recognised to be somewhat world leading, the self-assessment report for the admin unit also notes that due to the nature of conducting nuclear research, much of their work is challenging to publish. Assessing research quality is therefore very challenging for the evaluation committee.

IFE-HOF adheres to IFE's institutional Code of Conduct, which the evaluation committee find to be satisfactory. IFE has a code of conduct in terms of behaviour and issues of integrity and has established a 'whistleblower system'. The detailed methodology on how to embrace

appropriate ethics is welcome and sends a strong positive message to the research and industrial communities.

2.1 Research quality and integrity

Research group Human and organisational factors (HOF) overall assessment

The Human and Organisational Factors (HOF) research group at the Institute for Energy Technology (IFE) exhibits notable strengths and weaknesses, with a promising outlook for achieving its goals and making significant contributions to the field of human factors and safety research.

The strengths include specialised expertise, applied research focus, societal impact, interdisciplinary collaboration and international recognition. To begin with, the HOF group boasts a team of researchers with diverse backgrounds and extensive expertise in human factors, interaction design, and safety. The group's emphasis on applied research ensures the relevance and practical applicability of its findings to real-world challenges in various industries. Furthermore, the research conducted by the HOF group has made substantial contributions to societal development, particularly in influencing nuclear safety policies worldwide and promoting sustainable development. The group actively collaborates with industry stakeholders, regulatory authorities, and other research organisations, enhancing the breadth and depth of its research impact. Finally, The HOF group is internationally recognised as a leader in human factors and safety research, particularly through its involvement in the largest and longest-running nuclear safety project globally.

The main weaknesses are related to recruitment challenges and low ambition in regard to publication outlets, making the impact in the scientific field weaker. The group faces challenges in recruiting Norwegian researchers due to limited availability of relevant formal education, often necessitating recruitment from countries outside Norway. While the group has a long publication record, there is a reliance on conference publications, with limited representation in high-quality journals.

Despite the challenges, the HOF research group is well-positioned to achieve its goals, given its specialised expertise, applied research focus, and strong collaborative networks. By leveraging its strengths and addressing weaknesses, the group can continue to make significant strides in advancing human factors and safety research.

In an international context, the HOF research group stands out for its leadership in nuclear safety research and its influence on global policies. The group's involvement in international collaborations and its role in the largest nuclear safety project worldwide underscore its strength and relevance on the global stage. In conclusion, the HOF research group at IFE exhibits strong potential for achieving its goals and making significant contributions to the field of human factors and safety research, both nationally and internationally. With continued strategic focus and collaboration, the group is poised to maintain its position as a leader in the field and drive positive societal impact.

3. Diversity and equality

Many relevant points regarding diversity and equality were discussed under 1.6.

There, it shown that the unit have a number of initiatives to relating to gender and they have a very healthy mix of international staff.

One possible concern is that responses from admin unit provided during the interview is that staff often pointed to standard HR policies. For example, when the topic of hidden bias was

discussed, the response from the unit was that recruitments all follow the same process, which include people in HR department who are specialised in these factors. This is certainly a valid point and is true of most units. However, the committee would encourage this specific unit to think of specific ways they can enhance gender and diversity, particularly when they are in the area of the social sciences and can perhaps reach a recruitment pool outside the narrow technology and science domains of other units. Awareness is needed at a personal level of all staff members, not only HR. The unit should make sure that staff is educated regarding hidden bias, and that call texts are made attractive to minority representatives. There are good examples as well as online tools for such practices that can be readily implemented without the need to create from scratch.

4. Relevance to institutional and sectorial purposes

The unit state in the self-assessment report that their research is "mainly meant to contribute to the general knowledge base". This seemed like a very vague ambition and also undersells the overall impact of the unit's research activity.

In the self-assessment report of the unit states that "this unit has rarely been involved in commercialisation. The research focus does not lend itself to it well and the customers are often the international nuclear organisations". In the interview, the reasoning presented for this was that most of the research that is done at IFE HOF is at TRL 4-6, producing prototypes. Also, approximately 60% of research is within a nuclear context, and the staff member ideal candidate has 20 years of experience within nuclear field, so there is a strong desire not to lose people.

In the interview it was clear that there has been some thought into commercialisation in the future.

Also, in the self-assessment report section 4.4 there was a statement. "For us, digitalisation is "How we can use digital technology to do more with less effort and get it done quicker, safer, and cheaper". This seems really interesting and possibly a very valuable source of recognition, but this was not elaborated on in the self-assessment report.

Recommendations:

- Explore opportunities for commercialisation going beyond TRL 4-6. The evaluation committee understand that the unit's work is not that easily commercialisable and that this would require re-engineering of products, with quality assurance and licensing. The committee recommend the unit engage with other research units nationally or internationally who have managed to successfully commercialise this type of research.
- Disseminate the work on their strategy to use digital technology to do more with less effort and get it done quicker, safer, and cheaper. This could be very distinctive and (possibly) commercialisable.

5. Relevance to society

This section clearly states the four parts of the RCN strategy, the three parts of the HEU strategic plan and also the five most relevant SDGs. However, there is no elaboration of how these are achieved or any tangible examples.

Of course, it is clear that IFE HOF do contribute to SDGs. For example, the simple fact that they work with nuclear safety and the safety of work is a clear over-arching link. reducing the chance of accidents. As one small example, IFE HOS develop ways to ensure changes of

procedures in nuclear control rooms are validated in simulators before they are implemented. They are also very involved in nuclear research, the main programme being EURATOM. A number of clients want IFE HOF to have more involvement, but they only participate in some degree due to Norwegian funding limitations.

IFE HOF have a very specific and admirable strategic focus on outreach activities including school visits, career talks, community research projects, and public lectures.

Recommendations:

- Explore ways that potential partners can collaborate with IFE HOF on funding proposals.
- Develop skills within the unit to provide tangible examples of research quality and impact and to develop and build impact cases to sell their work. This will benefit IFE HOF's engagement with customers, partners, potential partners, funding agencies and unit evaluators.

5.1 Impact cases

No impact cases were provided and so unfortunately the evaluation committee could not assess this section.

The evaluation committee recommend the admin unit invest some time and effort into collecting data and information on their impact to support communication activities and any future evaluations.

Methods and limitations

Methods

The evaluation is based on documentary evidence and online interviews with the representatives of Administrative Unit.

The documentary inputs to the evaluation were:

- Evaluation Protocol that guided the process
- Terms of Reference
- Administrative Unit's self-assessment report
- Administrative Unit's impact cases
- Administrative Unit's research groups evaluation reports
- Bibliometric data
- Personnel and funding data
- Data from Norwegian student and teacher surveys (only for HEI's)

After the documentary review, the Committee held a meeting and discussed an initial assessment against the assessment criteria and defined questions for the interview with the Administrative Unit. The Committee shared the interview questions with the Administrative Unit at least two weeks before the interview.

Following the documentary review, the Committee interviewed the Administrative Unit in an hour-long virtual meeting to fact-check the Committee's understanding and refine perceptions. The Administrative Unit presented answers to the Committee's questions and addressed other follow-up questions.

After the online interview, the Committee attended the final meeting to review the initial assessment in light of the interview and make any final adjustments.

A one-page summary of the Administrative Unit was developed based on the information from the self-assessment, the research group's evaluation reports, and the interview. The Administrative Unit had the opportunity to fact-check this summary. The Administrative Unit approved the summary with minor adjustments for clarity.

Limitations

The Committee judged that the Administrative Unit's self-assessment report was insufficient to assess all evaluation criteria fully, and some information gaps remained after the interview with the Administrative Unit. This affected the depth of the evaluation across almost all dimensions of this evaluation report.

List of administrative unit's research groups

Institution	Administrative Unit	Research Groups
Institution: Institute for Energy Technology (IFE)	Human Organisational Factors (HOF)	Human Organisational Factors (HOF)

Terms of References (ToR) for the administrative unit

The board of IFE mandates the evaluation committee appointed by the Research Council of Norway (RCN) to assess the two research divisions in IFE; Energy- and Environmental Technology (ENET) and Digital Systems (DS), based on the following Terms of Reference.

Assessment

You are asked to assess the organisation, quality and diversity of research conducted by Energy- and Environmental Technology and Digital Systems as well as their relevance to institutional and sectoral purposes, and to society at large. You should do so by judging the unit's performance based on the following five assessment criteria (a. to e.). Be sure to take current international trends and developments in science and society into account in your analysis.

a) Strategy, resources and organisation
b) Research production, quality and integrity
c) Diversity and equality
d) Relevance to institutional and sectoral purposes
e) Relevance to society

For a description of these criteria, see Chapter 2 of the life sciences evaluation protocol. Please provide a written assessment for each of the five criteria. Please also provide recommendations for improvement. We ask you to pay special attention to the following [n] aspects in your assessment:

1. Relevance of the research to Norwegian and European industry partners
2. Ability of the organization to adapt to changes in the market
3. Ability of the organization to deliver high quality research within profits requirements set by the research council of Norway
4. Sustainability impact and execution in the research strategy

In addition, we would like your report to provide a qualitative assessment of Energy- and Environmental Technology and Digital Systems as a whole in relation to their strategic targets. The committee assesses the strategy that the administrative units intend to pursue in the years ahead and the extent to which they will be capable of meeting their targets for research and society during this period based on available resources and competence.

Documentation

The necessary documentation will be made available by the life sciences secretariat at Technopolis Group.

The documents will include the following:

- a report on research personnel and publications within life sciences commissioned by RCN
- a self-assessment based on a template provided by the life sciences secretariat
- Interviews with representatives from the evaluated units

Interviews with representatives from the evaluated units

Interviews with personnel connected to Energy- and Environmental Technology and Digital Systems will be organised by the evaluation secretariat. Such interviews can be organised as a site visit, in another specified location in Norway or as a video conference.

Statement on impartiality and confidence

The assessment should be carried out in accordance with the *Regulations on Impartiality and Confidence in the Research Council of Norway*. A statement on the impartiality of the committee members has been recorded by the RCN as a part of the appointment process. The impartiality and confidence of committee and panel members should be confirmed when evaluation data from IFE are made available to the committee and the panels, and before any assessments are made based on these data. The RCN should be notified if questions concerning impartiality and confidence are raised by committee members during the evaluation process.

Assessment report

We ask you to report your findings in an assessment report drawn up in accordance with a format specified by the life sciences secretariat. The committee may suggest adjustments to this format at its first meeting. A draft report should be sent to IFE and RCN by [date]. The two research divisions Energy- and Environmental Technology and Digital Systems should be allowed to check the report for factual inaccuracies; if such inaccuracies are found, they should be reported to the life sciences secretariat no later than two weeks after receipt of the draft report. After the committee has made the amendments judged necessary, a corrected version of the assessment report should be sent to the board of IFE and the RCN no later than two weeks after all feedback on inaccuracies has been received from IFE.

Appendices

1. Description of the evaluation of EVALMIT
2. Invitation letter to the administrative unit including address list
3. Evaluation protocol
4. Template of self-assessment for administrative unit (short-version)

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