

Molde University College

Periodic evaluation of study program – Fall 2024

Master of Science in Sustainable Energy Logistics

Final report based on external evaluation

Arild Hoff – Coordinator of study program

January 2025

1 Introduction

This is the final report in the periodic evaluation of the MSc in Sustainable Energy Logistics program 2024.

The evaluation is performed according to the regulations described in the quality system at Molde University College. It starts with a description of the process, followed by a section commenting the feedback from the industry contacts and another section commenting on the report from the external expert. The next section is addressing each suggestion for potential changes or adjustments of the program and the final section with general conclusions.

This final report is written by the coordinator of the study program with support from the members of the research group in energy logistics. A preliminary version was presented for the quality team, involving the student representatives, in the meeting December 2 and then sent to the faculty for further discussions December 4. The final version was completed after some new suggestions from the staff and students. It will now be sent to the faculty board for approval before submitted to Studieutvalget.

2 The process of periodic evaluation of the program

The evaluation process has followed the same procedures as the periodic evaluation of the MSc Logistics program in 2022. In early 2024, the program coordinator Arild Hoff started preparing the internal report to be used as the basis for the evaluation, assisted by Sigrid Haugros at the study office. The research group in energy logistics has been consulted during the whole process.

On March 14, a preliminary report was presented for the students on the program and the staff before discussions in the quality team and the faculty. In early April, two reference persons from the industry were appointed. These were Chair of Logistics Development in Equinor, Atle Alvestad, and Site Manager at NorSea Vestbase, Ann-Mari Rovik. The tentative report was sent to these industry contacts, and their comments and suggestions were received in April/May. The preliminary report was updated with this feedback, and then discussed further by the staff and in the quality team, before completed.

An external expert, working as a professor at the Norwegian School of Economics, NHH, was appointed May 14, and agreed to complete the report within the end of the summer holidays. However, this expert got seriously ill and had to withdraw from the task. By September 27, Professor Mario Guajardo, also at NHH, was appointed as the replacement and provided with the internal report and all necessary attachments. He delivered his expert evaluation by November 6.

3 Comments from industry contacts

The Chair for Logistics Development in Equinor, Atle Alvestad, was challenged to write his opinion about the program and delivered his comments May 7, 2024.

He concludes that Equinor is very satisfied with the structure of the program and states that it is relevant for their business.

He refers to several former students, now working in the company, and emphasizes many of the current courses and seminars as crucial for the business. They are satisfied with the program structure, with basic courses in optimization, energy technologies, and advanced energy logistics and economics courses including the three seminars on energy logistics.

Alvestad also mentions that it could be interesting to see a better integration of subjects regarding digitalization and automatization in logistics in the mandatory courses. He does not think that any of the current subjects are superfluous but suggests having a continuous evaluation of the relevance of the courses with respect to the development in the energy industry. In addition, he states the positive

of having research-based master theses in cooperation with the industry, and the importance of treating sustainability, renewable energy and advanced data analysis in the program for preparing the students for the challenges and opportunities in the future.

The other industry contact, Site Manager at NorSea Vestbase, Ann-Mari Rovik, sent her comments to the program by April 28, 2024.

She agrees with Alvestad that the program is very relevant for them as a supplier to the oil and gas energy sector, and provides competence needed in the years to come. She also emphasizes the importance of focusing on sustainable energy sources and green energy investments, aiming for zero emissions, energy efficiency and renewable energy sources. In particular, she is satisfied with the recent inclusion of a new course LOG778 in offshore energy logistics planning and the sustainable technologies in course LOG775.

Rovik points out the important topics for the future as understanding the environmental consequences related to the need for renewable energy and energy efficiency. She emphasizes the importance for knowledge of possible digital solutions integrated in smart energy systems, and understanding how to upscale renewable energy together with development in technology for storing energy, which will be even more important in the future.

She concludes that the program is good with many relevant subjects, and that logistics and energy are highly interconnected.

4 Report from external expert

The external expert, Professor Mario Guajardo from NHH, was provided with the internal report, the comments from the industry contacts and other relevant documentation of the program, and he delivered his report by November 6, 2024.

His assessment of the program is overall positive, and he states that the program is relevant for the society and the labour market. His opinion is that the name of the program, the structure and the contents are appropriately designed, and that the learning outcome are well aligned with the curricula. He also states that the program offers good opportunities for students to learn and research about an industry sector which is relevant for Norway and worldwide.

He mentions six action points for improvement, which will be commented in detail in the next section:

- Recruitment of students
- Description of study plan and topics
- Course evaluation process
- Diversify connection with industry
- Alumni
- Internationalization

Guajardo concludes that the program is conducting a relevant mission to educate students in sustainable energy logistics, and that the graduated students should have acquired a solid understanding in the relevant areas making them capable to conduct important work as professionals in the private or public sector or to continue further in research positions.

The main concern is, however, the recruitment of students, which has decreased considerably in the last couple of years, and sustaining a larger inflow of high-quality candidates should be a major task to address in the near future. He also concludes that all action points mentioned above should have some potential for improvement.

5 Comments to the suggested changes

The suggestions from the industry contacts and the external expert are discussed with the research group in energy logistics and comments to each of them follows below.

Atle Alvestad, Equinor:

- *A stronger integration of subjects concerning digitalization and automatization in logistics*

Topics on digitalization and automatization in logistics are covered in three courses:

- o LOG775 - energy chains in the Industry 4.0 context: smart power grids, integrated energy networks, smart fields / integrated operations in energy industry.
- o IDA720 - methods and specialized systems and software for examining big data sets in order to draw conclusions regarding the information they contain.
- o IDA715 - discrete event simulation of business processes with the use of simulation software.

The first course is already mandatory, while the two latter are elective courses.

- *A continuous evaluation of the relevance of courses with respect to the development of the industry sector, by inviting industrial contacts as guest lecturers and/or co-supervisors on theses.*

It is planned to implement a digital questionnaire for the program graduates working in the energy industry and for other relevant industry companies for the continuous evaluation of courses relevance.

The practice of having guest lectures from industry will be continued and possibly expanded. Currently, guest lecturers from the industry are used in courses LOG777, LOG778, IDA715 and LOG904-116. Guest lectures from the energy logistics academic network are included in courses LOG775, LOG776 and LOG904-183.

Co-supervision of MSc theses from industry on energy logistics topics has been widely used since 2005 and will be continued.

- *It is positive with research-based master theses written in cooperation with the industry giving relevant problems to the student and value back to the companies.*

Master's theses research with connection to industrial problems is a practice we have been emphasizing from the start of the program. Since 2015 there have been more than forty master theses completed related to real-life energy industry problems.

Ann-Mari Rovik, NorSea Vestbase:

- *The content of the course LOG775 should give insight in policy and regulations around energy both nationally and internationally, and how these are influencing the energy market and sustainable development.*

These topics are rather covered in the course LOG776, where several course modules are devoted to energy policy, such as energy policy and environmental policy; electricity markets and regulations. This will be made clearer in the course and program descriptions.

- *Considering exchanging the course LOG765 as an elective with a more energy related subject, i.e. how to use local and renewable energy sources.*

The course mentioned is an elective. The topic of using local and renewable sources is to a large extent covered in LOG776, while the topic of energy transition and integration of energy systems is covered in LOG904-183. This will be emphasized even more and made clearer in the course and program descriptions.

- *Important subjects for the future are understanding of the environmental consequences in combination with the need for renewable energy and energy efficiency.*

Topics of environmental impacts of traditional and renewable energy production and energy efficiency are covered in several courses. The technological aspects are discussed in LOG775, while zero-emission projects offshore, carbon capture and storage (CCS), and hydrogen will be presented in course LOG778. The course LOG776 includes a substantial part on socio-economic appraisal of energy projects where the environmental impacts are in focus. In course LOG777, several cases have focused on relationship between renewable energy production and energy efficiency such as waste to energy. In addition, a new seminar on cost-benefit analysis of energy projects, where methods for evaluation of environmental impacts will be an important part, is under development. The points mentioned will be emphasized in the course descriptions.

- *It is important to get knowledge of possible digital solutions integrated in smart energy systems.*

This point was also mentioned by the contact from Equinor. The topic on smart energy systems such as managing energy chains in the Industry 4.0 context, operating smart power grids in cities, smart buildings, integrated energy networks for small communities, smart fields/integrated operations in the oil and gas industry is covered in LOG775.

- *It will become even more important in the future to understand how to upgrade renewable energy together with technology development for storing energy in combination for technologies developed for carbon capture and storage (CCS).*

Technologies aspects of energy capture and storage are planned to be included in LOG775. The topic of CCS and energy cells logistics system planning will be included in course LOG778.

Mario Guajardo, NHH (external expert):

- *The program is probably at a point where it needs to reinforce its recruitment strategy.*

Suggestions are

1. *targeting more strongly terminal candidates from bachelor programmes at national level*
2. *targeting students from abroad with access to funding from their national funding sources or organizations where they work*
3. *add some inflow of students through additional partnerships at international level*
4. *reinforce or change the administrative process of handling the applications*

These are all important issues. Some actions discussed with the research group in energy logistics are being implemented:

- Last years, some improvements and offering of new courses on energy logistics at the bachelor's programs at our university were made (i.e. updating course PET101 Olje- og Gassindustrien, new courses LOG410 Offshore Energy Logistics and LOG400 Logistics Planning in the Energy Sector). As a result, the admission in 2024 had several graduates from our bachelor programs in Petroleum Logistics and Economy, Supply Chain Management and Marine Logistics enrolled to the MSc in program in Sustainable Energy Logistics. Complementing it, there are discussions with the faculty administration for giving more courses in energy logistics in the bachelor programs.
 - Development of courses in hybrid form with the aim of targeting terminal candidates from bachelor programs on national level and candidates from industry working full time.
 - Offering a semester study, a full study or a two-diploma program, and supervision of MSc theses to Erasmus students from cooperating universities (in Spain, Germany, etc.) with energy profile.
 - Establishing new collaboration at international level (universities with energy profiles in Netherlands, Portugal, France, etc.).
 - Facilitating the involvement of the head of the MSc program and research group representatives in the student admission procedure.
- *It may be important to refresh or complement some of the fundamental topics with recent developments to adapt the programme to the world's dynamic given the disruptions of some fields and the high speed at which some scientific fields progress. A more explicit inclusion of data science and analytics, automation in logistics and AI may signal that the program is actively and continuously adapting its contents as to keep pace with reality*
- A new course, IBE710 Artificial Intelligence in Logistics, is offered as an elective from the spring 2025. It is also planned to actively and continuously adapt content of fundamental courses LOG725, LOG820, LOG734, IDA720 and IDA715, as well as the energy-related course LOG775 with explicit inclusion of data science and analytics, automation in logistics and AI as to keep pace with reality.
- *It might be worthy or more explicit to incorporate data science and analytics (like machine learning) in some of the courses. As for now, the only course devoted to analytics is IDA720, and to a less extent, LOG775 and LOG734 but in those analytics do not play a major role. In LOG775 the description does not mention much about methodologies and how data is used. LOG734 suggests that analytics bears just a minor share discussed at the end of the course. Likely, there is much more content across these and other courses not elicited from the descriptions.*
- Machine learning will be included in the new course IBE710.
- *The topic automation in logistics (like the use of automated robots in warehouses or introduction of automated technologies for vehicles) does not appear covered in the current curricula - the inclusion of artificial intelligence (AI) in the offer of the courses at the moment is non-existent. It is worthy to wonder how this could be incorporated in some of the courses or seminars in near future.*

As mentioned above, a new course in AI will be offered from the spring 2025, and automation in logistics will be considered included in several existing courses.

- *The rate of response of students to course surveys is to be encouraged by either offer a share of time of the final lecture to respond the survey, or by displaying a pop-up message after students log in to remind filling the survey*

This is to some extent already carried out. The pop-up message appears in the Canvas system and cannot be ignored in the last days of the survey. Even more emphasis on these surveys should be implemented to increase the response rate.

- *Reinforce the connection with industry by diversifying links with more institutions*

It is already a good relationship with the industry and continuously works towards strengthening the ties and expanding this relationship. There is a permanently ongoing process of establishing new industry connections with institutions through MSc students working with companies and industrial PhD students. In the last two years it is developed many relationships with representatives from the offshore wind industry through the Norwegian Offshore Wind cluster.

- *A relatively low score of the programme with respect of students' awareness about working life may be improved by exposing students early to real-life-word problems and creating awareness about how the programme builds towards their working life careers*

This is something which should be emphasized even more, and is also commented earlier in this report.

- *As for now there appears to be no consistent effort of the programme to keep track of its graduates and no statistics and contact details of many of them. Offering yearly activities for the programme alumni helps in networking, building programme reputation, job recruitment, may give constructive feedback to the programme, trigger master thesis topics, research collaboration, internships, job offers, etc.*

This is a good suggestion which should be followed up. There is certainly a need to organize alumni for the program to keep track of statistics, graduates and contact details, and to offer yearly activities or elaborate a survey. This should be coordinated with the other logistics master programs at the institution.

- *The option to take an exchange semester with cooperating universities in Europe through the Erasmus exchange programme is rarely used. Organizing group visits to nearby countries where the energy sector play an important role including industrial visits for a short period in the context of a specific course or as a general activity of the programme may may enrich the experience to study abroad.*

The main problem with taking an exchange semester through the Erasmus agreements is that not many universities we cooperate with have logistics or energy profiles and teach relevant courses in English. Such opportunities are being explored and making new agreements with relevant universities should be emphasized.

Group visits to nearby countries may also be organized with support from the faculty.

- *Students do not exploit so much the academic network linked to the programme. It is worthy to reflect about the opportunities to establish relationships with institutions in other countries.*

This is considered as a crucial aspect. There is already a good network, but it should be a continuous process working to expand it.

- *The internationalization of the programme may be intensified by establishing links with the invited lectures from abroad to give seminars and granting the opportunity for students to conduct abroad part of their master thesis lectures.*

This is related to the point mentioned above, and something continuously working on. The current courses contain several guest lectures from academy partners from Norway, Sweden, Canada, and Brazil. We are analyzing how to include and make other partners from Croatia, Spain, Portugal, and France accessible, to invite for guest lectures/seminars and provide opportunity for students to conduct part of their theses there.

In addition to the points above mentioned by the evaluators, there are some aspects that has come up in the discussions and should be considered when modifying the study program.

Among possible changes in the program with respect to the fundamental topics, it is suggested to replace course LOG708 Applied Statistics in the first semester by course LOG820 Vehicle Routing instead of teaching it in the second semester and make course IDA715 Discrete Event Simulation mandatory in the second semester. This change is requested because at first, knowledge and skills from LOG820 are necessary for mandatory course LOG778 taught on the second semester, and at second, knowledge and skills from course IDA715 become highly relevant for the program. This will, however, need to be coordinated with the other study programs using LOG820 as a mandatory course.

The program could be strengthened by more new energy logistics related seminars in the third semester.

There is also an ongoing process of promoting the program by improving the program description, learning outcome and working perspectives

Emphasizing and supporting the recruitment process throughout the organization and specifically handling applications in the study admission office should be of the highest priority

6 Final conclusion

This is the first time a periodic evaluation of the MSc in Sustainable Energy Logistics program has been performed. It is to some extent based on a similar evaluation for the MSc Logistics program from 2022. The evaluation has taken place during the year 2024, and staff members and students have been involved and given valuable input to the process.

The evaluations of the program are in general positive, and hence, no substantial changes seem necessary at this stage, although several suggestions for improvements are mentioned and will be considered.

The critical issue, which is also highlighted by the expert report, is the recruitment of students to the program. Looking at the admission in the fall 2024, there is a positive development with 16 students starting and at least 12 still active in the program after the first semester.

External evaluation report of Molde University College's study programme MSc in Sustainable Energy Logistics

Prof. Mario Guajardo, NHH Norwegian School of Economics

06.11.2024

1. Introduction

This report focuses on the MSc in Sustainable Energy Logistics offered by HiM, from an external perspective. As background, I received the 2024's internal evaluation report and a series of documentation which I have studied in detail. In addition to this material, I have complemented my views based on the many years of experience teaching at the master programmes at NHH and at other international institutions.

In general, my assessment of the programme is positive. The programme is definitely relevant for society and for the labour market. The name of the programme, its structure and contents are appropriately designed. The learning outcomes are well aligned with the curricula. The programme offers good opportunities for students to learn and research about an industry sector which is relevant for Norway and worldwide.

Without elaborating further in more general aspects of my assessment, I am focusing below in six *action points* which I believe may serve as suggestions for how the programme can improve in near future.

2. Action points

2.1 RECRUITMENT OF STUDENTS

The number of recruited students is rather low in the past two years. Moreover, the tuition fee for students coming from outside EU/EEA is considerably affecting the possibilities for candidates who otherwise in the past would have considered to enroll in the programme. Thus, it might become critical if the number of students stabilizes at this low level or if it declines further during the coming years. The programme is probably at a point where it needs to reinforce its recruitment strategy to have a sustainable volume of high-qualified applicants. Targeting more strongly terminal candidates from bachelor programmes at national level is one possible strategy. Another possibility is to target students from abroad with access to funding from their national funding sources or organisations where they work. Additional partnerships at international level or with more national companies may also add some inflow of students.

Reinforcing the administrative process also appears to be of importance in the recruitment, as the internal report refers to losing candidates due to the handling of applications in the study admission office. I do not have details about this, but it is clear that the programme does not afford losing highly qualified students, especially if they were willing to fill a vacancy and they did not manage because of some administrative reason. The programme administration should make sure that all applications are handled timely.

2.2 STUDY PLAN AND TOPICS

In general, the programme offers a broad variety of relevant courses following a coherent timeline. I find the programme is well structured, with a fair share of mandatory courses, elective courses, seminar series, and thesis work.

It is clear to me that the courses cover fundamental and traditional topics in logistics. Given this solid basis of courses, it is worthy to wonder how the programme adapts to the world's dynamic and how new topics are incorporated to the offer. Especially given the disruptions of some fields and the high-speed at which some scientific fields progress, it may be important to refresh or complement some of those fundamental topics with recent developments. In this regard, I have three main observations.

First, the incorporation of data science and analytics at this point might be worthy of more explicit incorporation in some of the courses of the programme. Machine learning techniques, for example, are part of what company recruiters have been hearing about in recent years, and they would probably appreciate candidates with an appropriate toolkit. As for now, the only course thoroughly devoted to analytics is IDA720 (Applied data analytics). To a less extent, additional efforts in this direction are captured in other courses like LOG775 and LOG734. These courses have incorporated the word analytics in the title, but from the description it appears that analytics does not play a major role. In the former, the description does not mention much about methodologies and how data is used. The latter suggests that analytics bears just a minor share discussed at end of the course. Likely, there is much more content across these and other courses not elicited from the descriptions.

Second, automation in logistics has been playing a role for many years. There are many applications in real-world, for example the use of automated robots in warehouses or the introduction of automated technologies for vehicles (in the broad sense) to perform transport by road, sea, and air. As for the course descriptions, this topic does not appear covered in the current curricula.

Third, and connected to the above, the inclusion of artificial intelligence (AI) in the offer of courses at the moment is non-existent. I do not think this is critical yet, as the disruption of AI is a bit more recent, but it is worthy to wonder how this could be incorporated in some of the courses or seminars in near future. Prominent logistics stakeholders such as Amazon have been reporting on the use of artificial intelligence, for example, and local companies will soon (if not now!) demand candidates with some knowledge about AI in their backgrounds. Students themselves are curious for the topic and may feel attracted to take a course on AI if it is offered.

A more explicit inclusion of these topics may help signaling company stakeholders and students that the programme is actively and continuously adapting its contents as to keep pace with reality and to prepare professionals matching requirements of job market recruiters.

2.3 COURSE SURVEYS

The rate of response of students to evaluate the course they take appears to be very low. Naturally, in some courses with very few students a low absolute number of respondents is expected, but this low number of responses appears to be a constant spread around most courses. Securing feedback from students is valuable for the improvement and continuous assurance of quality of the courses. Thus, it is to be encouraged that hopefully all of them respond the survey. At some institutions, it has been established that a share of time of the final lecture is offered to the students to respond the survey. Alternatives to this practice, which is probably not the best way for lecturers to finish their courses, is

to team up with webmasters in charge of the digital platform of the courses to display a pop-up message or a welcome message after students log in to remind them filling the survey.

2.4 CONNECTION WITH INDUSTRY

From its origin, the programme has been well connected with topics relevant for the local industry. Partnerships with a couple of institutions and their letters reporting on the programme reveal a positive opinion and satisfaction with respect to contents and graduated candidates. I identify, however, a couple of actions that may reinforce the connection with industry.

First, it is about creating opportunities to team up with more partners. This may help diversifying links of the programme with more institutions, which may in turn imply good connections for students and hedge against the risk or disruptions that some of the current partners might have in the coming years.

Second, the students' responses to the survey outlined in the internal report reveal a relatively low score of the programme with respect of their awareness about working life (Table 8 of the internal report). Although their opinion might change during the last semester conducting the thesis (which is after the survey has been responded), exposing students early to real-world problems and creating awareness about how the programme builds towards their working life careers may contribute to improve their views.

2.5 ALUMNI

The programme may benefit from keeping track of its graduates and from a more established relationships with them. As for now, there appears to be no consistent effort of the programme to keep track of all its graduates, and it lacks statistics and contact details of many of them. Many of the popular educational programmes out there offers yearly activities for their alumni. This helps in many aspects, such as networking, building reputation for the programme, and job recruitment of young candidates. Alumni may also give constructive feedback to the programme, from their current perspective probably employed at some job position relevant to the programme.

Furthermore, inviting current students to some activity where they can meet past graduates may trigger master theses topics, research collaborations, internships, job positions, etc.

2.6 INTERNATIONALIZATION

Although the academic network linked to the programme shows internationality, it appears that students do not exploit this so much. Moreover, given the current geopolitical situation, it is understandable that the opportunities for a double degree with a Russian institution is not longer an option. If this was a successful practice in the past, with the possible added value of talented students recruited from such partner university, it is worthy to reflect about the opportunities to establish relationships with institutions in other countries.

The internal report refers to the option for students to take an exchange semester with cooperating universities mainly in Europe through the Erasmus exchange programme, but the option is rarely used by them. Why this trend happens is intriguing, because in many other master programmes the option of going to study abroad for a while is one of the highlight experiences for students. Perhaps the fact that the programme focuses on a very relevant topic for Norway is one of the reasons they prefer to

remain local. However, there are other nearby countries where the energy sector, including oil and gas, play an important role and it may enrich the experience of the students to study there. If a whole semester is not their main choice, maybe organizing a group visit to some of those countries, including industrial visits, for a short period may help. This could be in the context of a specific course or as a general activity of the programme. Similar experiences of other master programmes have shown this is possible and valued by students, and even some funding sources can be found out there to materialize this idea.

As one of the points of evaluation is to discern whether the graduated students are well qualified for an international career, it may add value for them to be more exposed to environments outside Molde and Norway. Inviting lecturers from abroad to give seminars currently help in this regard, but it is not clear the degree of connection of students to these lecturers or to other forms of internationalization beyond the week of the seminar. Establishing research links with these lecturers and granting the opportunity for students to conduct abroad part of their master thesis, for example, may intensify the international ties of the programme.

3. Short conclusion

This external report concludes the programme is conducting a relevant mission to educate students in the areas of sustainability, energy, and logistics. After finishing the programme, the candidates will have acquired a solid understanding of topics in these areas and will likely be capable to conduct important work as professional in the public and private sectors. They are also in good position to continue further in research positions.

Over the last ten years, the programme has been in healthy shape. However, in the last couple of years the number of students has decreased considerably. Sustaining a larger inflow of high-quality candidates should be a major task to address in near future. Efforts on refreshing the course topics with recent trends, reinforcing ties with industry and alumni, and intensifying the degree of internationalization of the programme have also been identified as actions for improvement.

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07. mai 2024

Tilbakemelding på studieprogrammet "Sustainable Energy Logistics"

Kjære Professor Arild Hoff,

Vi viser til din henvendelse om å bidra med tilbakemeldinger på masterstudiet i Sustainable Energy Logistics ved Høgskolen i Molde. Vi setter pris på muligheten til å dele våre synspunkter og erfaringer, og håper at innspillene vil være til nytte i den videre utviklingen av studieprogrammet.

Generelt er vi i Equinor svært fornøyde med oppbygningen av studieprogrammet, og vi finner det relevant for vår bransje. Vi ønsker å fremheve seminarsemesteret som et særlig positivt aspekt ved utdannelsen. Formatet med intensive ukeseminarer har vist seg å være effektivt for å formidle dybdekunnskap, fremme engasjement og samarbeid mellom studenter, samt sikre god oppfølging fra forelesere.

Basert på tilbakemeldinger fra medarbeidere som har gått masterstudier i Molde:

Basisemner av betydning:

- Optimering
 - o LOG725 – Transportation and Distribution: Fokus på optimalisering i logistikk, som er viktig kompetanse i vår sektor.
 - o LOG820 – Vehicle Routing: Emnet har et fokus på optimering innen logistikk, og er viktig kompetanse for våre fartøy og helikopterplanleggere.
 - o LOG778 – Offshore Energy Logistics Planning har hovedfokus på utvikling av beslutningsverktøy for resurs- og aktivitetsplanlegging i offshore energilogistikk. Viktig at studenten har vært gjennom LOG725 og LOG820 i forkant, for å sikre tilstrekkelig kunnskap innenfor modellering og ruteplanlegging.
- Energi verdikjeder, teknologi og økonomi
 - o LOG775 Energy Analytics and Sustainable Technologies
 - o LOG745 Industrial Organization and Competition Policy
 - o LOG776 Economics of Energy Value Chains

Vi mener at følgende seminarer og emner er spesielt verdifulle:

- Offshore Upstream Logistics
- Energy Transition
- Games Theory in Logistics

For uteksaminerte studenter ser vi etter følgende generelle kunnskaper:

- Problemløsningskompetanse i komplekse situasjoner med flere alternativer.
- Kunnskap om optimering, simulering, cost benefit analyse og spillteori
- En overordnet forståelse for supply chain og evnen til å se sammenhenger og optimalisere på tvers av verdikjeder (LOG775,745,776)
- Prosjektlederkompetanse, og evne til raskt å sette seg inn i nye problemstillinger (LOG765)
- Analytiske ferdigheter, inkludert bruk av verktøy som Excel, Power BI, Sap Analytics Cloud, Spotfire, Arena (IDA715), AMPL og CPLEX (LOG725, LOG820), R (LOG708), Python (IDA720)

Vi mener at studieprogrammet i stor grad dekker de fagene som er relevante for vår virksomhet. Det kunne imidlertid vært interessant å se en sterkere integrasjon av emner som omhandler digitalisering og automatisering i logistikk, da disse områdene blir stadig mer sentrale i vår industri.

Ingen av de nåværende fagene fremstår som overflødige, men vi anbefaler en kontinuerlig vurdering av kursets relevans i forhold til bransjens utvikling, gjerne ved å invitere industrikontrakter som gjesteforelesere og/eller biveiledere. Det er positivt med forskningsbaserte masteroppgaver som skrives i samarbeid med industri, dette gir arbeidsrelevante problemstillinger for studenten, og gir verdi tilbake til industrien.

Vi mener det er viktig at temaer som bærekraftig utvikling, fornybar energi, og avansert dataanalyse er integrert i studieprogrammet for å forberede studentene på de utfordringene og mulighetene som ligger foran oss.

Vi håper at disse tilbakemeldingene vil være nyttige i den videre utviklingen av masterstudiet i Sustainable Energy Logistics. Vi ser frem til et fortsatt godt samarbeid med Høyskolen i Molde og er åpne for en dialog for ytterligere diskusjon rundt disse temaene.

Vennlig hilsen,

Atle Alvestad (476527)

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Kristiansund, 28. April 2024

Master of Science of Sustainable Energy Logistics

Studieprogramevaluering

Dette er et meget aktuelt studium i dag og som en leverandør til olje og gass sektoren, kan jeg si at dette er en kompetanse vi trenger mer av i årene som kommer. Energisektoren er i en konstant endring og vil fremover endre seg hurtig, noe som igjen krever studenter, som også etter endt utdanning, fortsetter å utvikle sin kunnskap innenfor fagfeltet.

«Verden styres mot en energikrise» - et utsagn flere har kommet med i de siste årene. Geopolitiske spenninger, økende etterspørsel etter energi og overgang til mer bærekraftige energikilder er noen av faktorene som spiller inn. Det internasjonale energibyrået (IEA) snakker om både en klimakrise og energikrise hvis man ikke i de kommende årene ser en kraftigere økning i grønne investeringer. Som leverandør jobber vi mot et mål om å ha null utslipp i våre egne operasjoner innen 2030, finne metoder for å gjenbruke energi på, levere grønnere energi i form av fornybare energikilder og energieffektivisering, hvor vi også skal være en tilrettelegger for å redusere utslipp hos våre kunder.

Det som blir viktig for studentene er å ha en god forståelse for energiomstillingen. Dvs. kunnskap om vindkraft, solenergi, vannkraft og andre teknologiske bærekraftige løsninger. Dette virker å være ivaretatt gjennom emne LOG775 Energy analytics and sustainable technologies. Innholdet kan med fordel gi et innblikk i politikk og regelverk hvis dette ikke allerede er ivaretatt. Det er viktig med god forståelse av både den internasjonale og lokale politikken rundt energi, ulike reguleringer, samt hvordan disse påvirker energimarkedet og bærekraftig utvikling. Dette kommer også frem gjennom en nylig studie gjennomført av Nupi i 2024, hvor man har sett på utdanning rundt energi og behovet for kompetanse i arbeidsmarkedet.

Jeg synes det er veldig bra at LOG778 blir tatt med inn i programmet som omhandler Offshore energy logistics planning. Det er et veldig relevant emne, som vi som leverandør til både offshore olje og gass, men også etter hvert offshore vind, vil kunne ha god nytte av kunnskapen som tilegnes. Hvis man ser emnene i sammenheng med beskrivelsen av programmet, ville jeg vurdert en utskifting av LOG765 Project planning and control som et valgfag med et mer relevant emne innenfor energi. Noe vi er opptatt av er energiuavhengighet - hvordan bruke lokale og fornybare energikilder, som kan være et innspill til enten et emne eller seminar.

Temaer som blir viktige fremover, blir forståelsen av de miljømessige konsekvensene, sett i sammenheng med behov for fornybar energi og energieffektivisering. I dagens digitaliserte samfunn blir det viktig å ha kunnskap om mulige digitale løsninger som er integrerte i smarte energisystemer. Det å forstå hvordan man kan oppskalere fornybar energi sammen med teknologiutvikling for lagring av energi blir mer og mer viktig i den kommende tiden. Dette henger tett sammen med teknologier som kan utvikles for både karbonfangst og lagring.

Et flott program med veldig mange relevante emner som vi ser et stort behov for i den kommende tiden fremover. Liker veldig godt måten dere knytter logistikk og energi sammen på i programmet, da disse to henger tett sammen.

Med vennlig hilsen

Ann-Mari Rovik



Site Manager

NorSea Vestbase

Molde University College

Periodic evaluation of study program – Spring 2024

Master of Science in Sustainable Energy Logistics

Internal evaluation report

Arild Hoff – Coordinator of study program

April 2024

Contents

1	Introduction.....	3
1.1	Topics to be addressed.	3
2	Description of the study program	4
2.1	Learning outcomes.....	5
2.2	Study plan	6
2.3	Recommended elective courses	7
2.4	Seminar series in the third semester	8
2.5	Master thesis in the fourth semester	9
3	Recruitment and student progress	9
4	Quality assurance	13
4.1	Class meetings.....	13
4.2	Quality Team	13
4.3	Faculty meetings	14
4.4	Course evaluations.....	14
4.5	The study barometer	14
4.6	Internationalization.....	16
5	Teaching and evaluation	17
5.1	Grading procedures regular courses.....	17
5.2	Seminar series.....	18
5.3	Master theses	18
5.4	Teachers' competence	20
6	Relevance for industry and society	21
7	Summary.....	23
8	Attachments	24
9	Timeline	25

1 Introduction

The regulation about quality assurance and development in higher education given by The Norwegian Ministry of Education and Research (Kunnskapsdepartementet) states in §2.1 point 2 (translated from Norwegian)

The institutions should carry out periodic evaluations of their study programs. Representatives from industry or social life, students, and external experts, relevant to the study program, should contribute to the evaluations. The evaluation results should be public.

The quality system at Molde University College states that the periodic evaluation should be carried out every sixth year and emphasizes that the purpose of the evaluation is continuous improvement of the study programs. The evaluation should ensure that the program's learning objectives are updated and relevant, and that the subjects included in the program are designed with activities and evaluations contributing to student's achievement of the learning objectives. The evaluations should also contribute to the program's inclusion in the University College's mission and relevance for the labour market and society in general.

The periodic evaluation should complement the annual quality work and contribute with a general and external view on the program's form and content. It should be a tool for the work on developing the program.

This document is the internal evaluation report written by the program coordinator. It is presented for and discussed with the staff contributing to the program and the student representatives for the program. All parties have contributed with suggestions and comments when finalizing the report. Additional comments from representatives from the industry are also considered. This report should be the basis for an evaluation performed by an external expert, and a final report should be written summarizing the work and suggesting actions and further development of the program.

1.1 Topics to be addressed.

The quality system states the following mandate for the external evaluation.

The evaluation should consider:

- The study program's relevance for society and labour market.
- Whether the program provides a good learning environment.
- Whether the program has a high enough degree of accomplishment.
- Whether the program's learning outcome descriptions are updated and relevant.
- Whether the program's content, learning activities and evaluation formats supports the general learning objectives.

The external evaluation report should suggest how to improve the quality of the study program. It should point out good and weak sides of the program and suggest actions for potential improvement.

Externally, the most important factor might be to what extent the program is relevant for the labour market as well as for research. We should investigate if there are subjects that are missing or superfluous, and whether the program meets the current and expected future requirement for competence in the society.

Some other topics relevant to consider are:

- Is the name of the study program adequate?
- How is the profile of the study program compared to similar programs at other institutions?
- Does the composition of subjects give a good progress in the study?

- Is the program satisfactory linked with research and professional development?
- Are the graduated students well qualified for an international career?
- Are the students satisfied with the quality on teaching, feedback and evaluation in the program?
- To what extent do the students contribute to the development of the teaching activities and evaluation forms in the program?

2 Description of the study program

The Master of Science (MSc) in Petroleum Logistics at Molde University College was started in year 2015, initiated by the Energy Logistics research group. It was developed as a natural extension of the BSc program in Petroleum Logistics offered since 2002, with involvement of offshore operating energy companies and their providers such as Statoil and NorSea group, in the curriculum development. At the start, the study program had a two-diploma collaboration agreement with the Gubkin Russian State University of Oil and Gas in Moscow, with the possible option of getting master degrees from both universities. Due to the political situation this collaboration is now terminated. In 2020 the study program was modified and renamed to MSc in Sustainable Energy Logistics since the study was extended to include other energy sources in addition to oil and gas, and courses on new sustainable energy technologies, energy economics, and energy transition.

The program is closely related to the MSc in Logistics with several courses given in both programs including energy logistics examples, and with some special courses related to energy logistics mandatory for the MSc in Sustainable Energy Logistics.

The study consists of 120 ECTS over four semesters. The admission requirement is a relevant bachelor's degree with average grade of C or higher. Normally between 10 and 20 students have been admitted to the study each year. More detailed statistics are shown later in this document.

The first semester consists of four mandatory courses. Three of them are taken together with the MSc Logistics students, while one is specializing on energy logistics and technologies. In the second semester, the study has three mandatory courses, where two of them are specific for the sustainable energy logistics program. In addition, there is one elective course which in principle can be chosen among all other logistics courses on master level, although the six courses considered most relevant are recommended. The number of mandatory courses in the second semester were increased from two to three from the study year 2022-2023.

The second year of study follows the same structure as the MSc in Logistics with the third semester consisting of a seminar series with 10 intensive weekly seminars on different topics followed by the proposal for the master thesis. Among the seminars offered there are usually 3-4 with a direct focus on energy logistics. The fourth semester is devoted to writing the final master thesis.

The study handbook describes the MSc in Sustainable Energy Logistics program as follows:

Logistics deals with the organization of the flow of products, services and information from the raw materials to the end user and builds on a broad spectrum of academic disciplines. For a large number of industrial and business companies, achieving high quality logistics operations will be the key competitive factor for future success. Oil and gas companies or other industry dealing with the energy sector are no exception from this. Today, all companies pay attention to what kind of energy source they use. This will be increasingly important in the future, as policy and regulations are likely to become stricter. The

combined knowledge of energy markets and energy sources, as well as efficient logistics solutions, makes this program unique.

The international MSc program in Sustainable Energy Logistics at Molde University College – Specialized University in Logistics (HiMolde), includes most of the courses from the previous international MSc program in Petroleum Logistics. Some of the courses are, however, new courses. The program is held as a full-time program (120 ECTS credits) over two years in Molde, and consists of 90 ECTS credits of course work, and a MSc thesis of 30 ECTS credits in the fourth and final semester.

Along with presenting a broad range of logistics topics, the program gives an understanding of the energy situation in the world, comparing existing renewable energy sources, as well as non-renewable sources, in terms of costs, qualities and availability. The program also provides knowledge about efficient energy management, like e.g. dynamic purchasing from different energy sources, and analysis of energy use and emissions. The main objective is to give knowledge within a broad spectrum of energy topics in combination with logistics.

The website describing the study program is found at

<https://www.himolde.no/english/studies/programmes/msc-in-sustainable-energy-logistics/index.html>

2.1 Learning outcomes

The learning outcomes are specified as follows:

After completing the programme, the successful candidate is expected to:

Knowledge

- *have good and general knowledge about logistics and supply chain management (SCM) in general.*
- *have specialized knowledge about SCM and sustainable energies.*
- *have specialized knowledge about different types of energy sources and the relationship between these.*
- *have extensive knowledge of scientific theories and methods relevant to SCM, operational logistics and sustainable energy.*
- *have knowledge about operations research and operations management in general.*

Skills

- *be able to use advanced theory and methods to identify inefficient energy usages in supply chains.*
- *be able to propose improvements of organizational/structural changes and suggest ways of implementing such changes associated with sustainable energy in a supply chain.*
- *be able to understand the specific challenges connected to the different supply chains, energy usages and the energy market.*

General Competence

- *be able to present and communicate professional issues relevant to logistics and sustainable energy.*
- *be able to apply acquired knowledge and skills within new areas of research and applications.*
- *be able to read scientific papers and other scientific work with a critical view.*

2.2 Study plan

The study plan for the first year for students started in the fall 2023 is shown in Figure 1.

MSc in Sustainable Energy Logistics	
First semester	LOG708 Applied statistics
	LOG725 Transportation and distribution
	LOG745 Industrial organization and competition policy
	LOG775 Energy analytics and sustainable technologies
Second semester	LOG776 Economics of energy value chains
	LOG777 Business cases in energy logistics
	LOG820 Vehicle routing
	One elective course

Figure 1. First year for students on Sustainable Energy Logistics

From the spring 2025 the course LOG777 will be replaced by a new mandatory course LOG778 Offshore energy logistics planning. Then LOG777 might become an elective course.

The mandatory courses are shortly described as follows:

- LOG708 Applied statistics

Introduction to descriptive statistics. Presenting topics like probability distributions, samples and populations, estimation and inference, confidence intervals, testing of statistical hypotheses, significance levels and P-values. Gaining familiarity of the statistical package R is central in the course.

A one-week preparatory course in basic statistics (LOG718) for students without statistical background is given before the semester starts to make sure that students have the necessary skills for starting on LOG708.

- LOG725 Transportation and distribution

The course focuses on logistic problems appearing in transportation and distribution planning such as transportation and transshipment, minimum-cost flow in network, shortest path, maximal flow, facility location and various location-covering problems. To deal with these problems, the course introduces mathematical programming to formulate the problems, and the use of standard software for solving the mathematical models.

- LOG745 Industrial organization and competition policy

The purpose of this course is to provide approaches for economic analysis of strategic interactions between firms operating in imperfectly competitive markets. It concerns different social economic topics such as market structures, non-cooperative game theory, product differentiation, price discrimination and public regulations.

- LOG775 Energy analytics and sustainable technologies

The course describes various energy resources, world energy production, consumption, and trade flow. It gives an overview of energy value chains and sustainability, explains technological specifics and environmental challenges associated with various energy sources and shows how energy chains are managed in the *Industry 4.0* context. It also shows decision support frameworks for efficient development and operations of integrated energy networks.

- LOG776 Economics of energy value chains

The course covers topics like fundamentals of energy economics and economics of both conventional and alternative energy sources. It also considers electricity market and regulations in addition to energy and environmental policy, trade-offs between efficiency, equity and sustainability, and appraisal of energy infrastructure development.

- LOG777 Business cases in energy logistics

The course consists of three different cases taken from specific companies, public organizations or research institutions. The cases will focus on managing various operations in both the energy sector and other businesses concerned with the efficiency of energy use, environmental impact, and various energy-related logistical challenges. The students should write an assignment for each case with an analysis of the logistical problem and indicating a potential solution for the problem.

- LOG778 Offshore energy logistics planning

The course gives an outline of worldwide energy production offshore including wind, oil, and gas, offshore oil and gas fields and offshore wind development projects in Norway and Europe. Offshore energy logistics networks on the Norwegian Continental Shelf (NCS) and their developments are studied, focusing on infrastructure, actors, and main upstream offshore logistics activities. The focus of the course will be on the development of decision support tools for upstream logistics planning problems such as location and installation of energy production units, cargo transportation and aerial transportation of offshore personnel, operations and maintenance of offshore production units, onshore base location and operations, and design of offshore emergency response systems. The special focus will be on safety and zero emissions in offshore energy logistics.

- LOG820 Vehicle routing

The course covers aspects of last-mile distribution and routing problems such as arc routing, the travelling salesman problem and many variants of the vehicle routing problem. Emphasis is placed on solving the problems with classical construction heuristics and by using mathematical modelling.

2.3 Recommended elective courses

The fourth course in the second semester is elective. All logistic courses on master level are approved, but the recommended courses are as follows:

- IBE700 Enterprise resource planning (ERP) systems

An ERP-system supports and automates business processes across functional areas by integrating the organization's functional areas and sharing information across the organization in real time. This course is a practical hands-on course introducing how business processes are executed with the support of an ERP system. Students will use a commercially available ERP-system (SAP) to build an understanding of the functional capabilities of such systems.

- IDA715 Discrete event simulation

The course focuses on development of simulation models for logistics systems and processes through discrete events scheduling and handling. It presents queue scheduling and queueing networks, input analysis/calibration and output analysis, performance metrics and flow management. The students learn implementation of simulation models using modern simulation software, as well as verification and validation of the models.

- IDA720 Applied data analytics

Data analytics is the process of examining data sets in order to draw conclusions regarding the information they contain with the aid of specialized systems and software. A significant challenge arises when working with big data in many real-life settings, where data of various nature is collected in huge volumes. To achieve benefits, the data sets examination is conducted with a specified goal, or in other words, with a properly formulated practical question. When the question is determined, the steps of data analysis include capturing the needed data from various sources, cleaning, preparing, and aligning it before further formal analysis may be conducted and its results may be interpreted and finally, communicated to the appropriate audience to determine the best course of action.

- LOG733 Exact optimization methods in logistics

The course focuses on solving problems from logistics formulated as deterministic optimization models. Examples of problems include production problems, shortest path and knapsack problems. Modelling will be covered only briefly, as this is supposed to be known in advance. Problems treated include Linear Programming problems and Discrete Optimization problems. Emphasis will be put on the Simplex algorithm for Linear Programming and Branch and Bound search for discrete problems. Dynamic programming and other solution methods are also treated.

- LOG734 Heuristics in analytics

The course focuses on using heuristic optimization methods to solve computationally challenging optimization problems. An understanding of heuristics is built from the ground up, starting from classical construction and improvement heuristics. The course then proceeds with a thorough treatment of metaheuristics. Attention is drawn towards the implementation of heuristics using a suitable programming language. Examples of using heuristics in prescriptive analytics (solving hard combinatorial optimization problems) and in predictive analytics (using metaheuristics for classification and prediction problems in data mining) are discussed at the end of the course.

- LOG765 Project planning and control

The course includes topics like identifying, organizing, governing and financing a project. It looks at management of project teams, models for project organizing and the role of a project manager. In addition, tools and techniques for identification, planning and budgeting are discussed, together with cost and quality control, project uncertainties, resource planning and risk management.

2.4 Seminar series in the third semester

The third semester is structurally the same as for the MSc Logistics program. The semester consists of 14 weeks containing a series of one-week seminars on a huge variety of different topics. The seminars are classified according to the specialization or subvariant best suited for the topic, and approximately 3-4 seminars have a direct focus on energy logistics. Normally, there are two or three seminars every week, and each seminar gives 2.5 ECTS. The students can only take one seminar per week, but apart from that they choose freely at least 9 of the seminars given in the semester. One seminar in Research Design, is mandatory for all students and should prepare the student for the final master thesis work

in the last semester. Seminar holders are mostly internationally recognized professors from universities abroad, but to some extent the members of the Energy Logistics research group at Molde University College also give seminars on topics within their expertise. Some examples of seminar holders from the industry exist as well.

There are several seminars specially concerning Energy Logistics. The plan for 2023, included seminars in *Offshore Upstream Logistics*, *Integrated Downstream Petroleum Logistics* and *Energy Transition*. The previous year included a seminar in *Offshore Wind Logistics*, a topic which is now developed into a new semester course starting from 2025. The energy logistics seminars are offered to students on the other master programs in logistics as well.

Students are encouraged to sign up for the seminars they expect to take at the start of the semester. The actual due date for signing up is, however, Thursday in the week before the seminar is going to be held. This gives the students much flexibility to change their mind during the semester and choose seminars relevant for their master thesis when the topic is decided. The negative side of this practice is, however, the uncertainty for the seminar holders, who in many cases gets a different number of students than planned for.

At the end of the semester, students should write a proposal, i.e. a description and starting point for the master thesis. This proposal should be defended orally and gives 5 ECTS when approved.

Evaluation formats of the seminars are discussed in chapter 5.

2.5 Master thesis in the fourth semester

The last semester in the study is devoted to writing a master thesis. The thesis is an independent extensive work done under the supervision of an advisor/professor within the discipline. A thesis can be written by a single student or two students together. Candidates are relatively free to choose topics, as long as it is approved by the supervisor and program manager. A thesis can be applied and related to a company or governmental body, or it can be in the form of a theoretical research project. Many of the master theses within energy logistics are written in close cooperation and with advisors from energy companies. There are also numerous examples of students from the MSc Logistics program choosing energy related topics for companies within the industry.

The evaluation procedure for the theses is presented in chapter 5.

3 Recruitment and student progress

The tables and figures presented in this section are taken from the Tableau data visualization system providing statistical information based on data provided by Molde University College.

Table 1 shows the development in applications since the start in 2015. The number of applicants varied a lot the first years, and then increased considerably from 2021. The reason for this partly due to the fact that international applicants then was allowed to apply with electronic documents, making it easier than previously when paper copies had to be sent. However, we can also see a change in the student numbers after changing the focus and program name from petroleum to sustainable energy logistics. Note that tuition fees for student outside EU/EEA were introduced in Norway in the spring 2023, i.e. after the due date for the international applicants. Hence, a large group of the total number of applicants is assumed to be international applicants not able/willing to pay the tuition fee, and the

number is expected to be reduced considerably for the coming years when the tuition fees are announced before the due date.

Table 1. Applications and acceptance 2015 – 2023

STUDY PROGRAM	YEAR	Applicants	1.priority	Offered a place	Answered YES	Met	% of offers
92 Master of Science in Sustainable Energy Logistics	2015	93	55	42	20	14	33,3%
	2016	59	23	19	16	10	52,6%
	2017	116	50	21	16	12	57,1%
	2018	83	32	15	14	11	73,3%
	2019	88	60	8	7	7	87,5%
	2020	148	107	22	15	12	54,5%
	2021	227	181	30	21	15	53,3%
	2022	204	166	16	8	6	37,5%
	2023	239	197	18	10	7	38,9%

As the table shows, the number of students starting each year is varying between 6 and 15.

Figure 2 shows the origin of the students completed or still active in the studies by the year started. As we can see, there has been a high degree of students from outside the EU. The total number of students has been low the last two years, but the defection of international students due to the tuition fees were to some extent compensated by a higher number of Norwegian students last year. Most of these are recruited from the bachelor studies at Molde University College.

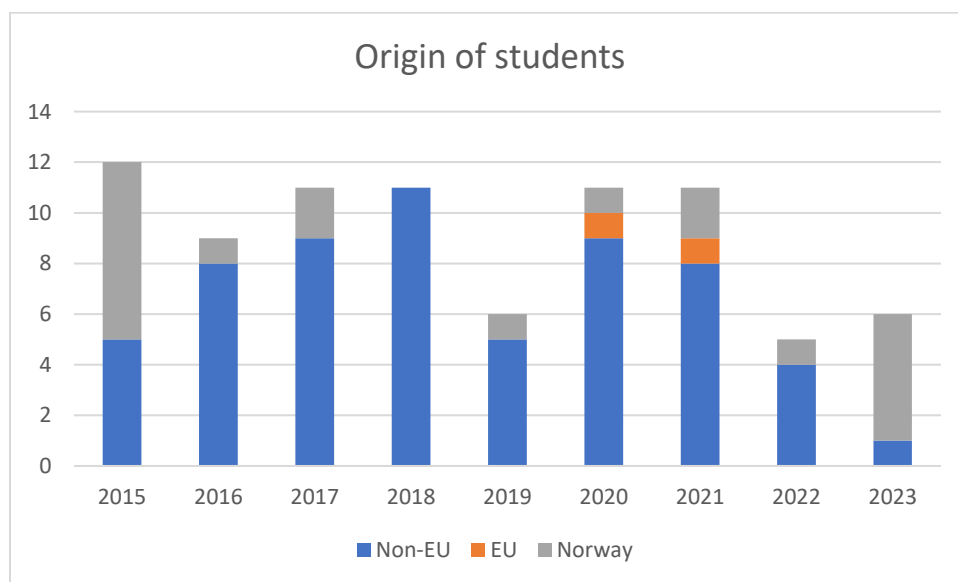


Figure 2. Origin of students

Figure 3 shows an overview of the gender of students starting on the program. As we can see, apart from 2021, where the number was equal, there has been a dominance of male students in each class.

Antall startende

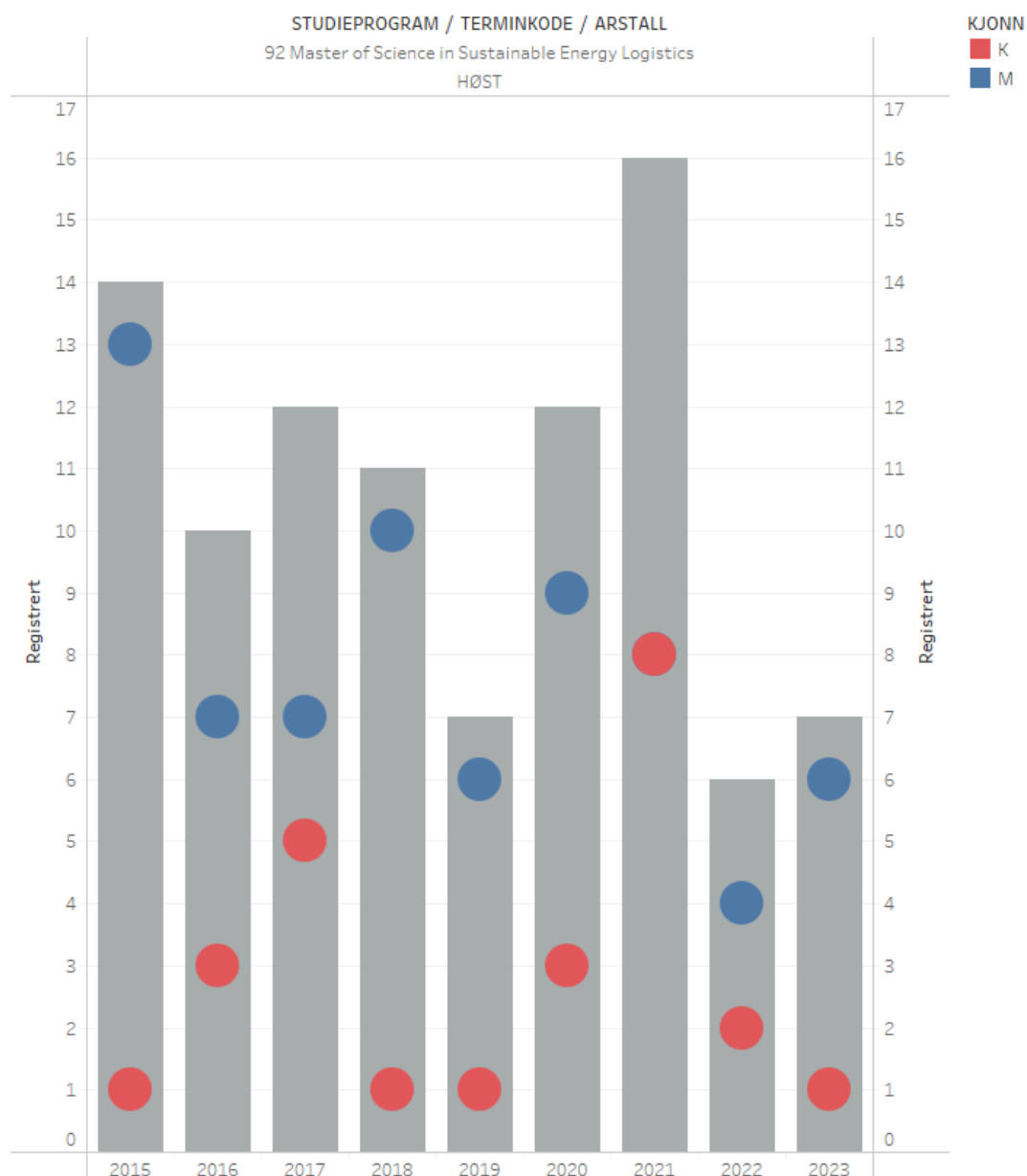


Figure 3. Gender of students 2015 – 2023 (Tableau)

Table 2 shows the number of ECTS taken by the students in the program in each of the semesters from 2015. The table shows both the total number and the average among the active students the given semesters. With the normed progression, each student should take 30 ECTS every semester. Note that the low number in the spring semesters 2016 is due to the fact that some students were on exchange semester in Moscow.

Table 2. ECTS taken by students in the program 2015 – 2023 (Tableau)

Beståtte studiepoeng

ARSTALL	TERMINKODE / STUDIEPROGRAM					
	VÅR			HØST		
	92 Master of Science in Sustainable Energy Logistics			92 Master of Science in Sustainable Energy Logistics		
	BEST_SPOE..	Aktive	Beståtte studiepoeng..	BEST_SPOE..	Aktive	Beståtte studiepoeng..
2015				390.0	14	27.86
2016	135.0	7	19.29	590.0	22	26.82
2017	582.5	19	30.66	602.5	21	28.69
2018	332.5	16	20.78	722.5	27	26.76
2019	665.0	23	28.91	580.0	18	32.22
2020	570.0	18	31.67	480.0	18	26.67
2021	540.0	18	30.00	675.0	28	24.11
2022	715.0	25	28.60	462.5	18	25.69
2023	437.5	18	24.31	395.0	15	26.33

In Figure 4, we can see the percentage of students finalizing the MSc degree in normed time (2 years) and with one, two or more semesters additional time. The exact numbers are 68.3% in normed time, 79.3% with one extra semester, 84.1% with two extra semesters and 85.4% with more than two semesters delay.

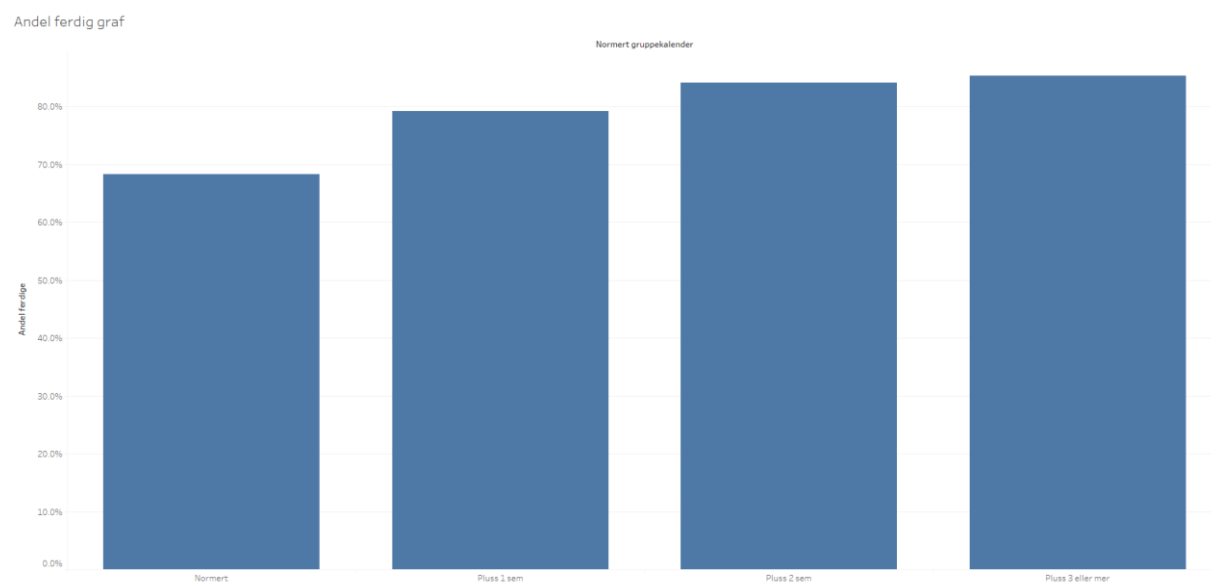


Figure 4. Percentage of students finalizing the degree in normed time starting 2015 – 2021 (Tableau)

4 Quality assurance

4.1 Class meetings

Class meetings are planned approximately 1-2 times per semester. The last years, they have been a combination of physical presence and digital participation online.

The classes are defined together with the MSc in Logistics. Early in the first semester, an introductory meeting is arranged, and class representatives are elected. Later in the semester another meeting is held mainly for information about the possible subvariants and elective courses in the second semester.

At the end of the second semester a meeting presenting the seminar series in the fall will normally be held. In the third semester there are not planned specific class meetings, but the seminar in Research Design in early October is mandatory for all students and giving them information about research and the thesis writing.

Early in the fourth semester, a class meeting with focus on the theses, due dates, evaluation process and similar can be arranged.

Class meetings do usually not take any formal decisions but are used for information and answering questions from students.

After the first meeting electing class representatives, these are invited to arrange a get-together party paid by the faculty, for all first-year master students. This is usually held after approximately 1.5 month of the semester. This party consists of several activities like quizzes, games and more physical activities, with the purpose of enhancing the interaction between students coming from own bachelor studies well familiar with Molde and the students just arrived at the town. The student representatives will appoint an arrangement committee responsible for planning this party, while the program coordinator is providing assistance in the planning process and purchasing food, snacks and necessary equipment.

4.2 Quality Team

The Quality Team represents the programs MSc Logistics, MSc Sustainable Energy Logistics, and the Experience-based Master in Logistics. It consists of the class representatives for both years together with the program coordinator and another staff member teaching in the master programs. One representative from the study office is normally attending the meetings as well. The number of class representatives is two or three, where one preferably should come from the sustainable energy logistics program. However, in cases where none of these students have volunteered, they have been represented by the MSc logistics representatives.

The Quality Team will usually have two meetings per semester. One in the middle of the semester to summarize the semester so far, and another at the end of the semester discussing the course evaluations and possible improvements for the next year.

Other topics of actual interest are included in the agenda when necessary, and the team members are invited to bring up their own matters.

The mandate of the Quality Team is defined in the University College's Quality System. The purpose is to secure good contact and information exchange between the students and the academic staff, and to be an arena for discussing the structure and development of the study program. The minutes of the

meetings are sent to the Dean and Faculty Administration and the Director of Studies and Academic Affairs. Special actions based on discussions in the Quality Team meetings are followed up by the program coordinator. The minutes and follow-up actions are discussed in the next meeting of the team.

4.3 Faculty meetings

Faculty meetings are held irregularly often as a faculty lunch with light food combined with specific topics to be discussed. Topics for these meetings can vary a great deal, but changes to the study plan for the programs are typically discussed in such meetings. The formal decisions are still left to the Dean and the Faculty Board.

4.4 Course evaluations

The University College's quality system states that all courses should be formally evaluated at least every third year. In addition, new courses, courses with new teachers and courses where the content is substantially changed should be evaluated formally the first time.

The evaluations are typically done by a standard form with some questions where students should set the grade (1 - 5) according to their opinion on different aspects of the course, and some free text giving them the opportunity to comment further details. The evaluations are accomplished in the student administrative system Canvas at the end of the semester, and the summary together with an evaluation report from the teacher is sent to the program coordinator before discussed in the Quality Team.

Student representatives will often perform their own survey for courses independent of the formal evaluations. These results are also discussed in the Quality Team and the comments are sent to the teachers as feedback and for considering eventual suggestions for adjustments to the teaching.

4.5 The study barometer

The study barometer is an annual survey taken in the fall semester among second year program students on all educational institutions in Norway. Students are asked to give their feedback on a scale 1 – 5 showing their satisfaction about different part of the study program. Table 3 shows the answer to the question about overall satisfaction in 2023. The columns at the right shows the percentage answers on each alternative. The result shows a relatively high score with an average score of 4.2, among the 73.3 % of the total number of students responding to the survey. This is a small increase from 2022 which had an average score of 4.1.

Details from the study barometer in 2023 can be found on:

https://www.studiebarometeret.no/en/student/studieprogram/232_92/detaljer

Table 3. Students' overall satisfaction in 2023 (Studiebarometeret)

To what extent do you agree that:

Scale (1-5): 1 = Do not agree and 5 = Fully agree

	Avg.	Std.dev.	# responses	1	2	3	4	5
I am, overall, satisfied with the programme I am currently attending	4.2	0.79	10	-	-	20	40	40

Some selected results are shown below. Table 4 shows the students' opinion on their own learning outcome. All averages, except for the question about innovative thinking, are from 4 and higher. The innovative thinking, with a score of 3.8, is still not very low, and the students seems to be very satisfied by the learning outcome on the program.

Table 4. Students' opinion on their own learning outcome (Studiebarometeret)

How satisfied are you with your own learning outcomes so far, concerning:

Scale (1-5): 1 = Not satisfied and 5 = Very satisfied

	Avg.	Std.dev.	# responses	1	2	3	4	5
Experience with research and development work	4.0	0.94	10	-	-	40	20	40
Discipline- or profession-specific skills	4.1	0.99	10	-	10	10	40	40
Knowledge of scientific work methods and research	4.1	0.88	10	-	-	30	30	40
Oral communication skills	4.3	1.06	10	-	10	10	20	60
Critical thinking and reflection	4.0	1.15	10	-	10	30	10	50
Cooperative skills	4.1	1.10	10	-	10	20	20	50
Ability to work independently	4.6	0.52	10	-	-	-	40	60
Written communication skills	4.3	0.95	10	-	-	30	10	60
Innovative thinking	3.8	1.14	10	-	20	10	40	30
Theoretical knowledge	4.0	0.82	10	-	-	30	40	30

Table 5 and 6 shows the students response on questions regarding teaching and feedback in the study. Here, we can see that the general opinion on teaching is still relatively high, although the scores are lower than for the learning outcome. The lowest scores appear on questions regarding the organization of the teaching to facilitate student participation and on the fellow students' ability to give constructive feedback. This could indicate that it might be possible to improve by involving the students to a higher degree in the teaching activities.

Table 5. Students' opinion on teaching and feedback (Studiebarometeret)

To what extent do you agree with the following statements?

Scale (1-5): 1 = Not satisfied and 5 = Very satisfied

	Avg.	Std.dev.	# responses	1	2	3	4	5
The teaching is organised so as to facilitate active student participation	3.6	1.12	11	-	18	27	27	27

The academic staff make lectures and seminars engaging	3.8	0.87	11	-	-	45	27	27
The academic staff convey the curriculum in an easy-to-understand manner	4.0	0.89	11	-	-	36	27	36
The teaching covers central parts of the curriculum well	4.1	0.83	11	-	-	27	36	36

Table 6. Students' opinion on feedback (Studiebarometeret)

How satisfied are you with:

Scale (1-5): 1 = Not satisfied and 5 = Very satisfied

	Avg.	Std.dev.	# responses	1	2	3	4	5	NA
The number of times you have received feedback from academic staff on your work	3.9	1.20	10	-	20	10	30	40	-
Academic discussions with and counselling from academic	3.7	1.00	10	-	10	30	30	20	10
The academic staff's ability to give constructive feedback on your work	3.9	0.99	10	-	10	20	40	30	-
Your fellow students' ability to give constructive feedback on your work	3.1	1.20	10	10	20	30	30	10	-

The lowest scores on the study barometer are found on the group of questions concerning working life. This is commented further under Section 6 - Relevance for industry and society.

The Candidate survey (Kandidatundersøkelsen) is a bi-annual survey among students finalizing an academic degree the previous year. However, due to the low number of Norwegian students on the program in the latest years, no statistics exist for the MSc Sustainable Energy Logistics. Hence, we do not know in detail the job situation of the graduated students. Looking at the MSc Logistics students, however, a high majority of the students have a relevant job six months after graduation, and it is reasonable to think that the situation is similar for the MSc Sustainable Energy Logistics students.

4.6 Internationalization

The MSc Sustainable Energy Logistics is an international study program where all courses are taught in English. As presented in Section 3, the majority of the students the latest years have been non-Norwegian, with an exception for the admissions in 2023, which saw an increase of Norwegian students to some extent compensating for the reduced number of international applicants due to the introduction of tuition fees. Currently 6 different nationalities are represented in the program.

The first years of the MSc Petroleum Logistics program included the possibility of spending a semester at the Gubkin Russian State University of Oil and Gas in Moscow to get a two-diploma degree, but due to the international political situation, this is no longer an option. Instead, students can choose exchange studies in the second semester at cooperating universities mainly in Europe through the Erasmus exchange program. This option is, however, rarely used by the students in the program.

Similarly, master students from other universities can have one or two semesters study exchange in Molde taking master courses and writing master theses. The seminar series in the third semester is a popular option for external exchange students, while first and second semester courses also receive some students on Erasmus exchange from cooperating universities making the group of students on the courses even more international than those admitted to the program.

The option of exchange visits for shorter periods is available for the staff members as well, and several members of Energy Logistics research group take a week of teaching combined with joint research activities at the cooperating universities abroad.

The program gets advantages from a sustainable academic network in energy logistics, i.e. it has an international focus both in teaching and students' research. The courses and seminars related to the program have permanently guest lectures and industry cases from cooperating universities in Brazil, Canada, UK, Spain, Sweden, Denmark, Czech Republic, Poland, and Croatia.

The academic staff in Molde includes many professors with origin from different parts of the world, and in particular the seminar series in the third semester and external grading of master theses will include well-recognized academic and industry researchers from other countries. Many of these seminar holders and external graders are involved in research cooperation with the staff at HiMolde, making their teaching in the seminars and common research a synergy benefiting both activities.

5 Teaching and evaluation

The program courses use a wide range of teaching and study methods. Standard courses run over one semester with classes once or twice per week. Students have homework in terms of exercises, computer lab work, case studies and essays, both individually and in groups. A few courses are taught intensively over a few selected weeks instead of more regularly over the semester. This is in exceptional cases where teachers are not able to give lectures every week.

The traditional teaching method is classroom lectures. However, even before the pandemic many classes had the opportunity to follow the lectures digitally either live online or by video recordings. During the pandemic digital teaching was the main rule, and several courses has replaced the traditional lecture format with online meetings. Even after the pandemic, digital alternatives are an option on most semester courses, while the seminar series in the third semester requires physical presence both by students and seminar holders.

5.1 Grading procedures regular courses

Semester courses are graded in the scale (A – F) where F is a failure, and other grades are passing on different quality levels. Some courses have a final exam counting 100% of the grade, while others have partial exams or essay writing during the semester counting for a certain percentage of the grade in addition to a final exam counting for the rest. The most common exam form is a one-day written school exam.

The course responsible is also responsible for the grading. Courses selected for a formal evaluation (ref. chapter 4.4) are required to have an additional external grader the same year. Graders are suggested by the course responsible and approved by the program coordinator and the study office.

Figure 5 shows the distribution of grades on all subjects taught in the program in the last five years. These are only passing grades, and the failed exams comes in addition with approximately 2.9% of the total number. The statistics count exams independent of the size of the course and show a very high degree of top grades (A's and B's). One reason for this skewed distribution is the high number of small 2.5 ECTS seminars in the third semester where top grades are more common than on the normal semester courses. Grading of master theses is commented specifically in section 5.3.

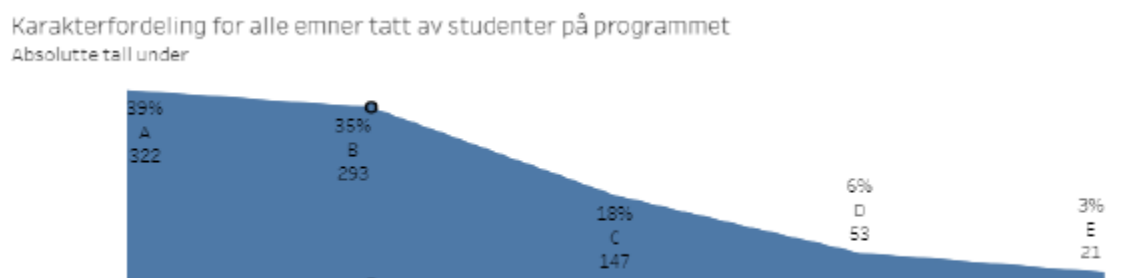


Figure 5. Distribution of grades on all subjects 2019 – 2023 (Tableau)

5.2 Seminar series

The one-week seminars in the third semester are intensive courses with a mix of lectures, homework, discussions and student presentations. The most common format is lectures before noon and exercises/group work after noon, with an oral or written exam or a final report with due date on Friday, even if variants exist. Most seminars are evaluated by the same letter grade (A – F) as the regular courses. A few exceptions with pass/fail grading exists. Exact format of the exams varies a great deal. Some have a final written or oral exam. Others have several partial exams to be delivered during the seminar week, while others again are evaluated by an essay or final task to be delivered at the end of the seminar week.

5.3 Master theses

The master theses are graded with the same letter scale as ordinary courses with the quality description for the grades as follows:

Grade	Description
A	Excellent
B	Very Good
C	Good
D	Satisfactory
E	Sufficient
F	Fail

Starting from 2021, the supervisors will not grade their own students. Hence, an evaluation committee consisting of one internal staff member and one external grader is appointed for each thesis. Internal

and external graders for the theses are appointed by the program coordinator after suggestions from the supervisors. External graders are chosen both from Norwegian and international universities specialized in energy logistics, and also from the academic and industry energy research centres.

The supervisor will organize the oral presentation and find a suitable time. Previously the oral presentation has been held as a physical meeting, but also from 2021, digital presentations has been the general rule. The supervisor and both graders should be present together with the students involved. The format of the oral presentation is as follows:

1. The student(s) present their main findings for approximately 20 minutes. If two students have written a thesis together, both should contribute equally during the presentation.
2. After the presentation, the graders and the supervisor initiate a discussion around the thesis, points out weaknesses and strong points and ask the students to clarify any indistinctness. This session should last up to 30 minutes.
3. When the discussion is finished, the students log out and the supervisor stays in the meeting to answer questions before he/she leaves the meeting, and the two graders agree about a final grade.

Delivery of master thesis is due at the end of May in the fourth semester of the study, and the oral presentation will take place around two weeks later. Students not able to finalize the thesis within this date, will be given a new chance at the end of the fall semester. The exception is if students have special reasons like sick or maternity/paternity leave in the period around the due date. If so, they might apply for the option of delivering at the end of August.

Figure 6 shows an overview of the grades given for master theses up to 2020 (when the supervisor was a part of the evaluation committee deciding the grade) and from 2021 (when the supervisor was replaced by another staff member). The total number of theses in the different years are given in parentheses. The low numbers overall make some fluctuations from year to year, but we can see that the majority of the theses gets grades on the A, B or C level. This might not be very surprising as most students work hard for one semester and will deliver a thesis considered at least good in most respects. Students in risk of failing or getting a poor grade, will also usually be advised by their supervisor to postpone delivery until the next semester.

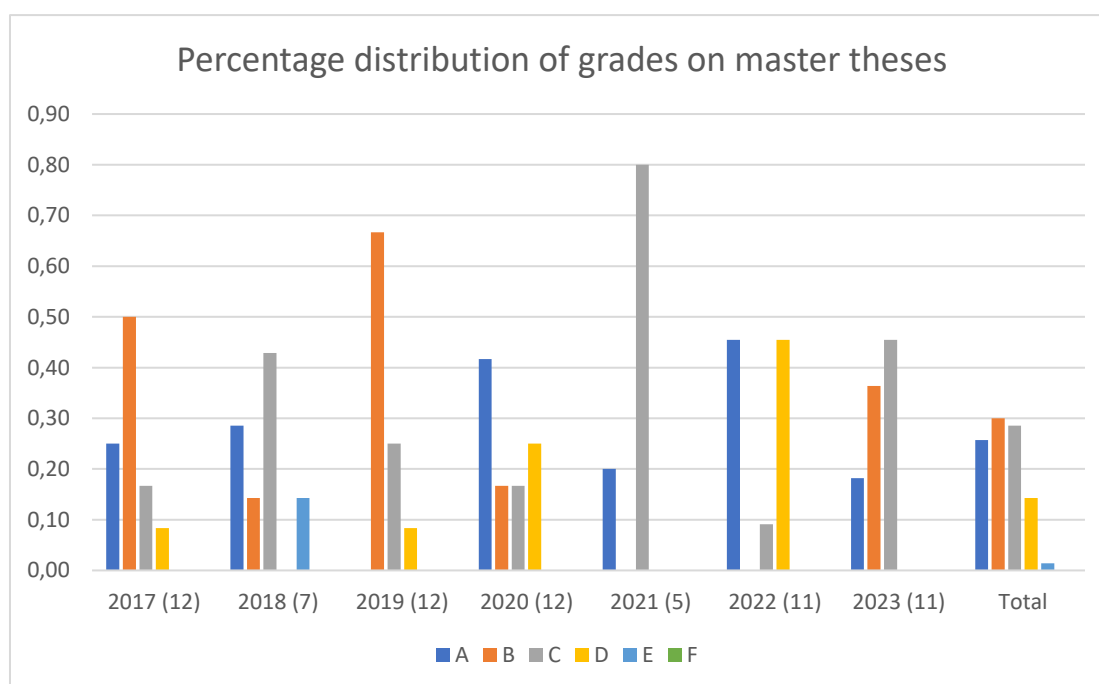


Figure 6. Grade distribution of master theses 2017 – 2023.

5.4 Teachers' competence

Table 7 below, gives an overview of the formal competence of the staff responsible for mandatory or recommended elective courses in the MSc program in Sustainable Energy Logistics in the study year 2023/2024. Most of the courses are taught by the members of the Energy Logistics research group. Note that for some of the courses there are contribution from several of the staff members. In addition, comes the seminar holders in the third semester. The specific seminars in energy logistics are organized by the staff members from the Energy Logistics research group, but often with the guest lecturers from the industry and cooperating universities and research centres.

The involved staff members are also teaching courses for the programs MSc in Logistics, BSc in Petroleum Logistics and Economics, BSc in Logistics and Supply Chain Management, BSc in IT and Digitalization. The exact allocation of teachers to courses can vary from one year to the next.

Table 7. Competence for teachers on the MSc Sustainable Energy Logistics program 2023/2024.

Name	Permanent / Temporary	Percentage of position	Courses
Lecturer			
Yauhen Maisiuk	Permanent	100%	IDA715
Associate Professor			
Terje Andersen	Permanent	100%	LOG765
Halvard Arntzen	Permanent	100%	LOG708
Yury Redutskiy	Permanent	100%	LOG775 LOG777
Paulo Ribas	Permanent	100%	LOG775 Seminars
Homayoun Shaabani	Temporary	40%	LOG733
Katerina Shaton	Permanent	100%	LOG745 LOG776 LOG777
Bjørnar Aas	Temporary	20%	Seminars
Professor			
Irina Gribkovskaia	Permanent	100%	LOG725 LOG777 LOG820 Seminars
Arild Hoff	Permanent	100%	- ¹
Lars Magnus Hvattum	Permanent	100%	LOG734
Bjørn Jæger	Permanent	100%	IBE700
Gilbert Laporte	Temporary	20%	- ²
Sebastian Alberto Urrutia	Permanent	100%	IDA720

¹ Program coordinator.

² Professor II from HEC Montreal. Used for consultancies and co-supervision of master and PhD theses in energy logistics.

Names in **bold** indicate members of the Energy Logistics research group.

6 Relevance for industry and society

In Norway, Equinor Logistics and Emergency Response Department has been an industry partner from the start of the program in 2015, sharing knowledge and experience in offshore oil, gas, and wind logistics, providing guest lectures, excursions for students, cases and assignments for courses, topics for MSc and PhD theses and advising students. Since 2017, 19 MSc theses were defended on Equinor logistics topics, five of them from Sustainable Energy Logistics master program and 14 from Logistics master program. One industrial PhD student from Equinor Logistics and Emergency Response Department and two PhD students who wrote their theses on Equinor logistics topics have defended their PhD theses in Logistics at Molde University College in 2015, 2019 and 2020, and one more industrial PhD student from Equinor started in 2020. Currently, three PhD students at Molde University College conduct their research on energy logistics topics provided by Equinor. Other industry examples of long-term cooperation are NorSea Vestbase, who annually organizes excursions for students, provides guest lectures and topics for MSc and PhD theses; and Sintef Ocean Energy and Transport center, providing guest lectures, cases, assignments, co-supervisors for MSc and PhD students, and external graders. One more example is Vissim AS, who introduced the offshore wind logistics direction, jointly developed a seminar in offshore wind logistics, training students on their resource management software and providing guest lectures and topics for master theses. They recommended Molde University College as a member in the Norwegian offshore Wind (NOW) industry cluster, and in the Horizon Europe 2024 Offshore Wind calls application consortium. Hence, NOW is now also a partner in teaching offshore wind logistics.

During the last six years, there has been a close collaboration with Petrobras Logistics Research center and Petrobras Integrated Logistics Planning Department through the UTFORSK joint project in oil, gas, and renewable energy logistics. As result of this cooperation, five MSc theses (one in Sustainable Energy Logistics and four in Logistics) were defended on Petrobras topics, a former Petrobras logistics researcher (Paulo Ribas) was recruited to the staff from 2022 and an industrial PhD student from Petrobras started at Molde University College in 2023. Researchers and planners from Petrobras are involved in the development of courses, providing guest lectures, cases and topics for MSc and PhD theses. Another example of industry cooperation abroad is other Brazilian energy companies that through cooperation with the university PUC-Rio, Brazil, provide real cases to study, data for research, and guest lectures in SEL courses.

The Candidate survey has only been accomplished for the related MSc Logistics program, but it indicates that this master program is highly relevant for the industry and society. Of the 22 respondents graduated last year, 19 had gotten a relevant job six months after graduation. This survey is, however, only limited to Norwegian students, and we have no exact data from the MSc Sustainable Energy Logistics where most students have been non-Norwegian.

Looking at the jobs listed by the MSc Logistics students, we can see business areas such as energy and oil/gas, indicating that these industries need highly qualified logistics personnel and a specialized education within energy would probably not be a disadvantage. We also know examples of students from the MSc Sustainable Energy Logistics getting relevant jobs both in Norway and in their home country. We do not have exact statistics about this but know in particular two recently graduated students employed by Equinor.

Currently, two of the active PhD-students at Molde University College are recruited from the MSc Sustainable Energy Logistics program, showing that this is also a possible path for a career. In addition,

we have knowledge of four other students from the program enrolled in PhD studies at other Norwegian Universities.

Looking at the responses in the Study barometer from the current students of the program, we can see a bit lower score on questions related to the working life compared to other aspects of the study. The results are shown in Table 8.

Table 8. Students' opinion on working life (Studiebarometeret)

*To what extent do you experience the following:
Scale (1-5): 1 = To a low degree and 5 = To a high degree*

	Avg.	Std.dev.	# responses	1	2	3	4	5
Representatives from the labour market contribute to teaching (e.g. as guest lecturers / instructors)	2.8	1.23	10	10	40	20	20	10
I receive useful information about which occupations / fields are relevant for me	2.9	1.10	10	10	20	50	10	10
I receive useful information about how my skills and knowledge can be used in the labour market	3.1	1.29	10	10	20	40	20	20
I receive training in how to convey my skills and knowledge to potential employers	2.9	1.45	10	20	20	30	10	20
There are possibilities for cooperating with representatives from the labour market on projects / coursework	2.7	0.82	10	-	50	30	20	-

These average results are not critically low, ranging from 2.7 to 3.1, indicating that most students are relatively satisfied even with these aspects. The lowest scores come on the questions about representatives from the labour market contributing to teachings and projects/coursework. This is a bit surprising, due to the fact that most courses use guest lectures and examples taken from the industry.

We should, however, also consider the fact that the survey is taken in the third semester of the study, i.e. before the students have started on their master thesis. Topics for master theses are to a high degree chosen as real life problems in different companies. Hence, it is expected that more students will see the industry relevance towards the end of their study, and the scores would probably have been higher if the survey had been taken in the fourth and final semester.

Still, the students' answers indicate that this is an area with a potential for improvement. Perhaps some more could be done to emphasize that the cases and examples used in the regular courses are real-life examples from the industry. The industry contacts might also to a higher degree explain about the knowledge and skills they are looking for when recruiting new employees.

The preliminary evaluation report was sent to industrial contacts from Equinor and NorSea Vestbase. Both contacts concluded that they were very satisfied with the program and the content was very relevant for their industries.

Equinor emphasized that in particular the seminar series were positive for providing depth knowledge within specialized areas, and mentioned offshore upstream logistics, energy transition and game theory as examples of seminars essential for them. They also list five bullet points as the necessary knowledge they are looking for among recently graduated students.

- Problem solving competence in complex situations with several alternatives.
- Knowledge of optimization, simulation, cost benefit analysis and game theory.
- A general knowledge of the supply chain and ability to see connections between value chains.
- Project leader competence and the ability to understand new problem areas.
- Analytical skills, including use of specific software tools.

Based on these points, they think that the mandatory courses in the study are giving a good basis for a job in the industry. They do not feel that any courses are superfluous but recommends a continuously evaluation of each course related to the development in the industry. In addition, they recommend a close cooperation with the industry by using contact persons as guest lecturers and co-supervisors on master theses.

They also emphasize the importance of including topics as sustainable development, renewable energy and advanced data analytics in the study program. One area mentioned with a potential for improvement, was to better integrate topics concerning digitalization and automatization in logistics, as these topics are getting more relevant in the industry.

NorSea Vestbase are also satisfied with the content of the study and states that it provides knowledge they will need in the coming years. They emphasize the need for getting a good understanding of conversion of energy sources, and knowledge of technology on sustainable energy sources such as wind, solar and hydraulic power. This should currently be integrated in the course LOG775 about energy analytics and sustainable technologies. They also support the inclusion of the new course LOG778 in offshore energy logistics planning in the program. This is a course they consider as very relevant for them as a supplier to both the offshore oil/gas and the offshore wind industry.

One specific suggestion for adjusting the program is to exchange the elective course LOG765 in project planning and control with a more relevant energy topic. One potential suggestion for such a topic is energy independences – how to use local and renewable energy sources.

Like Equinor, NorSea Vestbase are also concerned about digitalization and mentions digital solutions integrated in smart energy systems as an area where knowledge will be more needed in the current digitalized society. How to upscale renewable energy and technological development for storing energy is getting more important in the future, and this is closely related to developing technologies for carbon capture and storage.

7 Summary

In general, the MSc Sustainable Energy Logistics program gets relatively good score from the students on most of the parameters considered in the evaluation. The education is also considered important for the industry as both industrial contacts states that the content of the program is relevant for their company. The traditional petroleum sector will still be important for Norway in the foreseeable future,

and the inclusion of new energy sources is also considered a necessary adjustment when these sources gradually will take over.

Equinor mentions that a stronger integration of subjects concerning digitalization and automatization in logistics could be interesting, and that a continuous evaluation of the relevance of the courses is necessary to keep up with the development in the industry.

NorSea emphasizes the need for knowledge about politics and regulations on energy market. This is to some extent treated in the spring course LOG776 but could be considered in other courses as well. Another suggestion is to exchange the project planning course as an elective with a more relevant energy topic, ex. energy independence, and how to use local and renewable energy sources.

The most critical factor for the program seems to be the recruitment of students to the program. The reduction of international students due to the introduction of tuition fees, were to some extent compensated with more Norwegian students in 2023, making the number of students high enough for a class in the current study year. However, promoting the program by improving the program description, learning outcome and working perspectives, and recruitment process should be of highest priority for the coming years to make sure that the program is viable. It is important that this is emphasized and supported throughout the organization, as we have many examples of losing highly qualified students to the program due to the handling of applications in the study admission office.

8 Attachments

- Studiebarometeret (2023);
https://www.studiebarometeret.no/en/student/studieprogram/232_92/detaljer
- Minutes from meetings in the Quality Team (2023 + 2024)
- Internal accreditation document for program (2015 + 2020)
- Annual study program reports (2022 + 2023)
- Course evaluations and teacher's reports (Spring + Fall 2023)
- Seminar overview and evaluations 2023
- List of master theses 2015 - 2024 (students, supervisor, title)
- Comments to the tentative internal report from two industry contacts

9 Timeline

2024

January 1: Program coordinator starts preparing the internal report.

March 2: Send preliminary report to the Energy Research Group + Dean/Head of Office + Quality Team

- Ask for suggestions for two Industry contacts.
- Ask for suggestions for external expert.
- Due date for suggestions March 11.

March 6: Discuss the program evaluation in the Quality Team meeting.

March 13: Update preliminary report after feedback from research group and Quality Team.

March 13: Send preliminary report to the faculty and all students on the SEL master. Due date for comments March 22.

April 15: Adjust report according to feedback and send it to industry contacts Atle Alvestad at Equinor and Ann-Mari Rovik at NorSea Vestbase.

May 27: Finalize report and send it to faculty, students, Quality Team for comments.

September 15: Update the report according to new input and send the complete report to external expert Professor Mario Guajardo at NHH, with all necessary attachments.

Fall semester 2024: When the external expert sends his report, a final evaluation report should be written. Then a draft should be sent to the faculty and Quality Team for comments, before the final report is completed and sent to the Faculty Board, Studieutvalget and University Board.