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**European Master in Renewable Energy (EMRE)  
European Master in Sustainable Energy System Management  
(SESyM)  
Hanze University of Applied Sciences**

*Report of the limited programme assessment  
14-15 June 2022*

Utrecht, The Netherlands  
July 2022  
[www.AeQui.nl](http://www.AeQui.nl)  
*Assessment Agency for Higher Education*

## Colophon

### Programme

Hanze University of Applied Sciences

European Master in Renewable Energy (EMRE) (wo-master)

European Master in Sustainable Energy System Management (SESyM) (wo-master)

Location: Groningen

Mode of study: fulltime

Croho: 69299 (EMRE); 69298 (SESyM)

Result of institutional assessment: positive

### Panel

Raoul van Aalst, chair

Fokko Mulder, domain expert

Henny Romijn, domain expert

Joke Westra, domain expert

Maarten Peels, student

Marianne van der Weiden, secretary

The panel was presented to the NVAO for approval.

The assessment was conducted under responsibility of:

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*This document is best printed in duplex*

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## Summary

On 14 and 15 June 2022 an assessment panel of AeQui visited the European Master in Renewable Energy (EMRE) and the European Master in Sustainable Energy System Management (SESyM) at the Hanze University of Applied Sciences (HUAS). The committee judges that both programmes meet each standard; the overall quality of the programmes **meets the standard**.

Both EMRE and SESyM are fulltime wo-master programmes with a study load of 90 EC (16 months), offered in English, in cooperation with other European universities. The partnerships are embedded in EUREC (European Renewable Energy Research Centers). EMRE trains post-graduate students to become tomorrow's applied energy specialists, SESyM focuses on the multidisciplinary aspects of energy systems, providing management and communication skills as well as the necessary technical knowledge to tackle the challenge of the energy system transition. Both programmes also encourage the development of broader capabilities in students for taking account of important socio-economic and policy factors that affect the scope for successful implementation of technological applications for the energy transition.

### Intended learning outcomes

EMRE aims its graduates to be experts in applied technologies for the energy transition. SESyM aims to deliver business engineers with a fundamental understanding of renewable energy systems. The intended learning outcomes are described in competence profiles and reflect a research-based education with an explicit international and intercultural dimension. They are clearly defined at application oriented master's level. The professional and domain-related competences cover an appropriate range of academic and professional knowledge, skills and attitudes, relevant for the domain of the energy transition. The programmes are well-embedded in the European partnership EUREC and the regional networks of the center of expertise in energy EnTranCe and the New Energy Coalition. The academic level of the programmes is ensured by regular national and international calibration. The programmes can call upon a Professional Board with senior industry representatives, that will resume its activities after a break in its engagement due to COVID-19 restrictions. These regional, national and European networks enable the programmes to connect to state-of-the-art application oriented developments in the energy transition domain. The panel understands and appreciates the rationale to offer English-taught programmes with English names. The panel supports the intention to diversify the Programme Board membership in line with current energy transition issues. The assessment panel assesses that the intended learning outcomes of both EMRE and SESyM **meet the standard**.

### Teaching-learning environment

The curricula of EMRE and SESyM consist of three semesters. After the core semester at HUAS, students have to spend either the specialisation semester or the thesis semester in another country. The curricula are well-designed, with an emphasis on analytical and research skills, to be applied to practical problems. The panel confirms the academic orientation of both programmes and understands the necessity of the larger study load with regard to the European dimension of the programmes. Students are introduced to the knowledge and issues related to the domain of the energy transition: EMRE focusing on applied technology and SESyM on renewable energy technology systems encompassing technological, economic and business dimensions. The programmes strive for continuous development, e.g. by strengthening the link between lecturers' research, teaching and final master projects. The panel appreciates the commitment, but advises to consider how this fits with the rather generalist approach of the EMRE and SESyM curricula. For HUAS core students, the obligation to spend a semester at a European partner university may also interfere with the matching of specialisation taught at HUAS, linked to local research, and the final master project necessarily performed elsewhere. Through the EUREC partnership with other European universities, students have a wide choice of specialisations. The international student body and the emphasis on groupwork are valuable aspects of the programmes. The programmes were able to respond to the COVID-19 situation and to support students in the

new circumstances. The admission procedure is well-considered and results in a good match between students and programmes. The student numbers are fairly stable over the years. HUAS would welcome a larger number, but this needs coordination within EUREC, to maintain a reasonable balance with the other partners. For both EMRE and SESyM, the first semester has the objective to harmonise the knowledge differences originating from the wide variety of backgrounds. The teaching staff is qualified and committed. Communication between staff and students is open. The Board of Studies plays an active role in monitoring the quality of modules. Student facilities and services are good, the research facilities are state-of-the-art and invite cooperation with knowledge partners. The assessment panel assesses that the teaching-learning environment of EMRE and SESyM **meets the standard**.

#### Assessment

The programmes have an adequate assessment system, based on the assessment policy of HUAS and the Institute of Engineering, and the EUREC framework. The panel finds that assessments are geared towards the programmes' learning objectives. Being part of the EUREC network of peers ensures an international calibration of the master level of assessment. For further development, the panel supports the programmes' intention to align the assessments more strongly to the HILL didactical model. Examination regulations and regular calibration sessions internally and within the context of EUREC ensure the validity, reliability and transparency of assessment. The Examination Board and its assessment committee play a proactive role and monitor the quality of assessment regularly. The panel assesses that the student assessment systems in EMRE and SESyM **meet the standard**.

#### Achieved learning outcomes

Students carry out a research project in a company, research institute or university and write a master thesis to show that they have achieved the intended learning outcomes. They also submit a summary in the form of an international academic conference paper or journal paper and a SWOT analysis based on a self-reflection. An oral defence and a presentation for a EUREC jury in Brussels are part of the assessment process. This combination of outcomes is

a strong point. The panel studied a sample of fifteen EMRE and sixteen SESyM theses of the last two years and is satisfied that they are at master's level. Overall, the panel agrees with the grades and considers the feedback from the examiners relevant and helpful. The company supervisor's assessment would be more helpful if given as feedforward of where the student could still grow and improve rather than a grade for academic work, as the assessments were often indicating appreciation of the work without much critique. The panel found the theses generally good pieces of work on an impressive range of topics which is evidence of the substantial breadth in academic-level supervision capabilities present within the teaching team. Minor improvements are possible, such as a stronger link between the research question and the literature review, and more context and/or generalisation on the basis of the case study at hand to the wider application in the energy transition field. A number of thesis works in recent years resulted in (contributions to) refereed scientific publications. Alumni look back on their master's programme with appreciation. They find suitable employment in the industry or as researchers. The panel assesses that the achieved learning outcomes of EMRE and SESyM **meet the standard**.

#### Recommendations

The EMRE and SESyM programmes meet the criteria for accreditation. To support the programmes in their further improvement, the panel formulates the following recommendations:

- reactivate the Professional Board and diversify its membership when doing so, with attention to achieving greater balance between the number of professionals in the 'electrons versus molecules fields';
- consider if and how the intention to forge a closer link between staff's research and teaching fits with the rather generalist approach of the EMRE and SESyM curricula, and the planning of thesis work at HUAS;
- consider if staff exchange with partner universities and increasing the teams' diversity can strengthen the teaching team even further;
- ask the company supervisor to provide feedback/feedforward rather than a grade for a student's thesis project;

- stimulate students to pay more attention in their thesis to the academic and social context of their research topic;

- evaluate the desirable number of students, in relation to the number of FTE staff within the programmes, and the attraction of funding for research facilities by the staff.

All standards of the NVAO assessment framework are assessed positively; the assessment panel therefore awards a positive recommendation for the larger study load and the accreditation of the programmes EMRE and SESyM.

On behalf of the entire assessment panel,  
Utrecht, July 2022

R. van Aalst,  
Chair

M.J.H. van der Weiden,  
Secretary

## Introduction

This report describes the outcome of the evaluation of the European Master in Renewable Energy (further: EMRE) and the European Master in Sustainable Energy System Management (further: SESyM) at the Hanze University of Applied Sciences, on 14 and 15 June 2022. The Hanze University of Applied Sciences (further: HUAS) offers a wide range of associate degree, bachelor's and master's programmes. Both EMRE and SESyM are fulltime programmes, to be completed in 16 months. The programmes share the same domain (energy transition), educational design (European master with core, specialisation and thesis) and orientation (application oriented wo-master).

### The institute

HUAS is a multidisciplinary university of applied sciences, located in Groningen, and working closely together with regional partners in the Northern Netherlands. Learning and research are closely intertwined with society. The European and regional approach with a focus on sustainability is reflected in HUAS being a European Engaged University. HUAS is leading in the field of the energy transition and in the development of entrepreneurship and innovative, applicable knowledge. It is a key partner in the New Energy Coalition, a continuously growing network of knowledge institutions, businesses, government bodies and ngo's working together to accelerate the energy transition for a sustainable future. HUAS is made up of 16 schools, which offer 89 bachelor's programmes, 24 master's programmes and 12 associate degree programmes. HUAS currently comprises more than 31,000 students, more than 3,400 staff members and 50 professorships for applied research.

### The programme

Both EMRE and SESyM are joint European programmes and consist of a core, a specialisation and a thesis. EMRE is offered by four core universities (HUAS, the Netherlands, University of Zaragoza, Spain, Oldenburg University, Germany, MINES-Paris Tech, France) and six specialisation universities (University of Northumbria, UK, National Technical University of Athens, Greece, University of Zaragoza, Spain, University of Perpignan, France, IST Lisbon, Portugal, and HUAS, the Netherlands). The core of SESyM is offered by

HUAS, the Netherlands, while the three specialisations are offered by the University of Zaragoza, Spain, Howest University of Applied Sciences, Belgium, and HUAS, the Netherlands. Per September 2022, the Technological University of the Shannon (Ireland) will come in as a second core provider. The partnerships are embedded in EUREC (European Renewable Energy Research Centers).

EMRE and SESyM are 90 EC programmes. The core semesters of both programmes (30 EC) have a harmonising function, providing a knowledge foundation and levelling the playing field across students. The specialisation semesters (30 EC) provide the opportunity to deepen knowledge in a chosen technological field at a different university. In the final semester (30 EC), students show that they are qualified through a research project. To ensure the European dimension of the master's programme, students are required to study in at least two different countries.

EMRE aims to train post-graduate students to fill the gap between the growing industry demand for specialised renewable energy expertise and the skills currently available on the job market. Students acquire a solid foundation in key renewable energy technologies (wind, solar, bioenergy, hydropower) and also learn about the socio-economic issues surrounding the deployment of these technologies. Available specialisations cover photovoltaics (Northumbria), wind energy (Athens), grid integration (Zaragoza), solar thermal and associated renewable storage (Perpignan), ocean energy (Lisbon) and sustainable fuel systems for mobility (Groningen).

SESyM focuses on the interplay between the technological, business and economic sides of energy systems. Upon graduation, students become business engineers with a fundamental understanding of renewable energy systems. In the core semester, students will learn about systems management with legal, environmental, economic, social and technical aspects; system integration and planning; modelling; scenario development; strategic decision-making; and communication. Available specialisations cover sustainable energy management (Zaragoza), sustainable energy and ICT (Howest), and system innovation management (Groningen).

Students wishing to enrol in the EMRE or SESyM programme must comply with EUREC and HUAS admission requirements. For EMRE, applicants are required to hold a BSc in Engineering (Electrical, Mechanical, Chemical), Mathematics or Physics, or equivalent with appropriate work experience. Students wishing to enrol in the SESyM programme are required to hold a BSc in Engineering Management, Business, ICT, Economics, or equivalent with appropriate work experience. Furthermore, they must prove to possess an adequate level of English proficiency and are expected to present an authentic and convincing motivation letter. The EUREC organisation checks whether students applying for admission to the master programme meet the EUREC entry requirements, and forward a list of eligible students to the core provider. The annual intake of EMRE and SESyM students generally ranges from 20 to 30.

The teaching staff for both programmes consists of 35 lecturers. Most of them (25) have a PhD, four are working on their doctoral dissertation, and six have a master's degree. Almost all of them have didactical qualifications (including the Basic Examination Qualification) and recent research experience. An important element of the knowledge

community is EnTranCe | Center of Expertise Energy. Seven professors are linked to EnTranCe.

### **The assessment**

HUAS assigned AeQui to perform a quality assessment of its two programmes in the domain of the energy transition. In close co-operation with the programme management, AeQui convened an independent and competent assessment panel. A preparatory meeting with representatives of the programme was held to exchange information and plan the date and programme of the site visit.

In the run-up to the site visit, the assessment panel studied the self-evaluation report on the programmes and reviewed a sample of recent graduation projects: fifteen for EMRE, and sixteen for SESyM. The findings of the report and the results of the review of graduation projects were input for preparatory email exchange between the panel members and discussions during the visit.

The site visit was carried out on 14 and 15 June 2022 according to the programme presented in attachment 2. The panel assessed the programme in an independent manner; at the end of the visit, the chair of the assessment panel presented the initial findings of the panel to representatives of the programme and the institution.

In this document, the panel reports its findings, considerations and conclusions according to the 2018 NVAO framework for limited programme assessment. A draft version of the report was sent to the programme management; its reactions have led to this final version of the report.

Initiated by the programme, a development dialogue is planned in November 2022. The results of this development dialogue have no influence on the assessment presented in this report.



## Intended learning outcomes

EMRE aims its graduates to be technological experts in the energy transition. SESyM aims to deliver business engineers with a fundamental understanding of renewable energy systems. The intended learning outcomes are described in competence profiles and reflect a research-based education with an explicit international and intercultural dimension. They are clearly defined at master's level in the application oriented energy transition field. The professional and domain-related competences cover an appropriate range of academic and professional knowledge, skills and attitudes, relevant for the domain of the energy transition. The programmes are well-embedded in the European partnership EUREC and the regional networks of the center of expertise in energy EnTranCe and the New Energy Coalition. The academic level of the programmes is ensured by regular national and international calibration, and is illustrated by e.g. regular occurrence of (contributions to) published work in refereed journals from its students. The programmes can call upon a Professional Board with senior industry representatives, that will resume its activities after a break in its engagement due to COVID-19 restrictions. These regional, national and European networks enable the programmes to connect to state-of-the-art developments in the energy transition domain. The panel supports the intention to diversify the Programme Board membership in line with current energy transition issues. The assessment panel assesses that the intended learning outcomes of both EMRE and SESyM meet the standard.

### Findings

The aim of EMRE is to provide post-graduate students a solid foundation and specialised expertise in key renewable energy technologies, such as wind, solar, bioenergy and hydropower systems. SESyM focuses on the interplay of renewable energy technologies with the business and economic sides of energy systems and aims to deliver business engineers with a fundamental understanding of renewable energy systems.

For each programme, the intended learning outcomes are formulated in a competence profile, based on the EUREC framework: a graduate from a EUREC Master receives a research-based education at a high technical level which enables him/her to take on a range of specialist roles in the renewable energy business. EUREC master programmes are mainly industry oriented but also give access to further education (PhD). Intended learning outcomes are formulated in terms of knowledge and skills, and include competences related to the European dimension of the programmes, such as the ability to participate effectively in an international, multidisciplinary team and to assess the importance of intercul-

tural topics in the exercise of the student's professional activities. The European character implies that they have English programme names, that they are taught in English and that graduates are able to communicate findings in both written and oral form in English to the problem owner and other relevant stakeholders. The panel appreciates that, for each programme, the professional and domain-related competences cover an appropriate range of academic and professional knowledge, skills and attitudes, relevant for the domain of the energy transition.

The academic level of EMRE and SESyM is well-assured by their link to EUREC, a network of renewable energy research in Europe. The partner universities of both programmes are accredited and are all well-established educational institutes as well as being recognised at an international level for their work in the field of renewable energy technology. The Academic Board of the programmes has been especially active in the first years of the programmes, calibrating the academic level with other academic programmes and giving advice on the thesis regulations and the research modules. Since then, the academic level has been so firmly established and consistently

confirmed that the Academic Board is now more in the background, available for advice when needed. In addition, HUAS and the University of Groningen work together in the New Energy Academy. This provides good opportunities for knowledge exchange and research cooperation, with HUAS working on applied topics and the University of Groningen on more fundamental issues. Several teaching staff are also employed at other universities or have collaborations with staff in these institutions (e.g. TU Delft or TU Eindhoven).

The distinction between the EMRE and SESyM profiles is clearly visible: they attract students with different backgrounds and cover different issues in the energy transition. EMRE graduates are energy specialists with a broad view, SESyM graduates are connectors with sufficient technological background to communicate with 'pure' technicians and engineers. The panel was informed that HUAS offers a third master programme in the domain of the energy transition, i.e. Energy for Society. The complementarity of this set of programmes, ranging from the technological to the business and social approach of the energy transition, is valuable. It fits well with the regional focus on the energy transition and the active role of HUAS in this strategic development.

Both EMRE and SESyM make good use of the networks at regional, national and European level. These networks enable the programmes to connect to state-of-the-art developments. The programmes utilise the links between the various levels well: they add regional input to the European network, while participation in a European platform strengthens the regional level. Participation of students from different countries and with varying experience ensures that EMRE and SESyM students acquire a broad perspective.

The local and regional network is explicitly visible in EnTranCe, the center of expertise in energy, where scientists, students, companies, governments and social institutions meet each other and

share their knowledge. In addition, a Programme Board with senior representatives of regional industry provides valuable input and advice to the programme management. Due to the COVID-19 restrictions, the activities of the Programme Board have been rather limited in the past two years. The programme management intends to revitalise the Board and to diversify the Board's membership. The panel supports this intention and advises using this re-start in line with current energy transition issues, e.g. by broadening the current focus on the molecular field to include electrons as well.

### Considerations

The assessment panel considers that the intended learning outcomes of EMRE and SESyM match the academic and professional standards and the requirements of the international field of the energy transition. Both competence profiles clearly reflect the master's level and are sufficiently distinctive: EMRE focusing on technology, SESyM more on the economic and business embedding of technologies. The EUREC partnership and the strong research and development networks at regional, national and European level ensure that both programmes are geared to the expectations of the international professional field and enable them to keep up with the fast developing domain of the energy transition. The fact that the competence profiles include the ability to work in an international and intercultural environment is a strong point. The panel understands and appreciates the rationale to offer English-taught programmes with English names. The panel supports the intention to reactivate the Professional Board and to diversify the membership when doing so.

Based on the interviews and examination of the underlying documentation, the assessment panel establishes that the intended learning outcomes of EMRE and SESyM **meet the standard**.

## Teaching-learning environment

The curricula of EMRE and SESyM consist of three semesters. After the core semester at HUAS, students have to spend either the specialisation semester or the thesis semester in another country. The curricula are well-designed, with an emphasis on analytical and research skills, to be applied to practical problems. The panel confirms the academic orientation of both programmes and understands the necessity of a larger studyload of both programmes. Students are introduced to the knowledge and issues related to the domain of the energy transition: EMRE focusing on technology and SESyM on economic and business aspects. The programmes strive for continuous development, e.g. by strengthening the link between lecturers' research and teaching. The panel appreciates the commitment, but advises to consider how this fits with the rather generalist approach of the EMRE and SESyM curricula. Through the EUREC partnership with other European universities, students have a wide choice of specialisations. The international student body and the emphasis on groupwork are valuable aspects of the programmes. The programmes were able to respond to the COVID-19 situation and to support students in the new circumstances. For both EMRE and SESyM, the first semester has the objective to harmonise the knowledge differences originating from the wide variety of backgrounds. The teaching staff is qualified and committed. Communication between staff and students is open. The Board of Studies plays an active role in monitoring the quality of modules. Student facilities and services are good, the research facilities are state-of-the-art and invite cooperation with knowledge partners. The assessment panel assesses that the teaching-learning environment of EMRE and SESyM **meets the standard**.

### Findings

EMRE and SESyM are fulltime programmes with a study load of 90 EC, to be completed within 16 months. Students start with a core semester (30 EC), which provides a knowledge foundation and levels the playing field for the students who come in with different educational and cultural backgrounds. The specialisation semester (30 EC) provides the opportunity to deepen knowledge in a chosen technology, usually at a different university in the partnership. Finally, students show that they are qualified through a research project in a company, a research laboratory or at a university (30 EC). Either the second or third semester must be completed in a different country than the core semester.

### Orientation

The applied academic orientation of both EMRE and SESyM is visible in the curriculum. Both programmes offer a specific research methodology module in the core semester (the Energy Transition Project in the EMRE curriculum, focusing on the principles of the theory and application of re-

search methodology, the module Research Methodology and Skills in SESyM). In line with the programmes' academic, integrative and reflective learning objectives, the modules' learning objectives include reflective, analytic and evaluative abilities. Examples are the SESyM module Fundamentals of Modelling Energy Systems where students learn to apply methods for the validation and verification of created models, and the EMRE module on Biomass Energy where students learn to process analytical results into a scientific report, drawing appropriate conclusions linked to scientific literature.

While the orientation and level of both EMRE and SESyM are academic, the focus is on the applicability of students' knowledge and skills to challenges faced in society. Students learn to apply their academic skills to practical problems and to design effective solutions. This includes the development of professional and communication skills. In their thesis research project, students integrate the academic and applied character of the programme. The panel recognises the valuable

combination of academic level and applied focus and finds it is well-implemented.

#### *Contents and structure*

The EMRE core semester offers modules in different technological domains of the energy transition: solar, biomass, wind & marine, and the issue of energy transport, distribution and storage. This ensures that students acquire a solid foundation of the technical and engineering side of innovative energy system design and implementation. They also learn about their various interdisciplinary aspects and the socioeconomic issues surrounding these technologies. Theoretical courses are supported by laboratory workshops.

In the second semester, students choose a specific technological domain as their specialisation. Six options are offered by the EUREC partnership, in six different universities (Northumbria, Athens, Zaragoza, Perpignan, Lisbon and Groningen).

The SESyM core semester starts with the introductory module Energy Transition: Context, Policy, and Good Practice, providing a broad overview of aspects that relate to successful development and transfers of low or zero emission energy technologies, both in developed and developing countries. The lecturer explained to the panel how the variety of disciplinary backgrounds of incoming students is handled by organising additional lectures on technology for students with a business or economic background and vice versa. Next, students follow modules in technology, markets & business, modelling and innovation, and, finally, research methodology and skills. This core knowledge will allow students to analyse energy business challenges from an interdisciplinary perspective.

The second semester is a specialisation, where students focus on System Innovation Management (at HUAS), on Sustainable Energy Management (at the University of Zaragoza) or on Sustainable Energy & ICT (at Howest UAS).

During the specialisation semester of both programmes, in-depth conceptual knowledge is accompanied by practical work and technically oriented company visits.

During the final semester of each programme, students apply their acquired knowledge and skills in a thesis project at a company, a research laboratory or at a university. Two HUAS lecturers and a company supervisor are allocated to a student's research project. At the end of the master's programme, students defend their dissertation at HUAS in Groningen and present their final results to assessors from the EUREC universities, during presentation days in Brussels.

Having studied the module descriptions, the panel confirms that the contents are up to date and of an appropriate level. A number of modules is concentrated in a short period of three weeks. The panel heard from the lecturers that, in some courses, they combine the contents of their modules in a larger assignment, thus enabling students to go more in-depth.

The panel appreciates that the range of partner universities with their specific expertise offer students a wide choice of specialisations. In their meeting with the panel, students noted an occasional overlap between core and specialisation modules. From the lecturers, the panel heard that part of such overlap is created by design, offering repetition and application of concepts. EUREC organises regular meetings between lecturers of the core and specialisation semesters to address this kind of challenges. Lecturers emphasise their frequent informal contacts with partner universities' colleagues as well. The panel concludes that the programmes are aware of the risk of unjustified overlap and handle this adequately.

Generally, a university's specialisation is linked to its staff's research focus and expertise and students write their thesis on a topic related to their supervisor's specialisation. In the EUREC programmes, this link is less direct. Because EUREC regulations do not allow a student to spend both

the second and third semester at the home university, the thesis project is usually not directly linked to the expertise of the home university's staff. This makes the EUREC master programmes a little more generalist than specialist. The panel respects this choice, since thesis supervision is well-organised (see below, on standard 4) and the European dimension and international learning environment clearly provide an added value. Besides, the panel considers this a valuable approach for the domain of the energy transition, where making connections is crucial. During the site visit, the panel was informed that the programmes intend to integrate their staff's research and the educational programmes more strongly. This is in itself a sensible approach, but the panel advises to consider how this relates to the more generalist set-up of the EMRE and SESyM curricula and the obligation to spend a semester elsewhere.

Both programmes adopt the HILL educational philosophy (High Impact Learning that Lasts). Currently, implementation in SESyM is more advanced than in EMRE. In all modules, group work is an important part of the didactic approach. Students work together in class and on projects, answering each other's questions from their varied international and disciplinary backgrounds. The latter occurs especially in SESyM, where the students' previous bachelor degrees are of a wider range than in EMRE. The students and alumni confirmed the importance of this diverse learning community in their meeting with the panel.

#### *Recent developments*

In 2020 and 2021 the programme was confronted with the consequences of the COVID-19 restrictions. Students tended to struggle with for instance motivation issues, but lecturers and mentors provided additional care for these students, so that no one was left behind. The programmes organised for instance (lecture) rooms for students on campus so that they could work together or follow online lectures. Some students needed a bit more time to complete their studies in these circumstances. Students were granted an

additional re-sit for assessments when they ran the risk of study delay because of sickness or quarantine.

#### *Incoming students*

EUREC Master programmes welcome young graduates as well as professionals looking for a career reorientation. The average age of incoming students in EMRE and SESyM is 28-29 years. Generally, the majority of students comes from European countries, but the relative proportion of Dutch, European and non-European students varies from year to year. The student numbers are fairly stable over the years. HUAS would welcome a larger number, but this needs coordination within EUREC, to maintain a reasonable balance with the other partners.

Students register and apply through EUREC. Admission decisions are taken by HUAS. For admission to EMRE, applicants must have a BSc degree in engineering or a scientific discipline (e.g. physics, chemistry, mathematics) or equivalent with appropriate work experience. For SESyM, applicants need a BSc degree in a technological or business related discipline (such as business, economics, environmental sciences, engineering, social sciences, political sciences, geology, engineering management, energy management, IT, built environment or architecture). SESyM applicants need to have a strong interest in business and the energy industry and prove this in a motivation letter. All applicants need to prove that they have achieved a sufficient level of English. The panel agrees that the high success rates of both programmes for the 2017, 2018 and 2019 cohorts (more than 90% for EMRE, more than 93% for SESyM) reflect the effectiveness of the admission criteria. Success rates for the 2020 cohorts were a little lower (78% and 87% respectively), due to COVID-19.

#### *Staff*

The teaching staff consists of 2.56 FTE for EMRE and 2.03 FTE for SESyM. During the site visit, the panel discussed whether this is sufficient for the desired quality of teaching. Both management

and the teachers themselves explained that the number of FTE refers to net teaching time only: preparation, teaching classes and assessment. Altogether 35 lecturers are involved in both programmes. The lecturers find their teaching load feasible because of the significant synergy with their research activities and because of the strong formal and informal communication and cooperation between them. The self-evaluation report mentions that, during the COVID lockdowns, the Institute of Engineering provided mental and physical support for the lecturers.

The information provided includes an overview of the academic and didactic qualifications of the teaching staff. Almost all lecturers have a PhD degree or are working on their dissertation, have recent research experience and more than five years of didactic experience in higher education. Most of them have obtained the basic qualification in examination (BKE) as well. The panel confirms that these qualifications are fully adequate. Moreover, the meetings during the site visit showed that the lecturers are capable, energetic and motivated and that complaints about modules and teachers are rare. The Board of Studies monitors the quality of teaching systematically and the programme manager regularly asks the students whether any improvements are necessary. Appropriate actions are taken when needed. The teaching team could be strengthened even further by more (gender) diversity and by staff exchange with partner universities. The lecturers recognised both issues and welcomed the suggestions.

#### *Language*

The master programmes run in English. The cooperation with European partner universities and the international character of the curriculum, with students spending at least one semester abroad, make this self-evident. Students come from a wide variety of countries and must prove their adequate language proficiency as part of the admission process. During the site visit, the panel ascertained that the lecturers have a good level of English proficiency as well.

#### *Infrastructure*

The panel commends the programmes for their extensive and state-of-the-art facilities, mostly located in the EnTranCe building on the Zernike Campus. A tour around the EnTranCe facilities and the Energy Academy showed how inviting these facilities are for both knowledge partners and students. In and around EnTranCe, experiments with new technologies can be carried out in cooperation with public and private partners, the close proximity with researchers of the University of Groningen in the Energy Academy stimulates cooperation in research activities. Talks for the general public in the Energy Barn and for students and researchers in the Energy Academy and the Energy Coalition are organised to spread knowledge. Students appreciate both activities, but especially the more focused ones in the Energy Coalition are interesting for them. These are important extracurricular activities.

Students feel well-supported in practical and logistical issues when they move to a partner university. This support was continued during the COVID-19 restrictions and was much appreciated.

#### *Tutoring and student information*

Student support is intensive and personal. The small number of students each year (approximately 20 for each programme), the commitment and the short lines of communication with lecturers and programme management, and the EnTranCe building as a focal point contribute to a valuable and helpful system of student support. The student chapter in the self-evaluation report and the meeting with students and alumni confirm that they feel well taken care of.

The students consider the diversity of their student groups an asset. Lecturers ensure a safe learning environment, considering the differences in national and cultural backgrounds of the students. If needed, a student can call upon a person of confidence.

### Considerations

The assessment panel considers that the contents and structure of the curricula of EMRE and SESyM are well-designed. They introduce the students to the knowledge and issues related to the domain of the energy transition: EMRE focusing on technology and SESyM on the interplay of renewable energy technologies and economic and business aspects. The emphasis on analytical, research and reflective skills reflects the academic orientation of the programmes and ensures the academic level. Students learn to apply these skills to practical problems and to design effective solutions. The set-up of the curriculum makes the programmes generalist rather than specialist, which suits the interconnected domain of the energy transition rather well. The plan for a stronger link between lecturers' research and education may, therefore, be less self-evident than in more specialist programmes. The partnership with other European universities not only effectively broadens the scope of specialisations for students, but also provides a valuable international and intercultural learning environment. The panel there-

fore understands the necessity of a larger study-load of both programmes. The EUREC organisation stimulates meetings between the lecturers of all partner institutes to ensure coordination between the core and specialisation semesters. EUREC is also involved in the registration of applicants for the master programmes. Admission decisions are taken by the institutes themselves. The EMRE and SESyM success rates show that HUAS is doing this well. The teaching teams are capable and enthusiastic. Their openness to new developments is visible in the positive reaction to the panel's suggestions to organise staff exchange with partner universities and to increase the teams' diversity. Students can call upon their teachers within and outside of classes and feel well-supported. The facilities for teaching and research are extensive and inviting.

Based on the interviews and examination of the underlying documentation, the assessment panel establishes that the EMRE and SESyM programmes **meet this standard**.

## Assessment

The programmes have an adequate assessment system, based on the assessment policy of HUAS and the Institute of Engineering, and the EUREC framework. The panel finds that assessments are geared at the programmes' learning objectives. Being part of the EUREC network of peers ensures an international calibration of the master level of assessment. For further development, the panel supports the programmes' intention to align the assessments more strongly to the HILL didactical model. Examination regulations and regular calibration sessions internally and within the context of EUREC ensure the validity, reliability and transparency of assessment. The Examination Board and its assessment committee play a proactive role and monitor the quality of assessment regularly. The panel assesses that the student assessment systems in EMRE and SESyM **meet the standard**.

### Findings

The assessments in EMRE and SESyM are based on both the assessment policy of HUAS and the Institute of Engineering, and the EUREC framework. The programmes informed the panel that the combination of these policy frameworks does not present a problem, since the different rules and regulations are to a large degree harmonised. EMRE and SESyM students are registered as HUAS students, so follow the HUAS regulations, but the programmes make sure that these regulations fit the EUREC policy. The staff is currently designing a new assessment policy, to accommodate the HILL didactical model, and will make sure that the new policy will be in line with the HUAS and EUREC assessment policies.

The HUAS assessment policy implies that, for all programmes, learning objectives at module level are derived from the intended learning outcomes at programme level. For both EMRE and SESyM, an assessment matrix demonstrates that all intended learning outcomes are assessed in the core and specialisation modules and the thesis. The panel was told that the specialisation semester, if spent at a partner university, is treated as an exchange semester. The Examination Boards of the universities involved accept the 30 EC of the partner programmes, based on a check of the Teaching and Examination Regulations as part of the EUREC procedures.

Assessment methods in EMRE are mainly written exams and lab exercises. Some modules also require an assignment in which students work with scientific articles and present it to an audience. In SESyM, almost all assessments are assignments. Many of these assignments include modelling, writing reports or essays and/or presenting the results to an audience. In line with the assessment policy, all assessments include an individual component. The programme staff intends assessments to move towards more integrated ways of testing that facilitates deeper learning, in line with the further implementation of the HILL didactical model in both EMRE and SESyM. As mentioned above (standard 2), this process is further advanced in SESyM and the panel encourages both programmes to continue in this direction.

The panel finds that the assessments reflect the master level. Being part of the EUREC network of peers and the exchange of students in the programme between core and specialisation providers assure the calibration of the level of each university. The panel agrees that any deviation of level, within the bandwidth of the regular student performance, will immediately be noticed. The Teaching and Examination Regulations include a helpful equivalence table for EUREC master marks, explaining and comparing the meaning of grades in the different partner universities.

To safeguard validity and reliability of assessment, assessors and examiners must be qualified



and are officially appointed by the Examination Board. Assessors/examiners must have at least a master's degree and a BKE. Additional requirements must be met by thesis supervisors (see standard 4). Lecturers/examiners discuss interpretations of assessment criteria in calibration sessions to ensure that evaluations are valid and reliable and contribute to meaningful assessment. Assessment forms and rubrics are available to guide the assessment process. Students are informed about the assessments in the module handbooks and through Blackboard.

The Examination Board of the Institute of Engineering is responsible for quality assurance of assessment and education at programme level for EMRE and SESyM. The Examination Board and its assessment committee play a proactive role in safeguarding the final level of the degrees and the quality of assessments. Members of the Examination Board are trained by the HUAS legal advisor and participate in national Examination Board training sessions. All members of the Examination Board and assessment committee have achieved the BKE. The division of roles between management (organising assessment) and Examination Board (safeguarding quality) is clear for all concerned and works well, the panel heard.

Each year, the assessment committee screens parts of the curriculum, examinations or procedures, including screening of graduation portfolios, and reports its findings to the Examination Board. Each year, the Examination Board draws up an annual report. The panel notes that these are

extensive, with a full report on procedural aspects. The panel advises to make them more informative by a stronger focus on results and outcomes. The panel is satisfied that there are clear procedures to prevent plagiarism (using SafeAssign) and a protocol on how to act in cases of suspected plagiarism and fraud.

### Considerations

The panel considers that the programmes have an adequate and well-organised assessment system. The panel realises that, in SESyM, assignments are used as the main assessment method more than in EMRE, because the latter has a more disciplinary engineering focus whereas the former is more focused on achieving multi-disciplinary systems integration. For further development, the panel supports the intention to align the assessments more strongly to the HILL didactical model. Being part of the EUREC network implies a continuous calibration of the master's level of assessment. The Examination Board and the assessment committee are competent and qualified. They fulfil their role proactively. Together with the programme management, they ensure that the assessments comply with both the HUAS and EUREC policies and quality standards.

Based on the interviews and examination of the underlying documentation, the assessment panel establishes that the EMRE and SESyM programme **meet this standard**.

## Achieved learning outcomes

Students carry out a research project in a company, research institute or at a university and write a master thesis to show that they have achieved the intended learning outcomes. They also submit a summary in the form of an academic international conference paper or journal paper, and a SWOT analysis based on a self-reflection. An oral defence and a presentation for a EUREC jury in Brussels are part of the assessment process. This combination of outcomes is a strong point. The panel studied a sample of fifteen EMRE and sixteen SESyM theses, summaries and SWOTs of the last two years and is satisfied that the theses and summaries are at master's level. Overall, the panel agrees with the grades and considers the feedback from the examiners relevant and helpful. The company supervisor's assessment would be more helpful if given as feedforward rather than a grade. The panel found the theses generally good pieces of work on an impressive range of topics. Minor improvements are possible, such as a stronger link between the research question and the literature review, and more context and/or generalisation on the basis of the case study at hand in relation to relevant broader energy transition aspects. Alumni look back on their master's programme with appreciation. They find suitable employment in the industry or as researchers. The panel assesses that the achieved learning outcomes of EMRE and SESyM **meet the standard**.

### Findings

The final semester in both programmes is devoted to the thesis project. This is intended to provide the student with the opportunity to apply and demonstrate the skills and knowledge gained during their study by performing in-depth research into a particular area of renewable energy in order to make a contribution to innovation and to knowledge in that area. Students can do their project in the industry, a research institute or research programme within a university department. The project will include among others a critical analysis of academic literature and an applied scientific research on a certain energy related topic at academic level. The thesis committee checks the proposed master thesis projects for both consistency and suitability. Students have to submit a thesis, a summary in scientific article style, a company and self-evaluation report on student performance and a presentation and defense in respectively Brussels and Groningen. Graduates receive a HUAS degree, plus a EUREC certificate. Currently, EUREC issues a Certificate of Equivalence for EMRE students. This document formally states that the different degrees given by the four core universities are equivalent in value and contents. As soon as there are more than one core university for SESyM, those students will receive a similar certificate.

Two HUAS lecturers are allocated to a student's research project thesis. The first supervisor guides the student through the thesis process, gives feedback at specified moments and assesses the student at the end. The role of the second supervisor is limited to reading and assessing the final report and summary, to ensure objectivity. Thesis supervisors must have a PhD or PD-Eng or at least be a PhD candidate and need to perform actual and current research in the field. They may be granted dispensation for the BKE on the basis of thorough experience in research and academic master projects' supervision. In addition, the company must appoint a master thesis mentor/supervisor. The company supervisor oversees the content of the student's assignment and is asked for advice on the assessment of the student's performance. The two university assessors carry out their work independently and thereafter synthesise the results of their assessments. The panel concludes that the so called 'four-eyes principle' has thus been implemented rigorously for all parts of the graduation programme.

Students start the process of thesis preparation in the core semester and continue this in the specialisation semester. The students are responsible to find a research topic and a thesis host, but the

programmes and EUREC regularly publish thesis research topics that are offered by partners in their network and by EnTranCe. A student's draft proposal is judged by the thesis committee on its potential and suitability as an EMRE or SESyM master thesis project. All student research project proposals are vetted by the thesis committee to ensure quality. During the first few weeks of the project the student develops a 1-2 pages research project plan, which is inspected by the supervisor. Once approved, the plan is the basis for a first meeting with the first and company supervisor. A second meeting is scheduled after two months. At the end of the project, before the submission of the thesis report, the student has an evaluation meeting with the company supervisor and writes a self-evaluation report on the basis of the feedback received. The self-evaluation includes a SWOT analysis addressing areas of improvement for the future and stating the most important matters that have been learned during the master thesis project. The company supervisor's assessment is given as an advice.

The first and second supervisor examine the thesis and give a grade for the report (70%) and the summary (10%). The final 20% is awarded on the basis of the presentation in Brussels before a jury of three professors: from HUAS, the partner university of the student's specialisation and one of the other partner universities. A grading scheme with assessment criteria and rubrics is available to guide the grading process. Examiners told the panel that the rubrics are a helpful support tool to formulate feedback and explain the grade, although a simpler version would be welcome.

Prior to the site visit, the panel reviewed a representative sample of recent (2019-20 and 2020-21) graduation projects and its associated outputs: fifteen for EMRE, and sixteen for SESyM. Overall, the panel considers the work done of a good level. The combination of a full report with a summary, a SWOT analysis, an oral defence and a presentation in Brussels is commendable. The

panel appreciates that students succeed in limiting the number of pages of their reports and considers the summaries very useful both as a learning tool and a succinct output of the executed research. The panel values the range of topics and the choice of methodologies in both programmes. Modelling is a dominant part of the work. Validation and reflection on the assumptions behind the choice of parameters could sometimes be stronger. The theses are well-structured, but it would help the reader if a short section (1-2 pages) on context would be provided at the beginning and if, at the end, the student would zoom out again and reflect on the scope for wider generalisation of the outcomes. In some cases, a stronger link between the literature review and the research question would be helpful too.

Looking at the learning objectives for the EMRE thesis research, the panel notes that the first learning objective ('has demonstrated to introduce a research project understanding issues of energy strategy and politics at different levels of context') is not addressed in all theses. The panel advises either reconsidering or reformulating this learning objective, because it seems to be more appropriate for SESyM than EMRE, or asking students to pay more attention to it.

The panel generally agrees with the grades given by the examiners and notes that students receive extensive and helpful feedback. The grades given by the company supervisors are often (very) much higher and do not reflect the actual level of the thesis. It is clear that their evaluation is based on the student's performance during the project rather than on the academic outcomes and the written work. Cultural differences between countries probably play a role as well. The panel can imagine that the final thesis grade may be disappointing for a student after receiving a much higher grade from the company supervisor. It may be better to ask the company supervisor to say something about what a student should continue to do or how to improve, giving valuable

feedback/feedforward rather than just excellent scores. The panel feels that this would be more helpful for a student's further development.

Upon graduation, students easily find suitable employment in a variety of companies and research institutes. A number of them continue a research career as a PhD, either at HUAS or elsewhere. Alumni look back on their master's programme with appreciation, as was apparent from the documentation and from the panel's conversation with alumni. EUREC supports an active alumni association.

The programmes use their contacts with companies and institutions, part of which were involved in hosting thesis projects, to update the professional profiles. Given the quickly evolving domain of the energy transition, this is a valuable exercise.

#### **Considerations**

The panel is satisfied with the overall level of the EMRE and SESyM graduates' final theses. A number of thesis projects in recent years has resulted

in (contributions to) peer reviewed scientific publications, which testifies to the academic level reached. It is evident that they are at the intended master's level. Minor improvements are possible, such as a stronger link between the research question and the literature review, and more context and/or reflection on extent of generalisability of findings and recommendations on the basis of the case study at hand. The assessment process is extensive and fair. Alumni appreciate the programme and virtually all of them gain a good position in the field of the energy transition. The panel concludes that the overall level of the theses, combined with the positive evaluation and employment position of alumni, shows the achievement of the intended learning outcomes.

Based on the interviews and examination of the underlying documentation, the assessment panel establishes that the EMRE and SESyM programme **meet this standard.**

## Attachments

## Attachment 1 Assessment committee

**Raoul van Aalst** is a NVAO-trained chair of programme assessments for AeQui.

**Fokko Mulder** is Full Professor Materials for Integrated Energy Systems at TU Delft.

**Henny Romijn** is Associate Professor Technology & International Development at TU Eindhoven.

**Joke Westra** is Senior Teacher & Researcher for the lectorate Reliable Power Supply at Hogeschool Arnhem Nijmegen.

**Maarten Peels** is a bachelor student Philosophy at Utrecht University.

The panel was supported by **Marianne van der Weiden**, external NVAO-certified secretary.

All panel-members and the secretary signed a declaration of independence and confidentiality, which were submitted to NVAO.

## Attachment 2 Programme of the assessment

### Tuesday 14 June 2022

<u>Time</u>	<u>Meeting</u>
16:30-17:00	Welcome, Meet and greet with members of the programme (pitch)
17:00-18:00	Interview with management (board and management team)
18:00-18:45	Dinner break – internal consultation
18:45-19:45	Content of the programme (students and alumni)
19:45-20:00	Break
20:00-21:00	Meeting about professional field (members of the Professional Board; partners EnTranCe)
21:00	End of day

### Wednesday 15 June 2022

<u>Time</u>	<u>Meeting</u>
09:00-10:00	Research infrastructure (lecturers, teacher-researchers)
10:00-10:15	Break
10:15-11:15	EMRE (teachers, lecturers, management and EUREC – partners)
11:15-11:30	Break
11:30-12:30	SESyM (teachers, lecturers, management and EUREC – partners)
12:30-13:00	Lunch break
13:00-14.30	Campus tour with information market
14:30-15:30	Quality Assurance meeting (Board of Studies, Examination Board, Assessment Committee, EUREC quality assurance, Academic Board)
15:30-16:15	Campus tour (continued)
16:15-17:45	Break, internal consultation
17:45-18:00	Final impression with feedback panel
18:00	Drinks and bites

## Attachment 3 Documents

- Self-evaluation report
- Theses selection of 15 students (EMRE)
- Theses selection of 16 students (SESyM)
- Appendices to the self-evaluation report:
  - Thesis and Examination Regulations Master EMRE 2021-2022
  - Thesis and Examination Regulations Master SESyM 2021-2022
  - Staf EMRE-SESyM 2022
  - Strategisch Jaarplan Hanzehogeschool 2021-2026 Betrokken en Wendbaar
  - Strategisch Jaarplan EnTranCe 2021-2022
  - Jaarplan Instituut voor Engineering 2021-2022
  - Meerjaren-Personeelsplan (MPP) Engineering 2021-2026
  - EUREC MoU 2012
  - Jaarverslag Examencommissie 2020-2021
  - Examencommissie Huishoudelijk Reglement 2021-2022
  - Leden Commissies 2021-2022
  - Competence Profile EMRE EUREC
  - Competence Profile SESyM EUREC (in progress)
  - EMRE Harmonized Learning Outcomes CORE
  - SESyM Harmonized Learning Outcomes CORE (in progress)
  - Quality Assurance Systems EUREC Masters EMRE and SESyM
  - Thesis Manual EMRE Cohort 2020-2021
  - Thesis Manual EMRE Cohort 2019-2020
  - Thesis Manual SESyM Cohort 2020-2021
  - Thesis Manual SESyM Cohort 2019-2020
  - Study Guide EMRE 2021-2022
  - Study Guide SESyM 2021-2022
  - Short Module Description EMRE Core 2021-2022
  - Short Module Description EMRE SFS 2021-2022
  - Short Module Description SESyM Core 2021-2022
  - Short Module Description SESyM SIM 2021-2022
  - Updated Professional Profile EMRE-SESyM
  - Toetsbeleid Engineering