



NVAO • NETHERLANDS

# ACADEMIC MASTER PROGRAMME ENERGY SCIENCE

Utrecht University

## PANEL REPORT



NVAO • NETHERLANDS

ACADEMIC MASTER PROGRAMME  
ENERGY SCIENCE  
Utrecht University

LIMITED INITIAL ACCREDITATION  
PANEL REPORT

*7 MARCH 2019*



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# 1 Executive summary

The Accreditation Organisation of the Netherlands and Flanders (NVAO) received a request for an initial accreditation procedure regarding a proposed academic master Energy Science at Utrecht University. NVAO convened an expert panel, which studied the information available and discussed the proposed programme with representatives of the institution and the programme during a site visit.

The following considerations have played an important role in the panel's assessment.

The Energy Science Master's degree programme at Utrecht University intends to educate students to become scientists who are able to contribute to the transition towards sustainable energy systems. The programme has defined intended learning outcomes that show a multidisciplinary perspective, paying attention to science and technology as well as economics and policy. This multidisciplinary perspective is essential to the programme's distinctive profile.

According to the panel, the intended learning outcomes are well defined, appropriate for an academic Master's programme, and sufficiently aligned to the needs and requirements of the professional field. The panel appreciates the multidisciplinary approach of the programme and recognises the distinctive value of this profile. However, it advises the programme to solidify its profile and work on establishing a stronger, more distinctive position as a separate programme.

The panel has a positive impression of the teaching-learning environment and the composition of the curriculum. According to the panel, all relevant disciplines, topics and methods are addressed. The structure of the programme is clear and the panel considers the intended learning outcomes on programme level to have been translated well into learning goals for the different components of the study programme. The panel does think, however, that some perspectives (economic and societal) and topics (digitalisation) can be given more explicit attention in the curriculum.

The panel concludes that an appropriate admission procedure is in place and that students are offered sufficient opportunities to make up for deficiencies. The panel also thinks the programme and its content are sufficiently internationally oriented, partly because of the international academic staff and student inflow. International exchange, however, is not a strong element of the programme, according to the panel. The panel recommends the programme to make international exchange more easily accessible to students.

The programme's teaching staff is sufficiently qualified to deliver education, according to the panel. Nevertheless, the panel thinks it is desirable for certain components in the programme to be taught by lecturers from disciplines other than technical ones (especially economic and societal), in order to enhance its multidisciplinary character.

The panel agrees that a sufficient assessment system and appropriate procedures are in place. However, it observes that these procedures are not always followed consistently by all teaching staff, especially with regard to assessment of the Master Thesis. Because of this, the assessment is not sufficiently transparent and consistent. According to the panel this may lead to incorrect results. Thus, the panel concludes that correct execution of assessment procedures is not sufficiently guaranteed. Therefore the panel sets the condition that the programme should develop a plan of action with regard to how it will guarantee adherence to the assessment procedures. Also, it should give account of the execution of this plan of action. Moreover, the programme needs to deliver a new set of theses (including their assessments) for the panel to evaluate.

According to the panel, the programme sufficiently demonstrates that students achieved the intended learning outcomes. Also, the panel sees that alumni perform well in the professional field. Moreover, the panel thinks the programme has a good outflow to academic careers as well.

The panel comes to the conclusion that the programme meets standards 1, 2 and 4 and partially meets standard 3. Given these considerations, the panel advises NVAO to take a conditionally positive decision regarding the quality of the proposed programme academic master Energy Science at Utrecht University.

The Hague, 7 March 2019

On behalf of the assessment panel convened for the initial limited accreditation assessment of the academic master Energy Science at Utrecht University,

prof. dr. ir. Geert Verbong  
(chair)

drs. Anne-Lise Kamphuis  
(secretary)

## 2 Introduction

### 2.1 The procedure

NVAO received a request for an initial accreditation procedure including an information dossier regarding a proposed academic master programme in Energy Science. The application was received on May 17th, 2018 from Utrecht University.

An initial accreditation procedure is required for a programme to be registered as eligible to issue legally recognised degrees. Only recognised institutes can submit an application. The same standards apply as in the case of re-accreditation of existing programmes. The initial accreditation however is an ex ante assessment of a programme based on the design of the programme as a whole. The design of the first year has to be well elaborated; course descriptions have to be available to the panel. The programme becomes subject to the normal accreditation procedures once initial accreditation has been granted.

To assess the program, the NVAO convened an international panel of experts (see also Annex 1: Composition of the panel). The panel consisted of:

*Chair:*

- Prof.dr.ir. Geert Verbong, full professor of System Innovations & Sustainability Transitions at Eindhoven University of Technology;

*Panel members:*

- Prof.dr.ir. Valérie Cappuyns, professor of Economics and Corporate Sustainability at University of Leuven (KU Leuven);
- Ir. Martin Scheepers, research manager of Energy Transition Studies at ECN part of TNO;

*Student member:*

- Vera Broek, student of Biomedical Sciences at Leiden University Medical Centre.

The panel was assisted by Anke Schols, policy advisor at NVAO, as process coordinator and Anne-Lise Kamphuis, senior researcher and policy advisor at Odion Onderwijsonderzoek, as secretary.

This composition reflects the expertise deemed necessary by NVAO. All panel members signed a statement of independence and confidentiality.

The panel has based its assessment on the standards and criteria described in the NVAO Assessment framework for the higher education accreditation system of the Netherlands (Stcrt. 2016, nr 69458).

The following procedure was undertaken. The panel members prepared the assessment by analysing the documents provided by the institution (Annex 3: Documents reviewed). The panel organised a preparatory meeting on November 21st, 2018. During this meeting, the panel members shared their first impressions and formulated questions for the site visit.

The site visit took place on November 22nd, 2018 at Utrecht University. During this visit, the panel was able to discuss the formulated questions and to gather additional information during several sessions (Annex 2: Schedule of the site visit). Afterwards, the panel discussed the findings and considerations and pronounced its preliminary assessments per theme and standard. At the end of the site visit, the initial findings were presented to the institution.

Based on the findings, considerations and conclusions the secretary wrote a draft advisory report that was first presented to the panel members. After the panel members had commented on the draft report, the chair endorsed the report. On 25 January 2019 the advisory report was sent to the institution, which was given the opportunity to respond to any factual inaccuracies in the report. The institution replied on February 4th.

All suggested corrections were adopted. Subsequently the final report was endorsed by the panel chair. The panel composed its advice fully independently and offered it to NVAO on March 7th, 2019.

## 2.2 Panel report

The first chapter of this report is the executive summary of the report, while the current chapter is the introduction.

The third chapter gives a description of the programme including its position within the institution, Utrecht University, and within the higher education system of the Netherlands.

The panel presents its assessments in the fourth chapter. The programme is assessed by assessing the themes and standards in the Initial Accreditation Framework. For each standard the panel presents an outline of its findings, considerations and a conclusion.

The outline of the findings are the objective facts as found by the panel in the programme documents, in the additional documents and during the site visit. The panel's considerations consist of the panel's judgments and subjective evaluations regarding these findings and their relative importance. The considerations presented by the panel are at the basis of a concluding overall assessment.

The panel concludes the report with a table containing an overview of its assessments per standard.

## 3 Description of the programme

### 3.1 General

|                 |                                     |
|-----------------|-------------------------------------|
| Country         | : The Netherlands                   |
| Institution     | : Utrecht University                |
| Programme       | : Energy Science                    |
| Level           | : master                            |
| Orientation     | : academic (wo)                     |
| Specialisations | : Systems Analysis, Natural Science |
| Degree          | : Master of Science                 |
| Location(s)     | : UTRECHT                           |
| Study Load (EC) | : 120 EC                            |
| Field of Study  | : Science (in Dutch: Natuur)        |

### 3.2 Profile of the institution

Utrecht University is an international research university divided into seven faculties. It has boasted high positions in international rankings for many years. Utrecht University aims to offer high-quality, innovative education. It described its model of education as personal, interactive and flexible.

Utrecht University employs over 6,700 staff members, of which over 600 professors. It offers 49 Bachelor's programmes and 146 Master's programmes. At the moment app. 30,000 students are enrolled in these programmes.

The Energy Science Master's degree programme is part of the Faculty of Geosciences, which offers four Bachelor's programmes and 16 Master's programmes. Within this faculty, the programme is linked to the Copernicus Institute of Sustainable Development.

### 3.3 Profile of the programme

The Energy Science Master's degree programme at Utrecht University is a two-year fulltime programme of 120 EC, taught in English. The programme aims to address the challenges society faces with regard to the transition to sustainable energy systems. Last year (2017-2018) 55 students enrolled in the programme. The Energy Science programme has two specialisation tracks: Systems Analysis and Natural Science. The vast majority of students enrol in the Systems Analysis track.

The programme has existed since 2005 as a specialisation track in other programmes. Since 2013 it has been a specialisation track within the Science and Innovation Master's degree programme at the Faculty of Geosciences. However, it became clear that the specialisation did not fit the programme and the other specialisations entirely, focusing more on natural science and less on innovation. Following the advice of the assessment panel of the re-accreditation of this programme in 2017, the Energy Science specialisation decided to continue as a separate Master's programme.



## 4 Assessment per standard

This chapter presents the evaluation of the standards by the assessment panel. The panel has reproduced the criteria for each standard. For each standard the panel presents (1) a brief outline of its findings based on the programme documents and on documents provided by the institution and the site visit, (2) the considerations the panel has taken into account and (3) the panel's conclusion. The panel presents a conclusion for each of the standards, as well as a final conclusion.

The assessment is based on the standards and criteria described in the NVAO Assessment framework for the higher education accreditation system of the Netherlands (Stcrt. 2016, nr 69458). Fundamental to the assessment is a discussion with peers regarding the content and quality of the new programme.

Regarding each of the standards, the assessment panel gives a substantiated judgement on a three-point scale: meets, does not meet or partially meets the standard. The panel subsequently gives a substantiated final conclusion regarding the quality of the programme, also on a three-point scale: positive, conditionally positive or negative.

### 4.1 Standard 1: Intended learning outcomes

*The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.*

#### *Outline of findings*

The Energy Science Master's degree programme at Utrecht University intends to educate students to become scientists who are able to contribute to the transition towards sustainable energy systems. To do so, the programme has a multidisciplinary perspective and focuses on analysing various components in the context of the full energy system. On the one hand, this requires knowledge of underlying science and technology. On the other hand, it also requires an understanding of economics and policy, since the energy transition takes place in a societal context.

The programme has defined seven intended learning outcomes. In the information dossier these are related to the Dublin Descriptors (Master's level).

The inclusion of economic and policy perspectives in the programme, besides technological aspects, is part of the programme's profile, as confirmed by the programme management. According to alumni and representatives of the professional field this profile is distinctive for the programme as compared to similar programmes, which are usually more exclusively technologically oriented.

The Department the programme is part of (IEES: Department of Innovation, Environmental and Energy Sciences) has a societal advisory board that comes together once a year to discuss the Department's education and research. The faculty management explains that the new programme was briefly discussed in one of the board's meetings. Also, members of the board were consulted individually about their opinions and ideas on the new programme. A member of the board explains he feels the board's ideas and suggestions are taken very seriously by the programme.

Alumni and representatives of the professional field point out that the programme is very relevant to today's (issues in) society. According to them, there is a need in the professional field for technically educated professionals who can build bridges to other disciplines, like economics and policy, and communicate well with a variety of professionals. This is necessary in order to enhance the energy transition in society.

#### *Considerations*

According to the panel, the intended learning outcomes are well defined and appropriate for an academic Master's programme. They are also sufficiently aligned with international requirements. The intended learning outcomes cover a broad range of knowledge and skills from the relevant disciplines and methodology. The panel appreciates the multidisciplinary approach of the programme and recognises the distinctive value of this profile. However, it advises the programme to solidify its profile and work on establishing a stronger, more distinctive position as a separate programme.

The panel notes that the intended learning outcomes relate to the relevant Dublin Descriptors sufficiently. However, the Dublin Descriptor on learning skills has not been explicitly related to the intended learning outcomes. The panel does see that life-long learning skills are addressed in the programme, but this should be made more explicit by formulating an intended learning outcome about life-long learning skills.

The panel is convinced the intended learning outcomes align with the needs and requirements of the professional field, as is confirmed by the societal advisory board, alumni and representatives of the professional field. The panel does think, however, that the programme could consult the professional field more systematically and explicitly.

#### *Conclusion*

The programme meets standard 1.

## 4.2 Standard 2: Teaching-learning environment

*The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.*

#### *Outline of findings*

##### Curriculum

The first year of the programme, consisting of four periods (of 15 EC each), is designed to acquire knowledge from all relevant disciplines and methodologies. In the first three periods students follow five mandatory courses (Energy Conversion Technologies 1 and 2, Energy in the context of Sustainability, Advanced Energy Analysis and Energy Systems Modeling) and one elective. In the fourth period students in the Systems Analysis track take the course 'Consultancy Project' in which they work in small groups to carry out a scientific research for a company. Students and alumni say they especially appreciate this course, as it allows students to apply their knowledge in a real life case for a company as well as practice professional skills. Students in the Natural Science track conduct the Natural Science Research Project in the fourth period of the first year or take electives.

The second year of the programme is dedicated to electives (including an internship of 22.5 EC) and the Master Thesis (30 EC), in which they conduct an individual research project, supervised by a staff member with relevant expertise and holding a PhD.

In the information dossier the intended learning outcomes are related to the courses in the curriculum. Students say they feel the curriculum covers all relevant knowledge and skills, which becomes evident in the Consultancy Project amongst others. Alumni confirm that the programme covers all relevant basic knowledge but do point out more attention could be paid to (the impact of) digitalisation.

The new programme was briefly discussed in one of the societal advisory board meetings a few months before the site visit. In this meeting, the board commented the programme may focus more explicitly on educating energy transition managers and pay more specific attention to the economic and societal aspects of this job. Teaching staff indicate they are considering this option.

The information dossier mentions that the content in the curriculum is cumulative. The panel informed about this issue in several sessions during the site visit and received inconclusive answers. Some suggested that the Consultancy Project and the Master Thesis have entrance requirements, while others suggested these are only recommended but not required.

The programme deploys various work forms, including lectures, (computer-based) exercises and projects. During the programme students work on projects in teams several times. Students indicate that while they value group work for the purpose of practicing teamwork skills, they think there is too much group work in the programme. They would appreciate more individual assignments in order to get more feedback on their individual achievements and progression.

As to the feasibility of the programme, students and management both point out there is an issue in the setup of the programme with regard to the internship. The internship is scheduled parallel to a course, but it is difficult for students to complete both courses simultaneously, possibly leading to study delay.

#### Admission

Admission criteria for the programme are described in the Education and Examination Regulations. Incoming students should hold a university Bachelor's degree in a related subject. Furthermore, they need to prove to have gained specific relevant knowledge, insight and skills by means of an application consisting of former education and grades, a CV and a motivation letter. The Admissions Committee, installed by the Programme Leader, evaluates every application on a case-to-case basis and decides whether or not an applicant is accepted.

Applicants who do not meet the admission criteria may be offered a pre-master programme. The programme management explains this is not a fixed programme as it can be adjusted to the specific deficiencies of applicants. It usually encompasses 30 EC and is mostly followed by applicants with a Bachelor's degree from a hbo-programme (university of applied science).

As the programme is multidisciplinary, students come from diverse backgrounds, which may lead to specific deficiencies for some students in certain courses, despite the admission procedure. The programme management explains this is dealt with by giving an overview of prior knowledge and skills students should master in the first lecture of every course. Also, suggestions are given as to how students can catch up on deficiencies.

#### Internationalisation

The programme strives for international diversity in terms of student inflow and teaching staff. The information dossier mentions about one third of the academic staff is international. There was also about one third of international student inflow in the last three years. During the programme students are offered the opportunity to follow electives abroad or do their internship and/or thesis abroad. Students point out that although international exchange is possible, it is not strongly encouraged in their opinion. They believe it takes a lot of effort and say they are not extensively informed about the possibilities.

#### Teaching staff and facilities

The teaching staff of the programme consists of members of the Energy & Resources Group from the Department of Innovation, Environmental and Energy Sciences (IEES), and as such are actively involved in research. All lecturers are required to have a relevant PhD (or be in the process of getting it). Moreover, all tenured teaching staff should have a Basic Teaching Qualification (BKO). Associate and full professors should also have a Senior Teaching Qualification (SKO).

The management confirms that all lecturers have a technical or natural science background. The panel inquired whether the management intended to hire staff from other backgrounds, in the light of the multidisciplinary perspective the programme strives for. The management indicates that they recently hired an economist with a technical background for this purpose. They also mention having good connections with the Utrecht School of Economics, which regularly provides guest lecturers.

The faculty is located at the Utrecht Science Park. It has several buildings with multiple large and smaller lecture rooms. Students have access to various computer rooms, workstations and workspaces. The Blackboard electronic learning environment is used to make information and materials available to students, including a Blackboard community. The programme also has its own website to inform

students. NRG, the student association for Energy Science students, organises study-related and social events.

#### *Considerations*

In general, the curriculum is well-composed to allow students to achieve the intended learning outcomes, according to the panel. The panel notes that all disciplines, topics and methods are addressed so that students can acquire a sufficient basis for their professional or academic career. The panel does think, however, that some perspectives can be given more explicit attention in the curriculum. This includes the economic and societal aspects of energy transition and the impact of digitalisation in the professional field. The panel recommends the programme to pay more attention to these topics as they are important issues if one wants to contribute to the transition towards sustainable energy systems.

The panel appreciates the variety of didactical work forms the programme applies. However, it thinks the programme could achieve a better balance between individual and group work. According to the panel, the amount of individual (project) assignments could be increased.

The panel notes that there is an issue with regard to the scheduling of the internship in the curriculum, as is confirmed by students as well as management. The internship is now scheduled parallel to an elective course, which is hard to combine. The panel recommends the programme to solve this issue in the curriculum.

The cumulative character of the curriculum can be made more explicit according to the panel. The panel especially advises the programme to clarify possible entrance requirements for specific courses.

The panel concludes that an appropriate admission procedure is in place. It appreciates the fact that each application is individually evaluated by the Admission Committee. The panel also thinks the programme offers sufficient opportunities for students to make up for deficiencies.

The panel thinks that the programme and its content are sufficiently internationally oriented. The international academic staff contributes to this. International exchange, however, is not a strong element of the programme, according to the panel. The panel recommends the programme to look into the current possibilities and make international exchange more easily accessible to students.

The programme's teaching staff is sufficiently qualified to deliver education, according to the panel. Nevertheless, the panel finds it desirable for certain components in the programme to be taught by lecturers from other disciplines (especially economic and societal), in order to enhance its multidisciplinary character. The panel sees that the current teaching staff is in essence sufficiently aware of other perspectives, but believes the quality of education would benefit from lecturers with a background in other disciplines.

The panel is impressed by the facilities the programme offers students. It also thinks that information provision and student services suffice.

#### *Conclusion*

The programme meets standard 2.

### 4.3 Standard 3: Assessment

*The programme has an adequate system of student assessment in place.*

#### *Outline of findings*

The programme follows the faculty-wide assessment policy, which requires course coordinators to submit an examination matrix for each exam. The faculty is working on developing specific assessment plans for each programme. During the programme, a variety of assessment methods is used, including written exams, research papers, assignments, presentations and pitches.

Course coordinators have the primary responsibility for the quality of examinations in their course. The Board of Examiners, which has delegated part of its responsibilities to the Committee of Assessments, regularly reviews a sample of examinations as well as thesis assessments, to ensure the quality of examinations and assessment.

The panel reviewed a sample of 15 theses and their assessments in preparation for the site visit. It observed inconsistencies among lecturers in the way rubrics were filled out. In some cases elaborate feedback was provided whereas in other cases it was not. Also, the panel discovered the filled-in rubrics did not always clarify in a transparent way how a grade was established.

In one case the thesis (content) was graded with a 5, which was compensated by a 7 for the process. The panel inquired with the Board of Examiners whether it approves of this procedure. The Board of Examiners makes clear it does not approve of this procedure and acknowledges this as a shortcoming. Another thesis was graded with a 6,9 for content, whereas the panel thought it was insufficient. Upon being asked, the supervisor explained that in his opinion the thesis was indeed poor but that the student showed a lot of progression during the process, which in his eyes compensated for the poor thesis.

#### *Considerations*

The panel agrees that a sufficient assessment system is in place, with a variety of assessment methods appropriate for the learning objectives of the courses. According to the panel, the quality of exams is enhanced by the assessment policy. Furthermore, the panel has a positive impression of the Board of Examiners and the Committee of Assessments as to how they ensure the quality of exams.

The panel notes that appropriate procedures for assessment are in place. However, it observes that these procedures for assessing the Master Thesis are not always followed consistently by all teaching staff. The panel also observes that the Board of Examiners does not always succeed at noticing and handling situations in which the assessment procedures are not followed correctly.

The panel points out that teaching staff is not aligned regarding how they assess the Master Thesis and weigh its different components, provide feedback and fill out rubrics. The panel also observes shortcomings in the way the role of the second examiner is realised in the Master Thesis assessment. Because of this, the assessment is not sufficiently transparent and consistent. According to the panel this can lead to incorrect grades. Therefore, the panel concludes correct execution of assessment procedures for the Master Thesis is not sufficiently guaranteed.

The panel sets the following condition: the programme should develop a plan of action with regard to how it will guarantee adherence to the assessment procedures for the Master Thesis. Also, it should give account of the execution of this plan of action. Moreover, the programme needs to deliver a new set of theses from 2019 and 2020 (including their assessments) for the panel to evaluate.

#### *Conclusion*

The programme partially meets standard 3.

### 4.4 Standard 4: Achieved learning outcomes

*The programme demonstrates that the intended learning outcomes are achieved.*

#### *Outline of findings*

The programme has existed since 2005 as a specialisation track in other programmes. Because of this, there is already a substantial number of graduates. The panel has reviewed 15 theses from 2017-2018

according to the assessment criteria and rubric of the programme. Three out of 15 theses did not meet the programme's criteria, according to the panel. The panel discussed these cases with the programme's staff during the site visit (see standard 3).

Representatives from the professional field indicate alumni are of great value to the professional field. They do not see any particular gaps in their knowledge or skills. Looking at energy systems from a multidisciplinary perspective, graduates are appreciated for being able to build bridges between various professions and coming up with creative solutions for problems. Having a firm, broad basis, alumni turn out to be of added value from the start.

The information dossier mentions that the Department appointed 15 graduates to a junior researcher position in the last five years. The programme management explains there are currently 14 PhD candidates left.

#### *Considerations*

According to the panel, graduates in general demonstrate having achieved the intended learning outcomes. The panel has seen several theses demonstrating an excellent level and concludes that most theses are sufficient. Also, the panel sees that representatives from the professional field are satisfied with the achieved level of alumni and that alumni perform well in the professional field. The panel especially appreciates the capability alumni have, according to representatives of the professional field, to quickly learn new things and be of added value right from the start. Moreover, the panel thinks the programme has a good outflow to academic careers as well.

In spite of these positive impressions, 3 out of 15 theses reviewed were insufficient according to the panel. The panel concludes that this is primarily caused by shortcomings in the ensuring of assessment procedures (see standard 3), rather than by the general achieved level of graduates.

The panel advises the programme to conduct alumni research in order to gather more comprehensive data on how alumni perform after graduating.

#### *Conclusion*

The programme meets standard 4.

## 4.5 Assessment of the Programme Extension

The panel assessed the request of the institution for the extension of the programme according to the Protocol for programme extension of October 8, 2003.

In the assessment of applications for programme extension, NVAO primarily focuses on whether the programme demonstrably requires extension of the curriculum in order to meet one or both of the criteria below:

- attaining the exit level desired from an international perspective;
- attaining the exit level based on the requirements of the professional field.

#### *International perspective*

When the bachelors and masters were introduced in the Netherlands, technical academic programmes, leading to the title *ir.* (*ingenieur*), were set at a duration of five years (300 EC; three years for the bachelor, two years for the master) in order to allow students to attain an internationally comparable level. The international standard for the programmes was five years. Offering an education of four years, implying a one-year master's programme, would have put graduates of Dutch programmes in an unfavourable position compared to their peers abroad, regarding the knowledge and skills they would have acquired.

The learning outcomes and outline of the programme are at a level that is comparable with those of similar (international) programmes.

The programme demonstrates that it aims for a broad spectrum of technical and methodological knowledge about energy systems and economic/societal knowledge on top of that. The panel agrees that students need at least a year to acquire this knowledge sufficiently. Besides these fundamentals, an elaborate research (thesis) and an (optional) internship are important components of the programme, in order to allow students to develop sufficient research skills and professional experience. According to the panel, a two-year study is required to address all required components sufficiently. This justifies the additional workload.

#### *Professional field*

The intended learning outcomes should enable students to meet the standards in the professional field on an equal basis with their peers from other countries. This means they need thorough understanding of a broad range of (applied) theory from various disciplines, technical as well as economic and societal. Representatives from the professional field and alumni underline that a multidisciplinary approach is essential to be able to meet the challenges the professional field currently faces. Moreover, students need to develop good methodological knowledge and skills, which is why the research thesis is an important component of the programme. As consultancy is a major part of the work of most alumni, professional skills are indispensable. The programme addresses this requirement by means of practice-oriented (consultancy) projects and an (optional) internship. The combination of these various requirements validates a total workload of 120 EC.

The panel is convinced that these arguments are valid. It therefore agrees that the programme needs two years to cover all the qualifications that graduates should master in order to be competitive on the international academic Energy Science job market.

#### 4.6 Qualification and field of study (CROHO)

The panel advises to award the degree Master of Science to the academic master Energy Science. The panel supports the program's preference for the CROHO field of study 'Science'.

#### 4.7 Conclusion

According to the panel, the programme's intended learning outcomes are well defined and appropriate for an academic Master's programme. The panel also believes they are sufficiently aligned to the needs and requirements in the professional field. The teaching-learning environment suffices in enabling students to achieve the learning outcomes. While the panel concludes that the assessment policy and procedures are in place, it observes that the procedures for the Master Thesis are not consistently followed by all staff members, resulting in possible incorrect grades. The panel therefore decides that standard 3 is partially met. The panel has a positive impression of the achieved exit level of graduates. All in all, the panel assesses the quality of the programme as conditionally positive.

The panel sets the following condition:

The programme should:

- develop a plan of action with regard to how it will guarantee adherence to the assessment procedures for the Master Thesis;
- give account of the execution of this plan of action;
- deliver a new set of theses from 2019-2020 (including their assessments) for the panel to evaluate.

The panel gives the following recommendations:

- Solidify the programme's profile and work on establishing a stronger, more distinctive position as a separate programme.
- Clarify the way life-long learning skills are addressed in the programme.
- Consult with the professional field more systematically and explicitly.
- Pay more attention in the curriculum to economic and societal aspects of energy transition and the impact of digitalisation in the professional field.

- Improve the balance between individual and group work.
- Solve the issue in the curriculum regarding the parallel scheduling of the internship and an elective course, which are hard to combine.
- Clarify possible entrance requirements for specific courses.
- Look into the current exchange possibilities and make them more easily accessible to students.
- Consider expanding the current teaching staff with lecturers from a background in other disciplines than technology and natural science.
- Conduct alumni research in order to gather more comprehensive data on how alumni perform after graduating.



## 5 Overview of the assessments

| Standard  | Assessment                    |
|---|-------------------------------|
| <b>Intended Learning outcomes</b><br><i>Standard 1 : The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements</i> | Meets the standard.           |
| <b>Teaching-learning environment</b><br><i>Standard 2 : The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.</i>                                   | Meets the standard.           |
| <b>Student assesment</b><br><i>Standard 3: The programme has an adequate system of student assessment in place.</i>   | Partially meets the standard. |
| <b>Achieved learning outcomes</b><br><i>Standard 4: The programme demonstrates that the intended learning outcomes are achieved..</i>   | Meets the standard.           |
| <b>Conclusion</b>   | Conditionally positive        |

## Appendix 1: Composition of the panel

### Chair:

- Prof.dr.ir. Geert Verbong, full professor of System Innovations & Sustainability Transitions at Eindhoven University of Technology;

### Panel members:

- Prof.dr.ir. Valérie Cappuyns, professor of Economics and Corporate Sustainability at University of Leuven (KU Leuven);
- Ir. Martin Scheepers, research manager of Energy Transition Studies at ECN part of TNO;

### Student member:

- Vera Broek, student of Biomedical Sciences at Leiden University Medical Centre.

The panel was assisted by Anke Schols, policy advisor at NVAO, as process coordinator and Anne-Lise Kamphuis, senior researcher and policy advisor at Odion Onderwijsonderzoek, as secretary.

## Appendix 2: Schedule of the site visit

The panel visited Universiteit Utrecht on November 22, 2018 as part of the external assessment procedure regarding the academic master Energy Science.

| Thursday |       | Nov 22   | (Staff) members  |
|----------|-------|--|--|
| 08.45    |       | Informal meeting with the committee                            |  |
| 09.00    | 09.30 | Preparatory meeting and reviewing documents                    |  |
| 09.30    | 10.00 | Meeting with Dean and Faculty Management (Dutch)               | (Dean), (vice-dean), (head of section Energy & Resources),   |
| 10.15    | 11.00 | Meeting with programme management (English)                    | (Director of Education), programme leader ES as of 1-9-18), (programme leader ES until 1-9-18), (education coordinator)  |
| 11.15    | 12.00 | Meeting with Board of Examiners & Assessment committee (Dutch) | (Chairman Board of Examiners SD & member Board of Examiners Faculty of Geosciences), (chairman Board of Examiners Faculty of Geosciences), (chairperson Assessment Committee), (secretary Board of Examiners SD) |
| 12.00    | 12.45 | Lunch  |  |
| 12.45    | 13.30 | Meeting with lecturers (English)                               | (6 lecturers)  |
| 13.45    | 14.30 | Meeting with students (English)                                | (4 students)   |
| 14.45    | 15.30 | Meeting with alumni and representatives from the field (Dutch) | (alumnus), (alumnus), (alumnus), (work field), (work field/alumnus)  |
| 15.30    | 16.00 | Room for additional meeting                                    | To be decided  |
| 16.00    | 17.15 | Deliberations panel  |  |
| 17.15    | 17.30 | Main findings presented by the chairman (English)              | All interested staff and students  |
| 17.30    |       | Drinks and end of site visit                                   |  |

## Appendix 3: Documents reviewed

### *Programme documents presented by the institution*

- Information dossier
- Appendices to the information dossier:
  - Overview of the intended learning outcomes in relation to the Dublin descriptors
  - Members of the Advisory Board of the Copernicus Institute of Sustainable Development
  - The relation between courses and the degree qualifications
  - Course calendar Energy Science 2017-2018
  - Energy Science Master's thesis-based publications, conference presentations, scientific reports and awards, 2011-2017
  - Admission criteria Energy Science Master's Degree programme
  - Staff allocated to the Energy Science Degree programme (January 2018)
  - Rubric assessment form Master's thesis
  - Energy Science Master's thesis 2014-2015 and 2015-2016
  - Course catalogue 2017-2018, including Education and Examination Regulations
  - Study success rates
  - Report Macrodoelmatigheid UU 006940
- Theses
  - Sample of 15 theses, differentiated grades, of which 4x Natural Science 11x Systems Analysis
- Documents made available during the site visit:
  - Course Catalogue 2018-2019
  - Assessment plan
  - Exams from 2017-2018
  - Course guides from 2017-2018
  - Year evaluations Energy Science for 2017-2018
  - Sample of internship reports
  - Sample of consultancy project reports
  - Nota Toetsbeleid Faculteit Geowetenschappen (2012)
  - Strategieplan Geowetenschappen 2017-2020
  - Strategic plan Copernicus Institute of Sustainable Development 2018-2022
  - Jaarverslag Centrale Examencommissie Geowetenschappen 2017-2018
  - Lecturing at the Copernicus Institute of Sustainable Development
  - Zelfevaluatie Universiteit Utrecht (2017)
  - Adviesrapport Instellingstoets Kwaliteitszorg (2018)

## Appendix 4: List of abbreviations

|      |  |
|------|--|
| Ba   | bachelor's degree  |
| EC   | European credit point                                      |
| hbo  | professional higher education                              |
| Ma   | master's degree  |
| NVAO | Accreditation Organisation of the Netherlands and Flanders |
| wo   | Academic orientation                                       |

The panel report was ordered by NVAO for the initial accreditation of the programme academic master Energy Science of Utrecht University

Application no.: 006940



Nederlands-Vlaamse Accreditatieorganisatie  
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