

Challenges of Energy Transitions

GEO4-2525

*Course manual*

2025

Course Coordinators & Lecturers:

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Source: Appolinary Kalashnikova, Unsplash (2018)

Contents

[1. General Course Information 3](#_Toc207125085)

[1.1. Course Information 3](#_Toc207125086)

[1.2. Eligibility 3](#_Toc207125087)

[1.3. Learning objectives 3](#_Toc207125088)

[1.4. Learning motto 4](#_Toc207125089)

[1.5. Communication 4](#_Toc207125090)

[1.6. Attendance 4](#_Toc207125091)

[1.7. Studying with a handicap 4](#_Toc207125092)

[2. Course content 5](#_Toc207125093)

[2.1. Assessment 5](#_Toc207125094)

[2.2. Quick overview of the lectures 5](#_Toc207125095)

[2.3. Course material 6](#_Toc207125096)

[2.4. Content of individual lectures 6](#_Toc207125097)

[Lecture 1 (3 Sept) – Introduction & Grounding: status of energy & climate; the challenge 6](#_Toc207125098)

[Lecture 2 (8 Sept) – Energy history; Energy since 1945 – the Great Acceleration 7](#_Toc207125099)

[Lecture 3 (10 Sept) – The next energy transition: The Long Goodbye to Fossil Fuels 7](#_Toc207125100)

[Lecture 4 (15 Sept) – The next energy transition: Energy Scenarios 8](#_Toc207125101)

[Lecture 5 (17 Sept) – The Status of Energy Investments 8](#_Toc207125102)

[Lecture 6 (22 Sept) – Essay writing 8](#_Toc207125103)

[Lecture 7 (24 Sept) – The Energy Transition as a Contested Must-Do 9](#_Toc207125104)

[Lecture 8 (29 Sept) – Before you do a Big Project – the PESTLE checklist 9](#_Toc207125105)

[Lecture 9 (1 Oct) – Guest lecture – Offshore Wind Projects in the North Sea 10](#_Toc207125106)

[Lecture 10 (6 Oct) – T of PESTLE – Technology prospects and uncertainty 10](#_Toc207125107)

[Lecture 11 (8 Oct) – E of PESTLE – Economic aspects of the energy transition and energy projects 10](#_Toc207125108)

[Lecture 12 (13 Oct) – the other E of PESTLE – Environmental aspects of new energy technologies 11](#_Toc207125109)

[Lecture 13 (15 Oct) – P of PESTLE – Politics aspects of Climate Change Mitigation (globally, regionally, nationally) 11](#_Toc207125110)

[Lecture 14 (20 Oct) – L of PESTLE – Introduction to the energy law framework and related challenges 12](#_Toc207125111)

[Lecture 15 (22 Oct) – S of PESTLE – Energy transitions from a normative perspective – An energy law treatise and energy justice 13](#_Toc207125112)

[Lecture 16 (27 Oct) – Wrap-up 14](#_Toc207125113)

[Final assignment feedback session (29 Oct) 14](#_Toc207125114)

[4. Fraud and Plagiarism 14](#_Toc207125115)

[4.1. Use of ChatGPT/AI 16](#_Toc207125116)

# General Course Information

## Course Information

**Course title:** Challenges of Energy Transitions

**Course code:** GEO4-2525

**Number of EC:** 7.5

**Period, academic year:** Period 1, 2025-2026

**Language:** English

## Eligibility

Compulsory:

* MSc Energy Science – ca. 50

Open to:

* MSc Innovation Science (open to those) – ca 15
* MSc Sustainable Business Innovation
* Other MSc courses on request and subject to approvals

Not eligible:

* MSc Sustainable Development (because of overlap with SD course Energy Supply)

## Learning objectives

Upon completion of the course, the student will have:

* an understanding of the energy transition as socio-technical system change;
* quantitative knowledge of the energy system and – from that – a deep appreciation of the magnitude of the challenge and the time lines involved;
* an understanding challenges of both private sector investors and of public sector policy makers in terms of the PESTLE framework (Political, Economic, Social, Technological, Legal, Environmental);
* come to appreciate that all new energy options have pros and cons and analyze these using the lenses of PESTLE.
* is able to write about this with nuance and understanding for a general audience.

## Learning motto

*„Will man glauben, daß dies die intensivste und stolzeste, vielleicht förderlichste Art des Lernens ist — das antizipierende Lernen, das Lernen über weite Strecken von Unwissenheit hinweg? Als Pädagoge sollte ich ihm wohl nicht das Wort reden, aber ich weiß nun einmal, daß die Jugend es außerordentlich bevorzugt, und ich meine, der übersprungene Raum füllt sich auch mit der Zeit wohl von selber aus.“*

Thomas Mann, Doktor Faustus (1947)

## Communication

Brightspace will be used for all communication concerning the course. You are therefore kindly requested to regularly check Brightspace for announcements, assignments, changes to the timetable and so on.

**Questions about the course content**

You can ask questions to Gert Jan Kramer or any other lecturer before, during or after

lectures and during the Q&A session towards the end of the course.

**Questions about organizational matters and assignments**

You can contact Maxine Fromm ([m.fromm1@uu.nl](mailto:m.fromm1@uu.nl)) via e-mail for any organizational or assignment related questions.

Urgent and/or personal questions should be directed to Maxine Fromm, with Gert Jan Kramer ([g.j.kramer@uu.nl](mailto:g.j.kramer@uu.nl)) in cc.

## Attendance

Attendance during lectures is not obligatory, but **strongly recommended**, with the expectation of 90% attendance. The lectures cover material related to the topic and the texts of mandatory reading, but they are not a summary of the reading material. The lectures are thus additional and provide relevant context for your final assignment. Also, as often as possible in the second hour we will ‘flip the classroom’ and invite students to volunteer to introduce a couple of debating points related to the topic at hand.

## Studying with a handicap

Our education institute tries to meet the needs of students with a handicap as much as possible by offering facilities that eases their studies. However, students play an active part in this as well. Only students that have a contract with the department are eligible for facilities and special regulations. Students with a contract need to announce themselves to the course coordinator in the first week of each period in order to discuss the possibilities. If you do not have a contract yet, please contact the study advisor of your study programme.

# Course content

This course provides a broad *non-technical* background to the energy transition for Energy Science students and other students interested in the topic. It builds on the understanding the energy transition is a system transition and it puts challenges central. While focus is on ‘the energy transition’, the plural in the title of the course reflects the fact that there have been energy transitions before, and that – within the present energy transition – there are mini transitions worthy of our attention.

The first four lectures are devoted to past energy transitions, a big-picture introduction to the current energy system and the use of scenarios to come to grips with uncertain future transition processes. In the subsequent lectures, the system change challenge is broken down into challenges for investors, for policy makers and for society at large, using PESTLE and TECOP as analytic frameworks. Investor challenges will be considered through Technical, Commercial and Operational lenses. Next, the Political, Economic, Environmental, Legal and Social lenses inform the challenges of policy makers and for society at large.

## Assessment

Students will take turns in summarizing the reading material and introducing a discussion on the topic. Active participation will be rewarded by ‘rounding up’ the grade for the essay.

Students will write a 2500 word essay on “pros, cons and consensus” concerning a technology, issue, …, within the broad encompass of the energy transition. Students will work in pairs of two. The students will do the research for their essay during the full course period when the students will receive instruction and coaching. The final write-up is done towards the end and/or during the exam week (the specific deadline will be announced in due time).

The essay needs to be handed in via Brightspace. Brightspace registers the time of submission and this will be used to check if you have met the deadline. Late submissions will **not be graded**. In addition, submission via Brightspace is used for checking for plagiarism (see Section 4).

The final grade needs to be 5.5 or higher in order to pass the course. If the final grade is below 5.5, you have the right to take a resit. For this, you will get the chance to improve your essay and implement received feedback within three days after receiving your final grade. However, please note that this resit is capped, which means that the highest grade you can receive is a 6.

If it has been noted by the course coordinators and lecturers that a student has been totally invisible during the course and frequently absent from the lectures, prof. Kramer may invite the student in for a conversation to test the student’s knowledge of the course content. Grading of the essay is then conditional on a satisfactory performance.

## Quick overview of the lectures

1. Introduction & Grounding: status of energy & climate; the challenge
2. Energy history; Energy since 1945 – the Great Acceleration
3. The next energy transition: The Long Goodbye to Fossil Fuels
4. The next energy transition: Energy Scenarios
5. The Status of Energy Investments
6. Guest lecture – Essay writing
7. The Energy Transition as a Contested Must-Do
8. Before you do a Big Project – the PESTLE checklist
9. Guest lecture – Offshore Wind Projects in the North Sea
10. T of PESTLE – Technology prospects and uncertainty
11. E of PESTLE – Economic aspects of the energy transition and energy projects
12. the other E of PESTLE – Environmental aspects of new energy technologies
13. P of PESTLE – Politics aspects of Climate Change Mitigation (globally, regionally, nationally)
14. L of PESTLE – Introduction to the energy law framework and related challenges
15. S of PESTLE – Energy transitions from a normative perspective – An energy law treatise and energy justice
16. Wrap-up
17. Final assignment feedback session

## Course material

The reading material should be read **in advance of the corresponding lecture**. By doing so, you will be able to get a better understanding of the lecture and obtain additional knowledge from the lecturer by making critical questions, remarks and providing feedback.

The readings are indicated and linked below. As a UU student, you have access to several e-libraries and can download the articles for free: <https://www.uu.nl/en/university-library/searching-for-literature>. In case you cannot open a link or struggle with retrieving assigned materials, please contact Maxine Fromm.

Some material that may be inaccessible to you will be uploaded to Brightspace under ‘Course Content’, in the corresponding lecture folder. This is also where the lecture slides will be uploaded.

## Content of individual lectures

### Lecture 1 (3 Sept) – Introduction & Grounding: status of energy & climate; the challenge

Lecturer: Gert Jan Kramer

Mandatory reading:

1. [Climate Change 2023 Synthesis Report – Summary for policymakers](https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf), IPCC, 2023.
2. Keith Williges et al., [Fairness critically conditions the carbon budget allocation across countries](https://pdf.sciencedirectassets.com/271866/1-s2.0-S0959378022X00034/1-s2.0-S095937802200019X/main.pdf?X-Amz-Security-Token=IQoJb3JpZ2luX2VjEIn%2F%2F%2F%2F%2F%2F%2F%2F%2F%2FwEaCXVzLWVhc3QtMSJHMEUCIQDt8%2BZtH5M8Mm3ok%2B9chOPRjVZGVTKLfWEmYRz8dnpKrQIgPHAOlMZznsNF2RJxzFn6GhHsG14iHsfkn%2Fcjf3xHCPsqsgUIcRAFGgwwNTkwMDM1NDY4NjUiDA5ux0RC%2BHTjwg4wjSqPBUu7iKOYeT6djrez8yfSDTAkXWiyh7racqgXOKW4myekv5rEA63jshKuaJRg4MkweOhkL9w2KdWzImKAWKQAVSDvIny8mL9FgsnTfl0kuUSgJuKe73zyohLFuZW7gNL4At0TUulx%2BqG6W1fwJ7q8P5tZgyUp%2Fek1Wb0mL3ZSvJEYAPIQZIFHCiaBBIBFhyjDwJWpD%2BGrCVHKceCNsTOEoXDNuSTSv9PmduA5rhpsJKx83a9QQKRKC%2BNQVTegq9eSCzFaNaTrptrFgy9gQOQsDXzsqIV5Ofubw4WQTFXqkM2CtJsjwHCC3UKm6%2FkhtQ25yrxSwLYhp4NPKI8eAhgRzZIidHOWTnr4gYR4qX8N%2BNHM2cLzmClw4M1Yypb5OLnQJ74jWuZOdYKuydxtPKsHvyGVEN6peQuvoxsjRvdxZ74jUrG4T6Y81ZnobwmCZKPaZ6aNXGF1pr5XDsAiqDCKAbm8HWlJhVnbOlmsblSQcnL3uhfOvj0OBJwJ7jS%2BlxfKUjIJT9JdO0rZU1xvSy3RfXBsJxqeSEoNOKQ5Cj5ijoNAnIbxaWuDjh3HjcKs8XGf%2BbMvp5k0cf6LWy2QFkstpfm4Oehsz6E1ZKs2PExh8tLv8tY7%2B5yhS2X3AVG3TkOYSO9JBtDF%2F0oz59yOTp2vdRrnwJk3yfbp%2FbJHTz4th5xbCvelBieYVrnVFIlVItM83CcwhOTNY5FQV1E4MFQvK4j4BC8mEAAIYF0wwMOCvYJ%2FUqLGPYNjaiRJeFsLlcuY6MmDhrZvz0Naoa%2BXyrPKrhlpFgHUhSyTyoZHHTqvWS0lqsCEzKvy5%2BFNDFclZBM5HWqF7kjUsRzwI5JEignAsq71N0ZrZi4xXp4rhKkJuV8wxYettQY6sQGlqVBRVn2Z1WN557ZooSccbVQlprfFBlyJpxlfc2Oo%2BlJYLifmGuj1kI1W86QbEtnOj5Lu4IvmGcjJqNTuvSBKFabIsZM2PzqVdLIgeZklj%2BX0Fkrw5dJFNtkAOoFOODGCnt%2BkXGff9KaUcaMMNq9oHC7lWAzqsSIBOtouPKJnyrnrbTv2OTbk0hxRmIRiphXKmsgaABxbeKLpYivrZ2wsbzB7ukdmOstQ4MBXklyJLrY%3D&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Date=20240801T091020Z&X-Amz-SignedHeaders=host&X-Amz-Expires=300&X-Amz-Credential=ASIAQ3PHCVTYZ6M4J2XU%2F20240801%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Signature=8f2ec65075630ee4809ba62fd3451f11eedd908276287a59fabc01078ab1213d&hash=32e32820cb66f470be8c7445b5dcd4651bc1ff6d07d7247d5c2f197bf5de1ad3&host=68042c943591013ac2b2430a89b270f6af2c76d8dfd086a07176afe7c76c2c61&pii=S095937802200019X&tid=spdf-33995e51-1524-4e87-95cc-34d9d4236b50&sid=8906f9c714d1f841f019a497d5fdbca1c45agxrqb&type=client&tsoh=d3d3LnNjaWVuY2VkaXJlY3QuY29t&ua=140858050c5), Global Environmental Change, 2022.

Deepening material (optional reading):

* Kim Stanley Robinson, *The Ministry for the Future*,2020. The best ‘climate novel’ I (GJK) know.

Assignment:

Write about 1 page about your i) motivation to study Energy Science and ii) what you see as the main challenges for the energy transition. Upload it to Brightspace, ideally before the lecture. This will be open access to all who participate in the course.

Lecture (1 hour): Overview of the course. Learning objectives; ways of working; assessment. Key insights from the IPCC report, carbon budgets, implication of carbon budgets for nations and regions.

Discussion (2nd hour): your motivation and the challenges that we see. We will use this hour to get a feel for what you as a student group seek from energy science and what you know (or think you know).

### Lecture 2 (8 Sept) – Energy history; Energy since 1945 – the Great Acceleration

Lecturer: Gert Jan Kramer

Mandatory reading:

1. McNeill, J.R. and Engelke, Peter. *The Great Acceleration – An environmental history of the Anthropocene since 1945.* The Belknap Press, 2014. Introduction; Population and Energy; Conclusion (Brightspace).
2. Will Steffen, Wendy Broadgate, Lisa Deutsch, Owen Gaffney and Cornelia Ludwig, [The trajectory of the Anthropocene: The Great Acceleration](https://journals.sagepub.com/doi/10.1177/2053019614564785), The Anthropocene Review **2** (1): 81–98,April 2015.
3. Simon Pirani, *Burning Up – A global history of fossil fuel consumption* (Pluto Press, 2018), Chapter 11, *Interpretations and Ideologies* (Brightspace).

Deepening material (optional reading):

* McNeill and Engelke, *op. cit.*: the full book.
* Crutzen, Paul, [The Anthropocene](https://www.mpic.de/3865097/the-anthropocene), Max Planck Institute for Chemistry, 2000

Lecture (1 hour): Past energy transitions: from ancient times to the onset of the great acceleration.

Second hour: student summary (by volunteers) and group discussion of “the great acceleration”.

### Lecture 3 (10 Sept) – The next energy transition: The Long Goodbye to Fossil Fuels

Lecturer: Gert Jan Kramer

Mandatory reading:

1. *Special report on the Oil Industry: The Long Goodbye*, Economist, March 2024 (Brightspace).
2. Simon Pirani, *Burning Up – A global history of fossil fuel consumption* (Pluto Press, 2018), Chapters 12, *Possibilities*, and 13, *Conclusions*. NB: some of Ch. 12 is a bit dated; always be mindful of the publication date (Brightspace).

Deepening material (optional reading):

* Daniel Yergin, *The Prize: The epic quest for oil, money and power*, Simon & Schuster, 1990. The classic history of the oil industry. Well worth reading all 900 pages.
* Sam Light, [The method behind Just Stop Oil’s annoying madness](https://wagingnonviolence.org/2023/12/the-method-behind-just-stop-oil-annoying-madness/), Waging Nonviolence, 2023
* Rupert Read and Samuel Alexander, [Extinction Rebellion: Insights from the Inside](https://www.resilience.org/stories/2020-07-07/extinction-rebellion-essays-from-the-inside/), resilience.org, 2020

Lecture (1 hour): Overview of the role of oil in society; a personal reflection by GJK of the struggle of one oil major, witnessed as a long-term employee.

Second hour: student(s) debate the role of activism to force an immediate (or very fast) end to oil.

### Lecture 4 (15 Sept) – The next energy transition: Energy Scenarios

Lecturer: Gert Jan Kramer

Mandatory reading:

1. [Global Energy Outlook 2024: Peaks or Plateaus?](https://www.rff.org/publications/reports/global-energy-outlook-2024/), Resources for the Future (RFF), 2024. An overview of current global energy scenarios.
2. [Energy Security Scenarios – Summary](https://www.shell.com/news-and-insights/scenarios/the-energy-security-scenarios/_jcr_content/root/main/section_926760145/promo_copy_142460259_1698265813/links/item0.stream/1679345012896/4dccc89eba3c80899dc0e61b43ce07839d7899ee/energy-security-scenarios-summary.pdf), Shell, 2023.
3. Arnulf Grubler et al., [A low energy demand scenario for meeting the 1.5 °C target and sustainable development goals without negative emission technologies](https://www.nature.com/articles/s41560-018-0172-6), Nature Energy, 2018

Deepening material (optional reading):

* [Shell Energy Security Scenarios – full report](https://www.shell.com/news-and-insights/scenarios/the-energy-security-scenarios/_jcr_content/root/main/section_926760145/promo/links/item0.stream/1679344984968/5bc8327925d66e1402040d0e79fed7291bf9b7e9/energy-security-scenarios-full-report.pdf), Shell, 2023.
* [World Energy Council – Scenario Foundations](https://www.worldenergy.org/assets/downloads/Report_World_Energy_Council_Scenario_Foundations_2024_V1R8.pdf?v=1713428119), World Energy Council, 2024.
* Pierre Wack, [Scenarios: Uncharted Waters Ahead](https://hbr.org/1985/09/scenarios-uncharted-waters-ahead) and [Scenarios: Shooting the Rapids](https://hbr.org/1985/11/scenarios-shooting-the-rapids). [Pierre Wack](https://en.wikipedia.org/wiki/Pierre_Wack) was the founder of scenario planning at Shell. These papers lay out the general philosophy as well the scenarios that he developed in Shell in the early 1970s that helped Shell during the 1973 oil crisis.

Lecture (1 hour): Theory of futuring and scenario making; storytelling and quantification; coming to grips with uncertainty; overview of important scenarios and scenario makers.

Second hour: student summary (by volunteers) and group discussion of energy scenarios.

### Lecture 5 (17 Sept) – The Status of Energy Investments

Lecturer: Gert Jan Kramer

Mandatory reading:

* [World Energy Investment 2024](https://iea.blob.core.windows.net/assets/60fcd1dd-d112-469b-87de-20d39227df3d/WorldEnergyInvestment2024.pdf) , IEA, 2024
* [Energy Transition Investment Trends 2024](https://about.bnef.com/energy-transition-investment/) , Bloomberg New Energy Finance (BNEF), 2024

Assignment: pick out the 2 or 3 figures that you found particularly insightful and/or surprising and give a short explanation. Hand-in via Brightspacebefore 12 noon on 16 Sept, 2025. This allows me (GJK) to skim through them to see what struck you.

First hour: student insights (volunteers) from the IEA and BNEF material

Lecture (2nd hour): Summary of the state of energy investments and the challenges ahead.

### Lecture 6 (22 Sept) – Essay writing

Lecturer: Bram Vermeer

Mandatory reading:

* J. Jacobs [Trying to Live a Day Without Plastic](https://www.nytimes.com/2023/01/11/style/plastic-free.html), *The New York Times*, January 11, 2023
* Farhad Manjoo, [Nuclear Power Still Doesn’t Make Much Sense](https://www.nytimes.com/2022/09/16/opinion/nuclear-power-still-doesnt-make-much-sense.html), *The New York Times*, September 17, 2022

Both these essays highlight how you introduce a contentious topic for a broad audience, approach the issue in a surprising way and captivate the reader. They can serve as inspiration for your own essays.

Deepening material (optional reading):

1. John D. Ramage, John C. Bean, and June Johnson. *Writing ­Arguments: A Rhetoric with Readings*, 11th edition, Pearson, NY, 2018.

Lecture (2 hours): Researching and writing a ‘pros, cons and consensus’ essay about a contested issue. What issues can be advanced with such an essay? For which audience are you writing and why? How does an essay for a broad audience differ from a scientific article? How to research it? How do you, as a scientist, weigh facts and opinions? How to find a middle ground if there is no consensus? How to structure an essay, present factual materials and ensure that a reader keeps reading?

### Lecture 7 (24 Sept) – The Energy Transition as a Contested Must-Do

Lecturer: Gert Jan Kramer

Mandatory reading:

* Christopher H. Stefes, [Opposing Energy Transitions: Modeling the Contested Nature of Energy Transitions in the Electricity Sector – Review of Policy Research](https://onlinelibrary.wiley.com/doi/abs/10.1111/ropr.12381) , Review of Policy Research, 2020

Deepening material (optional reading):

* Matt Ince and Erin Sikorsky, [The Uncomfortable Geopolitics of the Clean Energy Transition](https://www.lawfaremedia.org/article/the-uncomfortable-geopolitics-of-the-clean-energy-transition), Lawfare, December 2023
* Jörg Radtke, [Resolving Conflicts Around the Energy Transition](https://www.rifs-potsdam.de/en/blog/2023/08/resolving-conflicts-around-energy-transition), Research Institute for Sustainability, 2023

Lecture (1 hour): Some examples of how contestation has delayed and is delaying the energy transition – and what to do about it. Aspects will be revisited in lecture 15.

Second hour: first batch of students present their essay topic.

### Lecture 8 (29 Sept) – Before you do a Big Project – the PESTLE checklist

Lecturer: Gert Jan Kramer

Mandatory reading:

1. David Hillson, [How risky is your project — And what are you doing about it?](https://www.pmi.org/learning/library/risky-project-doing-it-9351), Project Management Institute, 2014.

Deepening material (optional reading):

* Bent Flyvbjerg and Dan Gardner, *How Big Things get done: The surprising factors behind every successful project, from home renovations to space exploration*, Random House, 2023.

Lecture (1 hour): PESTLE is short for Political, Economic, Social, Technological, Legal, Environmental. Since virtually all energy projects and big and (individually and/or collectively) contested, these projects (and by extension the whole energy transition) needs to be considered from multiple angles. This list provides the structure for the remainder of the lecture series.

Second hour: second batch of students present their essay topic.

### Lecture 9 (1 Oct) – Guest lecture – Offshore Wind Projects in the North Sea

Lecturer : Jasper Vis (SSE Renewables)

Mandatory reading:

* F. Taminiau and B. van der Zwaan, [The Physical Potential for Dutch Offshore Wind Energy](https://www.lidsen.com/journals/jept/jept-04-04-032), Journal of Energy and Power Technology, 2022.

Lecture & discussion with Jasper Vis (2 hours): [Jasper Vis](https://www.linkedin.com/search/results/all/?fetchDeterministicClustersOnly=true&heroEntityKey=urn%3Ali%3Afsd_profile%3AACoAAACA8PQB7fBLbybPzy8oGMpX_D0cuST2CuY&keywords=jasper%20vis&origin=RICH_QUERY_TYPEAHEAD_HISTORY&position=0&searchId=27a5bbf1-b628-4cea-b413-8a6db26670da&sid=FLK&spellCorrectionEnabled=true) is an alumnus of Utrecht University with an MSc in Science & Technology (1996) and been working for over a decade in offshore wind development. He is currently country manager of SSE Renewables for the Netherlands. He will tell us about his experience developing offshore wind projects in the Netherlands and the North Sea region.

### Lecture 10 (6 Oct) – T of PESTLE – Technology prospects and uncertainty

Lecturer: Gert Jan Kramer

Mandatory reading:

1. IEA, [Energy Technology Perspectives 2023](https://iea.blob.core.windows.net/assets/a86b480e-2b03-4e25-bae1-da1395e0b620/EnergyTechnologyPerspectives2023.pdf),
2. Gert Jan Kramer and Martin Haigh, [No quick switch to low-carbon energy](https://www.nature.com/articles/462568a), Nature (2009)

Deepening material (optional reading):

* David Edgerton, *The Shock of the Old: Technology and global history since 1900*, Profile Books, 2006.

Lecture (2 hours): An overview of technology status and progress and how it affects the energy transition, including the timeline.

### Lecture 11 (8 Oct) – E of PESTLE – Economic aspects of the energy transition and energy projects

Lecturer: Gert Jan Kramer

Mandatory reading:

1. [Stern Review – Wikipedia](https://en.wikipedia.org/wiki/Stern_Review). This Wikipedia page gives a good summary of the 2006 report and its reception.

The Stern review is the original benchmark report making the case (and calculations) that climate change mitigation and a rapid energy transition make economic sense for humanity.

1. Avinash Dixit and Robert Pindyck, [The Options Approach to Capital Investment](https://hbr.org/1995/05/the-options-approach-to-capital-investment?registration=success), Harvard Business Review, May 1995.

This article lays out in simple terms how uncertainty modifies the simple Net Present Value analysis (the conventional way to calculate profitability in Energy Science). By using the ‘real options’ approach, one can understand that investment in a loss-making project can be a rational decision if it creates the option to do subsequent profitable projects. Conversely, it also explains that uncertainty about market conditions, or rapid technical change might induce a wait-and-see attitude.

Deepening material (optional reading):

* Nicholas Stern, [15 years on from the Stern Review: the economics of climate change, innovation and growth](https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2021/10/Stern_Review_15th_anniversary26_Oct_2021.pdf), 2021. Slides of a talk on the 15th anniversary of the reports publication.
* Nicholas Stern, [The Economics of Climate Change](https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.98.2.1), the Richard T. Ely Lecture, 2008.  
  a 40-page exposition on the main arguments.
* Nicholas Stern, [Stern Review final report](https://webarchive.nationalarchives.gov.uk/ukgwa/20100407172811/https:/www.hm-treasury.gov.uk/stern_review_report.htm), 2006. The full report.
* Avinash Dixit and Robert Pindyck, *Investment under Uncertainty*, Princeton University Press, 1994.   
  A book-length exposition of real options theory.

Lecture (1 hour): Net present value analysis and its extension through the real options approach.

Second hour: student summary (by volunteers) and group discussion of the economics of climate change mitigation (Stern review and societal-level economic impacts).

### Lecture 12 (13 Oct) – the other E of PESTLE – Environmental aspects of new energy technologies

Lecturer: Gert Jan Kramer

Mandatory reading: will follow later

Lecture (1 hour): I will select one aspect of “environmental” based on where the group interest lies.

Second hour: student summary (by volunteers) and group discussion of the topic.

### Lecture 13 (15 Oct) – P of PESTLE – Politics aspects of Climate Change Mitigation (globally, regionally, nationally)

Lecturer: Gert Jan Kramer

Mandatory reading: will follow later

Lecture (1 hour): I will select one aspect of “environmental” based on where the group interest lies.

Second hour: student summary (by volunteers) and group discussion of the topic.

### Lecture 14 (20 Oct) – L of PESTLE – Introduction to the energy law framework and related challenges

Lecturer: Maxine Fromm

During this lecture, we will focus on the legal dimension of the energy transition(s). To understand the legal foundations, we will start by briefly going through the basic workings of international, EU and national legal frameworks.

After this introductory part, we will focus on the field of energy law: Which specific laws/topic areas fall under energy law? Who are relevant legislators, policy organizations and drivers of energy law? Which challenges stand in the way of energy law contributing effectively to an energy transition?

Lastly, we will take a closer look at EU energy law and examine the Renewable Energy Directive as an example of EU legislation. Finding your way around EU legislation is a useful skill for your own research and professional work, which is why we will also practice how to find, read and understand the structure of EU legislation.

Mandatory reading:

1. [*Basic Concepts of Law*](https://link.springer.com/chapter/10.1007/978-3-319-57252-9_3), Jaap Hage (2017) in Introduction to Law, Springer International Publishing, only sections 1-3, pp 34-39 (6 pages)

This chapter describes basic legal concepts that are relevant for understanding how different legal fields are structured, which different types of legal rules, who is bound/has rights under different laws and how legal rules are systemized. An understanding of these legal foundations is needed to be able to understand what energy law, as a sub-field of the general legal framework, constitutes.

1. [*What Is Energy Law?*](https://www.springerprofessional.de/en/what-is-energy-law/19284130)*,* Raphael J. Heffron (2021) in Energy Law: An Introduction, Springer Briefs in Law (13 pages)

This chapter gives a basic overview of the most relevant content, actors, laws and regulatory levels of energy law.

1. [*Why is energy law resistant to changes required by climate policies*](https://www.sciencedirect.com/science/article/pii/S266627872300003X)*?*,Kaisa Huhta, Seita Romppanen (2023), Energy and Climate (3 pages)

This article gives an overview of both the challenges that energy law is facing as well as the challenges that energy law itself is creating for the energy transition. The author only touches very briefly on the potential to overcome these challenges: Can you think of more (practical) ways to do so?

1. [The Renewable Energy Directive (RED) 2018/2001](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC) and its most [recent amendment (RED III)](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023L2413&qid=1699364355105)

For the RED, focus on the following:

* the introductory sentences (right after the title)
* Recital (2) (the recitals follow after ‘WHEREAS: …’)
* Art. 1, 2 and 3 (which you find further down in the document, after the 131 recitals). You do not need to read all the definitions of Art. 2 in-depth, just get an overall understanding of how these definitions are formulated.

Every EU directive is essentially structured in the same way and these provisions can help you to get a quick understanding of the overall context: Why the EU has the competence to legislate (introductory sentences), what the purpose of this directive is (recitals and Art. 1), what the relevant definitions are (Art. 2) and the most important substantive rule(s) (Art. 3).

After reading the RED, have a look at the amending Directive. You can briefly skim through the recitals again, which explain why an amendment is needed. Then you can have a brief look at Art. 1, which includes some amendments. You do not need to look into the substantive content of the amendments, focus on the formulations (e.g., XYZ is replaced) that express a change.

### Lecture 15 (22 Oct) – S of PESTLE – Energy transitions from a normative perspective – An energy law treatise and energy justice

Lecturer: Maxine Fromm

In the previous lecture, we focused on how legal frameworks, and specifically energy law, function. In this lecture, we focus on the more normative side of energy law: How should energy law function? Which principles should it follow? Whom should it protect? Which objectives should it pursue? Who should create energy laws? These questions relate to the topic of energy justice, a concept that has emerged during the last two decades. It poses the questions of how energy can be produced, used and consumed in a just manner, and which justice implications a transition towards a sustainable energy system may have.

During the second half of the lecture, we will go through the two main theoretical lenses (the tenets and principles approaches) of energy justice. These lenses can help you to structure and analyze justice issues. Afterwards, we will have an open discussion on case studies chosen and presented by students. We will utilize the energy justice theories to identify potential arguments and considerations that are relevant to the conflict at hand.

Mandatory reading:

1. [*A treatise for energy law*](https://academic.oup.com/jwelb/article/11/1/34/4792991), Raphael J. Heffron et al. (2018) Journal of World Energy Law and Business, focus on sections 3 and 4 (14 pages)

This article proposes seven principles of energy law. As energy law is rooted in many different legal disciplines, the authors distill these principles from different legal frameworks, such as environmental law, human rights law and EU law. When reading these principles, try to be critical: Do the principles make sense to you and do you believe they support the energy transition? To what extent are there trade-offs/tensions between these principles that could hinder the energy transition?

1. [*Advancing energy justice: the triumvirate of tenets*](https://www.researchgate.net/publication/259459020_Advancing_Energy_Justice_The_triumvirate_of_tenets), Dr Darren McCauley et al. (2013) International Energy Law Review (4 pages)

This short paper focuses on three dimensions of justice: procedural, distributive and recognition justice. These three dimensions can help to analyze justice issues and spot where and how justice issues may arise. Try to be critical when reading the paper: Do you think that a division into three justice dimensions makes sense? Is something missing?

1. [*Energy justice: Conceptual insights and practical applications*](https://efl-stichting.nl/app/uploads/2022/08/Sovacool_Dworkin-AE-Justice20190902-14416-15urgi3-with-cover-page-v2-1.pdf), Benjamin K. Sovacool, Michael H. Dworkin (2015) Applied Energy (11 pages)

This paper adopts a principle approach to energy justice, i.e., it puts forward a number of principles that energy consumers, policy makers and producers should follow to achieve energy justice. Again, try to stay critical when reading this paper: Are the principles clear to you? Do you think it is possible to adhere to all of them? Do you think they are effective in guiding the behavior of consumers, policy makers and producers? Would you add any principles?

### Lecture 16 (27 Oct) – Wrap-up

Lecturers: Gert Jan Kramer and Maxine Fromm

In this final lecture we will do a short review of what you have learned during this course and reflect on how you can use this in the next two years of the Energy Science master, and how you can keep up-to-date with developments and broaden your understanding of the energy transition as you prepare for a career after your studies.

### Final assignment feedback session (29 Oct)

Please note that on October 29, there is another lecture scheduled in your timetable. This timeslot will not be used for a lecture, but a potential check-in and feedback moment on your final assignment. You will receive more information on this opportunity and a specific schedule in due time.

# Fraud and Plagiarism

You are always expected to hand in your own authentic work. Discussion with others can be enriching but the final product always has to be your own. All scientific research, including that of a student, builds on the results of the work of other researchers, either in a positive or in a negative sense. Those other researchers deserve the credits for their work, in the form of a correct acknowledgement. In short: quoting is allowed (and even necessary), but copying other researchers' work and presenting it as if it were one's own, is plagiarism: a huge sin in science. Lecturers have software to check tests for plagiarism and they will apply this software. Students, who plagiarise, run tremendous risks: in the worst-case scenario they are expelled from the programme for a year. The Teaching and Examination Regulations of the programme draws up the sanctions with which a student who is caught plagiarising, will be confronted.

You can find the Teaching and Examination Regulations at:

<http://students.uu.nl/en/practical-information/academic-policies-and-procedures/regulations>

More information on fraud and plagiarism can be found here:

<https://students.uu.nl/en/practical-information/policies-and-procedures/fraud-and-plagiarism>

Fraud and plagiarism mean any action or non-action of a student that wholly or partly prevents an accurate assessment of his or her knowledge, understanding and skills.

Fraud includes:

* allowing other persons to complete all or part of an assignment;
* obtaining the relevant examination questions or assignments before the date or time of the examination will be held;
* making up the answers to questionnaires, interviews or research data

Plagiarism is defined as including data or texts written by other persons in one’s work, without acknowledging the source. Plagiarism includes in any event:

* copying and pasting text from digital sources such as encyclopaedias or digital journals without quotation marks and references;
* copying and pasting text from the internet without quotation marks and references;
* copying printed matter such as books, journals or encyclopaedias without quotation marks and references;
* including a translation of such source texts as mentioned above without quotation marks and references;
* paraphrasing such source texts as mentioned above without due referencing; paraphrasing should be marked as such (by explicitly linking the paraphrased text to the original author in the text or in a note) so as to avoid the impression that these are the student’s own ideas;
* copying others’ visual, audio or test material without due reference and thus allowing it to be regarded as one’s own work;
* submitting one’s own work written for a previous course as if written originally for the new course, unless explicitly allowed by the teacher of the course.
* copying the work of other students and allowing it to be regarded as one’s own work. If this happens with the permission of another student, the latter will be accessory to plagiarism;
* if one of the authors of a joint assignment commits plagiarism, the other authors will be accessory to plagiarism if they should or could have known that the former committed plagiarism
* submitting assignments acquired from a commercial organisation (such as a website providing abstracts or papers) or written by someone else in return for remuneration.

**Fraud and plagiarism in group work**

In group work, the group as a whole is responsible for the work that is handed in. If one of the group members commits fraud or plagiarism, the work cannot be assessed and the whole group will be called to the Board of Examiners. If the Board of Examiners determines that fraud or plagiarism has been committed, an appropriate sanction will be determined for each group member separately and the work will be declared invalid. If group members that are not guilty of the fraud or plagiarism want to receive a grade, the product will have to be re-written in such a way that a plagiarism-free work can be assessed. Make sure you are aware of your team members’ work. Check each other’s work and call attention to someone’s work if necessary.

**Free-riding**

There is an effort requirement for the group work. Insufficient contribution to the group work (or ‘freeriding’) can have consequences for one’s individual process grade within the group grade. Evidently it is optimal when issues on free-riding are resolved with communication within the group, but it the freeriding is persistent, you should feel encouraged to contact your group supervisor about the issue. Whether a student has sufficiently contributed will be decided by the course coordinator, in coordination with the group supervisor.

## Use of ChatGPT/AI

It is important to us that you use this course to further develop your own writing and critical thinking skills. This will prepare you for the next academic and professional steps you may take and allow you to arrive at your own, well-reasoned opinions and conclusions. We therefore strongly reject an *excessive* use of AI, not only for reasons of fraud and plagiarism, but also because we want you to use the opportunity to truly take something away from this course. In the lecture on essay writing, guest lecturer Bram Vermeer, will point to acceptable and helpful ways to use AI, specifically in idea generation and writing style improvement. If you make use of AI following these guidelines, explain how and what in a short addendum to the essay: “Methods – use of AI”.

This is the official UU policy on the use of AI: The use of an AI tool (such as ChatGPT or a similar tool) is regarded as fraud if a student generates texts with it and presents them as his/her own work for the purpose of a summative or formative assessment such as an examination, an essay, thesis or dissertation (or parts thereof). You can find more information here: <https://students.uu.nl/en/news/guidelines-chatgpt>.

Please also bear in mind that at this point, an extensive use of AI is often noticed by graders (due to similarities in arguments with other students, certain phrasings, etc.). If suspicions arise, we may ask you to justify and explain your arguments to see that they have been developed by yourself.