

A young man with short brown hair and a beard, wearing a dark t-shirt, is focused on working on a technical device. He is using a thin rod or wire to adjust a component on a white panel. The background shows a laboratory or workshop environment with various equipment and a green exit sign.

Welcome at the TU/e Graduate School Event

Master Sustainable Energy Technology (SET)

< Name + function staff member + department >

< name student + 1st year / 2nd year >

Welcome to Sustainable Energy Technology!

Today's program

- Presentation (30 min)
 - Master program SET
 - Pre-Master program SET
 - Master program SELECT
- Time for questions (15 min)

CONTENT

MASTER SUSTAINABLE ENERGY TECHNOLOGY (SET)

- **Brainport region**
- SET: why?
- SET: what?
- SET: specializations
- After graduation
- SET Pre-Master program
- Application / More information
- MSc program SELECT



The Netherlands

**Top-ranking
Dutch
university**

Brainport

At the heart of
the Brainport region

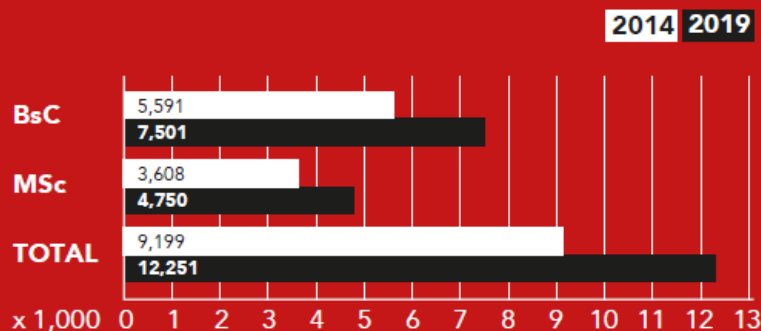
Strong technology
heritage in Eindhoven

Eindhoven

Accounts for 23,1% of total Dutch private R&D expenditure*



Student growth



*Costs and figures are based on the year 2019



Engineers for the future

More than **93** nationalities

12,251 total number of students

92% of the graduated students finds a job within 6 months. Nationwide this is 89%



86% Dutch
14% International

3,298 total degrees awarded
1.441 BSc / 1.455 MSc
120 PDEng / 282 PhD



73% Male
27% Female

59,341 total number Alumni
83% Male, 17% Female

*As in 2019

The TU/e campus
covers an area of
75 hectares

EAISI:
Artificial intelligence

3 Interdisciplinary
research institutes

EIRES:
Energy transition

ICMS: Complex
molecular systems



Ecosystem and characteristics



47 new patent applications

7 patents filed by third parties

29 provisionals converted

35 transferred via
a transfer or license



2747* Scientific publications



54 New start-ups and spin-offs



15 Large research labs



50 Smaller research facilities



International working environment

3,301.3 Total staff (fte)

2,122 Research staff (fte)



64.3% Dutch

154 Full professors



35.7% International

138 Part time professors



61.5% Male

144 Associate professors



38.5% Female

300 Assistant professors

1,572 PhD fellows



Rankings:



CWTS Leiden Ranking 2020:
TU/e no. 4 in industry cooperation



Times Higher Education:
2021 no. 187 of 1000



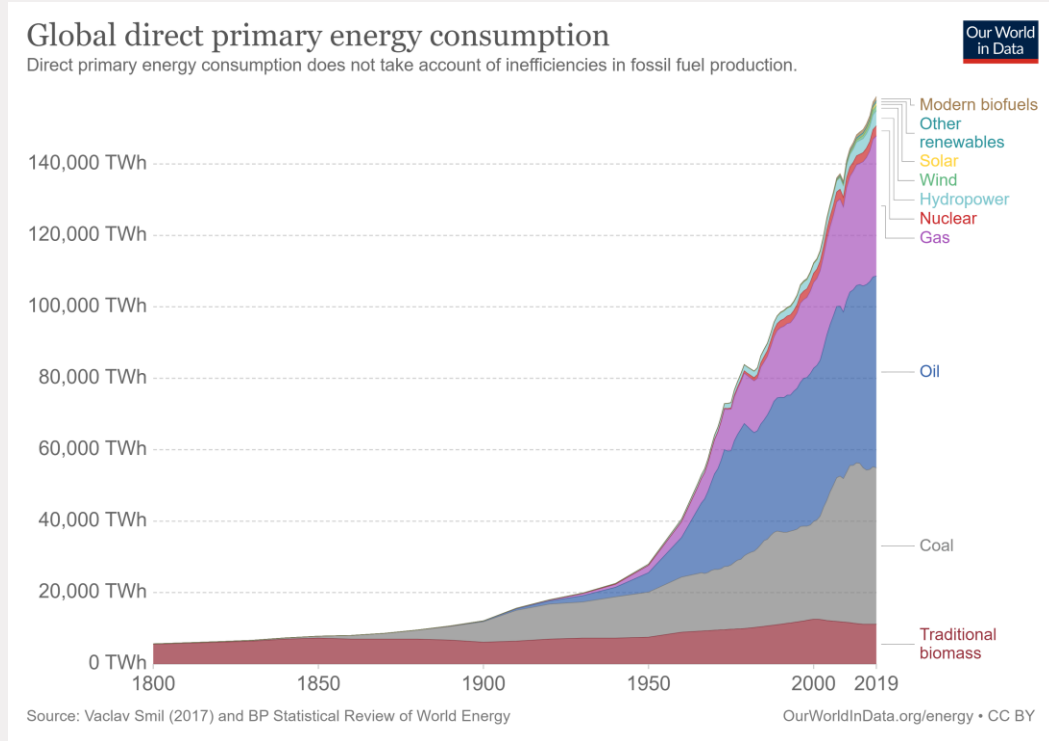
QS-Ranking 2021:
no. 120 of 1003

CONTENT

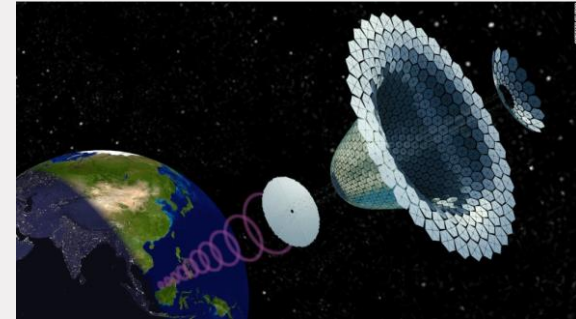
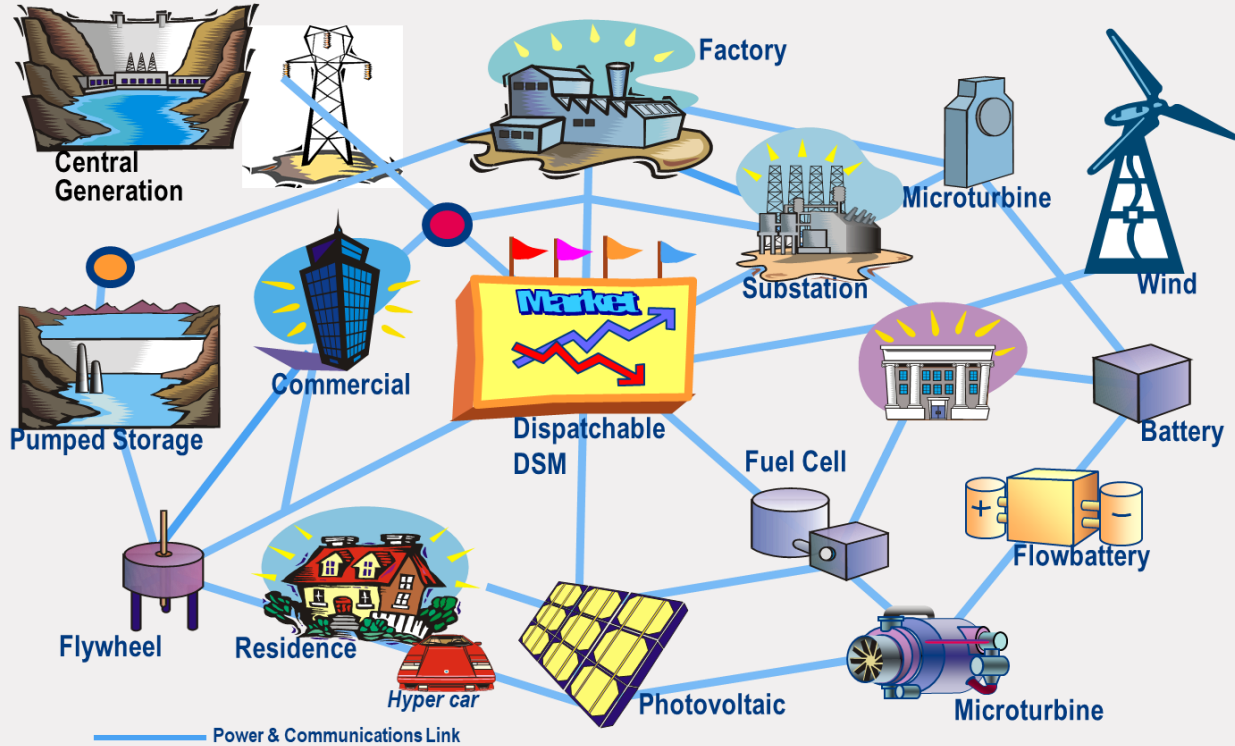
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The need for an energy transition



Future power system?



Example of SET



METAL FUELS – THE GREEN ENERGY SOLUTION

The mission of our researchers is to enable clean, renewable energy for everyone at any time. They want to provide a solution to the energy management challenge, which has become the greatest barrier to a more sustainable energy system. Metal fuels have the potential to become the dominant circular energy carrier.

→ READ MORE

<https://www.tue.nl/en/research/research-areas/energy/>

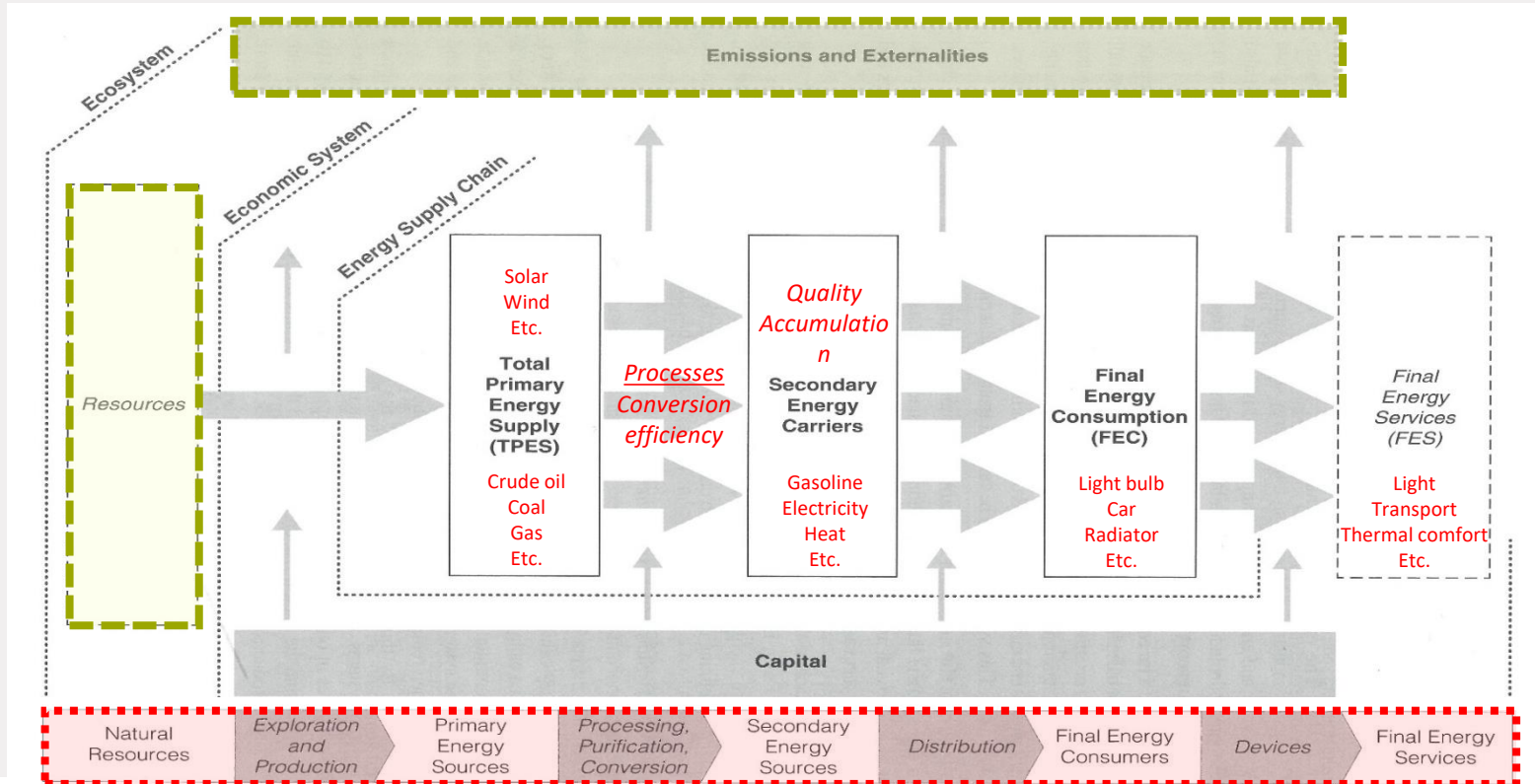
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The energy system

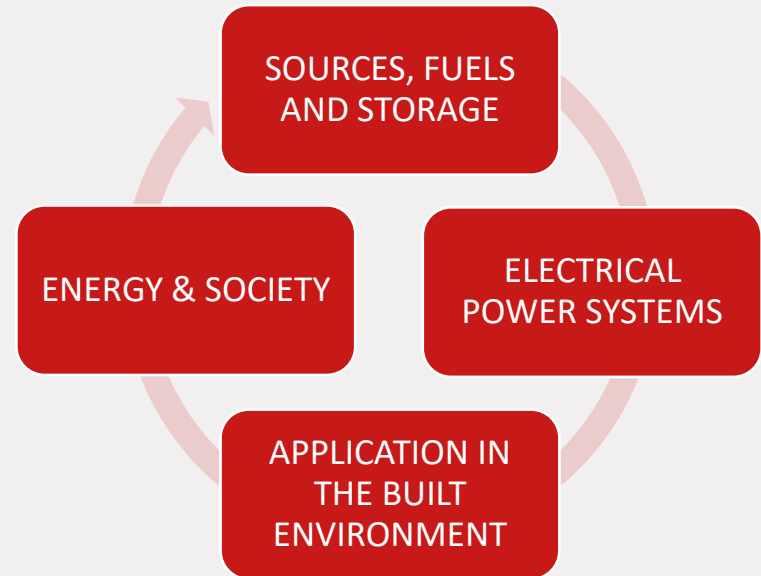
Bradford 'The energy system' fig 1.9; adapted from 'Energy efficiency indicators: Fundamentals on Statistics' (Paris: OECD/IEA, 2014)



Master Sustainable Energy Technology

MISSION: Educate academic engineers who possess scientific knowledge on and insight into the design, behaviour and performance of energy technologies, and the integration of these technologies in grids, buildings, and into society at large

- Focus on technological aspects of sustainable energy
- Broad basis and system integration approach
- Program is characterized by 4 themes reflecting the whole energy system



Master Sustainable Energy Technology

Specialists from many fields are involved

Cooperation between 6 departments:

- Applied Physics (AP)
- Built Environment (BE)
- Chemical Engineering and Chemistry (CEC)
- Electrical Engineering (EE)
- Industrial Engineering and Innovation Sciences (IE&IS)
- Mechanical Engineering (ME)

Master Sustainable Energy Technology

- Duration: 2 years (120 EC)
- Entry for international students: September
- Entry for TU/e students: every month
- Language: English
- Degree: Master of Science (MSc)



Program overview

- **Core program (30 EC)**

1st year

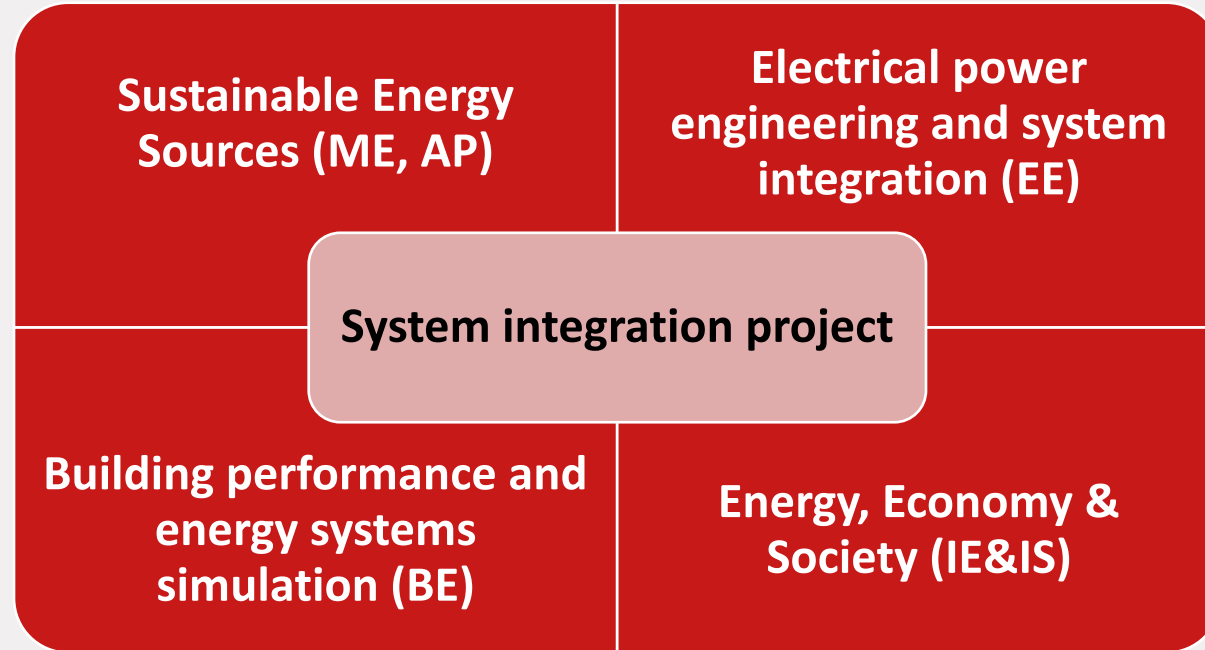
- Specialization courses (15 EC)
- Free electives (incl. homologation, 15 EC)

2nd year

Internship
(15 EC)

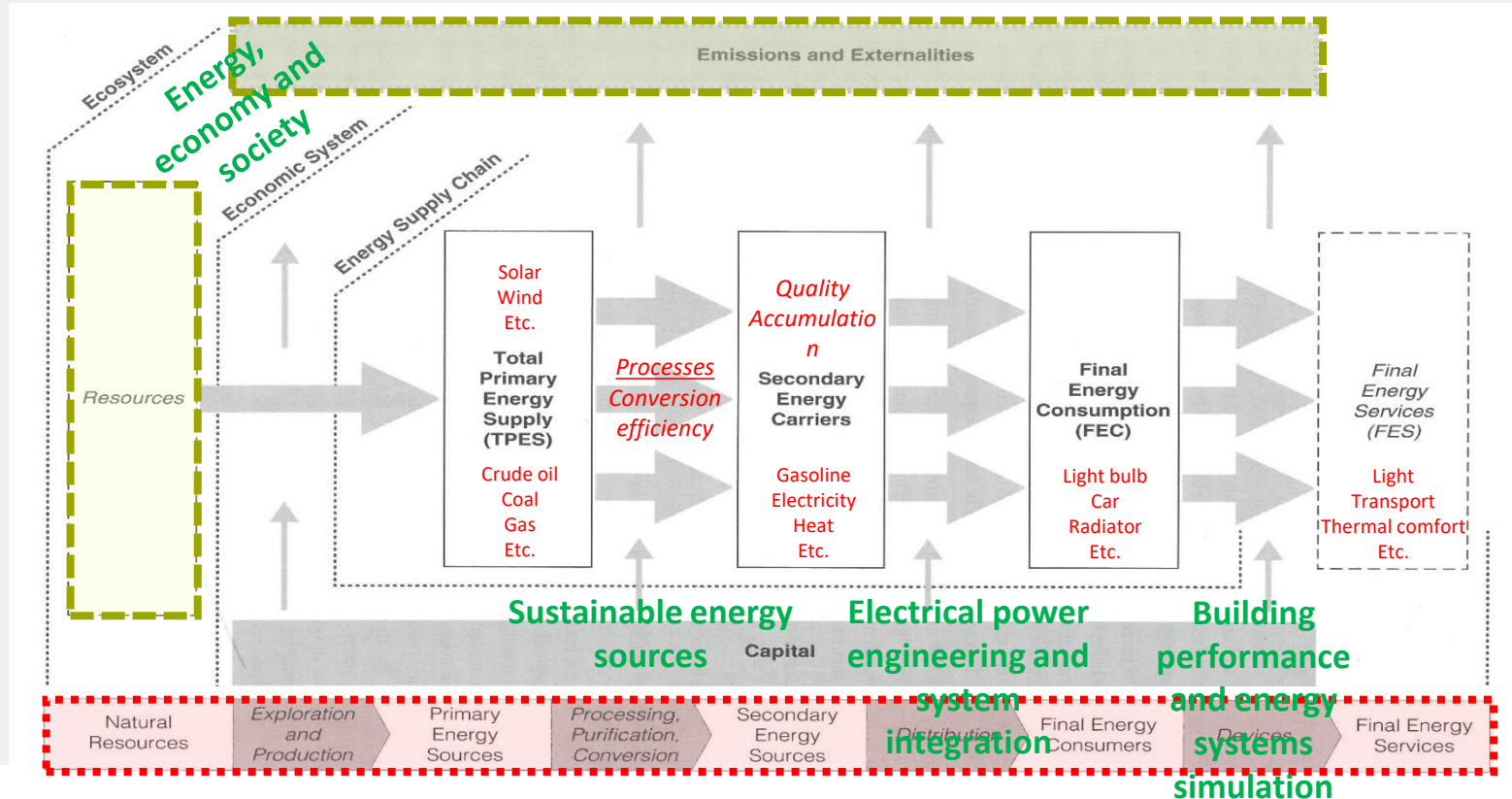
Graduation project
(45 EC)

SET - core program



Positioning of core courses in the energy system

Bradford 'The energy system' fig 1.9; adapted from 'Energy efficiency indicators: Fundamentals on Statistics' (Paris: OECD/IEA, 2014)



System integration project (10 EC)



“Group assignment, in which sustainable energy has to be applied to a concrete, real-world problem”

“Multidisciplinary project team (+/- 5 members) in collaboration with stakeholders (e.g. industry, municipality)”

CONTENT

MASTER SUSTAINABLE ENERGY TECHNOLOGY (SET)

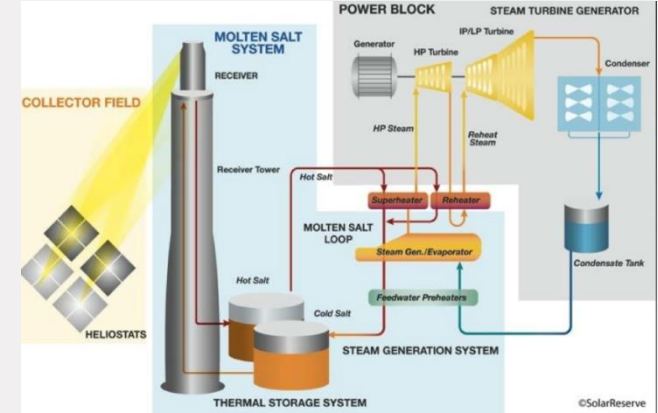
- Brainport region
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Program Overview – specialization

| | | |
|----------|--|---------------------------------------|
| 1st year | • Core program (30 EC) | |
| | • Specialization courses (15 EC) | |
| | • Free electives (incl. homologation, 15 EC) | |
| 2nd year | Internship (15 EC) | Graduation project (45 EC) |

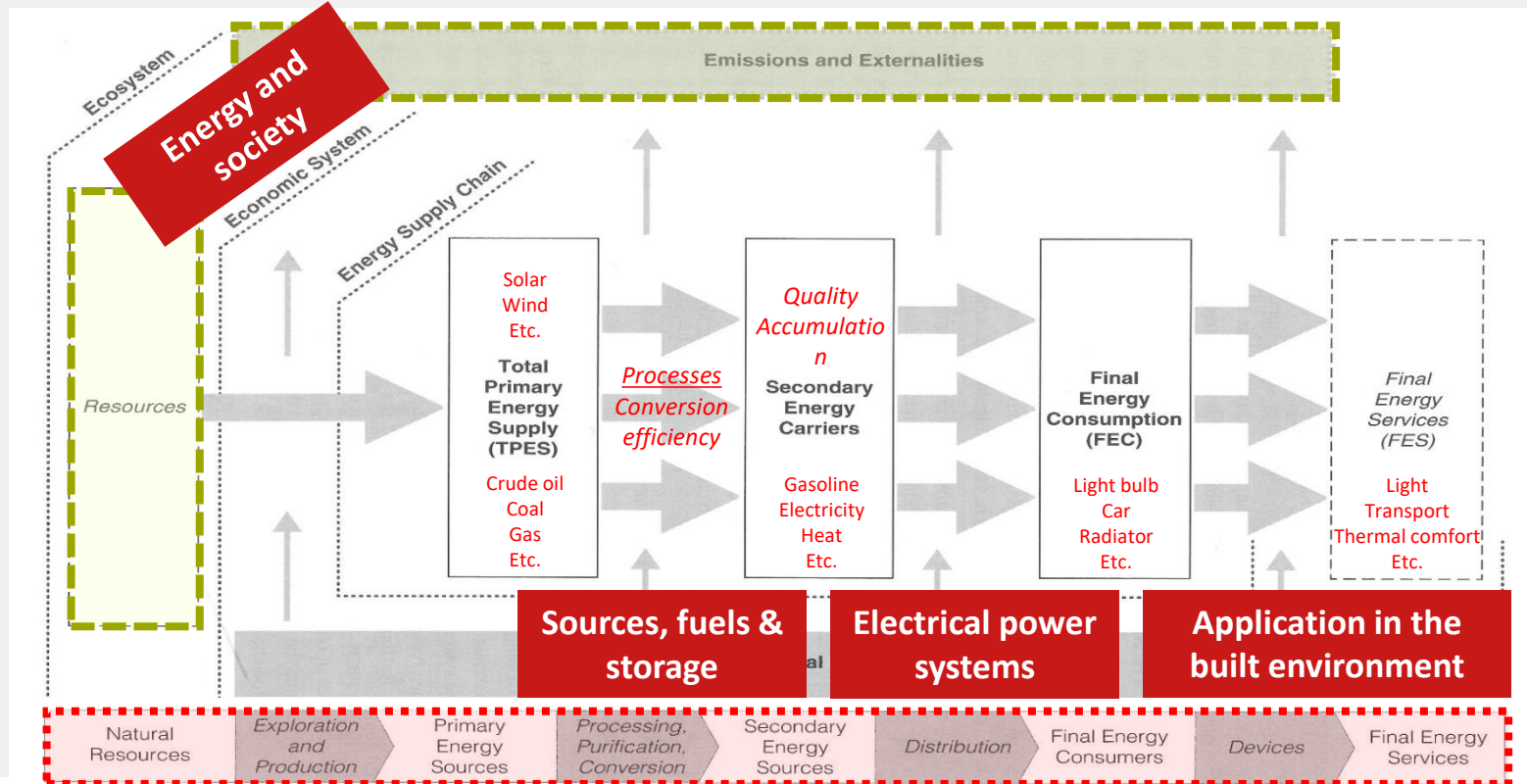
Specialization themes

- Sources, fuels & storage (ME, AP, CEC)
- Electrical power systems (EE)
- Application in built environment (BE, W)
- Energy & society (IE&IS)



Positioning of specialization themes in the energy system

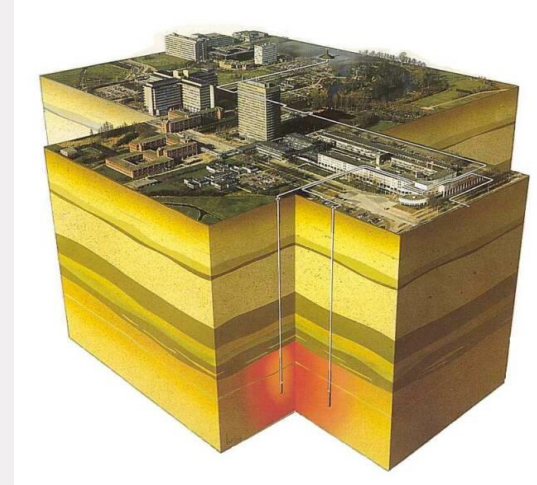
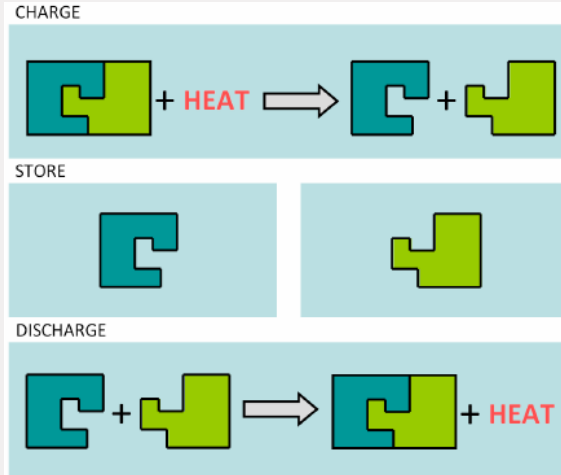
Bradford 'The energy system' fig 1.9; adapted from 'Energy efficiency indicators: Fundamentals on Statistics' (Paris: OECD/IEA, 2014)



Sources, fuels & storage

Mechanical Engineering

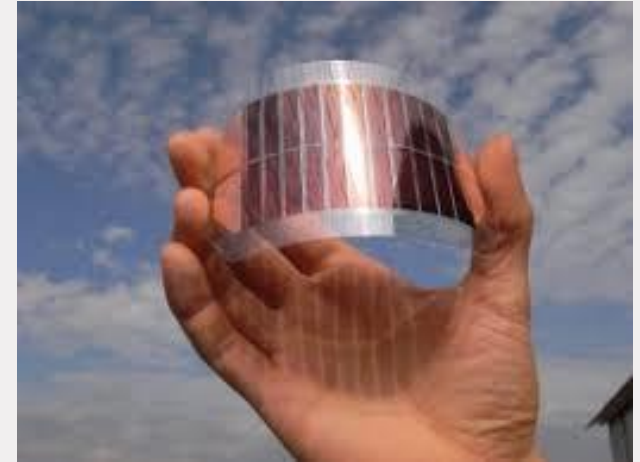
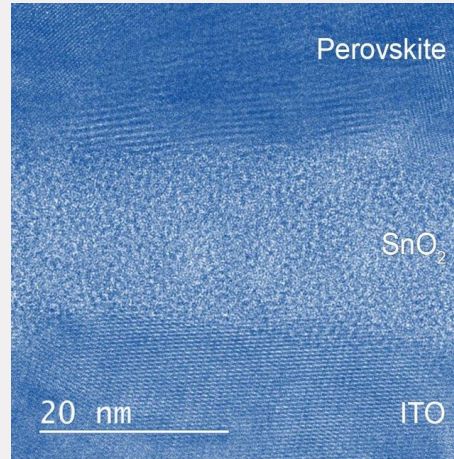
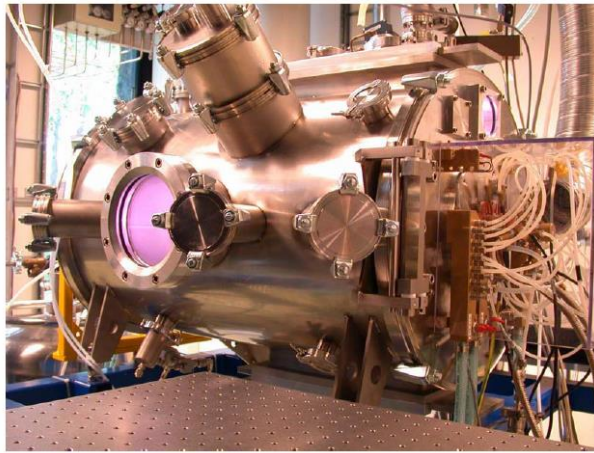
- Thermochemical Heat storage
- Geothermic
- PhotoVoltaic Thermal panels
- Metal fuels



Sources, fuels & storage

Applied Physics and Chemical Engineering & Chemistry

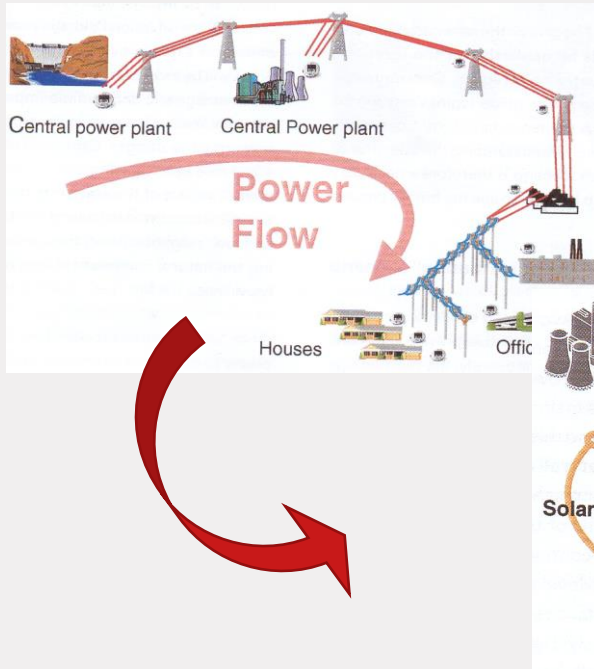
- Crystalline silicon and thin film solar cells
- Polymer solar cells



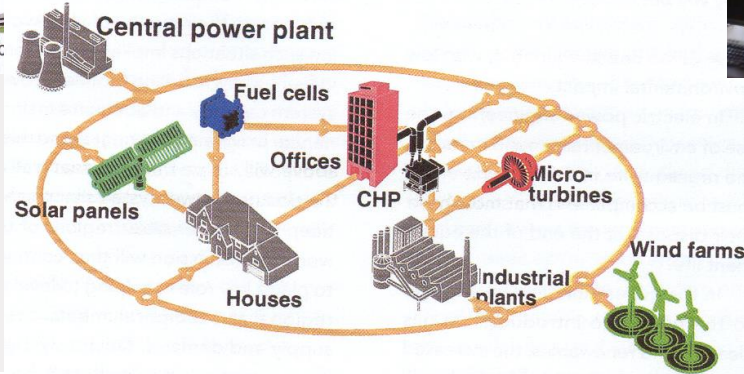
Electrical power systems

Electrical Engineering

vertical power flow



horizontal power flow



The TU/e Power Quality Laboratory



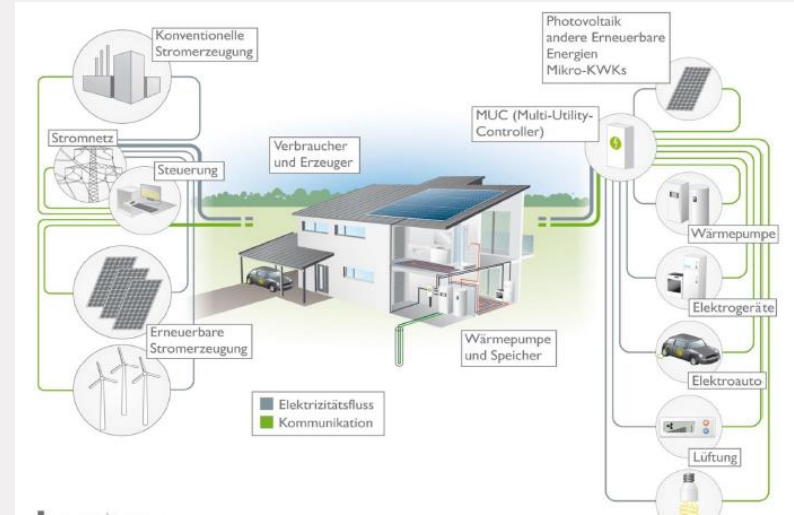
Application in built environment

Mechanical Engineering & Built Environment

- Sustainable energy-positive built environment



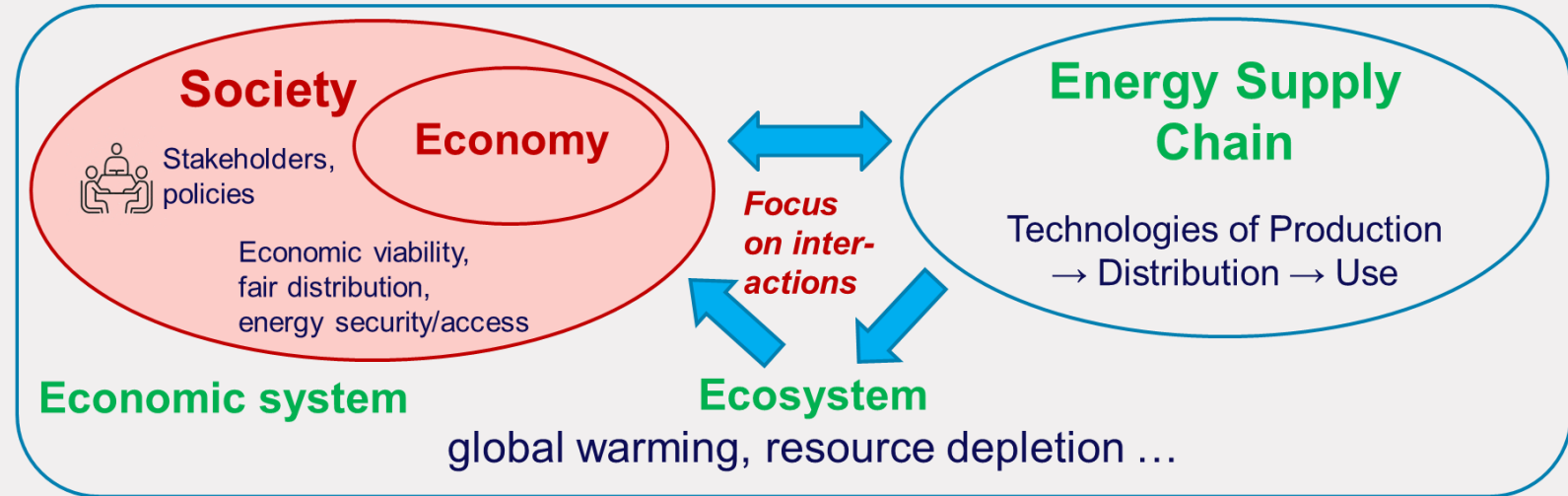
- Climate adaptive building shells



Energy & society

Industrial Engineering and Innovation Sciences

How technology works in the real world: **development**, **application** and **diffusion** of technology.



Specializations SET – sections

| Sources, fuels & storage | Electrical power systems | Application in built environment | Energy & society |
|--|--|--|--|
| Plasma and Materials Processing (AP) | Electrical Energy Systems (EE) | Building Physics and Services Built Environment (BE) | Technology, Innovation & Society (IE&IS) |
| Transport in Permeable Media (AP) | Electro mechanics and Power Electronics (EE) | Energy Technology (ME) | |
| Energy Technology (ME) | | | |
| Power & Flow (ME) | | | |
| Functional Organic Materials and Devices (CEC) | | | |
| Macro-Organic Chemistry (CEC)* | | | |
| Molecular Catalysis (CEC)* | | | |

*Only for students with bachelor's degree Chemical Engineering or comparable

Examples of internship projects

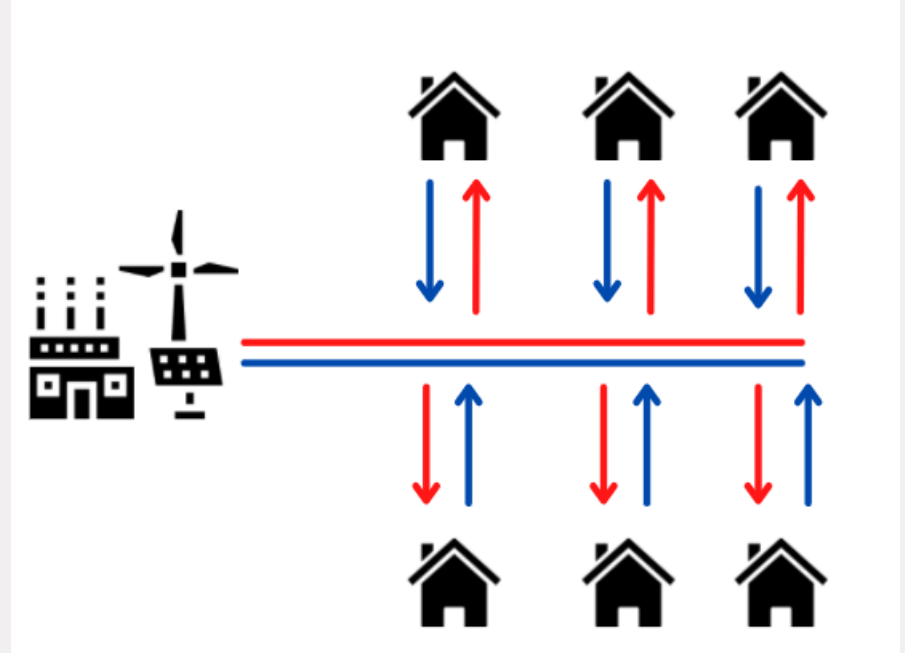
- 'Promoters and inhibitors for the potential of upscaling social enterprises for rural electrification of India' (IE&IS)
- 'Assessment and improvement of scale model household level TCM storage for direct hot water supply'(ME)
- 'Self-adjusting Interleaving of Boost Type DC-DC Converters' (EE)
- 'Aggregated Economic Value to households: A starting point Plan' (IE&IS)
- 'Flame Performance for Different 3-D Burner Deck Models' (ME)
- 'Vapour-Assisted Solution Processing of Methylammonium Lead Triiodide Perovskite Photovoltaic Devices' (CEC)

Examples of graduation projects

- 'Optimal Energy Trading using Reinforcement Learning for an Energy Storage System'
- 'Integrated local energy systems in Dutch residential areas'
- 'Thermal Modelling and experimenting on Solarus Power Collector'
- 'Electric drive system design toward integration of variable flux reluctance machines and transmission systems'
- 'Development and application of a reactive forcefield for Ca-doped MgCl_2 hydrates for thermochemical heat storage'
- 'Atomic layer deposited nickel oxide for perovskite solar cells'
- 'Investigating Energy Saving Potential of Switching Solar Absorbance Coatings on Buildings'

Graduation project – Silvia Nieddu

Performances analysis of the software Modelica in modelling and simulating thermal dynamic behaviour with focus on heat transmission and consumption in a district heating system.

The logo for Modelica, featuring a stylized 'm' with a red dot above the 'i' and the word 'MODELICA' in a sans-serif font.

Coaching

- Mentor program: Full, associate or assistant professor
- Student mentor
- Academic advisor



Exchange program: DTU SE - TU/e SET



<https://www.dtu.dk/english/Education/Incoming-students/Exchange>

Exchange program: DTU SE – TU/e SET

What

- For TU/e-SET students: yr 1 at TU/e, yr 2 at DTU
For DTU-SE students: yr 1 at DTU, yr 2 at TU/e
- 5 students per year, max 2 students per section
- Involved sections:
 - [Energy Technology](#) (Mechanical Engineering)
 - [Electrical Energy Systems](#) (Electrical Engineering)
 - [Power & Flow](#) (Mechanical Engineering)
 - [Plasma & Materials Processing](#) (Applied Physics)



Exchange program: DTU SE - TU/e SET

Why is this an opportunity?

- International experience
- More possibilities to construct an optimal course portfolio making use of courses offered at DTU
- Opportunity to study at two world-leading universities
- Get a supplement in your MSc diploma

Student teams



STUDENT TEAM **Solar Team Eindhoven**

Solar Team Eindhoven is working on the sustainable mobility of the future and will participate in the 2019 World Solar Challenge in Australia with their solar car Stella Era. This family car can also share energy and park itself autonomously in the sun to charge.



STUDENT TEAM **Team Energy**

Team Energy realizes events to accelerate the transition towards sustainable energy. We aim to inform, inspire and connect students.



STUDENT TEAM **SOLID**

Team SOLID is working on a new concept called "metal fuels", in which metals are used to sustainably store energy.



STUDENT TEAM **Core**

They want to use e-waste as raw material in the future by retrieving elements in their and reusing them!



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After graduation:

- PDEng program Smart Buildings and Cities (2 years)
- PhD program (4 years)
- Job in consultancy, government, research or industry



@Bart van Overbeeke Photography

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Pre-Master Sustainable Energy Technology

- Duration: 1 year (30 EC)
- Time of entry: September
- Language: English

Why?

- Can you handle the level?
- Eliminate deficiencies

What?

- Program of 30 EC, to be achieved within one year
- Focus on mathematics (10 EC)



Pre-Master program 2022-2023

| | | | |
|-----------|----------|--|-----|
| quarter 1 | 2DL60 | Linear Algebra | 2.5 |
| | 2WBB0 | Calculus variant 2 | 5 |
| quarter 2 | 2DL40 | Advanced Calculus I | 2.5 |
| | 4PB00ONL | Heat and Flow (online) | 5 |
| | 4EB00 | Thermodynamics | 5 |
| quarter 3 | 4GB10 | Combustion Engine | 5 |
| | 4EC10 | Dynamics of energy systems | 5 |
| | 5APA0 | Power Electronics* | 5 |
| | 7XSUC0 | Design for a Sustainable Future: specializing enterprise | 5 |
| quarter 4 | 7S9X0 | Introduction building performance | 5 |
| | 5XWA0 | Power system analysis and optimization* | 5 |

| | |
|--------------------|-------|
| Compulsory courses | 25 EC |
| Elective course | 5 EC |

| |
|---------------------------------------|
| Additional training (no EC's): |
| RSI-training (mandatory) |
| Arbo en milieu (mandatory) |
| Matlab (strongly recommended) |

* Option for students with a HBO bachelor in EE or comparable.

Difference Bachelor WO & HBO (in general)

University of technology:

- **Developing** new technology and design methods to solve technological problems
- Education focusses on (mathematical and physical) concepts and their implications
- Students do also internal research projects
- All lecturers are involved in scientific research
- **Internship is a research project**

University of applied science:

- **Applying** existing technology and design methods to solve technological problems
- Education focusses on practical applications
- Multiple internships in companies/industry

How to prepare during your bachelor's program?

- A pre-master's program is more work than one might think. You must be willing to work hard.
- It is not advised to do the pre-master in combination with a part-time job in industry.
- Subscription for a pre-master via Studielink before **May 1st**.
- required minimum level of mathematics: pre-university (VWO) mathematics B or [TU/e mathematics B test](#) **completed before September 1st**
- required minimum level of English proficiency: pre-university (VWO) level English or [English language proficiency test](#) **completed before September 1st**

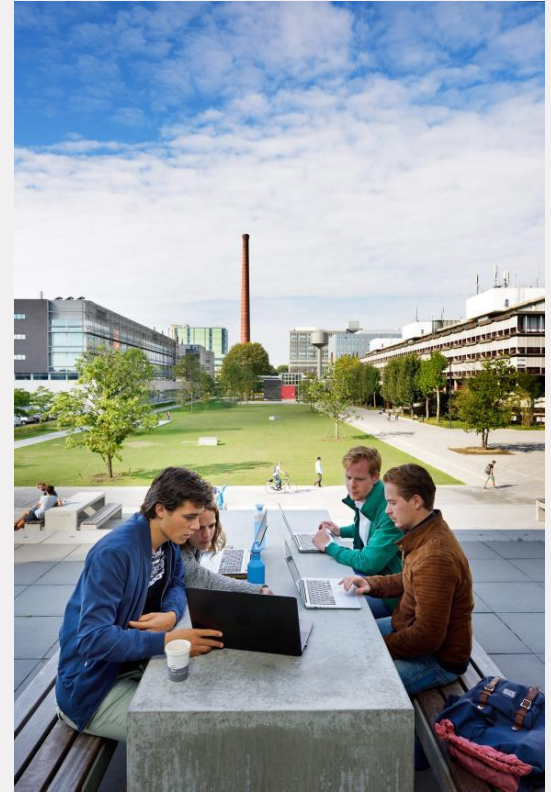
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Admission with a BSc degree in:

- Advanced Technology (pre-mechanical engineering track)
- Aerospace Engineering
- Applied Physics
- Chemical Engineering
- Electrical engineering (Automotive included)
- Marine Technology
- Mechanical engineering
- Molecular Science and Technology



Admission via pre-master's program

Depending on hbo degree:

➤ direct admission:

- Automotive
- Aviation / Aeronautical Engineering
- Chemical Engineering / Technische scheikunde
- Electrical and Electronic Engineering
- Engineering Physics
- Mechanical Engineering
- Mechatronics

➤ Individual admission by admission committee

Tailor-made pre-master's programs for other (university + HBO) diplomas via admission committee Admission.Mech@tue.nl



APPLICATION MASTER PROGRAMS

For Dutch students:

- More information about admission: www.tue.nl/admission
- Application via <http://www.studielink.nl/>
- Questions: studereren@tue.nl

For international students:

- Check the requirements for admission via www.tue.nl/admission
- Apply at the online [application form](#) (available from 1 Oct – 1 May)
- Application fee of €100 for each application (non refundable)
- Application procedure takes +/- 8 weeks
- You will be informed by email about the outcome of your application
- Questions: io@tue.nl



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- **MSc program Select**



MSc SELECT

Environmental Pathways for
Sustainable Energy Systems

Study two years in two different
countries

Energy Technology with strong focus
on innovation & entrepreneurship

KIC InnoEnergy Masterschool, information:
<http://www.kicinnoenergy.com/education/master-school/>



**Real-world
energy challenges.
Collaborative solutions.
A sustainable tomorrow**



Sigvard Eklund
Award

2016

European
Youth award

2015

Forbes
30 under 30

2016

HULT Global
Challenge

2012

MIT Co Lab
Awards

2016



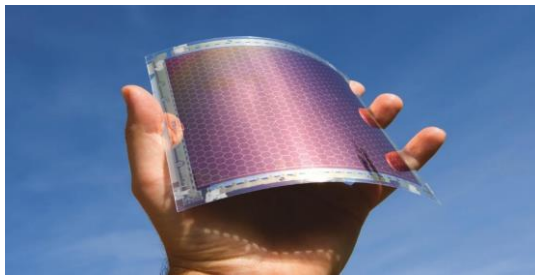


MSc SELECT

Environomical Pathways for Sustainable Energy Systems

Second year specializations

- Polygeneration (KTH)
- Offshore energy systems (IST)
- Solar Systems (UPC)
- Innovation in Energy systems (TU/e)
- Sustainable Fuels Economy (AGH)
- Solar systems (UPC)



More information & Questions

Information:

- TU/e-website: <https://www.tue.nl/en/education/studying-at-tue>
- Master SET: <https://www.tue.nl/en/education/graduate-school> (info on Master's program, curriculum, interviews with students and alumni)

Questions:

- Content program: me.studyinformation@tue.nl