Energy Business and Innovation

—

2022

Introduction

19.4.2022

Aalto University
School of Business

Overview of the session

- Course practicalities
- Key concepts and introduction into the course
- Group work topic introduction and group discussions

Practicalities

Course teachers

Samuli Patala

- **Assistant Professor, Organization and Management**
- **https://people.aalto.fi/samuli.patala**
- **Samuli.patala@aalto.fi**

Heli Nissilä

- **Postdoctoral Researcher, Organization and Management**
- **https://people.aalto.fi/heli.nissila**
- **Heli.nissila@aalto.fi**

Introduction – Samuli Patala

- **Focus: Sustainable Business**
- **Speciality areas: energy transition, circular economy management, collaboration for sustainability, sustainable business models**
- **Experience from many collaborative research projects involving companies and other stakeholders (e.g. Smart Energy Transitions 2015-2021, NeoCarbon Energy 2014-2017). Currently working with a large project focused on circular economy development in the textile sector. Prior work experience from energy and manufacturing technology industries**
- **Teaching sustainability-focused courses at the Department of Management Studies and Aalto Executive Education**

Introduction – Heli Nissilä

- **Post-doctoral researcher at the Department of Management Studies**
- **Sustainability in Business:**
  - How do new sustainability-driven markets and industries emerge? How can actors and communities create new markets and industries through collective action?
- **PhD from the Department of Industrial Engineering and Management (Aalto School of Science):**
  - Industry emergence in solar energy in the North
  - Sustainability transitions – niche creation for renewable energy
- **Ongoing research project in impact investing in the Nordics:**
  - Exploring category emergence and valuation practices of impact investors (https://aaltoimpactinvesting.com/)

Course format

The course is mostly online, with the exception of two in-class sessions – 26.04 and 05.05

The lectures will be mostly held synchronously during the Zoom sessions, with ample room class discussions

- **Some short pre-class videos might be included for some sessions**

Main pre-class preparation are the course readings listed in the syllabus

Tools used during the course

MyCourses – Syllabus, readings, lecture materials, pre-class materials, assignment descriptions and submissions, quizzes

Zoom – Syncronous sessions

Flinga – online whiteboard for in-class discussions

Zoom-etiquette

Make sure your display name is your actual name

Full group sessions

- Cameras on when possible
- Microphone muted
- Use chat for questions

Small group breakouts

- Cameras on
- Let everyone talk…be mindful of not ‘hogging’ the time

Session will be recorded for future viewing

Individual assignments

Personal assignment 1 is due: 10.5.2022 23:59 (Letter to editor, 1 page)

Personal assignment 2 is held 12.05.2022 13:15-14:15 (Literature quiz 1)

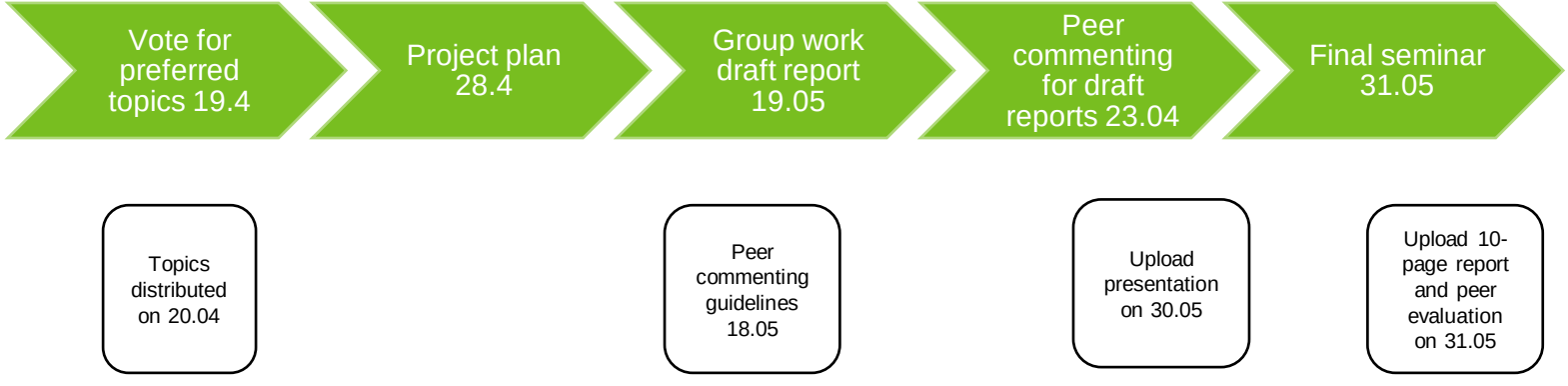
Personal assignment 3 is due: 12.5.2022 23:59 (Consumption, 1 page)

Personal assignment 4 is due: 17.5.2022 23:59 (Business models, 1 page canvas)

Personal assignment 5 is due 3.6.2022 13:00-14:00 (Literature quiz 2)

Group assignment

The most important assignment during the course is the group work, which involves a client organization



Grading

Group work final report and presentation and peer evaluation (Max 50 points, compulsory)

Group assessment. max 40

Individual evaluation based on peer feedback from group members, max 10 points

Personal assignments 4 pcs (Max 50 points, compulsory)

3 x writing assignment, max 30 points

2 x literature quiz assignment, max 20 points

Background of the course

Extensive social energy research in BIZ and ARTZ during last decade

- Large research consortiums, high number of publications, huge range of topics (energy consumption, user innovation, innovation intermediaries, energy communities,

Energy transition, industry renewal, is systemic and requires multidisciplinary approach

Aalto offering was: technology, markets/economics, less about innovation, systemic change / transitions

Program

Date	Topic	Notes and readings
Tue 19.04 13.15-16.00	Intro + Practicalities Short introductions on group assignments Grouping + topic voting	
Thu 21.04 13.15-16.00	Meeting the clients day	Meetings with the client organizations for the course group work
Tue 26.04 13.15-16.00	Sustainability transition approaches	Live session in-class! (Flipped classroom) Readings #1 and #2 due
Thu 28.04 13.15-16.00	Energy's role in society Guest: Ines Peixoto Guest: Tapio Tuomi	Reading #3 due
Tue 03.05 13.15-16.00	Incumbents in energy transitions	Readings #4 and #5 due
Thu 05.05 13.15-16.00	Climate & Energy Negotiation Game (or other simulation)	Live session in-class! (Simulation) Reading #6 due
Tue 10.05 13.15-16.00	Public policy and energy transitions Guest: Paula Kivimaa	Readings #7 and #8 due Personal Assignment #1 due

Program

Thu 12.05 13.15-16.00	Quiz 1 (Readings #1-#6) 13:15-14:15 Citizen's energy literacy enabling and challenging energy business Guest: Sini Numminen (15-16)	Personal Assignment #2 (Quiz 1) is on Mycourses at 13:15-14:15
Tue 17.05 13.15-16.00	Business models	Reading #9 due Personal Assignment #3
Thu 19.05 13.15-16.00	Perspectives on energy investing and finance Guest: Aleksi Lumijärvi	Reading #10 due
Tue 24.05 13.15-16.00	Myths of innovation – what we can learn from innovation Guest: Janne M Korhonen	Readings #11 and #12 due Personal Assignment #4 due
Tue 31.05 13.15-16.00	Final Presentations	Final presentations of the group assignments
Fri 03.06 13:15-14:15	2nd literature quiz	Personal Assignment #5 (2nd quiz) is on Mycourses at 13:15-14:15

Discussion

Why are you taking this course?

What specific areas of energy business and innovation are you interested to learn more about?

(Breakout rooms / Flinga)

Flinga code:
F5FPG73

Course concepts and introduction

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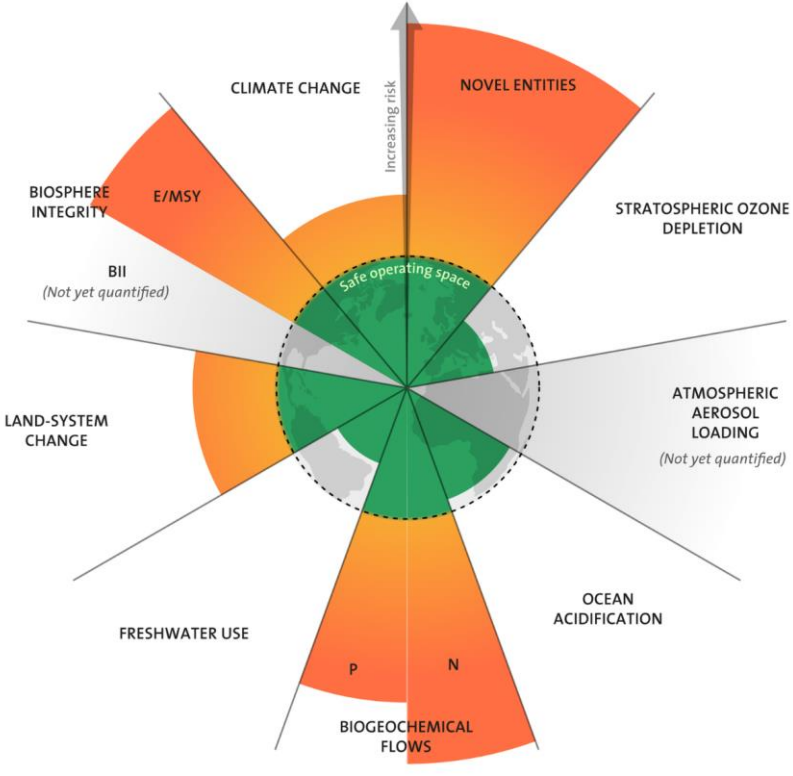
'Utilities are not innovators. This is the most distant thing from Silicon Valley probably you can think of in terms of speed of change.'

—Alberto Gandolfi, Head of European Utilities Research Team, Goldman Sachs

(Europe's Energy Evolution podcast, Oct 1, 2018)

Planetary boundaries



Rockström et al., 2009;
Perrsson et al. 2022

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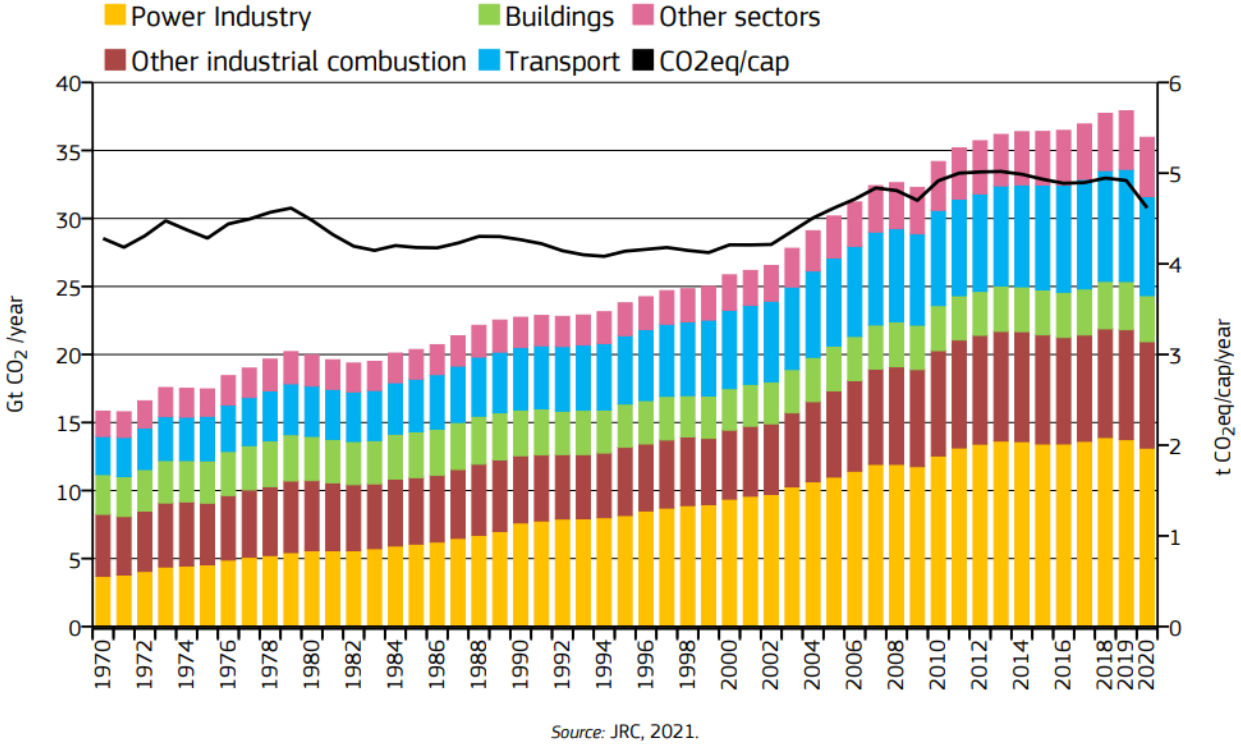
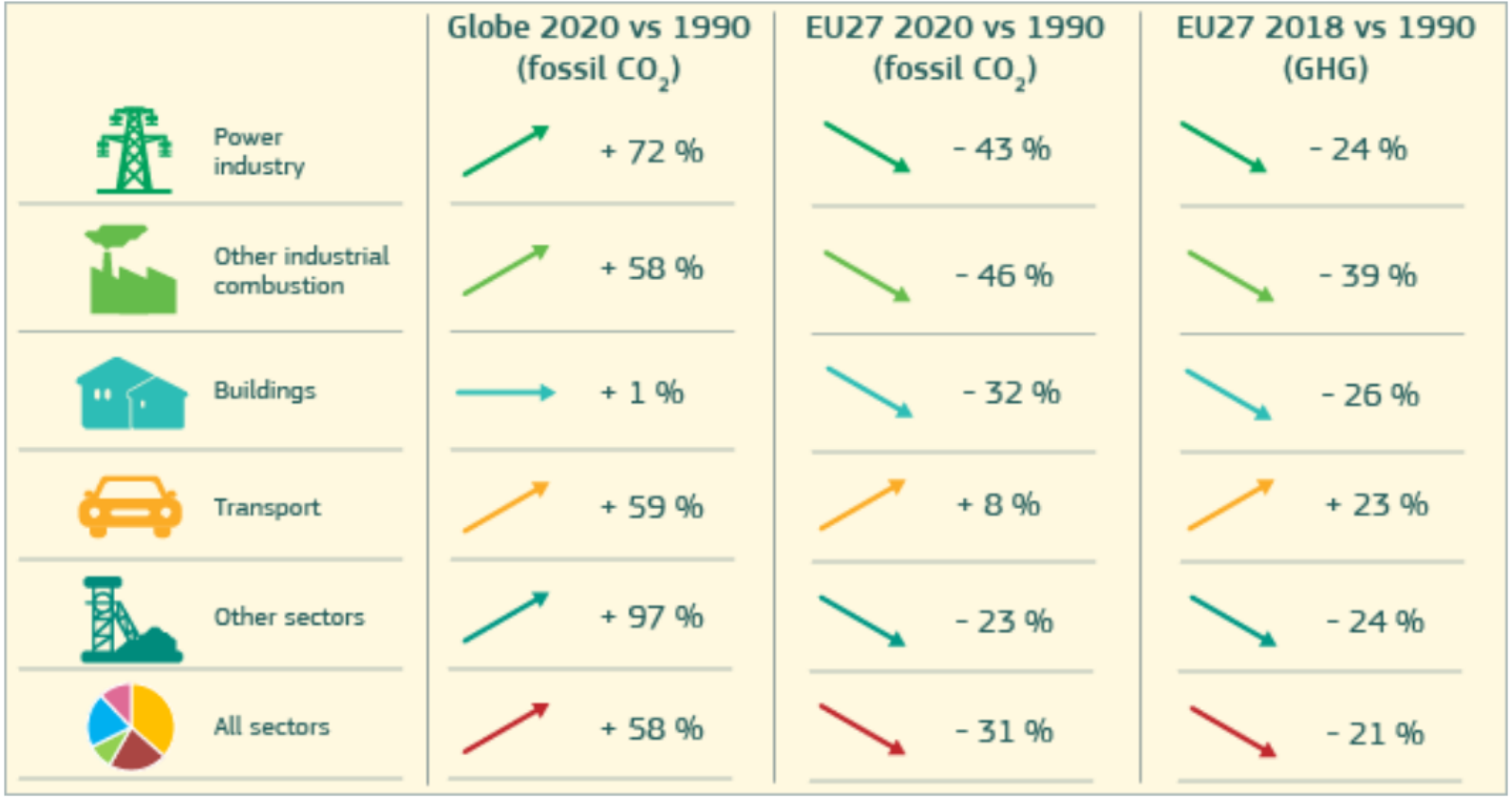
CO2 emissions



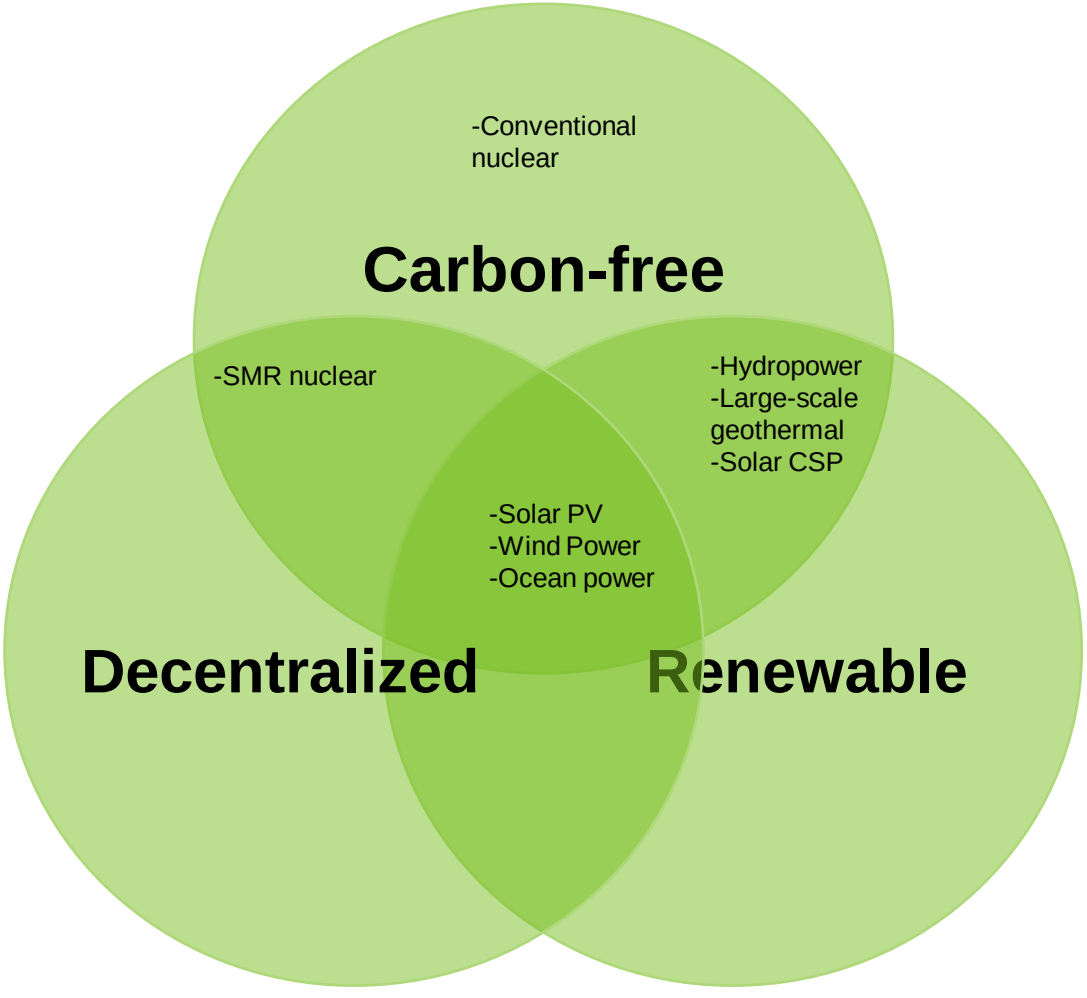
Source: JRC, 2021.

CO2 emissions



A?

Decarbonizing the energy system



Renewable energy trends

FIGURE 8.
Shares of Net Annual Additions in Power Generating Capacity, 2010-2020

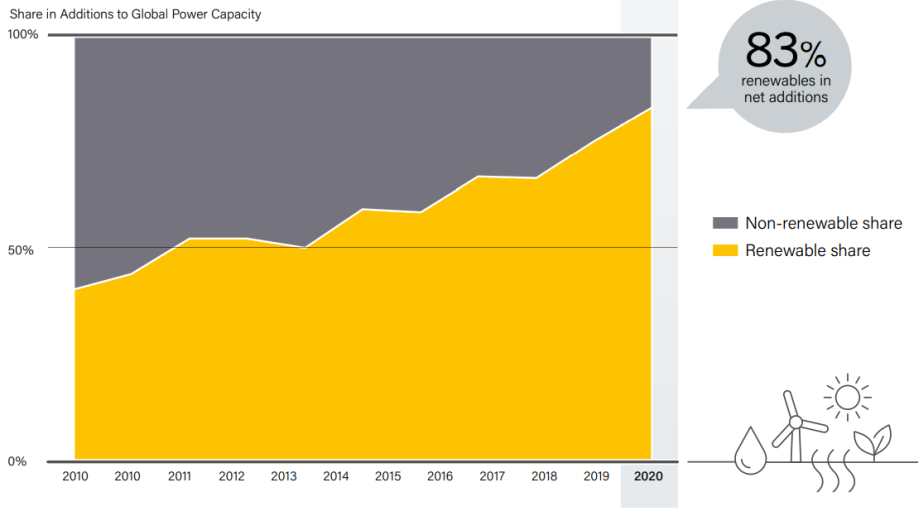
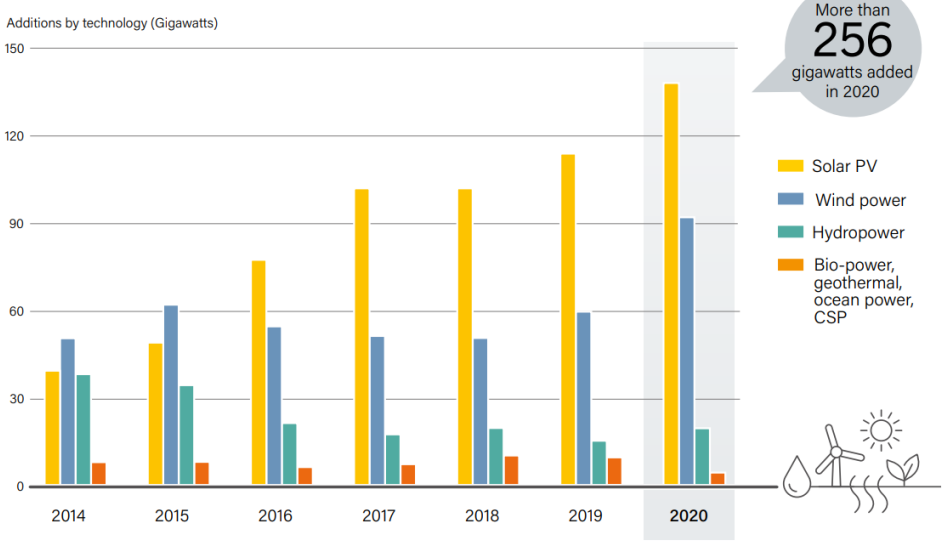


FIGURE 7.
Annual Additions of Renewable Power Capacity, by Technology and Total, 2014-2020



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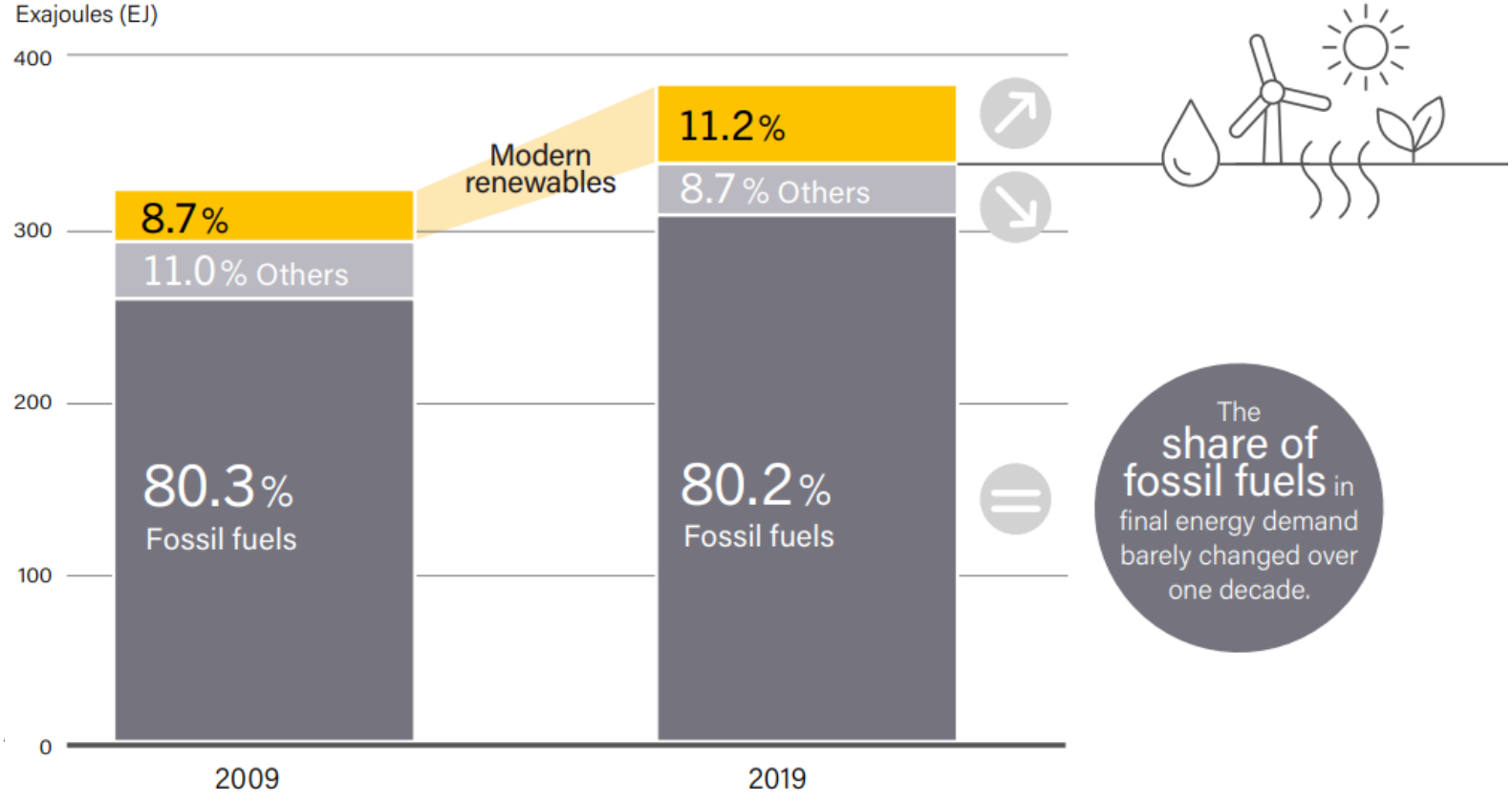
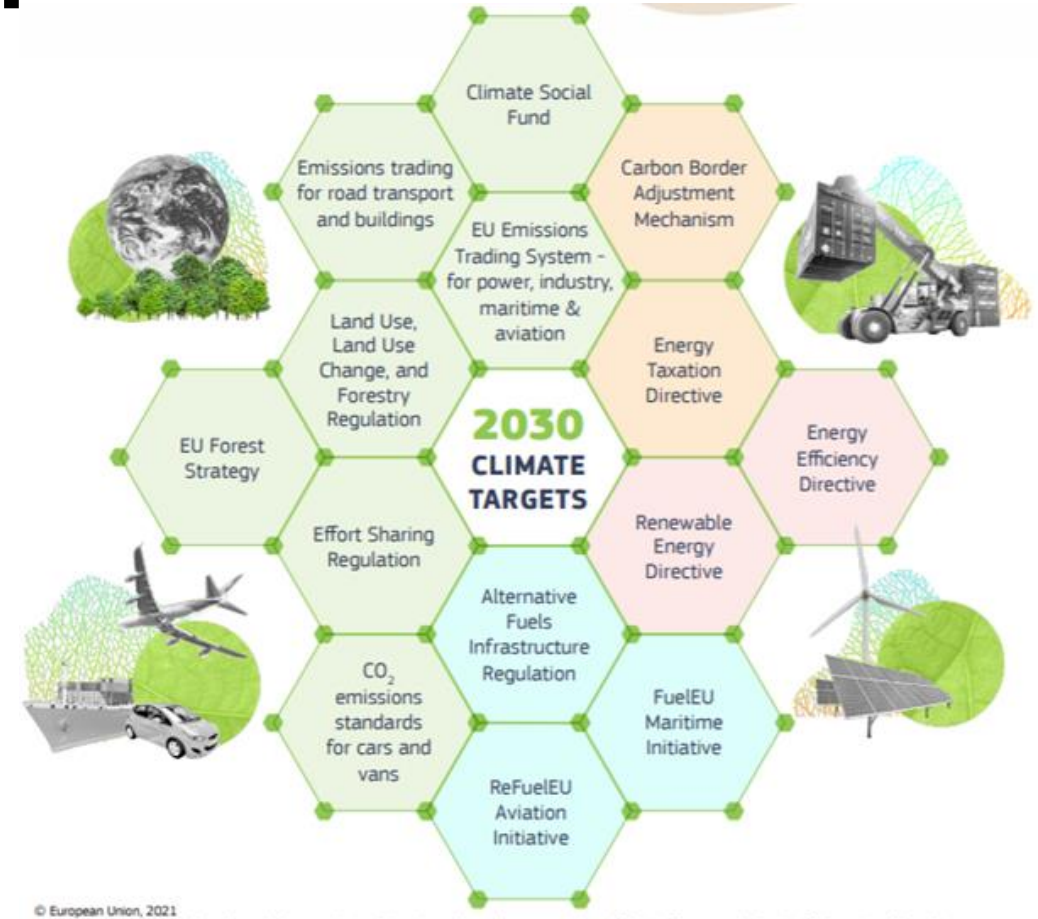
Source- REN21: Renewables Global Status Report 2021

Renewable energy trends

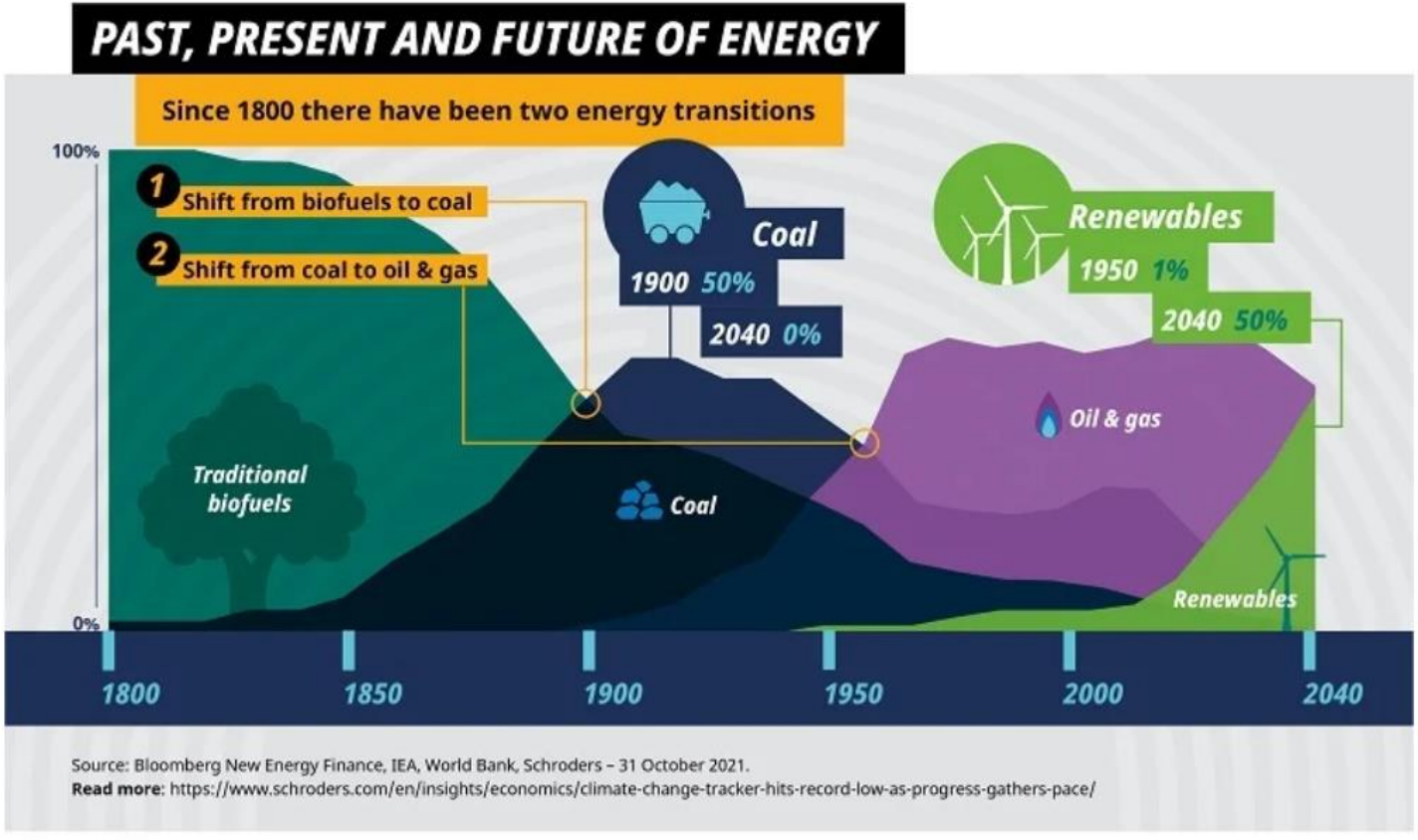
FIGURE 2.
Estimated Renewable Share of Total Final Energy Consumption, 2009 and 2019



Role of policies



Energy transitions

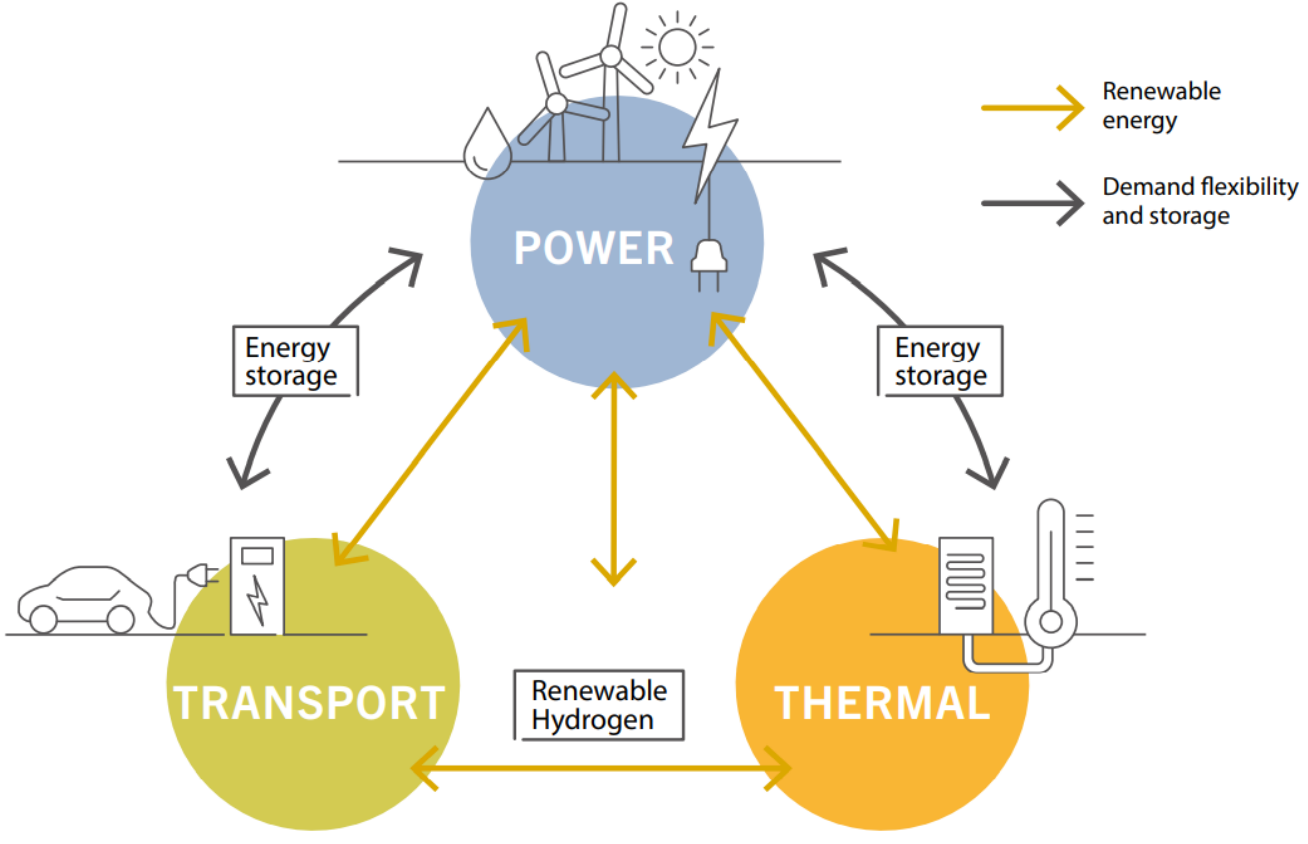


Renewables and the energy system

- **A growing share of intermittent renewables in the energy system requires key enabling technologies to balance supply and demand. These include:**
  - Energy storage technologies
  - New grid technologies
  - Electric vehicles
  - Heat pumps
- **Also new services, e.g. demand flexibility, monitoring**

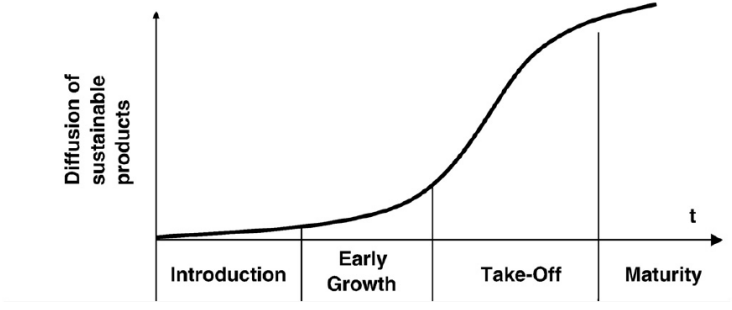
Many of the new business opportunities of the energy transition are in these areas

Renewables and the energy system



Innovation

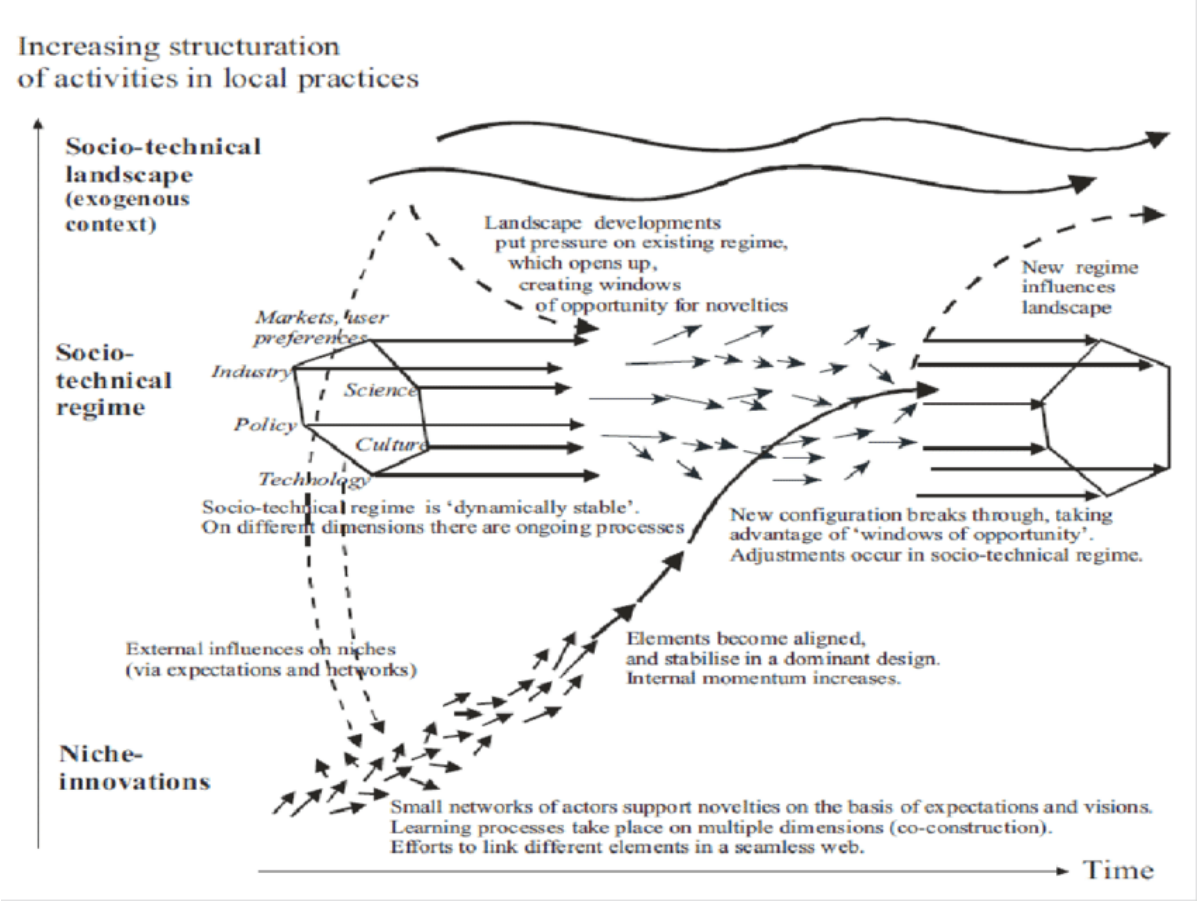
(Schumpeter, 1939)



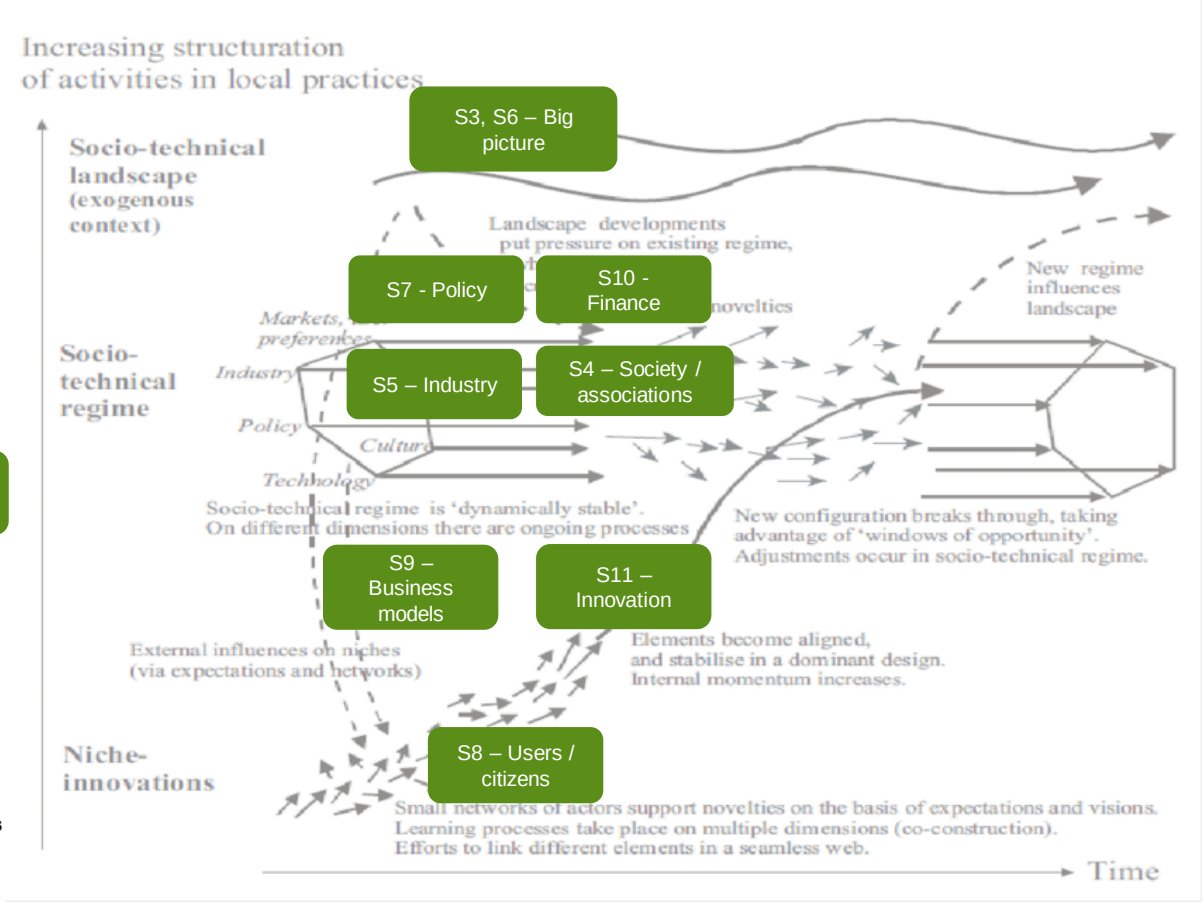
- **Nature of innovation**
  - Sustainaining vs. disruptive
  - Radical vs. incremental

  (Christensen, 1997)
- **Types of innovation**
  - Products
  - Services
  - Business models
- **Innovation often involves many stakeholders!**

Sustainability transitions (MLP framework)



Roadmap of the course



S3, S6 – Big picture

S7 - Policy

S10 - Finance

S5 – Industry

S4 – Society / associations

S2, S12 – Group projects

S9 – Business models

S11 – Innovation

S8 – Users / citizens

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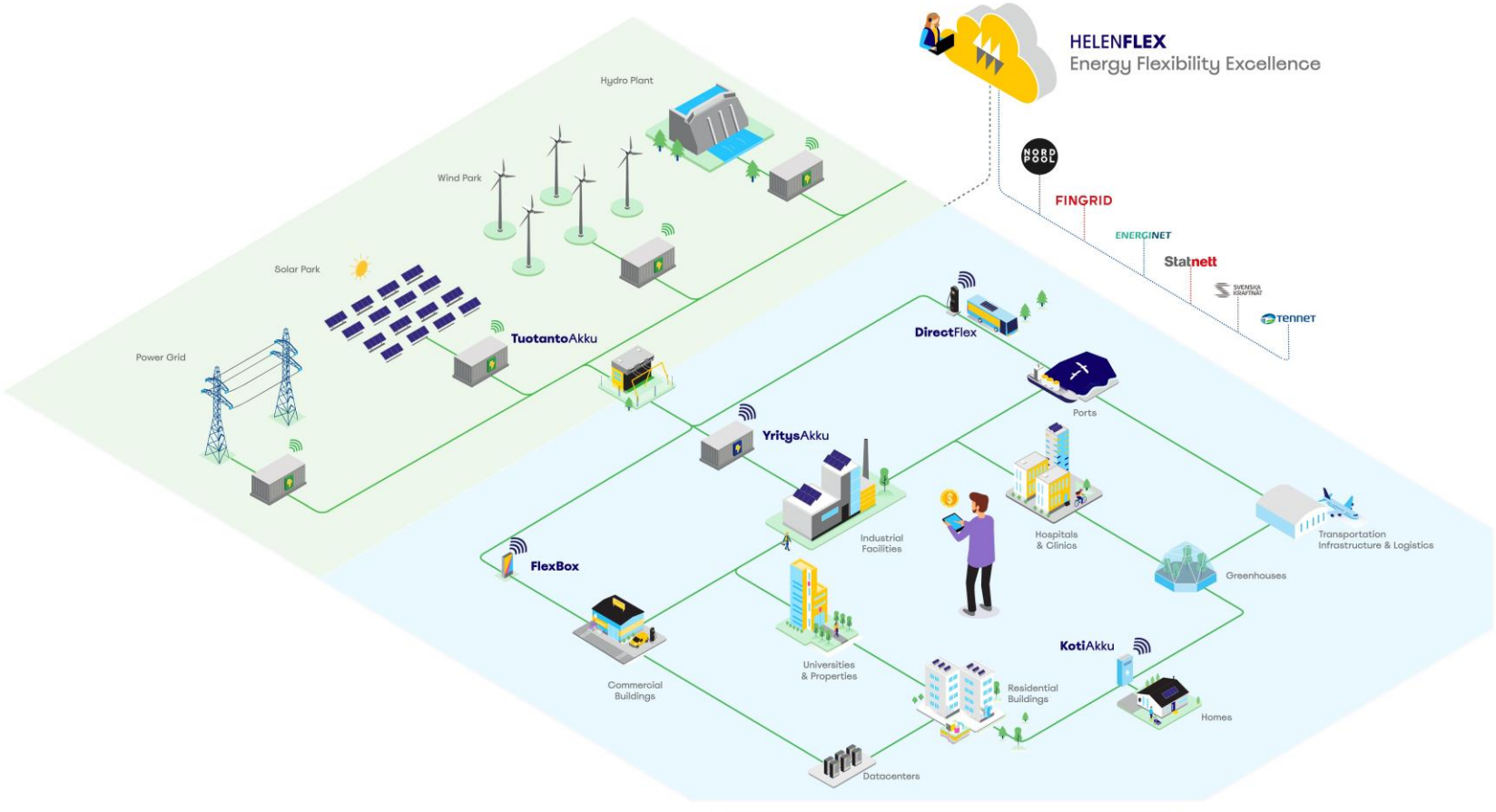
Break (~10 min)

Group work topic introductions

SUPPLY AND DEMAND SIDE FLEXIBILITY



Solution-market fit

Helen is strengthening Energy Storages & Flexibility business with a digital, highly scalable HelenFlex solution.

HelenFlex will combine Helen's 100 years of experience with data and the latest energy storage, IoT and AI technologies.

HelenFlex development and maintenance is a large investment; therefore, Helen's management seeks additional revenue streams to back up the business case.

TEAM X

Management considers HelenFlex internationalisation to Swedish, Norwegian and Estonian markets as a viable opportunity for growth.

Your team will first need to analyse and compare these countries to the Finnish reserve market. Parameters for comparison should at least include:

- Ancillary services (e.g. FCR, FRR)
- Average prices €/MW, and
- Technical requirements

After that, prepare a GTM proposal for one selected market. The proposal should at least include:

- Market evaluation
- Companies (direct HelenFlex competitors) providing demand-side flexibility services and their business logic
- Requirements for business operations in selected country/market

TEAM Q

Large-scale Energy storage is one of the core products of the HelenFlex portfolio. It offers customers more safety, cost savings, and additional revenue from Fingrid reserve markets.

Energy storage remains to be an expensive asset; for example, the price of 1WM storage varies between 500k€-1M€). This challenge makes the customer consider different financial (off-balance sheet) instruments, such as "leasing" and "as a service" (i.e. OPEX models).

Helen management is interested in a partnership with reliable market leaders who specialise in energy storage financing. Your Team will need to explore the Finnish market and identify 3-5 companies that offer financial instruments for energy storage. Regarding the potential companies, please describe and include in your analysis:

- Investors excpectation in return of the investment, what are the KPIs for the investor
- What other type of investments they have in their portfolio
- How much money they aim to invest for example during nrxt 5-10 years for battery energy storage

Motiva Oy

We are a sustainable development company for the government that encourages efficient and sustainable use of energy and materials.

We provide public administration, businesses, municipalities and consumers with information, solutions and services to make resource-efficient, effective and sustainable choices.

We combine the opportunities of multidisciplinary know-how and digitalisation to enable sustainable change.

Motiva

Energy Business and Innovation - master's course: Motiva's business project

Research problem

- Residential apartment buildings develop and maintain a property repair plan (PTS, pitkäntähtäimen suunnitelma)
  - No similar model is available for single-family homes or semi-detached houses even though careful maintenance of a small house, as well as the planning of repair operations, help maintain the condition and value of the property, improve housing comfort and increase energy efficiency
- The willingness of smallhouse owners to invest in energy renovations is low
  - It would be essential that any future potential for reducing energy consumption and transitioning to renewable energy should be exploited when repairs are made
- Repairs and energy efficiency investments in small houses are carried out mainly as compulsory repairs of broken equipment and structures
- In the context of the 'compulsory' renovations, the opportunity to improve energy efficiency in a cost-effective way is ignored.
  - With lack of planning, there is a risk of undesirable or even incorrect order for the whole.

Motiva

Energy Business and Innovation - master's course: Motiva's business project

Choice of perspective and solutions:

It is possible to consider the problem, for example:

- from the perspective of the owner and user of the property
- from the point of view of the advisory, planning and contractor services on the market

Research questions could include:

- By what means and arguments can owners of small houses be motivated voluntarily for systematic planning of property maintenance? What obstacles do owners/residents experience?
- What kind of information or material do owners/residents need on the topic?
- What actions do owners/residents know how to and want to take on their own?
- What actions do they buy as services?
- What kind of professionals and experts do they use for home maintenance and renovation?
- What kind of services owners/residents would like to use in maintenance and renovation? Are such services available easily?
- Cost perspective: price tag for small house owner/resident's own annual maintenance work – and what is liquidity if all or part of the annual maintenance work is purchased as a service?

Motiva

Energy Business and Innovation

2022-04-08
Tomi Mäkiaho

ROTOTEC

CLEVER GEOENERGY PIONEER

Geoenergy Investments in Macro Economy

Problem	Geoenergy aka Ground Source Heat Pump based heating and cooling systems are being widely installed in Fennoscandian countries. Most of the investments are made for systems serving a single building or a building complex. What is the macro economical impact of such investments?		
Key Questions	**Who are stakeholders benefiting from investments?** E.g. the public sector, companies, citizens	**What is macro economical impact of investments?** How to calculate financial value of green energy e.g. carbon neutral commitments and lower carbon emissions? What kind of effect a geoenergy system has on property value? In what degree do the investments support domestic labour?	**What would be macro economically viable level of subsidies?** Eu and therefore Finland has set emission reduction targets. Actions to move towards carbon neutrality costs money. What is the ”return of investment” for government subsidy money used for geoenergy investment?
Outcome	Description of geoenergy investment’s value chain and other stakeholders’ roles	Tables, formulas and/or charts to describe country level impact of investments	Considerations of the most beneficial subsidy level for geoenergy investments

1. Commercial surplus solar energy

Very often with commercial properties the size of the roof/plot would allow for much larger solar PV installations to be made, but the electricity demand curve of the site and solar power generation profile does not allow for bigger systems to be economical, since a lot of surplus would be generated, thus degrading the return on investment for the power plant.

Many companies are interested to find new ways to lower their carbon footprint and create value from larger and smarter implementation of solar electricity into their business.

SOLNET

What to do with it?

Sell it to the grid

Virtual battery service – power is generated and consumed in different locations under same owner

Portfolio level utilization of generated power

SOLNET

Study outcomes

Case study for an example company with a wide-ranging property portfolio – where can they generate & consume, what's the scale, how much of their demand can they fulfill, business case?

Market analysis of virtual battery services (Finland and/or EU-level) that electricity companies offer – differences, best practises?

SOLNET

2. Solar for apartment buildings

A recent legislation change in Finland now enables solar power produced on the roof of an apartment building to be used by the residents in their apartments, whereas before it was only possible to use that power for the building utilities (elevators, HVAC etc.)

The housing association (or "energy community") can now decide to invest into a solar PV system and the generated power is distributed to the residents based on ie. the size of their apartment

SOLNET

How to do it?

How to make it work? How to distribute the power/benefit fairly to the residents? Impact of legislation?

Who benefits and how? Utility companies, construction companies, property owners, residents, renters – profitability? What are the KPI:s to measure the business case?

Study outcomes

Case studies:

1. New building - business case for each stakeholder (e.g. construction company, owner, tenant)
2. Existing building – business case for the housing association

Market analysis – current status and business opportunities to increase on-site solar electricity for apartment buildings

SOLNET

Aalto-university course Energy Innovation and business: Finnish Clean Energy Association's projects

Tapio Tuomi, Executive Director

Project 1: Taking environmental changes into consideration in political lobbying for the energy transition – a security policy perspective 1/2

- The Finnish Clean Energy Associaton seeks to influence the parliamentary elections in 2023 in the following ways:
  - Maintaining the goal of “Finland becoming carbon neutral by 2023” irrespective of the composition of the future government
  - Ensuring that the government program includes credible measures for achieving this goal, including measures for increasing the amount of renewable energy, increasing energy efficiency, promoting alternative low- carbon transportation, and legitimating the energy transition and ensuring its justness and evenhandedness.
- The project develops a communication strategy/campaign for “selling” the energy transition to decision-makers in a way that it gets acknowledged in the elections. A focus is on how to take environmental changes, in particular security policy aspects related to the Russion invasion in the Ukraine, into consideration when promoting the energy transition, i.e. how to adjust lobbying to stakeholder expectations and raise arguments, view points and macro-cultural changes that resonate in policy audiences.

Project 1: Taking environmental changes into consideration in political lobbying for the energy transition – a security policy perspective 2/2

- Key questions include:
  - How does the Russian invasion in the Ukraine influence energy security and energy policy in Finland? What are the risks of Finland being dependent on imported fuel sources?
  - How can the Finnish Clean Energy Assocation take security policy perspectives into consideration when communicating about the importance of the energy transition to decision-makers? What are the related key arguments?
  - How do security policy view points and arguments relate to other traditional view points and arguments that are frequently used when promoting the energy transition, including industry, environmental and social policy perspectives?
  - How and through what kind of channels can the Clean Energy Association promote this message?

Project 2: Crafting value to the members of the Finnish Clean Energy Association & constructing the local ecosystem around distributed renewable energy 1/2

- The goal is map out ways by which the Finnish Clean Energy Association could better respond to its members expectations and needs and better serve them and to develop ideas for attracting new members and further developing the local ecosystem around distributed renewable energy.

Project 2: Crafting value to the members of the Finnish Clean Energy Association & constructing the local ecosystem around distributed renewable energy 2/2

- Questions to be answered include:
  - What kind of expectations and needs do current members have with respect to the Clean Energy Association?
  - How can the Clean Energy Assocation better serve its members‘ needs?
  - What can be done to attract new members?
  - How can the Clean Energy Assocation further develop and tighten the networks among renewable energy actors and organizations and enhance collaboration among them? What kind of wishes do different organizations have in terms of building the ecosystem?
  - What are the strengths and weaknesses of the current ecosystem/community in distributed renewable energy in Finland?

Aalto - Agri-PV and the energy transition

Agri-PV solutions take advantages of synergies between food and solar energy production

- Market analysis of the agri-pv market
  - Where are the key markets located?
  - Are there alternative technologies / products involved?
  - What type of key actors/stakeholders are typically involved? (e.g. large/small companies, farmers, public sector)
  - Growth prospects: what is the market outlook and potential for the near future
  - Analysis of potential conflicts between farmers, citizens or companies that emerge with Agri-PV
- Case examples
  - The assignment should preferably have detailed analysis of one or more successful/prominent agri-pv projects

Aalto - Europe's energy transition

The energy transition in Europe is in flux due to Ukrainian war and the need to replace energy/fuels imported from Russia.

Broad view: what are the major impacts of this development on Europe?

- Key policy developments
- Which countries are most effected?

Market development: how will this effect market trends regarding renewable energy?

- Which technologies/solutions are most effected?
- What are the potential sustainability impacts (long-term/short-term)?

What to do to shield against the effects of such threats - best strategies for increasing energy independence? Can be a case study of a specific country, e.g. Finland

Summary of topics

1. Helen – Helen Flex Internationalization
2. Helen – Energy Storage Financing
3. Motiva – Energy renovations in single-family housing
4. Rototec – Macro-economic impacts of geoenergy
5. Solnet – Commercial surplus solar energy
6. Solnet – Solar for apartment buildings
7. Clean Energy Assoc. – environmental changes and political landscape
8. Clean Energy Assoc. – value creation for assoc. members
9. Aalto – Agri-pv markets
10. Aalto – Europe’s energy transition

Group discussions

Groups

GROUP 1	
Ollila	Iisa Helena
Niemelä	Jannika Miiu Marita
Vuori	Antti Artturi
Hietanen	Rasmus Joonatan
Mies	Pascal Niklas
Laukkanen	Iina
GROUP 2	
Heinonen	Heta Helmi Lyydia
Saukkonen	Ellen Elina
Mattheiszen	Matias Otto
Ruiz Reyes	Aran
Flores Cáceres	Tamara Paz
GROUP 3	
Autio	Eero Ilmari
Willberg	Iida Maria
Björkstam	Cecil Maximilian
Rojo	Sami Jaakko Petteri
Liimatainen	Sami Petteri
GROUP 4	
Dey	Kaustav
Först	Maria Karoliina
Khalid	Faiz
Raulo	Rita Tuula Inkeri
ÇAĞATAY	Ege

GROUP 5	
Jantunen	Mikko Joonatan
Schoierer	Lukas
Tanny	Nusrat Islam
Karhi	Heli Annika
Liu	Weiming
GROUP 6	
Lam	Lydia
Kortetmäki	Inka Reetta Maria
Kabir	Afrida Nahiyan
Laukkanen	Kiia Katariina
Zarei	Niloufar
GROUP 7	
Laiho	Laura Oona Annukka
Paaso	Sakarias Lauri Olavi
Toivonen	Jenni Johanna
Korolyuk	Anna
Saari	Sampo Elias

GROUP 8	
Peysson	Noah
Salonen	Sami Aleksi
Benko	Mykola
Halonen	Laura Marleena
Suutala	Miika Johannes
GROUP 9	
Uusitalo	Daniel Jussi Petteri
Kukkonen	Joona Mikael
Nyyssönen	Alisa
Kovalainen	Jenni Pauliina
Kontto	Eemeli Sakari
Nygård	Minttu Marikki
GROUP 10	
Tallavaara	Essi Julia
Turpeinen	Atte Juhani Olavi
Tammikivi	Jonna Iida Emilia
Lahtinen	Salla Katariina
Laaksonen	Iida Hilda Maria
Kukkohovi	Anna

Discussions

Choose the breakout room that corresponds to your group number

Discussion in breakout rooms with your group:

- **Introductions, etc.**
- **Expectations for group work**
- **Topic choice for group work – choose 3 preferred topics**

EACH GROUP SHOULD VOTE FOR THEIR TOP 3 TOPICS ON THE MYCOURSES DISCUSSION FORUM BY THE END OF THE DAY 19.4!

Schedule for client meetings on 21.4

12:30-13:00 Rototec

13-13:40 - Solnet

13:50-14:20 – Motiva

13:50-14:20 – Aalto

14:30-15:10 – Finnish Clean Energy Association

15:20-16:00 – Helen

Please choose the right Zoom-link for your client! (Links are on Mycourses)

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