EEE407 - Renewable Energy
Week 1: Course Introduction and Scope

ADANA ALPARSLAN TÜRKEŞ
SCIENCE AND TECHNOLOGY UNIVERSITY

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Department of Electrical and Electronic Engineering

Spring 2020

Outline

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Course Instructor

Dr Kasım Zor
Electrical and Electronic Engineer, PhD

Research Interests

- Energy Analytics, Energy Forecasting, Distributed Generation, Energy Economics, and Energy Efficiency

Contact Information

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Course Information

Course Title	Code	Semester	T+L (Hours)	Credits	ECTS
Renewable Energy	EEE407	7–8	3+0	3	5

Table 1: Table of Course Information

- Prerequisites: None
- Language: English
- Level: Bachelor
- Type: Elective

Course Assessment and Evaluation

Assessment Type	Quantity	Weight
Attendance	16	5%
Quizzes	4	10%
Assignments	1	10%
Midterm Examination	1	20%
Projects	1	15%
Final Examination	1	40%

Table 2: Table of Course Assessment and Evaluation

	Course Type	Allowed Rate	Allowed Hours
Absentee Rate	Main Course	30%	13

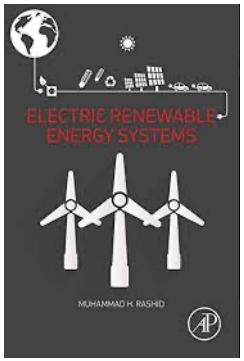
Table 3: Table of Absentee Rate

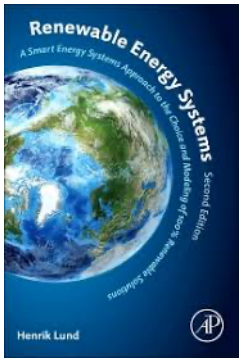
Learning Outcomes

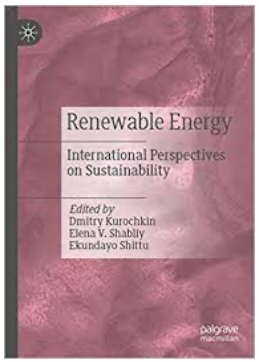
- Define commonly used terms in energy systems
- Distinguish between energy and power terms
- Describe energy production and consumption on a distributed, national, and global scale
- Explain technical principles behind a variety of power generation technologies
- Employ correct units while describing energy and power terms
- Calculate energy and power consumed or generated in a system scenario for given inputs or outputs
- Calculate the efficiency of an energy system
- Calculate and benchmark emissions from different energy production technologies
- Implement basic forecasting applications and feasibility calculations for renewable energy systems

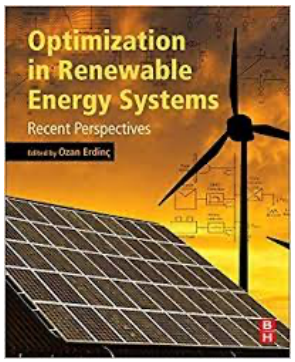
Recommended Sources

Textbooks [1, 2, 3, 4]

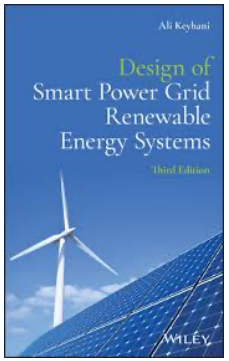


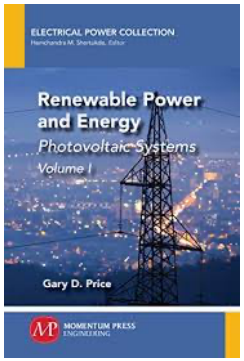


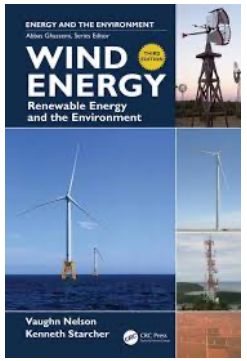


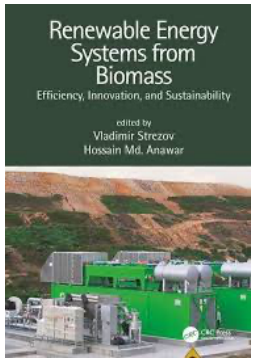


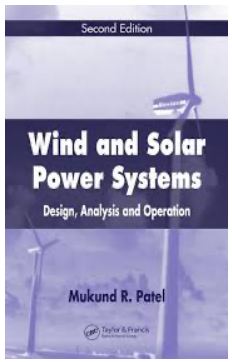
Additional Resources [5, 6, 7, 8, 9, 10, 11]

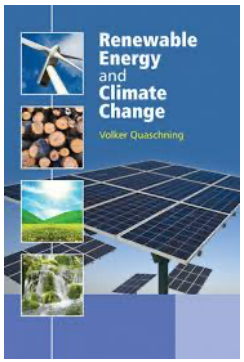


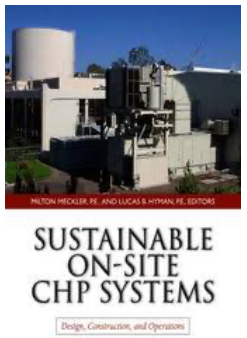












Outline

Course Contents – Week 2

Fundamentals of Energy, Transformations, and Units

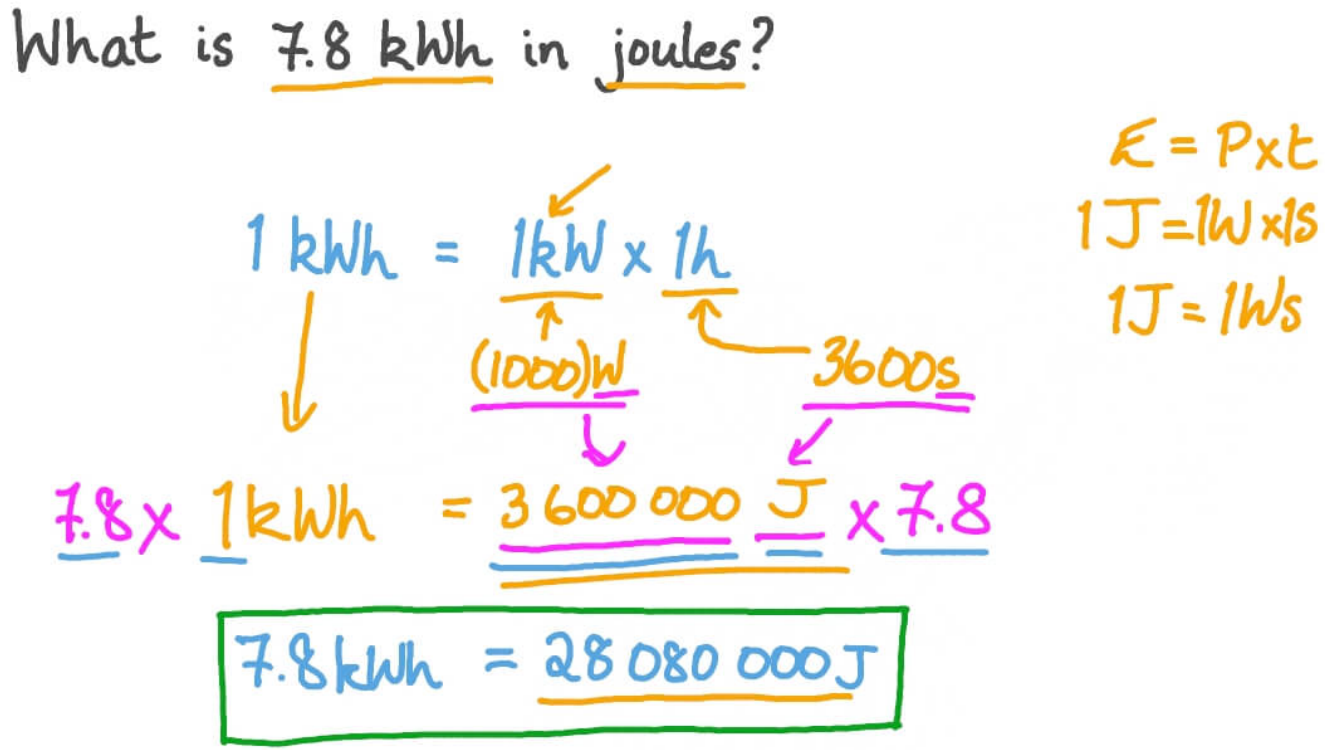


Figure 1: A transformation example [12]

Outline

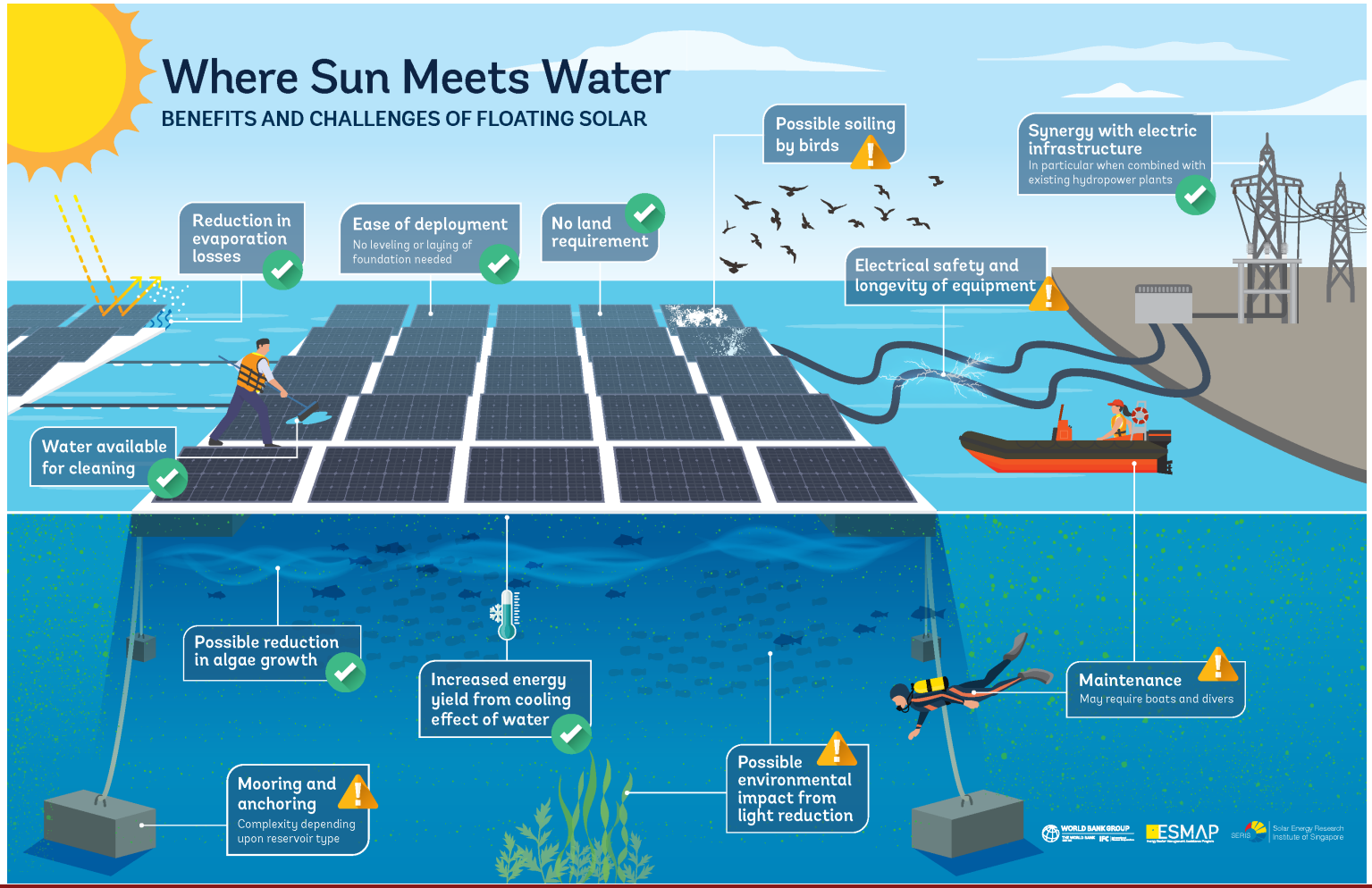
Course Contents – Week 3

Introduction to Renewable Energy [13]

Outline

Course Contents – Week 4

Solar Energy - Part 1 [14]



Outline

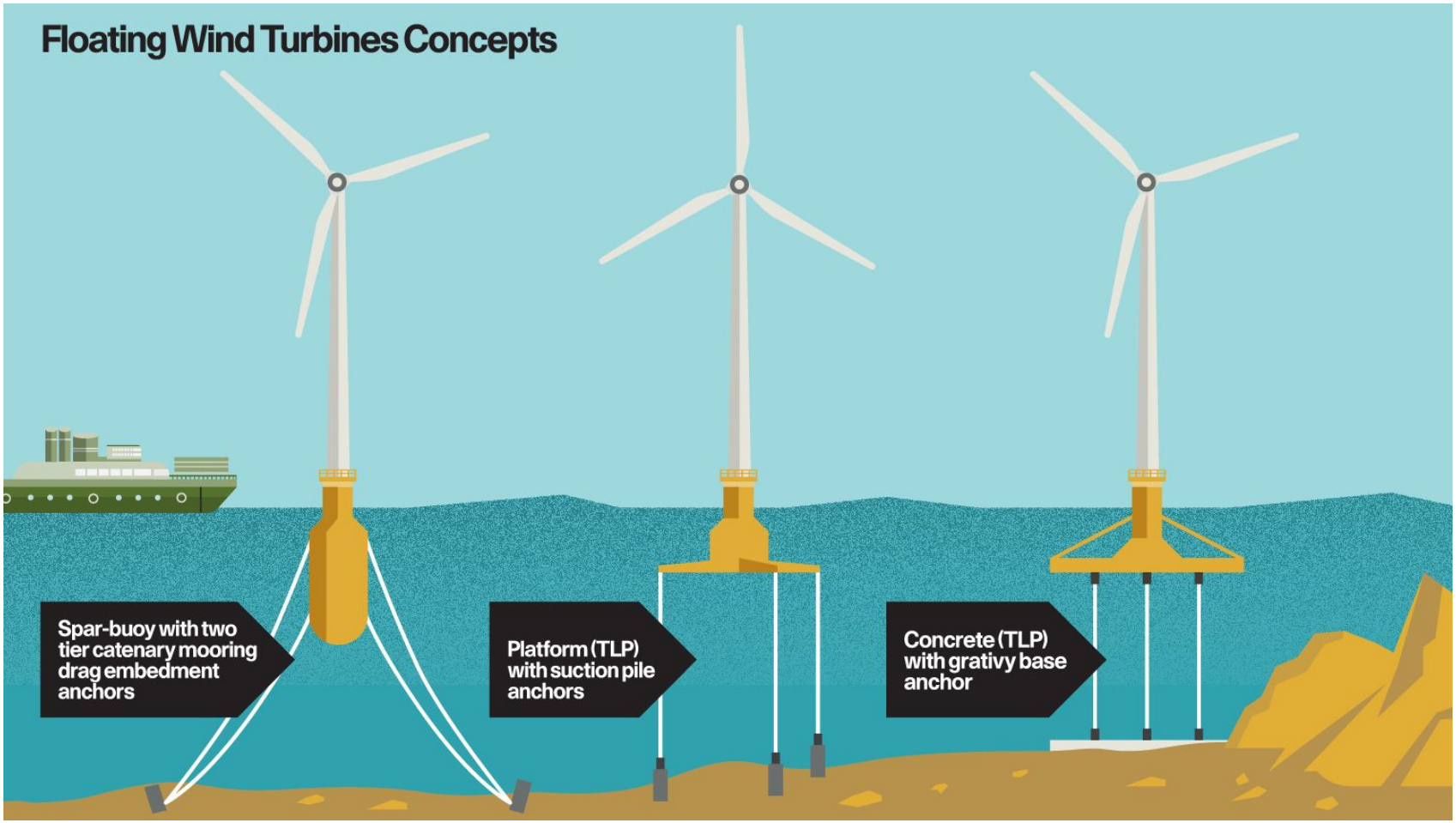
Course Contents – Week 5

Solar Energy - Part 2 [15]

Outline

Course Contents – Week 6

Wind Energy - Part 1 [16]



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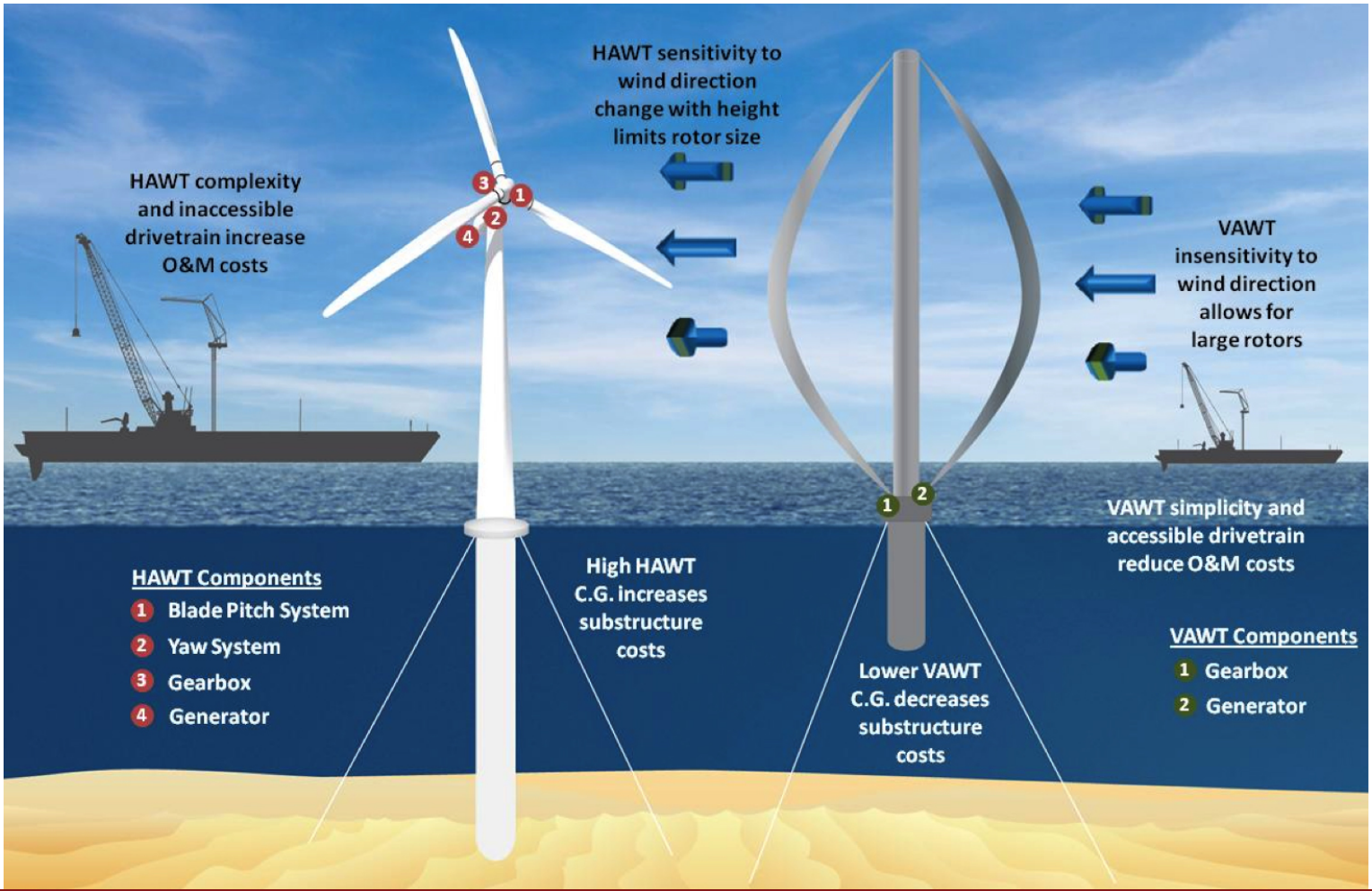
Course Contents – Week 7

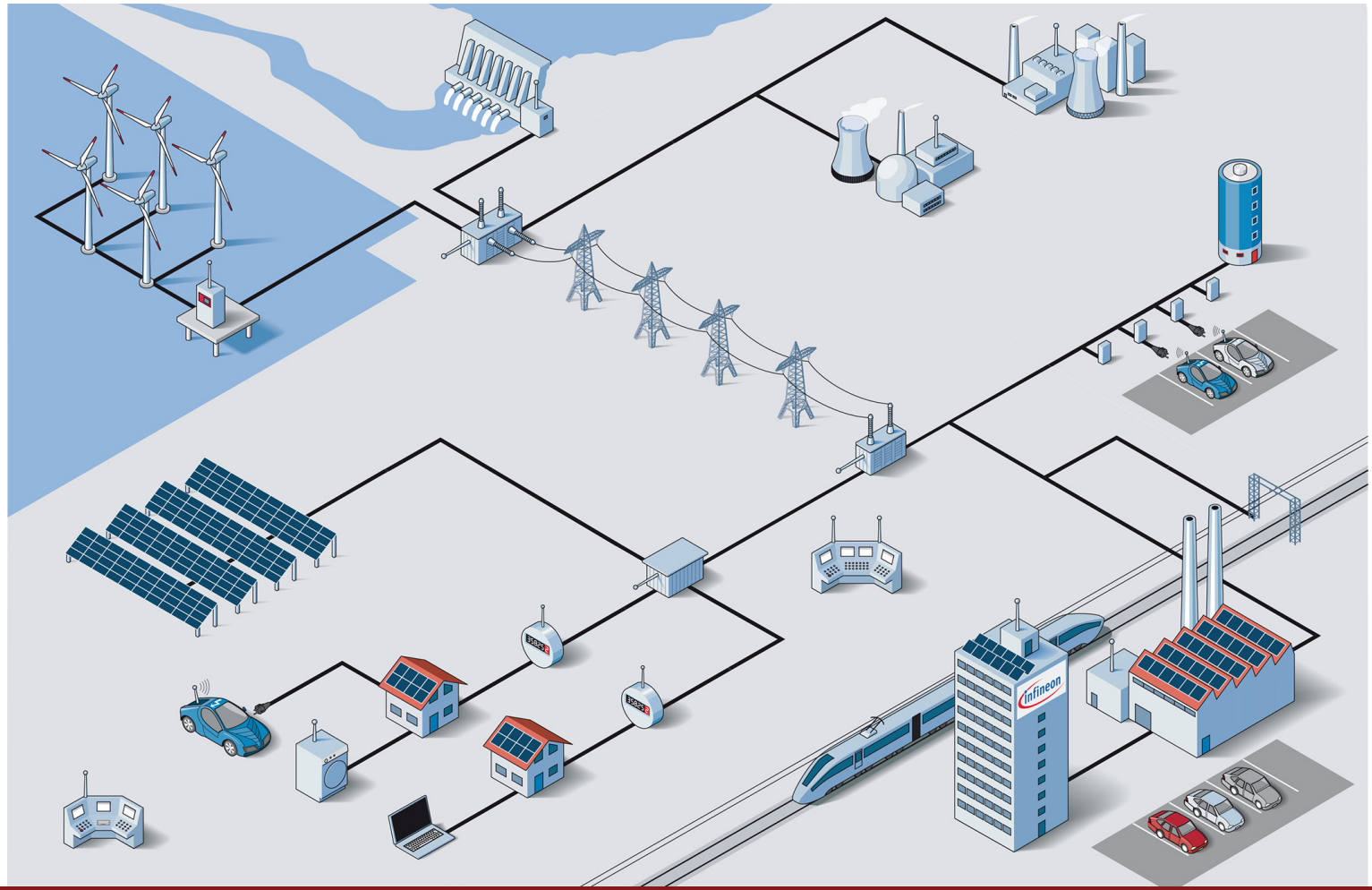
Wind Energy - Part 2 [17]



Outline

Course Contents – Week 8

Renewable Energy Forecasting [18]



Outline

Course Contents – Week 9

Midterm Examination (Paper-Based)

Examples of midterm exam and its solutions will be shared with students before the exam.

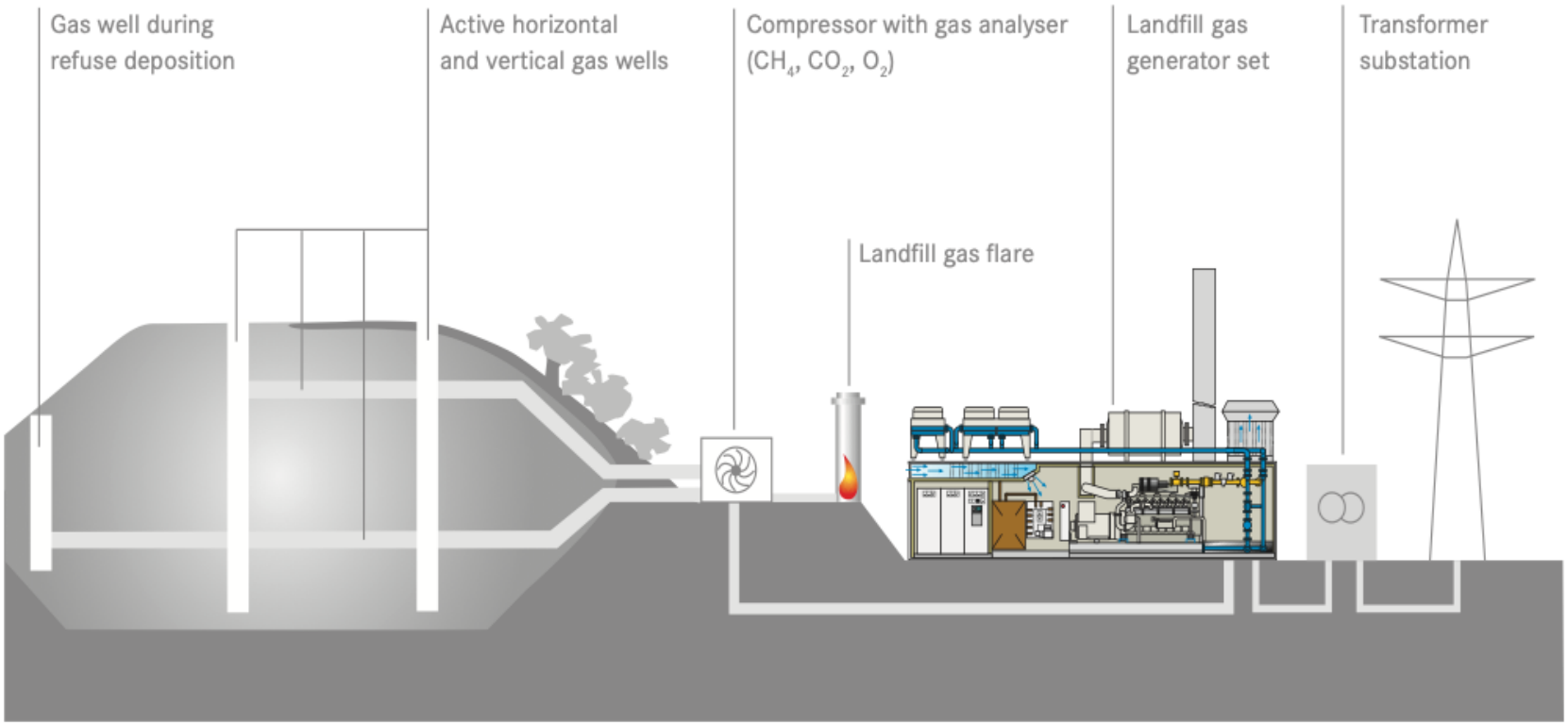
#	Difficulty	Minutes	Pts	Scope
Q1	Very Easy	5	10	W1–W3
Q2	Easy	10	20	W4–W5
Q3	Moderate	30	30	W6–W7
Q4	Hard	45	40	W3–W8
Total		90	100	W1–W8

Table 4: Assessment of Midterm Examination

Outline

Course Contents – Week 10

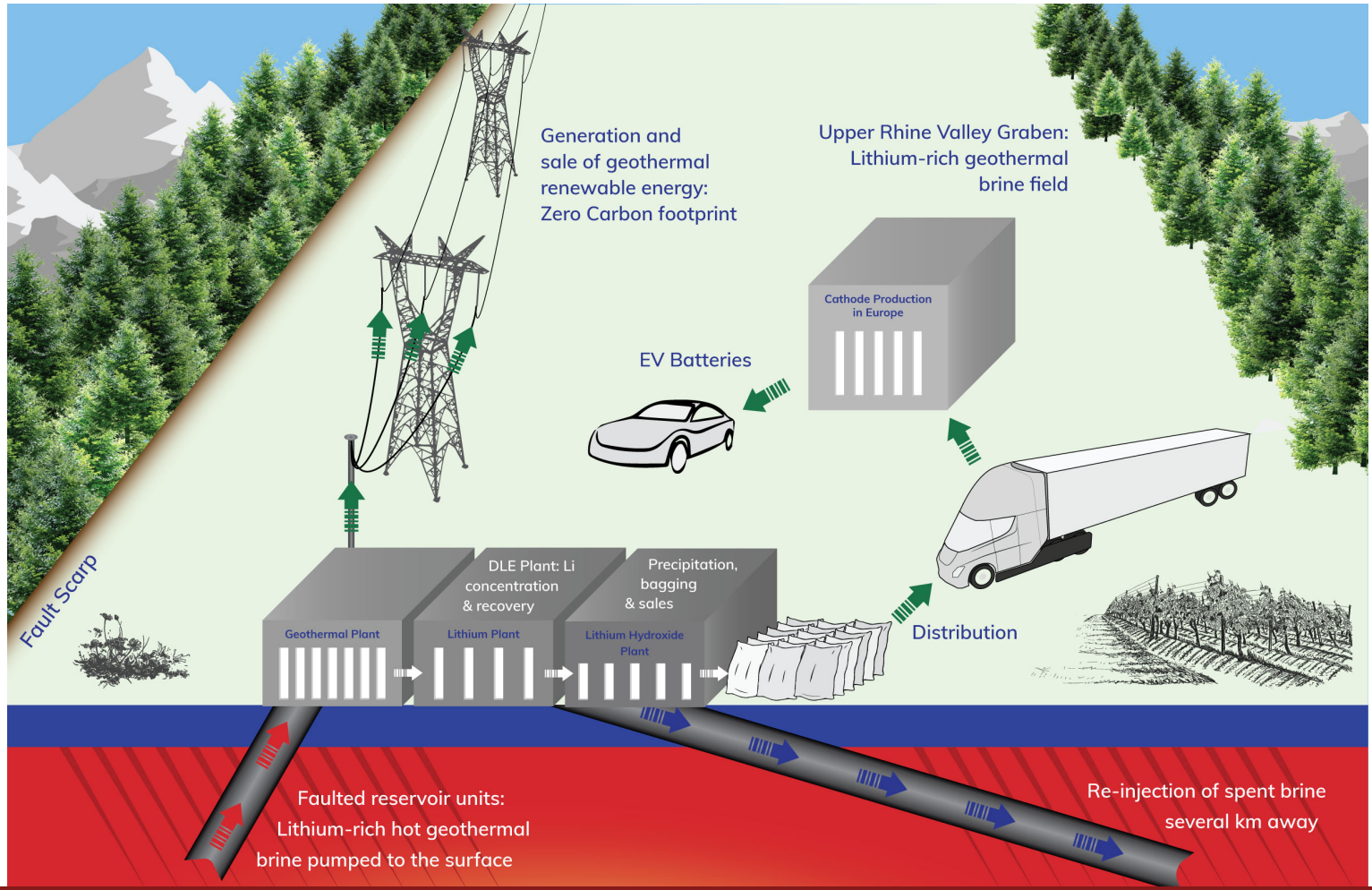
Bioenergy, Renewable Cogeneration and Trigeneration Power Plants [19]



Outline

Course Contents – Week 11

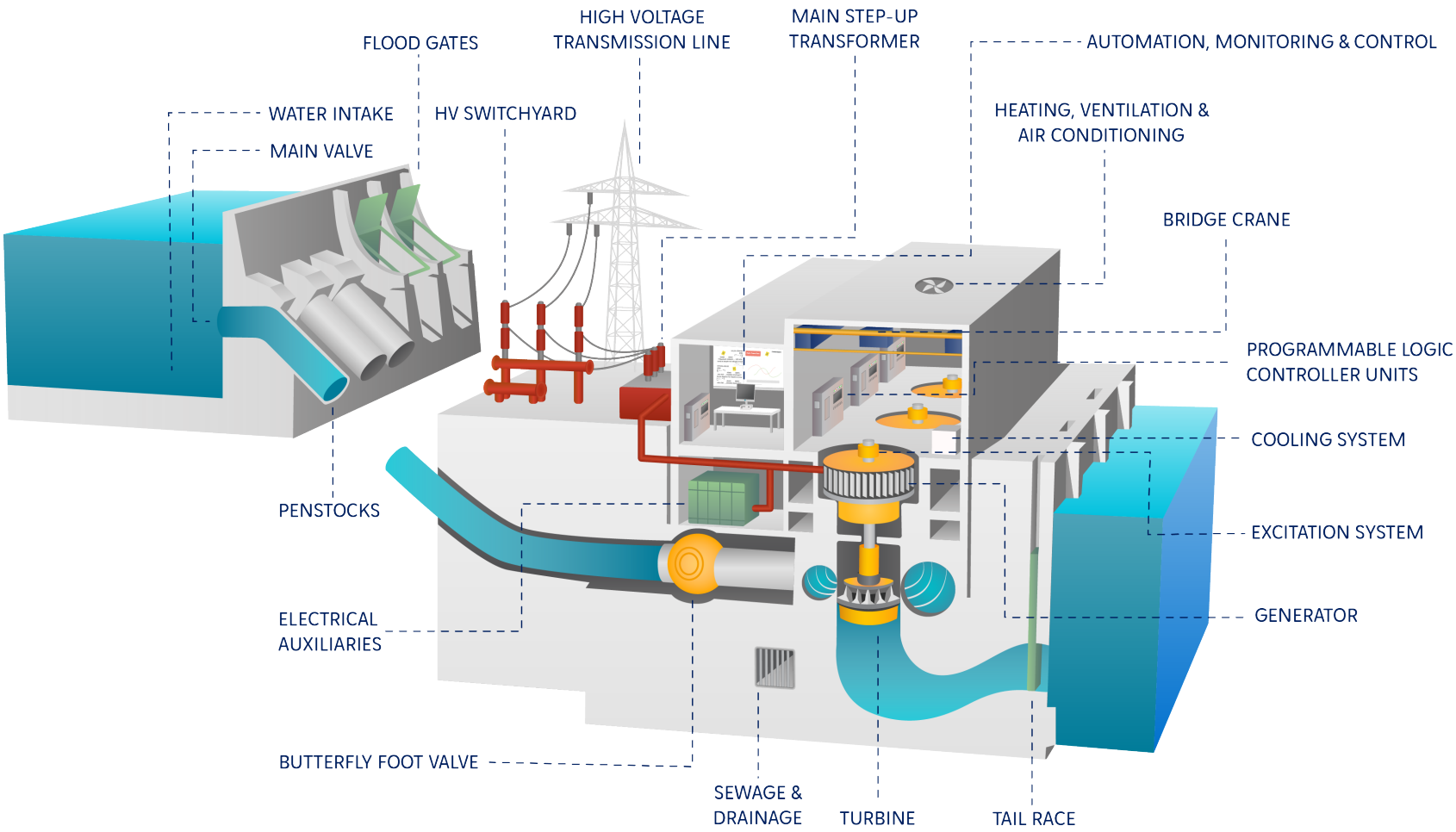
Geothermal Energy [20]



Outline

Course Contents – Week 12

Hydraulic Energy [21]



Outline

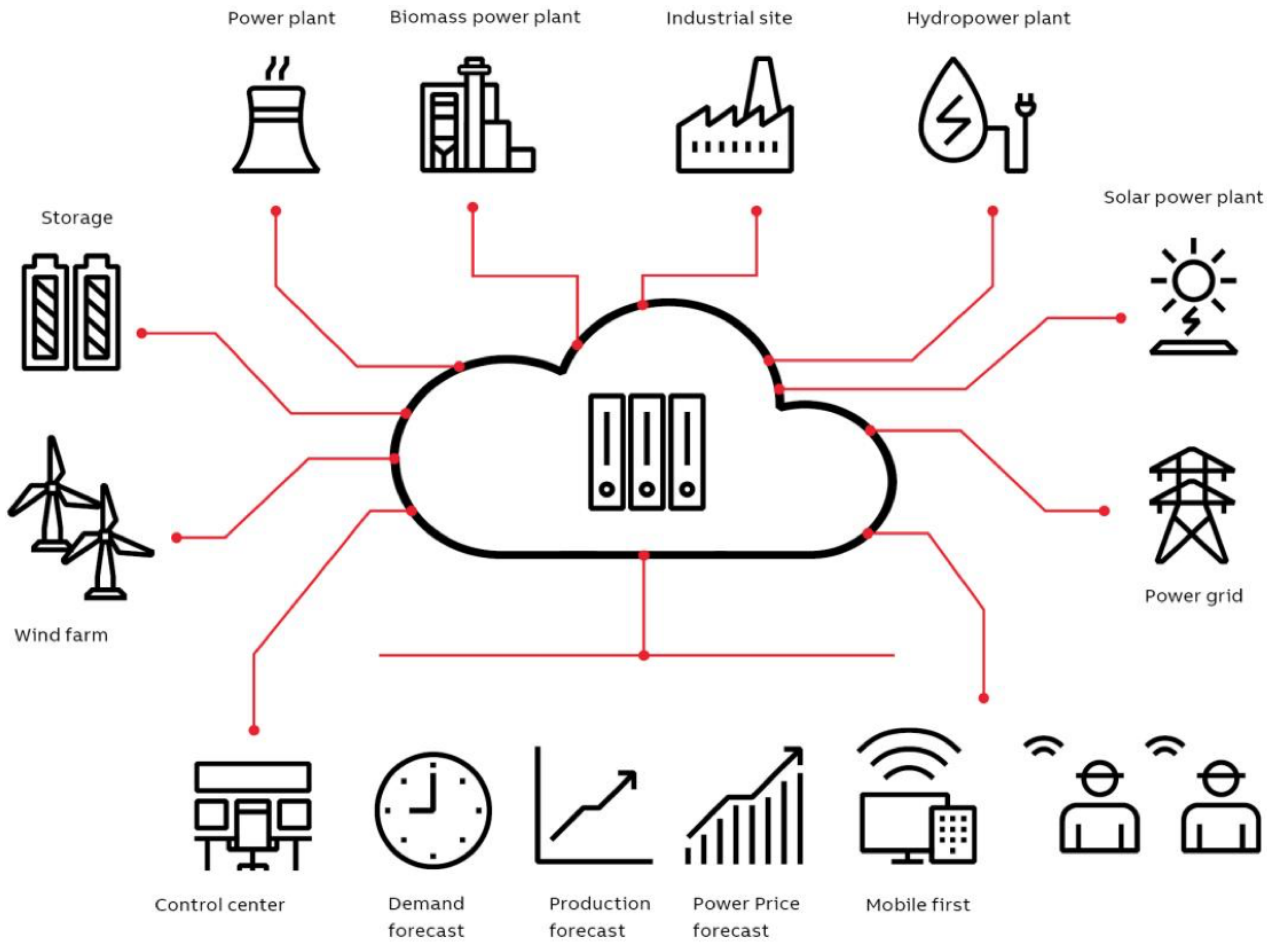
Course Contents – Week 13

Ocean, Wave, and Tidal Energy [22]

Outline

Course Contents – Week 14

Energy Storage, Microgrids, and Virtual Power Plants [23]



Outline

Course Contents – Week 15

Case Study: Feasibility Assessment for Renewable Energy Systems [24]

Outline

Course Contents – Week 16

Final Examination (Paper-Based)

Examples of final exam and its solutions will be shared with students before the exam.

#	Difficulty	Minutes	Pts	Scope
Q1	Very Easy	5	10	W1–W15
Q2	Easy	10	20	W10–W14
Q3	Moderate	30	30	W10–W14
Q4	Hard	45	40	W15
Total		90	100	W1–W15

Table 5: Assessment of Final Examination

References I

[1] Muhammad H. Rashid. *Electric Renewable Energy Systems*. Academic Press, 2016.

[2] Henrik Lund. *Renewable Energy Systems: A Smart Energy Systems Approach to the Choice and Modeling of 100% Renewable Solutions, 2nd Ed.* Academic Press, 2014.

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[4] Ozan Erdinç. *Optimization in Renewable Energy Systems*. Butterworth-Heinemann, 2017.

[5] Ali Keyhani. *Design of Smart Power Grid Renewable Energy Systems, 3rd Ed.* Wiley, 2019.

[6] Garry D. Price. *Renewable Power and Energy: Photovoltaic Systems*, volume 1. Momentum Press, 2018.

[7] Vaughn Nelson and Kenneth Starcher. *Wind Energy: Renewable Energy and the Environment, 3rd Ed.* CRC Press, 2019.

References II

[8] Vladimir Strezov and Hossain M. Anawar. *Renewable Energy Systems from Biomass: Efficiency, Innovation, and Sustainability*. CRC Press, 2019.

[9] Mukund R. Patel. *Wind and Solar Power Systems: Design, Analysis, and Operation, 2nd Ed.* CRC Press, 2006.

[10] Volker Quaschning. *Renewable Energy and Climate Change*. Wiley, 2010.

[11] Milton Meckler and Lucas B. Hyman. *Sustainable On-Site CHP Systems: Design, Construction, and Operations*. McGraw-Hill, 2010.

[12] Nagwa. Video: Converting between joules and kilowatt-hours.

[13] Tim Price. 6 renewable energy trends to watch in 2019.

[14] Energy Sector Management Assistance Program. Where sun meets water: Floating solar market report.

[15] ecoticias.com. Acciona y abengoa construirán la primera planta termosolar de latinoamérica.

[16] Tim Probert. Bigger, better, stronger turbines.

[17] D. Todd Griffith. Innovative offshore vertical-axis wind turbine: Rotors.

References III

[18] Leitat Managing Technologies: Projects Blog. Power supply to become more efficient, more stable and more secure.

[19] MTU Onsite Energy. Combined heat and power from biogas. Technical report.

[20] Global Geothermal News. Germany: Insheim geothermal power plant successfully supplies brine for lithium extraction demonstration plant.

[21] Omexom. Hydro: The leading renewable source for electricity generation.

[22] Nick Kaloterakis. National geographic, tidal energy: Diagram of tidal energy technologies.

[23] Matti Vaattovaara. Microgrids and virtual power plants. ABB WEC seminar.

[24] Liquid Learning. 10th pmo leadership summit.