

Energy Initiative Forging Future Engineer Leaders

Fall 2018

Seoul National University - The University of Tokyo

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Engineers Club: 14:00~15:30, Mon; Leaders Forum: 13:00~14:30, Fri, Rm 038-428

Course Outline

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|---|------------|
| 1. The Future of Coal | 05% |
| Carbon capture & sequestration is the key, technologies and costs associated with the generation of electricity from coal | |
| 2. The Future of Oil & Gas | 05% |
| Growing concerns and possible solutions: the interdependency of natural gas and electricity systems | |
| 3. The Future of Nuclear | 15% |
| For an expansion of nuclear power to succeed, four problems must be overcome: cost, safety, waste, and proliferation | |
| 4. The Future of Renewables | 15% |
| Combined dynamics of solar, wind, and other renewables and how they match the dynamics of energy needs | |
| 5. Case Study for the U.S. | 10% |
| New policies advance actions to address environmental concerns, and increase energy independence and security | |
| 6. Case Study for France | 10% |
| France derives about 75% of its electricity from nuclear energy, due to a long-standing policy based on energy security | |
| 7. Case Study for Germany | 10% |
| Energy transition receives international attention because of the ambitious effort to increase share of renewables | |
| 8. Case Study for Russia | 10% |
| 'Grand Gas Bargain' is in the pipeline on the Gazprom anti-trust case, as something that changes the way Gazprom operates | |
| 9. Case Study for China | 10% |
| China has positioned itself to dominate in new energy technologies such as batteries and electric vehicles | |
| 10. Case Study for India | 10% |
| The past years have witnessed a significant decline in the cost of renewables such as wind and solar power in India as well | |

Course Assessment

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| 1. Class Participation | 20% |
| 2. Future Report (Fossil, Nuclear, Renewables) | 20% |
| 3. Outlook Report (EIA, EM, BP, IEA) | 20% |
| 4. Leaders Forum (Seoul↔Tokyo) | 20% |
| 5. Term Paper | 20% |

Lecture Note

EIFFEL

K.Y. Suh, 2018

Readers Digest

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|---|-------------|
| 1. International Energy Outlook (pdf) | EIA, 2018 |
| 2. Sustainable Energy – without the hot air (pdf) | McKay, 2009 |
| 3. The Future of Coal (pdf) | MIT, 2007 |
| 4. The Future of Natural Gas (pdf) | MIT, 2016 |
| 5. The Future of Nuclear Energy in a Carbon Constrained World (pdf) | MIT, 2018 |
| 6. The Future of the Nuclear Fuel Cycle (pdf) | MIT, 2011 |
| 7. The Future of Nuclear Power (pdf) | MIT, 2003 |
| 8. The Future of Solar Energy (pdf) | MIT, 2015 |
| 9. Business Models for Distributed Energy Resources (pdf) | MIT, 2016 |
| 10. The Future of the Electric Grid (pdf) | MIT, 2011 |
| 11. World Energy Issues Monitor (pdf) | WEC 2018 |
| 12. Annual Energy Outlook (pdf) | EIA, 2018 |
| 13. Energy Outlook (pdf) | EM, 2018 |
| 14. Energy Outlook (pdf) | BP, 2018 |
| 15. World Energy Outlook (pdf) | IEA, 2017 |
| 16. The Outlook for Energy Under a Trump Administration (pdf) | AC, 2017 |
| 17. Why Is 'Nuclear France' Going Renewable (pdf) | 2017 |
| 18. Germany's Energy Transition: Lessons and Next Steps (pdf) | 2016 |
| 19. Russia's "Pivot to Asia": The Multilateral Dimension (pdf) | 2017 |
| 20. China's Global Renewable Energy Expansion (pdf) | 2017 |
| 21. Optimal Energy Mix in Power Generation India (pdf) | 2018 |
| 22. Japan's Energy Mix Policy (pdf) | 2017 |
| 23. Energy Challenges for Japan, China and Korea (pdf) | 2016 |
| 24. China-Korea-Japan Power Grid Interconnection (pdf) | 2017 |
| 25. South Korea's Renewable Energy Policy (pdf) | 2017 |

Meeting Agenda

Class	Date	Day	Engineers Club ¹	Reading ²	Leaders Forum ³
1	09/03	Mon	Climate Change: Alarmists v. Sceptics	1	-
2	09/07	Fri	-		Global Warming: Data or Dogma?
3	09/10	Mon	Sustainable Energy	2	-
4	09/14	Fri	-		More Sustainable Energy
5	09/17	Mon	The Future of Fossil Fuel	3, 4	-
6	09/21	Fri	-		The Future of Fossil Fuel Report
7	09/24	Mon	Seoul Club (Home Stay)	-	-
8	09/28	Fri	-		Seoul Forum (Home Stay)
9	10/01	Mon	The New Energy Equation	-	-
10	10/05	Fri	-		The Zero Carbon Solution
11	10/08	Mon	The Future of Nuclear Energy	5~7	-
12	10/12	Fri	-		The Future of Nuclear Energy Report
13	10/15	Mon	The Future of Nuclear Energy		-
14	10/19	Fri	-		The Future of Nuclear Energy Report
15	10/22	Mon	The Future of Renewables	8, 9	-
16	10/26	Fri	-		The Future of Renewables Report
17	10/29	Mon	The Future of Electric Grid	10	-
18	11/02	Fri	-		The Future of Electric Grid Report
19	11/05	Mon	Case Study for the U.S.	16	-
20	11/09	Fri	-	11	World Energy Issues Monitor 2018
21	11/12	Mon	Case Study for France	17	-
22	11/16	Fri	-	12	EIA Annual Energy Outlook 2018
23	11/19	Mon	Case Study for Germany	18	-
24	11/23	Fri	-	13	EM Energy Outlook 2018
25	11/26	Mon	Case Study for Russia	19	-
26	11/30	Fri	-	14	BP Energy Outlook 2018
27	12/03	Mon	Case Study for China	20	-
28	12/07	Fri	-	15	IEA World Energy Outlook 2017
29	12/10	Mon	Case Study for India	21	-
30	12/14	Fri	-	22~25	Seoul↔Tokyo Forum 2018

1. Engineers go for the future. Leaders make it. The world leaders, entrepreneurs and dignitaries jetting in to World Economic Forum 2018 have identified the biggest threats to prosperity as environmental. A global risk survey places extreme weather events, natural disasters and failure of climate change mitigation and adaptation in the alarm zone for both likelihood and impact. This course shall lend itself to energy reality forum for future leaders. As the Grand Energy Transition fast becomes a reality, technology turns out to be the key to a decarbonized energy future. In particular, advances in electric storage and renewable energy will carry the potential to dictate the pace and the scale of the energy transition. The rapid implementation of renewable energy capacity across the globe means that there is a degree of certainty about the future role of renewables in the global energy mix. However, its impact is growing as renewable energy displaces hydrocarbons, particularly oil and coal, in power generation. Improvement in electric storage has the potential to revolutionize the transport sector as the electric vehicles become a viable alternative to petrol and diesel fueled cars. Factors that could further dampen the growth in energy demand growth such as energy efficiency and the end to energy subsidies will remain high on the agenda of global energy leaders. One of EIFFEL’s goals is to help encourage more bright minds to pursue careers in energy engineering. Students and the instructor shall be working to create and foster technological breakthroughs to improve the world. Those are the kind of innovators we need as future leaders. The **Engineers Club** shall be opened and led by the instructor.
2. The **Readers Digest** shall shed light on a worldly roadmap to ZERO (Zero Emission Renewed Outlook) studied with EIFFEL. A low carbon economy, low fossil fuel economy, or decarbonized economy is an economy based on low carbon power sources that therefore has a minimal output of greenhouse gas (GHG) emissions into the atmo- and biosphere, but specifically refers to the carbon dioxide. GHG emissions due to human activity are, still arguably though, one of the most dominant causes of observed global warming or climate change, or even extreme weather, since the mid-20th century. Continued emission of GHGs may cause further warming and long lasting changes around the world, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Shifting to low carbon economy on a global scale could bring substantial benefits both for developed and developing countries. Many countries around the world are designing and implementing low emission development strategies. These strategies seek to achieve social, economic and environmental development goals while reducing emissions and increasing resilience to climate change impacts.
3. The **Leaders Forum** shall be inviting the students of both campuses to a forum where all the energy climate agenda will be placed on the table for shared thinking, cooperative research, collective learning, and interactive discussion. EIFFEL is slated to be home to an interdisciplinary initiative that links science, innovation, and policy to transform the world’s energy system in order to meet the challenges of the future. Students from both schools shall work with the instructor to identify tomorrow’s energy challenges, and study cutting-edge solutions. They are expected to prep to participate in discussions in leaders forum.
4. The **Future Report** and **Outlook Report** shall preview the future of the energy resource and global and regional outlook. Submit a one pager in preferably PDF via email to kysuh@snu.ac.kr by 12:00 midnight Thursday right.
5. The **Term Paper** shall individually be emailed to kysuh@snu.ac.kr by 12:00 midnight, Friday, December 21. The template shall be posted so that everybody can kick start on her/his project sooner rather than later resorting partly to references 22~25.