THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

COLLEGE OF ARTS & SCIENCES

STUDY ABROAD OFFICE

FedEx GLOBAL EDUCATION CENTER
CAMPUS BOX 3130
CHAPEL HILL, NC 27599-3130

T 919.962-7002
F 919.962-2262
studyabroad.unc.edu

January 15, 2018

Administrative Board of the College of Arts & Sciences

Dear Colleagues:

The Study Abroad Office and HonorsCarolina submit for your approval a proposal for the establishment of a new program to be offered beginning **Summer 2019**.

Proposed Program: **UNC Burch in China (Clean Technology)**
Proposed Program Location(s): **Seoul, South Korea; Shanghai & Shenzhen, China; Hong Kong, SAR**
Faculty Program Leader: **Gregory Gangi, UNC Inst for the Environment**

Program Information

This proposed faculty-led program would be offered for **3+ weeks (3 credits)** during the **Summer** term.

Program Rationale: The world is struggling to come to terms with climate change. Vital to dealing with climate change is the need for the world to undergo a fundamental transition in energy away from fossil fuels. The current global energy transition is one of the most significant events currently taking place in our world. There are plenty of reasons for both optimism and pessimism when it comes to decarbonizing the global economy.

Renewable energy and energy-efficiency technologies are evolving at a rapid rate, and Americans have never been more curious about them. The prices for energy sources like solar and wind have fallen precipitously over the past thirty years and now compete with conventional fuels like coal and nuclear in many markets. Experts also expect the price of energy-storage technologies to scale up during the next decade and become an affordable option for utilities, residential consumers and industry. Meanwhile, advances in information and communication technologies are giving consumers the power to manage their own consumption in a manner that was unfathomable even a decade ago, electric cars and self-driven cars promise revolution in the way we get around, and a growing number of credible experts talk of a coming “death spiral” for electric utilities. Hence, it is not an exaggeration to state the Joseph Schumpeter’s idea of “creative destruction” is about to play itself out in dramatic fashion around the issues of electricity. In this class, students will take a deep dive into studying today’s electricity issues.

Target Audience: This proposal is very similar to the Burch Program I led in Germany, Denmark and Sweden during 2013 and Germany and the Netherlands in 2017. All of the “energy” students have landed very good entry jobs in the renewable energy sector. All of these students de-scribe the Burch program has having had a critical impact on subsequently went about developing a career trajectory. A list of where these students landed is available upon request.

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The lessons of the 2013 Burch Program were the inspiration behind the UNC Clean Tech Summit. Around two thousand students have already participated during the past five years. Students have appreciated the opportunity to interact with entrepreneurs, CEOs and thought leaders in the clean technology sector. It has now completed its fifth year and is becoming a place where companies in the clean technology sector come to find talented students for internships and jobs.

Anticipated Number of Students: 10 – 15
Student Levels Allowed: Sophomore, Junior, or Senior

Program Learning Objectives: The goal of this course is not only to meet with policy-makers and explore the policies that are encouraging the growth of the clean energy and broader clean technology sector. The course will also use clean technology as a lens to gain insights into how innovation advances in China and South Korea. The course will also explore the link between industrial policy and economic strategy in China and South Korea and how this affects the growth of a sector like clean technology. An important part of this course will involve visiting companies that are at the forefront of the clean technology sector. This will include companies such as BYD, Huawei, Hanwha and LG. One of the questions we will seek to answer while in China and South Korea is how their companies scale up so quickly and reach a point where they have a competitive advantage that is hard to challenge?

Program Academics

Proposed Course Name/Number: ENEC 490H

Course Description: The goal of this course is not only to meet with policy-makers and explore the policies that are encouraging the growth of the clean energy and broader clean technology sector. The course will also use clean technology as a lens to gain insights into how innovation advances in China and South Korea. The course will also explore the link between industrial policy and economic strategy in China and South Korea and how this affects the growth of a sector like clean technology. An important part of this course will involve visiting companies that are at the forefront of the clean technology sector. This will include companies such as BYD, Huawei, Hanwha and LG. One of the questions we will seek to answer while in China and South Korea is how their companies scale up so quickly and reach a point where they have a competitive advantage that is hard to challenge?

Description of Academic Instruction: The goal of this course is not only to meet with policy-makers and explore the policies that are encouraging the growth of the clean energy and broader clean technology sector. The course will also use clean technology as a lens to gain insights into how innovation advances in China and South Korea. The course will also explore the link between industrial policy and economic strategy in China and South Korea and how this affects the growth of a sector like clean technology. An important part of this course will involve visiting companies that are at the forefront of the clean technology sector. This will include companies such as BYD, Huawei, Hanwha and LG. One of the questions we will seek to answer while in China and South Korea is how their companies scale up so quickly and reach a point where they have a competitive advantage that is hard to challenge?

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Description of Excursions/Activities: The group will fly to Seoul, South Korea and from Seoul will fly on to Shanghai and then to Shenzhen. From Shenzhen we can take a bus to Hong Kong and we can fly back to the US from Hong Kong. Each site will highlight policy-makers, company representatives, and thought leaders at each site.

Course Prerequisites: NO

Degree Requirements? This proposed course will fulfill Elective course requirements

Language Prerequisites: NO

A proposed syllabus is included as an addendum to this proposal.

Faculty Program Leader Information

Faculty Program Leader Bio: As an undergraduate and graduate student he spent a total of three years in Germany. The idea of taking students to Germany to study environmental policy has been something that germinating in his mind for a long time before implementing a similar program to this proposal in 2013. Two colleagues followed up and offered a spinoff in 2015. He has kept the spirit of this program alive at UNC since 2013 through the development of the annual Clean Tech Summit (http://ie.unc.edu/cleantech/). He has also taught a version of his "Future of Energy" class as a Maymester class and included field trips across a vast swath of the eastern half of North Carolina to look at innovations in solar, wind, ocean energy, bioenergy and energy efficiency. He is looking forward to teaching as part of this program as he sees an opportunity to apply his diverse background to have an impact in the rapidly developing and evolving field of sustainability.

Other Course Instructors
Colleagues in industry will serve as guest speakers and contribute significantly to the course by providing the applied perspective on the course content.

Experience in Proposed Location(s): While Dr. Gangi has limited experience in the region, our partner, Markus Wilhelm, has significant networks and connections. Additionally, we will work with a local program provider who are prepared to support the program regarding local culture and knowledge.

Experience Leading Student Groups: Dr. Gangi has taught a variety of experiential learning courses at UNC. He has taken students on summer programs to Siberia, the Galapagos and the Sierra Nevada. He also ran the Sierra Nevada, three times as a Burch program (2003, 2004 and 2008).
Additionally, he teaches a course on coral reef ecology and takes students every spring for a ten-day trip to the Virgin Islands National Park. Hence he feels extremely comfortable leading students on off-campus programs.

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Program Location(s)

Proposed Location(s): Seoul, South Korea; Shanghai, China Shenzhen, China; Hong Kong, SAR

Location Rationale: No country is more pivotal in today's energy transition than China. China is the biggest emitter of greenhouse gasses in the world but at the same time, China is scaling up the production of clean energy and other clean technologies at an impressive rate. Most experts believe that China has hit peak coal use and that China is attempting to use its manufacturing capacity to lead the world on the energy transition. Two factors seem to be motivating rapid change in China. The first is the bad state of air quality in especially Northern China which is sometime referred to the airpocalypse and the second is a desire on the part of pol-icy makers to position China at the forefront of what they believe will be the most important industries of the future.

South Korea was just ranked (January 2018) by Bloomberg news as the most innovative country in the world. It only took South Korea a generation to transform itself from one of the poorest to one of the richest countries in the world. At the heart of this transformation has been a commitment to education and research and development. Government policy in South Korea has in the recent decade been very supportive of the growth of clean technology. During the recent global recession, South Korea passed a rather large stimulus and the bulk of the stimulus went towards greening the nation's infrastructure. South Korea's response to the recession has given rise to a new brand of Keynesianism- Green Keynesianism. South Korea is also along with China a global leader in the renewable energy manufacturing space.

Korea's emphasis on innovation is being pushed even harder by its large neighbor. As China begins to move away from labor intensive industry towards advanced manufacturing is strong challenge to South Korea's economy. This has in turn pushed Korea to promote innovation even harder. However, not everything is rosy in South Korea. The bulk of innovation is concentrated in large companies which is a reversal of countries like Germany, Sweden and the United States. South Korea is working to create a more vibrant and innovative sector of small and mid-sized enterprises (SMEs) but this does constitute an important weakness in their system. While we are in South Korea we will examine what types of pro-grams they are developing to promote the role of SMEs in their economy.

Connections at the Proposed Location: This program is rather unique in that it represents a partnership between UNC and Strata Solar. Markus Wilhelm who is the CEO of Strata Solar, one of the largest solar developers in the United States is going to organize all the company visits. The companies we will visit are all important suppliers of Strata Solar but they are not limited to the solar energy space and indeed many of these companies are huge conglomerates like Huawei. It is unlikely that a group of American student would be given inside access to such companies but Markus Wilhelm is closely connect with senior level management in all the companies that we are targeting. I will work with university contacts to organize some visit with university faculty and perhaps policy- makers to discuss in more detail the innovation and policy landscape.

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Health & Safety Information

Health Insurance: The Study Abroad Office coordinates with the Office of Risk Management Services to enroll student and faculty participants in international accident and health insurance through GeoBlue for the duration of the program.

Safety & Risk Information: We also aim to reduce risk by setting boundaries on extracurricular travel during free time. Furthermore, the plan is to keep students pretty busy during our brief time in each city so as to limit opportunities for trouble. Finally we will have to build into the budget money for a UNC student from China to participate and act as a translator when needed and to help with any emergency like a medical illness.

Study Abroad Office staff will continue to monitor events in the host country and the U.S. State Department Travel Advisories in accordance with the UNC *Policy Concerning Global Study, Travel, and Research*.

Health Information: Both countries have adequate medical care and are served by GeoBlue providers.

Required Vaccinations (if applicable): None required

Health, safety, and security information will be presented to students during the required pre-departure orientation.

Conclusion

A letter of support from the home academic department is included in as an addendum to this proposal.

We are happy to provide any additional information necessary for your review of this program. Thank you for your time and your support of global opportunities for Carolina students.

Sincerely,

Jason Kinnear

Jason A. Kinnear
Assistant Dean of Study Abroad

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October 8, 2018

RE: Burch Study Abroad

Dear Associate Dean Kinnear:

It is a pleasure to support the application of Dr. Greg Gangi for the Burch Study Abroad program to Asia on clean tech and renewable energy. Dr. Gangi has been the primary intellectual organizer for the Clean Tech Summit every year at UNC for the past four years. In this role, he has raised private funds to support the conference, managed the theme and content of the meetings, and developed many contacts in the banking, finance, start-up, energy, and technical industries. He is a tireless advocate for our environmental students and has made student networking with industry leaders an integral component of the Summit. Two summers ago Dr. Gangi led a successful Burch Summer Study Abroad group to The Netherlands and Germany to visit clean tech and smart cities examples from an international perspective. He is well known among students for being their advocate in finding internships and networking with potential employers. He is also a tireless supporter of students who seek graduate school opportunities. He is an excellent teaching faculty member dedicated to student success, having won a national advising award and several teaching awards at UNC.

I have no doubt that this Burch program to Asia will find many interested students from a broad array of backgrounds. Dr. Gangi's previous Burch study abroad programs have had nearly double the applicants seeking to participate than the trip can accommodate. If this new experience in Asia is anything like his programs to Europe, students will be enthusiastic to participate and will not be disappointed for their efforts. Students in ECON, BUSI, PLCY, PLAN, and many STEM fields (especially ENEC) would find this study abroad experience of interest. A recent survey by the Research Triangle Clean Tech Cluster (RTCC) of the workforce in this region of NC reveals that there are already 19,000 jobs in clean tech companies. This is a growth area for the NC economy and an opportunity for UNC students to gain valuable insight about the future in clean tech. Students are aware of the industry growth and will be eager to build their experience and knowledge. I wholeheartedly support this study abroad program.

Sincerely,

Jaye E. Cable, Ph.D.
Chair, Environment, Ecology, and Energy Program
Professor, Department of Marine Sciences

Proposed Itinerary for 2019 Burch Program to South Korea and China

The goal of the program is to engage in a site visit during the morning/early afternoon and return to our hotel and do a mixture of lecture and seminar style class in the later afternoon. In addition to covering the material on the syllabus, each class will review the events of the day and make sure students understand the key take away points and will prepare students for the following day so that they can ask relevant questions and make the most of each visit. We will seek hotels where there is a meeting space to accommodate our group for class sessions

Program dates:

Leave the US on May 17th

May 19th- Group meet in Seoul for orientation

May 20th Visit to Hanwha – Highlights:

- The #2 ranking individual at the company and also the son of the CEO (Mr. D. Kim) has been invited to give a keynote talk at the 2019 Clean Tech Summit. Mr. Kim will also make sure we are given a high level visit.
- Acquired Q Cells in 2012 making it not only the third largest panel maker in the world but the possessor of top-notch technology it acquired via its purchase of Q Cells. Q Cells has been the leading German company in this space and had once been the global leader in solar panel manufacturing and R&D.
- Hanwha is considered a global leader in developing the next generation of solar technology.

May 21 Visit to LG - Highlights:

- LG Chem one of the biggest players in the energy storage sector
- LG Panels are considered the highest quality mass market solar panel. Often used for projects in limited space areas like roof tops where efficiency is really important.

May 22- Meeting with a representative of the Seoul Municipal Government

- Focus on urban energy, building and transportation policies.

May 23- Visit Seoul University-

- Lectures on the drivers of innovation in South Korea and on Korea's commitment to green growth

May 24- Meeting with a representative of the National Government

- Learn about Green Growth focus that was initiated as part of the five-year plan in 2009. Included in those plans are commitments to develop a modern smart grid and embark the country on a massive green building program.

May 25- Free day

May 26- Morning flight to Shanghai

May 27- Visit Jinko Solar - Highlights:

- World's largest solar panel manufacturer
- Operates one of the largest R&D Centers in the world in the area of PV panel research

- Corporate Social Responsibility- Has been actively involved with US NGOs for a number of years now. Donating large numbers of panels to groups like Grid Alternatives that make solar accessible to low income households.

May 28 Visit BYD - Highlights:

- Several mid-level managers participated in the 2015 UNC Clean Tech Summit
- Introduced first electric trucks
- Biggest electric car manufacturer in the world
- Built the largest lithium ion battery factory in the world.

May 29- Visit Envision Energy (wind) - Highlights:

- Envision is a global player in the wind and solar space
- The future of energy depends just as much on software as physical infrastructure and Envision is a leader in developing the software that will allow electric grids to integrate large amounts of distributed renewable energy.

May 30 - JA Solar

- Large global player in the solar industry including large projects in the developing world
- Visit their large R&D Center

May 31- TBA- Would like to set up a visit with one of the major universities in Shanghai to talk to an energy policy expert.

June 1- free day

Jun2 – Travel to Shenzhen

June 3- Visit Huawei - Highlights

- Considered one of the world's most innovative companies (https://www.fastcompany.com/company/huawei)
- A leader in the Information and Communication Technology (ICT) space
- Microgrids, energy efficiency and future smart grids will all rely on ICT and Huawei is positioned to be one of the global leaders in this space.

June 4- Shenzhen Bus Group - Highlight

- By 2017 Shenzhen Bus Group had replaced all 5,698 of its buses with electric vehicles.

June 5 - Shenzhen Modern Renewable Energy Limited - Highlights:

- Major producer of wind turbines
- Producer of advanced inverters (necessary to convert DC current from renewable energy to AC current)

June 6 - Great Wall Renewable Energy - Highlights:

- Producer of advanced micro inverters
- Developer of advanced software for managing renewable energy facilities

Travel to Hong Kong in the afternoon

June 7 CK Infrastructure Holdings

June 8- Course wrap up

June 9 –Project presentation and wrap up

June 10- return to US from Honk Kong

ENEC 490 - Clean Technology: How and Why the Future is being made in Asia

Instructor: Greg Gangi
Email: ggangi@email.unc.edu

Course Description

China and South Korea have emerged as two of the world most technologically innovative countries. The course has two main goals. The first is to explore why these two countries are able to push innovation and technological innovation so quickly. We will use clean technology as a lens to better understand how innovation, industrial policy and economic strategy functions in China in South Korea. We will naturally consider what steps the United States must take to compete in world where countries like China and South Korea are so effectively creating many of the industries of the future. The second goal of the course is to explore innovations in the energy, transportation, smart cities and food technology space coming out of China and South Korea.

Sir David Attenborough recently made the claim that climate change is putting the collapse of civilization onto our near-term horizon. No country is more pivotal in today's energy transition than China and no country will play a more pivotal role than China in deciding whether humanity can do something about the climate challenge before it is too late. China is the biggest emitter of greenhouse gasses in the world but at the same time, China is scaling up the production of clean energy and other clean technologies at an impressive rate. While it is hard to get reliable data for China, many experts do believe that coal use has peaked within China

Most of our time will be spent looking at energy and transportation related transformations. The world is struggling to come to terms with climate change. Vital to dealing with climate change is the need for the world to undergo a fundamental transition in energy away from fossil fuels. The current global energy transition is one of the most significant events currently taking place in our world. There are plenty of reasons for both optimism and pessimism when it comes to decarbonizing the global economy.

Renewable energy and energy-efficiency technologies are evolving at a rapid rate, and Americans have never been more curious about them. The prices for energy sources like solar and wind have fallen precipitously over the past thirty years and now compete with conventional fuels like coal and nuclear in many markets. Experts also expect the price of energy-storage technologies to scale up during the next decade and become an affordable option for utilities, residential consumers, and industry. Meanwhile, advances in information and communication technologies are giving consumers the power to manage their own consumption in a manner that was unfathomable even a decade ago. Electric cars and self-driven cars promise revolution in the way we get around. Hence, it is not an exaggeration to state the Joseph Schumpeter's idea of "creative destruction" is about to play itself out in dramatic fashion around the issues of energy, transportation and urban planning. In this class, students will take a deep dive into these issues. China also has over 1.3 billion people and dwindling farm and water recourses. Given these land and water constraints, food security is an issue that is gaining increasing attention in China. We will also explore what steps, such as the development of new technologies, China is taking to secure it future food supply.

Learning objectives

1) Use clean technology has a lens to understand how innovation ecosystems in China and South Korea and compare those systems to the United States.
    a. Try to develop an understanding of how South Korea is trying to encourage an increase in start-ups.
    b. Explore reasons why South Korea is able to be so innovative when its economy is dominated by a few very large corporations (cheobols) that have been run by a single family over several generations.
    c. Learn about the role of the Communist Party in the Chinese economy.
    d. Understand how state policies in China have led to the growth of new industries.
    e. Understand the relationship between universities, research institutes, government agencies and the private sector in both South Korea and China.
    f. Explore changes the United States will need to make to compete with these two economies in the future.
2) Understand the Chinese and South Korean vision for the future of energy at the corporate and state level.
3) Explore Chinese and South Korean strategies for making urban areas more sustainable.
    a. Examine how technology will be employed to make cities more efficient and also consider to what degree certain of these new technologies can also impinge on human privacy and be used to strengthen authoritarian aspects of the state.
    b. Explore strategies for electrifying urban transportation in China and South Korea
4) Understand the Chinese and South Korean vision for the future of transportation at the corporate and state level.
    a. What are these countries doing to shake up this important global industry?
    b. The electric vehicle revolution: China's play to dominate the global car industry in the near future.
    c. Innovations in public transportation
5) Explore innovations in China and Korea that are aimed at insuring their future food security. Questions we will explore include:
    a. How is China planning to overcome increasing water constraints on agricultural production?
    b. What technologies are being emphasized to allow for more sustainable food production?

c. Are there any apparent game changing technologies being developed?

d. How is South Korea dealing with the problem of an aging farm population?

e. What is the role of overseas food production in land owned and controlled by Chinese and South Korean companies for creating food security?

Course requirements

Students are required to attend all daily activities and be actively engaged, as well as complete reading assignments on Sakai and write two blog posts, an opinion editorial, and a final paper.

Evaluation

Here is how your grade will be determined:

1) 25 pts – Participation grade- Engagement is an essential part of this course. If you show up for an activity looking sluggish because you stayed out late, then points will be deducted. At all activities you are expected to come across as an excellent ambassador for UNC. If you do not meet my subjective definition of being a good ambassador, I will deduct points. More information about my expectations will be provided.

2) 20 pts – Two Blogs Posts (See: http://cleantechinnovation.web.unc.edu/)

3) 20 pts. – Editorial - "Either lessons or challenges for the US"

4) 35 pts – Final paper and presentation

Due Dates

Blog posts should be completed within three days of the assigned topic. No blog posts will be accepted after June 9th

Editorial - Due June 6th

Final Paper- Due June 9th and presentations will take place on June 8th and 9th.

Blog posts

An example of blog posts from my previous Burch Program can be found here:

http://cleantechinnovation.web.unc.edu/

Expectation will be higher this time for the blog posts because they will be viewed by a larger audience than in the past. Within the Institute for the Environment I am now part of the Clean Technology and Innovation Program. I have a colleague in this program who has a professional background working in communications with clean tech industries. She will provide some editorial feedback before these are posted and they will be re-posted in a new venue that will reach at least 5000 people on our communications list. This will be a nice way to connect our students with industry leaders in the Southeast who are curious to know what our students are learning.

Paper assignment:

After I accept students into a Burch program, I meet with each student individually and learn about their individual interests. During this meeting, we identify a topic from a list I construct that is most suited to an individual student and, in some cases, make changes to the topic description. Students will be expected, when appropriate, to use some primary source material including interviews (when allowed) with people we are going to engage with. Working with each student to find a topic that fits their individual passion has worked very well in the past and there have even been cases of students like Megan Neligan (2013 Burch program) who have used their research paper to make a pitch for a specific internship. A large percentage of my 2017 students found their way into clean tech related internships during the following summer and the expertise they developed through the program and individual papers certainly helped make them competitive for these opportunities. Note that I generally prefer rising sophomores and juniors over rising seniors for these programs so that they have time to use this experience as a career stepping stone.

Readings:

The readings for the class that are not available through the Web will be posted on Sakai

Prior to departure, please watch the following video, as it is blocked in China: Jing, Jai. Under the Dome: Investigating China's Smog. https://www.youtube.com/watch?v=T6X2uwlQGQM

Contact hours:

Days will be run similar to my Burch programs in Europe. Each day we will aim to leave our hotel by 8:30 AM. We will spend our time meeting with individuals from the corporate, academic, and government sector (especially the municipal government sector). Our aim will be to return to the hotel by 3:00 and then assemble for approximately two hours before dinner. During these two hours we will discuss the events of the day and put them into the context of our learning objectives. We will also prepare for the next day. The goal will be to make sure the students are prepared to engage with the people who are on our schedule during the following day. The goal is to prepare students so that they make a good impression by engaging with our speakers in a manner that will solicit high quality responses and create robust discussion. We will spend roughly 2 hours in visits and 2 hours in seminar each day.

Recommended books:

1. McGregor, Richard. The Party: The Secret World of Chinas Communist Rulers. Penguin, 2012
2. Kroeber, Arthur. China's Economy; What Everyone Needs to Know. Oxford, 2016.

3. Tudor, Daniel. Korea: The Impossible Country: South Koreas Amazing Rise from the Ashes: The Inside Story of an Economic, Political and Cultural Phenomenon (Revised and Expanded). Tuttle Publishing, 2018.

Agenda for class meetings

May 19

Topics: Orientation: Story of the Global Energy Transition; How and why China and South Korea became two of the most important players; introduction to Korea

Readings and videos:

1) Bana, Sarosh. "Market Report: South Korea and Its Renewable Energy Ambition." Market Report: South Korea and Its Renewable Energy Ambition - Renewable Energy Focus, Elsevier Ltd, 27 Mar. 2013, www.renewableenergyfocus.com/view/31482/market-report-south-korea-and-its-renewable-energy-ambition/.
2) Pae, Peter. "South Korea's Chaebol." Bloomberg.com, Bloomberg, 5 Oct. 2018, www.bloomberg.com/quicktake/republic-samsung.
3) McKenna, John. "South Korea and Sweden Are the Most Innovative Countries in the World." World Economic Forum, 6 Feb. 2018, www.weforum.org/agenda/2018/02/south-korea-and-sweden-are-the-most-innovative-countries-in-the-world/.
4) Federal Reserve Bank of St. Louis. "How Did South Korea's Economy Develop So Quickly?" St. Louis Fed, Federal Reserve Bank of St. Louis, 19 Mar. 2018, www.stlouisfed.org/on-the-economy/2018/march/how-south-korea-economy-develop-quickly.

May 20

Topics - 1) The role of Government Policy in Greening South Korea. Unlike China there is also a grass roots component to South Korea's push into clean technology.

2) The role of chaebol's in the South Korean economy. How can something so seemingly anti-innovative like the chaebol system still play a leading role in what is considered the most innovative economy in the world?

Activity: Visit Hanwha Headquarters

Highlights:

- The #2 ranking individual at the company and also the son of the CEO (Mr. D. Kim) has been invited to give a keynote talk at the 2019 Clean Tech Summit and has deferred until 2020. Mr. Kim will make sure we are given a high level visit.

- Hanwha is a good example of a chaebol and will provide us with a good model for understanding the history of chaebols and the role of cheabols in the modern Korean economy.
- Hanwha acquired Q Cells in 2012 making it not only the third largest panel maker in the world, but the possessor of top-notch technology. Q Cells had been the leading German company in this space and had once been the global leader in solar panel manufacturing and R&D.
- Hanwha is considered a global leader in developing the next generation of solar technology.

Readings:

1) South Korea's Move towards Renewables." Energy Transition, Heinrich Boll Foundation, 2 July 2018, www.energytransition.org/2018/06/south-koreas-move-towards-renewable-energy/
2) Kang, Yi hyun. "Grassroots Solar Energy in South Korea." Energy Transition, Heinrich Boll Foundation, 27 Sept. 2018, www.energytransition.org/2018/09/south-koreas-grassroots-energy-transition/.
3) Kim, Sung-Young. "South Korea Doubles down on Green Growth." East Asia Forum, 23 Dec. 2015, www.eastasiaforum.org/2015/12/25/south-korea-doubles-down-on-green-growth/.
4) Lee, Jae-Seung. "South Korea: Green Growth as a Development Strategy." A Planet for Life, 2015, www.regardssurlaterre.com/en/south-korea-green-growth-development-strategy.
5) "Energy Poll: 8 out of 10 South Koreans Want Clean Energy." Renewable Energy World, 18 Sept. 2018, www.renewableenergyworld.com/articles/2018/09/energy-poll-8-out-of-10-south-koreans-want-clean-energy.html.
6) "South Korea's Move towards Renewables." Energy Transition, Heinrich Boll Foundation, 2 July 2018, www.energytransition.org/2018/06/south-koreas-move-towards-renewable-energy/.
7) Deign, Jason. "South Korea Strengthens Grid to Take on More Renewables." Greentech Media, Greentech Media, 20 Feb. 2018, www.greentechmedia.com/articles/read/south-korea-strengthens-grid-to-take-more-renewables#gs.3eG7RNo.

May 21

Topics - How South Korea became the world's most innovative Country: The role of chaebols: Discuss case studies Hanwha and LG

Activity: Visit LG headquarters

Highlights of LG visit:

- LG Chem is one of the biggest players in the energy storage sector
- LG Panels are considered the highest quality mass-market solar panel. Often used for projects in limited space areas like rooftops where efficiency is important.

Readings:

1) Chung, Sungchul. "The Korean Innovation Story." *Issues in Science and Technology*, Excelsior, 2007, www.issues.org/chung/.
2) Dominquez, Gabriel, and Srinivas Mazumdaru. "Why Innovation Is King in South Korea | DW | 10.02.2016." *DW.COM*, 10 Feb. 2016, www.dw.com/en/why-innovation-is-king-in-south-korea/a-19038625.
3) "South Korea Tops Innovation Ranking as US Tumbles." *The National Business*, Bloomberg, 23 Jan. 2018, www.thenational.ae/business/south-korea-tops-innovation-ranking-as-us-tumbles-1.697834.

May 22

Topics - Smart Cities and Green Urbanism in South Korea: Focus on how Seoul (Population 10 million) has been able during the past few decades to make constant strides towards making the city greener and more sustainable.

Activity: Meeting with a representative of the Seoul Municipal Government

- Focus on urban energy, building, and green space and transportation policies.
- Learn about the Cheonggyecheon and Seoullo 7017 projects and later visit and explore these projects. Both of these projects involve the demolition of former important car arteries in the heart of Seoul and their conversion into public green space with appropriate development around the projects.
- Discuss the creation of Songdo (new car-free city 20 miles from Seoul in preparation for visit

Readings:

1) Sisson, Patrick. "Songdo, South Korea's City of the Future, Has a Green Vision." Curbed, , 2 Nov. 2015, www.curbed.com/2015/11/2/9904808/songdo-korea-city-planning.
2) "South Korea Conceptualizes the Ultimate Smart City." NewCities, 26 Feb. 2018, www.newcities.org/cityquest-songdo-south-korea-conceptualized-ultimate-smart-sustainable-city/.
3) Hosey, Mike. "Sustainable Cities: Seoul, South Korea." Think Sustainability, 28 Feb. 2018, www.thinksustainabilityblog.com/2018/02/28/sustainable-cities-seoul-south-korea/.

4) "Seoul: A Megacity on a Human Scale." Seoul: The MegaCity with High Quality of Life - Salini Impregilo Digital Magazine, Mar. 2018, www.webuildvalue.com/en/global-economy-sustainability/seoul-a-megacity-on-a-human-scale.html.
5) Garfield, Leanna. "South Korea Is Building a $40 Billion City Designed to Eliminate the Need for Cars." *Business Insider*, 14 July 2018, www.businessinsider.com/songdo-south-korea-design-2017-11.

May 23

Topics: South Korean firms challenging Chinese firms for dominance of the global clean energy market.

Activities: Visit Seoul University and meet with economic development specialist. Explore the pros and cons of South Korea's innovation ecosystem; the importance the culture places on education; learn about how South Korea positions itself in the global market vis-à-vis China.

- Lectures on the drivers of innovation in South Korea, Korea's commitment to green growth, economic competition with China.

Readings:

1. Jiae, Sohn. "Korean Firms Expand Solar Energy Investment." KOREA.net Gateway to Korea, 22 Feb. 2016, www.korea.net/NewsFocus/Society/view?articleId=132914.
2. Hiscock, Geoff. "Japanese, Korean Makers Battle for Energy Storage Supremacy." Editor's Pick, The Australian Business Review, 18 June 2015, www.theaustralian.com.au/business/japanese-korean-makers-battle-for-energy-storage-supremacy/news-story/3f3bc93c6a58b0421dce94f5b8bbe9bb.

May 24

Topics - Innovation in the agricultural space in South Korea; focus on national polices around clean energy, energy efficiency and food security. S. Korea's aging farm population and what S. Korea is doing to reinvigorate its agricultural sector.

Activities: Meeting with representative(s) of the National Government

- Learn about Green Growth focus that was initiated as part of the five-year plan in 2009. Included in those plans are commitments to develop a modern smart grid and embark on a massive green building program for the country.
- Learn about government programs to boost start-ups in the agricultural technology space.

Readings:

1. Jackson, Ben. “Solar Agriculture: S. Korea's New Farming Revolution?” KOREA EXPOSÉ, 8 Feb. 2018, www.koreaexpose.com/solar-agriculture-s-koreas-new-farming-revolution/.
2. Dong-Phil, Lee. “Smart Farm Technology Set to Revolutionize Korean Agriculture.” Worldfolio, 2016, www.theworldfolio.com/interviews/smart-farm-technology-set-to-revolutionizehttp://www.theworldfolio.com/interviews/smart-farm-technology-set-to-revolutionize-korean-agriculture/4074/-korean-agriculture/4074/.
3. Lee, M.H. “Government Looks to Farming Startups to Boost Agriculture Industry.” Korea BizWire, 20 Feb. 2018, www.koreabizwire.com/government-looks-to-farming-startups-to-boost-agriculture-industry/111494.

May 25- Morning visit to Songdo. Afternoon is free for sightseeing. (Charter bus to Songdo)

Note you must see “Under the Dome” youtube video (linked below) before arriving in China because it is blocked in China. This video details the air pollution issues faced in China.

May 26 - Travel to Shanghai

Topic- Introduction to China; lecture on what drove China to become the leading country in the clean technology space; discussion of the role of the Communist Party in the Chinese economy.

Readings and video link:

1. Jing, Jai. Under the Dome: Investigating China’s Smog. https://www.youtube.com/watch?v=T6X2uwlQGQM

2. Albert, Eleanor, and Beina Xu. “The Chinese Communist Party.” Council on Foreign Relations, Council on Foreign Relations, 14 Mar. 2018, www.cfr.org/backgrounder/chinese-communist-party.

3. Veugelers, Reinhilde. “China Is the World's New Science and Technology Powerhouse.” The Bruegel Newsletter, Bruegel, 30 Aug. 2017, www.bruegel.org/2017/08/china-is-the-worlds-new-science-and-technology-powerhouse/.
4. “China to Spend over USD 2 Billion in R&D This Year.” The Economic Times, India Times, 7 Jan. 2018, www.economictimes.indiatimes.com/news/international/business/china-to-spend-over-usd-2-billion-in-rd-this-year/articleshow/62403032.cms.
5. Insights, HEC Paris. “Yes, You Can Outmuscle Chinese Imports Through Innovation And R&D.” Forbes, Forbes Magazine, 30 Apr. 2018, www.forbes.com/sites/hecparis/2018/04/25/how-us-manufacturers-can-outmuscle-chinese-imports-through-innovation-and-rd/#720960062f76.

May 27

Topic: Chinese Industrial Policy: Clean Technology as sector targeted for domination; the rise of the solar industry in China to become the global leader.

Activity: Visit Jinko Solar

Highlights:

- World's largest solar panel manufacturer
- Operates one of the largest R&D Centers in the world in the area of PV panel research
- Corporate Social Responsibility- Has been actively involved with US NGOs for a number of years now, donating large numbers of panels to groups like Grid Alternatives that make solar accessible to low income households.

Readings:

1. Kenderdine, Tristan. "China's Industrial Policy, Strategic Emerging Industries and Space Law." The Canadian Journal of Chemical Engineering, Wiley-Blackwell, 12 May 2017, www.onlinelibrary.wiley.com/doi/full/10.1002/app5.177.
2. McCarthy, Gina. "If Trump Dumps the Paris Accord, China Will Rule the Energy Future." Foreign Policy, Foreign Policy, 31 May 2017, www.foreignpolicy.com/2017/05/31/its-time-for-the-united-states-to-lean-in-to-climate-change/.
3. Hepler, Lauren. "The Sustainable Superpower? 5 Reasons for China's Clean Tech Boom." GreenBiz, GreenBiz Group Inc., 18 July 2017, www.greenbiz.com/article/sustainable-superpower-5-reasons-chinas-clean-tech-boom.
4. Campbell, Joel. "Becoming a Techno-Industrial Power: Chinese Science and Technology Policy." Issues in Technology Innovation, Center for Technology Innovation at Brookings, Apr. 2013, www.brookings.edu/wp-content/uploads/2016/06/29-science-technology-policy-china-campbell.pdf.

May 28

Topic: Innovation in China; Jinko, Envision, and BYD as case studies of how Chinese companies emerge and rapidly become key global players in new industries.

Activity: Visit Envision Energy (wind)

Highlights:

- Envision is a global player in the wind and solar space
- The future of energy depends just as much on software as physical infrastructure and Envision is a leader in developing the software that will allow electric grids to integrate large amounts of distributed renewable energy.

Readings:

1) Wenderoth, Michael C. "China Is Innovating Faster Than You Imagine." Forbes, Forbes Magazine, 11 Apr. 2018, www.forbes.com/sites/michaelcwenderoth/2018/04/11/china-is-innovating-faster-than-you-imagine/#ef312c273d9f.

2) "Three Snapshots of Chinese Innovation." McKinsey Quarterly, McKinsey & Company, Feb. 2012, www.mckinsey.com/featured-insights/asia-pacific/three-snapshots-of-chinese-innovation.
3) Kuriakose, Smita et al.. Accelerating Innovation in China's Solar, Wind and Energy Storage Sectors. World Bank Group, 19 Oct. 2017, www.documents.worldbank.org/curated/en/981901507788036856/pdf/120374-REVISED-159p-China-Green-Innovation-FINAL-DRAFT-OCT-2017.pdf.

May 29- Electrification of transportation- How China is upending the global transportation industry – Part one

Activity: Visit BYD

Highlights:

- Several upper-level managers participated in the 2015 UNC Clean Tech Summit, so we have decent connections here
- Introduced first electric trucks
- Biggest electric car manufacturer in the world
- Built the largest lithium ion battery factory in the world.
- Rapidly emerging as one of the key global players in the transportation and energy storage sector.

Readings:

1. Technology, Energy Innovation: Policy and. "China's All in On Electric Vehicles: Here's How That Will Accelerate Sales In Other Nations." Forbes, Forbes Magazine, 30 May 2018, www.forbes.com/sites/energyinnovation/2018/05/30/chinas-all-in-on-electric-vehicles-heres-how-that-will-accelerate-sales-in-other-nations/#4e71b954e5c1.
2. Wesoff, Eric. "Mega Financing Rounds Affirm China Is the Center of the Electric Vehicle World." Greentech Media, GTM, 20 Sept. 2018, www.greentechmedia.com/articles/read/china-is-the-center-of-the-electric-vehicle-world#gs.j_LwbTI.
3. "Can Electric Cars Make China This Century's Detroit?" Bloomberg.com, Bloomberg, 24 Aug. 2018, www.bloomberg.com/news/articles/2018-08-24/can-electric-cars-make-china-this-century-s-detroit-quicktake.

May 30

Topic: Electrification of transportation – Part II; Explore how Chinese companies are developing major export markets for clean technology, not only in developed countries, but also in developing countries

Activity – visit JA Solar

- Large global player in the solar industry including large projects in the developing world. JA Solar is one of the leading solar developers of large scale solar projects in developing countries.
- Visit JA Solar's large R&D Center

Readings:

1. Douglas, Ross. "The Future of Urban Mobility: China's Electric Horizon." The Urban Mobility Blog, 24 May 2018, www.urbanmobilitydaily.com/the-future-of-urban-mobility-chinas-electric-horizon/.
2. Taylor, Alan. "The Bike-Share Oversupply in China: Huge Piles of Abandoned and Broken Bicycles." The Atlantic, Atlantic Media Company, 22 Mar. 2018, www.theatlantic.com/photo/2018/03/bike-share-oversupply-in-china-huge-piles-of-abandoned-and-broken-bicycles/556268/.
3. Chen, Frank. "China Testing Super Maglev Trains That Could Hit 1,000km/h." Asia Times Online :: Asian News, Business and Economy., 6 Mar. 2018, www.atimes.com/article/china-testing-super-maglev-trains-hit-1000kmh/.
4. "Milestones in China's High-Speed Railway Development." Xinhuanet, 1 Apr. 2018, www.xinhuanet.com/english/2018-01/04/c_136862909.htm.

May 31

Topic - Food security and Technology

Activity: TBA (Doug Cameron, a global leader in food and agriculture technology and a major investor in Chinese start-ups in the Agtech space has agreed to help us plan this day)

Readings:

1. Xu, Yunbi et al.. "Agriculture and Crop Science in China: Innovation and Sustainability." NeuroImage, Academic Press, 3 Feb. 2017, www.sciencedirect.com/science/article/pii/S2214514117300144.
2. Cornish, Lisa. "Understanding China's Foreign Agriculture Investments in the Developing World." Devex, 30 Apr. 2018, www.devex.com/news/understanding-china-s-foreign-agriculture-investments-in-the-developing-world-92639.
3. McMillan, Tracie, and George Steinmetz. "How China Plans to Feed 1.4 Billion Growing Appetites." National Geographic Magazine, National Geographic, 2 Feb. 2018, www.nationalgeographic.com/magazine/2018/02/feeding-china-growing-appetite-food-industry-agriculture/.
4. Patton, Dominique. "China Seeks to Rejuvenate Countryside with 2018 Rural Policy." Reuters, Thomson Reuters, 5 Feb. 2018, www.reuters.com/article/uk-china-policy-agriculture/china-seeks-to-rejuvenate-countryside-with-2018-rural-policy-idUKKBN1FP0NO.

June 1 Free Day

June 2 – Travel to Shenzhen

Topic: Energy Storage

Readings:

1. Rathi, Akshat. “China Added as Much Battery-Storage Capacity in 2018 as All Previous Years Combined.” Quartz, Quartz, 29 Aug. 2018, www.qz.com/1371099/china-added-as-much-battery-storage-capacity-in-2018-as-all-previous-years-combined/.
2. Sanderson, Henry. “Electric Cars: China's Battle for the Battery Market.” Financial Times, Financial Times, 5 Mar. 2017, www.ft.com/content/8c94a2f6-fdcd-11e6-8d8e-a5e3738f9ae4
3. “Chinese Government's Strategic Push for Energy Storage to Yield Large Flow Battery Projects.” Energy Storage News, 6 Nov. 2017, www.energy-storage.news/news/chinese-governments-strategic-push-for-energy-storage-to-yield-large-flow-b.

June 3 -

Topics: Smart grids and microgrids. How the Internet of things (IoT) is helping to build smarter cities in China.

Activity: Visit Huawei a global leader in IoT

- Considered one of the world’s most innovative companies (https://www.fastcompany.com/company/huawei)
- A leader in the Information and Communication Technology (ICT) space
- Microgrids, energy efficiency and future smart grids will all rely on ICT and Huawei is positioned to be one of the global leaders in this space.
- Note that Huawei is sending one and possibly two high level execs to this year’s UNC Clean Tech Summit, so this will help us get a high level company visit.

Readings:

1. Network, China Daily/Asia News. “Shenzhen Becoming 'Smarter' City.” Inquirer Technology Shenzhen Becoming Smarter City Comments, 27 June 2018, www.technology.inquirer.net/76950/shenzhen-becoming-smarter-city.
2. Staff, AVNetwork. “China's Megacity Shenzhen Features the World's Largest Smart City LED Display System.” Systemscontractor, AVNetwork, 30 May 2018, www.avnetwork.com/news/chinas-megacity-shenzhen-features-worlds-largest-smart-city-led-display-system.

June 4

Topic - How Shenzhen is trying to be a model clean city:

Activity: Visit Shenzhen Bus Group

Highlights

- Shenzhen now has electrified all of the buses in the city- over 16,000 buses
- Learn how Shenzhen can charge so many electric buses on a daily basis without taking down the grid. The grid in an American city would struggle to be able to charge so many buses and avoid a blackout at the same time.
-

Readings:

1. Xue, Lulu, and Weimin Zhou. "How Did Shenzhen, China Build World's Largest Electric Bus Fleet?" World Resources Institute, 4 Apr. 2018, www.wri.org/blog/2018/04/how-did-shenzhen-china-build-world-s-largest-electric-bus-fleet.
2. Hodges, Jeremy. "Electric Buses Are Hurting the Oil Industry." Bloomberg.com, Bloomberg, 23 Apr. 2018, www.bloomberg.com/news/articles/2018-04-23/electric-buses-are-hurting-the-oil-industry.
3. Roberts, David. "China Made Solar Panels Cheap. Now It's Doing the Same for Electric Buses." Vox, Vox, 24 July 2018, www.vox.com/energy-and-environment/2018/4/17/17239368/china-investment-solar-electric-buses-cost.
4. Staff, Asian Correspondent. "How Shenzhen Became China's Most Sustainable City." Asian Correspondent, 21 June 2018, www.asiancorrespondent.com/2018/06/how-shenzhen-became-chinas-most-sustainable-city/.

June 5

Topic - Wind Energy in China- What is the trajectory for the growth of wind energy in China; Are Chinese companies positioned to dominate the growing global market for off-shore wind?

Activity: Visit Shenzhen Modern Renewable Energy Limited

Highlights:

- Major producer of wind turbines
- Producer of advanced inverters (necessary to convert DC current from renewable energy to AC current)

Readings:

1. Yuanyuan, Liu. "China Makes a Big Bet on Offshore Wind." Renewable Energy World, 27 Oct. 2017, www.renewableenergyworld.com/articles/2017/10/china-makes-a-big-bet-on-offshore-wind.html.
2. Yuanyuan, Liu. "China's Wind Power Industry Expected to Rebound." Renewable Energy World, 3 Apr. 2018, www.renewableenergyworld.com/articles/2018/04/china-s-wind-power-industry-expected-to-rebound.html.
3. Sun, Xiaojing, and Diangui Huang. "An Explosive Growth of Wind Power in China." International Journal of Green Energy, Taylor & Francis, 17 Jan. 2014, www.researchgate.net/publication/263563430_An_Explosive_Growth_of_Wind_Power_in_China.

June 6 – Topics: The application of advanced software to energy management. How advanced software is being developed to manage an increasingly complex grid composed of energy storage and lots of decentralized energy production.

Activities: Visit Great Wall Renewable Energy and travel to Hong Kong in the afternoon

Highlights:

- Producer of advanced micro inverters
- Developer of advanced software for managing renewable energy facilities

Topic: Application of advanced software to energy management

Readings:

1. Staff. "The State of Energy Innovation in China." Venture IQ, Venture IQ, 26 Apr. 2018, www.ventureiq.nl/the-state-of-energy-innovation-in-china/.
2. West, Darrell M., and Qi Ye. "Integrating Digital Technologies and Energy Management in China." Brookings, The Brookings Institution, 1 Dec. 2017, www.brookings.edu/research/energy-management-in-china/.

June 7 – Course wrap up

June 8- Course wrap up

June 9- Presentation of final projects/research paper

June 10- Return home