



NC STATE UNIVERSITY

Department of Nuclear Engineering
&
Humanities and Social Sciences
Interdisciplinary Studies

Geographies of Energy – a course in sociotechnical decision making

Lisa Marshall

OECD-NEA Nuclear-Social Science Nexus Workshop

December 12-13, 2019



Road Map

- **Reason** behind course development
- **Overview** of program & course
- **Rationale** of approach & its applicability
- **Lessons learned** for program, lecturer & nuclear program
- **Takeaways from** approach for policy makers & practitioners; and, implications for practice

Reason for Course Development

“[E]nergy is far and away the most significant international resource system and political nexus, weighing in as the defining concern of a majority of the largest companies, parastatal firms, and national enterprises”.

Zimmerer, Karl S. *New Geographies of Energy*. *Annals of the Association of American Geographers*, 101 (4) 2011, pp. 705-711

- Need for students to think through not only technical solutions to problems but also decision-making variables of what one's energy portfolio looks like, could look like & why?
- And for non-technical students to have an understanding of how energy is created & produced layered with social variables
- Energy is one of the key drivers in modern society



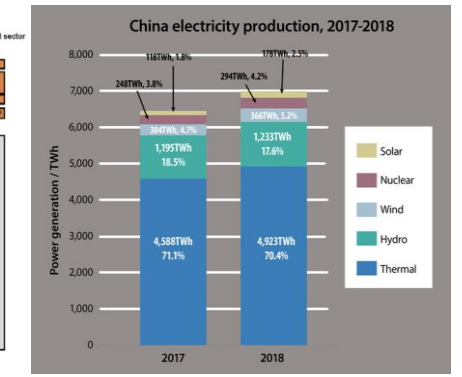
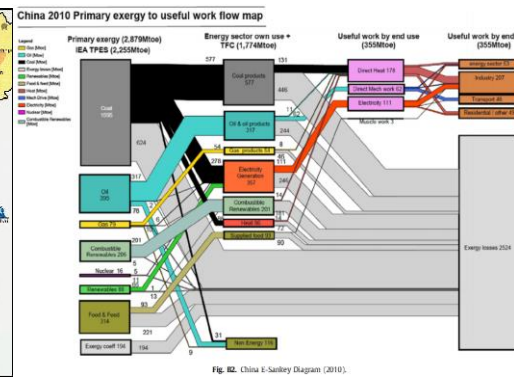
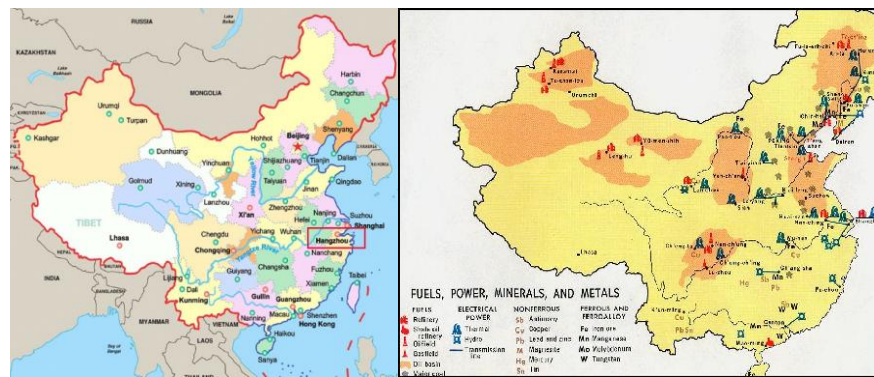
Course Overview – Approach & Applicability

Lisa Marshall, Lecturer

- Director of Outreach, Retention & Engagement in Department of Nuclear Engineering (2001 -)
- Teaching since 2004 “Introduction to Engineering & Problem Solving” section
- Course required for all incoming first year engineering students (~1400)
- Lead for the Nuclear Engr Department First-Year Engineering Design project (up to 19 teams)
- Energy geographer & GIS specialist; research areas – nuclear energy, engineering education, NPT

STS 490 Issues in Science & Technology – Geographies of Energy

- Sociotechnical approach to the energy landscape
- Energy geography as a discipline; human-environment relations/implications; extraction economy & resource life cycle
- Yi-Fu Tuan (sense of place), Bonnett (big ideas in geography), Pasqualetti (energy geography), Woods (mental & physical map making, power of maps), etc.
- Seminar format with student discussion leads, article reviews, film evaluations, neighboring nation energy profiles, qualitative research team project & final media product
- Multimodal literacy is stressed (Saunders & Abers; 2003)
- Collaborative and integrative pedagogical approaches taken (Woodward, 1998; Saunders, 2012)
- Daily 75-minute classes



Program Overview

Study Abroad Office Mission @ North Carolina State University

- is to serve all North Carolina State University students by providing academically well-matched, **immersive experiences abroad**, with a commitment to safety & accessibility.

China Study Abroad Program in Engineering, STS & International Relations

- **6-week program established in the early-90s**
- Lisa Marshall joined in the summer of 2016 with Dr. Griffin (program director, Political Science), Dr. Eichen (Mechanical Engineering)
- **Counterparts at Zhejiang University** in Hangzhou China: Dr. Gu/Ms. Wang (mechanical engineering)
- **Caterpillar as our industry partner** in Clayton NC & Tianjin, Xuzhou
- 2018 added Dr. Bottomley (electrical engineering); 2018 & 2019 added Dr. Zhu (mechanical engineering)
- Beijing, Hangzhou (home base), Shanghai
- **Unique approach: engineering redesign project, interdisciplinary perspectives general education (GEP) option, social science GEP option**
- **Geographies of Energy course (2016-)**



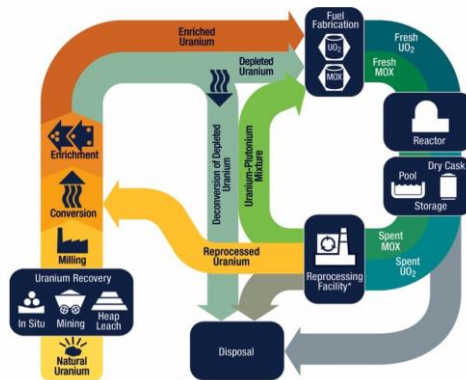
Approach & Applicability – Nuclear Energy

Geographies of Energy

- **Appropriateness of nuclear & other sources as part of the energy portfolio**
- **Technical:** uranium & nuclear fuel cycles ... extraction, fabrication, production, distribution, spent fuel management, (decommissioning), advanced reactors
- **Social:** policy, economics, energy securitization, risk, public perception, environment
- **Scale:** international-regional-national-personal implications
 - UNFCCC...Paris Agreement through COP 24
 - Silk & Road Initiative; China's Overseas Initiative
 - Green economy

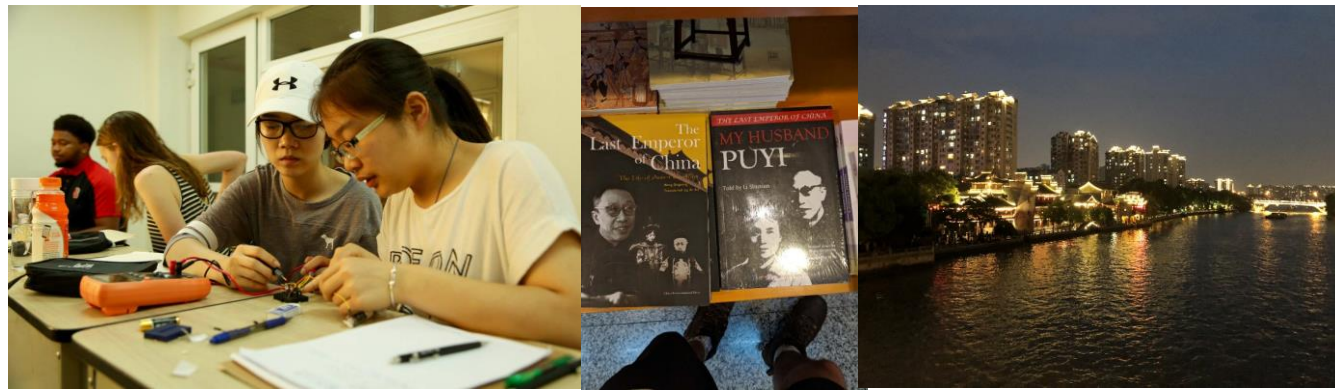
Use of...

- Datasets & qualitative research ... ethnographic method...field technique
- Professional skills development
- Cultural interaction & impact; precautions in research
- Reflection



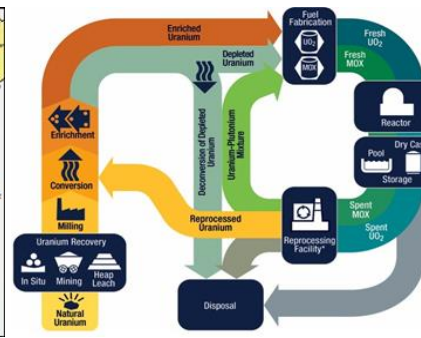
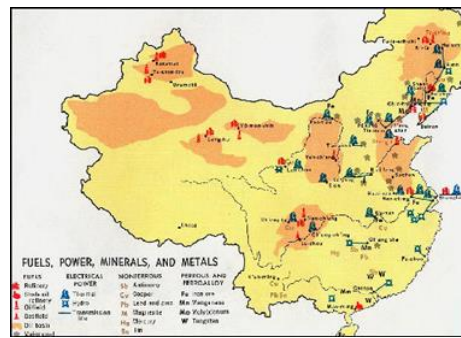
Lessons Learned/ Takeaways from Course

- Challenges & benefits of teaching across various student technical competencies
- Strength of team & individual assignments
- Students desire deeper dive into social framework for an understanding of energy (policy), ethics etc.
- Interview project solidified nuisances of energy decision making (experiential)
- Incorporate industrial/scientific field visits (challenges in some nations)
- More interdisciplinary connections with other (study abroad) courses needed
 - Intro to International Relations, redesign course, **history project (place making/monuments)**
 - **@ NCSU** Energy & Environment, Peace & War in the Nuclear Age, Introduction to Nuclear Engineering, Intro to Nuclear Energy (for non-majors)
 - **New course** in Geographical Thought & Methods (fall 2020)
- Geographies of Energy scale up; follow-up course



Implications for Practice

- Energy landscape as a combination of physical & non-physical variables
 - Identity: (inter)national, historical, locational, individual
 - e.g. Creating Asia: China in the World at the Beginning of the Twentieth Century (Rebecca Karl, 1998) & other texts ...diasporic, experiential
 - Quality of life/ethics
 - Waste management
 - Climate change
- Technical competencies must start early, be straight forward & engage various stakeholders
- Sociotechnical framework for an understanding of (nuclear) energy
- Continued conversations (somewhat LaTourian...geographer in nuclear... for the coproduction of knowledge)





Questions/
Contact

Thank You 😊

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**Paper submitted is a work in progress; still flushing out implications, etc.*