Sustainability and Climate Change in Nuclear Energy: How Nuclear Scientists and Engineers Understand their Role in Building a Sustainable Future

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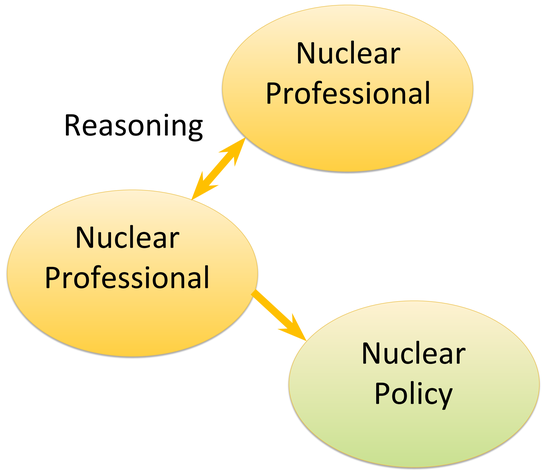
Introduction

- The climate change crisis and need for clean energy highlight the connection between **science**, **society**, and **policy**
- **Nuclear energy technologies** hold potential to address global energy and change energy policy
- Understanding the **forms of reasoning** used by scientists and engineers in talk among themselves can enable productive avenues for developing **nuclear energy policy**

Forms of Reasoning

- Reasoning is the act of constructing a logical argument with a claim and support
- Technical reasoning includes forms of argument that produce legitimate scientific and engineering knowledge
- Prudential reasoning involves forms of argument that produce judgments based on value
- Previous research indicates that nuclear professionals use technical reasoning among themselves and prudential reasoning with the public
- **Our hypothesis is that nuclear scientists use prudential reasoning among themselves to frame nuclear as a sustainable energy source that reduces carbon emissions and meets energy demands**



Research Methods

- Rhetorical: used to analyze the internal expert-to-expert rhetoric of nuclear energy scientists and engineers to examine what forms of prudential reasoning are important to scientists and engineers
- Qualitative: used to collect the data, which is based on participant observation and interviews with key scientists and engineers from a large national nuclear science and engineering association

Data Collection

- 4 nuclear science national conferences
- 46 session transcripts
- 24 total interviews
- 252 total participants

What Is a Nuclear Professional?

- Nuclear science or engineering background
- B.S. and/or M.S. or Ph.D. in nuclear
- Industry, federal/state regulatory bodies, academic, or NGOs

Findings

*environmental codes = references to radiation, safety or nuclear technology's relationship to the environment
*positive tone = nuclear technology benefits the environment
*negative tone = nuclear technology is a risk to the environment

Sample: 3,463 lines

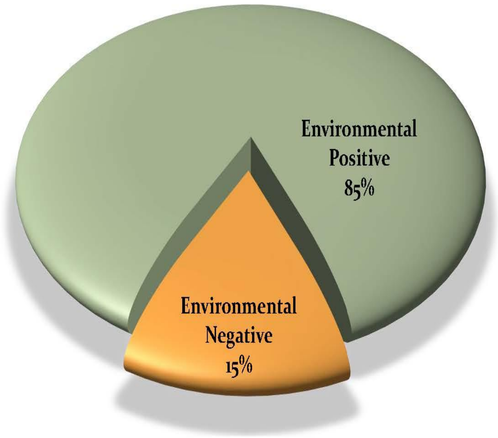
Lines coded as environmental: 203

Positive Tone: 172

Negative Tone: 31

Environmental Positive Themes

- Radiation is natural and is not harmful to humans in the dosages produced by nuclear energy
- Nuclear energy works in conjunction with, but is superior to, other "clean" technologies, i.e. it produces more electricity, is more reliable, and is not as geographically limited
- The safety of nuclear energy is self-evident and is a primary reason why nuclear energy is the best option
- Nuclear energy is deemed"zero-carbon" "carbon-free" despite storage concerns



Examples

- *"In order to get this amount where you even start to see an effect at all, you'd have to crawl inside an operating reactor."*
- *"I don't necessarily believe that it's [geologic storage] the only way, and that we can't have safe surface storage."*
- *"Clearly hydroelectric, but solar and wind have geographic limitations for practical implementation that are not as limited with nuclear; and the consistency of the electrical output is a big chunk of whatever goal to reduction of carbon emission - there's no debate."*
- *"I think it's not possible, not viable, to imagine a practical solution to our energy system that addresses the challenges of climate change and also excludes nuclear energy."*

Implications

- Calling nuclear clean energy as a form of strategic definition
- Nuclear complicates the balance between finding solutions to climate change and environmental justice
- Prudential reasoning values cutting carbon emissions over radiation concerns
- Using scientific arguments to address environmental issues

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