

Life Cycle Assessment of Coal and Nuclear Energy Generation

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Motivation

- 65% of global greenhouse gas emissions are from carbon dioxide produced by fossil fuels and industrial processes
- 35% of global greenhouse gas emissions are from the electricity and heat production and other energy sectors

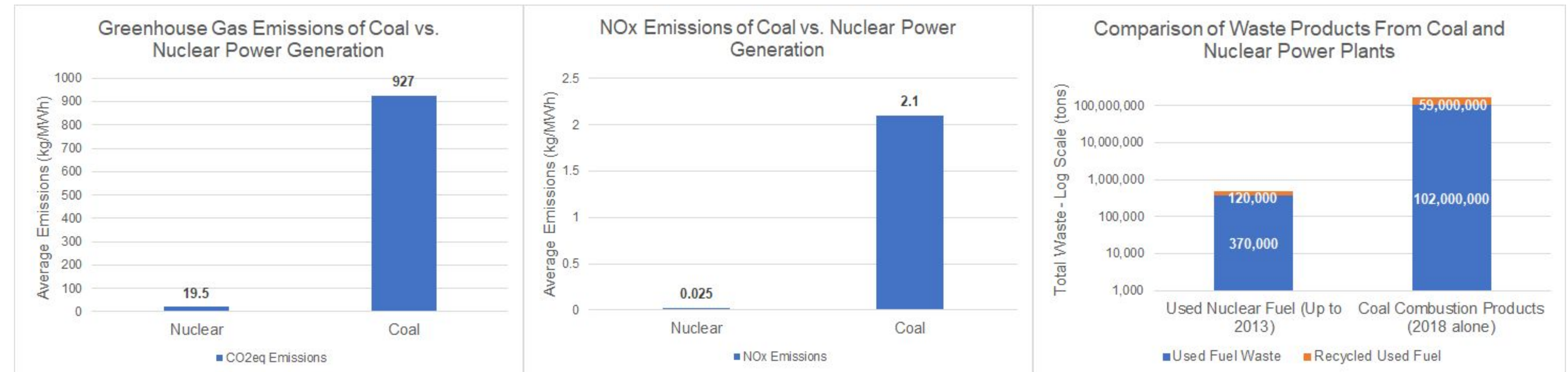
System

- The system boundaries include required materials, resources, and on-site processes
- The system boundaries do not include construction or transportation of materials
- The system inputs include raw materials, land, and energy
- These inputs are from the following sectors: fossil fuel electric power generation, nuclear electric power generation, coal mining, and uranium-radium-vanadium ore mining
- The system outputs are atmospheric emissions and waste pollutants

Social Justice Implications

- Non-environmental adverse effects of coal and uranium mining include physical and mental health problems, solastalgia, and socioeconomic inequalities
- Nuclear energy generation is better for the health and wellbeing of people who live near nuclear power plants because it produces less waste than coal energy generation
- Nuclear energy generation is better for the health and wellbeing of those throughout the world because it releases less emissions than coal energy generation

Results



- Raw Materials
- Land
- Energy

Coal/Nuclear
Energy
Generation

- Atmospheric Emissions
- Waste

Conclusions

- In 2018 alone, the waste products produced from the combustion of coal amounted to 161,000,000 tons while the amount of all nuclear waste produced up to the year 2013 amounted to 490,000 tons
- Coal energy generation produces 2.075 kg/MWh more NOx emissions than nuclear energy generation
- On average coal power plants produce over 47 times more CO2eq emissions than nuclear power plants for every MWh of power produced

Background & Comparison of Results

- A 2013 comparative LCA study verifies our findings by stating that coal energy generation has produced 660-1050 kg/MWh of CO2eq emissions and nuclear energy generation has produced 3-35 kg/MWh of CO2eq emissions
- The same study states that coal energy generation has produced 0.3-3.9 kg/MWh of NOx emissions and nuclear energy generation has produced 0.01-0.04 kg/MWh of NOx emissions