

Pullah Bhatnagar

I'm now part of **IPESE**

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I hold a Bachelor's degree in Mechanical Engineering and a Master's degree in Physics from Birla Institute of Technology and Science, Pilani. My academic journey took an interdisciplinary turn during my undergraduate studies, igniting a passion for Renewable Energy. This led me to pursue a specialized Master's program in Renewable Energy (RENE), spanning two prestigious institutions : KTH Royal Institute of Technology in Stockholm for the first year and Ecole Polytechnique in Palaiseau for the second year. For my master's thesis, I conducted research at IPESE, and currently, I am engaged in doctoral studies at IPESE and Ecole Polytechnique Federale de Lausanne, in collaboration with CIRAIG.

## My research

Since the Industrial Revolution, ocean temperatures have risen by nearly  $1^{\circ}\text{C}$ , resulting in sea level rise and climate change, primarily due to greenhouse gas emissions. Industries currently account for 30% of global emissions, staggering 54 gigatons of  $\text{CO}_2$  equivalent annually. To limit temperature rise to  $1.5^{\circ}\text{C}$ , society can maximum emit upto 250 gigatons of  $\text{CO}_2$  equivalent, necessitating widespread decarbonization efforts. This research endeavors to confront this imperative head-on by addressing the pressing need for industry-wide adaptation to societal net-zero trajectories. Operating within dynamic market landscapes characterized by the ascendance of renewable technologies, the study sets out to chart a course towards sustainable industrial transformation. The project begins with a thorough audit of current industry infrastructure and operations. It then develops comprehensive blueprints for decarbonization, considering a range of available technologies and future industry needs. Using advanced techniques like Process Integration through Mixed Integer Linear Programming, the research generates and optimizes various blueprints at the company level. By integrating lifecycle metrics, the focus is on identifying energy-efficient configurations and identify appropriate symbiosis within and outside the industry. Using prospective analysis, the research crafts actionable roadmaps for achieving net-zero goals amid market and technological uncertainties. By assigning probabilities to different configurations, it equips industry stakeholders with strategic insights, advancing progress towards a sustainable future gra

# Graphical abstract

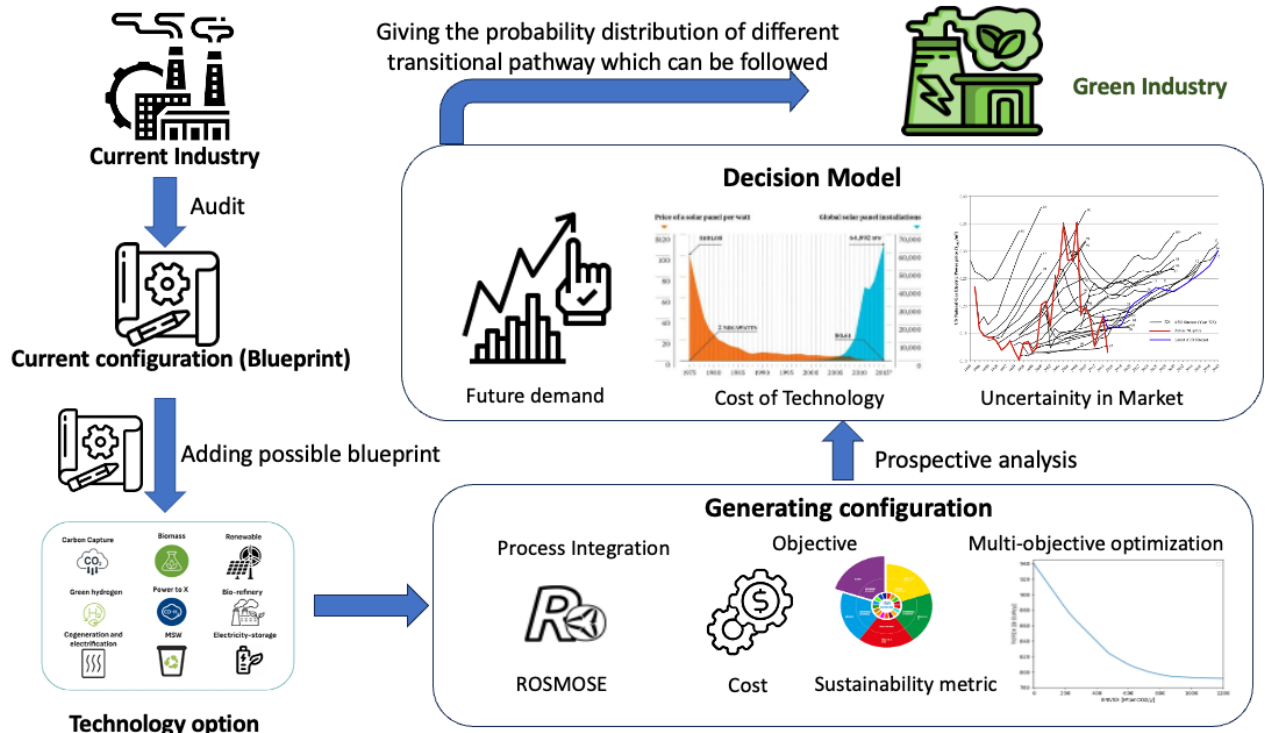


FIGURE 1 – My Graphical Abstract

# References