

# **Thesis Project Portfolio**

## **Board Buddies**

(Technical Report)

## **Renewable Microgrids: the Essential Decentralization of Sustainable Energy in South Asia**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science  
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## **Table of Contents**

Sociotechnical Synthesis

Board Buddies

Renewable Microgrids: the Essential Decentralization of Sustainable Energy in South Asia

Prospectus

## **Sociotechnical Synthesis**

My technical project, Board Buddies, was developed in a team for the ECE Capstone. By combining traditional board game entertainment with modern digital and wireless capabilities, Board Buddies offers a unique solution for people seeking to connect with loved ones across distances. My STS project revolved around introducing renewable microgrids for South Asia. It explores the ramifications of this transition, highlighting the need for technological and financial solutions to support this critical shift towards a resilient clean energy economy.

### *Technical Report: Board Buddies*

Board Buddies is an Internet of Things (IoT) product that seamlessly blends software and hardware to bring a twist to traditional board game entertainment. The system consists of two game boards that allow two players located in different parts of the world to play a physical board game, with the boards communicating wirelessly through a central server. When a player makes a move on their board, the system relays the information to the other board, which reconfigures itself accordingly. The game is played on an 8x8 tile display that incorporates pushbuttons and LEDs to facilitate player interaction.

Board Buddies also addresses a growing need for a unique entertainment system that can be enjoyed by long-distance couples, friends in different colleges, grandparents, and grandchildren, and others who are physically separated but enjoy the social interaction and engagement that comes with playing a physical board game. As the COVID-19 pandemic has forced people to rely more heavily on digital communication, there is a growing desire for the social connection that comes with in-person activities. Board Buddies provides a solution to this problem, allowing individuals to enjoy the fun of a physical board game even when they can't be in the same location.

Furthermore, Board Buddies represents a step forward in the board game industry, opening up a new sector that marries traditional board games with modern digital and wireless capabilities. To ensure a seamless and fair gameplay experience, the system's backend code moderates player choices and prevents illegal moves or one player from going twice in a row. This is communicated externally through an LCD display, further enhancing the immersive and engaging nature of the game. Overall, Board Buddies is an exceptional example of how IoT technology can revolutionize traditional forms of entertainment, offering a new and exciting way to play physical board games that will undoubtedly capture the hearts and minds of players worldwide.

*STS Report: Renewable Microgrids: the Essential Decentralization of Sustainable Energy in South Asia*

The transition from fossil fuel-based energy economies to clean energy economies in South Asia has become a pressing issue in recent years due to the various geopolitical, environmental, and public health-focused ramifications that are associated with this transition. The region is currently grappling with the challenge of transitioning its energy infrastructure and cultural reliances to cleaner sources of energy, particularly amidst concerns over climate change, public health, and energy security. This transition is motivated by the potential benefits of decentralized, renewable microgrids, which offer resiliency from natural disasters, cleaner air and waterways, and cheaper power in the long term.

The use of solar, wind, and hydroelectric energy production in South Asia presents a unique opportunity to capitalize on the potential benefits of a decentralized energy economy. Despite several countries in the region making substantial progress in this regard, significant obstacles must be overcome to fully realize the potential of renewable microgrids. These

obstacles include issues related to energy infrastructure, policy frameworks, financing, and geopolitical concerns over energy security and international trade. The deployment of renewable microgrids in South Asia requires a rethinking of the current energy infrastructure and policy frameworks, which must be conducive to the development of decentralized, renewable energy systems. Additionally, financing models that align with the unique challenges of the region must be developed to ensure the affordability and accessibility of renewable microgrids. The geopolitical implications of transitioning to a clean energy economy in South Asia cannot be ignored, and policies must be developed to address concerns related to energy security and international trade.

The deployment of renewable microgrids in South Asia has the potential to address a range of challenges that the region currently faces. However, significant obstacles must be overcome to fully realize the potential of decentralized, renewable microgrids. This will require a coordinated effort between governments, policymakers, and stakeholders to create the necessary policy frameworks, infrastructure, and financing models to support the transition to a cleaner energy economy in South Asia.