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4-24-2020

## **Efficient Energy: How the Integration of Smart Grids Will Enhance the Current US Energy System**

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### **Recommended Citation**

Pederson, Margeaux, "Efficient Energy: How the Integration of Smart Grids Will Enhance the Current US Energy System" (2020). *Celebrating Scholarship and Creativity Day*. 118.

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# Efficient Energy: How the Integration of Smart Grids Will Enhance the Current US Energy System



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## Abstract:

The energy production industry is one of the largest emitters of greenhouse gases globally due to fossil fuel dependence by nations including the United States, which produces the highest per capita gas emissions in the world. Thus, US energy production greatly extrapolates the effects of climate change across the world. Drawing on scientific journals, data sets, and legislative policies, smart grids and technologies can transform the current US energy system by improving energy reliance and combat energy insecurity.

## What are smart grids?

Smart grids are electrical systems that consist of controls, computers, automation, and new technologies that allows for two-way communication between the utility and its customers, and the sensing along the transmission lines.



## Research Question

How can smart grids be used as an adaptation strategy to improve efficiency and resiliency in the United States electrical grid system?  
How can local communities use smart grids to combat energy insecurity and adapt to climate change?



## Methods:

I collected information and data from a variety of sources revolving around the energy grid system in the United States: academic sources, scientific reports, case studies, and data spreads. In addition, I highlighted two case studies of cities, Boulder, Colorado and Austin, Texas, who have implemented smart grids and smart technologies into the city's systems identifying the advantages and disadvantages of smart grids.

Using this research on the topics of economics, policy, management, environment, and security as well as drawing on the successes and challenges on the implementations of the two cities, I determine if smart grids and technologies are beneficial adaptation methods for energy security and social equity.

## Case Studies:

### Boulder, Colorado



### Austin, Texas



	Boulder – Xcel Energy and City	Austin - City
<b>Goals</b>	- 100% renewable by 2030 - Economic and resilience benefits from renewables	- Utility owned by the city - Net-zero community emissions by 2050 - Decentralized and green energy in the future
<b>Strengths</b>	- Resident excitement: control, renewables, and saving money	- Local energy, consumer services, and electrification
<b>Weaknesses</b>	- Unimagined energy costs - More testing	- Software and hardware issues

"I feel like it has a lot of really valuable components to it, it was a good test, but we didn't interface with the customers as well as we could have".  
- Kara Mertz, Boulder's Environmental Action Project Manager

"Many of the participants already consider themselves green, but as one volunteer states, "by being able to monitor my energy use down to the circuit and plug, I can do my part to reduce waste and reduce my overall energy consumption, helping me be more efficient in my electricity use and save even more money."  
- Pecan Street Homeowner, Austin, Texas

## Results:

Smart grids allow more flexibility in energy systems for both providers and consumers, while supporting green economies and improving efficiency. While smart grids and smart technologies present many benefits for cities searching for climate adaptation solutions, they are not yet financially accessible for all communities. Governmental policies and aid and advancements in the private sector could help make smart technologies available for everyone.

## Conclusion:

The United States would greatly benefit from the integration of a smart grid energy distribution system by improving efficiency and resiliency through the financial advantages, policies, consumer control, climate conscious, and information security, which will aid in combatting energy insecurity and climate change. Despite this, there are social equity concerns, making sure this technology is accessible and affordable for everyone without raising electricity costs.