Energy Gang Portfolio

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Assignment 3/4: Digital Storytelling: Vision to Proposed Plans

How they are told, who tells them, when they're told, how many stories are told, are really dependent on power. Power is the ability not just to tell the story of another person, but to make it the definitive story of that person.
-Chimamanda Ngozi Adichie

Digital Storytelling

Include your Digital Storytelling work at the top of the page. Many of you have already been experimenting with this idea of how to bring your vision into a narrative framework through your City Sensing work. You should use those experiences and material as a good first step in thinking about how to do digital storytelling. People narrated over a video trail walk, narrated over images, and told really beautiful stories that placed themselves, and material together. We are asking that you repeat this, but focus on aspects of the topics you have chosen. Tell a human, emotional story.

You can find resources here:
https://digitalstorytelling.coe.uh.edu/page.cfm?id=22&cid=221

If you want to see stories without the media richness, but beautifully told narratives here are some from our own community: https://news.virginia.edu/content/double-take-two

If you want a depiction of how to integrate a narrative over digital media to help evoke a response coupled to narrator insights (not solving) check out this item that was shared from the IX sensing (thanks Sean): https://youtu.be/ES5jlog31CmY

Vision

~~By reconfiguring the energy grid in areas where the Charlottesville community is underserved, and by utilizing hybrid energy sources and implementing strategies to increase community awareness, we can establish a norm in Charlottesville where the grid is designed and built with long-term goals in mind; power lines are easy to maintain, energy is sourced renewably and from a mixture of sources, and that the community is informed about their energy consumption, able to make reasonable and helpful decisions regarding energy choices, and is supported by a grid which does not restrict their ability to form and proliferate their social organizations. Our communities are made aware of their energy impact, are able to embrace clean energy, and the power grid consistently provides power to all communities, and helps them maintain their economic, social, and industrial viability.~~

By addressing multiple issues surrounding energy in Cville, we hope to serve those who are disenfranchised improve their energy use. The main focuses of our approach will be diversified energy sources, as well as community awareness of energy consumption. For the grid aspects, our goals are to improve the current grid for long-term durability. This will be combined with diversified energy sources, such as solar, wind, and nuclear. However, these changes will meaningless without community engagement. Hence, we will emphasize awareness among our targeted communities. This will consist of information about energy options from our diverse portfolio, as well as incentives for individuals to reduce their personal usage. Our two pronged approach will create an effective system of energy provided to a community, as well as a community aware and involved in the energy at their disposal.

There is a distinct stratification of resources across the various income brackets of Charlottesville, as is the case with every city of the world. Electricity is one of these things, but we maintain that it shouldn't be; with electricity being as ubiquitous and cheap as it is for most people, we believe that electricity should be a right. Yet the impoverished often receive unreliable power delivery and generation methods indicative of societal apathy and perhaps greed as far as energy consumption and electrical grid maintenance. We hope to serve the electrically disenfranchised through a dual approach of 1) improving the current electrical grid's robustness through diverse green energy sources such as solar power and wind power in addition to improving its reliability and durability and 2) increasing awareness of energy systems and consumption by informing the general public about their energy footprints, energy source diversification et. al, and additionally creating incentive programs emphasizing the reduction of energy consumption. Our two-pronged approach will create a robust city-wide power management system that is augmented by an energy-aware community equipped to make choices that increase city-wide energy efficiency such that there is surplus power actually available for the electrically disenfranchised.

Background and Literature Review

One major step towards a better grid is decentralization, as described by Kalee Thompson in her article on smarter power grids. Finding new sources of energy, with wind and solar, and new storage places, like local battery centers or even peoples' cars. The goal is consistency, as well as data to track current performance for any improvements or maintenance. It can even be broken into tidal levels as the new service models discussed in UNST ("How To Create A More Resilient Power Grid"). However, getting this kind of smaller scale work could be difficult to convince people to buy into. Some may just trust the one grid. That's where modeling can save the day. Research has been conducted to model different energy sources and endpoints to optimize the grid based on these inputs (Bayatloo and Bozorgi-Amiri). While the model was tailored to a Middle Eastern region, the approach can be tailored to other cities and regions if needed. And, even if we don't use the exact model, the underlying principles could be applied to diversify the grid as best needed.

Adding to the idea of grid improvements, we also need to have good solutions for the cases when finding new sources of energy is not possible as the result of something like a natural disaster. Utilities use 'Outage Management Systems' that have shown potential to reduce outage durations by as much as 25% ("IEEE Smart Grid"). Using AI, we can greatly increase the predictive capabilities of these systems in an attempt to finely control the wide variety of sources we are targeting efficiently and accurately in a way that doesn't cause problems for any one participant. AI has been shown to reach amazing levels of accuracy with relatively complex modern pattern problems. Shenzhen, for instance, is already using AI in various industries such as farming to greatly increase farm productivity and monitoring capabilities. Work is already being done to get the preemptive decision-making right so that if a disaster does hit, solutions are already in the pipeline, such as a "deep learning method for estimating the repair and restoration time using historic outage data and weather forecasts" ("IEEE Smart Grid"). Furthermore, AI sort of ties right into the idea of a smart, connected city by "consolidating information from different sources , such as smart meters, social media, customer phone calls, and protection devices for faster and more accurate damage assessment". Damage assessment is a key thing to get right here because it directly determines how strong the restorative action has to be.

Research Questions and Division of Labor

What areas of Charlottesville most need improved grid technology to improve their living conditions and provide future opportunities to the area?

Michael: To what extent would renewable energy sources benefit those in need? Would they benefit those in need at all, or would they reduce the power of the grid?

Jack: Who is willing to change their lifestyle to reduce their power consumption, and what steps can we take to encourage this change?

How does the culture of the students and community interact with the behaviors related to sustainability?

Keerthi: Which incentive programs exist to support our vision of a more conscious and integrated energy system? How could we make any of these work for Charlottesville?

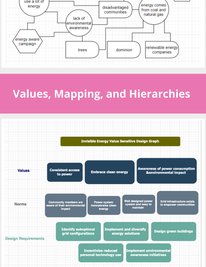
What are the social and physical constraints to implement a new power system?

Jimmy: How do Chinese and American people differ in their views on energy consumption?

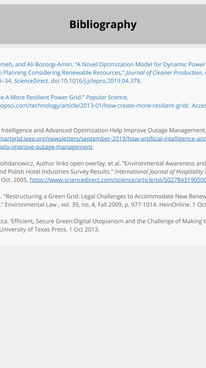
To what extent does our existing political structure differ from China's, in how we can implement reasonable chang

Stakeholder Diagram and Analysis

Dominion - maintain power; provide power to new neighborhoods; maintain energy production efficiently
Citizens - have lights, computers, phones; become eco-conscientious
Power-line workers - deal with repairs, upkeep; track wire scheme, grid effects
Scientists - improve technologies; reduce cost or improve efficiency
Solar panel companies - observe market trend; increase efficiency; provide know-how and products
Environment - flora and fauna; emissions; land management
Meteorologists- predicting weather patterns and contacting power companies
Local Government - define standards and administration of public works initiatives



Values, Mapping, and Hierarchies



Bibliography

Bayatloo, Fatemeh, and Ali Bozorgi-Amiri. "A Novel Optimization Model for Dynamic Power Grid Design and Expansion Planning Considering Renewable Resources." *Journal of Cleaner Production*, vol. 229, Aug. 2019, pp. 1319–34. *ScienceDirect*, doi:10.1016/j.jclepro.2019.04.378.

"How To Create A More Resilient Power Grid." *Popular Science*, https://www.popsci.com/technology/article/2013-01/how-create-more-resilient-grid/. Accessed 2 Oct. 2019.

"How Artificial Intelligence and Advanced Optimization Help Improve Outage Management." *IEEE Smart Grid*, https://smartgrid.ieee.org/newsletters/september-2019/how-artificial-intelligence-and-advanced-optimization-help-improve-outage-management.

panelPaulinaBohdanowicz, Author links open overlay, et al. "Environmental Awareness and Initiatives in the Swedish and Polish Hotel Industries-Survey Results." *International Journal of Hospitality Management*, Pergamon, 25 Oct. 2005, https://www.sciencedirect.com/science/article/pii/S0278431905000708.

Ferrey, Steven. "Restructuring a Green Grid: Legal Challenges to Accommodate New Renewable Energy Infrastructure." Environmental Law , vol. 39, no. 4, Fall 2009, p. 977-1014. HeinOnline. 1 Oct, 2009.

Slayton, Rebecca. 'Efficient, Secure Green:Digital Utopianism and the Challenge of Making the Electrical Grid "Smart". University of Texas Press. 1 Oct 2013.