World Without Fossil Fuels - Video Notes

- Checking & Savings analogy to energy sources where solar & biomass are income (checking acct) and fossil fuels are our "collective savings"
- Clean energy production is not new – technologies have been understood and applied for centuries; supremacy of oil over already-existing clean methods is related to profits, control, manipulation, monopolies
- World w/o oil alternative reality game in 2007
    - Players' experiences demonstrated ingenuity, behavioral changes, and sparked discourse – all of which are important factors in "real world" progress

Reading Notes

Pathways to a zero-carbon economy: Learning from large scale de-carbonisation John Wiseman

- Major obstacles hindering decarbonization are social and political – without discounting technological & financial hurdles
- Common priorities and recommendations among government authored strategies include carbon taxes, policy measures, business & consumer incentives, and public awareness
- Rapid improvement strategy in industry: energy co-generation through recycled heat energy
- Concept of *prosperity without growth* (Tim Jackson) – reframing what flourishing, prosperity, and success looks like and how it is defined; change from unlimited consumption to wellbeing and social cohesion

Daily or personal notes and observations

- Socio-political hindrances slowing transition to clean energy production are evident through personal & corporate greed, divisive ideologies, and prioritization of pressing matters
    - Corporate/ industry greed: example of electric- vs gas-powered cars. 2006 film *Who killed the electric car?* demonstrates corporate efforts made to advance gas vehicle production for profit. Today, oil companies are beginning to invest in natural gas & electricity to keep up with growing EV demand without losing profit https://cleantechnica.com/2019/10/09/breakdown-of-interdependency-between-big-auto-big-oil/
    - Divisive ideologies: advocating for clean energy, environmentally beneficial design, etc. can push people into the "tree hugger" box that is often associated with "leftist/ liberal" ideologies which can shun people out of communities (U.S., Brazil, and other growing number of places globally)
    - Prioritization of urgent issues: oftentimes this topic is moved down on the list of important matters when compared to allocating monies towards addressing business opportunities, violence, health issues (not to diminish the importance of any) but all urgent issues should and can be addressed simultaneously because they all impact each other

Energy cogeneration: A strategy for de-carbonization and resiliency

This method is commonly known as combined heat and power (CHP) where heat energy resulting from electricity generation is recycled and used productively rather than wasted. The system can use both fossil- and renewable-based fuels. The most common fuel used in CHP is natural gas, but other common fuels include biogas and biomass. Wiseman's 2014 *Pathways to a zero-carbon economy* report claims CHP is a promising strategy in industry because the practice is highly energy-efficient addressing concerns related to energy consumption and demand. In the report, the strategy is only addressed under industrial uses because there must be a substantial and continuous generation of electricity or mechanical power demanded by the facility's operations. Other applications of CHP include commercial, institutional, and utilities. While traditional centralized power plans and boilers perform at approximately a 50% efficiency, CHP localized systems perform at approximately 75% efficiency according to the Office of Energy Efficiency & Renewable Energy from the US Department of Energy [DOE].

A common CHP configuration consists of an engine or turbine that generates electricity from a gas or liquid fuel, while the heat exhausts from the generation is recovered and used for heating or cooling the system or the facility. The electricity is used in the facility or stored for later use. Another common configuration, especially useful with biomass, involves using a boiler to power a steam turbine where the steam powers a generator for electricity, and the excess steam or hot water is used for cooling and heating purposes.

In addition to energy efficiency and waste minimization, a major benefit for CHP users is the financial advantage. High efficiency decreases energy related costs, especially those subject to market fluctuations and uncertainties. Not only are these benefits enjoyed by individual industrial users, but also by greater communities and regions, especially when it comes to resiliency. Critical infrastructure facilities, such as hospitals, schools and universities, police and fire stations, lodging, and airports, among others, are examples of some institutions that implement CHP and can be crucial points of resources for communities during disasters (DOE, 2018). While implementing CHP in institutional settings for disaster preparedness and relief is important, its use should not be exclusively for disasters. Rather, CHP technologies should be expanded to diversify and optimize localized clean energy generation and usage.

An example of CHP implementation for community resiliency is in Fairfield, CT. Significant investments have created a resilient microgrid system consisting of natural gas, solar PV, and reciprocating engines to continuously power the town's critical infrastructure, including the local shelter and cell phone tower (DOE, 2018). According to the Office of Energy Efficiency & Renewable Energy, Florida is among one of the states with the highest technical potential to implement CHP at critical infrastructure sites. Taking advantage of this potential seems like a promising step in de-carbonization, especially in a state that is frequently at high risk for natural disasters which result in prolonged power outages.

Microgrid at the University of California, San Diego implements solar PV and natural gas-fired combined heat and power to generate approximately 79% of its own energy.

Financial challenges and constraints are identified as key obstacles preventing a rapid shift towards a world without fossil fuels (Wiseman, 2014). Energy co-generation may have a high initial cost, like most other investments in various industries, but the long-term energy and financial savings from this strategy should be an indicator of long-term financial promise and trend towards a circular economy.

Clean Coalition (n.d). *Microgrids across the United States.* https://clean-coalition.org/community-microgrids/microgrids-across-the-united-states/

U.S. Department of Energy [DOE] Office of Energy Efficiency & Renewable Energy (n.d.). *Combined heat and power basics*. https://www.energy.gov/eere/amo/combined-heat-and-power-basics

U.S. DOE Office of Energy Efficiency & Renewable Energy (2018). *CHP for Resiliency in Critical Infrastructure.* https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/CHP_Resiliency_in_Critical_Infrastructure_0.pdf

Wiseman, J. (2014). *Pathways to a zero-carbon economy: Learning from large scale de-carbonisation strategies.* Visions & Pathways. https://apo.org.au/sites/default/files/resource-files/2016-03/apo-nid70173.pdf