environment 155 final project, fall 2022

ENERGIZING CHANGE

a zine exploring an equitable energy future

CALLING FOR A JUST TRANSITION

Dear Reader,

Energy is an integral and indispensable part of human lives. We use energy to power everything: from toasting bread to monitoring vitals during life-altering procedures. Most of our energy resources come from extracting resources from land: coal, oil, and natural gas. Currently, our systems and economy are built upon the fact that natural resources are "free", and we only have to pay for their extraction. With the primary goal of fueling efficiency and making a profit, we have neglected to care for and respect our land, as well as, the animals, plants, and people living on it. The fossil energy system has polluted our earth and has stolen from, exploited, and burdened our Black, Brown, and poor communities

It is clear that if we are to continue sustaining life and mitigating human-accelerated climate change, this energy system must change. *In this zine, we explore a few of the obstacles between the fossil fuel past and a* ***'just' energy transition*** *to a healthier, equitable future*.

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WHERE IS MY WATERMELON CUTTER!?!

BY ANGEL MORE

With fossil fuel energy and capitalism, we have accelerated time.

Imagine a very cold winter, so cold that humans wouldn't be able to work in those conditions. Nothing much would get done, but with the introduction of fossil fuels, we get any and all work done. Fossil fuels power trains and machines that can work in harsh conditions. Fossil fuels have fundamentally changed the way we experience time and seasons. Anything can be done, at any moment, quickly.

You can see this acceleration of time replicated in the fashion industry. Walk into Forever 21 today, and then go there in a month (maybe even 2 weeks), and you will see completely different clothing being sold. Fast fashion and the constant churning of new trends contribute much to our landfills, emissions, and obsession with seeking out the next **NEW** thing.

On the other hand, past emissions from fossil fuels in the atmosphere are affecting us now—shown through recent environmental effects like extreme heat and floods—while our emissions from today will affect us in the future. Our past is coming to haunt us.

Time is no longer linear. Maybe it looks like this:

The History of Rising Fossil Energy Use

Andreas Malm helps us understand the complex history of fossil fuels becoming our central source of energy. Prior to fossil fuels, water power was the leading energy source; it was popular and cheap. When coal came along, people didn't like it–coal changed their way of life – and the atmospheric consequences were known. However, the drawbacks couldn't compare with the advantages; with coal, you could transport it, store it, and work at any time. Coal could replace labor and allow for more productivity; thus, with the rise of fossil fuels, a commodified labor market was created. The British cotton industry was able to launch cotton manufacturing off of fossil fuels and create a competitive market, with more factories, more power, and more labor. Competitive markets and capitalism were built alongside the rise of fossil energy.

The rise of the fossil fuel economy transformed labor into a commodity. It reduced humans to a wage, a number. Sure, we are being more "efficient" and saving time when using coal, but we are acting like coal is a never-ending supply. We are constantly looking to expedite time without caring about the impact on the planet and labor conditions, and forgetting that one day we could run out of fossil fuels.

Humans were able to survive without Amazon Prime shipping and saving mere seconds just a few years ago. We must think about how time plays into a 'just' transition. How do we make reparations for past harms that will persist in ecosystems and bodies for decades? How do we experience time now, and is it necessary to strive for the capitalistic tendency of efficiency? Do we need to continue living our lives at 110%, or is there room to slow down and breathe? How are we elevating humanity by paying people horrible wages and sticking them in horrible conditions just so we can send someone their fourth "Chuzy Chef Watermelon Slicer Watermelon Cutter Kitchen Gadget" in less than 48 hours?

ECOSYSTEMS AND BIODIVERSITY

BY JOSE ROBLES

Renewable energy firms struggle to meet demand due to the intermittent availability of renewable resources (sunlight, wind). One solution is expansion of generation, but several issues quickly present themselves.

Renewable energy sources tend to lack reliability when producing power. Turbines require wind, and solar panels require sunlight, both of which are inconsistent and unpredictable. Humans have no control of the weather. To compensate, multiple sites, with varying sources of production, are utilized to mitigate the impact of these unfavorable events.

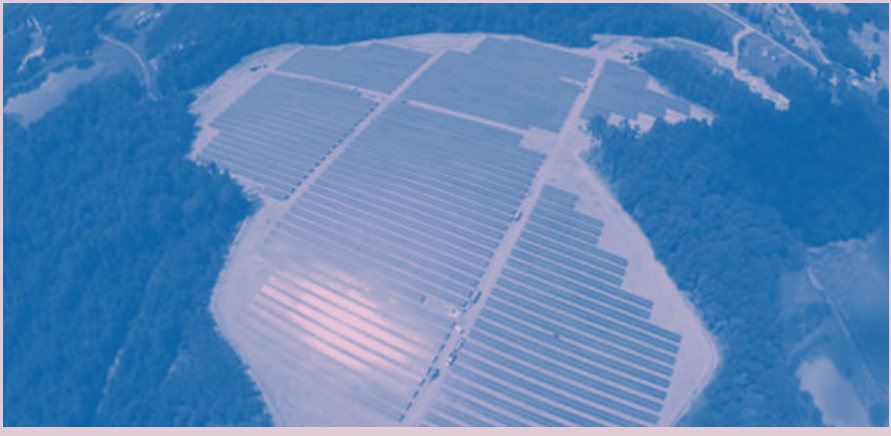
Issues arise when teams realize that flora and fauna must be disrupted in order to establish new infrastructure. Instances include: the **clearing of forests** for solar fields, **disruption of waterways** for dams, and the **endangerment of birds** by spinning turbines. These actions disrupt ecosystem health (Spillias, 2020). A potential solution would be to develop renewable energy sources on already established infrastructure.

For example,

- Solar panel installation on the roofs of homes and buildings.
- Use of elevated solar arrays to shade crops that are intolerant of direct sunlight, like coffee
- The use of wave generators to protect the coastline acts as a sea wall.

A just energy transition includes biodiversity protection. Ultimately, our pursuit of sustainable energy is rooted in climate action, which is motivated by environmental stewardship and ecosystem service preservation.

If we reach zero emissions but decimate biodiversity in the process, have we succeeded at all?



LAND USE AND RESOURCE DEPLETION

BY AVA MCCANDLESS

A prominent oversight in the sustainability of renewable energy is the amount of land use across all aspects of a renewable's life cycle analysis: creation, usage, and disposal.

Solar panels are regarded superficially as "zero-emission" energy generators, but this description fails to acknowledge the emissions that are created during the extraction and manufacturing stage. This also applies to the production of batteries for electric vehicles. The quartz for photovoltaic solar panels, and nickel and lithium for batteries all require invasive mining operations (Turley, 2022). This is a crucial consideration for a just transition because *if our race to renewables involves a proliferation of mining in vulnerable communities, regions, or countries, it will ineluctably replicate environmental injustice patterns of the fossil age.*

Moving forward to the usage phase of a renewable's life cycle, there must be careful thought given to the placement of energy generation. A distributed system grounded in large-scale generation plants located far from most consumption has been the system of fossil modernity, but it is not conducive to equitable distribution of environmental harms and benefits.

RENEWABLE ENERGY HAS A LIFE CYCLE

When undeveloped land is purchased, or taken from its dwellers by dispossession, and turned into a solar farm, its ecology is significantly altered. Species habitats may be fragmented, rainwater infiltration can be reduced, agricultural potential is limited, and open space is depleted. To reiterate the solution offering of the previous section, a just energy system will creatively utilize already-developed land before considering untouched land. And, when it does come to new development, communities must be the architects and decision-makers of facility placement.

Lastly, the endpoint of renewable infrastructure shall not be treated as negligible. Solar panels and turbines have lifespans, and we must have plans for their demise before we rush into their creation. Solar panel recycling programs need significant funding and implementation. Wind turbines are made of several layers of mixed materials, rendering recyclability extremely difficult. Thus, we are tasked with the question of where they go when they are no longer functional. Again, there must be rules around waste from the renewable energy system, or else communities burdened by fossil waste may be harmed again.

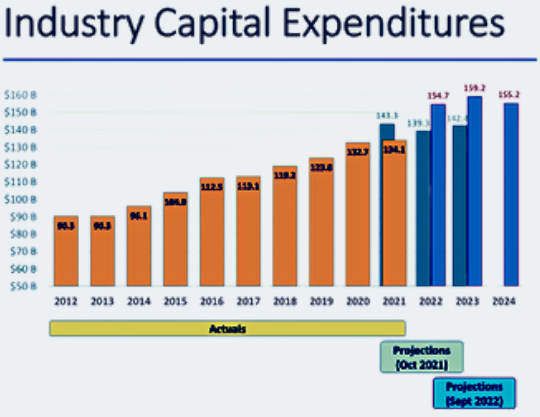
All this to say, renewables are wonderful, and necessary, ***and*** nuanced, and imperfect. Renewables are a tool to a just energy future, but must be coupled with strategies like distribution and energy use reduction. The goal is to break the fossil-established cycle of extraction, land dispossession and ecosystem pollution, rather than perpetuate it behind a "renewable" facade.

UNLOCK THE GRIDLOCKED GRID

BY JACKSON SENDELL

The United States' electrical grid is complex, consisting of generation facilities and transmission and distribution wires. It has historically been centralized, meaning generation and management occurs geographically separate from consumption. **The grid is not compatible, in its current state, with renewable energy.** It functions on a "just in time" system, where utilities scrupulously balance supply with demand to meet economies of scale. Renewables, by contrast, are more variable, less predictable, and most cannot be generated on demand. The distribution wires are also intended to transport electricity in one direction, from generator to consumer. Renewable energy, such as rooftop solar, necessitates two-way flow.

From an economic perspective, grid transformation will require massive capital investment from the public and private sectors. Furthermore, a decentralized grid that would be more compatible with renewables will mean less revenue for utilities, meaning less profit AND less cash flow for maintaining the infrastructure (Kind, 2013). This raises the question, why would utilities spend money modernizing the grid if they don't see a future where they're included? Government intervention will aid the mission to prioritize function over profit.



Graph Source: EEI

Two potential solutions are:

1. **Transition the grid to a mainly decentralized system and thus reduce the dependency on centralized utility investment.**
2. **Find a working mix of centralized – with renewable energy sources, of course – utilities and decentralized technologies. This way, centralized utilities could continue to invest in the grid and its future.**

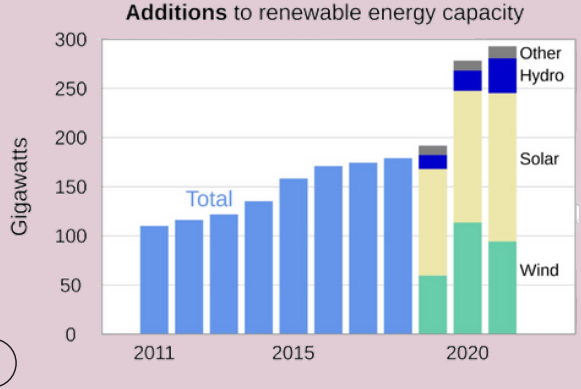
Above all, the reimagination of the grid must seek to enable energy democracy – a fully centralized grid will not suffice.

CALIFORNIA, LEADING BY EXAMPLE

BY ROBERT SMITH

California aspires to operate a carbon neutral power grid by 2045. To accomplish such a goal and to reap the benefits, California plans on investing heavily in both renewable energy and energy storage, while also moving away from fossil energy (Newsom, 2021).

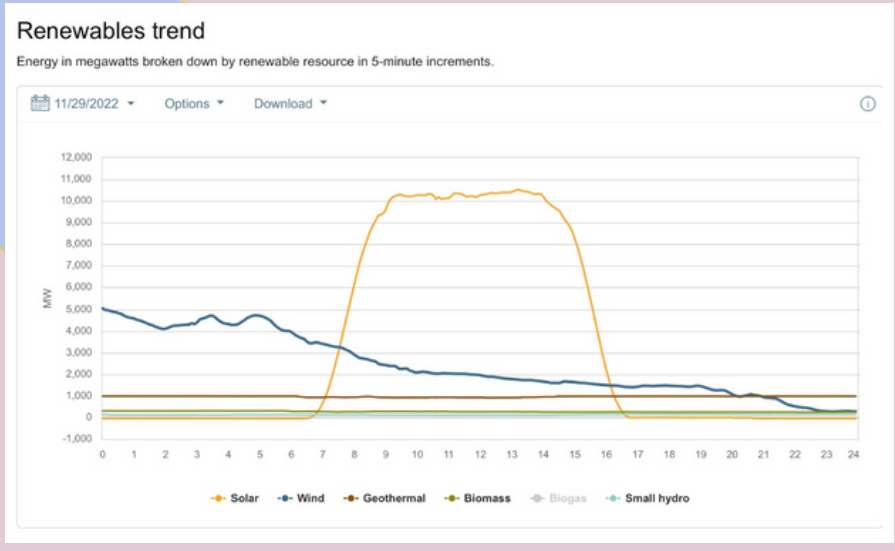
The California energy commission considers **solar, wind, small Hydro, biomass** and **geothermal** to be renewable energy sources. These renewables collectively accounted for 67,500 or **35%** of the 194,100 GWh of electricity generated within California throughout 2021 (California Energy Commission, 2021). Note, 126,600 GWh of electricity generated came from nonrenewable sources. If California is to achieve its 2045 goal, it will not suffice for current and future renewable energy projects to simply close this roughly 126,000 GWh gap. This is due to the fact that demand for electricity will increase as a result of population growth and the current transition from gas to electric for everything from cars to lawnmowers. Renewable energy requires infrastructure beyond current grid capabilities. Thus, California will be investing tens of billions to not only implement renewable energy into the power grid but to make it more capable as well.



This graph illustrates California's renewable energy additions as of 2020. For the past three charted years, wind and solar have seen the largest increase in production capability. This is because California aims to primarily rely on wind and solar to achieve a renewable power grid. Graph Source: IEA

California is well aware renewable energy production needs to be paired with a means of storage to fully replace fossil energy. Currently, California has the capacity to store just under 4000 MWh of electricity. The California energy commission predicts that California will need roughly 49,000 MWh of storage capacity to achieve a carbon-neutral power grid. So, California will be investing tens of billions into energy storage over the next couple decades.

It is important for California, and all other states, to recognize reducing consumption as a powerful tool, alongside storage, in bridging the gap between renewable capacity and energy demand. To synthesize the ideas of the previous four sections: the energy future will not look like the fossil past – there must be more sustainable consumption *and* less consumption over all.



This image illustrates renewable energy production in California during different times of the day. As you can see, solar energy production is relatively high between the hours of 6 AM and 5 PM in the winter months. Notice, this period of time is typically when the sun is shining. However, after 5 PM, solar energy production sharply decreases. Notice, this time period occurs when the sun is not shining.

Graph Source: CASIO

OUR PLAYLIST: *INSPIRED BY AN ALTERNATE FUTURE*

FOR YOUR LISTENING

OUR PLAYLIST: *INSPIRED BY AN ALTERNATE FUTURE*

FOR YOUR LISTENING

As we work to transition to a just and cleaner future, it is important to appreciate art, relationships with loved ones, culture, and anything else that brings us joy. Joy, a vital human emotion, is recognized in the environmental justice movement as a way to break away from the exploitive nature of capitalism. Since music is one of our greatest joys and creations, we have included a playlist of songs that we think speak to an alternate future—maybe even a future based on the past! Enjoy!

*** citations in white are sources from class syllabus*

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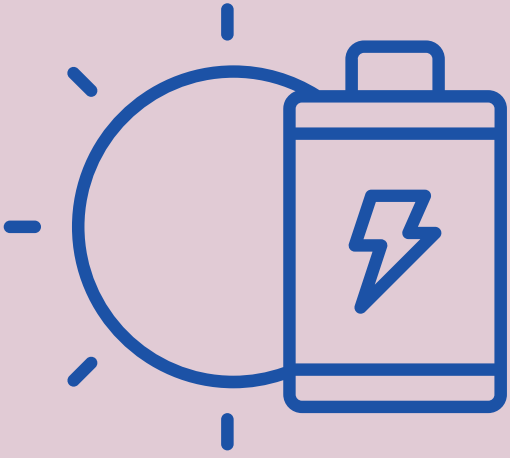
A JUST TRANSITION

What issues are facing the state and beyond to ensure a ‘just’ energy transition away from fossil fuels and towards renewable energy resources?

A look into the obstacles and pathways, curated by students of Environment 155



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