Welcome everyone, thank you for joining us
We know how busy you are, trying to change the world!
I want to thank my sponsors, Clean AIRE NC and Sierra Club, and also friends and colleagues who helped to make this presentation better
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<th>Session 1: Utilities in the US: The Big Picture</th>
<th>Session 2: The Regulatory Process in NC</th>
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**Session 3: Energy Justice: Why Is It Taking So Long?**

**Session 4: Communities on the Frontline**

| Tuesday, October 26                          | Tuesday, November 9                     |

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<th>Session 5: Power Generation: Cost vs Benefit</th>
<th>Session 6: Building a Clean Energy Future</th>
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The original title was “why HAS it taken so long?” but the REAL Q is “why IS IT TAKING so long?” because we are only at the stage of RECOGNIZING the injustices, not actually fixing them.

So why HAS it taken so long?
Because we have completely ignored the public health tragedies, environmental degradation, climate change, and compounding inequities of our current fossil-fuel dominated system.

WHO is ignoring these damages? The Public Utilities Regulators as well as the utilities they regulate. Everyone knows - it’s more than obvious. The rules that govern what regulators consider in electricity “costs” MUST be changed. Regulators will tell you “oh we are only ECONOMIC regulators, we don’t look at enviro issues.” This is unfair and tragic.

Let’s dive in and see what they are, and more importantly, how to change the system so that it is more fair, more just and more transparent.
Agenda: Session 3

1. What is an “EJ lens” and what are NC’s unique EJ risks?
2. EJ Lens: health and environmental damages
3. EJ Lens: location, location, location
4. EJ Lens: jobs and the economy
5. Why is EJ taking so long? Utility influence on gov’t

6. **Bottom line**: the disproportionate impact of dirty energy on vulnerable populations can no longer be “swept under the rug”
Pulling Back the Curtain

Session 3: What Are NC’s Unique EJ Risks?
Jim Hansen: sea level could rise 10 feet by 2060
- Due to instability of Greenland, Antarctic ice sheets as they melt
- NOAA warned US insurance co’s of the same
- Even 3 feet would be catastrophic – ESP. WITH HURRICANE STORM SURGE
- Hansen warns of chaos = flight from coastal cities worldwide
They are NOT the ones driving climate change with high energy consumption
-- Climate refugees might reach one billion by 2050 (U.N 2017)
-- 26 million [already] displaced by weather disasters every year
-- Disasters displace 3 to 10 times more people than conflict and war worldwide

U.N.: By 2050, world could have 1 BILLION climate refugees
NC: Coal Ash is Climate Threat

- U.S.: 100 toxic coal ash sites
- Current flood maps **underestimate** danger from heavier rains and floods
- NC: **6 coal ash sites**
- Cost to clean up NC’s coal ash: **$5-6 billion**
- Coal ash: mostly **unregulated**

- **Duke Energy doesn’t want to pay** for coal ash cleanup

- ash contaminates groundwater, toxic brew of contaminants and heavy metals, i.e. arsenic, lithium, cobalt, radium, thallium, molybdenum etc.
• NC: 9.7 million pigs/hogs; 700 million chickens
• NC has 3,300 waste lagoons
• Hog waste leaked from 30 ponds after Hurricane Florence hit in September 2018
• An additional 75 lagoons close to overflowing
• In 2016, Hurricane Matthew inundated 14 hog waste lagoons
  – Millions of animals died in flooding
Flooding = Injustice

When I first made this slide ~2-3 years ago, Durham had 8 days over 100 degrees F; and the average expected 2036-2065 was 49 days, now increased by 1-2 days/year

- "Wet bulb" temperature = air temperature + humidity
- In humid climates, +95 degrees F + high humidity is a deadly combination

### NC: Days 100+ Degrees F To Increase Dramatically

<table>
<thead>
<tr>
<th>WHERE WE ARE NOW</th>
<th>WHERE WE ARE CURRENTLY HEADED</th>
<th>WITH BOLD ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historically</td>
<td>1971-2000 average</td>
<td>38 days per year</td>
</tr>
<tr>
<td>9 days per year</td>
<td>51 days per year</td>
<td></td>
</tr>
<tr>
<td>2036-2065 average</td>
<td>Late Century 2070-2099 average</td>
<td></td>
</tr>
<tr>
<td>82 days per year</td>
<td></td>
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</tbody>
</table>

- TODAY: **Durham has 9 days** per year over 100 degrees F
- 2036-2065 average: **51 days** per year
- 2100: **82 days** per year
Don’t remember if you pointed out that with bold action we could keep it to 38. Also could mention that heat stress is the #1 weather-related killer.

cathy buckley, 10/23/2021
CBS News: natural disasters cost the U.S. $306 BILLION in 2018 alone

- 362 deaths, significant economic impacts
- 2017 was the third hottest year ever on Earth, only 2016 and 2012 were warmer
- 2018: North Carolina had warmest year ever recorded
- NOAA: July 2019: the hottest month on Earth-ever
- Hurricane Dorian: 185 mph sustained wind speeds
ClimACT Group at AppState - Oct 2021

IF YOU WONT ACT LIKE ADULTS WE WILL

THE CLIMATE CRISIS CAN'T HEAR YOUR EMPTY PROMISES

WHY IS MY TUITION MONEY KILLING THE PLANET?
Lancet Study: 75% of Young People Very Worried About Climate

- Surveyed 10,000 young people ages 16-25
- 10 countries, including U.S.
- Survey took place in early 2021
- 75% of young people think the “future is frightening”
- Young people in countries like Philippines and Brasil have very high rates, i.e. 90%+

https://grist.org/article/climate-anxiety-study-young-people-think-humanity-is-doomed/
Pulling Back the Curtain

Session 3: EJ Lens: Health, Environmental Damages = “Externalities”

STOP FOR QUESTIONS
“Health care costs and lost worker productivity are direct economic impacts of air pollution, so large they exceed the costs of climate policy.”

– Global Burden of Disease studies

**REPEAT 2 TIMES:** Clean energy technologies available TODAY would cost far, far less than the burden of air pollution

Shindell: “it would be unconscionable not to act [on clean energy transition because it would save lives and the most vulnerable].

*2017 Lancet Study* found that in 2015, air pollution killed 1.81 million people in India and 1.58 million in China.
• Dr. Drew Shindell of Duke University’s latest research: over the next 50 yrs:
  – Avoided deaths: $37 TRILLION
  – Avoided health care: $37 billion
  – Increased labor productivity: $75 billion
  – $700 BILLION PER YEAR in benefits from improved health and labor ALONE, far more than the cost of transition. The U.S alone accounts for roughly two-thirds of the benefits over the next 15 years

● Internal combustion engine vehicles are only 20-30% efficient
● Power plants are slightly better at ~35%
● Very best power plants, i.e. new natural gas plants, are 40-50% efficient
● NOTE: most of Duke E’s current fossil gas plants are converted from coal, so far less efficient, even less efficient than coal
What are externalities? Costs NOT included in the cost of goods.

For power plants, that means coal ash, air and water pollution, health and environmental damages, climate change.

Health: asthma, heart attacks, lost productivity.

EPA’s new tool measures the health benefits of EE/RE.

“Monetizes” $$ health benefits, i.e. benefit per kWh.

U.S. divided into 10 regions to account for different costs and quality of electricity, i.e. solar output in AZ versus NC.

Based on 2017 electricity costs.

COAL: 17-27 cents/kWh (cost to generate ~3-5.5 cents/kWh)

NATURAL GAS: 10 cents/kWh (cost to generate ~4-10 cents/kWh)

NUCLEAR: hard to say, since accidents like Fukushima in Japan have cost ~$187 BILLION (so far); nuclear industry is
exempt from the cost of accidents in U.S.
## Electricity: Costs Versus Benefits

<table>
<thead>
<tr>
<th>Source of Electricity</th>
<th>Cost to Generate 1 kWh</th>
<th>Externalities/Damages/Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>3 to 6 cents/kWh</td>
<td>17 – 27 cents/kWh; coal ash piling up, very toxic; mercury poisoning, 60% of all rivers and streams contaminated in U.S.; 40% of total mercury from coal; 66% of acid rain from coal</td>
</tr>
<tr>
<td>Natural Gas – Combined Cycle</td>
<td>4-6 cents/kWh</td>
<td>10 cents/kWh</td>
</tr>
<tr>
<td>Natural Gas – Peaker</td>
<td>7-30 cents/kWh</td>
<td>10+ cents/kWh</td>
</tr>
<tr>
<td>Nuclear</td>
<td>3-20 cents/kWh</td>
<td>Huge liability issues since utilities are essentially exempt from accidents; nuclear waste a big problem</td>
</tr>
<tr>
<td>Solar</td>
<td>3-10 cents/kWh</td>
<td>No water use; no air or water pollution; huge jobs benefit</td>
</tr>
<tr>
<td>Wind</td>
<td>2-5 cents/kWh</td>
<td>No water use; no air or water pollution; huge jobs benefit</td>
</tr>
</tbody>
</table>
Pulling Back the Curtain

Session 3:
EJ Lens: Location, Location, Location
Study finds marginalized communities bear brunt of U.S. climate crisis

BY SHARON UDASIN - 10/05/21 11:03 AM EDT

Disadvantaged communities in the U.S. are enduring the worst consequences of the climate crisis, as extreme weather conditions continue to exacerbate existing social and racial inequalities, a new study has found.

Growth of global heat ... correlates to US fracking boom, other methane emissions; NASA says most of the increased methane is from gas & oil; fracking is the worst

DESPITE PR fr DUKE, COOPER ... Duke's emissions are up b/c methane
‘The Harms of Fracking’: New Report Details Increased Risks of Asthma, Birth Defects and Cancer

The most authoritative study of its kind reveals how fracking is contaminating the air and water – and imperiling the health of millions of Americans

- Reviewed 1,200 peer-reviewed studies
- PROBLEMS: breathing carcinogens like benzene and formaldehyde, barium, strontium, can be radioactive, also asthma, and venting methane makes it worse, risk of leukemia
- Water contamination, pre-term births, birth defects, muscle spasms
- Huge number of trucks
- “Produced” water, which is wastewater laced with chemicals
Map of orphaned oil and gas wells from the [Washington Post](https://www.washingtonpost.com)

81,283 documented orphan wells across the country that were drilled and then improperly abandoned by oil and gas companies.

**Each orphan well** spews methane, a potent greenhouse gas 86 times more powerful at warming the planet in the short term.

The analysis also found that **about 9 million Americans live within one mile of an orphan well, including 4.3 million people of color and 550,000 children younger than 5** who are especially vulnerable to health problems tied to air pollution.

**The number of undocumented orphan wells could be as high as 3.4 million**, according to recent estimates from the Environmental Protection Agency.

There is a federal bill to address this problem
Duke Energy plans to build 10-15 fracked gas-burning power plants in the Carolinas over the next 15 years - or convert old coal plants into fossil gas plants.

Duke wanted to build the Atlantic Coast Pipeline to bring fracked gas from Pennsylvania and West Virginia to NC - initial cost ~$5 billion, final estimate ~$8 billion.
cathy buckley, 10/23/2021
U.S. Electricity Mix 2020

● NC is very susceptible to climate change losses due to low-lying land, hurricanes, already high humidity and summer temperatures

● NC imports all coal and natural gas, and cost of pipelines, transporting coal, health and enviro damages are huge and not counted.
Can you put the key on again?
cathy buckley, 10/23/2021
Cost of Natural Gas 1976 - 2009

Natural Gas Wellhead Price - In Current $

Price in $ adjusted by CPI Urban

• Methane or fossil gas is a super-potent GHG, 86 times worse for the climate than CO2
• Methane leaks ~2.5 to 5% in production and pipelines - could be higher
US heating bills will jump as much as 54% this winter, says government

Nearly half the homes in the US use natural gas for heat, and they could pay an average $746 this winter, 30% more than a year ago

Pulling Back the Curtain

Session 3: EJ Lens: Economics and Jobs
U.S. DOE: 79 Solar Jobs v. 1 Coal Job

Workers Required to Produce the Same Amount of Electric Power (2016)

- **Coal**: 160,119 coal workers produced 1.24 billion megawatt hours (7,745 per worker)
- **Natural Gas**: 362,118 natural gas workers produced 1.38 billion megawatt hours (3,812 per worker)
- **Solar**: 373,807 solar workers produced 36.75 million megawatt hours (98 per worker)

Source: US Department of Energy

## Clean Energy: More Jobs Per $$ Output

- Oil and natural gas: 0.8 jobs
- Coal: 1.8 jobs
- Energy efficiency: 7.0 jobs
- Solar: 5.4 jobs
- Wind: 4.6 jobs

Bottom line: Jobs per $1 million contribution to

The Reversing Origins of U.S. Corporate Profits, 1950-2004

Financial services increased from less than 10% to nearly 50% of corporate profits

Manufacturing declined from 60% to less than 10% of corporate profits

Source: Ray Dalio, Bridgewater Associates.
Pulling Back the Curtain

Session 3:
Are ANY States Counting the Costs of Pollution? YES!
Pulling Back the Curtain

Session 3: North Carolina’s Clean Energy Success Story
- NC has a fair amount of UTILITY-SCALE solar, relative to other states - but really this isn’t saying much
- NC has VERY FEW residential or business sized solar, i.e. ROOFTOP solar
- In many other states, rooftop solar is a substantial percentage, i.e. VERMONT
- We will look into this in greater detail in future sessions
North Carolina
Installed Solar PV
2005-2018

2nd in U.S.

Installed Solar
System Size
- Less than 100kW
- 100kW - 5MW
- Greater than 5MW

Data source: North Carolina Utilities Commission
NC Clean Energy Success Story: $12 BN 2007-2015, now $28 BILLION

- From 2007 to 2015, North Carolina had $12 BILLION in clean energy economic development
  - Includes energy efficiency, solar, wind, biomass and other resources
  - 82,400 full-time equivalent jobs
  - From 2007 until 2016, North Carolina taxpayers spent $322 million on tax rebates for clean energy, but returned $529 million in state and local taxes, so that every $1.00 spent on tax incentives returned $1.50

https://energync.org/ncseas-view-renewable-energy-tax-credit-continues-strong-roi/
https://solarstates.org/#state/north-carolina/counties/solar-jobs/2019
Top Ten Counties

- Iredell: 925
- Mecklenburg: 823
- Durham: 780
- Wake: 664
- Buncombe: 493
- Orange: 405
- Sampson: 300
- Union: 220
- Madison: 218
- Montgomery: 168

https://solarstates.org/#state/north-carolina/counties/solar-jobs/2019
Key; overlap.
cathy buckley, 10/23/2021
Clean energy/energy efficiency provide more jobs per unit of electricity generated

https://energync.org/rti2019/
### Top 5 Counties for Clean Energy Investment

**TOTALING OVER $2.844 MILLION**

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>TOTAL INVESTMENT</th>
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<tbody>
<tr>
<td>Duplin</td>
<td>$797.6 MILLION</td>
</tr>
<tr>
<td>Robeson</td>
<td>$690.9 MILLION</td>
</tr>
<tr>
<td>Cumberland</td>
<td>$468.8 MILLION</td>
</tr>
<tr>
<td>Bladen</td>
<td>$457.4 MILLION</td>
</tr>
<tr>
<td>Catawba</td>
<td>$430 MILLION</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$2.844.7 MILLION</td>
</tr>
</tbody>
</table>

Source: RTI Economic Impact Analysis of Clean Energy Development in North Carolina -2017 Update and 2019 Update
State incentives for clean energy between 2007 and 2018, including the now expired North Carolina renewable energy investment tax credit and state appropriations for the Utility Savings Initiative, totaled $1.2 billion. This has led to an additional $1.4 billion in tax revenue for state and local governments, an overall positive fiscal impact.

https://energync.org/rti2019/
Money spent on coal and gas leaves the state - poof!
With clean energy, money and jobs stay in NC!
Swine-waste-methane is also a problem, since some utilities call it “clean energy,” but it’s actually an abomination of energy justice
Dominion, and perhaps Duke E, way overcount the “value” of swine waste methane
Money spent on coal and gas leaves the state. Might be a goos spot to mention how swine gas is counted many times over, also cutting out solar and wind.

cathy buckley, 10/23/2021
Elected Officials and Regulators Must Realize Huge Risks of Current Path

- Elected officials, regulators and utilities must recognize that our current system does NOT include staggering health and environmental costs, which are obviously unfair and hit the poorest communities hardest
- Energy justice (Ej) must be part of all decisions - NCUC and NCGA
- Costs of clean energy are way down - need to count the BENEFITS, which include reduced health and environmental damages, as well as JOBS!
What we have is an electricity system that works for the INCUMBENTS and the FOSSIL FUEL industry, not regular people

Here’s what needs to change:

1. Lack of transparency
2. Lack of meaningful process, so that all voices are included, i.e. low income customers, wind advocates, solar advocates, health and enviro experts, non-profits – anyone who wants to
3. Utilities don’t count the staggering environmental and health damages from fossil fuels; and regulators look the other way
4. Utilities look honestly at future fossil fuel supplies, including oil, fossil gas (fracked and conventional); and regulators look the other way.
- This slide is from [Stanford Professor Mark Jacobson](http://markjacobson.stanford.edu), who did an analysis of every state in the U.S.
- NOTE: NC’s clean energy solutions rely heavily on OFFSHORE WIND and UTILITY-SCALE solar, but rooftop -- AKA “distributed” solar - plays a role, so that Commercial/gov’t/rooftop solar could provide ~10% of electricity.
- The value of local, rooftop solar is that it’s close to “load” i.e. CUSTOMERS, and the value is going up as the climate changes.
- CSP, which could provide 5% of NC’s electricity, is an acronym for Concentrating Solar Power, a solar “thermal” solution that heats up a liquid, which then heats water to turn a steam turbine. I won’t get into this technology because it’s primarily used in the Western US, where there is less humidity, i.e. water vapor. One reason why AZ can generate so much more electricity from solar PV or CSP is that the humidity is so low. Water vapor in the atmosphere dissipates the solar intensity. So CSP works in high-solar, low-humidity states like AZ, UT, CA, NV, NM.
- Recent outages in NOLA from Hurricane Ida showed that large
fossil gas power plant did not work as planned, so solar advocates have been trucking in solar panels to provide electricity

- Incumbents benefit from current system, but change is necessary and inevitable - people want FREEDOM of CHOICE, and Polluters must pay!
- Clean energy jobs FAR exceed the number of jobs for large, central station power plants - plus many other jobs, such as in energy efficiency, solar, onshore and OFFSHORE wind, which is just taking off, geothermal,
- Utilities build power plants to accommodate ‘peak power’ needs, so batteries are a threat; peakers run ~1-5% hrs/yr
- More distributed generation = less sales for incumbents; small decrease in sales = big decrease in profit
- Big power plants expected to run 30-40 yrs...or more
- Do what Germany did: allow ANYONE to buy and sell electricity, and make sure clean energy that’s generated is used FIRST
- Many good solutions - we just need to implement them
- Cost of clean energy way way down
- Proven, effective programs for low-income
- Financing of clean energy or energy efficiency upgrades is KEY - and doable
- More transparent and inclusive processes
- Information presented in a way that it makes sense to non-experts
- Ability to print basic information on-demand from utility filings such as rate cases, IRPs, renewable energy and other dockets
● More folks showing up in places like NC Utilities Commission (PUCs), state environmental offices
● Frontline communities, BIPOC, youth, activists, landowners, homeowners and others are demanding change -- change will happen!
● The electricity system is going through the biggest change since its inception: moving from large, polluting, fossil fueled central station power plants to clean, distributed electricity. Electric Vehicles are game-changers because of the potential to use car battery also as a home battery
THANK YOU

www.cleanAIREnc.org  www.sierraclub.org

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