



Center on
Global Energy Policy
at COLUMBIA | SIPA



Turning Plans for Green Electrons into Green Electrons

November 2, 2023 – EPRI

Both can be true:

Climate change is real. We need to act like it's a planet-killing crisis...

We are behind in the clean energy transition...

We are not spending enough on the clean energy transition...

A 100% green economy is largely an economics problem, not an engineering challenge...

We care about climate change...

... but we need to stay cool, celebrate wins, focus on cost, and not get (overly) depressed.

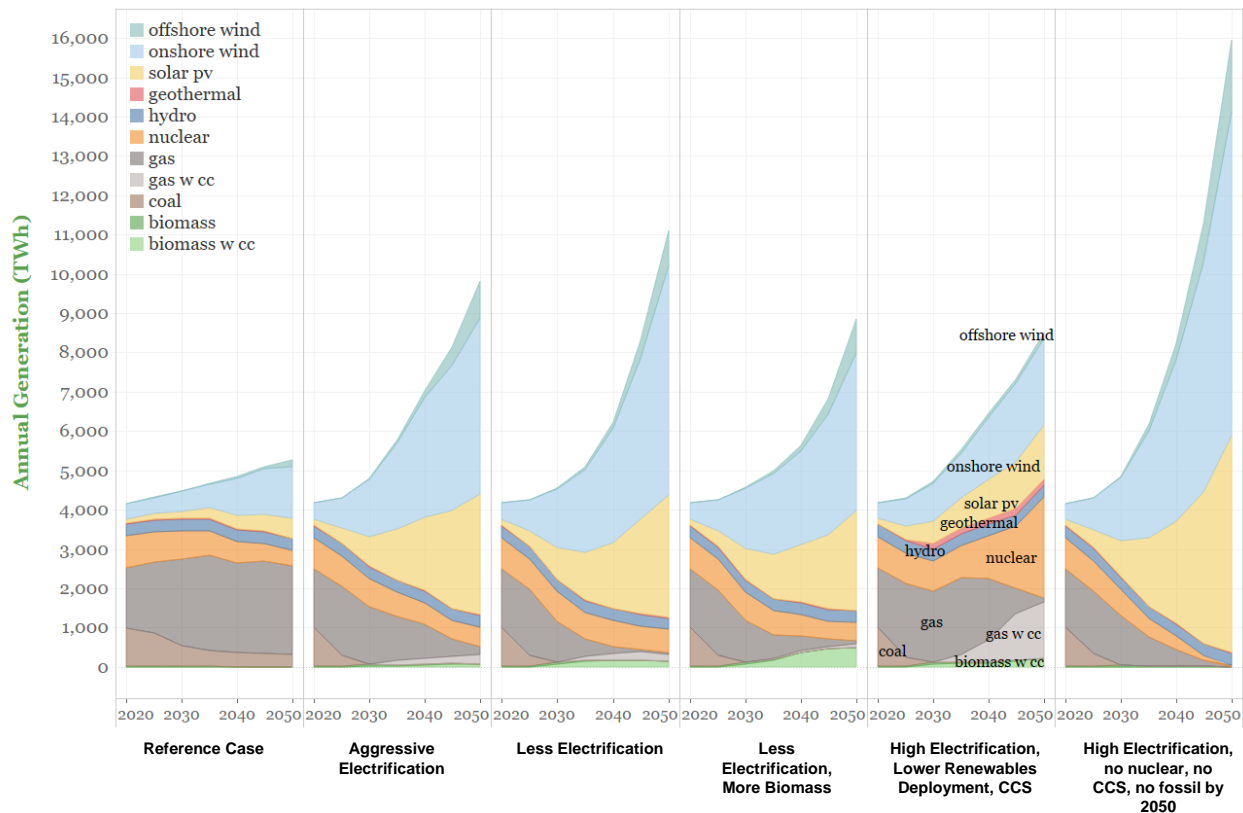
... but we're moving too fast for the grid.

... but energy poverty is real and exacerbated by clean energy spending.

... but energy markets evolve incredibly slowly.

... but [insert favorite infrastructure] is ugly and we need to preserve open space.

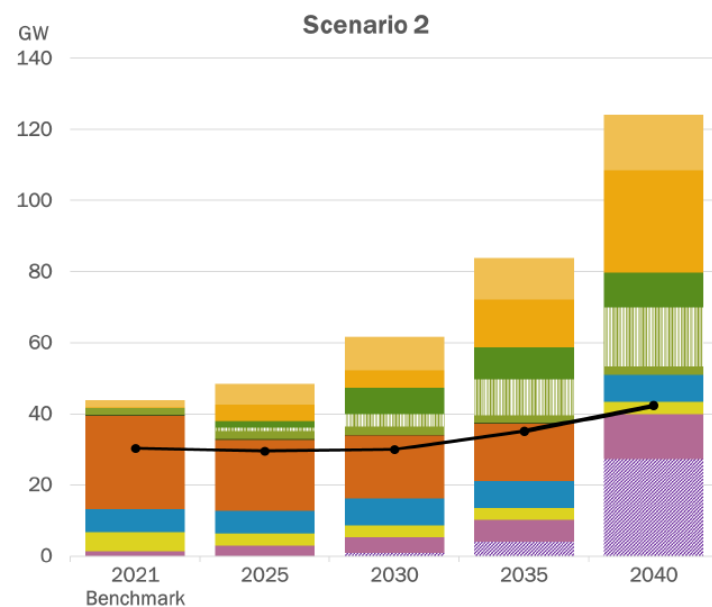
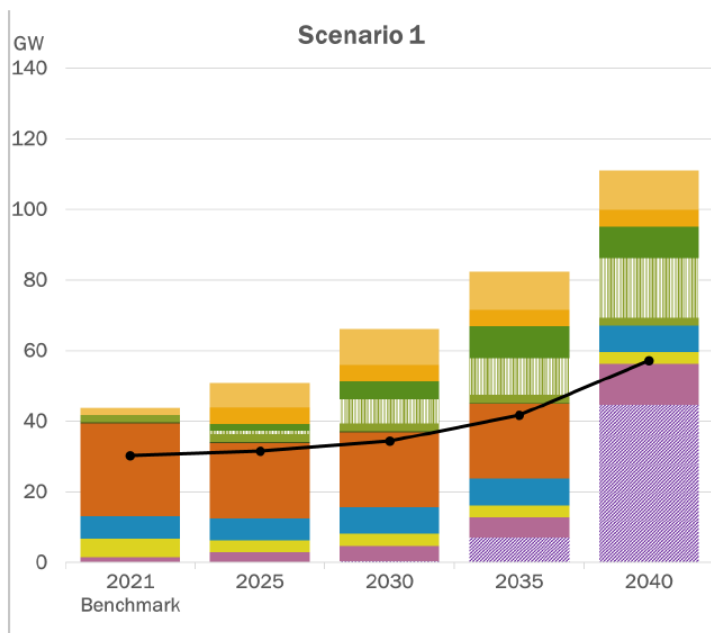
Trend #1: Uncertainty and (too many?) Options



Princeton University, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Larson, et al.

[https://netzeroamerica.princeton.edu/img/Princeton%20NZA%20FINAL%20REPORT%20SUMMARY%20\(29Oct2021\).pdf](https://netzeroamerica.princeton.edu/img/Princeton%20NZA%20FINAL%20REPORT%20SUMMARY%20(29Oct2021).pdf)

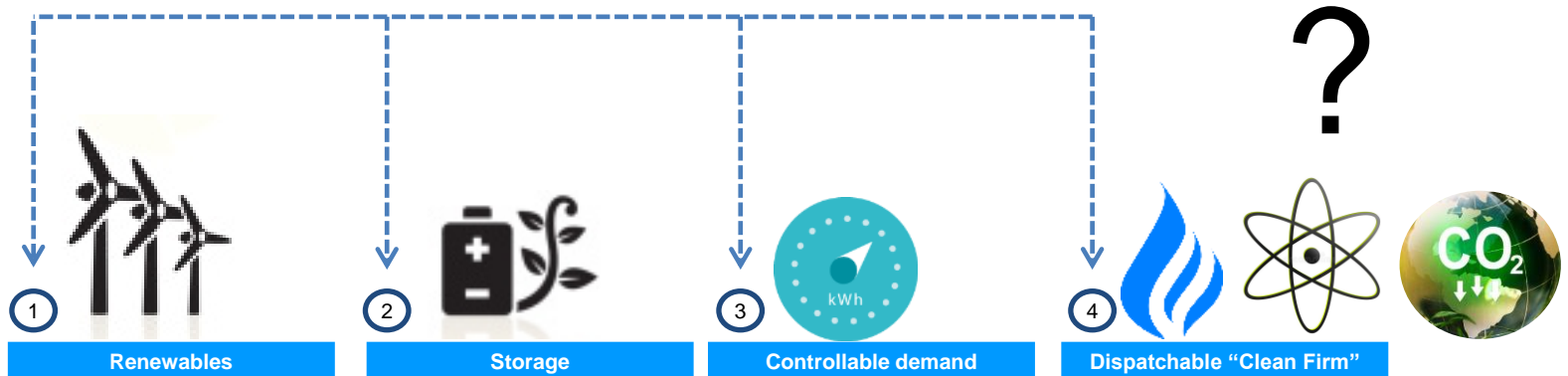
Trend #1: Uncertainty and (too many?) Options



- ExistingNuclear
- NewNuclear
- Hydro
- ExistingFossil
- NewFossil
- Other
- DEFR
- ExistingLBW
- NewLBW
- OSW
- UPV
- BTM-PV
- ESR
- Peak Load

Trend #1: Uncertainty and (too many?) Options

The Four Product Future:

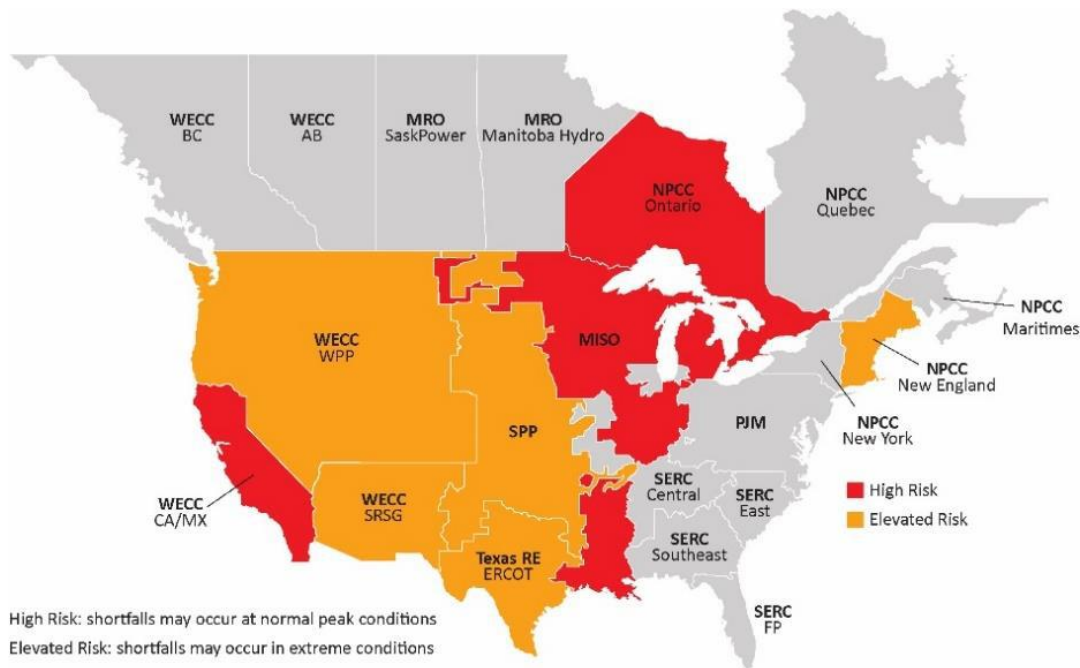


Adapted From: <https://www.nrg.com/insights/energy-education/the-four-product-future-transforming-the-energy-industry-today.html>



Ensuring reliability during and after policy driven transitions should be a key consideration in setting Energy Policy. The implementation of policy decisions can significantly affect the reliability and resilience of the [bulk power system].

Trend #2: Reliability Top of Mind



Source: The North American Electric Reliability Corporation 2022 Long-term Reliability Analysis

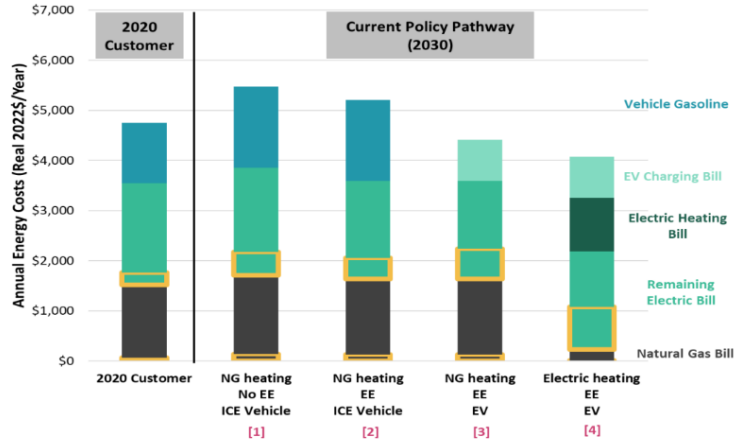


ERO Reliability Risk Priorities Report

North American Electric Reliability Corporation – August 2023

Trend #3: Cost Matters & is a Key Equity Consideration

FIGURE 3: ANNUAL ENERGY COSTS FOR RESIDENTIAL NON-LOW-INCOME CUSTOMERS UNDER THE CURRENT POLICY PATHWAY⁴¹



⁴¹ Yellow boxes represent the clean energy program costs within the distribution portion of the bills.

TABLE 3: RESIDENTIAL CUSTOMER TYPES IN 2030

Customer Type	Heating	Energy Efficiency	EV or ICE Vehicle
[1]	Natural Gas	No	ICE
[2]	Natural Gas	Yes	ICE
[3]	Natural Gas	Yes	EV
[4]	Electricity	Yes	EV

Energy Insecurity in the United States

- Among all US households in 2020, 33.53 million experienced some form of Energy Insecurity.
- 24.61 million reduced or went without food or medicine to pay energy costs.
- 12.36 million received disconnection notices.
- 6.03 million were unable to use an air-conditioner.
- 12.20 million left their homes at unhealthy temperatures to avert high energy bills.
- 5.08 million were unable to use heating equipment.

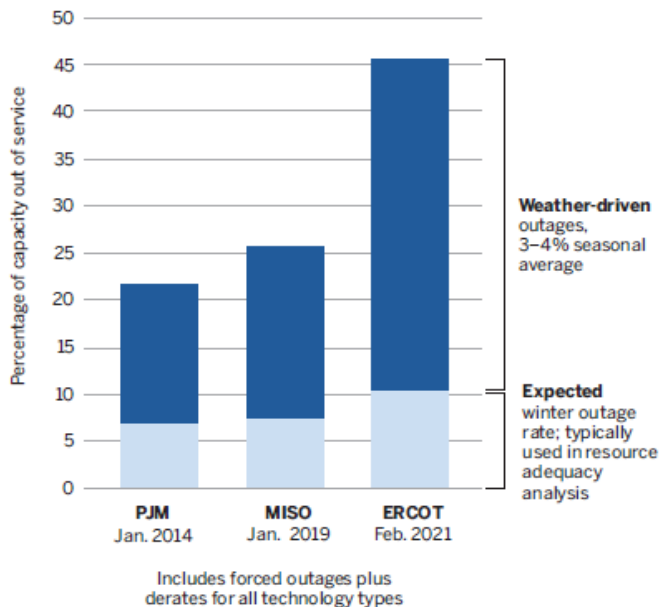
Source:

<https://www.energypolicy.columbia.edu/publications/energy-insecurity-in-the-united-states/>

Trend #4: Extreme Weather

FIGURE 12

Total Unplanned Outages During Recent Cold Weather Events



Source: Energy Systems Integration Group.

“...while randomly occurring forced outages are still important to consider, it is increasingly important to consider correlated generator failures and outages, due to either the underlying weather or other root causes.



Redefining Resource Adequacy for Modern Power Systems:
Energy Systems Integration Group - 2021

Trend #5: New Generation is Slow to Show

Future reliability assessments hinge on assumptions around how long it takes to study, site, and construct new generation resources.

- Over 2 terawatts of new generation is currently in the queue – enough to replace every generator in the United States.
- Even long-term contracts with creditworthy counterparties aren't sufficient guarantee of success in rising rate environments.
- Tariffs and supply chain disruptions compound uncertainty

Despite the sizable nameplate capacity of renewables in the interconnection queue (290 GW), the historical rate of completion for renewable projects has been approximately 5%.

-- PJM Interconnection Energy Transition in PJM: Resource Retirements, Replacements & Risks

Offshore Wind Firm Cancels N.J. Projects, as Industry's Prospects Dim

Denmark's Orsted said it would be forced to write off as much as \$5.5 billion as wind developers in the U.S. face wrenching financing costs.

Another New England Offshore Wind PPA Cancelled

Offshore wind projects in New England are being terminated as the cost of completing them has risen sharply this year.

New York rejects Ørsted, Equinor and BP bids to adjust offshore wind contracts

The developers say increased costs have left the projects financially unviable, but the state said granting their petitions would pass billions in costs to ratepayers.

Offshore

Offshore contract cancellations likely following NY decision

Sean Wolfe
10.20.2023

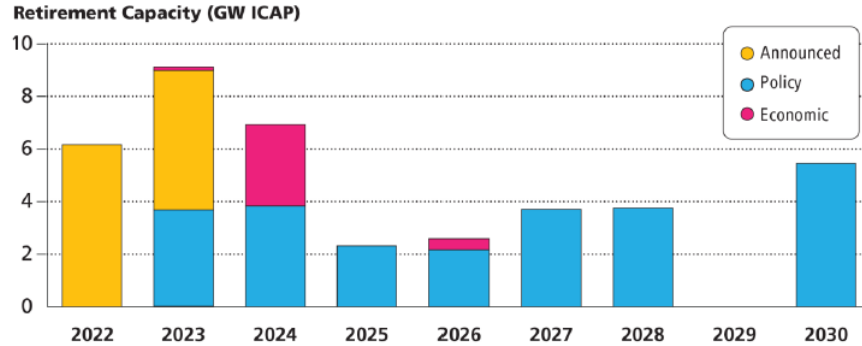


State & federal environmental policies are shuttering existing fossil resource...

... but new resources from coming online fast enough to replace them.

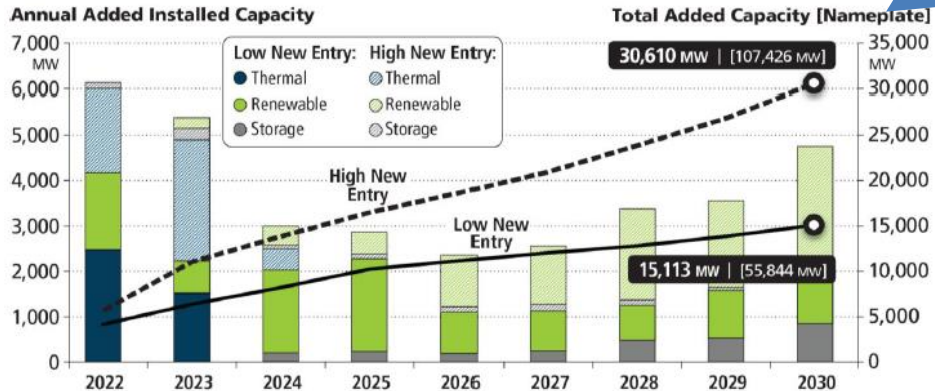
Trend #6: Retirements Keep Coming

Figure 1. Total Forecast Retirement by Year (2022–2030)

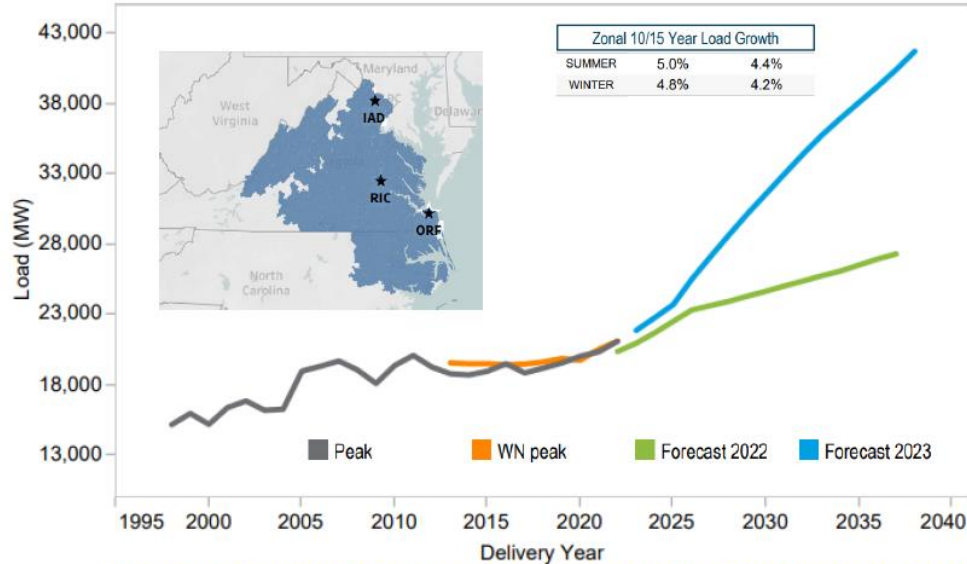


~ 40 GW of cumulative retirements by 2030

Figure 4. Forecast Added Capacity



Trend #7: The Load Growth Wildcard



<https://pjm.com/-/media/library/reports-notice/load-forecast/2022-load-report.ashx>

Dominion Energy tapped to build \$2.5B in transmission under PJM’s \$5B proposal

PJM staff also selected Potomac Electric Power, Public Service Electric & Gas, FirstEnergy, LS Power, NextEra and Transource to build transmission to address growing load and power plant retirements.

Published Nov. 1, 2023

Utility Dive, Nov. 1, 2023

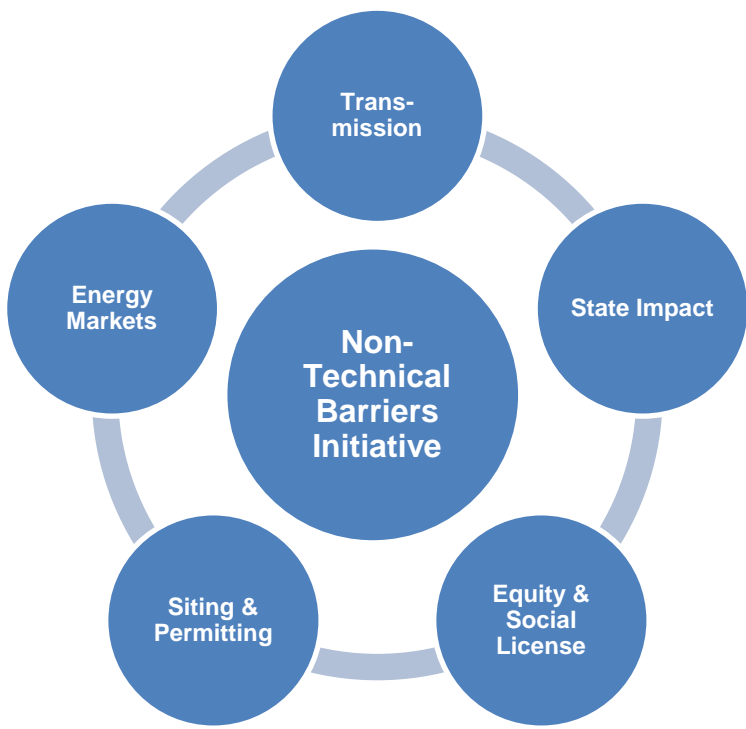


Driven by electrification, hydrogen production, data centers, crypto mining, and other computational and energy-intensive methods such as artificial intelligence (AI), **new loads can emerge and grow faster than generation and transmission can be built.**



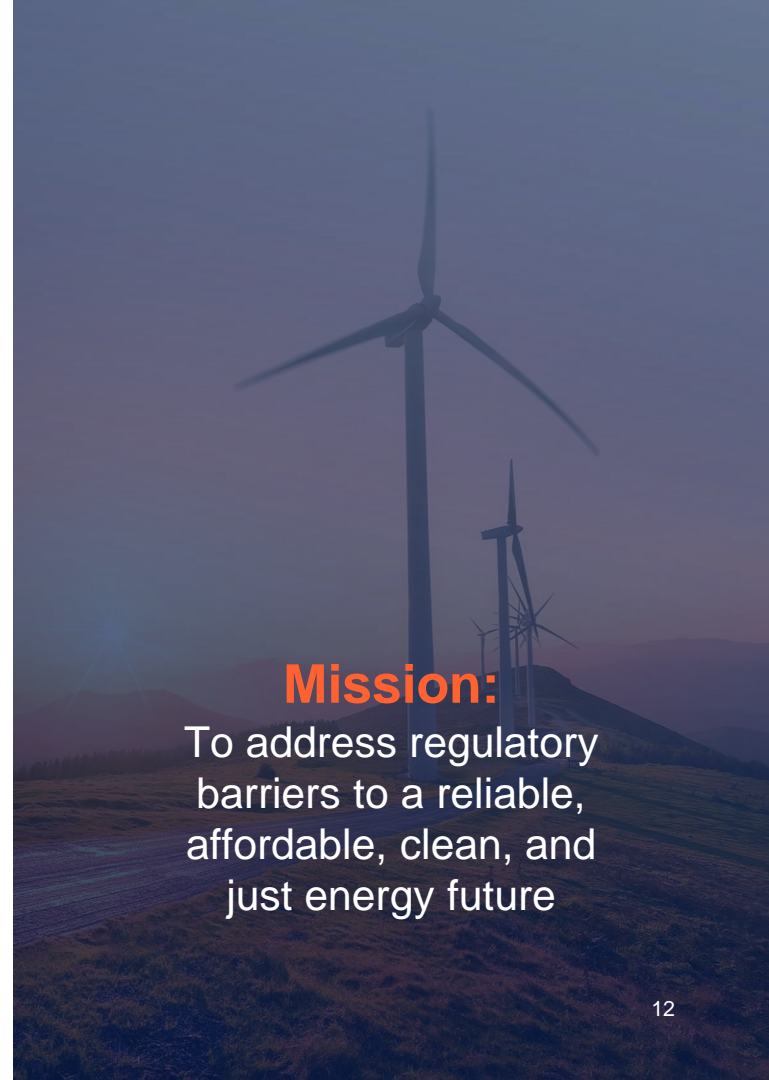
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August 2023
(Emphasis added)



Non-Technical Barriers:

Policies and regulations that delay or frustrate achievement of an expeditious transition to a clean energy economy



Mission:

To address regulatory barriers to a reliable, affordable, clean, and just energy future

State Impact Program

The path to a
clean energy
future runs
through
50 State
Capitals.

States are **indispensable** to deploying clean energy infrastructure.

- Major regulators & drivers of the clean energy transition
- Commercial counterparties to many major clean energy contracts

State regulators are **vastly underserved** compared to federal counterparts.

- Expertise, training, data & analysis
- Commercial expertise

Solutions must **build capacity** at the state level.

- Build the “human supply chain” utilizing Columbia’s non-partisan, non-advocacy educational mission

Transmission Framing Matters

What does Transmission mean to you?

Deep decarbonization ↔ American energy abundance

Lower cost renewables ↔ Lower cost energy

Hedge against climate change ↔ Improve system reliability

Green Jobs ↔ American manufacturing jobs

1. Transmission has largely been built via political compromises between states or within single states with cohesive energy policies.
2. Federal regulatory policy *evolution* on planning & interconnection.
3. Potential for legislative *revolution*.

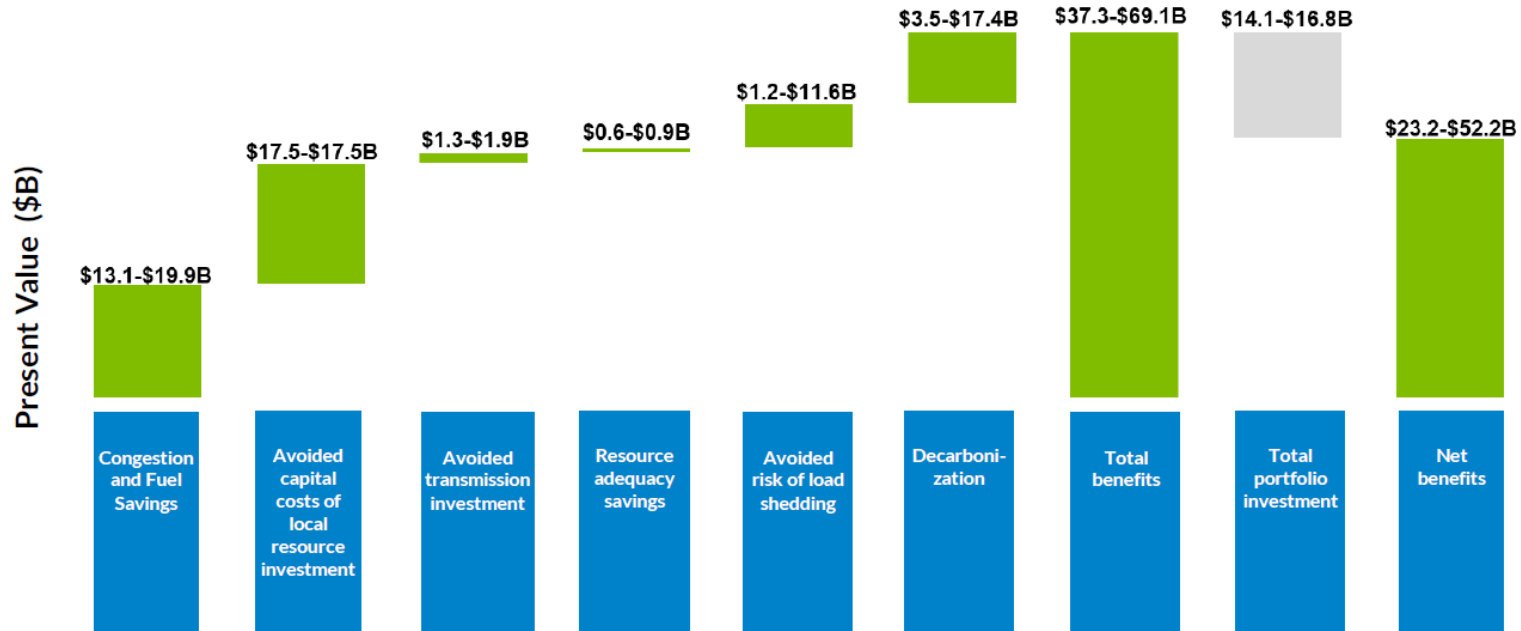
“ Our permitting process is broken, and although political agendas got in the way of passing comprehensive reform last Congress, I have not stopped fighting for changes that that will enable us to get American produced energy to the people that need it, drive down energy costs, support our allies and help us achieve energy security.

Senator Joe Manchin,
April 18, 2023

Transmission Framing Matters

L RTP Tranche 1 Benefits vs. Costs 20 – 40-Year Present Value (2022 \$B)

Calculations are generally based on conservative assumptions including the analysis period and discount rate



Energy Markets Need to Evolve

Today's Markets:

- Least Cost
- Reliable

Tomorrow's Markets:

- Least Cost
- Reliable
- Meet State Policy

- Current Renewable Energy Credits need to evolve to be more location & time specific
- Need for “Dispatchable Emissions Free Resources
- Clean capacity vs. Clean megawatt-hours

