# The Net-Negative $CO_2$ Baseload Power Initiative

Addressing Climate Change Concerns

Protecting the Baseload Power Infrastructure

Securing the Economic Future of Coal Communities

West Virginia Public Energy Authority

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# *Net-Negative $CO_2$ Baseload Generation Technology*

- Established in June, 2021 as a 501(c)(6)
- The Team

Steve Winberg
Chairman & CEO

Ken Humphreys
Treas. & Sec.

Fred Palmer
Senior Consultant

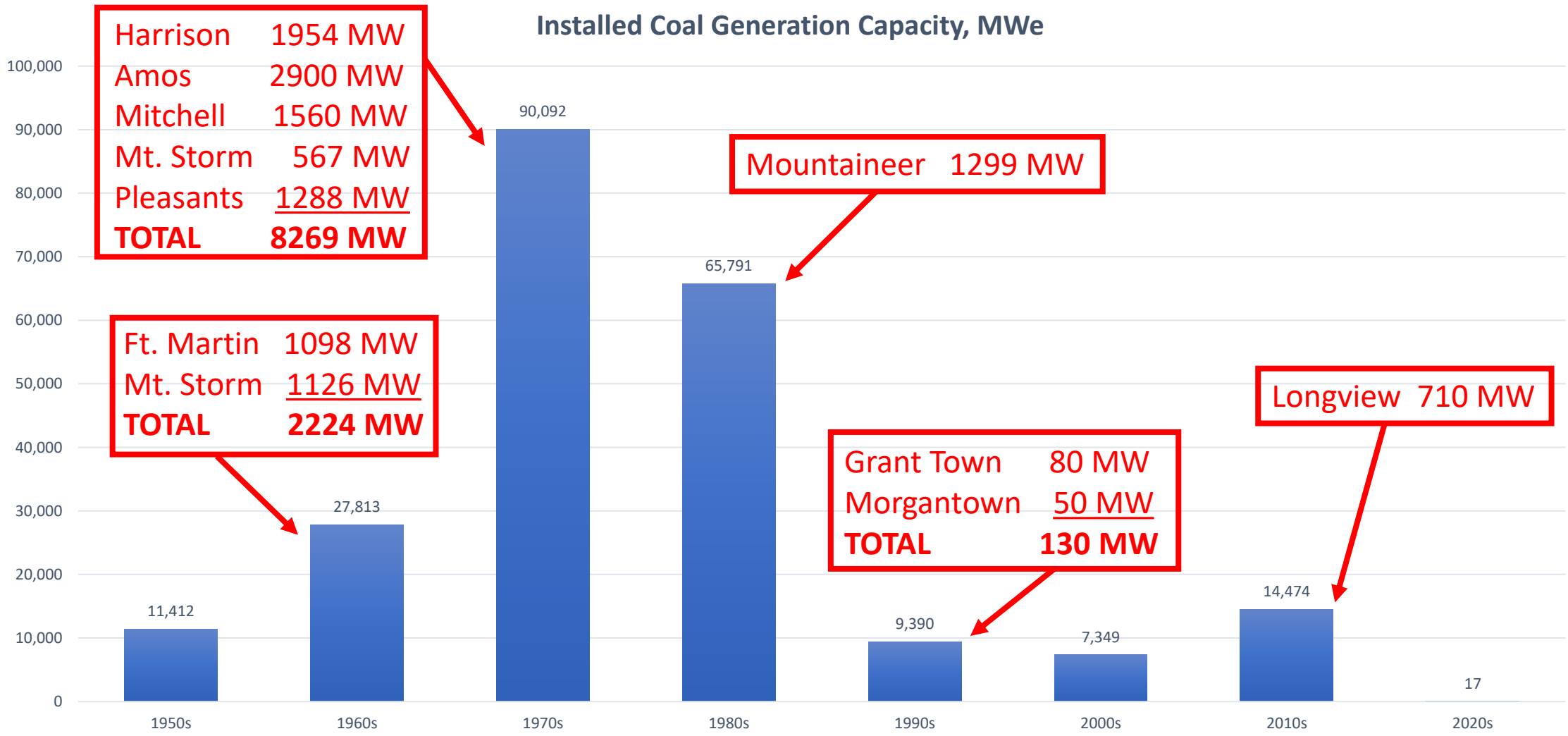
- Our Sponsors
  - CONSOL Energy
  - Peabody
  - PFBC-EET

# *Situation Assessment*

***The Facts***

- Coal is not the problem – $CO_2$ is the problem – but coal opponents have demonized coal and the public largely accepts this demonization
- India and China came to coal's defense at COP26. Small word changes matter:
  - "Phase down" not "Phase out"
  - Unabated coal, not all coal
- An Administration change in three years is unlikely to substantially mitigate ESG, shareholder, State and international pressures that work against conventional coal.
- Coal opponents are well-funded, getting "richer", and view any coal win as a temporary stay of execution.
- The net effect of expanded renewable tax credits, renewable portfolio standards and other renewables incentives are reducing coal plant dispatchability and degrading the investment returns on coal power projects.
- EPA is ramping up its regulatory assault on coal – both production and use.
- Power producers are moving away from coal.
- The coal industry needs to continue its defense, but defending the status quo is not enough.
- Offense is needed – Coal needs to be "For Something".

# *Existing Coal Fleet*



# *There Can be a Future for Coal*

- Positioning the existing coal fleet for the future
  - Need to protect the value of the existing infrastructure
  - Forestall premature coal plant retirements
- Tax Credit Parity
  - Generation only qualifies if generator is dispatchable on demand.
  - Generation only qualifies if there is significant $CO_2$ reduction
- 45Q Revisions
- Building a post-2030 future that adds new profit streams and creates societal value, including addressing climate change concerns:
  - Coal-to-Products
  - Coal-derived $CO_2$-to-Products
  - Net-Negative $CO_2$ Coal-to-Energy Generation
    - Net-Negative $CO_2$ Baseload Power Technology
    - Net-Negative $CO_2$ Hydrogen Technology

# Net-Negative $CO_2$ Baseload Power Technology

*Coal with Biomass Co-firing and CCS*

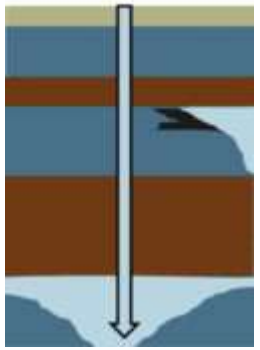
Coal

Biomass

Fuel Transport

Power Generation

$CO_2$



$CO_2$ Storage

**Baseload Power**

**$CO_2$ Footprint**

**Net-Negative $CO_2$ Footprint**

# *Proposed DOE Net-Negative $CO_2$ Baseload Power Program*

***Additional Details***

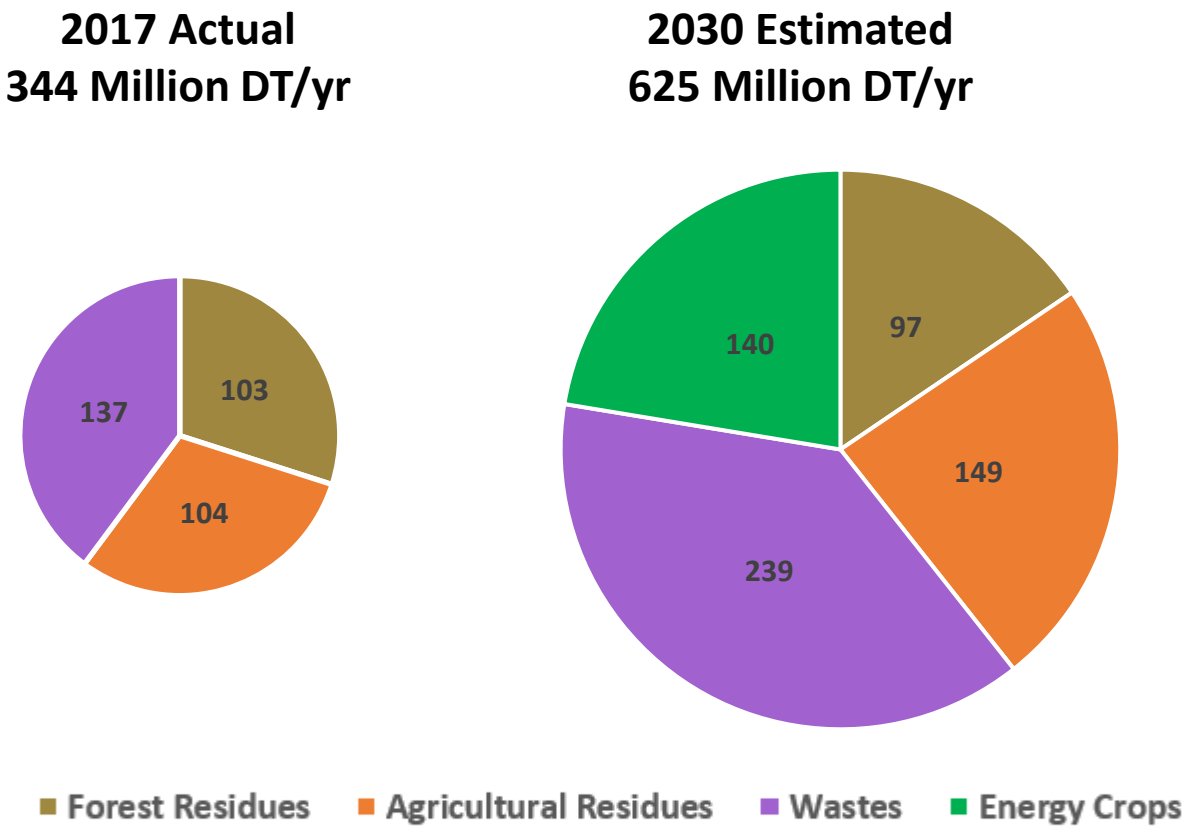
- Qualifying projects:
  - Must have a positive economic impact on coal communities.
  - Must have net-negative emissions using coal/biomass co-firing with CCS
- $300M for plant-specific engineering and economic studies
- $30B to cost-share deployment of the initial ~10 net-negative plants
- Power plant owners may competitively apply
  - Grants for engineering/economic Project Concept Studies
  - Cost-share for pre-FID Project Development Activities
  - A package of incentives to attract commercial co-investment and limit ratepayer impacts

# U.S. Biomass Resource

***Quantities are Sufficient to Sustainably Support Coal-Biomass Co-Firing***

- Existing Coal Generation Infrastructure
  - 212 GW of utility-scale coal plants
  - Transmission, supply chain, and permitting infrastructure for the plants are in place
  - 59 GW (28%) are scheduled to retire by 2035 with many of these plant sites candidates for retrofitting or repowering
- Abundant Domestic Coal Resources
  - World's largest reserves
  - 470-year supply at 2020 consumption rates
- Sustainable Domestic Biomass Resources
  - 20% co-firing of entire existing coal fleet would require 125 millions tons/yr of biomass.
  - The 2030 domestic, available biomass resource is estimated to be 625 million tons.
  - The U.S. is the world's largest exporter of wood fuel pellets with 9 million tons of 2020 exports to fuel international coal plants.

**Biomass Resource Available for New Uses**




Source: U.S. Department of Energy. 2016. 2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy, Volume 1: Economic Availability of Feedstocks.

# *Tax Credit Parity*

**Renewable Production and Investment tax credits**

- Initiated to reduce cost of renewables
- 30 years of renewable tax credits
- **Mission accomplished!**

Table 1b. Estimated unweighted levelized cost of electricity (LCOE) and levelized cost of storage (LCOS) for new resources entering service in 2027 (2021 dollars per megawatthour)

| Plant type | Capacity factor (percent) | Levelized capital cost | Levelized fixed O&M[a] | Levelized variable cost | Levelized transmis- sion cost | Total system LCOE or LCOS | evelized tax credit[b] | Total LCOE or LCOS including tax credit |
|---|---|---|---|---|---|---|---|---|
| **Dispatchable technologies** | | | | | | | | |
| Ultra-supercritical coal | 85% | $52.11 | $5.71 | $23.67 | $1.12 | $82.61 | NA | $82.61 |
| Combined cycle | 87% | $9.36 | $1.68 | $27.77 | $1.1 | $39.94 | NA | $39.94 |
| Advanced nuclear | 90% | $60.71 | $16.15 | $10.30 | $1.0 | $88.24 | -$6.52 | $81.71 |
| Geothermal | 90% | $22.04 | $15.18 | $1.21 | $1.4 | $39.82 | -$2.20 | $37.62 |
| Biomass | 83% | $40.80 | $18.10 | $30.07 | $1.1 | $90.17 | NA | $90.17 |
| **Resource-constrained technologies** | | | | | | | | |
| Wind, onshore | 41% | $29.90 | $7.70 | $0.00 | $2.6 | $40.23 | NA | $40.23 |
| Wind, offshore | 44% | $103.77 | $30.17 | $0.00 | $2.5 | $136.51 | -$31.13 | $105.38 |
| Solar, standalone[c] | 29% | $26.60 | $6.38 | $0.00 | $3.5 | $36.49 | -$2.66 | $33.83 |
| Solar, hybrid[c,d] | 28% | $34.98 | $13.92 | $0.00 | $3.63 | $52.53 | -$3.50 | $49.03 |
| Hydroelectric[d] | 54% | $46.58 | $11.48 | $4.13 | $2.08 | $64.27 | NA | $64.27 |
| **Capacity resource technologies** | | | | | | | | |
| Combustion turbine | 10% | $53.78 | $8.37 | $45.83 | $9.89 | $117.86 | NA | $117.86 |
| Battery storage | 10% | $64.03 | $29.64 | $24.83 | $10.05 | $128.55 | NA | $128.55 |

Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*

# *New Imperatives*

- Maintain U.S. electricity grid stability & reliability – dual challenge
    - Intermittent renewables presenting grid stability and reliability challenges
    - Exasperated by the need to expand electrification to industry, commercial, residential and transportation sectors

- Aggressive Administration $CO_2$ reduction targets

- Need for affordable electricity requires maximizing existing infrastructure

# *Tax Credit Parity*

- Investment and Production Tax Credits (ITCs and PTCs)
  - Incentivize low-carbon, reliable power
    - Minimum dispatchability requirement
    - Nuclear, Renewable, CCS-enabled fossil plants, and Net-Negative fossil plants can all meet a dispatchability requirement either stand-alone or with battery/low-carbon power back-up
  - Zero-carbon emitting plants would be eligible for a Base PTC.
  - CCS-enabled fossil plants with <100% capture would be eligible for a reduced PTC.
  - Net-Negative plants, effectively with >100% capture would be eligible for an increased PTC.
- 45Q Carbon Capture & Storage Tax Credit
  - Amount should be indifferent to the carbon capture technology employed (e.g., amine capture, ammonia-based capture, or direct air capture). The result “tons captured” not the technology type should be incentivized.

# *Required Actions*

***Enabling Deployment of Net-Negative $CO_2$ Baseload Power Technology***

Policy commitment to facilitate deployment of net-negative $CO_2$ baseload power, including:

- Enactment of The Net-Negative Baseload Power Act (H.R. 4891), which
  - Establishes a Net-Negative Baseload Power Program at DOE
  - Authorizes $300M in immediately available grant funding for engineering and economic studies at existing coal power plants sites
  - Provides DOE with new management tools and directs the acceleration of projects that will reduce the carbon footprint of the existing coal fleet with Net-Negative Technology (CCS and biomass co-firing)
- Appropriating the $300M in grant funding.
- Providing ~$30B in funding for the DOE Net-Negative Baseload Power Program for cost-shared retrofits/repowering of a first tranche of plants
  - Accelerates the reduction of the coal fleet's carbon footprint
  - Protects grid reliability and coal communities
- Tax Credit Parity
- *45Q Revisions*

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