Quantified Carbon
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https://repower.world
https://repowerscore.com

REPOWER

Introduction to the global programme

The *Repower* Initiative

- Funded by Founders Pledge, we are in the middle of a global non-profit research & promotion programme dedicated to the *repowering* of fossil power plants by low carbon heat sources such as **nuclear** or geothermal energy, reconfiguration as thermal heat stores or as clean energy grid interconnection points
- The initiative was joined **this week** by a **new partner**, one of the world's top-10 financial institutions, with $1 trillion USD earmarked for decarbonization project finance by 2050

Addressing a Key Decarbonization Challenge

"Decarbonisation is about two things: **Building stuff** and **closing stuff**"

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The Original Research Question(s)

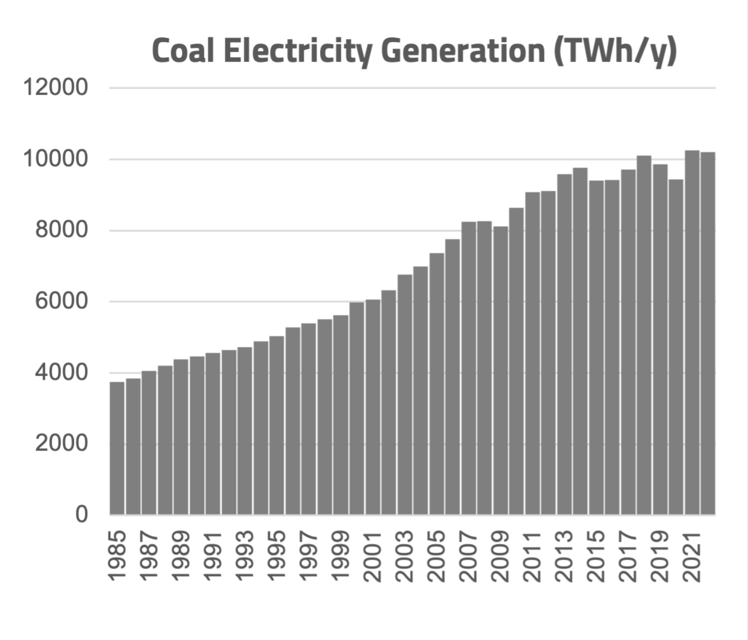
1. Can we decarbonize and at the same time avoid stranding investments, avoid firing the local workforce & avoid abandoning the site and the equipment?

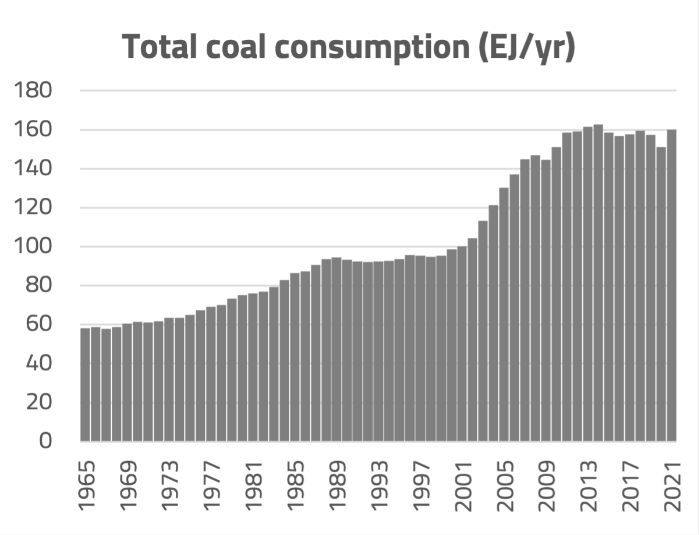
2. Can fossil power plant sites continue to fill *all their full current roles* in the system without the continued burning of fossil fuels?

A Vested Problem

1. Coal power is the largest form of electricity generation & largest source of emissions
2. The effective age of all coal plants is ~15 years, in critical places 7 years!
3. $ Trillions of recent investments

All to be scrapped, trillions stranded and millions of workers fired?





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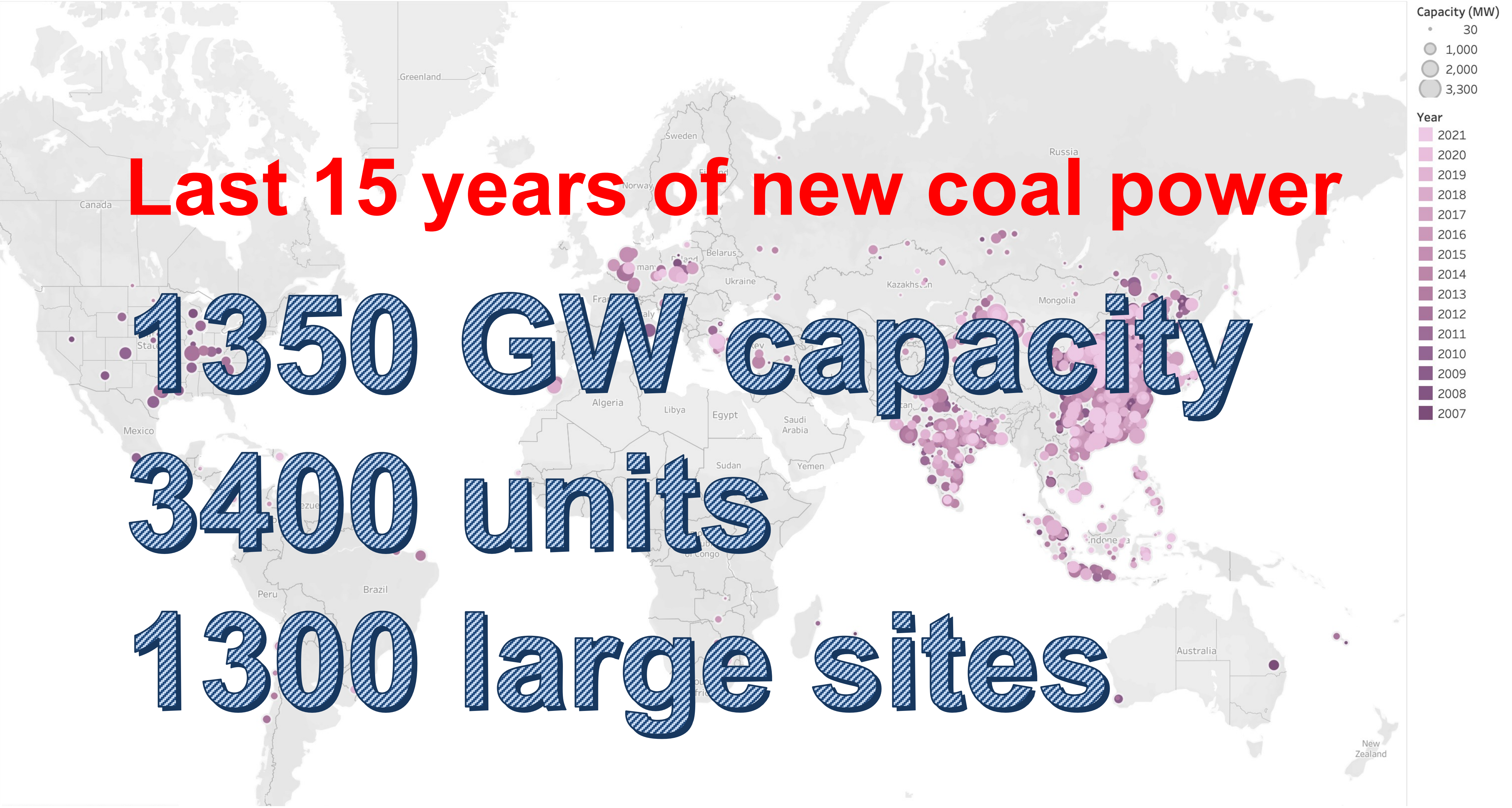
Last 15 years of new coal power



1350 GW capacity
3400 units
1300 large sites

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A wide suite of great options with varying TRL & timeline!

1. Repower or repurpose site with new heat sources
2. Use as renewable resource grid interconnection point
    - Large utility-scale solar farms
    - Onshore wind farms
    - *Offshore wind farms (coastal plants)*
3. Repower as “thermal battery” energy storage plants
4. Partially repurpose (for example the district heat interconnect)
5. Combination of the above

A spectrum within the repowering options!

- **Full repowering**
  Brand new (or under construction) coal plants are repowered by high-temp heat sources in 2030s, including re-use of the full steam cycle, condenser cooling system, grid connection and all auxiliary buildings

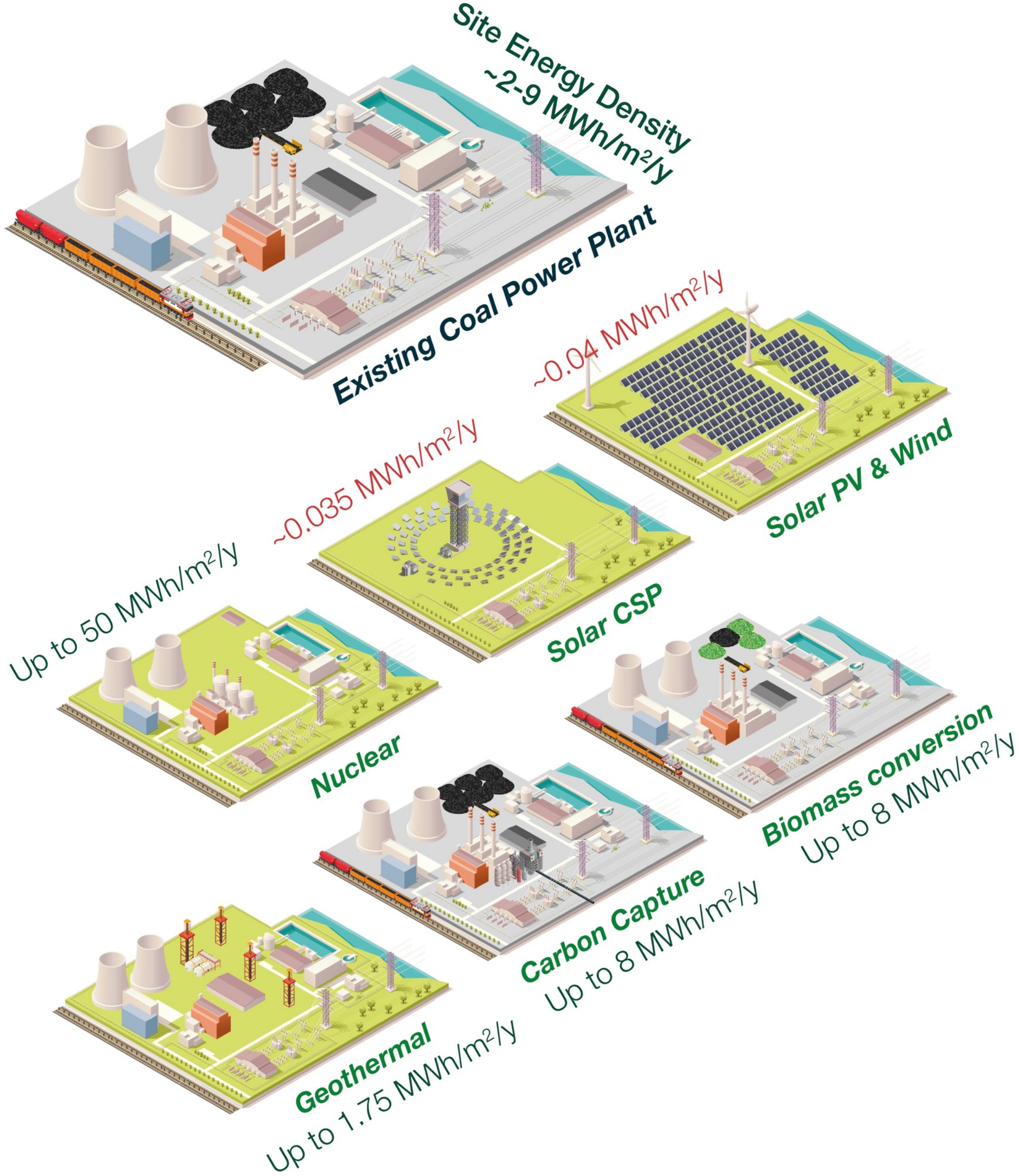
- **Partial repowering**
  Modern coal plants (effectively less than 15 y/o) today are repowered re-using condenser cooling, grid connection and auxiliary buildings

- **Repurposing**
  The plant sites of old, already decommissioned or fully depreciated units are repurposed with low-carbon energy, in many cases including grid connection

Options for "full" repowering

1. Energy density and ability to use existing equipment and workforce suggests advanced nuclear and advanced high-temp geothermal repowering as main pathways

2. Repowering a large steam turbine with smaller reactor(s) or geothermal wells via a thermal energy storage interface introduces flexibility!



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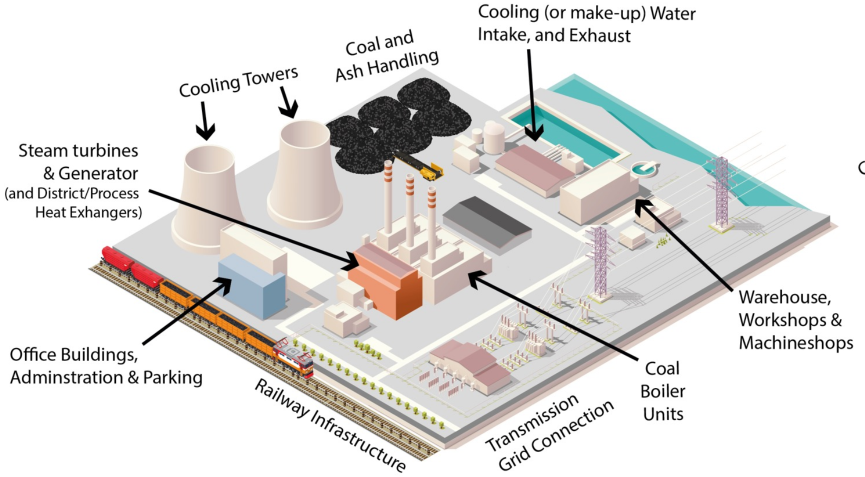
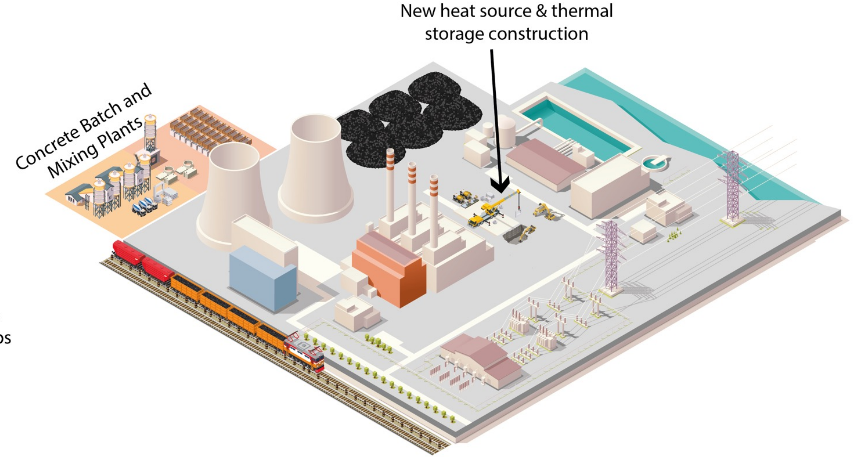
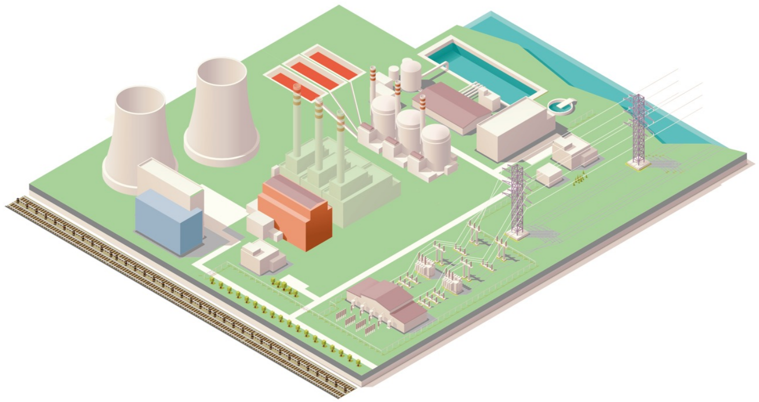
Summarized Example of a Parallel Process

1. Coal power plant → 2. Repowering → 3. Decarbonized







Repowering highlights

- **Global emissions-avoidance:** potential of up to 200 billion tons of CO_2
- **Job retention:** potential of up to 2/3rds of local plant work force
- **Just transition:** Long term investments and jobs in the communities that would otherwise suffer the worst local impacts from the energy transition
- **Cost savings:** Upfront cost savings of up to 35% compared to equivalent green-field projects (full repowering nuclear example)
- **Permitting:** No need for new sites, cooling water permits or power lines for new zero-carbon energy infrastructure – solving a main bottleneck

A solid and growing peer-reviewed research base

Article
Retrofit Decarbonization of Coal Power Plants—A Case Study for Poland
Staffan Qvist [1,*], Paweł Gładysz [2], Łukasz Bartela [3] and Anna Sowiżdżał [4]

Techno-economic assessment of natural gas combined cycle power plant decarbonization: small modular reactors versus carbon capture and storage
Paweł Gładysz [1,*], Łukasz Bartela [2], Magdalena Strojny [3], Lou Martinez Sancho [4] and Staffan Qvist [5]

Article
Repowering a Coal Power Unit with Small Modular Reactors and Thermal Energy Storage
Łukasz Bartela [1,*], Paweł Gładysz [2], Jakub Ochmann [1], Staffan Qvist [3] and Lou Martinez Sancho [4]

Article
Techno-Economic Assessment of Coal-Fired Power Unit Decarbonization Retrofit with KP-FHR Small Modular Reactors
Łukasz Bartela [1,*], Paweł Gładysz [2], Charalampos Andreades [3], Staffan Qvist [4] and Janusz Zdeb [5]

Energies 2021, 14, 2557. https://doi.org/10.3390/en14092557

Article
Repowering Coal Power in China by Nuclear Energy—Implementation Strategy and Potential
Song Xu [1], Yiu Hin Martin Lu [1], Meiheriayi Mutailipu [2], Kanti Yan [2], Yaoli Zhang [1,3,*] and Staffan Qvist [4,*]

Energies 2022, 15, 1072. https://doi.org/10.3390/en15031072

Article
Repowering a Coal Power Plant Steam Cycle using Modular Light Water Reactor Technology
Henryk Łukowicz [1], Łukasz Bartela [1,*], Paweł Gładysz [2] and Staffan Qvist [3]

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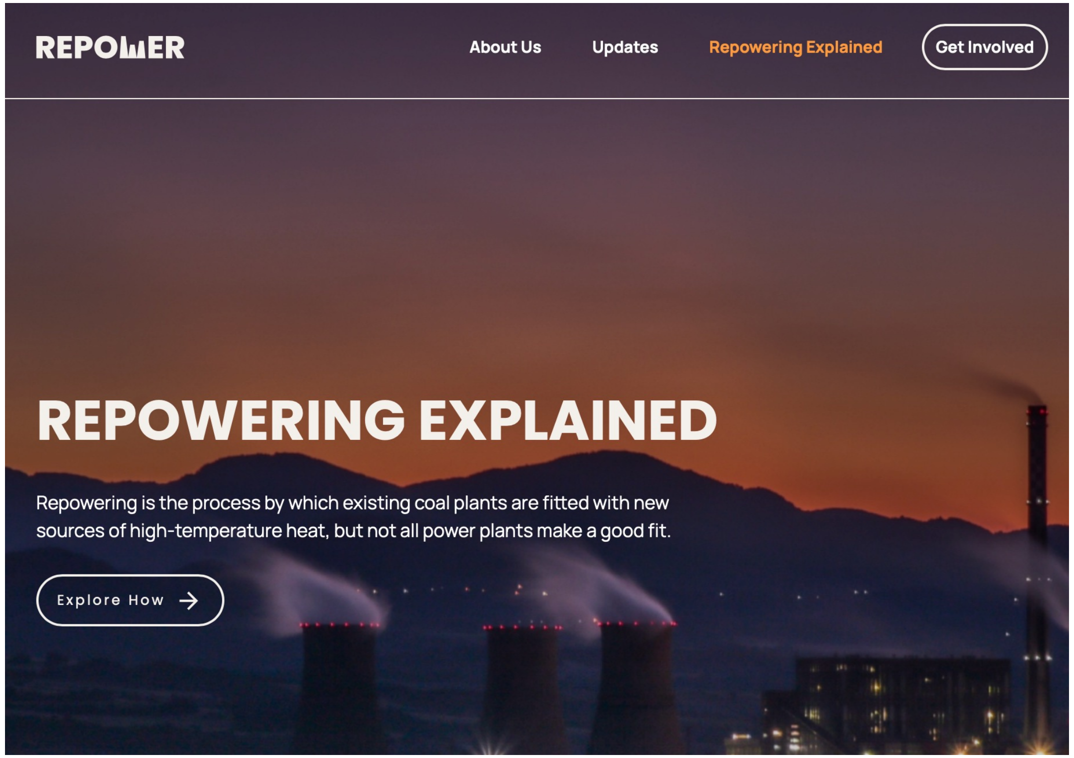
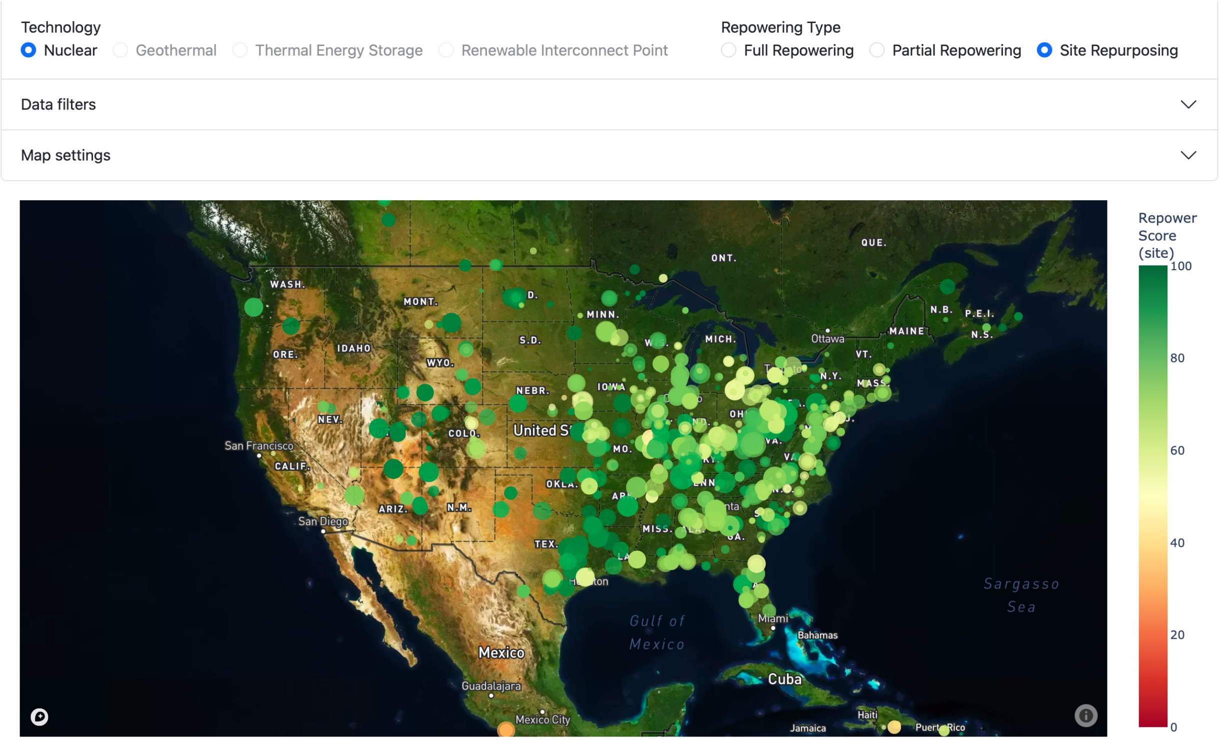
Learn more

https://www.repower.world



NEW (beta)

https://www.repowerscore.com



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