NICE Future
Nuclear Innovation: Clean Energy Future

Repurposing Coal Plants — An Innovative Way for Local Communities to Thrive

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Climate change is, by and large, an energy problem. More than two thirds of anthropogenic (human-caused) emissions come from burning fossil fuels for energy and transportation. In the 2015 Paris Agreement on climate change, most nations pledged to try to keep global warming under 2°C or even under 1.5°C.[1] Left unchecked, climate change of 3°C or more will wreak havoc on the world's ecological systems, which would have enormous consequences for people and nature.

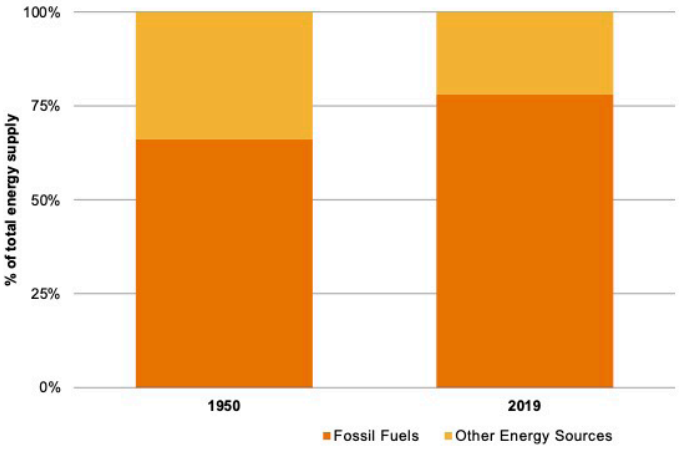

Figure 1. Percent of Energy Supply Fossil vs. Other, 1950-2019[2]

The world's energy sector is undergoing a profound transition to achieve these emissions reduction goals and expand access to clean energy in support of socioeconomic development, especially in emerging economies, while at the same time limiting the impacts of climate change, pollution, and other unfolding global environmental crises.

The urgency and scale of the needed emissions reductions cannot come at the cost of the future prosperity of developing nations. Access to energy is a fundamental requirement for socioeconomic development, improved quality of life, education, longer life expectancy, and lower maternal and child mortality rates. Increased levels of wealth and development also reduce people's vulnerability to the adverse effects of climate change.

The challenge of transforming the energy sector can be described as an "energy trilemma."[3] It is crucial for energy to not only become clean but also affordable and reliable. These three elements are vital to prevent global catastrophe while meeting basic needs such as healthcare, welfare, education, and security, while enabling every country to share in global prosperity.

The United Nations Sustainable Development Goals call for a swift and unified approach to addressing societal needs.[4] Currently, most of the world's population resides in impoverished countries, where over 85% of individuals survive on less than $30 per day (adjusted for purchasing power parity). Analysis by Our World in Data suggests that the global economy would need to expand fivefold to achieve a significant reduction in poverty.[5]

A transition from polluting energy sources to sustainable alternatives is necessary to ensure that these goals are met. According to most 1.5°C pathways, a 45% reduction in annual emissions from 2010 levels is needed by 2030.[6] Annual emissions have instead increased from 2010 to 2019, making it impossible to reduce emissions rapidly enough to achieve the desired goal.

Coal-fired power plants are the primary source of global CO_2 emissions, resulting in immense pressure to close them down. However, many of these power plants are relatively new assets (less than 15 years old) and have the potential to operate for another 50 years. In addition to providing reliable energy access, these power plants also generate employment opportunities and contribute to socio-economic development.

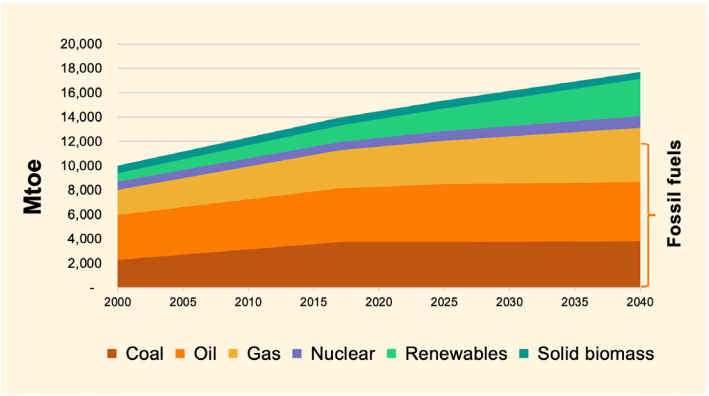

Figure 2. IEA Stated Policies by Scenario: World Energy by Source[7]

Furthermore, new coal power plants are under construction or in the planning stages in several developing countries, particularly in Southeast Asia and Africa. Halting the operation or cancelling the construction of these coal plants would have a significant impact on the growth and development of regional economies. Many of these countries are already exposed to the impacts of climate change and urgently need new energy infrastructure to strengthen their resilience against increasing risks.

Currently, coal remains a crucial energy source and driver of economic growth in both developed and developing countries. Despite international climate agreements to "phase down" the use of coal,[8] global consumption of coal has reached unprecedented levels, contributing almost one-third of global net annual CO_2 emissions.

The Campaign to Research the Impacts on Social Equity and Economic Empowerment (RISE[3]) within the Nuclear Innovation: Clean Energy Future (NICE Future) initiative, under the Clean Energy Ministerial—together with its partner organizations and member countries—seeks to address these challenges.

RISE[3] is exploring the potential to repurpose retired coal plant sites with carbon free, reliable, and resilient clean energy sources, such as nuclear energy. This would enable local communities that depend on coal plants for employment and tax revenue to continue to thrive. Closing these plants would result in job losses and economic stagnation for surrounding communities, loss of trillions of dollars of infrastructure investments, and reduce availability of reliable and resilient energy and transmission.

Repurposing Coal Plants for a Just Transition

Governments and utilities around the world are exploring the potential for emissions-free heat sources (such as small modular nuclear reactors [SMRs]) to replace coal boilers at retired coal plants. Replacing the coal boiler with a new source of heat can enable continued operation of the power plant with a new supply of clean steam, eliminating harmful air pollution and other environmental impacts from coal while maintaining employment and community benefits.

Benefits of Repurposing Coal

Repurposing coal plants can enable a just transition in communities and provide many benefits, including:[10]

- Workforce retention due to high skills transferability
- Creation of new, well-paid jobs
- Potential developmental paths for current coal plant workers where there are no equivalent jobs at a nuclear power plant (e.g., reactor operators and radiation technicians)
- Higher salaries relative to coal plant job equivalents
- Establishment of long-term jobs (more than 40 years)
- Maintenance and growth of a vibrant local economy
- Growth of local tax revenue
- Encouragement of outside investment (e.g., governments, corporations).

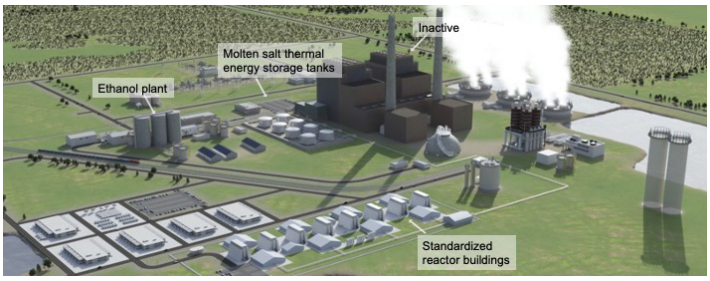

Figure 3. Rendering of a repowered 1,200 MWe, two-steam-unit plant[9]

Climate Strategies with Environmental Justice at Their Heart

A just transition should enhance human well-being, health, and capabilities; increase resilience; drive innovation towards a sustainable society at all levels; and spur economic growth and prosperity. Increasing access to clean, reliable, and affordable energy is fundamental for quality of life, health, and well-being and must be at the heart of global strategies to decarbonize global energy infrastructure.

Universal access to affordable clean energy is the focus of the United Nations Sustainable Development Goal (SDG) 7. Despite some progress in increasing energy access, the Energy Progress Report for SDG 7 indicates that 733 million people still do not have access to energy in 2021, compared to 1.2 billion lacking access in 2010.[11] Ensuring a just transition, with expanded access to clean energy, is a key tenet of the RISE[3] mission.

Repowering existing coal plant infrastructure by replacing coal-fired boilers with advanced nuclear energy offers a fast, low-risk path to decarbonizing global power generation. Repurposing the global coal fleet could enable a just and efficient transition by offering communities that currently depend on coal fired plants for energy, jobs, and tax revenues to retain or even improve upon these critical benefits—providing them with the opportunity to prosper and become indispensable to the emerging clean energy economy. Opportunity to accelerate and de-risk the clean energy transition while reducing the overall scale of investment required.

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1 UN Paris Agreement, accessed 2022. unfccc.int/process-and-meetings/the-paris-agreement

2 Our World in Data, 2017 and BP Statistical Review of World Energy, 2022 bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

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6 Intergovernmental Panel on Climate Change (IPCC), the United Nations body for assessing the science related to climate change. ipcc.ch/2022/04/04/ipcc-ar6-wgiii-pressrelease/

7 IEA (2021), World Energy Outlook 2021, IEA, Paris iea.org/reports/world-energy-outlook-2021, License: CC BY 4.0 iea.org/reports/world-energy-outlook-2021

8 At the 2021 UN Climate Change Conference of the Parties, COP26, world leaders agreed to phase down coal. businessinsider.com/cop26-concludes-with-agreement-to-phase-down-coal-2021-11

9 Terra Praxis Inc. render, 2022.

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11 2022 Tracking SDG7 Executive Summary. trackingsdg7.esmap.org/

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