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U.S.–China Coal Regions and Energy Transition Track II Dialogue

3rd Session: The Role of Business in the Energy Transition *(working title)* 





This backgrounder document is in support of the third session of the *2021–2022 U.S.– China Coal Regions and Energy Transition Track II Dialogue*. The U.S.–China Coal Regions and Energy Transition Track II Dialogue's goal will be to help stakeholders and policymakers in U.S.–China coal–producing regions understand the key themes and trends underway both in U.S. and China; to help develop new policy outcomes that can benefit coal communities facing the energy transition; and create a durable bridge between stakeholders in U.S.–China producing coal regions.

## COPYRIGHT NOTICE

This background document provides an overview and history of national strategies taken at the policymaking level and through businesses to hasten economic prosperity and clean energy approaches in the U.S. and China for coal–producing regions.

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## **United States**

## **National Framework and Background**

## **Federal Administration Policies**

In the United States at a federal level, shifting politics and priorities of the two main political parties have shaped the environment within which energy companies operate. Republican Administrations have generally favored reducing regulations in promotion of energy security and low-cost energy. For example, the Trump Administration, which viewed the continued use of coal as a national priority, used the U.S. Environmental Protection Agency (EPA) to revise regulations for power plants to ensure that coal-powered plants could remain operational for as long as possible, and endeavored to loosen restrictions related to oil and gas leases and permitting on federal lands. Democratic Administrations have tended to prioritize the role of transforming energy systems to reduce and eliminate carbon emissions to reach climate change goals. Accordingly, the Obama Administration's political priorities were to phase down coal-use due to climate change concerns through the Clean Power Plan and the supporting POWER Initiative.

The Biden Administration has led some of the most transformative efforts impacting the energy transition. The \$1.2 Trillion Bipartisan Infrastructure Deal (Infrastructure Investment and Jobs Act), passed in November 2021, focuses on rebuilding America's roads, bridges and rails, expanding access to clean drinking water, expanding high–speed internet, tackling the climate crisis, advancing environmental justice, and investing in forgotten communities. The needs of coal communities featured significantly in the deal, with specific funds allocated for clean energy (\$65 billion), rural broadband (\$65 billion), electric vehicle charging (\$7.5 billion), and abandoned wells (\$11.3 billion).

#### **Inflation Reduction Act**

In August of 2022, the United States Congress passed, and President Joe Biden signed into law, the Inflation Reduction Act (IRA) – essentially the largest attempt that the U.S. has ever made, largely through the use of incentives and credits for businesses and consumers, to hasten the energy transition and take action on climate change.

The IRA makes historic investments to transform the industrial sector and expand clean energy and electric vehicle manufacturing. Funding in the amount of \$9.7 billion through the US Department of Agriculture is slated for rural electric cooperatives to improve



resiliency, reliability, and affordability of rural electric systems. Proposed actions include purchasing renewable energy systems, zero–emission systems, or carbon capture and storage systems; and improvements to electric generation and transmission systems (\$760 million). Additionally, rural electric cooperatives will now be eligible for direct–pay clean energy tax credits.

More than \$300 million is set aside for "Energy Innovation" including grants and loans to provide financial and technical assistance for "underutilized renewable energy technologies" that are not as widely adopted. Tax credits include carbon capture and direct air capture (DAC) plant facilities. A new Clean Electricity Production Credit includes net–negative emission electricity production using solutions like Biomass Energy with Carbon Capture and Storage (BECCS). Net emissions for facilities are accounted for through cradle–to–gate life cycle assessment.

The IRA makes progress toward an equitable clean energy transition by investing in disadvantaged communities, renovating retired fossil fuel infrastructure, and employing displaced workers. The IRA aims to revitalize economies of energy communities by creating good-paying union job, and supporting workers in coal, oil and gas, and power plant industries by:

• Reinstating funding for the Black Lung Disability Trust Fund to aid coal miners suffering from respiratory challenges.

• Authorizing \$250 billion in loans through the Department of Energy's Loan Programs Office to improve outdated energy infrastructure including transmission lines, refineries and power plants for the net-zero economy.

• Providing a 10% bonus tax credit for wind and solar projects that are developed in former fossil fuel-based economic communities.

• Delivering tax credits for clean energy manufacturing projects that are developed in energy communities where coal mines and power plants have closed with bonus credit for projects creating good–paying union jobs.

Recent modeling by Rhodium Group highlights the substantial emissions reduction impact of the new law. Without significant changes, the United States is on track to reduce greenhouse gas (GHG) emissions by between 24% to 35% by 2030 compared to 2005 levels. With the IRA, this would increase to between 31% to 44% by 2030.



Source: Rhodium Group. The range reflects uncertainty around future fossil fuel prices, economic growth, and clean technology costs. It corresponds with high, central, and low emissions scenarios detailed in Taking Stock 2022.

## **Build Back Better Regional Challenge**

The Build Back Better Regional Challenge (BBBRC) is one of EDA's programs aimed at building strong regional economies and supporting community-led economic development. As a part of the American Rescue Plan COVID relief funding, EDA allocated \$300 million through a Coal Communities Commitment to support coal communities and help them create new employment opportunities including new industries. The EDA has dedicated \$100 million of its BBBRC funds and \$200 million of its Economic Adjustment Assistance funds to directly support coal communities.

The BBBRC represents several of the Biden administration's economic goals: for significant public investment to catalyze new markets and technologies; to include both growth and equity in shared prosperity; and for federal agencies to promote state and local innovation through place-based challenge grants.

The BBBRC acknowledges that the U.S. economy includes distinct regional economies, each with their own histories and opportunities. The program creates an opportunity for the universities, community-based organizations, local and state governments, and business intermediaries who received the grants to take a leading role in their economic development. (<u>https://www.brookings.edu/blog/the-avenue/2022/09/02/the-build-</u>



<u>back-better-regional-challenge-marks-a-new-era-of-place-based-industrial-</u> <u>strategy/</u>). The BBBRC provides each regional coalition with significant investments to tackle a wide variety of projects — including entrepreneurial support, workforce development, infrastructure, and innovation — to drive inclusive and equitable economic growth.

# U.S. Overview of the Role of Business in the Energy Transition

#### Role of Business

Private enterprise and business play an indisputably central role in shaping the future of the energy transition — through how they procure energy to that partnerships in their supply chain to the impacts of their investments and hires to the communities that they operate in. Large and small businesses around the world are adjusting policies and rethinking their business models due to changing energy infrastructure and public demand. Energy demand will only grow in the years ahead and the U.S. and world are entering a period of explosive demand for electricity. While some businesses are incorporating policies that disincentivize fossil fuels, others are decreasing their own carbon use through the organization of circular economies—where materials are reused or recycled instead of disposed of at the end of their life cycle. Investors are also becoming strategic drivers of change with increased attention on Environment Social Governance (ESG)–focused investing and shareholder concern for stranded asset risk.

The falling prices of renewable energy, making it increasingly cost-competitive or even cheaper than traditional fossil-fuel based energy sources, mean that the demand for renewable energy, driven primarily by corporations' will likely remain high. The corporate renewables market is expected to continue growing in the years ahead, spurred by demand such as through initiatives such as the RE100 Coalition: companies have committed to source 100% of their power from renewable sources.

#### Workers and Jobs

With the urgency, wide-ranging impacts, and complex nature of climate policy, the concept of a "just transition" that addresses economic and social implications can be difficult to define. The Just Transition Initiative (JTI)—a partnership between the Climate Investment Funds (CIF) and the Center for Strategic and International Studies (CSIS)— has developed a framework that incorporates many definitions and perspectives on just transitions. The JTI believes that including the key tenets of just transitions—inclusive



decision-making and the fair distribution of the benefits and costs—are necessary to achieve climate goals. Applying just transitions principles can help to alleviate concerns and resistance to climate policy by addressing potential risks to affected communities and ensuring residents' rights and future opportunities. The goal is to fairly allocate costs and benefits between affected parties.

The JTI reviewed numerous case studies and developed a framework to address social inclusion, distributional impacts, and the intention of policy. The framework includes recognizing disadvantaged groups, developing key plans through stakeholder participation, expanding the scope of impacts, and considering different time spans and geographic impact areas.



Source:<u>https://www.climateinvestmentfunds.org/sites/cif\_enc/files/knowledgedocument</u> <u>s/framework\_for\_just\_transitions\_download.pdf</u>

Coal-dependent communities in particular face myriad distinct economic, social, and environmental challenges. They must retrain displaced workers and develop new economic industries while simultaneously coping with a complex mix of other challenges related to health care, infrastructure deficits, mental health issues, and environmental contamination.



## **Retraining and Reskilling**

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When mines and other facilities close, it should be a priority to help miners and displaced workers retrain and find new gainful employment. Miners, like manufacturing workers, have extensive and specialized technical skills, but they may lack needed credentials or may find difficulty transferring those skills to new industries.

However, miners do have many skills that can be transferred effectively if transition services are in place. A recent Virginia Tech study found that many coal industry occupations, such as roof bolters and machine operators, require STEM–related skills and competencies that are in demand for production positions in growing manufacturing sectors. Coal workers are also well–prepared to find new work in the growing solar industry. A recent study found that the solar industry could potentially absorb nearly all of the workers projected to lose jobs in the coal sector, and the workers would likely see a raise in salary.

Rather than trying to find a single replacement for the jobs and revenue provided by the coal industry, many communities are seeking a mix of strategies by building up their own internal capacities. Often, coal-producing regions had made little or no historical investments in economic development because they had always been able to rely on revenue and jobs from coal. With the dwindling resources, they're now developing new visions for their economic futures.

# State and Regional Business and Case Study Profiles

## Wyoming

#### **Rocky Mountain Power Utility**

The main utility company in Wyoming is Rocky Mountain Power (RMP), a part of PacifiCorp. Part of RMP's territory covers Wyoming — the U.S's leading coalproducing state, providing abundant and easy access to coal as a baseload power source. However, RMP is committed to enhancing their renewable energy capacity, expanding transmission lines, and modernizing the energy grid. They have a clean energy plan called "Energy Vision 2020" to *"build an energy future that's reliable, clean and affordable."* RMP is the largest regulated utility owner of wind power in the Western US. By 2040, they will have added over 12,000 megawatts of renewable resources, which is enough to power 3.6 million homes. They are working to reduce energy demand and modernize the grid, while keeping costs below industry averages.

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The \$3.1 billion investment includes upgrading their existing wind fleet with larger blades and newer technology and building a new 140-mile Gateway West transmission segment in Wyoming to enable additional wind generation. Additionally, the project benefits rural economies by creating hundreds of construction jobs and adding millions in tax revenue to rural economies.

In 2014, PacifiCorp and the California Independent System Operator launched the Energy Imbalance Market (EIM) in November 2014. The EIM uses a sophisticated system to automatically balance demand every five minutes with the lowest cost energy available across the combined grid. By connecting utilities and leveraging diverse renewable resources across the West, the EIM lowers greenhouse gas emissions and enhances resilience of the energy system. The EIM has helped PacifiCorp cut their portfolio carbon emissions by 30 million metric tons. This resulted in more than \$2 billion in cumulative benefits for participating entities and over \$453 million in customer savings.

#### **TerraPower Natrium Reactor Demonstration Project**

Kemmerer, Wyoming, is currently home to the Naughton Power Plant, where the two remaining coal units are scheduled to retire in 2025. In 2021, TerraPower announced Kemmerer as the site for the Natrium nuclear reactor advanced reactor demonstration project (ARDP), supported by the U.S. Department of Energy (DOE). The project features a 345 MW sodium–cooled fast reactor with a molten salt–based energy storage system. The storage technology can boost the system's output to 500 MW of power when needed, which is equivalent to the energy required to power around 400,000 homes. The energy storage capability allows the plant to integrate seamlessly with renewable resources.

The project is expected to provide the next generation of clean, reliable, affordable energy production while providing a path to transition for Wyoming's energy economy, communities, and workers. The decision to locate the plant in Kemmerer included factors such as community support, the physical characteristics of the site, the ability of the site to obtain a license from the Nuclear Regulatory Commission (NRC), access to existing infrastructure, and the needs of the grid. The plant is expected to be operational in the next seven years.

According to project estimates, approximately 2,000 workers will be needed at the peak of construction. Once the plant is operational, approximately 250 people will support day-to-day activities, including plant security. Through the recently signed Infrastructure Investment and Jobs Act, DOE worked with Congress to allocate nearly



\$2.5 billion in new funding for ARDP. Federal funding is provided for the demonstration activity under a cost-shared cooperative agreement and the result of the project will be a commercially-owned generating asset.

## West Virginia/Virginia

West Virginia is the heart of Appalachian coal country, with more current and former coal workers and communities impacted by coal's future, than likely another other part of the nation. Even in a state where coal is so foundational, future demand for coal is not solid. For example, American Electric Power, the parent company of Appalachian Power and Wheeling Power estimates that renewable energy will constitute 40% of its electricity generation by 2030, whereas coal use will continue to decrease.

At the state leadership level, efforts are underway to attract new businesses to West Virginia. The Department of Economic Development and the Legislature have successfully attracted new–economy employers to West Virginia including NUCOR, GreenPower Motor Company, and Sparkz.

New thinking in economic revitalization has come forth through public-private coalitions. For example, Reclaiming Appalachia Coalition, works to spur mine reclamation projects throughout Central Appalachia that are responsive to community needs and that accelerate the growth of new, sustainable economic sectors.

The Appalachian Climate Technology (ACT Now) coalition is one of 21 winners of the \$1 billion Build Back Better Regional Challenge. Funded by President Biden's American Rescue Plan and administered by the U.S. Department of Commerce's Economic Development Administration (EDA), the Regional Challenge is awarding approximately \$62.8 million in grants to ACT Now, led by Coalfield Development Corporation, to create a hub of clean energy and green economy jobs. The federal grants are matched by \$2 million in state funds.

ACT Now will spur job growth in 21 economically distressed and coal-impacted counties in southern West Virginia by creating a hub of clean energy and green economy jobs. The coalition will support the transition from coal to solar power and will implement sustainable reuse projects on abandoned mine sites, rejuvenate brownfield sites with new facilities, and develop entrepreneurial programs to support employment. The ACT Now coalition plans to transform the former coal economy into a modern, clean regional economy, supporting training, new jobs, community development, and building resiliency to thrive in a global economy. West Virginia has embraced an "all of the above" energy strategy as they continue to diversify their economy.



After decades of decline in the coal economy and its related environmental impacts, the region currently suffers from persistent poverty and underinvestment. The coalition will address these issues by implementing sustainable reuse projects on abandoned mine sites; rejuvenating brownfield sites with new facilities equipped to train a diversified, skilled workforce and provide advanced manufacturing capacity; and developing entrepreneurial programs to support employment in environmental sustainability. The ACT Now coalition combines community engagement, a focus on equity and justice, and strong employer commitments from more than 200 private sector partners, including four of the five largest solar companies in the region.

#### **Other New Economic Drivers:**

Each community and region is embracing a different mix of economic revitalization. Tourism opportunities, including Southwest Virginia's Crooked Road trail – following key locations tied to the birth of country music – are being developed. Comprehensive strategies also seek to link multiple destinations and activities to encourage longer visits and create more local business opportunities. Examples include the Trail Towns program and the regional Bon Appetit Appalachia website promoting culinary tourism.

Southwest Virginia has become a site for developing Unmanned Aerial Vehicle (UAV) technology, becoming the site of the first remote drone delivery of medical supplies. It is also pursuing its potential as a center for information technology firms and data centers. The region makes use of its strong university programs, broadband infrastructure, abundant water supplies, and safe location.

#### Pennsylvania:

Coal-fired plants in Pennsylvania have been retiring as more efficient gas plants come online, fueled by the region's shale drilling boom. Since 2005, 14 coal plants have been retired in the state. Some of the former coal-fired power plants have been converted to run on natural gas. Others are being retired and are now ready for a new use. These former power plant sites offer many opportunities for new business, with excellent river, road, rail, and energy transmission infrastructure.

Pennsylvania's Department of Community and Economic Development (DCED) has created decommissioned coal-fired power plant redevelopment playbooks as a collaboration between state and local government, community and business stakeholders, environmental analysts, and market experts. The customized playbooks include unique assessments of each location's regional economy, overview of the site's potential liabilities, and at least three reuse options.



The former Sunbury Generation Plant, for example, along the Susquehanna River about 50 miles north of Harrisburg, has already seen transformation. The site was partially redeveloped to accommodate a 1,124–megawatt natural gas–fired plant. The more efficient gas plant requires many fewer employees, so the playbook is looking at other potential reuses on the remaining acreage, including a solar farm, data center, and another natural gas–fired plant.

The Mitchell Power Station, outside of Pittsburgh, is amidst a growing hub of industrial activity around the Marcellus Shale natural gas formation. The playbook recommends reusing the 856–acre site for chemical or plastics manufacturing. It's near Shell's new ethane cracker that uses natural gas liquids to manufacture ethylene, a building block of plastics. The playbook suggests the region could support up to four more "world–scale" crackers in the coming decade, with the projected production from the Marcellus and Utica shales.

## People's Republic of China

## **National Framework**

During the 14th Five-Year Plan period, an institutional framework for promoting green and low-carbon energy development will be basically established; a relatively complete policy, standard, market and regulatory system will be formed; and a green and lowcarbon energy transition promotion mechanism led by the "dual control" of energy consumption and the non-fossil energy target system will be constructed. By 2030, a complete basic system and policy system for green and low-carbon energy development will be basically established. Also formed will be an energy production and consumption pattern that non-fossil energy can basically meet the incremental energy demand and replace fossil energy stocks on a large scale, and energy security will be fully enhanced. The following priorities outline the areas of focus.

• Promote the building of an energy supply system featuring clean and low-carbon energy. With a focus on desert and Gobi areas, accelerate the construction of large wind and photovoltaic power bases, upgrade existing coal power units, explore and establish a mechanism for coordination between the transmission and reception ends of new energy power, and support the construction, integration and distribution of new energy power when possible. In accordance with the national and regional energy strategies, each region should take overall consideration of its own energy

demand and clean energy resources, in order to organize the implementation plans for the development and utilization of low-carbon energy at the city (county) level, and for regional energy supply. Regions should give priority to local low-carbon energy development and utilization, and import low-carbon energy according to demand, in order to form a pattern that non-fossil energy can basically meet the incremental energy demand and replace fossil energy stocks on a large scale.

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- Enhance the top-level design of new power systems. Promoting cleaner power sources and electrification of terminal energy consumption, and meeting the needs of new energy power development need overall development strategies and encouragement for enterprises. Promote the integrated development of the Internet, digital and intelligent technologies and power systems. Also, promote the development of new technologies, new forms of business and new models, and build a smart energy system. Additionally, strengthen the development of new power technology system, and carry out pilots for regional demonstrations of related technologies.
- Improve the power grid system for deep local use and wide-area transmission of renewable energy. Optimize the overall operation of the transmission network and power system to increase the transmission and consumption capacity of renewable energy. Make overall plans to distribute large power bases mainly supplying renewable energy, and optimize the allocation of regulatory resources in provincial power grids and above. Power grid enterprises should improve the acceptance capacity of new energy power, dynamically publish the capacity information of new energy power and provide query services, and connect qualified new energy power generation projects and distributed power generation projects to the power grid.
- Improve the flexible power construction and operation mechanism. Fully implement
  flexible transformation of coal power units. Promote the construction of controlled
  regulation reservoirs in river basins and the expansion of conventional hydropower
  stations, speed up the construction of pumped storage power stations, explore the
  application of small and medium-sized pumped storage technologies, and promote
  cascade hydropower storage. Make full use of the regulatory role of solar thermal
  power generation, carry out research and demonstration of new energy storage
  projects such as transforming abandoned mines into energy storage, and gradually
  expand the application of new energy storage.
- Improve policies for clean development and utilization of coal. Establish a long-term mechanism for the green development of coal mines, optimize the distribution of coal production capacity, and vigorously promote the clean and efficient use of coal. Formulate policies supporting mine optimization systems, improve the standard system for building green and intelligent coal mines, and improve the policy system supporting the development of intelligent technology, equipment, and personnel in coal mines. Improve policies supporting the comprehensive utilization of coal gangue, mine drainage, coal mine gas extraction and other resources, and ecological



management and restoration in mining areas. Increase support for the popularization and application of backfilling mining technologies in coal mines, and encourage the development and construction of new energy and energy storage projects in abandoned mining areas. In accordance with the law and regulations, speed up the procedures related to environmental protection, land use, approval and mining of high-quality production capacity, including green and intelligent coal mines, as well as coal mines guaranteed for supply. Scientifically evaluate the impact of coal enterprises' output reduction and closure, and improve supporting policies for coal enterprises' exit, transformation and development, and employee placement.

- Improve policies for the transformation of clean and efficient coal power. Under the premise of secure power supply, control and reduction of coal should be coordinated to promote the transformation of coal power to basic support and system regulatory power sources. According to the needs of secure and stable power system, the overall coordination between coal power units and non-fossil energy generation, natural gas generation and energy storage should be strengthened. Upgrade coalfired power units to save energy, improve efficiency, and provide ultra-low emissions. Fully tap the heating potential of existing large-scale cogeneration enterprises, encourage the cogeneration transformation of existing condensing coal power units within a reasonable heating radius, encourage the construction of coal-fired back pressure heating units in areas where coal-fired heating is allowed, and explore the implementation of the extraction steam storage transformation of coal power units. Orderly promote the closure and integration of outdated coal-fired power units and intensify the phasing out of coal-fired boilers. In principle, no new coal-fired power plants will be built, and coal-fired power plants will be encouraged to assume their social responsibilities on an equal basis, and energy conservation and emission reduction efforts will be intensified for coal-fired power plants. Support the construction of new energy storage facilities or the transformation of the existing sites and facilities of decommissioned thermal power units. Improve policies to support R&D and pilot demonstration projects on carbon capture, utilization and storage (CCUS) technologies in the thermal power sector.
- Establish a major scientific and technological collaborative innovation system for clean and low-carbon energy. Develop and give full play to the role of national laboratories in the field of energy. Form an energy technology innovation system that is led by national strategic scientific and technological forces, dominated by enterprises, and guided by the market, and deeply integrates industry, universities, research and application. Support leading enterprises in the industry in collaborating with universities, research institutes, and upstream and downstream enterprises to build a national platform for R&D and innovation in the field of energy, and promote the sharing and optimal allocation of various scientific and technological resources. Carry out joint research on key technologies such as basic components and components, basic software, basic materials, and basic processes in the energy



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> sector. Carry out collaborative innovation research on major energy technologies. Strengthen research and development of safety technologies related to new energy storage, and improve technical standards and specifications for equipment and facilities, planning and layout, design and construction, and safe operation.

- Establish a collaborative innovation mechanism for clean and low-carbon energy industrial and supply chains. Promote the construction of a clean and low-carbon energy technology innovation promotion mechanism oriented by demand-side technological progress, with deep integration of industry, university, research and application, upstream and downstream collaboration, and supply chain collaboration. Relying on major energy projects such as large new energy bases, upstream and downstream enterprises will be encouraged to cooperate in the research, development, manufacturing and application of advanced technologies and equipment, and form advanced technologies and industrial capabilities through integrated engineering and application. Accelerate collaborative research and demonstration of key technologies for advanced renewable energy fuels such as cellulose and ethanol, and bio-jet kerosene. Promote high-quality development of the energy and electronics industry, promote integration and innovation of information technology and products with clean and low-carbon energy, and accelerate innovation and upgrading of smart photovoltaic.
- Improve diversified investment and financing mechanisms to support green and lowcarbon energy transformation. Increase investment and financing support for clean and low-carbon energy projects and projects to ensure energy supply security. Support projects in the energy sector that make a significant contribution to carbon emission reduction through overall investment from the central budget, and include eligible major clean and low-carbon energy projects in the scope of local government special bonds. The National Green Development Fund and existing low carbon transition related funds should focus on the development and utilization of clean and low carbon energy, the construction of new power systems, and the green and low carbon transformation of fossil energy enterprises.
- Improve financial support policies for green and low-carbon energy transition. Explore the development of supply chain finance for clean and low-carbon energy industries. Improve the approval process and rating method for loans to enterprises in the clean and low-carbon energy industry, and fully consider the long-term growth of relevant industrial chains and their contribution to carbon peaking and carbon neutrality. Innovate green financial products adapted to the characteristics of clean and low-carbon energy, encourage eligible enterprises to issue carbon neutral bonds and other green bonds, and guide financial institutions to increase support for projects with significant carbon emission reduction benefits. Encourage the issuance of bonds linked to sustainable development and support the green and low-carbon transition of fossil energy companies. Explore and promote the application of basic energy information, and provide information service support for financial support for



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green and low-carbon energy transformation. Encourage energy companies to practice the concept of green development and fully disclose information related to carbon emissions.

- Promote green energy cooperation along the Belt and Road. Encourage innovation in financial products and services, and support the development and utilization of clean and low-carbon energy along the Belt and Road Initiative. Promote practical cooperation on green energy along the Belt and Road Initiative and explore a mechanism for collaborative development and cooperation between upstream and downstream enterprises of the clean and low-carbon energy industry chain. Guide enterprises to make overseas investment in clean and low-carbon energy, and pay attention to resource conservation, environmental protection and production safety in the development of related projects.
- Make full use of international factors to help the green and low-carbon development of domestic energy. Implement the list of industries to encourage foreign investment, improve relevant supporting policies, and attract and guide foreign investment in clean and low-carbon energy industries. Encourage foreign investment into our clean and low carbon energy industry innovation system incentive mechanism, strict intellectual property rights protection. Strengthen international cooperation on green electricity certification, propose the establishment of an international green electricity certificate system, and actively guide and participate in the formulation of international standards for the issuance, measurement and trading of green electricity certificates. Promote the establishment of the China-Eu Energy Technology Innovation Cooperation Platform and other international cooperation platforms for clean and low-carbon energy technology innovation, support multinational enterprises in setting up joint research and development centers for clean and low-carbon energy technologies in China, and promote joint innovation and demonstration applications in clean, low-carbon, decarbonized and carbon-free fields.
- Strengthen oversight in the energy sector. Strengthen oversight of energy market transactions and clean and low-carbon energy utilization related to green and low-carbon energy development and maintain a fair and just energy market order. Steadily push forward the reform of natural monopoly industries in the energy sector and strengthen supervision over relevant enterprises in terms of planning implementation, fairness and opening up, operation and dispatching, service prices, and social responsibility. Improve the evaluation mechanism for enterprises in power grids, oil and gas pipeline networks and other natural monopolies, focusing on their performance in ensuring energy supply, making scientific and technological innovations, and protecting the environment. Innovate ways to supervise new industries and business forms such as integrated energy services, new types of energy storage, and smart energy.



## **Provincial Framework**

## Shanxi

#### **Current Status and Achievements**

Energy enterprises in Shanxi mainly focus on promoting green mining technologies, clean usage of coal, substituting traditional energy with clean energy, investing in new energy and energy storage industry, and intelligence of energy industry to achieve low-carbon transformation.

The popularization and application of green mining technology in Shanxi Coking Coal (山 西焦煤) ensures safe production and improves the efficiency of resource exploitation. Shanxi Coking Coal used gas to generate electricity to relieve pressure on resources and the environment. Shanxi coking coal carried out clean energy replacement, realizing replacement for coal-fired thermal boilers under 35 tons per hour with clean energy. Also, Shanxi Coking Coal made bricks out of the residual mine waste and recycled the waste heat in the production process. Yongtai Energy (永泰能源) improved power generating efficiency by committing reconstruction for energy saving and consumption reduction. Also, Yongtai Energy invested in electrochemical energy storage project, and energy storage power station and landscape storage green base project, which promote the transformation to energy storage direction.

Jinkong Power (晋控电力) focused on optimizing the power structure, expanding the scale of clean energy power generation business, and vigorously expanding the wind power, photovoltaic and other new energy industries. Jinkong Power adjusted the industrial structure, accelerated the upgrading and upgrading of coal-fired generating units across the board, promoted the clean and efficient development of coal-fired power plants, and built units with high parameters, large capacity and low emissions. Jinkong Power actively promoted the deep integration of smart technology and the power industry, fostered smart energy projects in an all-round way, speeded up the construction of "smart power plants", and optimized multi-sectoral processes.

#### **Future Objectives and Policies**

As for the overall orientation, Shanxi Province has three main directions. First, Shanxi Province will promote carbon reduction, pollution reduction, green expansion and growth in a coordinated manner, and continue to optimize and upgrade the industrial structure. Also, strictly control the carbon emission of new projects, and resolutely curb the blind development of "two high-efficiency" projects. Secondly, Shanxi Province will support the development and application of green and low-carbon technologies, continuously



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promote the clean and low-carbon development, diversified usage, comprehensive storage and transportation of coal. Thirdly, give full play to the role of carbon trading mechanisms in controlling and reducing greenhouse gas emissions, and continue to encourage key industries such as electricity to strengthen internal management of carbon emissions and carbon assets. Guide enterprises to establish an internal management system for carbon emissions, and accelerate pilot projects for near-zero carbon emissions and climate investment and financing.

By 2025, for coal chemical industries in Shanxi Province, 40% of caustic soda, 30% of coal to methanol, 30% of coal to ethylene glycol, and 15% of synthetic ammonia should reach the energy efficiency benchmark level, and production capacity under benchmark should be cleared. Shanxi Province will accelerate the upgrade for traditional coal chemical industries, promote the expansion of industrial chain, develop the science supporting abilities, and promote the intelligent transformation of coal chemical industry. For key coal chemical projects that meet the requirements of industrial policies and planning, advanced technology, high level of environmental protection and energy efficiency, high output efficiency, and good intensive land use, the government will give support in each link. Also, Shanxi Province will increase financial support for coal chemical projects such as energy saving and water saving, environmental protection and safety upgrading, high–end extension of industrial chain, pilot test and industrial test. The coal chemical enterprises in line with the relevant policies and regulations can enjoy the relevant tax and financial fund support policies formulated by the nation and Shanxi Province.

#### Shaanxi

#### **Current Status and Achievements**

Energy enterprises in Shaanxi Province achieve diversified low-carbon transformation by developing CCUS technologies, developing new energy and new materials in parallel, promoting energy saving techniques, substituting traditional energy with clean energy, and promoting green finance.

Depending on the regional geographic advantage that oil and gas resources and coal chemical co-located, Yanchang Oil (延长石油) deployed CCUS projects, through which the carbon dioxide captured would be used for co2 flooding and geologic sequestration. These projects realized manufacturing and mining coupled together and could reduce CO2 emissions for 300000 tons per year. During the 14th Five Year Plan period, Yanchang Oil formulated the "oil, gas and electricity, new energy, and new material common development" strategy, which means Yanchang Oil will focus on promoting the development in fields like hydrogen, solar, wind, geothermal, biomass, placement of



electricity, carbon assets, and comprehensive energy storage. Also, Yanchang Oil will layout new chemical materials, fine chemicals and other industrial fields.

Shaanxi Coal Group (陕煤集团) will take advantage of market forces to eliminate the backward production capacity, stop or delay the construction of some mine projects under construction, and control the growth rate of production capacity. Shaanxi Coal Group will promote the application of energy–saving technologies to achieve energy conservation, emission reduction and efficient use of resources. In geothermal energy mining area, geothermal energy is used instead of natural gas heating to achieve "zero carbonization" of regional heating. Gas power generation is carried out in high mashgas mining area to convert gas into clean energy. Also, Shaanxi Coal Group will customize green financial products.

#### **Future Objectives and Policies**

Shaanxi Province will further control total energy consumption and energy intensity, and realize the reduction of energy intensity by 13.5% and carbon dioxide emission intensity by 18% during the 14th Five-Year Plan period. Shaanxi Province will promote the construction of Longji photovoltaic cells and modules (隆基光伏电池和组件), Yulin Innovation Hydrogen Energy New City (榆林科创氢能新城), Ankang Advanced Energy Storage Industrial Park (安康先进储能产业园) and other projects. Shaanxi Province will promote the upgrading of standards for the traditional energy industry, and accelerate the implementation and application of standards for new technologies, processes, equipment, materials and models in line with the special campaign to upgrade and transform traditional industries. Shaanxi Province will actively develop renewable energy, continue to expand the scale of wind and photovoltaic power generation, and develop geothermal energy according to local conditions. By 2025, Shaanxi Province will increase the proportion of installed non-fossil energy to 49.5%, increase the geothermal heating area to 70 million square meters, and increase the proportion of non-fossil energy consumption in the province to 16%.

Shaanxi Province will speed up the formulation of *Shaanxi Province's Hydrogen Energy Industry Development Plan*, support Yulin, Weinan, Tongchuan, Hancheng and other cities in building large–scale by–production hydrogen purification projects, and form two to three thousand–ton fuel cell–grade hydrogen plants. Shaanxi Province will accelerate research and development of green and low–carbon technologies. Fully relying on the innovation driven platform of Qin Chuangyuan, accelerate the development and promotion of green and low–carbon technologies. Shaanxi Province will optimize the industrial structure and layout, strictly implement the national industrial plan, industrial policies, "three lines and one order", planning environmental assessment, as well as the requirements of capacity replacement, coal consumption reduction and substitution, and regional pollution reduction, and resolutely stop the approval and construction of



projects that do not meet the regulations. In key areas, new production capacity of iron and steel, coking, cement clinker, plate glass, electrolytic aluminum, and coal chemical industry will be prohibited, the scale of coal-to-oil production capacity will be properly controlled, and new production capacity of oil refining will be strictly controlled.

### Inner Mongolia

#### **Current Status and Achievements**

Taking energy saving, consumption reduction and green power transformation as the starting point, and scientific and technological innovation as the core driving force, Inner Mongolia energy enterprises promote the development of green and low-carbon technologies, realize the transformation of clean energy and the development of new energy storage technologies, and build a green energy production system by combining green finance and emission reduction technologies such as CCUS.

Inner Mongolia Huadian (内蒙华电) promotes green power transformation, actively lays out landscape projects, and continuously deepens the three main business lines including cross-regional power transmission, coal-power integration and new energy development. In the "three-North" area, relying on the starting point of the UHV delivery channel, a large-scale clean energy base integrating wind, photovoltaic and coal electricity was arranged. By making full use of the favorable conditions of sufficient clean energy in Inner Mongolia, Inner Mongolia Huadian built a large clean energy base which was "base type, clean type, complementary and intensive, digital and standardized". Also, Inner Mongolia Huadian accelerated the transformation and upgrading of stockpiled coal power, explored the development of energy storage, hydrogen energy and other emerging industries, promoted the development of "integration of source, network, charge and storage" and "multi-energy complementarity" energy bases, and expanded comprehensive energy services.

Baogang Group (包钢集团) aims at achieving carbon peak in 2023, and carbon neutral in 2025. Baogang Group focuses on establishing green and low-carbon projects, promoting transformation and upgrading, and developing research and development. Baogang Group and Yueyanglin Paper Company (岳阳林纸) carried out carbon sink trading, sought financial support for carbon emission reduction, and explored carbon quota asset-based schemes. Also, Baogang Group built the world's first set of solid waste and carbon dioxide mineralization demonstration industrialization project, which could sequester 40,000 tons of carbon dioxide per year, and realize the green cycle. During the period of 14th Five Year Plan, Baogang Group planned to invest 815 million yuan to reduce carbon emission, expand the approaches of ecosystem carbon sinks, and develop carbon capture, utilization and storage (CCUS) technology. Baogang Group aimed at



constructing the largest "CCUS carbon neutral" demonstrative project in Inner Mongolia, as well as in the steel industry.

At present, Inner Mongolia has initially formed a comprehensive energy production system featuring both coal, electricity, oil, gas and scenery. The total primary energy production in the region is 650 million tons of standard coal. New energy has become the main force in the adjustment of energy structure, accounting for nearly one third of the installed power and one fifth of all electricity consumption. Inner Mongolia has promoted ecological energy management, control deserts and mining areas for more than 133 KM2, and built Kubuqi into the country's largest photovoltaic sand control base. Inner Mongolia has carried out green renovation of coal and coal-fired power plants, completed green renovation of one third production coal mines, and upgraded 66 million kW coal-fired units with ultra-low emissions.

#### **Future Objectives and Policies**

During the 14th Five-Year Plan period, Inner Mongolia will focus on the construction of new energy bases of 10 million KW in Mengxi and Mengdong, with the installed capacity of renewable energy generating capacity reaching more than 135 million KW, including 89 million KW of wind power and 45 million KW of photovoltaic power. Inner Mongolia will expand the solar hydrogen energy industry, cultivate a new growth pole of modern energy, focus on building wind energy and photovoltaic industrial clusters, and support the cultivation of hydrogen energy and energy storage industrial clusters. Inner Mongolia will double the number of new energy sources and build a new center for modern new energy sources. Implement flexible power grid engineering and build modern new power system. Implement coal control and carbon reduction project. Implement source-net load storage project and explore new ways to match supply and demand. Implement the green hydrogen economy project. Implement digital energy projects and modernizing governance capabilities. Carry out science and technology empowerment projects and build an innovation-driven experimental field. Carry out regional cooperation projects. Promote trade transformation and upgrading, strengthen cooperation on production capacity and equipment manufacturing along the Belt and Road, focus on wind power, solar power and other energy equipment, and build a platform for international production capacity cooperation.

In the future, Inner Mongolia will build diversified parallel mechanism. Market-based grid given priority projects will be given priority. The source network charge storage integration projects, renewable energy alternative, scenery hydrogen production integration projects will be promoted. Also, to promote the transformation of regional enterprises, new energy industry will be given important attention. Combined with the enrichment of scenery resources, further implement the chain extension and quality improvement, and attract the innovative R&D platforms and high-end manufacturing industries in the wind power and photovoltaic industries.





## Hebei

#### **Current Status and Achievements**

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Energy and utility companies in Hebei Province have made progress in diversified lowcarbon transition. Their main methods include investing new energy and clean energy, promoting clean and efficient usage of coal, and developing low-carbon industrial chain.

Hebei Jiantou Energy (河北建投能源), which is controlled by Hebei Jiantou Group (河北建 投集团), is a main energy company in Hebei Province whose power business is mainly coal-fired thermal power generation. But in recent years, Jiantou Energy had started to invest clean energy projects, including Tangshan Leting Bodhi Island offshore wind power project (唐山乐亭菩提岛海上风电项目), which was Hebei Province offshore wind power plant demonstration project; Cangzhou Haixing Nuclear Power Project (沧州海兴核 电项目), which was the first nuclear power project in Hebei Province; and large-scale hydropower projects in Jinsha River Basin. In addition, Hebei Jiantou Group invested in the establishment of China Suntien Green Energy (新天绿色能源) in 2010, whose main business was wind power generation. In 2021, its wind power plant was equipped with over 5000 GW cumulative installed capacity, and generated 13.469 billion KWH wind power, which was 36.31% higher than the previous year.

Jizhong Energy Group (冀中能源集团) takes a steady path of clean production and lowcarbon development, relying on scientific and technological innovation. In coal industry, Jizhong Energy Group first applied the technology of pile shotcrete to keep the roadway along goaf (堆喷混凝土沿空留巷工艺), and realized the full mining of coal. In addition, Jizhong Energy Group promotes the intelligent construction of coal mine, and independently builds the first intelligent gangue filling working face in Xingdong Mine. In terms of new energy investment, Jizhong Energy has developed and operated projects including solar power generation, hydrogen production, storage and distribution. It also made use of idle resources in the mining area that caused by capacity reduction, and prepared a 300,000 kW photovoltaic power generation project in Zhangjiakou, as well as a distributed photovoltaic power station in Jingxing mining area. Besides, Jizhong Energy extends chemical new energy industrial chain. With integration and reconstruction of internal assets such as coke, PVC, and glass fiber, and investment in mergers of upstream and downstream industry chain, Jizhong Energy builds a batch of industrial bases including Handan Coal Chemical Industry, Cangzhou Chlor-alkali Chemical Industry, and so on. The industrial chains achieve increase in energy efficiency and carbon emission reduction.



#### **Future Objectives and Policies**

Heibei Province has introduced policy documents to promote diversified low-carbon transformation of traditional coal enterprises.

*Hebei Province "14th Five-Year" (2021-2025) Plan* provides the general orientation of energy enterprise transformation. Hebei Province will upgrade coal-fired power plants, and control coal power generation. Furthermore, Hebei Province will promote coal consumption reduction and replacement, as well as clean and efficient usage of coal. Besides, for the thermal power industry, energy-saving and low-carbon technology demonstration projects, and carbon capture, utilization and storage (CCUS) demonstration projects will be carried out.

In particular, specific instructions are provided by relevant documents. *Hebei Province "14th Five-Year" New Energy Storage Development Plan* (河北省"十四五"新型储能发展规划) encourages coal power plants to rationally deploy new energy storage, in order to participate in frequency and peak regulation service with coal-fired units. Moreover, the existing sites and facilities of decommissioned thermal power units will be explored to build new energy storage facilities. *Hebei Province Hydrogen Energy Industry Development "14th Five-Year plan"* (河北省氢能产业发展"十四五"规划) states to develop industrial by-production hydrogen project for coking plant in Tangshan, Handan, Cangzhou and other cities. The by-production hydrogen is aimed to ensure hydrogen usage in heavy truck, unmanned aerial vehicle (UAV), metallurgy, aviation and other fields.

#### Henan

#### **Current Status and Achievements**

Energy enterprises in Henan Province mainly adopt the development of clean energy, the construction of facility capacity, and the development of intelligent energy system to achieve diversified low-carbon transformation.

Yuneng Holdings (豫能控股), one of Henan's traditional big coal companies, is making transition by making energy–saving transformation of coal–power, increasing flexibility of coal power and building renewable energy projects. In terms of coal–power energy–saving transformation, research has been carried out on four aspects: "coal–power decoupling", "thermoelectric decoupling", "source–network decoupling", and "consumption and emission decoupling". Twelve related projects have been carried out by various coal–power enterprises, and results are expected to be achieved by the end of 2022.



In terms of increasing flexibility, Fenghe Power Generation (丰鹤发电), a subsidiary of Yuneng Holdings, and Henqi Power Generation (鹤淇发电) are working together to promote a new pattern of inter-city heating, which not only ensures urban heating demand, but also reduces resource waste.

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In terms of investing in renewable energy projects, Yuneng Holdings is enhancing the scale of installed wind power, photovoltaic power, and biomass power generation, and arranging emerging industries including pumped storage and geothermal energy. It devotes itself to establishing an intelligent and comprehensive energy system. At present, Yuneng Holding has obtained the countywide rooftop distributed photovoltaic development right in Xiangcheng County, Lushan County, Yahe Working area, Qi County, Changyuan City and other counties, and the installed capacity of distributed photovoltaic power generation project under construction is over 1000MW. Also, Xiangcheng County and many other projects have realized part of the capacity of grid-connected power generation. In addition, Yuneng Holdings has completed and put into operation eight wind power projects totaling 366MW, as well as 30,000 kW capacity and 2 charging stations in biomass cogeneration project.

#### **Future Objectives and Policies**

Henan Province "14th Five-Year" Plan provides the general orientation of energy enterprise transformation. Henan Province claims that it will control total coal consumption in a scientific and rational manner, and accelerate the increase in the proportion of clean and low-carbon energy. Also, Henan Province will accelerate research and development and demonstration of low-carbon technologies in key areas, guide enterprises to voluntarily reduce greenhouse gas emissions, and continue to launch pilots for low-carbon cities, parks, communities, and projects. In addition, it will explore new technologies and models for carbon capture, utilization and storage (CCUS). Quantificationally, Henan Province will complete over 50% ultra-low emission transformation in coking and other non-power industries, and increase the annual energy saving capacity by 3 million tons of standard coal in key industries.

In 2021, Henan Province held a press conference on how to accomplish green and low carbon transition during the 14th Five-Year Plan period and what goals to achieve by 2025. By 2025, the installed capacity of renewable energy in Henan Province will exceed 50 million KW, the scale of imported electricity will exceed 100 billion KWh, and the proportion of non-fossil energy consumption will reach about 16%. In the green upgrading of the industrial structure, Henan Province will carry out more than 100 key energy-using units, with an energy saving capacity of 2.8 million tons of standard coal. Also, Henan Province will build a number of carbon peak carbon neutral pilot parks and enterprises.



#### Shandong

#### **Current Status and Achievements**

Energy enterprises in Shandong Province focus on developing intelligent coal-industry technology, producing relevant chemical products, and investing in renewable and clean products to promote diversified low-carbon transition.

With coal production capacity of 340 million tons per year, ranking the third in China's coal industry, Shandong Energy Group (山东能源集团) is one of the representative coal enterprises in Shandong Province. To accomplish low-carbon transition, Shandong Energy Group promotes intelligent exploitation technology, produces relevant chemical products, and invests in renewable and clean energy projects. Shandong Energy Group owns domestic first-class mining technology, independently develops the world's first high-reliability 5G private network system for mining, and builds nine national-level intelligent demonstration mines, which are the first batch in China. In terms of chemical products. As for clean energy projects investment, Shandong Energy Group builds a provincial-level new energy investment platform, and actively and orderly develop a 4 million-kilowatt offshore wind power project in the Bozhong region.

Yankuang Energy (充矿能源), which is a subsidiary corporation of Shandong Energy Group, changed its name from Yankuang Coal Group (充矿煤业) to Yankuang Energy in 2021, which showed its determination in transition development. According to its plan in the next five to ten years, Yankuang Energy will focus on five big industries including mining, high-end chemical new material, renewable energy, high-end equipment manufacturing and intelligent logistics. These new development directions will promote Yankuang Energy achieve its aims including lower carbon emission for high carbon energy, scale for clean energy, and intelligence for comprehensive energy.

#### **Future Objectives and Policies**

Shandong Province "14th Five-Year" Plan provides the overall direction of diversified low-carbon transformation for energy enterprises. Shandong Province will increase the efficiency of energy usage, and control the total energy consumption. Shandong Province will deter blind development of energy-intensive, pollution-intensive and resource-based projects. Also, green production will be promoted by carrying out the lead action of enterprises' cleaner production, by which key enterprises and demonstration zones will be established. Shandong Province will build environmental protection industry clusters in Jinan, Qingdao and Zibo, and support Rizhao in carrying out technological transformation and industrialization demonstration of natural gas chemical industry and hydrogen metallurgy.



In 2022, Shandong Province printed Shandong Province Gas Unit Construction Project and Other Eight Action Plan Notice (山东省燃气机组建设工程等八个行动方案的通知), in which secure energy supply and clean and low-carbon transition action plans were provided. One of them is relying on key energy enterprises to strengthen the construction of coal reserve capacity. Shandong Province will make full use of the land resources of the decommissioned coal mines to build Zao mine comprehensive logistics park (枣矿综合物流园), fertilizer mine (Taihui) coal storage base (肥矿 (泰惠) 储配煤基地) and other projects. The target is that in 2022, the reserve capacity will increase by 5.3 million tons, and from 2023 to 2025, the reserve capacity will increase by 6.7 million tons.