



JACKSON HOLE
CENTER FOR GLOBAL AFFAIRS

JACKSON HOLE GLOBAL FORUM 2018

**CLIMATE SOLUTIONS, COAL
COMMUNITIES, & ECONOMIC
DIVERSIFICATION**

REPORT & RECOMMENDATIONS

WWW.JHCGA.ORG/GLOBALFORUM

GLOBAL FORUM SPONSORS

Lead Sponsors

Wolfensohn Family Foundation

Steve Denning

Co-Sponsors



Supporters

CLEARPATH



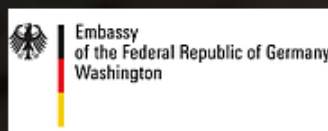
WILLOW STREET GROUP
TRUST AND FAMILY OFFICE SERVICES

Speyer Family Foundation

Jay Varley



Partners



Media Partner



FORUM EXECUTIVE SUMMARY AND HISTORY

Executive Summary

On November 8-9, 2018, the Jackson Hole Center for Global Affairs held the first Jackson Hole Global Forum: Climate Solutions, Coal Communities, and Economic Diversification, in Jackson Hole, Wyoming. Wyoming is the nation's largest coal-producer and the state depends heavily on the sector for public revenue. The forum brought nearly 50 speakers together with Wyoming state policymakers and national private sector and civil society leaders to explore how coal communities such as Wyoming can adapt to new opportunities for energy and economic diversification. A climate change forum in coal country, the Forum successfully created a bipartisan and forward-looking platform for discussion largely devoid of politics or biases.

The Jackson Hole Center for Global Affairs distilled the conversations and observations into three overarching recommendations for Wyoming. These recommendations represent the opportunities identified and views of JHCGA, not necessarily Forum speakers or participants.

- 1. Create a Global Coal Communities Network that works with China and other global coal communities (India, Germany, Japan) to collaborate and hasten the commercial implementation of clean energy innovations and opportunities**
- 2. Keep and attract young people through a public-private structured financing and entrepreneurial ecosystem**
- 3. Provide new deals/roadmaps that attract renewable energy and renewable energy enabled industries**

Forum History

In 1989, U.S. Secretary of State Jim Baker hosted Soviet Foreign Minister Edward Shevardnadze in Jackson Hole for a Cold War focused bilateral summit. The informal nature of the meeting and Jackson Hole's scenery helped to strengthen the ties between the two leaders and ease the tensions of the Cold War. From this historic event was borne recognition of Jackson Hole's unique "Power of Place" - the impact that Jackson Hole itself can play in bringing people together to grapple with global challenges. The Jackson Hole Global Forum continues in this tradition.

Testimonials

"I attend a number of conferences each year and I can't say enough about how insightful and expansive these discussions have been" - David Halligan, former CEO, Goldwind Americas

"I'm really grateful to JHCGA for their visionary leadership in bringing a thoughtful and substantive discourse to the heart of Wyoming and the Rocky Mountain West" - David Firestein, University of Texas at Austin

FORUM GOALS AND WYOMING OVERVIEW

Why “Climate Solutions, Coal Communities and Economic Diversification”? Because Wyoming is the U.S.’s largest producer of coal – the most carbon-intensive fossil fuel – historically producing almost 400 million tons annually. **Wyoming depends heavily on coal and other minerals for public revenue – providing approximately 70 percent of Wyoming’s revenue.** Coal’s global challenges have directly impacted Wyoming’s economic outlook. The state levies no personal or corporate income tax. Tax revenue is provided through severance, property, and sales tax levied on the mineral industry. This has meant that coal’s decline has created serious fiscal challenges for Wyoming and recent years have seen a precipitous drop in revenue. **Wyoming provides around 10 percent of the U.S. total energy,** the bulk of which comes from coal, oil and gas.

Further, Wyoming is non-competitive economically. In 2017, Forbes ranked Wyoming 49th in Economic Climate and Bloomberg ranked Wyoming 50th in their Economic Evaluation of States Index. Wyoming has a problem keeping its youth. Of all workers 18 years old, only 40 percent are still working in Wyoming ten years later. Wyoming lost 5,595 residents between July 2016 and July 2017, the largest decline since 1989.

Citizens agree that there is a need to diversify Wyoming’s economy. As Governor Mead recently stated at the Governor’s Business Forum as it related to the state’s task force to diversify the economy – ENDOW – “These young people are not asking ‘Should we do this?’ They’re asking when we can do this. They’re telling us to do it and do it now.”

Against this backdrop, the Forum’s goals were to contribute to the economic diversification discussion – specifically for Wyoming, and for places like Wyoming, through bringing in new, international, and diverse global perspectives and ideas. Secondly, the Forum’s goals were to create new partnerships. The third goal was to help set in motion climate leadership in Wyoming.

ENDOW

Led by Governor Mead’s Economically Needed Options to Diversify Wyoming (ENDOW) Initiative, Wyoming is working to develop a 20-year economic diversification strategy with explicit targets to guide the evolution of Wyoming’s economy in order to build a sustainable and diversified, value-added economy by 2038. ENDOW’s mandate is to grow additional sectors alongside, not in lieu of, including advanced manufacturing and the knowledge and creative sector (healthcare, financial and professional services, digital technology, and arts and culture).

ENDOW has focused on the core building blocks of **workforce and education, health and quality of life, infrastructure, entrepreneurial ecosystem, and state capabilities.** Looking ahead, ENDOW sees next generation engines in **natural resources, tourism and recreation, agriculture, advanced manufacturing, and the knowledge and creative sectors.** The recommendations of the Jackson Hole Global Forum are meant to contribute to the ENDOW discussion – how to economically diversify Wyoming.

GLOBAL MEGATRENDS AND GLOBAL COAL COMMUNITIES TAKEWAYS

Speakers representing China, Germany, Norway, the UAE, Alberta, the U.S. Federal Government, Texas, Missouri, Colorado and Montana described common themes and divergent approaches in responding to these trends. Overall realities and global trends discussed included:

- o Fracking and the huge disruption in the gas markets has led to gas displacing coal
- o The accelerating global demand for clean/renewable energy (a result of technology, not politics)
- o The growing trend toward electrification (e.g., transportation sector)
- o The mechanization of industry demanding cheap energy
- o The increasing impact of global climate change in creating economic dislocation and disruption at a very local level
- o The disadvantage at which communities place themselves when they do not respond to change

Common themes included the need for a long-term process of planning for economic diversification, incorporating the following characteristics: a clear economic diversification theory of change and strategy for acting upon it; depoliticizing economic transition and making budgetary response as bipartisan as possible; prioritizing community-driven solutions and understanding cultural heritage; a focus on solutions; and policy models based on standards rather than picking winners and losers. Differing approaches included:

CHINA

The China Model, Shanxi Province: Industrial restructuring and clean energy prioritization

China is the globe's largest energy consumer (23% of global totals in 2017) and the clean energy transition is underway. The Energy Production and Consumption Revolution Strategy (2016-2030) has issued a mandate to increase clean energy production and consumption and significantly reduce the proportion of fossil fuels - gradually establishing a modern energy system. Newly added energy demand is to be supplied by clean energy. Further, active reallocation of coal revenues from traditional to non-traditional industries is underway.

Case Study - Shanxi Province:

Like Wyoming, Shanxi is an important coal and power production base contributing to China's economic development and energy demands. The Province is rich in coal resources, with a total of 267.4 billion tons of discovered coal reserves and 1,453 billion tons of production capacity. Since 2005, Shanxi has tried to transform and diversify beyond coal dependency and in 2016 Shanxi Province formulated the Implementation Plan for the Comprehensive Reform of the Resource-Based Economy in Shanxi (2016-2020).

GERMANY

The German model, the Ruhr Region: public-private partnerships

In the Ruhr Region, where the population decreased by 600,000 beginning in the 1960's after the closure of mines, mine redevelopment and regional transformation with the involvement of all was prioritized. Via public private partnerships, the Government and private sector purchased abandoned coal mines and focused on redevelopment, making incremental improvements that contributed to a bigger picture with an inclusive participation process and advantages that include everyone.

Lessons Learned

- o Focus on “Lighthouse projects”: projects which can stand out to attract attention and rebrand a region
- o Improving higher education is a fundamental must
- o Technological innovations alone are not sufficient

ALBERTA

The Alberta Model: Invest in coal community transition and develop entrepreneurship

In Alberta, the decline of coal led to a political move to invest in coal community transition in order to maintain overall economic profile of province – oil and gas. This included a recently announced \$200M investment in renewable energy. The Alberta model of diversification has been to develop entrepreneurship so government can get out of the way. This has further highlighted the need for entrepreneurship and new ideas facilitated by investment in broadband, infrastructure, etc.

Lessons Learned

- o Find the catalysts for innovation – find mechanisms to get around 100 years of not having to be creative

NORWAY

The Norway Model: “Play to our strengths in core industries, and develop forward looking roadmaps” (i.e., invest where resources are likely to make the most difference)

Lessons Learned

- o Take advantage of hydropower to rollout electric vehicles (strategic focal point for electrifying other industries)
- o Electrify the shipping industry
- o Use experience in offshore operations to develop offshore wind capacity
- o Work together with trade unions and business towards shared goals and developing good jobs

UNITED ARAB EMIRATES

The UAE Model: “celebrate the last barrel of oil leaving the UAE” - Crown Prince of Abu Dhabi, H.H. Sheikh Mohamed Bin Zayed Al

Lessons Learned

- o Recognize and welcome the change, and responding is vital to stability and to future generations
- o Make large investments in renewable energy.
- o Hydroelectric power station at Hatta Dam to be first of its kind in the region.
- Large scale investments in carbon capture for coal-fired facilities
- o 2017 announcement to build a clean coal power station by the first quarter of 2021 to generate 1,800 mw/year. Looking to the future UAE signed an agreement with China and Saudi Arabia to build and operate a 2,400 mw clean coal plant fully operational by 2023

MISSOURI

The Missouri Experience: “Bring in the elements of culture”

- o Everyone welcomes change until it directly impacts you.
- o Figure out the processes to set a vision, involve all the stakeholders and get communities to embrace change early because change will come from the youth.
- o The world will follow those nation’s that provide the leadership.

COLORADO

The Colorado Model: “Holistic” approach to power generation

- o Use portfolio of complementary assets to enable each to leverage the other (e.g., wind and natural gas)
- o Securitize coal plant retirements and allocate part of of the savings to reinvest in distressed communities
- o Heavily recruit renewable energy providers to set up manufacturing operations in the state

MONTANA

The Montana Model: Worker Retraining Challenges

Lessons Learned

- o Require 15% apprenticeships in all new construction contracts
- o Begin retraining before the dislocation occurs

TEXAS

The Texas Model: Follow the Money. "Texas isn't a Red State or a Blue State, it's a Green State and I don't mean environmentalism. Texans understand one thing and that is money" - Fred Beach, Energy Institute, University of Texas at Austin

Texans understand money and economics and development. Texas's Competitive Renewable Energy Zone spent \$7billion of rate payer money to build high voltage transmission lines to the panhandle where there was no wind power but a great wind resource. Now the state has 21 gigawatts and growing of wind capacity. There are days where 50% of the power on the grid comes from wind power.

Lessons Learned

Follow the technology and investment opportunities, not politics but economics

NEW IDEAS AND RECOMMENDATIONS

"So many governments are failing to prepare for the future" - Kate Gordon

"Coal is not the enemy, CO2 is the enemy" - Chris Rothfuss

SUMMARY

Wyoming's strength is as an energy producing state, producing around 10 percent of the U.S.'s energy. Wyoming can play to this strength and should lead in carbon capture but also actively encourage renewables. Doing so would keep Wyoming competitive as the western region and the globe move to a lower-carbon economy and harness the independent and pioneering spirit of Wyoming citizens. Taking affirmative action in this way will also stimulate economic diversification, maximize natural resources, reposition Wyoming favorably in the global economy, and respond to mega-trends.

Change has come due to economics and technology first, politics second. Wyoming is an energy exporter and other countries' policies have an impact on Wyoming's economy - for example, Germany's feed in tariff program, China's manufacturing incentives, and renewable portfolio standards policies at the state level.

Wyoming can hasten leadership in fields such as the commercialization of clean energy, while retaining Wyoming's youth and attracting new talent. This could be accomplished via a new ecosystem that provides innovation opportunities in industries of the future and financing availability in a beautiful state with a good education system, low cost of living, and unbeatable outdoor recreation opportunities. State leaders can start by updating outdated perspectives about climate, embracing a holistic approach to energy, enabling streamlined export of electricity from renewable sources, and establishing new sources of tax revenue. Wyoming's leaders have an opportunity to look to the new and growing markets created by national and global climate policies and capitalize on those opportunities to create prosperity for local communities.

1. CREATE A GLOBAL COAL COMMUNITIES NETWORK THAT HASTENS THE COMMERCIALIZATION OF CLEAN ENERGY

A Global Coal Communities Network to collaborate and hasten the commercial implementation of clean energy innovations and opportunities such as Carbon Capture, Carbon Tech, Solar, Wind, and Geothermal. Aligned with ENDOW Building Block Infrastructure, State Capabilities and Next Generation Engine Additive Manufacturing.

Wyoming's leadership through the University of Wyoming and Integrated Test Center has already developed **the competitive advantages, know-how, and widespread political and public support for carbon capture technologies**. At the same time, carbon capture and other carbon dioxide removal technologies are increasingly being seen as **crucial elements for a global toolkit** that needs to be scaled up and commercialized to respond to the high likelihood of global warming overshooting 1.5°C above pre-industrial levels. Likewise, Wyoming is positioned to lead in Carbon Tech, and expand alignment with the growing global demand for Solar, Wind, and Geothermal energy.

Wyoming can benefit from more international partnerships. In Carbon Tech, Japan is a natural partner. Alberta is geographically close and faces similar energy challenges. Germany has leading experience in managing the energy transition.

China is the world's second largest economy and largest consumer of energy, including coal. As a country which is undergoing a massive restructuring of its economy away from coal, there are bilateral opportunities for cooperation in the diversification of energy systems into other areas, such as:

- o **Selling LNG to China** as part of broader U.S.-China LNG Deal. As proposed at the Forum by Dan Slane, Trump Transition Team Infrastructure Advisor in a public announcement. See details of the proposed deal in the footnotes.
- o Tapping into **China solar expertise** to build out the Wyoming solar opportunity. Partner with China to bring in Chinese companies and investment to go all-in on solar and wind manufacturing partners. To be possibly combined with a swap to sell natural gas to China.

POLICY RECOMMENDATION

Create a Global Coal Communities Network. Some regions to begin with could be Wyoming-Alberta, Wyoming-Japan, or a Wyoming-China office in Shanxi, China. In parallel to the Wyoming-Taiwan Trade Office established early in 2018, a Wyoming-China Office, ideally situated in Shanxi Province (China's leading producer of coal), would provide trade and collaboration opportunities in the clean energy for coal communities space – including CCS, additive manufacturing in carbon tech, and renewable energy expertise. Similar networks/offices could be created in Europe, Asia, and more resulting in a global network focused on collaboration, trade and commercialization in clean energy technology and products. This network would help in global coal communities economic diversification efforts and, like the Bloomberg C40 network, but for coal communities, provide pathways forward on how coal communities can contribute and have a seat at the table in working towards global climate goals.

2. KEEP AND ATTRACT YOUNG PEOPLE THROUGH A PUBLIC-PRIVATE STRUCTURED FINANCING AND ENTREPRENEURIAL ECOSYSTEM

Aligned with ENDOW Building Block entrepreneurial ecosystem, and state capabilities

It's impossible to pick the winners of tomorrow. But growing climate consensus has the **young generation engaged and wanting to start companies**. Much research has been conducted in climate change, what is needed is for **financing to enter the commercialization of clean energy technologies**. ENDOW has already prioritized building an entrepreneurial ecosystem and through the Wyoming Business Council, is supporting and funding start ups in the state. In addition to these efforts, Wyoming can be reframed and marketed as an ideal place for entrepreneurs to come and start a business, with strong entrepreneurial ecosystem and world-class quality of life and outdoors. The state's coffers are limited and so what is needed is a public-private entity that can locate capital, bring it to Wyoming, and invest it in Wyoming's entrepreneurs.

In the German tradition, prioritize “**Light House Projects**” – projects that can galvanize new Wyoming pride and strengthen momentum and buy-in to new industries. The Forum provided widespread consensus that Wyoming has a **materials opportunity** – Notably in Carbon Tech, as mentioned above. According to the **American Jobs Project** Wyoming's carbon tech industry has the potential to support an annual average of 2,600 jobs through 2035, representing over 25 percent of the state's current manufacturing workforce.

Other examples include:

- o More applications of natural gas, for example as a feedstock for making chemicals. Convert natural gas in the US to methanol and shipping to China where there is vast interest and needs – it's simpler to ship through ports than LNG.
- o Rare Earth Materials – for next-generation technologies such as magnets for batteries
- o Carbon Fiber – convert methane or coal into carbon fibers
- o Geothermal – apply oil and gas expertise and competitive advantage
- o Carbon sequestered plastics and cement production
- o Wind turbines and transmission lines (more below)

POLICY RECOMMENDATION

Create a public private entity that promotes Wyoming's entrepreneurship ecosystem both within and outside of Wyoming and funnels both early stage and late stage venture capital into lighthouse projects such as carbon tech and the commercial clean energy environment. These efforts can be paired with a public relations campaign that markets Wyoming nationally, with a focus on spreading the word at colleges, and in entrepreneurial hubs like Silicon Valley.

3. PROVIDE NEW DEALS/ROADMAPS THAT ATTRACT RENEWABLE ENERGY AND RENEWABLE ENERGY-ENABLED OPPORTUNITIES

Help attract new industries by bringing new renewable energy to Wyoming. Aligned with ENDOW Building Block Infrastructure and Next Generation Engine Additive Manufacturing.

In addition to Wyoming's mineral resources, Wyoming has some of the nation's best renewable energy resources, including **50 percent of the best wind resources in the country**, ready for export. Attracting wind can bring new jobs, industries, and revenue to the state. In revenue, assuming 20,000 MW of new development over the next two decades - aligned with ENDOW's 2038 goals - this would bring \$5.6 billion in taxes over 20 years and 800 direct full-time annual O&M jobs.

In addition, Wyoming ranks 8th in the U.S. relative to **solar potential**.

Renewable energy can attract industries to Wyoming. Wyoming has an ideal climate and along I-25 and I-80 fantastic broadband connectivity making it an ideal destination for **data centers**, and virtually all high-tech companies want renewable generation (e.g. Microsoft in Cheyenne). Making it easy for these companies to source renewable energy is a critical piece to recruiting them. The same is true for Blockchain. Wyoming can build on the Blockchain 2018 legislation and create a **Blockchain Roadmap** modeled after Delaware - for example automating the process for companies to incorporate; laws to enforce contracts written and stored through blockchain; and using Blockchain to store property titles. Blockchain demands cheap energy, some of which can be renewable. Lastly, renewable energy access will help **attract the Fortune 500**. Increasingly, global multi-nationals want access to renewable power. Having well-established and streamlined pathways for these companies to access renewables will help recruit them to come to Wyoming (e.g. Facebook, Google, Walmart, and more).

Leverage Natural Resources for Home-Grown Industries and Additive Manufacturing

- o Carbon tech 3D printing of wind turbine blades - the blades are getting bigger and more difficult to transport on-site. Wyoming can be proactive in getting in on the ground level of companies looking to provide this service.
- o Manufacturing transmission lines in Wyoming through the Carbon tech competitive advantage.

BUT

Without new major transmission capacity construction (TransWest Express/Zephyr/Other), additional renewable energy development in Wyoming will be limited to about 5,000 MW.

Wyoming is the only state in the U.S. that **taxes wind generation**. This sends a clear message to wind developers that they should take their business elsewhere.

POLICY RECOMMENDATIONS

- A. **A New Roadmap:** There is a need for a better developer-state deal that has an incentive structure and takes into account transparency in the siting and permitting of developments and transmission lines. The end goal of that deal could be a wind development roadmap that takes into account wildlife and bird migratory routes, and is a transparent process with the understanding that such actions will expedite the siting and permitting process, and bring down the regulatory transaction costs. Wyoming’s leaders could establish an office at the Wyoming Infrastructure Authority dedicated to creating this roadmap as well as capitalizing on Wyoming’s prodigious renewable energy resources, thus providing the dedicated leadership and stability necessary for wind and solar developers to make investments in the state.
- B. **Revise Tax Revenue Structure:** Wyoming’s state revenue is currently dependent upon minerals extraction, leaving the state’s economic health vulnerable to fluctuations in commodities pricing. New economic development and the resulting population growth will require new infrastructure, none of which would be supported by the companies or citizens that are straining existing structures, due to the lack of corporate taxes. Establishing a nominal level of corporate tax that is competitive with neighboring states could generate much-needed revenue to support economic diversification and development.
- C. **Streamline Corporate Customer Access to Renewable Electricity:** Wyoming Public Service Commission could amend regulations to allow corporate customers, such as data centers and manufacturers in Wyoming to direct-purchase renewable power.
- D. **Advocate for new Transmission Infrastructure with the elected officials in D.C.** Petitioning the Department of Energy (DOE) and the Federal Energy Regulatory Commission (FERC) could result in a Fed-backed transmission plan which would include the transmission of Wyoming power to markets in the East; Southeast; and West Coast.
- E. **Remove Tax Burden on Wind Generation:** Wyoming is the only state in the U.S. that taxes wind generation. This sends a clear message to wind developers that they should take their business elsewhere. If Wyoming truly wants to take advantage of its wind resources, it should repeal the wind generation tax.

FOOTNOTES

LNG Proposal

1. China commits to purchase \$100 billion of LNG per year for ten years. First delivery scheduled on or before mid-2025.
2. China Development Bank issues loan guarantees in 2019 to enable development and construction of 5 or 6 LNG plants in Texas and Louisiana.
3. US eliminates their tariffs once 1 and 2 above are executed.
4. China begins development of infrastructure to receive the gas by mid-2025.
5. China begins construction of 200 new LNG ships.

Project Goals:

1. The US and China become connected “at the hip” through energy and are more dependent upon each other bringing us closer together and stops a trade war.
2. China is now able to convert coal fired power plants and other industrial users to clean natural gas, dramatically reducing carbon emissions and cleaning up their environment.
3. China meets their goal of 15 % use of natural gas as part of their total energy use.
4. The US is able to reduce its trade deficit by one third.
5. Satisfies US demand for China to open up its markets to US exports.
6. Economic development “game changer” for both countries creating tens of thousands of high paying energy and logistic jobs.
7. China now able to stop using coal and retrains coal employees to other energy occupations.
8. Opportunity to jointly engage in R&D projects to develop LNG improvements and new discoveries.

Win - Win for both countries