

China – U.S. Cooperation: Connecting An Asia - North America Super-Grid

by Roy Morrison

The good news about accelerating our global response to climate change comes from three scientists. In January 2022, in *Nature*, the preeminent scientific journal, Cong Wu, Xiao Ping Zhang, and Michael Sterling found that solar energy alone can “lead to full power availability all year round” by linking continental scale renewable energy systems with a 13 hour or more time differential. This means a link between Asia and North America using solar alone could meet all our energy needs..

As the sun sets at 6 PM in California, it’s 10 AM the next morning in Beijing. An under sea cable connection between an Asia super-grid across the Bering Strait, 52 miles wide with an average depth of only 160 feet, to Alaska and the North American super-grid will do the trans-continental job.

Continental grids will be built piece by piece, step by step, nation by nation. It’s an effective way to take advantage of the rotation of the earth to provide energy from the sun as well as from the wind. The larger the scale, the more efficient the use of renewable energy and the more cost effective. Cooperative and continental scale renewable energy development led by China and the United States is the basis for effective and timely global greenhouse gas displacement and climate change mitigation.

Building and interconnecting continental scale renewable grids is an engine for sustainable global economic growth that leads to ecological improvement and the fulfillment of the China Dream and the American Dream. Led by China and the U.S., inviting participation by all, we can build a larger, sustainable and just global economy. This will benefit all the world’s people and rest on a global convergence on sustainable norms and justice and fairness for all. The 21st century can become a time not just of

preventing global climate catastrophe but represent the movement toward a global ecological civilization.

It's time for President Xi and President Biden to take the initiative and embrace the promise of cooperative development of interconnected continental scale renewable grids. This can become a key feature of long-term China – U.S. relations because it is in the essential best interest of both nations. This does not remove various tensions and competitive rivalries between China and the United States, but it recognizes that continental scale renewable grids are a tool for climate change mitigation and advancing global prosperity and a basis for long term cooperation, not conflict.

The past year of 2022 has seen substantial steps by both China and the United States in advancing green house gas displacement goals. In 2022, China promulgated a National Climate Change Adaptation Strategy 2035. In 2022, the United States passed the Inflation Reduction Act with major climate change plans and policies.

Working on building and then interconnecting an Asian and North America super-grid as a global model is a preeminent example of China and U.S. mutually beneficial cooperation as a most efficient and cost effective means of accelerating transformation to a 100% renewable energy world.

Solar based continental scale grids combined with wind and hydro have three crucial advantages:

1. Solar is a readily globally available technology that can be installed as single panels or as solar farms or above parking lots, or on roofs, or as dual-use agriculture solar above pasture and crops. Each panel contributes to global greenhouse gas displacement.

2. Solar can be installed quickly. It has lead times of week to months and not the many years for large scale wind farms.

3. Solar costs continues to decrease and solar's efficiency in turning sunlight into electricity continues to increase. Fossil fuels can not compete with zero fuel cost renewables. Taking advantage of continental scale renewable energy systems reduces the amount of energy storage required.

Cooperation is the path for reducing costs of global renewable transformation, increasing efficiency and facilitating investment and sharing knowledge with the developing world. This is essential to meet the global renewable challenge, to help end global poverty in the context of social and ecological justice. This means for China and the U.S. a cooperative expansion of the Belt and Road initiative and U.S. AID efforts.

On a less than continental scale, as a first step, a mixture of wind, solar, hydro, geothermal, tidal combined with storage can do the job for 100% renewables. There is now reliable data on global sun and wind daily hourly output. In the *Journal Nature Communications* Oct. 2021 article "Geophysical constraints on the reliability of solar and wind power worldwide" uses 39 years of hourly solar and wind data (1980–2018) to analyze the ability of solar and wind resources to meet electricity demand in 42 countries, varying and optimizing the mix of renewable generation as well as energy storage capacity.

National and regional efforts are best understood as steps toward linked continental scale grids to enable not just reaching green house gas reduction goals, but ultimately to facilitate the removal or excess carbon dioxide from air and ocean through nature sequestration on land and sea and in biomass and to return the atmosphere to preindustrial carbon-dioxide levels below 300 part per million.

These are the fruits of humanity acting self-consciously as part of the co-evolutionary processes of the biosphere in a healing response to all influences that has enabled life to respond to periodic mass extinctions and once again thrive. This will not be accomplished by "degrowth" and a return to an imagined pre-industrial past.

Rather, we need to embrace smart growth that sends clear price signals for sustainability combining new market rules, regulations, laws that make sustainable goods and services cheaper, gain market share, become more profitable, and allow markets to operate without polluting, depleting, and ecologically damaging externalities.

The Costs of Failing to Seize the Initiative

The world faces an existential threat of climate disaster that affects all nations, the rich and the poor. 2022 was a year of worsening climate disaster globally from floods, drought, hurricanes and tropical cyclones, wild fires, mud slides, heat waves, and even record snows from the weakening of the Arctic polar vortex. Global green house gas emissions still continue to increase.

If we do not take aggressive measures to curb green house gas emissions we increase the risk of releasing irreversible global geophysical forces. We cannot refreeze melting permafrost on land and sea beds releasing gigatons of methane, or refreeze an ice free Arctic Ocean in the summer absorbing and not reflecting sunlight.

Reality, not posturing and political rivalries, must inform the policies and programs pursued by China and the United States essential to the long term self-interest of both nations and to the world community. It is not a coincidence that China and the United States are the world's two largest economies and the two largest green house gas emitters. They are also world's leaders in building renewable energy capacity.

By far the most dire long term threat to both nations and to civilization is the global consequences of climate change that, if unmitigated, will represent not simply an enormous cost, but an irresistible pathway to collapse. China and the U.S., by working

cooperatively, can vastly improve our chances not only to escape disaster but make global economic growth a force leading to ecological improvement.

Shape of the Super-Grid

Building an Asia and North American super-grid does not mean just a reliance on giant solar and wind farms and high voltage DC power lines. It also means widely distributed solar energy on roofs, over parking lots, along and above highways, as dual-use agricultural solar above pasture and crops. Each solar panel is a part of the global renewable energy transformation. While continental scale super-grids can embrace solar as a basic tool quickly installed, it will include other renewables.

A global renewable energy system that is emerging is additive. It combines primary generation from solar, wind, geothermal, hydro, tidal, biomass with further renewably driven non-polluting tools. These includes green hydrogen produced by renewably powered electrolyzers that split water into hydrogen and oxygen, energy storage, micro-grids and smart distribution networks, high voltage DC transmission. The hydrogen becomes a tool to power combustion turbines to meet peak power demands and to replace natural gas in existing pipelines.

The future continental scale renewable grid will be a combination of town and city scale micro-grids with their own generation and storage resources providing some, but not all, of their energy and storage needs. The micro-grid feeder(s) will separate from the larger grid if voltage and frequency are outside of operational norms and serve some, but not all, of the micro-grid needs using its generation and storage resources. Large scale system renewable power will combine with distributed generation and storage. There is always a dynamic balance between generation, storage and improved efficiency, and between distributed storage and system storage.

We have not yet fully appreciated the enormous capabilities of distributed storage resources, in particular, from large numbers of electric vehicles providing available stored power to the grid. New York City residents, for example, own 2 million automobiles. It's worth examining in some detail. When fully charged, current EV batteries on average can supply 66 kWh of electric power. This represents a maximum potential of 132,000 megawatt hours (mWh).

Assume just 10% of autos are not on the road, fully charged and connected to the grid and capable of providing 50% or 33kwh each to the grid. This means 6,600 mWh available for grid changing. This is about equal to total New York City 2020 daily electric demand February to April. This represents a fundamental shift not just in storage, but in supply with renewables providing the charging power.

EVs operate with much higher efficiency than the internal combustion engine, the equivalent cost equal to \$1.00 a gallon of fossil fuels. Not yet fully monetized, the value of EV storage to grid will represent substantial income flows to EV owners, further reducing net operating costs far below \$1.00 per gallon equivalent.

The Politics of 2022 and Now 2023

2022 has also seen an increase in political tension between China and the United States with talk of a new cold war, and increased military spending by both nations. In 2022, the Biden administration committed \$1.7 trillion dollars for industrial development in the Infrastructure and Jobs Act, the Inflation Reduction Act, and Chips and Science Bill to combat climate change and reverse the decline of U.S. high technology industrial leadership. Producing state of the art chips are similarly goals also pursued by China and the European Union.

But the United States also adopted Commerce Department regulations and export license requirements that could be used to limit the ability of China to fulfill its high technology development goals, particularly attempting to limit China's development and use of latest 3 nano-meter microchips. This is a clear signal that the U.S. feels threatened by China's goal to become global technological leader in many key 21st century fields such as robotics, quantum computing and, biotechnology.

Taking these steps, if actually implemented by the U.S., will lead China to use its substantial intellectual and engineering resources to accelerate an import substitution regime that, in the long run, will likely enhance, not retard, China's productive abilities.

2023 is the time for President Xi and President Biden to exert global leadership. Military conflict between the China and the U.S. would be a global catastrophe. A number of confidence building measures can be undertaken by China and the United States that make it clear that our rivalry will be political and diplomatic and not military.

The embrace by President Xi and President Biden of the cooperative pursuit of linked continental scale renewable grids can represent the wisdom of both leaders to pursue actions that will not only reduce the threat of climate disaster but put us on the path toward building a global, sustainable ecological civilization. It's up to our leaders to seize the opportunity.

Roy Morrison builds solar farms. His latest book is *The New Green Republic*

<https://www.amazon.com/New-Green-Republic-Roy-Morrison/dp/1951805887/>

Notes:

Solar Alone Can Provide 100% Energy Using Continental Links with 13 Hour Time Difference

Cong Wu, Xiao Ping Zhang, Michael Sterling, 2022. "Solar power generation intermittency and aggregation." *Nature*. January 25, 2022. Article Number 1363 (2022). <https://www.nature.com/articles/s41598-022-05247-2>

Solar and Wind Can Meet all Energy Needs in 42 Countries Studied

Dan Tong, David J. Farnham, Lei Duan et. al., 2021. "Geophysical constraints on the reliability of solar and wind power worldwide." *Nature Communications*. October 22, 2021. <https://www.nature.com/articles/s41467-021-26355-z#Sec1>

New York City Car Use , Electricity Demand and EV Storage Batteries

U.S.EIA, 2020. "Daytime electricity demand in New York City most affected by COVID-19 mitigation actions." May 22, 2020. <https://www.eia.gov/todayinenergy/detail.php?id=43855>



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