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Energy Policy as an Anchor for Sustainable Economic Transition in China

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China is the world's second-largest economy and largest emitter of carbon dioxide, and its economic and energy policy decisions have far-reaching implications.[*] [1] As short-term air quality and long-term climate risks come into focus for China, there is a clear need for an economic transition that allows the country to move to a more diverse, low-carbon, and innovative economy—in short, a truly *sustainable* economic transition.

Such a transition is closely in line with China's stated economic and environmental goals, and is consistent with national air quality targets and evolving global efforts to combat climate change. For example, the 12th Five-Year Plan (2011–2015) calls for a more strategic approach to development, efficient use of resources and prioritization of low-carbon growth. The nation's recent commitment to the United Nations Framework Convention on Climate Change further details China's commitment to low-carbon development by capping CO_2 around 2030.[2] Most recently, during the September 2015 visit by President Xi to the United States, China committed to a national cap and trade program, new efficiency standards for vehicles and buildings, and over $3 billion in funds to help poorer countries deal with the impacts of climate change. As China faces increased pollution, rapid urbanization, and economic pressure to diversify away from a heavy manufacturing base, the country is prioritizing a transition that can address these issues and serve as a model for other nations.

Government, business, and consumer decisions about how to generate and use energy will anchor this transition in the years ahead. This paper briefly outlines some of the key energy policy issues facing the country today, with a specific focus on the electricity and buildings sectors, and recommends a path forward to a more sustainable growth model that is firmly grounded in China's economic and environmental goals.[**] We focus on the following key policy areas:

- Smart energy generation and distribution
- Industrial and building energy efficiency
- Vehicle electrification
- Pricing and financing to spur investments in energy innovation
- Training the energy workforce of the future

Smart Energy Generation and Distribution[3]

In just a few decades, China has built the largest electricity sector in the world. The country's power grid had more than 770,000 kilometers of transmission infrastructure as of 2013,[4] 25% more than the U.S. grid.[5]

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[*] All references are available in a separate document, provided upon request.

[**] The Paulson Institute has published longer papers on each of the subjects outlined here, including recent technical reports on the power sector, demand response, building codes, building energy disclosure, and emissions trading. All reports are accessible at paulsoninstitute.org.

The power sector also accounts for about half of the country's annual coal consumption. Reforms in this area are key to meeting China's ambitious goals for air quality as well as related policies on coal consumption control, energy efficiency, renewable energy, and carbon emissions. The March 2015 "Deepening Reform of the Power Sector" policy document, also known as Document #9, issued under the joint authority of the State Council and the Central Committee of the Communist Party, reflects the need for widespread power sector reform.

Of the reforms currently being considered in China, we believe the following are key to bringing the power sector in line with a more sustainable approach to economic growth:

- **Promote efficiency and other cost-effective low-carbon options to meet new electricity demand.** Experience in other countries shows that when grid companies take an "integrated resource planning" approach that considers both demand-side resources like energy efficiency, and supply-side resources like new energy generation—and when companies evaluate the entire lifecycle cost of energy resources, including risk and reliability factors—they often find that energy efficiency and renewable energy can compete head to head with new investments in coal- and other fossil-based power plants.
- **Institute pricing reforms to encourage energy efficiency and renewable energy integration.** China's present power pricing system is designed to compensate generators for both fuel costs and capital costs based on planned annual operating hours—meaning generators are paid more, the more energy they produce.
  - Implement pricing reforms such as decoupling grid company revenue from sales volume (a method used in half of the U.S. states) to allow better integration of efficiency and renewable energy into the overall system.
  - Create market-based wholesale electricity pricing structures that compensate generators for capacity, generation, and ancillary services, especially those that improve the grid's flexibility.
  - Shift markets to a marginal cost dispatch structure that prioritizes very low operating cost renewable and clean energy sources, as well cheap demand response, over higher-cost fossil units.
  - Allow grid companies to claim expenses associated with energy efficiency programs. Such incentives are likely to be included in the new grid company reform in West Inner Mongolia, for example.[6]
  - Create additional incentives for grid operators to stop wasting, or "curtailing," renewable energy during off-peak hours. This can be achieved through a number of means such as by exposing grid operators to some of the costs of curtailment.

Industrial and Building Energy Efficiency[7]

Given the energy consumption and carbon implications of China's rapidly expanding building floor area—over 1.5 billion square meters annually, a total equivalent to roughly one-fourth of the existing commercial building area in the United States[8]—it is critical that the government prioritizes energy efficiency. China is already encouraging building energy efficiency through new technology promotion, building codes and standards, and financial incentives. However, administrative measures and government funds are simply not enough to generate needed investments. To successfully reduce emissions from the building sector, China should allow the market to play a greater role in delivering energy savings.

Two important market-driving policies are feasible in the short term and can help China improve the carbon intensiveness of the built environment:

- **Actively update, improve, and enforce building codes.** While China has implemented strong building codes, it is important that these codes be consistently updated to take the newest design standards and energy efficiency technologies into account, and also to ensure that they are rigorously enforced. Providing longer-term code update schedules and performance targets can mobilize the design and construction industries in advance, making future compliance easier and more likely. A 2009 United Nations study found that enforcement of building codes was above 80% in major Chinese cities but much lower in smaller cities and rural areas.[9] The Ministry of Housing and Urban Development (MOHURD) reports over 95% compliance in 2011 (up from just 2% in 2001); however the sample sizes are small and MOHURD itself acknowledges the need to strengthen enforcement in medium and small cities.[10] Improving building code enforcement approaches in major cities, and ensuring smaller cities and rural areas have access to the staff and resources necessary for code education and enforcement, will help drive the market for energy efficiency upgrades and products.
- **Promote building energy disclosure, especially in public buildings.** China has already set the stage for widespread conservation and disclosure efforts in public buildings, beginning as early as the 11th Five-Year Plan period.[11] By 2008, several policies were in place to support building energy disclosure, such as the State Council's 2008 Regulations on Energy Performance of Civilian Buildings and Regulations on Energy Performance of Public Buildings.[12] However, building owners and operators still often report that they feel they lack a strong, specific legal basis to publicly release building energy data, or to share it with appropriate government agencies.

Vehicle Electrification

In energy policy discussions, transportation is often discussed separately from electricity. But as China's electricity sector becomes greener and more sustainable, electrifying the transportation system—particularly passenger vehicles—can dramatically reduce the country's overall pollution and greenhouse gas emissions. Electric vehicles can also act as storage units for the power grid, taking in renewable energy during off-peak hours.[13]

Chinese leaders have already shown the political will to scale up the country's electric vehicle (EV) market, with a target of reaching 5 million EVs on the road by 2020.[14] Transportation electrification would benefit from the following policies:

- **Encourage grid operators to invest in "vehicle-to-grid" programs** that integrate electric vehicles into demand response programs, using the vehicles as backup storage units during periods of particularly high renewable energy load (such as at night).
- **Integrate electric charging infrastructure into building codes and standards**, so that new buildings are equipped with charging stations to support the growing fleet of EVs being used in China. Importantly, these standards should be as open and inclusive as possible to encourage rapid scale-up of electric vehicle technology.
- **Provide incentives for consumers to purchase electric vehicles**, including incentives to trade in older, less efficient combustion vehicles for new or used electric vehicles; cheaper license plates and parking for electric vehicles; feebates that tax the least-efficient vehicles and use the funds to promote efficient vehicles; and reduced driving restrictions for EV owners.

Pricing and Financing to Spur Investment in Energy Innovation[15]

Most experts agree that the single best way to promote investments into low-carbon technologies at the scale needed to transform the energy sector is to put an actual price on carbon. China's 12th Five Year Plan (2011–2015) affirmed that China would begin regulating greenhouse gas emissions through a carbon emissions trading system (ETS); [16] this was followed by the decision of the Third Plenum of China's 18th Party Congress in 2013 to impose a price on pollution that would reflect the associated environmental costs.[17]

China is now taking a leading role in developing emissions trading markets, and in many respects is far ahead of many countries and regions. The country currently has seven regional pilot trading programs in place, with a goal of integrating these into a national system by 2017. As China implements its September 2015 commitment to a national carbon cap and trade system—what will be the largest carbon pricing system in the world—the country should consider the following recommendations:

- **Include a legal framework.** Of China's seven pilots, only the Shenzhen and Beijing pilots are founded in law. [18] The other pilots are implementing their respective ETSs through administrative measures, [19] which have legal character, but are not binding on all local agencies, and lack legislation's statutory authority when it comes to enforcement and compliance assurance.
- **Set a specific cap on emissions that declines over time.** Only through an actual cap on emissions, which allows program participants to use efficiency alongside other measures to comply with the cap, can a trading system achieve its ultimate goal, which is to reduce the carbon intensiveness of China's economy.
- **Promote transparency** so that market participants can truly understand how permits are allocated, banked, and traded. This point is especially important as China ramps up its anti-corruption efforts.
- **Remain open to other complimentary pricing methods, including a carbon tax.** A recent Paulson Institute paper makes the case that some aspects of a carbon tax can actually support economic growth, so long as the revenues are used to cut taxes in other areas of the economy. [20]

Pricing systems are essential to a long-term sustainable economic transition, but they take time. In the interim, and even with such systems in place, China can take steps to support public and private sector investment into low-carbon technologies.

Training the Energy Workforce of the Future

As China invests in making its existing energy systems and buildings more efficient, it must also invest in its workforce. China has laid out plans to become a "talent-rich country" by 2020, seeking to attract top talent from abroad, increase investment in human capital, and raise the share of human capital in economic growth.[21]

There is ample evidence that the low-carbon industries of the future will require a workforce with a general level of "technical literacy"—the broad range of math, science, and engineering skills that anchor most emerging technology industries today.[22] China's government and businesses would do well to invest in these skills, along with the critical thinking skills central to creating a more innovative and entrepreneurial culture.

CONCLUSION

China has already put many of the high-level goals and policies in place to build an energy system and overall economy that is low-carbon and sustainable. These goals, when translated into specific policy actions at a more local level, can drive innovation and technology advancement, reduce pollution and climate risk, and ultimately put China on a path toward global energy—and sustainable economic—leadership.