

State and Federal Jurisdictions in U.S. Energy Efficiency Policy

A Primer for Chinese Provincial Policymakers

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16 January 2013

Introduction

The United States has a long-standing, well-developed framework for regulating energy efficiency. The framework permits federal, or centralized regulation of many elements of energy demand and supply management, but is flexible enough to accommodate state and local regulation as appropriate. This paper describes the impacts of energy efficiency policies on U.S. energy consumption trends, as well as the types of regulations typically adopted at each level of government. It also indicates the means for resolving conflicts among regulations.

We conclude the U.S. regulatory system works—it succeeds in saving energy despite its complexities, and despite the complexities of human behavior. Officials in China’s provincial governments may find useful corollaries in the work of the U.S. states to regulate energy-using equipment and utilities.

How Efficiency Policies Affect U.S. Energy Consumption

Energy demand in the United States has been stable for a decade. It is dominated by the buildings sector at 41 percent of all primary energy used followed by industry at 32 percent and transportation at 28 percent.¹ All major sectors except one—commercial buildings—have reduced energy intensity. Industry has reduced energy intensity by the largest amount—22 percent from 2004-12.² The residential sector, largely due to regulation of standards on building efficiency and residential appliances, has declined by almost the same amount.

By accelerating the rate of energy intensity reduction from its historic level of 1 percent per year to a 2 percent rate since 1990, the United States now saves at least 25 EJ annually—about 25 percent of total demand.

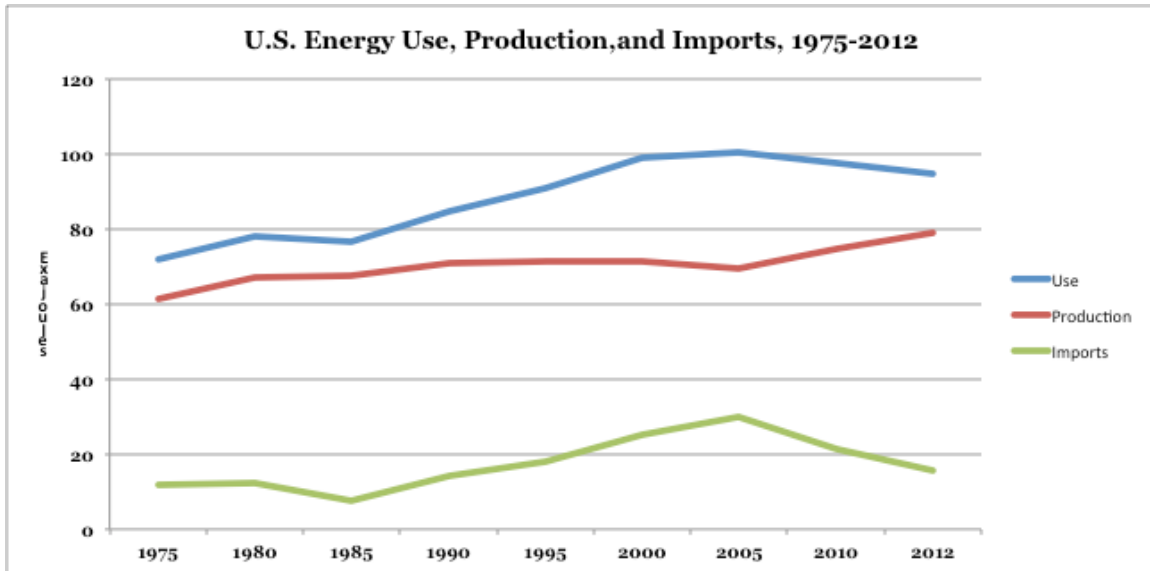


Figure 1: U.S. Energy Use, Production and Imports, 1975-2012

Source: U.S. Department of Energy, Energy Information Administration

Changes in fuel and carbon dioxide intensity has been comparable across all fuel types, at least until recently when coal use began falling. Coal burned in 2011 was 13 percent lower than in 2000. This decline is due in large part due to the substitution of natural gas for coal in power generation.³ For example, the U.S. Department of Energy estimated that the carbon intensity of the electric power and industrial sectors fell in the year 2009 by 4.3 and 3.0 percent, respectively, as a result of fuel switching from coal to natural gas.⁴ Gas became more attractive as its wellhead price in 2012 fell one-third below the average price of 2000-2005.⁵

U.S. Energy Efficiency Regulations

All U.S. policy, including regulation of energy efficiency, is shaped by its national constitution, which reserves to the states and local governments any power not specifically granted to the federal government. The U.S. constitution grants authority to the federal government to regulate interstate commerce, a power the federal government has used to regulate several elements of the energy system. Just as efficiency itself is a continuum, so too is the regulatory system. For example, the federal government has established national efficiency standards for the manufacture of appliances, but states regulate the utilities that provide electricity to run them, and local governments develop the building codes that influence installation and operations.

At all levels of government, regulatory officials must justify their decisions to regulate in a transparent process that makes the proposed regulation and supporting documentation

(for example, cost-benefit analysis or environmental impact assessment) available for public review and comment. Interested parties may challenge a government’s authority to regulate, as well as the efficacy of a proposed regulation. Conflicts between federal and state authorities may be resolved in the courts. For example, 14 states sued the U.S. Department of Energy for failing to enforce appliance efficiency standards already enacted by Congress and signed by the president.⁶

Each of these jurisdictions has its own strengths and weaknesses. The federal level is best for setting uniform standards for energy-using appliances and equipment bought and used throughout the country. The federal government has greater ability to fund and attract technical expertise, and can be more visible in providing leadership.

Table 1: Efficiency Policy Characteristics by Jurisdiction		
Level	Strengths	Weaknesses
Federal	<ul style="list-style-type: none"> • Uniform regulations • Access to technical experts • Access to funding 	<ul style="list-style-type: none"> • Limited ability to tailor policies
State	<ul style="list-style-type: none"> • Can be tailored to local need • Legal authority over utilities 	<ul style="list-style-type: none"> • Limited funding • Limited influence
Local	<ul style="list-style-type: none"> • Can be tailored to local need 	<ul style="list-style-type: none"> • Limited funding • Limited influence

Source: Adapted from National Renewable Energy Laboratory, Elizabeth Doris, Jacquelin Cochran, and Martin Vorum, “Energy Efficiency Policy in the United States: Overview of Trends at Different Levels of Government,” Golden, Colorado, December 2009.

The state governments can be more flexible and can more-readily adapt policies to appropriate state conditions. Significantly, the states provide the most important oversight and regulation of the utility sector, especially at the retail level.

Local governments are limited by funding and geographic influence, but sometimes have the best insights for tailoring policies to community needs.⁷

Most major elements of U.S. energy consumption are regulated a multiple levels. For example:

Vehicles

The federal government in 2010 established a new standard for average fleet fuel economy of 34 miles per gallon (6.9 liters per 100 kilometers) for U.S.-made automobiles beginning with the year 2017 model. This policy—which sets the “corporate average fuel economy,” or CAFÉ, of all cars manufactured by a given company—will eventually require a U.S. fleet average of 50 miles per gallon (4.7 liters per 100 km).⁸

The states of California and Massachusetts were influential in the adoption of this standard, which they viewed as vital to their interests in mitigating air pollution and climate change. The states have won a legal battle to regulate vehicle emissions, which overlaps with the authority to regulate fuel economy, and ten other states at least will join them. Because California represents such a large fraction of the market for cars in the

U.S., the industry finds it advantageous to cooperate with efforts to “nationalize” California standards.

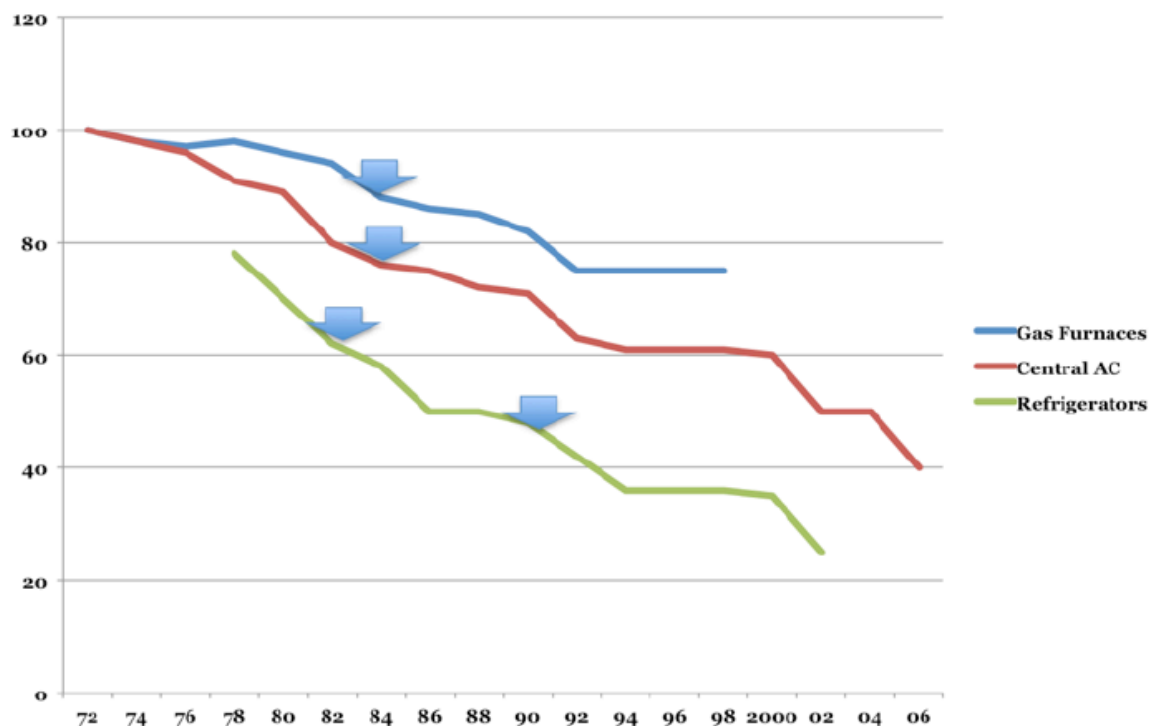


Figure 2: Effect of State Policies on Appliance Efficiency

Source: Meyers, J. McMahon, J. McNeil, and X. Liu, “Impacts of US federal energy efficiency standards for residential appliances,” *Energy* 28 (2003) 755-767

Appliances

States, again, especially California, led the way in creating appliance standards in the United States. State standards were perceived as creating a burden on manufacturers because it was costly for appliance-makers to meet differing standards in different states, so industry joined with the states and with environmentalists to seek a national standard imposed and enforced at the federal level. Federal standards have expanded to include over 50 types of consumer equipment and dramatically reduced the use of energy in the United States.⁹ Central air conditioning units made in 2006 used only half as much energy as in 1972. Refrigerators made in 2010 used only one-fourth as much energy as in 1972.¹⁰ In 2012, the federal government adopted a new standard for clothes washers, which will reduce current consumption by one-third (on top of a two-thirds reduction from 1973 levels). More than a dozen states have adopted appliance efficiency standards on equipment not required by federal law.¹¹

Buildings

Buildings consume an enormous amount of energy, but it is difficult for the federal government to regulate them. In such instances, they often use financial incentives as an alternative to regulation. For example, in 2009 the federal government set aside funds to weatherize one million low-income homes. State governments and private organizations cooperated to complete this task in 2012.

Utilities

U.S. electric utilities, as a result of state laws, spent an estimated \$7 billion in the year 2012 directly on energy efficiency improvements.¹²

States are increasingly requiring the electric and gas utilities operating in their states to promote and even finance energy-efficiency measures in their customers' buildings and facilities. Twenty states have set an energy efficiency resource standard which requires utilities to obtain a certain share of their "supply" for energy efficiency measures. Six other states have set targets (see figure). Some 30 states now have created loan funds, but some of them are quite small.¹³

For example, the state of Arizona requires its utilities to save 22 percent of otherwise expected electric power demand and to save 6 percent of expected gas demand by 2020. Maryland is requiring a 15 percent reduction in per capita energy consumption by 2015. New Mexico is requiring a 10 percent reduction of 2005-level retail kilowatt-hour sales to be saved by utility programs by 2020. New York will require a 15 percent reduction relative to projected year 2015 electricity use. Texas required a 25 percent reduction in annual growth in electric power demand 2012. Virginia will require 10 percent savings by 2022 relative to 2006 base power sales.

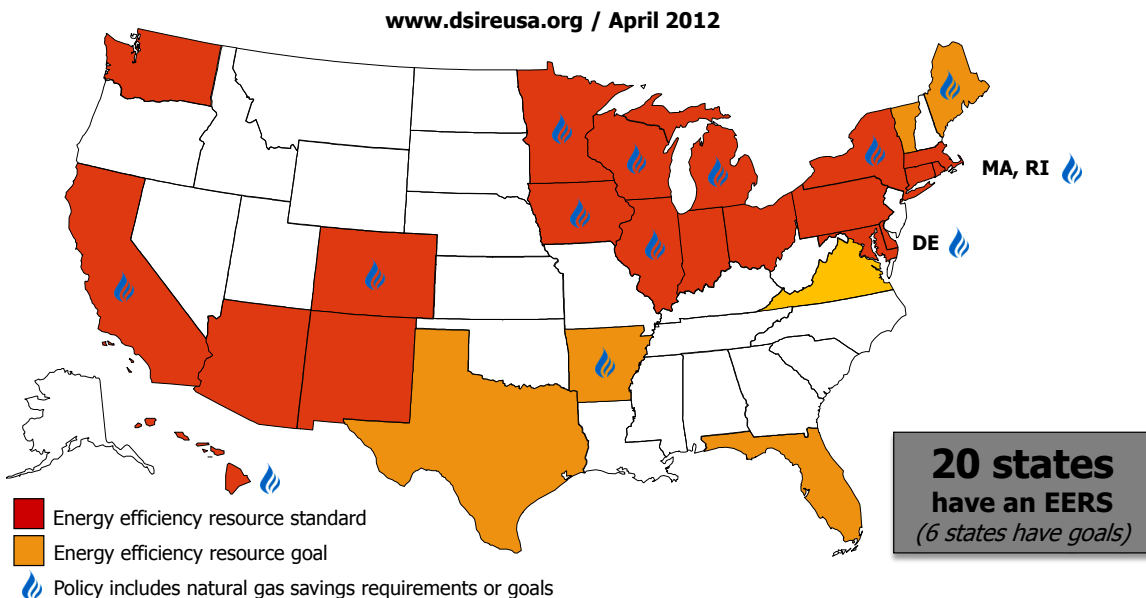


Figure 3: States Imposing Energy Efficiency Resource Standards on Utilities

Source: North Carolina Solar Center, www.dsireusa.org

Information Programs

Other key programs are information-based. The best known is the "Energy Star" rating program. The federal government sponsors and manages Energy Star because it has the technical resources to do so and it is an activity that benefits the entire nation, not just some states. Many states have their own energy offices, however, and these agencies lead information programs targeted to state and local needs. A Maryland program called

EmPower Maryland, for example, promotes utility sector efficiency in the state by publicizing utility and state financial incentives available. Other private efforts like that illustrated in the “EnergyHog.org” graphic shows efforts to reach young people about the importance of energy savings. These organizations, like the Alliance to Save Energy and the American Council for an Energy-Efficient Economy provide policy, technical, and public information using private, tax-deductible donations.¹⁴

What Works?

Recent assessments of the effectiveness of energy-efficiency policy in the United States point to regulatory policies as ranking among the most successful measures.¹⁵ One systematic and detailed analysis done by the American Council for an Energy-Efficient Economy (ACEEE) rates each of the states for the effectiveness of its individual policies. States along the east and west coasts rank in the top ten. The political drivers for strong policies in those states tend to be both environmental and economic. Also, a greater political acceptance by citizens in coastal states of the reality of market failures based on new economic and behavioral science has made it easier for state governors and legislators to enact strong measures.

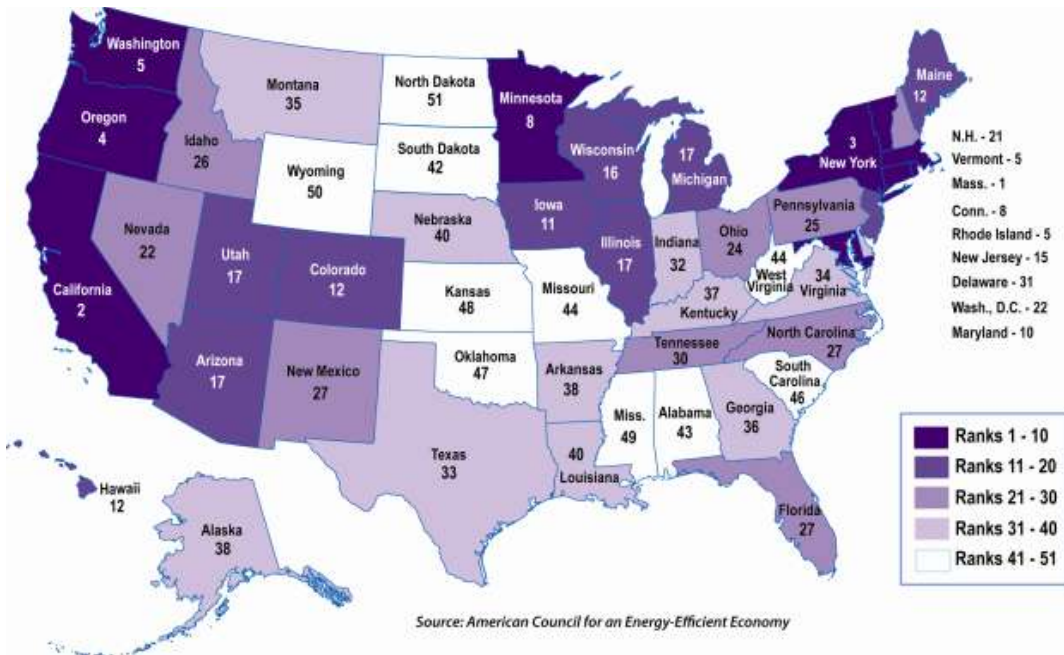


Figure 4: Ranking of States for Energy Efficiency Policies

Source: American Council for an Energy-Efficient Economy, www.aceee.org

ACEEE rates each state using an index based on a point system with a maximum possible score of 50 points. This index is composed of six categories of measures weighted by savings potential, which in turn are estimated by multiple studies. The categories include programs related to:

1. Requiring utility companies to deploy and encourage energy efficiency technologies
2. Encouraging automobile fuel economy and public transportation
3. Developing and enforcing building codes for energy efficiency
4. Deploying combined heat and power
5. Creating initiatives for energy savings within state government operations
6. Setting appliance and other equipment standards.

Utility programs are estimated to be capable of saving up to 40 percent of overall energy use, so utility programs count for up to 20 points in the ACEEE index. Scoring for policies such as building codes depends on the extent to which a state exceeds model regulations.

Utility programs tend to be concentrated on a kind of “portfolio” standard requiring utilities to acquire energy efficiency measures as a resource (see examples above). Ratings also include points for a “decoupling” policy; that is, a state gains points for having separated profitmaking from power generation by a utility. The top states are prompting about one billion dollars per year in utility spending on efficiency measures.

Combined heating and power promotion is evaluated based on the extent to which a state requires mandatory grid connection and “wheeling” (exchange of power between an independent supplier and a specific customer) over the grid.

The annual savings in the United States from utility programs and appliance standards alone is estimated at about 4 exajoules, or four percent of U.S. energy use in 2012.¹⁶

A recent Department of Energy laboratory recently summarized U.S. energy-savings experience by drawing the following conclusions:

- Leadership is needed and is found at all levels of government
- Coordination is important
- Efficiencies come from applying lessons-learned across sectors and jurisdictions.

In this last respect, the Chinese government and its provinces have a major advantage. A series of efforts recently has led to quiet exchange of “lessons-learned” by the provinces in implementing energy-efficiency policy. This activity represents a major step forward for Chinese policy makers.

Relevance To China

The main implication for Chinese policy makers of U.S. energy efficiency experience is that a market-oriented, open economy can and does rely heavily and effectively on regulatory policy to improve energy efficiency. Another implication is that the United States takes more seriously than many assume its environmental and economic responsibility to control energy waste.

The U.S. literature suggests that China could benefit from strengthening a few of its already strong energy-efficiency policy measures. This observation seems particularly true for the provincial level. China could greatly benefit from strengthening its regulation of the electric power grid and implementing policies more consistently across the provinces.¹⁷ China may also want to strengthen and improve its national appliance standards, and to continue to enforce industrial efficiency measures.

Table 2: Comparison of U.S. State and Chinese Provincial Efficiency Policy Strengths

Policy	Comment on U.S. Policies	Comment on Chinese Policies
Utility regulation	Many states have efficiency resource standards	Chinese utility regulation is very weak and inconsistent
Industrial sector	States rely mainly on market mechanisms plus some incentives	China has unprecedented industrial efficiency standards
Commercial buildings	Energy intensity in this sector has not improved	China lacks strong commercial building efficiency policy
Residential sector	Local governments regulate construction practice	Residential buildings have not been a priority in China
Appliances	States have led the way for efficiency regulations	Chinese appliance standards are managed by the central government
Automobiles	States have led the auto fuel economy push	Chinese provinces have generally not regulated auto fuel economy

Source: Authors

Chinese provinces regulate provincial utilities in a way similar to the way U.S. states regulate utilities. Policies vary widely across U.S. states and do so as well across Chinese provinces. Lack of consistent policies and enforcement can sometimes reflect differing situations in the local economy and climate, but probably most often reflects different attitudes among states or provinces as to the priority of energy-saving and environmental protection. This is either a policy strength or flaw, depending on whether one favors unfettered markets or environmental protection. That is, this is the essence of a political question. The extent to which the central government involves itself in the role and effectiveness of local governments in managing energy use depends on the extent to which the central government is committed to the idea of laissez-faire or public benefits.

The Chinese provinces remain key to industrial energy efficiency policy innovation and enforcement. Provincial leaders may be encouraged to take the lead to exceed national standards, policies, and expectations. Provincial experience could in this sense be used as a kind of laboratory from which the central government could then choose particularly effective policy innovations.

Summary

The purpose of this report has been to indicate for Chinese policymakers “what works” to save energy in the United States. We have explained policy efforts at different levels of government in the United States because responsibility and authority reside not only with the central but also the state and local governments. We draw conclusions both from the

literature and our own experience about the effectiveness of regulatory, incentive, pricing, and information policies to promote efficient use of energy in the United States.

Our most important conclusion is that the United States, despite its sometimes deserved reputation for being a wasteful energy consumer, has a successful though complex record of energy-saving policies. Chinese policymakers who face their own energy and environmental challenges could pay particular attention to the role states have played as policy leaders in regulation of the efficiency of energy-using equipment and as overseers of the power sector's role in acquiring energy-efficiency resources.

Endnotes

1. See, for example, Dennis P. Lockhart, President and Chief Executive Officer, Federal Reserve Bank of Atlanta, "A View of U.S. Manufacturing," presented at the Knoxville Economics Club, April 8, 2011. For time series data, see U.S. Department of Commerce, Bureau of Economic Analysis, Industry Economic Accounts Data, www.bea.gov (current on 4 January 2013). Industry remains a large energy consumer because industrial output remains high. Value-added from U.S. industry stands at about 20 percent of world output, roughly the same as over the past decade, and in 2011 reached its pre-recession level of 2008.
2. MER, p. 23 and BEA, <http://www.bea.gov/iTable/iTable.cfm?ReqID=5&step=1>, retrieved 4 January 2012.
3. MER, p. 7.
4. U.S. Energy Information Administration, "U.S. Carbon Dioxide Emissions in 2009: A Retrospective Review," Washington, D.C., www.eia.gov, retrieved 15 January 2013.
5. MER, p. 131.
6. For background on this issue, see U.S. Government Accountability Office, "Long-standing Problems with DOE's Program for Setting Efficiency Standards Continue to Result in Forgone Energy Savings," Washington, D.C., January 2007, www.gao.gov, retrieved 15 January 2013.
7. For an excellent discussion of strengths and weaknesses of federal, state, and local jurisdictions with respect to energy-efficiency, see National Renewable Energy Laboratory, Elizabeth Doris, Jacquelin Cochran, and Martin Vorum, "Energy Efficiency Policy in the United States: Overview of Trends at Different Levels of Government," Golden, Colorado, December 2009.
8. American Council for an Energy-Efficient Economy. See <https://aceee.org/topics/fuel-economy>, retrieved 5 January 2013.
9. Kenneth Gillingham, Richard Newell, and Karen Palmer, "Energy Efficiency Policies: A Retrospective Examination," *Annual Review of Environment and Resources*, 2006. v. 31, pp. 161–92.
10. See, especially, S. Meyers, J. McMahon, J. McNeil, and X. Liu, "Impacts of US federal energy efficiency standards for residential appliances," *Energy* 28 (2003) 755-767.
11. Appliance Standards Awareness Project, www.appliance-standards.org, retrieved 6 January 2013.
12. Each of the above examples was quantified by the American Council for an Energy-Efficient Economy. See, Steve Nadel, "Ring Out the Old, Ring in the New: Energy Efficiency Outlook for 2013," <http://aceee.org/blog/2013/01/ring-out-old-ring-new-energy-efficien>, retrieved 4 January 2013. See also, ACEEE, "New Clothes Washer and Dishwasher Standards Will Save Consumers Loads of Money, Protect the Environment," www.aceee.org, retrieved 4 January 2013.
13. See, for example, a summary of loan funds available as a result of efforts by the State of Maryland. <http://www.naseo.org/resources/selfs/state.aspx?State=MD>
14. See www.ase.org and www.aceee.org.
15. Gillingham *op cit*.
16. Gillingham *op cit*.
17. For a discussion of Chinese electric power grid issues, see William CHANDLER, CHEN Shipping, Holly GWIN, WANG Yanjia, "China Power: Benefits and Costs of the 'Strong, Smart Grid,'" *Entri*, Annapolis, MD USA, 2012, www.etransition.org.