THE WAY FORWARD

The Energy Future Coalition has not been alone in calling for a new direction for the country and the world on energy. For example:

- In 2004, the National Commission on Energy Policy released a bipartisan report focused on enhancing oil security, reducing climate risks, improving energy efficiency, expanding energy supplies, strengthening energy supply infrastructure, and developing better energy technologies.[37]
- In 2008, the Energy Security Leadership Council, a project of Securing America's Future Energy, called for electrification of the transportation sector, enhancing the nation's capacity for electric power generation (including nuclear, carbon capture, renewables, grid, and efficiency), boosting domestic biofuels, and increasing energy R&D.[38]
- In 2010, the American Energy Innovation Council – a group of America's top business leaders, including Bill Gates of Microsoft, Norm Augustine of Lockheed Martin, John Doerr of Kleiner Perkins, Chad Holliday of DuPont and Bank of America, and Jeff Immelt of GE – said that reforming and strengthening U.S. investment in energy innovation is the most critical element to securing America's future.[39]

And yet, in spite of these calls for change, our energy habits are still stuck in the past:

- Oil imports and carbon dioxide emissions have started to rise again, following brief declines caused principally by the recession.[40]
- Even apart from the spike in oil prices to $145 per barrel in July 2008 (and its subsequent plunge below $40), the trend in oil prices over the last decade has been upward – a trend that was reinforced by the recent unrest in the Middle East.[41]
- Petroleum represents an increasing share of the U.S. trade deficit, despite its volatile pricing, accounting for more than half of the total in 2010, rising to 59 percent in the first five months of 2011.[42]
- Renewable sources such as solar power, wind, and biofuels provided just over 8 percent of America's energy in 2010 – and despite very rapid growth rates in production, their share of the energy market has grown only slightly.[43]
- The evidence, scale, and impacts of climate change have all increased beyond the

point of credible scientific challenge. The last 10 years included nine of the 10 hottest years on record, extreme weather events are more frequent, and Arctic sea ice (to cite one obvious indicator) is disappearing rapidly. Summer sea ice extent, as of September 2010, is shrinking by an average of 11.5 percent per decade since the beginning of satellite records in 1979.[44] The chemical composition of the oceans is changing, as the absorption of carbon dioxide from the atmosphere steadily makes seawater more acidic.[45] Yet our emissions continue to accelerate on a global basis.

These facts underscore the urgency of America's energy challenge. What we must do is hurry our future. We must change the rules that present the largest barriers to our clean energy future and we must refocus our attention on America's most abundant energy resource – energy efficiency.

Some of the barriers that new rules can address include:

- ***Electric utility regulation*** – In most states, utilities are rewarded for investing in power plants, for which they earn a rate of return – and not for investing in consumer energy efficiency, for which they may be repaid but not earn an additional return.[46] When such utilities increase electricity sales, they increase their profit. Increasing energy efficiency – and thereby reducing the need for as much supply – means lower sales and lower profits, so efficiency investments are generally unattractive economically. Customer-owned power systems, such as solar panels, similarly reduce the amount of power that utilities need to generate, along with their profits. Independent renewable power producers face somewhat different barriers. Utilities often make it difficult or expensive for them to gain access to the grid. Fractured and overlapping regulatory jurisdictions impede construction of transmission lines needed to bring renewable energy to market. (If similar systems were in place for America's roads, the interstate highway system would not exist.) And once they reach the grid, renewable energy sources may not receive full credit for the value of their power; because of the intermittent nature of these sources, utilities often give a zero or low price for the "capacity value" of the generation.
- ***Lack of information*** – Energy is a complex technical subject, and consumers – both businesses and individuals – often lack the information they need to make investment

decisions, from the homeowner considering a new air conditioner to the factory owner thinking about a combined heat and power system. Similarly, credit and insurance providers, utilities, and state public service commissions are often unfamiliar with rapidly evolving renewable energy technologies, thereby hindering developer access to financing, increasing capital costs, and reducing the regulatory impetus for change.

- ***Disconnect between decision-makers and bill-payers*** – Many energy investments are made by someone other than the person who ultimately pays the energy bill. Typically, these decision-makers – e.g., homebuilders and landlords – do not make investments in efficiency and renewables that would be cost-effective for the ultimate bill-payer because they cannot be assured of recouping their up-front costs. In the U.S., this issue is estimated to affect almost half of residential space heating, 77% of residential hot water usage, and 90% of leased commercial space energy consumption.
- ***High capital costs*** – Renewable energy and energy efficiency require large capital investments that are recouped over time. These up-front costs can be daunting to those making energy choices – whether a homeowner, a business, or a utility, which can generally pass along higher fuel costs automatically. Decision-makers often have short investment payback horizons and are reluctant to invest in technologies even if they are cost-effective.
- ***Infrastructure*** – Refueling infrastructure is key to widespread market penetration of alternative vehicle technologies. For example, there are now more than 8 million flex-fuel vehicles (i.e., vehicles capable of operating on either gasoline or a blend of up to 85 percent ethanol) on the road in the U.S., having increased steadily from 140,000 in 1998.[47] But there are very few pumping stations where drivers of those vehicles can actually have a choice of fuels. Similarly, much of the infrastructure to support electric vehicles in this country is not yet in place. Gasoline and diesel benefit from the advantages of incumbency, brought about by decades of financial and policy support.

The new rules of America's energy future should move toward electricity and transportation systems that are clean, affordable, secure, and sustainable.

An effective energy strategy for the United States must begin by addressing supply and demand options – the production of energy and the use of it – on an equal footing. Energy policy has traditionally focused more on supply than demand, but arguably the latter has more near-term potential than the former.[48] Because of policies enacted after the 1973 oil embargo, the United States was able to decouple energy growth from economic growth. The nation uses roughly half as much energy as was projected 35 years ago, while still achieving the projected level of economic growth. Looking forward, steps to improve energy efficiency appear more cost-effective, less dependent on new technology development, and quicker to implement than new supply options for a cleaner and more reliable energy economy. In all sectors of our energy use – industrial, commercial, residential, and transportation – there is significant untapped efficiency potential.

An effective energy strategy must also address the issues of oil dependence and climate change together. Choices that pit one objective against the other should be avoided. The conversion of domestic coal to liquid fuels, for example, would reduce oil dependence but worsen the threat of climate change. Further improvements in transportation fuel efficiency, on the other hand, would reduce oil consumption by just as much, but at a fraction of the cost and with a net positive effect on carbon emissions.[49]

The long-term centerpiece of U.S. energy strategy – for transportation as well as power – must be electricity. Much has been written about the hydrogen economy of the future, but electricity has all of the virtues of hydrogen and fewer of the drawbacks.[50] Like hydrogen, electricity is an energy carrier, not an energy source – it is completely clean at the point of use, in terms of both conventional pollutants and greenhouse gases, but must be produced using energy from another source. Unlike hydrogen, electricity has an established distribution network and can be produced inexpensively today.

How would an electricity-centered economy address the challenges of oil dependence and climate change, and what would that energy future look like?[51]

First, that future would be electricity-centered, not electricity-only. Thus, heavy-duty vehicles and light-duty centrally fueled fleets could be powered by natural gas, while light-duty cars and trucks could run largely (but not solely) on electricity, with plug-in hybrids allowing routine daily travel on electricity but also extended range on a liquid fuel – perhaps a gasoline or diesel substitute derived from biomass. Transitioning the U.S. fleet of light-duty vehicles to plug-in hybrids could have at least two substantial benefits:

- It could reduce gasoline use by 40 to 55 percent by 2050, putting downward pressure on the price of oil and reducing the global flow of revenues to oil-producing countries – even as the trends in exploration are toward resources that are more difficult and costly to extract (e.g., the remaining oil in a tapped reservoir or deepwater resources far off-shore in challenging environments). Use of biofuels for extended-range travel could take cars off petroleum altogether.
- A fleet of hybrid vehicles is also a fleet of batteries.[52] If the cars are plugged in when not in use, a smart electric grid could draw on (or add to) their stored electricity to keep the system in balance – an increasingly challenging task as variable energy resources like wind and solar are added to the grid. Plug-in hybrids could provide thousands of megawatts of reserve power to the grid, and in the event of a power outage, a plug-in hybrid could power a house for a time, replacing the need for a backup generator.[53] The nation's fleet of vehicles has more generating capacity than the nation's entire fleet of power plants – by various measures, 10 to 35 times as much – although the difference in the usage of automotive engines versus power plants defies a useful direct comparison. If even a small proportion of our vehicles were plug-in electric vehicles, their batteries could potentially provide a significant source to peaking power, voltage regulation, and spinning reserve for the grid. To utilities, the value of this service would be up to $3,000 per year or more per car, helping to offset the increased initial cost of the vehicle to the consumer.[54]

Of course, the environmental benefits of plug-in hybrids depend entirely on how their electricity is produced. The use of energy from conventional coal-fired generation would provide little, if any, benefit, but using excess wind power when it blows the strongest and is needed the least – at night – would be clean and cheap. By thus creating a market for off-peak wind, plug-in hybrids would have the additional benefit of making development of these non-polluting, inexhaustible energy supplies more economically attractive.

None of these benefits will be realized, however, without a smart grid – the integration of modern information and communications technologies (ICT) into the management and distribution of electricity. A smart, ICT-enabled grid would improve the operation of the system from power plant to home appliance and reduce its energy consumption and climate impact at the same time. Ironically, the reliable and pervasive supply of electric power – without which ICT technologies could not exist – is among the last major sectors of the American economy to

have escaped widespread ICT penetration and transformation. Greater ICT use, among other things, would allow utilities to:[55]

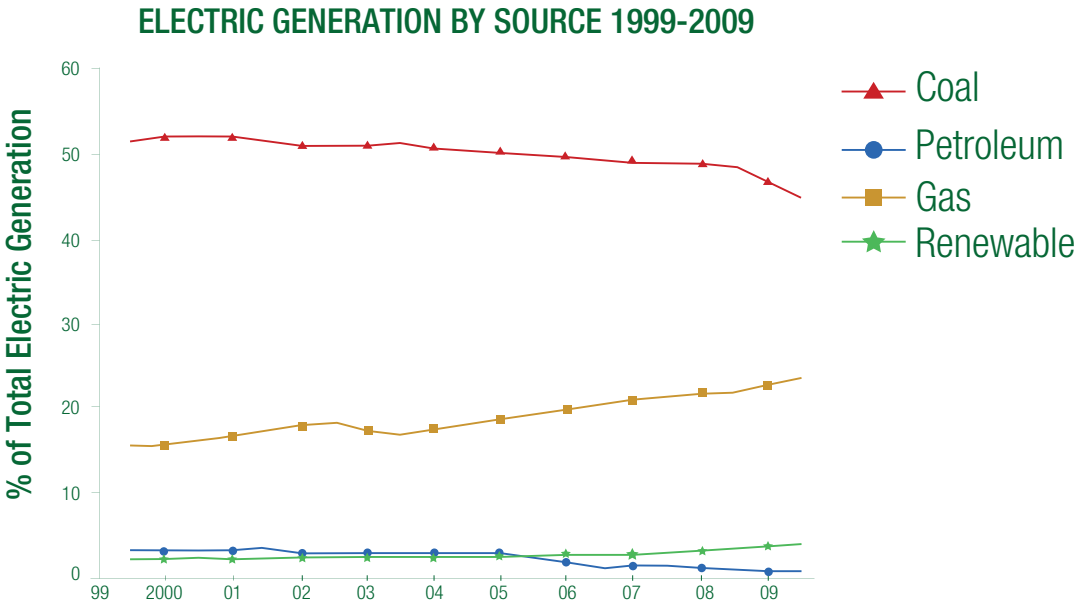
- Predict and thus avoid system outages automatically – and when they do occur, limit their scope and respond immediately to repair them.
- Manage the flow of power through transmission lines much more accurately and reduce electricity losses during transmission and distribution.
- Provide information to consumers that will allow them to reduce high-cost peak power demand and cut their electric bills overall.
- Buy and sell power from their customers – from rooftop solar panels, for example – and integrate it into the system seamlessly.
- Use electric vehicle batteries as backup power for the grid, enabling much greater use of intermittent renewable energy sources.
- Create a new platform for innovative household services that can only be imagined today, much as the convergence of the Internet and mobile telephony led to the iPhone, the iPad, and their proliferation of apps.

It remains unclear whether U.S. utilities will be nimble and open enough to take full advantage of these opportunities or whether they will block and slow progress towards them – and possibly get pushed aside by an entrepreneurial culture of third-party vendors who will take their customers away. The key, not surprisingly, is economic. As noted earlier, under most current state regulation, most utilities have little incentive and indeed may be financially penalized if they attempt to benefit their consumers in these ways. The business model of electric utilities today is built around investment and sales. The more electricity utilities sell, the more they profit. This model, which served the industry well for decades, is not as well suited to the opportunities and challenges that utilities now face – especially the end of robust growth in demand for power. If sales were to fall – due to increased efficiency in the use of energy, the spread of distributed generation sources like rooftop solar panels, or the decisions of large industrial customers to generate their own power or acquire it in some other way – then utilities would have to recover the cost of their past investments from a smaller and smaller revenue base. That, in turn, would raise the cost of electricity, making alternatives more attractive, driving customers away, and shrinking sales still further – potentially threatening the utilities' financial integrity.

None of that will happen quickly, of course, but the trajectory is undesirable. What is needed is a new business model for utilities – one that puts customer preferences first. Public service commissions

exist to stand between the monopoly provider of electricity and the consumer – to ensure a fair rate of return for the provider at the lowest cost to consumers. Typically this leads to a focus on keeping rates low. What is lost in that transaction, however, is the counterintuitive fact that higher rates can lead to lower costs – if the additional revenue is invested in managing the system more efficiently, reducing peak demand, helping customers to use less energy, and preventing outages. States that have moved in this direction have realized some of these benefits. California, for example, has some of the highest rates in the country, but its per-capita energy use is the lowest, and thus its citizens' electricity bills are also among the lowest.[56]

Other than using less electricity, the most direct way to reduce emissions is to rely on modern, well-controlled power plants and minimize the use of coal (without carbon capture and sequestration) as a fuel. From 1999 to 2009, gas and renewables (not including hydro) took almost 10 percent of the electric power generation market away from coal and oil.[57] This is a trend that should be encouraged and appears likely to continue for the near term, as stronger air pollution regulations will lead to the closure of the oldest, dirtiest coal-fired power plants that lack pollution controls, and as the sudden abundance of low-cost natural gas from domestic shale formations makes it the fuel of choice, particularly for new electric generation. Distributed energy generation will also play an important role; not only is there tremendous production potential, but smaller decentralized systems will also enhance both energy and national security.



The cost of renewable energy continues to drop as deployment increases, but it remains more expensive than gas, and its growth may slow unless policy makers at the state and federal levels continue and strengthen their support through renewable energy standards and/or tax incentives, as well as through regulations to facilitate the construction of long-distance transmission lines to bring wind and solar to market from distant locations in the Great Plains and desert Southwest. Renewable energy remains very popular with the public. More than half the states have adopted renewable electricity standards; several have been strengthened over time, notably in Texas and California; none has been repealed or reduced.

Strong national standards for renewable energy and energy efficiency would provide increased market certainty for technology deployment and would lead to increased private-sector investment, accelerating progress toward a clean energy economy and creating new jobs and businesses. A combined Clean Energy Standard would also be effective if energy efficiency is allowed to compete on an equal footing, if credits are based on greenhouse gas emissions, and if the standard leads to change in the nation's fuel mix over time.

Given these trends and the benefits of moving toward cleaner, more efficient electric generation and transportation systems, the new rules of America's energy future should include:

- Business models for utilities that compensate them for happy customers – for lower bills through increased efficiency, the ability to sell power back to the utility, reduced outages, power quality, and good customer service.
- Additional investment to bring the electric power grid into the 21st century, with increased use of monitors and sensors and the technologies to link them together and make sense of all that data.
- Integration of the smart grid with plug-in hybrid electric vehicles – facilitating recharging when power is cheapest and cleanest and enabling payment to vehicle owners for load balancing.
- Incentives to ensure that an adequate refueling network is available for alternative fuels – giving consumers options other than petroleum.
- Continued support for renewable energy and energy efficiency, with long-term incentives and stable policy frameworks to spur much broader deployment and with increased investment in research and development, focused on innovations that will drive down costs and improve efficiency.
- Rapid substitution of natural gas for coal as part of a systematic program to clean up or shut down power plants that lack up-to-date pollution controls, together with longer-term research

on breakthrough approaches to capture carbon dioxide from power plants (whether coal or gas) and dispose of it permanently.

The results of these interventions would be to reduce U.S. oil consumption substantially through the substitution of electricity, biofuels, and natural gas in the transportation sector and to accelerate the transition of electricity generation to cleaner sources such as natural gas and renewables. Combined with a new emphasis on efficiency in the transmission, distribution, and use of electricity, these steps begin to bring the dynamism of the ICT sector to energy, spurring creative and competitive new approaches to the underpinnings of our modern society, and encouraging innovation in a field where the market for new technologies is immense and truly global. These changes will make the American economy more efficient, productive, and competitive and will create an opening for manufacturing the new products that emerge. The transition to new clean energy systems is the preeminent global economic opportunity of the 21st century, and as a nation, we should provide policies and investments to lead the way forward.

Going forward, the Coalition will seek to realize the opportunities of the new energy economy by pursuing the following agenda:

Use less oil in transportation by changing the rules to:

- Continue to increase fuel economy standards for passenger vehicles;
- Prepare the electric power grid for electric hybrid plug-in vehicles;
- Expand the use of natural gas in heavy-duty and centrally fueled fleet vehicles; and
- Accelerate research and development on advanced biofuels and encourage the production of flexible-fuel vehicles and a fuel distribution system that gives consumers a choice at the pump.

Move toward a cleaner, more efficient electric power system by changing the rules to:

- Upgrade 40% of America's buildings – 50 million homes and businesses – by 2020 to make them more energy efficient;
- Promote new business models for electric utilities so that they and their consumers can co-invest and share in the savings available from energy efficiency;
- Develop new financing mechanisms and other tools to support energy efficiency upgrades in commercial, institutional, and residential buildings;
- Deploy new information and communications technologies that will enable consumers to enjoy more reliable, efficient, secure, and innovative energy services and to sell power to utilities as well as buy it from them;
- Allow consumers to schedule their use of electricity, like any other product, on the basis of its real cost – which can vary by an order of magnitude over a 24-hour period – making the system more efficient and less costly;
- Facilitate the transmission of renewable energy from remote areas to market;

- Remove barriers to and encourage the deployment of distributed energy generation technologies;
- Replace coal in electric power generation with cleaner energy sources and increased energy efficiency by providing clear regulatory direction to utilities;
- Ensure that abundant new reserves of natural gas from shale formations are produced in environmentally sound ways; and
- Continue research on carbon capture and storage for both coal- and gas-fired power plants.

The Energy Future Coalition is a broad-based, nonpartisan alliance that seeks to bridge the differences among business, labor, and environmental groups and identify energy policy options with broad political support. The coalition aims to bring about changes in U.S. energy policy to address the economic, security and environmental challenges related to the production and use of fossil fuels with a compelling new vision of the economic opportunities that will be created by the transition to a new energy economy.