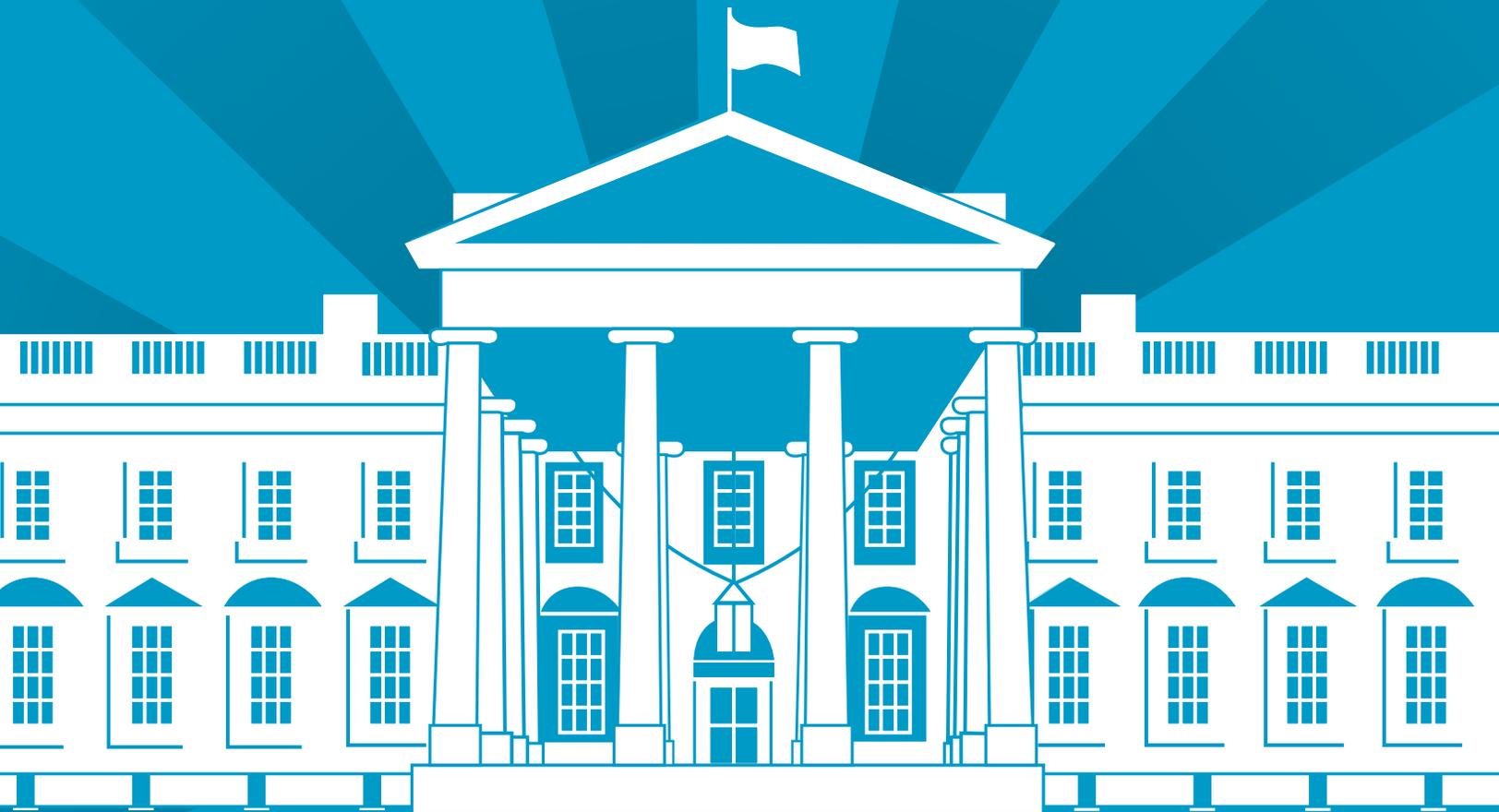




An Energy Plan for America

Manufacturing a Strong Future



EXECUTIVE SUMMARY

The United States is on the verge of experiencing a manufacturing renaissance, a notion that seemed almost inconceivable just a few years ago. The stakes are high: A manufacturing expansion is essential to rebuilding the middle class and supporting sustained economic growth. The prospect of long-term affordable, reliable natural gas supplies is helping to advance this once-in-a-lifetime manufacturing opportunity. Already, the manufacturing sector has added more than half a million jobs and announced more than 100 new capital projects in the U.S., representing \$95 billion worth of investments. Up to 5 million new manufacturing jobs could be created by the end of the decade.¹ Now is the time to set a clear, coherent national strategy on energy policy to accelerate this momentum and lay the foundation for a sustainable energy future.

Manufacturing was once at the core of the U.S.'s competitive advantage, but restoring the nation's manufacturing strength requires bold policies that ensure stable access to affordable energy. Energy is the lifeblood of manufacturing. In 2011, energy and feedstocks represented 42 percent of Dow's costs. For manufacturers such as Dow, energy costs can make the difference between investing in the U.S. or other nations. A comprehensive energy plan designed to ensure an affordable and reliable energy supply can provide the long-term certainty needed for Dow and other companies to continue to invest in the U.S.

Energy policy should strengthen the economy, increase and diversify energy supplies, and ensure energy security while minimizing the impact on the environment. Dow believes that a balanced approach featuring the following four pillars and policy recommendations will bring results.

1. Conserve by aggressively pursuing energy efficiency and conservation

- Improve the energy efficiency of buildings through updating building codes, adopting a building energy performance rating system, and offering financing mechanisms to stimulate investment in energy efficiency.
- Encourage investment in demand-side utility investment and provide mechanisms for timely recovery of costs, while establishing criteria to judge and award utility performance.

2. Optimize, increase and diversify domestic hydrocarbon resources

- Maintain a balanced natural gas market by ensuring that policy does not accelerate natural gas demand ahead of supply.

3. Accelerate the development of cost-effective clean energy alternatives

- Consider that technology-neutral market approaches are far more cost effective than alternative measures such as Renewable Portfolio Standards or feed-in tariffs.
- Collaborate with energy-intensive industries to develop pricing structures that encourage manufacturing competitiveness while boosting generation from alternative and renewable sources.

4. Transition to a sustainable energy future

- Put in place policies and legislation that realistically set greenhouse gas emission reduction targets for all the major economies, recognizing that no economy, developed or developing, can afford to compromise growth.
- Whenever carbon policies are pursued, all contributing factors, including renewables and efficiency initiatives should be coordinated into a single policy framework focused on driving tangible greenhouse gas benefits at the lowest possible cost to society.

The policies, technologies and businesses exist today to make this energy plan a reality. Dow has created a framework, including policy recommendations, for what we believe is an intelligent national energy plan. A compelling opportunity now exists to shape an energy future that is visionary, sustainable and secure.

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INTRODUCTION

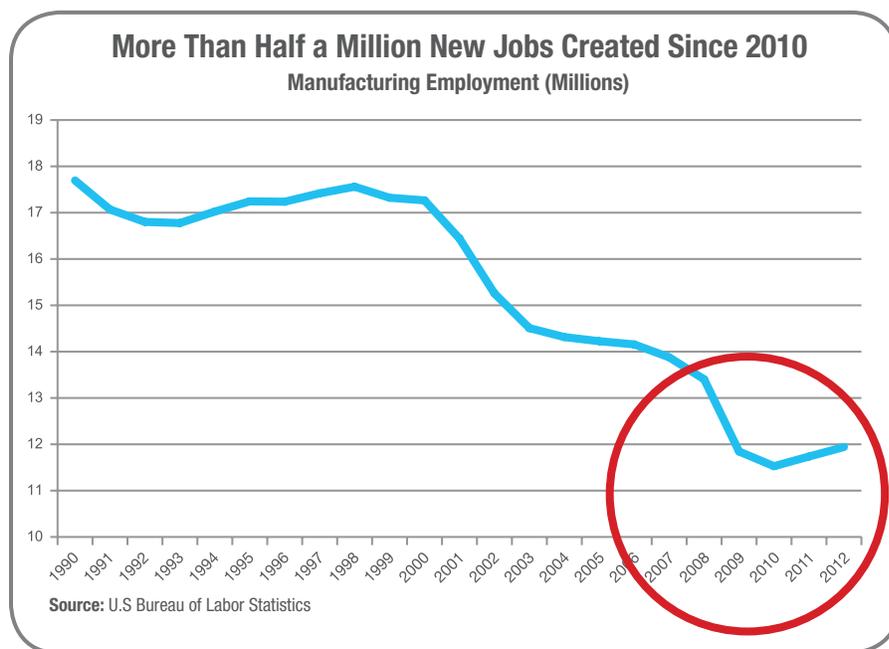
Competitive, Affordable Energy Is the Lifeblood of U.S. Manufacturing

The United States is experiencing a manufacturing renaissance, largely due to the increased commercialization of energy sources such as shale gas. Such a renaissance would have been inconceivable a decade ago: Between 2000 and 2008, high and volatile energy prices contributed to the closure of 42,000 U.S. factories and a \$30 billion loss in exports. Manufacturing fled to more affordable countries closer to predictable energy sources, and the U.S. shed more than 6 million jobs. Today, manufacturers are beginning to once again see the U.S. as a nation willing to invest in securing affordable and sustainable energy. In fact, the manufacturing sector, which employs 12 million people, has added more than half a million new jobs since January 2010.² The U.S. has a once-in-a-lifetime opportunity to not only maintain but accelerate this momentum.

Manufacturing matters to the United States because it provides high-paying wages, spurs innovation and is a key to reducing the trade deficit. Investments by U.S. manufacturers have the potential to generate millions of new jobs:

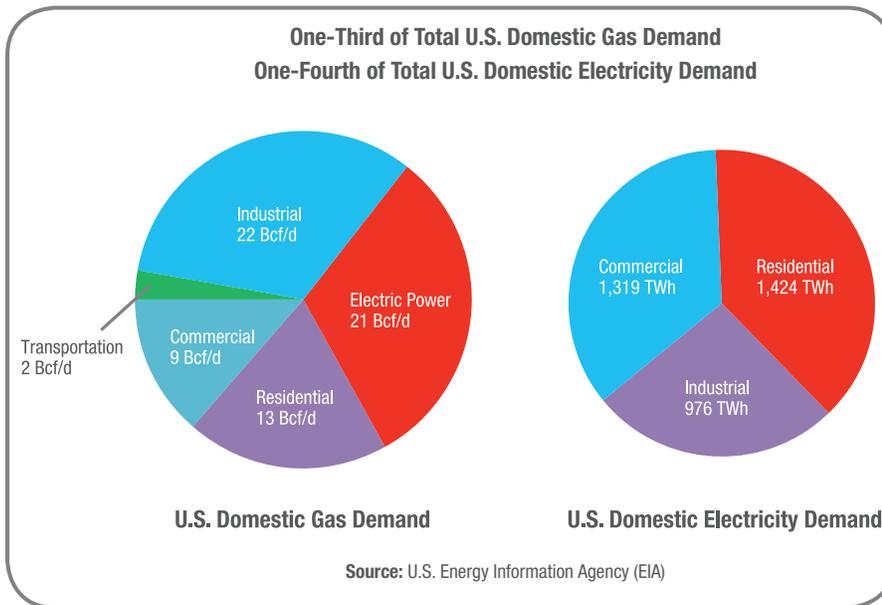
- Manufacturing is driving productivity growth in the U.S. economy, increasing at two and one-half times the rate of the service sector.³
- More than 100 new manufacturing projects across nine different industries have been announced in the last year and a half. These projects represent \$90 billion in investments.

Figure 1: After a Decade of Job Decline, the Manufacturing Sector Leads Job Creation



- More than a third of U.S.-based manufacturing executives at companies with sales greater than \$1 billion say they plan to bring back production to the United States from China, or are considering it. Higher U.S. manufacturing exports could add 2.5 million to 5 million jobs by the end of the decade, according to the Boston Consulting Group.

Figure 2: Industry Is a Third of U.S. Energy Demand



At the same time, the U.S. economy continues to face difficult challenges as the nation recovers from the recession. More than 12 million Americans are unemployed, and approximately 25 million are underemployed.⁴ Although economic recovery has been slow, progress is being made, and manufacturing is leading the way. For every new job created in manufacturing, five to seven jobs are created in the broader economy. Competitive energy is the catalyst that can continue to propel the manufacturing sector – and America – back to prosperity and create high-paying jobs.

Affordable, Reliable Energy – The Fundamental Competitive Advantage

Affordable and reliable energy is vital to economic growth, which is why all economies near and far compete for it – especially emerging economies. However, as global demand grows, so will concerns over security of supply, price volatility and greenhouse gas (GHG) emissions.

Countries are seeking to secure energy supplies in all the locations they can find, within and far from home borders. U.S. energy demand is expected to grow by 7 percent by 2035, with 78 percent to be supplied by fossil fuels. In contrast, global energy demand is expected to increase by 47 percent by 2035, with a majority of that demand being driven by Asia.⁵ To remain competitive, the U.S. needs secure and sustainable energy.

Manufacturing especially has a high stake in energy. The U.S. industrial sector, largely comprised of manufacturing, represents a third of total domestic gas demand. Industrial investments typically have long payback periods, which is why manufacturers such as Dow must consider what the political framework of a country might be 20-30 years in the future. Other countries are setting energy policy, allowing manufacturers to know what to expect when they invest. In the U.S., energy policy is fragmented among federal, state and local governments. The manufacturing industry needs predictability and some level of certainty. A comprehensive energy plan provides the long-term certainty for manufacturers to continue to invest in the U.S. With the opportunities

in front of us, it is time to advance a comprehensive energy policy that improves the nation's competitiveness and provides long-term energy security.

Key Challenges for the U.S.

Strong, coherent energy policy sets the foundation for helping the U.S. overcome some of its most pressing challenges, including:

- Restoring well-paying jobs
- Promoting domestic manufacturing competitiveness and propelling the manufacturing renaissance

A Comprehensive Energy Plan

Energy policy should serve to strengthen the economy, increase and diversify energy supplies, and ensure energy security while minimizing the impact on the environment. Dow believes a balanced, four pillar approach is necessary:

1. Conserve by aggressively pursuing energy efficiency
2. Optimize, increase and diversify domestic hydrocarbon resources
3. Accelerate the development of cost-effective clean energy alternatives
4. Transition to a sustainable energy future

Together, these pillars will enable the U.S. to create a sustainable economic future based on efficient use of energy, viable clean options and new technologies by:

- Using energy resources to drive the most economic growth
- Making clean alternatives economically viable
- Stimulating manufacturing growth and job creation
- Positioning the U.S. as a clean energy leader globally
- Attracting new investment and diversifying our economy

Dow's Role in the Solution

Founded in Midland, Michigan, in 1897, Dow is one of many companies that calls the U.S. home. We remain committed to growing in this country and have announced \$4 billion worth of investments in the U.S. Gulf Coast. However, we are deeply concerned that the U.S. continues to lose competitive ground, in part due to a lack of coherent direction in energy policy. We want to help reverse that trend. Although the U.S. is currently enjoying the lowest natural gas prices in more than a decade, as recently as 2008, prices were four times as high as they are today. A comprehensive energy policy that works to stabilize energy prices and diversify the nation's energy supply is a matter of national competitiveness. The demand for finite energy resources will continue to be driven by the needs of emerging economies, and diversification of the U.S.'s energy mix will be essential to ensure the nation's long-term security and a high quality of life.

8x

The chemical industry transforms energy into valuable products and, in the process, contributes to growth and job creation. The chemical industry adds to the value of energy use by a factor of about eight.⁶

A Sustainable Energy Future

A sustainable energy future is one that generates economic growth while giving everyone access to clean, affordable energy. The transition will take decades, requiring the U.S. to optimize fossil fuels while simultaneously accelerating the development of cleaner alternatives. Success requires intense collaboration, innovation and the courage to think and act differently.

We believe that a sustainable energy future is possible, and now is the time to act aggressively. Creating a sustainable energy future takes time. The transition not only requires reliable and responsible access to affordable energy, but also clean, alternative sources of energy to steadily replace fossil fuels.

Dow is uniquely positioned to deliver more sustainable solutions, bringing 115 years of material science experience and chemistry solutions to the table. We are not only a leading consumer of energy, but are also a recognized leader in energy efficiency. Plus, we are one of the largest providers of energy solutions to society. We work collaboratively to develop products and processes that make traditional energy sources more efficient and support new efficient, clean energy use across the world.

The following proposal is only a first step to creating a comprehensive energy plan for the United States. Success will require bold policy initiatives and increased collaboration between the public and private sectors.

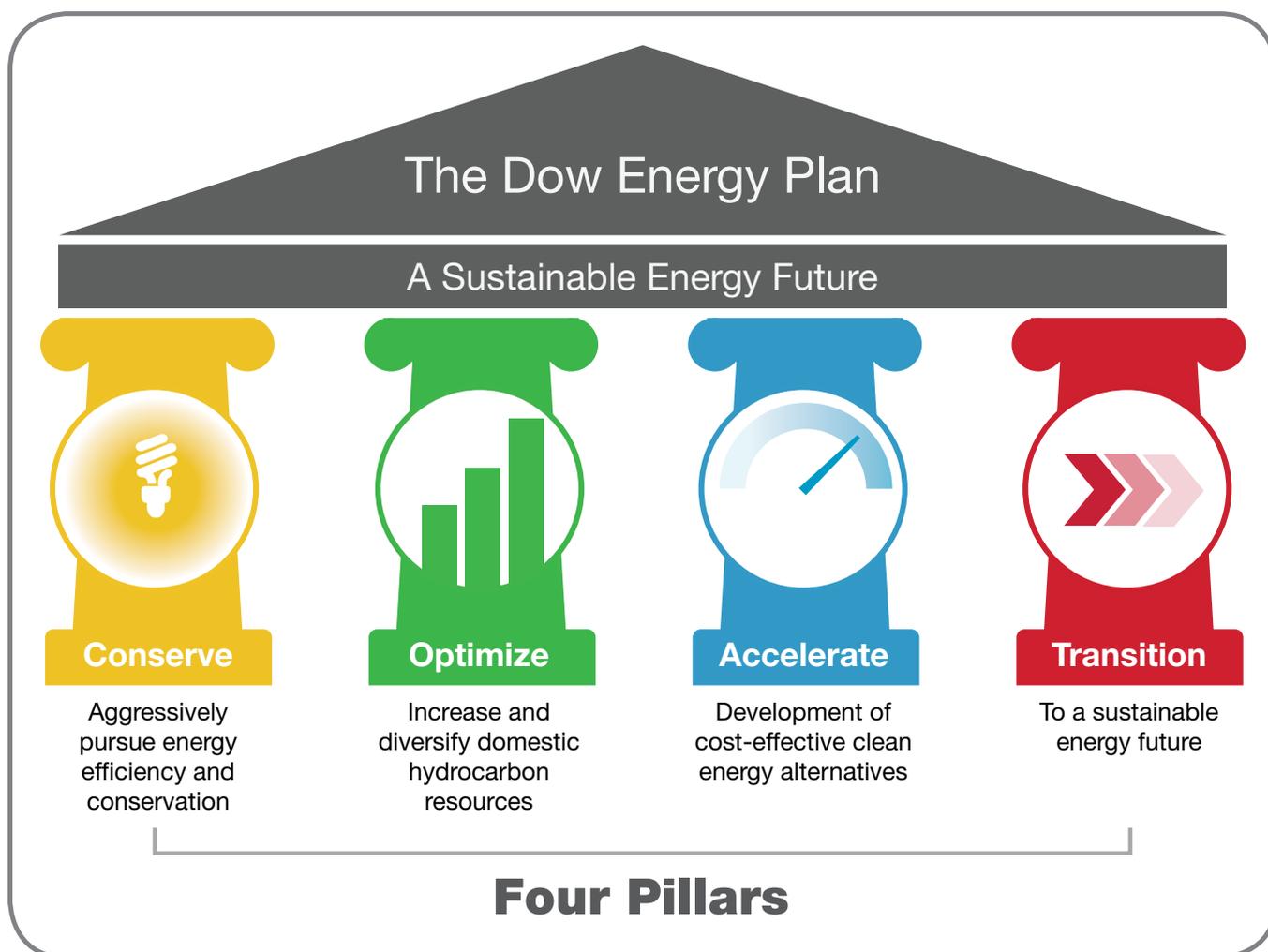
The reward is that the United States becomes a desired place for investment and jobs, diversifies its economic base and is a leader in the manufacturing sector. By aligning to a common vision and strategy, the U.S. will put itself on a path to sustainable economic growth.

DOW ENERGY PLAN FOR THE U.S. – FOUR PILLARS OF SUCCESS

Overview

As with many manufacturers, Dow has a strong stake in energy, which is why we've been working at the national and state levels to create a sustainable energy future. We believe the nation should develop a balanced energy policy that features the following four pillars of success. We are confident that doing so will help stabilize energy prices and revitalize manufacturing in ways that boost the U.S. economy.

Figure 3: Four Pillars of Success



PILLAR 1: Conserve by Aggressively Pursuing Energy Efficiency and Conservation



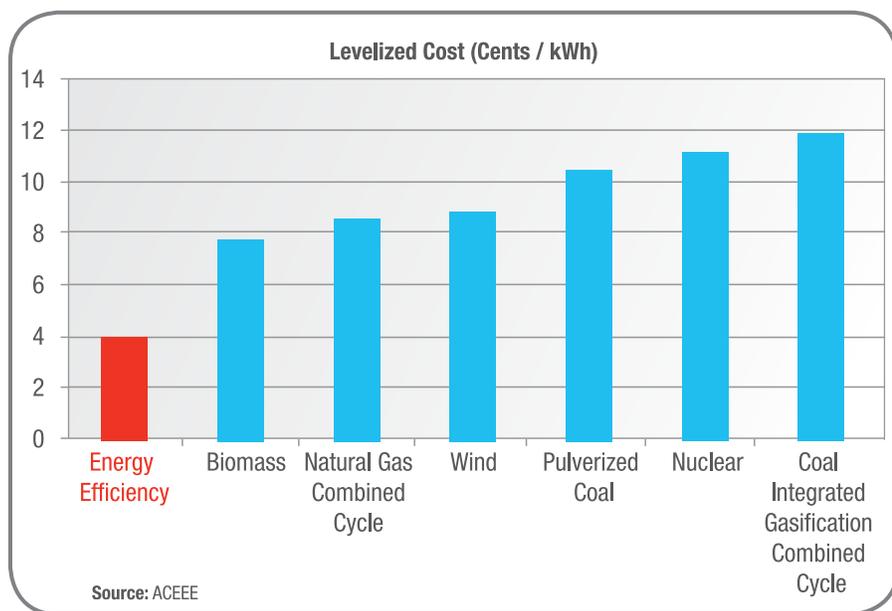
The Situation

Energy efficiency is the easiest and most affordable way to conserve energy while also reducing carbon emissions. Energy efficiency is about getting more from every unit of energy used, whether it is powering a home, business or vehicle. The economic benefits of energy-saving measures are enormous. Consumers have more disposable income, and businesses can devote capital to creating new products – all from savings on fuel and electricity. Multiple studies from the International Energy Agency (IEA), American Council for an Energy-Efficient Economy (ACEEE) and other associations have shown that the financial benefits of energy fuel savings far exceed the upfront investment costs of energy efficiency.

Dow is a firm believer in the benefits of energy efficiency. Since 1990, Dow's energy intensity as measured by Btu per pound of product has improved by more than 40 percent, contributing to a cumulative savings of \$24 billion and 5,200 trillion Btu. That is roughly equivalent to the annual energy

consumption of **48 million homes**. Dow's investments in energy efficiency saved energy and helped prevent more than 270 million metric tons of CO₂ emissions.

Figure 4: Energy Efficiency Is the Most Cost-Effective Form of Energy



Where Do the Real Opportunities Lie?

The U.S. wastes more energy than it uses. Half of the energy the U.S. derives from energy sources, including fossil fuels and renewables, ends up being lost due to inefficiencies. To solve this problem, the U.S. must improve efficiency in both how energy is generated and how it is used. Energy-efficiency policies today are set at federal, state and local levels, but are not

well-coordinated – standards and enforcement levels vary significantly across the country and across different economic sectors. If we are to utilize energy efficiency as a crucial component of the nation's energy portfolio, leadership is needed at the federal level to create a clear plan of coordination and responsibilities.

Opportunities

The nation must take a strong lead in developing policies, programs and incentives that accelerate energy efficiency and cut waste across all sectors of the economy: electric power generation, transportation, buildings and industry. To date, the level of improvement across these sectors has varied, in part due to differences in incentives. It is essential that policymakers collaborate with sector participants to create the proper incentives to promote energy efficiency.

Industry has been doing its part to improve energy efficiency by decreasing

energy intensity by more than 30 percent over the past two decades. The incentive to invest in energy efficiency is clear: U.S. companies compete in a global environment and managing energy costs means gaining a competitive edge. Other sectors have been less successful in improving energy intensity. The residential and commercial sectors have nearly the same energy intensity that they did 20 years ago. Light-duty cars and trucks – a subsector responsible for nearly 60 percent of all U.S. transportation energy consumption – have lowered energy intensity by 8 percent since 1990.⁷ Part of the problem with improving in residential, commercial and transportation sectors is the split incentive between the energy consumer and maker of a product. Policy has the ability to promote energy efficiency where such market barriers hinder improvement.

Industry

Industry plays a multi-faceted role in energy efficiency as an energy generator, consumer and manufacturer of energy-efficient technologies. U.S. industry has already embraced energy efficiency in order to succeed in a competitive global market. Without those investments, many companies might not have survived the high and volatile energy prices during 2000-2006, a period where our nation lost more than 6 million manufacturing jobs. Saving on energy costs allows companies like Dow to spend more on creating future technologies that enable other sectors to continue to improve energy efficiency.

Large industrial sites use Combined Heat and Power (CHP), also called cogeneration, which converts waste heat into steam to produce electricity. CHP is considered the most efficient way to produce steam and power. Cogeneration typically uses 20-40 percent less fuel than conventional power generation while also reducing GHGs.

Figure 5: Rejected Energy Vs. Energy Services in 2011

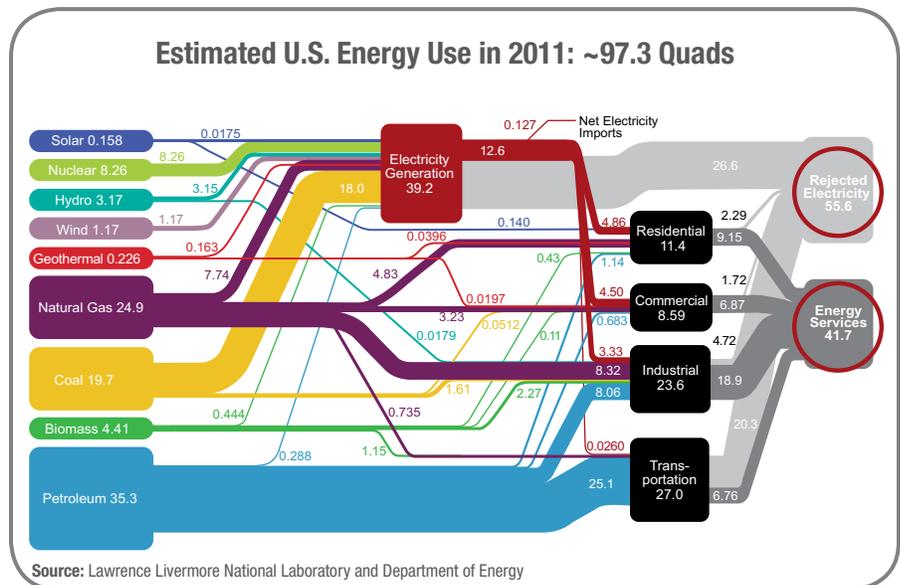
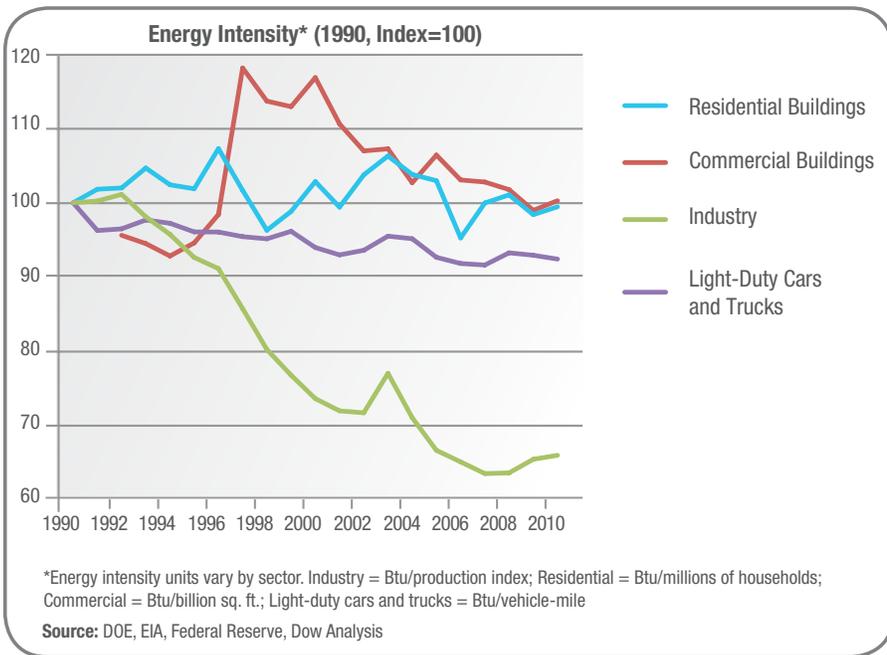


Figure 6: Industry Has Improved Energy Intensity by More Than 30%



Residential and Commercial Buildings

Residential and commercial buildings account for more than 40 percent of total U.S. energy consumption⁸ at a cost of roughly \$400 billion per year.⁹ Building sector energy consumption grew by more than 50 percent between 1980 and 2010.¹⁰ Substantial increases in home size, use of air conditioning and electronics, and other demands for energy services offset energy savings achieved by efficiency improvements in building systems and appliances over this period.

Buildings are long-lived physical assets; once

constructed, they lock in many of their energy consumption attributes for decades. With only a quarter of today's homes built in the last 20 years, the annual addition of new buildings is small compared to the existing building stock. Improving the energy efficiency of the building sector, therefore, requires a large-scale effort to upgrade the existing building stock as well as improve new buildings.

Split incentives remain a core problem behind lagging energy performance in the building sector. The problem exists when neither the residential building tenant, who pays monthly utilities, nor the building owner, who is responsible for capital improvements, wants to pay for efficiency upgrades because the incentives do not align. Implementing mechanisms such as on-bill financing can reduce disincentives and help the public take greater control of their energy costs through energy saving measures.

Building energy codes define minimum design and construction requirements for all new residential and commercial building and renovations. In the United States, the basis for most building energy codes are standards developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) and codes

Did you know?

If applied today, available energy efficiency technologies could reduce the energy use of residential and commercial buildings nationally by 20-25 percent.¹¹ This is the Btu equivalent of ALL U.S. oil imports from OPEC.

developed by the International Code Council (ICC). These standards and codes are developed by a consensus approach and updated approximately every three years, raising the performance bar over time. By regularly updating the stringency of building energy codes, the U.S. can raise the performance levels of its new housing stock and greatly reduce the building sector energy footprint.

Another significant problem is a lack of building performance transparency. Most building buyers and owners are unaware of a building's energy efficiency performance. Building energy performance ratings and disclosure programs are expanding in the U.S. A variety of disclosure programs have been implemented in numerous states and cities and are often restricted to certain buildings, such as large commercial buildings, residential or government buildings.

Utilities

One of the largest areas of opportunity lies in the electric power sector, where 67 percent of energy is lost due to inefficiency. Although electricity generation will never reach perfect efficiency, it is important that utilities continue to promote energy efficiency, both in generation and with their customer base, before building out expensive new capacity.

Today the federal government primarily advises state and local governments on which incentives they should provide utilities, and the federal government provides some funding to states that adopt recommended policies.

Transportation

Similar to the building sector, a split incentive exists between the manufacturer and customer in the transportation sector. However, awareness of energy performance is much higher in the transportation sector, due to transparent fuel economy ratings that have helped draw the public's attention to fuel efficiency. More stringent fuel economy standards also help drive innovation in creating new materials and improving engine performance – ultimately creating fuel savings and lowering energy consumption.

The Federal Corporate Average Fuel Economy (CAFE) standards have been highly effective in improving the energy efficiency of vehicles. Since the late 1970s when CAFE standards took effect, the average fuel economy for passenger cars has risen from less than 20 miles per gallon (mpg) to nearly 35 mpg. Similarly, the average fuel economy of light-duty trucks has risen from less than 20 mpg to about 25 mpg. New standards issued by the National Highway Traffic Safety Administration and EPA, if implemented, would raise the fleet-wide fuel economy basis to 40.9 mpg by 2021, and 49.6 mpg by 2025.

Did you know?

The average home has a half mile of gaps and cracks,¹² which are easily remedied with proper insulation and sealants.

Did you know?

Every 10 percent reduction in vehicle weight can improve fuel economy by 6-8 percent.¹³

Recommendations:

Utilities

- State public utility commissions (PUCs) should align utility financial incentives so that utility investments in demand-side resources (energy efficiency and demand response) are on equal footing with supply-side investments.
- Applicable agencies and utilities should implement policies to increase the use of Combined Heat and Power (CHP) in manufacturing and electricity production. National laws should be changed to allow for the full utilization of industrial waste energy. A major impediment to CHP and waste heat recovery projects are policies limiting market access, fair pricing and access to longer-term contracts. Greater flexibility is also needed to allow manufacturing facilities to sell power to the grid and other manufacturing facilities.

Buildings

- Facilitate energy productivity financing:
 - Establish a target for federal buildings of \$2 billion invested annually in guaranteed energy savings through energy service performance contracts (ESPCs).
 - Improve the accuracy of mortgage underwriting used by federal mortgage agencies by ensuring that energy costs (including both direct energy consumption and energy use in transportation) are included in the underwriting process.
 - States and local governments should establish effective mechanisms to finance energy efficiency and renewable energy improvements, such as on-bill repayments for finance programs administered by utilities.
- ASHRAE and ICC should continue to make timely, aggressive and cost-effective updates to their model building energy codes. States and local governments should quickly adopt these updates and deploy the resources needed to effectively enforce building energy codes.
- Make timely, aggressive and cost-effective updates to federal appliance, equipment and vehicle fuel-efficiency standards. Consider expanding the coverage of these standards to include additional products and equipment.
- Advance energy productivity through federal tax policy:
 - Promote innovation in energy productivity by extending federal tax incentives that encourage energy efficiency and by strengthening the qualifying criteria of these incentives to focus on emerging technologies and measures.
 - Remove the bias against energy-saving capital investments by shortening the depreciation schedules for such investments.
 - Enact policies that promote efficiency retrofits in existing residential and commercial buildings, maintain the use of targeted incentives and tax credits, and set a schedule to gradually phase out industry incentives.
 - Require the U.S. Department of Energy to develop or deploy an existing building labeling system that is user-friendly and universally available, and adopt its use in all government buildings.
- Increase investment in basic and applied R&D directed at improving the energy productivity of all sectors of the economy.

- Implement alternative financing tools to help manufacturers improve energy-efficiency without utilizing traditional direct capital investment financing models.

How Dow Is Delivering

Dow has a long history of leadership in energy efficiency. Our industrial energy-efficiency programs have been widely recognized, and the Company continues to collaborate to share best practices and expertise to help improve industrial energy conservation. At the same time, Dow is a leading producer of innovations that reduce energy use and greenhouse gas emissions, such as building insulation, light-weighting technology for vehicles and components that enable energy efficiency in water processing. For example:

- Dow was a pioneer in CHP in the early 1900s at its Michigan Operations. Today, most of Dow's operating capacity for energy is in the form of CHP, which results in 20-40 percent less fuel usage to produce the power and steam needed to run Dow's operations.
- Dow supplies a myriad of products to help drive home and building efficiency. Installed in more than 20 million residential and commercial buildings worldwide, STYROFOAM™ Brand insulation products save more energy each year than Dow uses to produce all of its products across the globe.
- Water and energy resources are intrinsically linked, and Dow's advanced filtration and separation technologies are designed to minimize the amount of energy required to filter water. The efficiency improvements of Dow's water treatment technologies have enabled an estimated energy savings equivalent of the annual GHG emissions of nearly 2 million households.
- Dow's advanced adhesives and lightweight automotive materials help reduce vehicle weight and improve fuel economy. For example, Ford and Dow are collaborating to cut 750 pounds from each vehicle by using super-light carbon fiber composites.

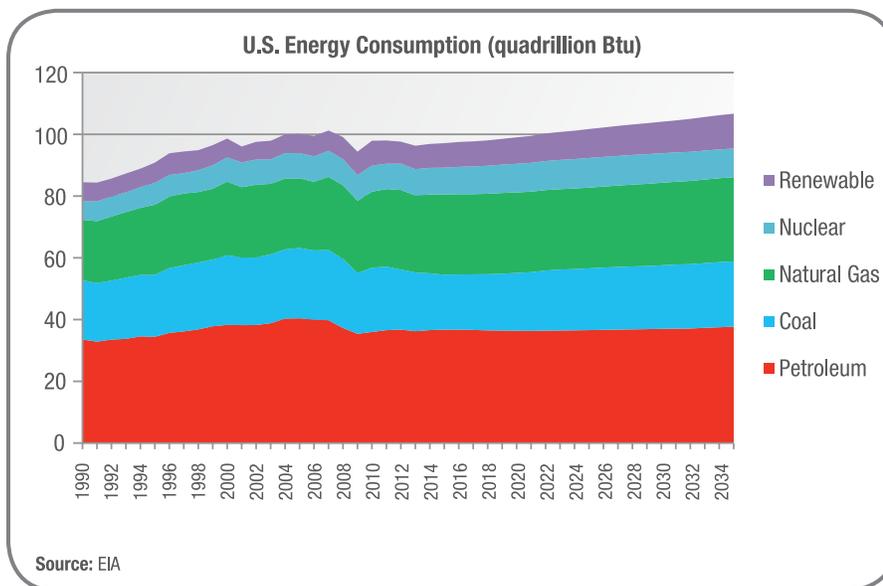
PILLAR 2: Optimize, Increase and Diversify Domestic Hydrocarbon Resources



The Situation

During the transition to a sustainable energy future, fossil fuels will continue to be a primary source of energy until cleaner energy technologies can be brought online at scale and at competitive prices. Fossil fuels comprise 83 percent of the U.S. energy supply and are expected to continue to be a major source of energy, given the recent boom in unconventional natural gas and oil production.¹⁴ The U.S. has the opportunity to jump-start the American economy with these unconventional resources, while working toward a diversified, sustainable mix of energy.

Figure 7: Fossil Fuels Are 83% of U.S. Energy Supply



In addition to oil and gas, coal is forecast to maintain a large share of the U.S. fuel mix. The nation should continue to explore sustainable uses of its abundant coal supplies. At this point, traditional coal is at risk due to stringent EPA regulations. Carbon capture and storage (CCS) has the potential to turn coal into a low-carbon energy source. However, it will require continued support at the R&D level to drive down capital and operational costs before CCS is a commercially viable option.

Opportunities

Increased oil and natural gas production could transform the U.S. into the most energy-secure nation. Currently, the U.S. imports almost half of its oil, and nearly a quarter of all imports come from the Middle East. Until recently it appeared this trend would only continue, but since 2008, domestic crude oil production has increased by 13 percent.¹⁵ By some estimates, North America could be producing more oil than the Middle East by 2020.

This increase in natural gas production is providing a huge advantage for the United States. Affordable domestic natural gas is contributing to lower utility bills for individuals, greater national energy security and billions of dollars in new investments. These investments are already making an impact by creating manufacturing jobs, increasing exports of value-added products, sparking stronger economic growth and fueling high-tech industries like clean energy innovation.

The U.S. chemical industry, especially, relies on natural gas not only as a heat and power source, but also as a source for raw materials for petrochemistry. Chemical manufacturers use ethane – as well as other materials derived from natural gas – to develop thousands of products that make American lives better, healthier and safer. To date, the chemical industry has announced \$50 billion in investments based on affordable natural gas.

The booming growth in unconventional natural gas production has created a short-term focus on oversupply concerns. However, the nation is just beginning to understand how the supply boom is creating a demand boom. Take the industrial sector as an example. What initially started

Figure 8: Rebounding Oil and Natural Gas Production Boosts Energy Security and Competitiveness

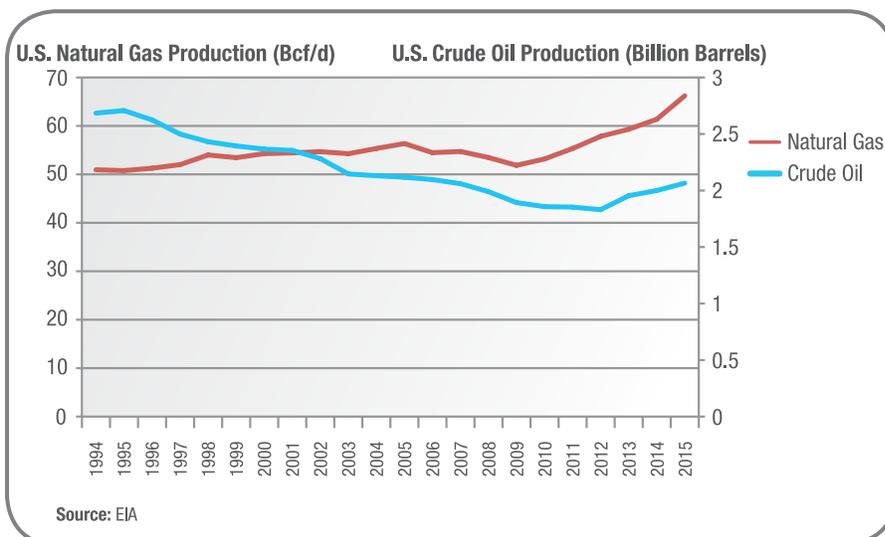
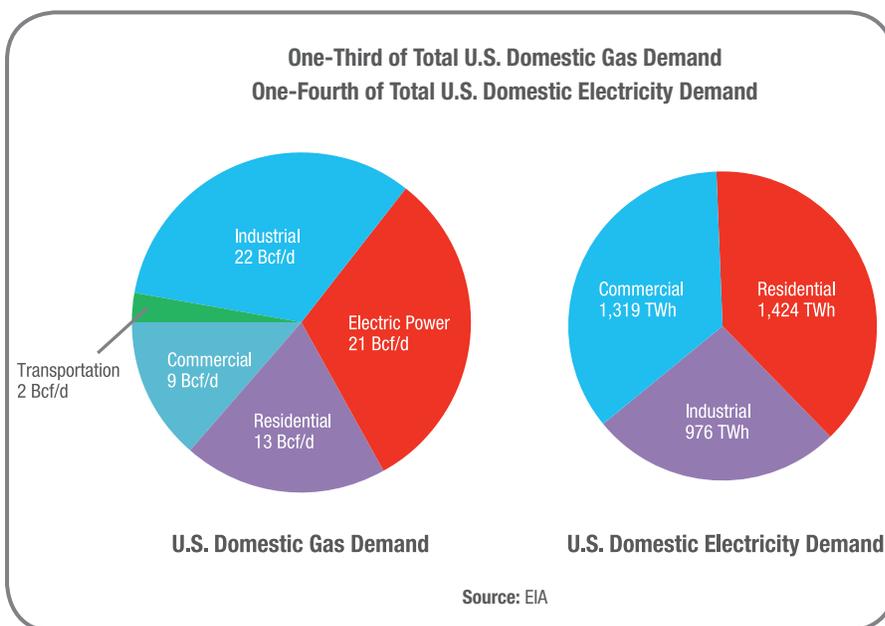


Figure 9: Industry Is the Largest Total Natural Gas Consumer in the U.S.



with investments within the petrochemical industry by Dow and other companies now has spread to investments by other energy-intensive industries, including fertilizer, steel, glass, aluminum and transportation. Affordable natural gas will play a large part in creating up to 5 million new manufacturing jobs by 2020. In addition to increased investment by manufacturing:

- Demand for natural gas is growing in all major sectors of the U.S. economy including electric utilities, industry and transportation.
- Natural gas consumption in the electric power sector has increased by 40 percent since 2009,¹⁶ and gas-fired plants are expected to account for 60 percent of the new generating capacity in the U.S. between 2011 and 2035.¹⁷
- Coal is increasingly being displaced by natural gas as aging coal assets reach the end of their useful lives.
- Vehicle fleets are increasingly using natural gas as fuel for transportation. Multiple transportation-intensive companies, such as Waste Management and UPS, are transitioning vehicle fleets from diesel fuel to natural gas.

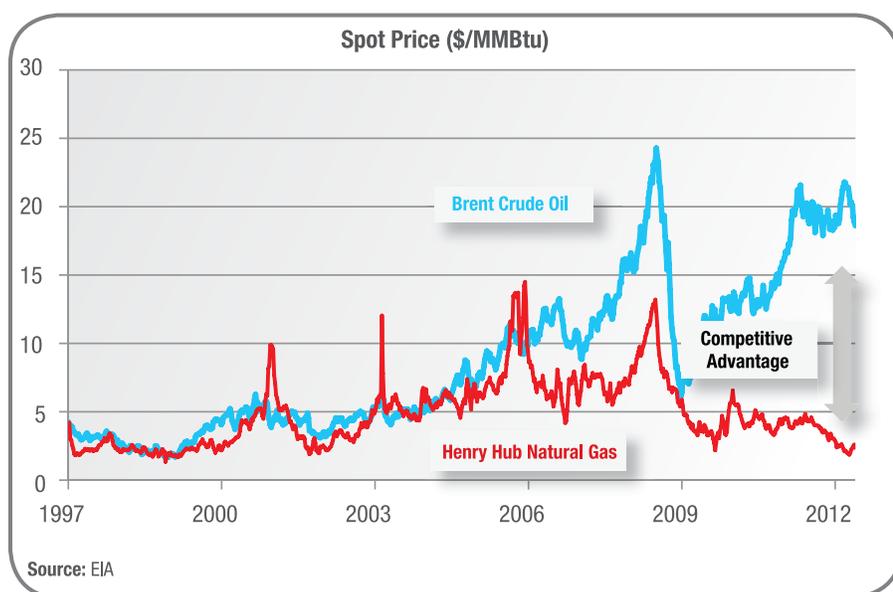
Did you know?

More than 96 percent of all manufactured goods are directly touched by chemistry through the use of ethane, a component of natural gas.

What Could Weaken U.S. Competitive Advantage?

Changes in natural gas prices can have a significant negative impact on manufacturing, which has highly elastic demand. When gas prices are high and volatile, manufacturing suffers. In petrochemicals, this is magnified, since gas is used as both an energy source and a raw material. U.S. manufacturing experienced the impact of high and volatile natural gas prices in the past decade when prices hit \$15/MM Btu.

Figure 10: Affordable and Stable Natural Gas Creates Once-in-a-Lifetime Opportunity



For the first time in more than a decade, due to recent discoveries and development of domestic shale gas, natural gas prices are affordable and relatively stable, especially when compared to oil. In fact, global oil is more than five times as expensive as natural gas on a thermal basis. The U.S. has a once-in-a-generation opportunity to rebuild the economy by enabling a vital manufacturing sector. It is critical to avoid a misstep that would derail this economic recovery.

Many factors can derail a manufacturing renaissance, which would return gas to parity with oil, and therefore, remove the competitive advantage of the U.S. These include:

- Measures that place excessive constraints on natural gas supply, such as bans or excessive restrictions on hydraulic fracturing
- Measures that artificially accelerate demand ahead of supply
 - Policies (or lack thereof) that drive the nation toward a single fuel
 - Subsidies that artificially accelerate the demand for natural gas vehicles
 - Regulations that force rapid conversion of coal-fired power plants to gas
 - Export of amounts of natural gas that prioritize export sales over U.S. gas competitiveness for manufacturers

Recommendations:

- Implement policies that recognize growing domestic natural gas demand in all major sectors of the U.S. economy including utilities, industry, transportation and potentially exports.
- Reformulate natural gas policies to consider the market-transforming innovation in low-cost shale gas. The U.S. should treat its natural gas as a critical resource for competitiveness and recognize the value that the domestic natural gas advantage can have on strengthening the U.S. economy through manufacturing and benefiting consumers with lower energy costs. Industry, for example, uses natural gas to create jobs and add value by a factor of eight.
- Avoid policies that place undue constraints on natural gas supply, such as bans or excessive restrictions on hydraulic fracturing.
- Prevent measures that artificially accelerate demand by driving the nation toward a single fuel, subsidizing natural gas vehicles or forcing rapid conversion of coal-fired power plants to gas.
- Take a prudent approach that considers the impact of liquid natural gas (LNG) exports on manufacturers as part of the determination of “national interest” for purposes of issuing LNG export permits.

How Dow Is Delivering

- Dow was among the first manufacturing companies to declare a comprehensive plan to take advantage of the structural changes in the domestic natural gas market. Dow has announced plans to invest more than \$4 billion in new U.S. production facilities based on the promise of affordable natural gas. These new facilities will create thousands of new U.S. manufacturing jobs, helping to support the U.S. economy and communities where we operate.
- As an energy solutions provider, Dow offers innovative chemistry and technologies for improved shale stabilization and well bore stability in addition to carbon capture and storage development.
- Dow offers a wide range of advanced chemistries and technologies that help effectively drive new energy production from conventional and unconventional sources. For example, Dow is a leading provider of chemistry-based solutions for drilling, fracturing, production, enhanced oil recovery and oil and gas transport, including advanced separation solutions for oil sands; flow assurance systems that perform in deeper water; rheology modifiers that withstand higher-pressure and higher-temperature drilling; and improved water treatment technologies for coal bed methane and hydraulic fracturing.

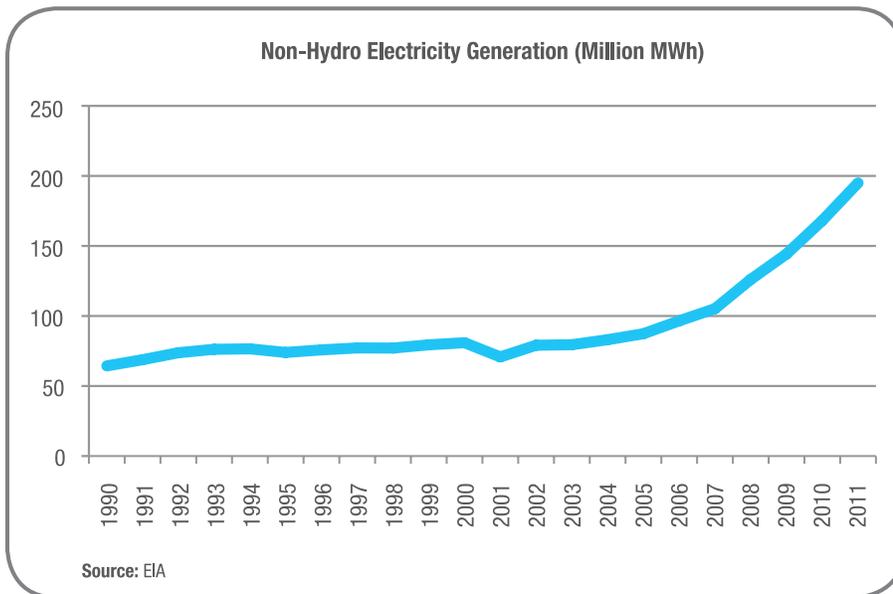
PILLAR 3: Accelerate Development of Cost-Effective Clean Energy Alternatives



The Situation

The need for energy security, economic growth and environmental sustainability is driving demand for clean, alternative energy sources. Combined, nuclear and renewable energy provide only 17 percent of U.S. energy today.¹⁸ A wide range of clean technology offerings exists. The appropriate choice of technology depends on geography, power needs and affordability.

Figure 11: Non-Hydro Renewable Electricity Has Nearly Tripled in Last Decade

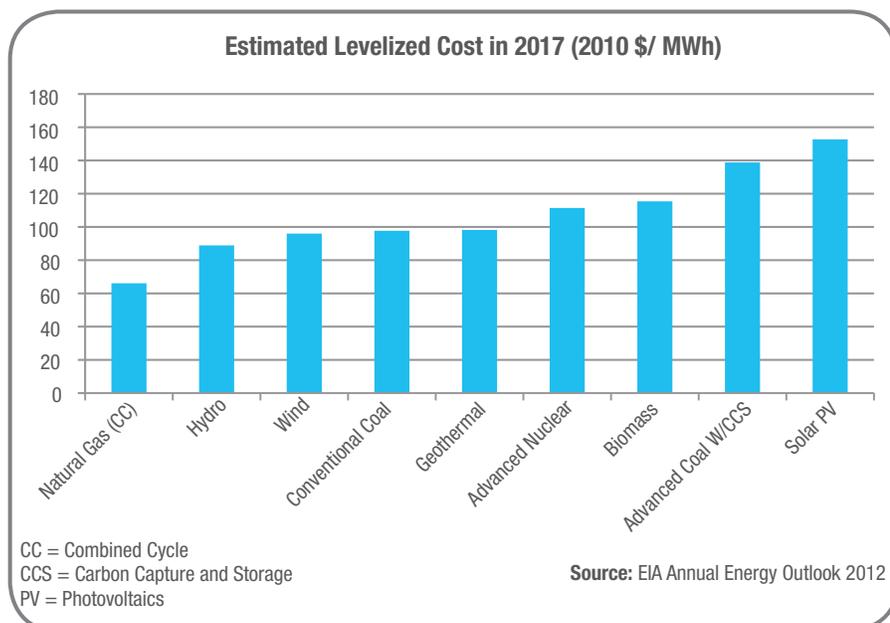


Only 13 percent of electricity in the U.S. is generated from renewable sources – and 63 percent of that is hydropower.¹⁹ Improved technology is continuing to lower the costs of other renewables sources, and policy is encouraging deployment. Wind generation, for example, though still small in comparison to total power generation, has increased by 20 times from 2000 to 2011.²⁰ To reach large scale, renewables need to overcome multiple challenges.

Though the costs of solar and wind power have dropped drastically over the last few decades, it

will take time for these sources to compete on their own – without tax credits or standards that create a market pull for the technology. These renewable sources are intermittent and not always available at peak demand hours, meaning some type of traditional base-load power – whether it be coal, natural gas or nuclear – will likely be needed for many years to support them. Further, the variability of wind and solar energy places novel challenges on infrastructure, and new infrastructure will be needed for the grid to support a large amount of power from these sources. Alternatively, technological advances in nuclear power make it economically competitive with fossil-based power sources. Nuclear power also has the advantage of providing a stable base-load with almost no GHG emissions footprint. Yet nuclear power still faces the challenges of waste disposal and public perception.

Figure 13: Some Alternative Energies Compete While Others Must Lower Costs



renewable generation and overcome infrastructural and technological challenges.

Solar and Wind: The economics of wind and solar power matter much more than resource availability, as solar and wind energy can be captured in many locations. Both solar and wind power must progress beyond policy-driven incentives to become competitive with traditional energy sources. Photovoltaic module costs tend to decline by 20 percent for every doubling of installed capacity. Similarly, power produced from wind decreases by up to 19 percent for every doubling of installed capacity. The combination of improved

technology and higher deployment gradually will bring these sources closer to competing with traditional sources. Even so, base-load back-up generation is still required to ensure reliability due to the intermittency of solar and wind, making the true cost of wind and solar a complex combination of energy storage, base-load capacity and the cost of technologies.

A combination of distributed and utility-scale generation will be needed to achieve increased renewable penetration, especially for solar. A large utility-scale solar farm requires a plot of land and intensive infrastructure build. On the other hand, a building already has roof space and the infrastructure in place to feed electricity back to the grid.

Electric Transportation: Electric vehicles also hold promise as an important contributor to a clean energy future. Key to success are cost-effective, environmentally friendly energy storage devices such as advanced battery packs. With strong automotive and chemical industries, the U.S. is well positioned to become the world leader in advanced battery manufacturing and electric vehicle production.

Nuclear Power Technologies: Nuclear energy is the only form of energy that can provide continuous base-load power with a small GHG emission footprint. The nuclear-powered high temperature gas-cooled reactor (HTGR) incorporates a safer design that intrinsically stops the reactor in the event of overheating. In most locations globally, the HTGR is already economically competitive with natural gas generation.

Biomass and Biogas: There are a variety of biomass energy sources including wood, wood waste, municipal waste and landfill gas. The benefit of biomass is that it can be used as a fuel for power generation without the intermittency of other renewable sources.

Biofuels: Biofuels are appealing as an alternative fuel that could lower foreign oil dependence and curb GHG emissions. Biofuels will require technological breakthrough before reaching the scale to become economically competitive with other liquid fuels.

Recommendations:

- Establish a clear set of national goals on renewable and alternative energy
- Partner with companies to create market-based incentives to develop and commercialize wind energy, biomass, biofuel, solar and energy storage, and to develop the necessary infrastructure
- Support R&D efforts aimed at improving renewable energy technologies
- Encourage utility buy-back of residential power generation
- Commit to sustaining the current level of nuclear power and support of HTGR technology
- Reward performance of new electricity generation capacity rather than investment or sales
- Use the most appropriate renewable resources suited to a geography
- Continue to attract companies to the U.S. that produce alternative energy solutions
- Collaborate with energy-intensive industries to develop pricing structures that encourage manufacturing competitiveness while boosting generation from renewable sources
- Consider technology-neutral market approaches used for any policies encouraging cleaner and alternative energy sources

How Dow Is Delivering

By collaborating with customers, researchers and others to produce innovative products and solutions for wind, solar, electric vehicles and other clean energy technologies, Dow is helping move the world toward a sustainable and affordable energy future.

- Dow is investing in next-generation solar technology across the value chain. For example, Dow continues to expand manufacturing capacity globally for ENLIGHT™ Photovoltaic Films, which help photovoltaic manufacturers to improve efficiency and lower their total system costs.
- Dow is working to incorporate economically viable, clean-technology energy alternatives into its operations. Examples include:
 - At Dow’s Pittsburg, California, facility, the Company utilizes solar energy to offset approximately 91 metric tons of carbon emissions per year.
 - Wind powers production for PROCITE™ films, products used in postal envelope applications, at Dow’s Hebron, Ohio, facility. The offset is equivalent to the electrical power used by 725 U.S. households for one year.
 - In 2013, Dow began sourcing clean power from biomass for its Automotive Systems plants at its Michigan Operations site, reducing annual energy usage by up to 1.5 megawatts per year or the equivalent of nearly 93,000 million Btu of natural gas.
- In a pilot project at its Michigan Operations site, Dow developed clean technology to convert recycled plastic into energy. Plastic that has been reused and recycled to its fullest extent can now be used as a fuel at the end of its life span, with a 96 percent energy recovery.

- Dow technologies are helping create lighter, stronger and longer turbine blades that help harness the power of the wind more efficiently. Today, 25 percent of the world's domestic wind turbine blades are made using Dow materials and innovations.
- Dow is collaborating with multiple partners, including government researchers, universities and other manufacturers, to accelerate alternative solutions. For example, Dow and Oak Ridge National Laboratory are working together to develop a carbon fiber precursor based on polyolefins to help reduce the cost of carbon fiber. In 2010, Dow also received a \$5 million grant from the Michigan Centers of Energy Excellence (COEE) program to help accelerate manufacturing process innovation to make a cost-effective carbon fiber for use as a strong lightweight material in industrial market applications such as wind energy and transportation.

PILLAR 4: Transition to a Sustainable Energy Future



The Situation

The goal of the first three pillars is to transition to a sustainable energy future, one that meets economic needs while minimizing the impact on the environment. Meeting the energy needs of a growing global population will be one of the greatest challenges facing humankind in the decades ahead. The U.S. must commit to playing a leadership role by slowing, stopping and eventually reversing the global growth of GHG emissions while preserving economic growth for future generations.

The technology exists to drastically curb emissions. In the long term, the fuel savings from GHG emission reduction efforts will outweigh upfront investment costs. Moving toward a sustainable energy future becomes a question of cost and timing for policymakers. The European Union (EU), for example, has quickly advanced its climate policies on multiple fronts, including emissions trading and extensive use of feed-in tariffs. However, progress has come with significant costs – costs that the EU is just beginning to understand.

GHG emission pricing policies, when pursued independent of the global community, can have a reverse effect: hurting the economy and raising global GHG emissions. A “carbon leakage” effect can happen when a region’s GHG emissions policy forces higher costs on energy-intensive manufacturers. This in turn causes manufacturers to shift production to regions without these added emission costs. Not only do jobs move away from the region that first implemented the GHG costs, but global GHG emissions also can increase, as typically, the products are now manufactured in a region with a much higher GHG intensity. The very negative impact of this carbon leakage effect underlines the necessity for global cooperation in achieving policies related to curbing global GHG emissions.

As electricity demand and unconventional fuel production grow, the interaction between water, climate change and energy must continue to be taken into policy considerations. Energy production and delivery depend heavily on water to extract fossil fuels, generate electricity and irrigate crops for biomass and biofuels. The U.S. Southwest particularly faces a risk of higher electrical dependence due to water scarcity. Though sufficient water supplies exist in other regions of the U.S., the potential for increased droughts and heat waves caused by climate change could stress water supplies nationally. It will become increasingly important to consider water usage in electricity generation.

Opportunities

Nations have struggled to reach a global agreement on how to mitigate GHG emissions. Many experts have been warning that absent rapid change, we will lock in a global average temperature increase of well above 2°C – a change expected to have significant climate implications. Although we likely face an extended period of fragmented climate protection policy actions at the national level, important progress already is being made. Due to factors explored in the first three pillars – including improvements in vehicle efficiency and the use of gas resources in the power sector – the U.S. is already a global leader in absolute reductions in GHG emissions.

- The U.S. is the first country to meet its Copenhagen targets: The U.S. committed to cutting GHG emissions by 17 percent below 2005 levels by 2020 at the 2009 UN climate change conference in Copenhagen. In January 2012, U.S. emissions were at 13 percent below 2005 levels, and power sector emissions were reduced by more than 17 percent.²¹
- By combining lower emissions from cleaner natural gas-fired power generation with the use of competitive feedstocks in manufacturing to produce clean energy alternatives, the U.S. has the opportunity to lead the transition to a sustainable energy future.

A transition to a sustainable energy future depends on nations across the world focusing on energy solutions that are both competitive and more environmentally sustainable than the alternatives they replace. A focused set of efforts is needed to implement improvements that will reduce costs and encourage significant economic growth.

Recommendations:

- Realistically set GHG reduction targets for all the major economies, recognizing that no economy can afford to compromise growth. These policies should account for the reality that developing countries need to pursue GHG reduction policies.
- Encourage and drive continuous investment in the U.S. and help unlock the “no regrets” opportunities for increased energy and resource efficiency, as well as timely capital replacement.
- Avoid taxing hydrocarbons whenever they are used as feedstocks, ultimately enabling lower emissions through the efficient solutions they provide.
- Whenever carbon policies are pursued, coordinate all contributing factors including renewables, efficiency initiatives and carbon policies into a single policy framework that focuses on driving tangible GHG benefits at the lowest possible cost to society.
- Consider water usage and security in energy production and electricity generation (or implement policies that ensure water supplies are not exhausted or tarnished).

How Dow Is Delivering

Since 1990, Dow’s energy intensity as measured by Btu per pound of product has improved by more than 40 percent, contributing to a cumulative savings of \$24 billion and 5,200 trillion Btu as of year-end 2012. As a result, Dow has avoided more than 270 million tons of emissions since 1990. Dow is continuing this momentum with innovative products and solutions as well as improvements in its own operations.

- The total 20-year North American production capacity of Dow insulation products (such as STYROFOAM™, THERMAX™ and GREAT STUFF™) when properly installed could save more than 1 trillion pounds of CO₂ equivalent.
- Dow; the City of Midland, Michigan; and Consumers Energy entered a purchase agreement in which biogas created by the city’s landfill is being used to generate electricity to power Dow’s corporate headquarters in Midland. The economically viable source of clean energy will save more than 12,000 tons of GHG emissions annually. This has placed Dow’s Corporate Center on the EPA’s Green Power Purchase Program Fortune 500 Partners List.
- The collaboration between Dow and The Nature Conservancy demonstrates that protecting nature can be both a global business strategy and a Company priority. By combining our resources and expertise, we are integrating the value of nature into Dow’s business decision-making.

CONCLUSION

There has never been a better time and more of a need for a comprehensive energy policy that will help revive the U.S. economy and put the nation on a path to sustainable growth. A national energy policy sets the stage for securing an affordable, diverse and sustainable domestic energy supply. It puts our nation's resources to work in creating the most jobs and economic growth. It also sends the signal to manufacturers that the U.S. not only wants to nurture but accelerate a manufacturing renaissance. Let's take advantage of the opportunity before us today. It is a matter of national competitiveness.

In an intensely competitive global environment and a slow-growth economy, too much is at stake to leave the U.S. reliant on a patchwork energy policy. Dow believes that the four pillars – conserve energy, optimize domestic supplies, accelerate cost-effective alternatives and transition to a sustainable energy future – serve as a guiding framework for an effective national U.S. energy policy. Dow cares about the future of the U.S. We have been headquartered in America for more than 115 years and continue to invest in the U.S. We use energy as a basic building block to create the modern materials that our global society needs. We are committed to being part of the solution, and we are asking you to also be part of the solution – a bold solution – that will require the collaboration of the government, utilities and manufacturing sectors.

www.dow.com/energy

Sources:

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