

ENERGY SECURITY AND THE ROLE OF CLEAN ENERGY

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KEY FINDINGS

Energy security is one of the top challenges to America's future prosperity, national security, and quality of life in the 21st century. Energy is not just national security in scope, but is an international security issue of the highest order. Without abundant, sustainable supplies of reliable, clean and affordable energy and the requisite delivery and distribution infrastructure, our economy will be artificially constrained and will not realize its full potential. This report outlines the energy security context and assesses the energy security impact of New Mexico's greenhouse gas (GHG) reduction rule, also known as the carbon pollution reduction rule. Key findings include the following.

- Our heavy dependence on foreign supplies of energy, particularly oil, creates geopolitical and economic vulnerabilities and risks, affecting our national security in both the short-term and longer-term.
- Supply interruptions of electricity or natural gas cause substantial dislocations and losses, even posing life-threatening risks. Energy price volatility can cause widespread suffering, economic hardships, and job losses.
- Aging energy infrastructure is increasingly inadequate to meet growing energy demand. Blackouts, brownouts, service interruptions, and rationing could become commonplace without new and upgraded capacity.
- Clean energy strategies can further the goals of energy security but these programs must minimize potential adverse economic impacts to enhance energy security.
- **New Mexico's GHG reduction rule has multiple well-designed elements that contribute to energy security, including predictability, market-based mechanisms, and extensive compliance flexibility.**
- **New Mexico's GHG reduction rule takes advantage of the state's energy resources and R&D capacity to foster innovation and create competitive advantage for future job creation and economic growth.**

¹ The views expressed herein are those of Daniel E. Klein and not necessarily those of the Institute for 21st Century Energy, for whom he has been a consultant in the development of the *Index of U.S. Energy Security Risk*.

SUMMARY

Broadly, we can state that “Energy Security” requires a reliable supply of clean & affordable energy, consistent with domestic and international objectives and sustainability. Last year, the first “Index of U.S. Energy Security Risk,” was unveiled by the Institute for 21st Century Energy (“Energy Institute”), presenting a first-of-its-kind effort to develop a comprehensive methodology for identifying, quantifying, tracking, and projecting these risks. The trends provide insight into U.S. efforts and trends over the past 40 years, and provide a sobering picture of a Business-as-Usual future. Looking forward, there are clear indications that energy security risks are again rising, approaching and perhaps even exceeding historic highs

By and large, a clean energy strategy is consistent with the goals of energy security. But potentially, there can be tradeoffs or conflicts, where some actions or requirements will be positive for some measures of risk, but potentially negative for others. Accordingly, for both energy security and economic competitiveness, environmental programs should seek to minimize these potentially adverse effects while pursuing the environmental benefits.

In 1991, the renowned Harvard University business strategist Michael Porter advanced what has since come to be known as the “Porter Hypothesis,” describing how well-designed regulations can promote innovation, and under certain conditions could actually *enhance* competitiveness. New Mexico’s GHG reduction rule can be seen to have multiple “well-designed” elements that provide predictability, use of market-based mechanisms, and extensive compliance flexibility. These elements would push New Mexico toward clean energy and energy efficiency, which contribute to energy security.

Because New Mexico’s program is well-designed with respect to market mechanisms and encouragement for innovation, its potential adverse effects seem to be small. Quite the contrary, with the program’s provisions specifically aimed to minimize risks, together with several inherent advantages in its energy resources and its educated R&D-oriented workforce, New Mexico appears well-positioned to foster innovation and create competitive advantage for future growth. Overall, New Mexico’s GHG reduction rule would appear to be beneficial to the goals of both clean energy and energy security.

ENERGY SECURITY AND RISK

Energy powers our modern world, and modern life as we know it would not be possible without abundant and reliable energy supplies. Developing countries will also need increasing amounts of energy in their quest to create a standard of living for their people that many of us have long taken for granted.

Energy prices permeate decisions of all businesses in every sector. If energy prices are erratic or artificially high because of a legacy near-sighted policy decisions, America’s businesses will produce less output, which in turn results in fewer jobs being created, lower wages, higher costs for goods and services, and a smaller tax base to fund federal programs.

With energy playing such a pivotal role in modern society, the energy security of supplies takes on a heightened importance. Energy security is one of the top challenges to our nation's future prosperity, national security, and quality of life in the 21st century. Indeed, we often take secure energy supplies for granted; it is only when these supplies become *insecure* that we are shocked into awareness:

- Our heavy dependence on foreign supplies of energy, particularly oil, creates geopolitical and economic vulnerabilities and risks, affecting our national security in both the short-term and longer-term.
- Tight oil supplies in the face of growing world demand have led to record oil prices, curbed economic growth and adversely affected U.S. trade balance.
- Some longtime traditional oil suppliers are facing declining production, and new replacements of conventional oil supply are lagging.
- Supply interruptions of electricity or natural gas, even as short as a few hours, cause substantial dislocations and losses, even posing life-threatening risks.
- Longer-term supply disruptions and energy price volatility can cause widespread suffering, economic hardships, and job losses.
- Aging energy infrastructure is increasingly inadequate to meet growing energy demand. Blackouts, brownouts, service interruptions, and rationing could become commonplace without new and upgraded capacity.

Energy is not only a national security issue, but is also an international security issue of the highest order. Global demand is projected to grow by nearly 50 percent by 2035, with most of that occurring in countries that are net importers of oil and gas supplies.² With oil being an internationally-traded commodity, and natural gas becoming increasingly traded, a supply disruption anywhere can affect consumers everywhere.

Other emerging trends, reflecting the new global energy landscape, could heighten our energy insecurity. Energy poverty haunts billions of people worldwide, and many developing countries have made the provision of modern energy services to their people a priority, knowing the positive impact reliable energy has on economic growth and prosperity. At the same time as new demand growth is emerging, more and more global energy resources are becoming inaccessible. Resource nationalism is on the rise, state-owned oil companies command a growing share of global reserves, project costs are climbing rapidly, and qualified engineers and skilled workers are becoming increasingly scarce. These trends promise to place tremendous pressure on energy markets for years to come.

For several decades, the U.S. has had an inadequate, contradictory, and shortsighted approach with regard to our energy future. These concerns have been voiced by a series of

² U.S. Energy Information Administration, *International Energy Outlook 2010*, July 2010, p. 1, <http://www.eia.doe.gov/oiaf/ieo/pdf/0484%282010%29.pdf>.

Administrations, both Democrat and Republican, over the decades. Presidential statements and rallying cries about “Project Independence,” “the moral equivalent of war,” and “America is addicted to oil” have become part of our national vocabulary. Yet in the nearly four decades since the Arab oil embargo in 1973, the risks of supply disruptions, price spikes, blackouts, shortages, and environmental concerns persist as pressing national economic and security priorities.

In a global economy, energy supplies and policies are important factors for national competitiveness. We must develop new, affordable, diverse, and clean sources of energy to underpin our nation’s economy and keep us strong both at home and abroad. Our energy future must address growing shortfalls in infrastructure capacity and emerging environmental issues. Without abundant supplies of clean, reliable, and affordable energy and the requisite delivery and distribution infrastructure, our economy will be artificially restrained and will not realize its fullest potential.

MEASURING ENERGY SECURITY RISK

But what does “energy security risk” actually mean? Surprisingly, when we scratch below the surface of the phrase, there is little consensus as to its meaning. To some, it’s how much oil we import. Others see it in terms of the price at the pump. Still others view security in terms of price stability, vulnerability to disruptions, or sustainability over the long term. And, they may all be right, since energy security risk spans many different time scales, geographies, industries, and physical forms.

Collectively, “energy security risk” encompasses a range of considerations – long-term and short-term, domestic and foreign, economic and political, and reliability in the face of natural and man-made risks. Broadly, we can state that “Energy Security” requires a reliable supply of clean & affordable energy, consistent with domestic and international objectives and sustainability.

But is this statement sufficient to establish policy and direction, or is it still too vague and qualitative? As the noted management consultant Peter Drucker observed, “If you can’t measure it, you can’t manage it.” If energy security remains a concept that can’t be measured, then we cannot easily answer basic questions such as “How are we doing?” and “Are things getting better or worse?” If policies are being debated that would have an effect on our collective energy security, then we should want a way to measure and track progress and effectiveness. Tracking progress requires metrics, and objective data to implement those metrics.

Last year, the first “Index of U.S. Energy Security Risk,” was unveiled by the Institute for 21st Century Energy (“Energy Institute”), an affiliate of the U.S. Chamber of Commerce.³ I was a consultant to the Energy Institute in conceptualizing and implementing this Index. The Index, to

³ U.S. Chamber of Commerce, Institute for 21st Century Energy, *Index of U.S. Energy Security Risk, 2010 Edition*, <http://energyxxi.org/energysecurity/>.

my knowledge, is a first-of-its-kind effort to develop a comprehensive methodology for identifying, quantifying, tracking, and projecting U.S. Energy Security Risks.

The Energy Security Risk Index comprises four classes of risks and concerns: (1) Geopolitical, (2) Economic, (3) Reliability, and (4) Environmental. These classes of risk are not independent, but interact, complement, and/or occasionally conflict with each other in complex ways. Articulating and quantifying these multiple dimensions requires more types of measurements than any single statistic can communicate. Accordingly, the methodology takes into account 37 individual metrics that collectively define sub-indexes for Geopolitical, Economic, Reliability and Environment risks, which in turn define the composite U.S. Energy Security Risk Index. The methodology and data are transparent, primarily using U.S. Energy Information Administration statistics to quantify risks as far back as 1970. Additionally, using forecasts such as those in EIA's *Annual Energy Outlook*, energy security risks are projected out at least twenty years into the future.

The trends provide insight into U.S. efforts and trends over the past 40 years, and provide a sobering picture of a Business-as-Usual future. The high water mark of energy security risks seen in 1980-1981 was virtually matched in the economic turmoil of 2008, and both periods were quickly followed by harsh and severe economic contractions. Looking forward, there are clear indications that energy security risks are again rising, approaching and perhaps even exceeding historic highs.

Yet this future of high risk, and the woes that accompany it, are not inevitable. The past is already behind us, and we can only observe it as passengers on our journey. But going forward, we're not just passengers; we're also drivers capable of adjusting our course. Policies matter. As individuals and as a nation we are capable of making choices and taking actions that reduce our energy risks and limit our exposure such that when crises do occur – as they inevitably will – they are less disruptive to our economy, security, and well-being.

A CLEAN ENERGY STRATEGY IS CONSISTENT WITH ENERGY SECURITY

“Clean Energy” refers to a variety of ways for producing and consuming energy that are less polluting, more efficient, and more sustainable than our traditional fossil-based energy processes. Precise definitions vary. Often, clean energy is used synonymously with renewable energy, particularly wind, solar, and some forms of hydro. Energy efficiency is often included, as the cleanest form of energy is that which is not needed. Others might include nuclear power for its CO₂-free power generation. Also, some describe clean energy to include lower CO₂-emitting fuels such as natural gas, some biofuels, and even coal with carbon capture and storage technologies.

There are many individuals and organizations throughout the country advocating for energy security. Similarly, many individuals and organizations advocate for cleaner air and reduced GHG emissions. Often, it seems, these two constituencies are indifferent, and occasionally even at odds, to the concerns and objectives of the other. But ironically, an energy security agenda and an environmental agenda tend to coincide more than they conflict.

By and large, a clean energy strategy is consistent with the goals of energy security: a reliable supply of clean & affordable energy, consistent with domestic and international objectives and sustainability. Actions that promote energy efficiency, environmentally cleaner energy supplies, diversity of sources, and innovation will also improve many of the metrics of overall energy security.

But potentially, there can be tradeoffs, where some actions or requirements will be positive for some measures of risk, but potentially negative for others. Generally, if clean energy actions also result in high-cost expenditures for little environmental benefit, substitute command-and-control requirements instead of market-based actions, or provide inadequate time to comply in a reliable and cost-effective manner, then other measures of energy security can be adversely affected. For example, electric utility demand side management (DSM) programs can reduce demand and enhance capacity reserve margins, but may put upward pressure on the average electricity rate. Similarly, renewable electricity additions can lower the CO₂ intensity of the economy and increase capacity diversity, but potentially at higher cost.

Accordingly, for both energy security and economic competitiveness, environmental programs should seek to minimize these potentially adverse effects while pursuing the environmental benefits. In 1991, the renowned Harvard University business strategist Michael Porter advanced what has since come to be known as the “Porter Hypothesis,” describing how well-designed regulations can promote innovation, and under certain conditions could actually *enhance* competitiveness.⁴

There are two main causal links in the Porter Hypothesis. The first part is that properly-designed environmental regulation can spur innovation, encouraging firms to improve processes to reduce costs and/or improve quality. The evidence for this linkage is now fairly well established.⁵ This is sometimes referred to as the “weak” version of the Porter Hypothesis, because by itself it does not state whether the *net* effect for businesses is positive or not; that is, whether or not the innovation improvements fully offset the costs of the regulations to the firm. This measure of net benefit to the firm is often called the “strong” version of the Hypothesis, and here the empirical evidence is mixed.

To be clear, the Porter Hypothesis does not suggest that regulation *per se* leads to innovation, only that properly designed ones do. Regulations that are not properly designed can stifle innovation and adversely affect costs, competitiveness, and energy security. The key phrase, of course, is “properly designed.” Elements that contribute to well-designed regulation include predictability, use of market-based mechanisms, compliance flexibility, and time flexibility. These are the elements that can encourage innovation that in turn can partially – and sometimes more than fully – offset the additional cost of regulation.

⁴ Michael Porter, “America’s Green Strategy,” in *Scientific American*, 264(4), p. 168, 1991.

⁵ Stefan Ambec, *et al.*, *The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness?*, Resources for the Future, Discussion Paper DP-11-01, January 2011, <http://rff.org/RFF/Documents/RFF-DP-11-01.pdf>.

It is worth noting that the cost-benefit test for environmental regulations for society is not necessarily whether the individual affected firms will be better off or not, but how the net cost of the regulations compares to the environmental benefits. By itself, the Porter Hypothesis does not suggest what a proper balance may be in a tradeoff between social benefits and private costs. Further, the “strong” version of the Porter Hypothesis doesn’t assert that innovation *will* offset the cost of regulation, merely that it *may*. But regardless of this net cost, it can generally be said that innovation is beneficial, improving the cost-benefit comparison relative to what would be indicated by a static analysis that did not take innovation benefits into account. Similarly, if regulations can be properly designed to encourage innovation, they will be more likely to be less costly in achieving its desired environmental benefits.

NEW MEXICO’S GHG REDUCTION RULE

Given these considerations of energy security, the desire for environmental improvements, and the potential for innovation, what can be said about New Mexico’s recently adopted GHG reduction rule?⁶ Specifically, how do the environmental benefits of regulations help energy security, and have the regulations been well-designed to limit potential adverse effects on energy security and competitiveness?

New Mexico’s GHG reduction rule can be seen to have multiple “well-designed” elements that provide predictability, use of market-based mechanisms, and extensive compliance flexibility:

- ***Predictability.***
 - The program provides an effective date of January 1, 2013 (or six months after 20.2.350 NMAC is no longer in force, whichever date is later).
 - The program defines a baseline amount for each source, and specifies how much the emissions or emissions rates are to be reduced in subsequent years.
 - The program provides the certainty of a long-term planning horizon, with the program’s sunset being ten years after the effective date, or sooner if a regional or federal GHG reduction program is in place.

- ***Market-based mechanisms and compliance flexibility.***
 - The regulation is market-based, and does not specify how CO₂ emissions requirements must be reached. Instead, sources are allowed to achieve compliance at the lowest cost possible. Source-specific options such as improved efficiency and lower-carbon fuels are allowed, as are actions at other owned facilities and offsets.

⁶ New Mexico Commission of Public Records, *Greenhouse Gas Reduction Program*, Title 20, Chapter 2, Part 100 (20.2.100 NMAC), <http://www.nmcpr.state.nm.us/nmac/parts/title20/20.002.0100.htm>.

- Offsets that are approved and determined by the department to be accurately measured, verifiable, enforceable, voluntary, additional and permanent can be used, as well as New Mexico offsets certified by the climate action reserve, or certified by any other protocol authorized by the department.
 - An owner or operator can use excess reductions at one source to comply at another source that it owns, operates, or controls.
 - The regulation includes a cost cap, such that once a source's expenditures on compliance reach the cap in a given year, its reduction obligation is satisfied.
- ***Time flexibility.***
 - The regulations provide a buffer of two years for existing sources before CO₂ reductions have to begin.
 - New sources for electricity generation begin with a baseline of 0.5 metric tons CO₂ per MWh, an amount well above the emissions rate for efficient natural gas combined cycle units. Their operation would likely earn excess reductions in the early years that could either be banked for future use and/or applied to other sources owned or operated.⁷
 - New sources for oil and natural gas operations assume best available control technology for the baseline, with annual reductions of roughly three percent in successive years.
 - Early action credits can be approved and used to comply with reductions needed at any source owned, operated or controlled by the same entity.
 - Sources may bank excess reductions indefinitely for later use,
 - Sources may borrow, or delay required emissions reductions, for up to one year, with a ten percent penalty.

New Mexico also has several inherent advantages with respect to natural gas supplies, renewable resources, offset and energy efficiency opportunities, low electricity rates, and an educated, R&D-oriented workforce. These features can enable New Mexico not only to meet the requirements of the recently-adopted GHG reduction rule, but to be able to use it to create a competitive advantage that can help it lead the U.S. in the twenty-first century.

- ***Natural Gas Supplies.*** New Mexico is a leading U.S. producer of natural gas, accounting for close to one-tenth of the U.S. total.⁸ The San Juan Basin located in New Mexico and

⁷ According to PNM's 2008 Integrated Resource Plan, a combined cycle natural gas unit will emit about 0.36 metric tons per MWh, more than 25 percent below the initial baseline for new sources. Source: *Prepared Testimony of Steven S. Michel on behalf of New Energy Economy*, before the Environmental Improvement Board, State of New Mexico, No. EIB 08-19(R), pp. 9-10, August 6, 2010.

⁸ U.S. Energy Information Administration, *State Energy Profiles: New Mexico*, http://www.eia.gov/state/state_energy_profiles.cfm?sid=NM.

Colorado contains the Nation's largest field of proved natural gas reserves. New Mexico rivals Colorado and Wyoming as the Nation's top coalbed methane producer, and approximately one-third of all natural gas produced in New Mexico is coalbed methane. The Blanco Hub, located in the San Juan Basin, is a major transportation point for Rocky Mountain natural gas supplies heading to West Coast markets.

Further, recent developments in the U.S. natural gas market, particularly the rapid expansion in our understanding of our enormous reserves of shale gas, have resulted in a dramatic and likely long-lasting improvement in our ability to use this lower-carbon fossil fuel. Between 2003 and 2008, the cost of natural gas for the electric power industry averaged between \$4 and \$7 per million Btu (MMBtu) higher than the average cost of coal.⁹ In 2008, however, this fuel price differential had narrowed to only \$2.53 per MMBtu. Moreover, this favorable outlook for natural gas is projected to continue; EIA's most recent projections indicate that the annual average natural gas wellhead price remains under \$5 per thousand cubic feet through 2022, and that the 2035 natural gas price forecast is \$1.66 per MMBtu less than the forecasts made just one year ago.¹⁰ These developments suggest that one of the possible GHG mitigation efforts – using natural gas instead of coal as a power generation fuel – will be lower cost, less volatile in price, and more domestically sourced than previously thought. All of these factors work favorably toward improved energy security.

- **Renewable Resources.** New Mexico is also blessed with a large endowment of renewable energy resources, particularly solar and wind. Relative to most other states, the development of these sustainable sources of power can be achieved at lower cost and/or in greater quantity.
- **Low Electricity Rates.** New Mexico already enjoys a substantial advantage in average electricity rates relative to adjacent states and the U.S. overall. In 2010 (through October), New Mexico's average retail price of electricity was 8.58 cents per kWh.¹¹ This was 8-15 percent below the average rates for the adjacent states of Arizona (9.85¢/kWh), Colorado (9.30¢/kWh), and Texas (9.41¢/kWh). It is also more than 15 percent below the U.S. average rate of 9.94¢/kWh. According to the NM Environmental Improvement Board, the maximum cost impact – that of a cost cap should sufficient lower-priced reductions not be available through efficiency, technology measures, or credits – would be less than one percent of utilities' revenues (and substantially less for oil refining and

⁹ U.S. Energy Information Administration, *Electric Power Annual 2009*, Table 3.8. "Weighted Average Cost of Fossil Fuels for the Electric Power Industry, 1998 through 2009," <http://www.eia.doe.gov/cneaf/electricity/epa/epat3p8.html>.

¹⁰ U.S. Energy Information Administration, *AEO2011 Early Release Overview*, December 16, 2010, http://www.eia.gov/forecasts/aeo/early_prices.cfm.

¹¹ U.S. Energy Information Administration, *Electric Power Monthly October 2010*, "Table 5.6.B. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, Year-to-Date through October 2010 and 2009," report released January 14, 2011, http://www.eia.gov/cneaf/electricity/epm/table5_6_b.html. Data developed through EIA Form EIA-826, "Monthly Electric Sales and Revenue Report with State Distributions Report."

gas processing).¹² As such, any cost impact of the regulation should be very small relative to the electricity rate advantage New Mexico already enjoys over its neighbors and the U.S. overall.

- **Energy Efficiency Opportunities.** New Mexico is about in the middle of the pack in terms of its per-capita energy usage. There is likely to be considerable potential for improving the energy efficiency of homes, appliances, businesses, and vehicles throughout New Mexico. In 2006, New Mexico ranked 21st highest among the states (plus Washington DC) in terms of per-capita energy consumption.¹³ The American Council for an Energy-Efficient Economy (ACEEE) has ranked states based on scores in eight categories of energy efficiency commitment and policy support as of 2006. In this national ranking, New Mexico was 25th among all states with a score of 15 points out of a possible 50 points.

Many of New Mexico's energy efficiency efforts are of comparatively recent vintage. For example, Public Service Company of New Mexico began implementing electricity conservation programs beginning in 2007. This comparative recency, coupled with the relatively low energy costs in the state, likely imply that there remain significant untapped sources of energy efficiency savings.

- **Offset Opportunities.** New Mexico would appear to have a wide range of GHG offset opportunities within the state. Offsets could include terrestrial and forestation projects, dairy biogas combustion, methane reduction at landfills, and rangeland management.¹⁴

The extensive size of New Mexico's oil and gas sector also offers large opportunities for offsets. While petroleum refining facilities, gas processing or treatment facilities, and gas compression facilities can be considered sources under New Mexico's GHG Reduction Program, there are many uncovered sources within these sectors, including oil and gas well sites and associated gathering and transportation systems. These uncovered portions of the oil and gas sector are collectively major sources of fugitive methane emissions; in 2008 these fugitive emissions amounted to well over 100 million metric tons of CO₂-equivalent emissions nationally.¹⁵ A number of technologies and practices have been identified for reducing methane emissions from natural gas systems. Since 1993, the U.S. EPA and the natural gas industry, through the Natural Gas STAR Program, have identified several Best Management Practices (BMPs) that are cost-effective in reducing methane emissions. In 2009 alone, U.S. emissions reductions from the Natural Gas STAR

¹² State of New Mexico, Environmental Improvement Board, *In the matter of the petition to adopt new regulations within 20.2 NMAC, Statewide Air Quality Regulations, to require greenhouse gas emissions reduction, New Energy Economy, Inc. Petitioner*, EIB No. 8-19(R), Dec. 30, 2010, paragraph 12, pp. 7-8.

¹³ Southwest Energy Efficiency Project, *State of New Mexico Fact Sheet: Energy Efficiency and Energy Consumption*, July 2009, www.swenergy.org/publications/factsheets/NM-Factsheet.pdf.

¹⁴ *Prepared Testimony of Steven S. Michel on behalf of New Energy Economy*, before the Environmental Improvement Board, State of New Mexico, No. EIB 08-19(R), p. 11, August 6, 2010.

¹⁵ U.S. Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2008*, December 2009, Table 17, p. 30, [ftp://ftp.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/ggrpt/057308.pdf](http://ftp.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/ggrpt/057308.pdf).

Program were equivalent to the avoidance of 34.8 million tonnes CO₂ equivalent.¹⁶

- ***Educated R&D-oriented workforce.*** The Index of U.S. Energy Security Risk also recognizes the importance of R&D and education as cornerstones of a secure energy future. Scientific discovery and technological innovation are indispensable for promoting economic growth and jobs, protecting the environment, advancing toward a clean energy future, improving the health of the population and safeguarding our national security in the technologically-driven 21st century. Yet for decades, the U.S. has had an inadequate, contradictory, and shortsighted approach with regard to our energy future. Similarly, human capital is also a vital factor for our long-term well-being, yet American universities are graduating fewer and fewer students in science, engineering, and mathematics. New Mexico, with its National Laboratories and other centers of excellence, is well-poised to play a leading role in a revival of the R&D and education so vital to our longer-term energy security. New Mexico's GHG reduction rule, with its strong embrace of market mechanisms and least-cost actions, provides strong incentives for innovation, and coupled with an educated, R&D-oriented workforce can establish leadership in innovative clean energy technologies.

In conclusion, it can be said that New Mexico's GHG reduction rule pushes New Mexico toward clean energy and energy efficiency, which in turn contributes to energy security. Because the program is well-designed with respect to market mechanisms and encouragement for innovation, its potential adverse effects seem to be small. Indeed, with the program's provisions specifically aimed to minimize risks, together with several inherent advantages in its energy resources and its educated R&D-oriented workforce, New Mexico appears well-positioned to foster innovation and create competitive advantage for future growth. Overall, New Mexico's GHG reduction rule would appear to be beneficial to the goals of both clean energy and energy security.

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Daniel E. Klein, President of Twenty-First Strategies, has over 35 years of consulting experience in energy, environmental, and economic analysis. For many years a Senior Vice President and Director of ICF Resources Incorporated, he founded Twenty-First Strategies in 1995 to offer energy and environmental consulting services to energy companies, government agencies, and others. Over the course of his consulting career, Mr. Klein has conducted hundreds of projects related to energy and environmental concerns, energy markets, electric utility fuel use, coal supply, transportation, and antitrust issues. His work in recent years has focused primarily on climate change, energy supply and usage, energy security, and related policy issues from the government side as well as strategies for the private sector. Mr. Klein earned a Bachelor's degree from MIT and an MBA from the Stanford Graduate School of Business.

¹⁶ U.S. Environmental Protection Agency, *Natural Gas STAR Program*, <http://www.epa.gov/gasstar/accomplishments/index.html>.