

# Energy Infrastructure Surety

## Critical Infrastructure Surety

### Future Energy Challenges

America's energy supply is essential to our economy and security. Issues such as increasing energy demand, vulnerability to disruptions from natural causes and malevolent threats, and industry restructuring could compromise the stability and reliability of our energy supplies. Failure to address these issues could threaten our nation's economic prosperity, compromise our national security, and literally alter the way we live our lives. Three overriding facts define the challenge of America's energy supply needs over the next two decades:

- Demand for energy is rising across the board, but particularly for natural gas and electricity;
- Energy supplies are being limited by a regulatory structure that, in many

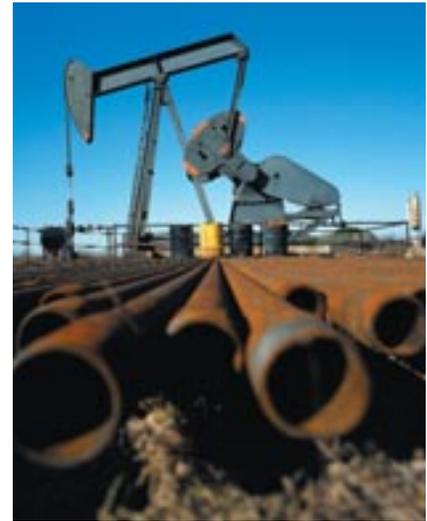
respects, has failed to keep pace with the advances in technology and an uncertain political environment that often discourages investment in desperately needed facilities; and

- Our energy infrastructure – that network of generators, transmission lines, refineries and pipelines that convert raw resources into usable energy and deliver it to end users – is woefully antiquated and inadequate to meet our future needs.

Unless these challenges are addressed, America's energy supply will be continually at risk...our citizens will encounter blackouts and other life-style altering disruptions...we will become increasingly dependent on foreign imports...and our economy will be hobbled by rising energy costs.

### Improving and Protecting our Energy Infrastructure

To meet these challenges will require a broad, system-level approach to match projected demands with reliable and sustainable energy supplies. Sandia National Laboratories has initiated research and development programs required to protect the surety (safety,



security, and reliability) of our energy supply and distribution infrastructure. Our areas of emphasis include:

- Supporting the need to diversify America's energy supply, understanding that diversity of supply means security of supply and that a broad mix of supply options, from coal to wind, nuclear to natural gas, will help protect consumers against price spikes and supply disruptions,
- Supporting the need to reduce our dependence on oil from unstable regions through improved domestic production and improved renewable energy technologies,
- Addressing the environmental issues of energy generation reducing the



cost of environmental compliance and accelerating the development of non-polluting resources,

- Improving the safety and integrity of natural gas transmission pipelines,
- Addressing the vulnerability of the energy infrastructure to physical and cyber threats and natural disasters, and
- Assessing the reliability of interactions between energy and other infrastructures such as banking, telecommunications, transportation, and water.

## Energy Infrastructure Research Projects

Sandia has been working in partnership with the private sector and federal agencies to study, understand, and provide information about the surety of the nation's energy supply infrastructure. The following brief examples illustrate some of this work.

### *Electric Grid Reliability*

- Sandia is currently using advanced modeling techniques to perform probabilistic characterization of voltage stability and assessments of the impact of distributed power technologies on the electric grid.
- In addition, Sandia has developed a testing facility to research control



techniques for distributed system including renewables, photovoltaics, concentrating solar, wind, and geothermal, storage, batteries, flywheels and magnetic energy storage, microturbines, and fuel cells.

- As a member of the Consortium for Electric Reliability Technology Solutions (CERTS), Sandia is working cooperatively with a large group of research organizations to help develop the next generation of control tools to improve the reliability of the electric power grid of the future.

### *Gas Pipeline Safety and Integrity*

- Sandia is currently looking at the applicability of both airborne and satellite based remote sensing imaging technologies to identify gas transmission pipeline leaks more quickly and cost effectively.

- In addition, Sandia is looking at the application of inline inspection techniques applicable with a new generation of pipeline “smart pigs” based on autonomous robot technology.

### *Fossil Energy Supply Enhancement*

- Sandia is focused on developing technologies to improve fossil fuel recovery, storage, conversion and utilization. These efforts are focused on advancements in the geosciences, advanced drilling and exploration diagnostics, and development of novel chemical processing technologies.

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