

US Pat. No.: 8,527,247; 8,121,708

Technology Readiness Level: 5

Key elements have been demonstrated in relevant environments

With the increasing demand for new energy distribution methods including increased efficiency and alternative sources, Intelligent Grid technologies are on the cutting edge of demand. The significance is taking the current energy infrastructure to the next level of sustainability, utility, and compatibility with recent advances in the energy field. As a result of the increased carbon emissions around the world, the only option is to explore the balanced integration of renewable and sustainable energies such as wind and photovoltaic power. This is achieved through utilizing advances in information technology and utilizing it as a feedback loop. This in turn can act as a control mechanism and automate the integration process for different power sources on an as-needed basis. This would also address the issues of costly energy storage and how to use different forms of energy more efficiently.

The technologies and methodologies for the Intelligent Grid available for licensing at Sandia National Laboratories include:

- A novel control system design methodology which provides a unique set of criteria to design nonlinear controllers for nonlinear systems with respect to performance and stability
- The nonlinear/adaptive power flow control applied to power engineering has the potential to revolutionize how control systems are designed through complex, multi-component and usually adaptive systems. This methodology also includes exergy sustainability for most open systems which may include mass, energy, entropy, and exergy flow analysis.
- The integration of wind technology can also be examined with the nonlinear power flow control design. This design allows the nonlinear dynamical system to be divided into generation, dissipation, and storage
- A methodology that provides a new collective control design as it applies to collective nonlinear multi-point, multi-output systems which contain controls, communications, and information flow

TECHNICAL BENEFITS

- Adaptive energy infrastructure
- More resilient to stresses and disruptions
- More efficient use of alternative power sources
- Valuable modernization of wind, solar, and electrical power systems through information technology

INDUSTRIES & APPLICATIONS

- Electric utility
- Renewable power/energy