POSITION PAPER

Automation is Critical to Achieving Global Energy Goals

Many countries are promoting renewable energy sources, encouraging sustainable transportation and adopting innovative technologies to achieve their energy efficiency goals, mitigate climate change and contribute to a more sustainable future.

A key objective in all of these programs is to enable the consumption of energy more efficiently to reduce demand through such measures as grid flexibility and decarbonization, demand flexibility in appliances and buildings, and vehicle fuel economy standards.[1] Advanced automation technologies, implemented by knowledgeable and skilled professionals, are being employed across the entire infrastructure of energy production, storage and transmission to keep global energy supplies safe, efficient and secure while meeting these demands of the future.

GLOBAL DEMANDS FOR ENERGY EFFICIENCY

Major initiatives and strategies aimed at improving the efficient use of energy can be seen across the globe, including:

- The European Union has set ambitious energy efficiency targets as part of its overall climate and energy policy. The Energy Efficiency Directive aims to achieve a 32.5% reduction in energy consumption by 2030 compared to business-as-usual projections.[2]
- The U.S. Department of Energy has implemented various energy efficiency programs, including appliance standards,[3] building codes[4,] and research and development[5] initiatives.
- China has launched its National Energy Conservation Program, which includes targets for reducing energy intensity and improving energy efficiency in key industries.[6]
- Japan's Top Runner Program sets energy efficiency standards for various products, with the goal of encouraging manufacturers to produce and consumers to purchase energy-efficient options.[7]
- India's Perform, Achieve, and Trade scheme targets energy-intensive industries and establishes mandatory energy efficiency targets. Companies that exceed their targets can trade their energy-saving certificates.[8]
- Australia's Energy Efficiency Opportunities program requires large energy-using businesses to identify, evaluate and report on cost-effective energy savings opportunities.

TRENDS IN ENERGY PRODUCTION, STORAGE, AND TRANSMISSION

A multitude of approaches are being used to respond to global demands for energy efficiency – with each depending on the skillful application of underlying automation technologies to achieve efficiency and safety:

ENERGY MIX

There is a significant global shift towards renewable energy sources such as solar, wind, hydro and geothermal. These sources are becoming more cost competitive and are being adopted to reduce reliance on fossil fuels and mitigate climate change. They also help to diversify the energy mix to reduce dependence on a single energy source, while enhancing energy security and reducing vulnerability to supply disruptions. A prominent example could be seen following the start of the Russia - Ukraine war. Since then, the price of fuels in the EU has risen, as have concerns related to the security of energy supply. Russia's decision to suspend gas deliveries to several EU member states has further impacted the situation.[9]

DECENTRALIZED AND DISTRIBUTED GENERATION

Distributed energy resources, including rooftop solar panels, small wind turbines and community-based projects, are becoming more prevalent. This trend reduces reliance on centralized power plants and enhances energy resilience. To respond to the damage from Hurricane Fiona in October 2022, for example, the U.S. Government introduced the Puerto Rico Energy Resilience Fund. This supports Puerto Rico's grid resilience efforts and the goal of meeting 100% of its electricity needs with renewable energy by 2050. A $450M investment is targeted specifically at introducing rooftop solar and battery storage installations across the region, with a focus to reach and support Puerto Rico's most vulnerable residents.[10]

Nuclear energy has the potential to be used in decentralized and distributed generation by means of small modular reactors (SMRs), which are smaller in both physical footprint and electrical output than conventional nuclear reactors. SMRs are being developed by various companies and organizations worldwide, with pilot projects and demonstrations underway.[11]

STORAGE TECHNOLOGY

Advances in battery technology and other innovative storage solutions like hydro, compressed air energy and thermal are being explored for various applications. Energy storage is critical to integrating large amounts of wind and solar power into the grid. According to BloombergNEF, energy storage installations are set to exceed 15 times the 2021 online capacity by the end of 2030. The U.S. and China are projected to account for more than half of global storage installations worldwide by the end of the decade.[12]

HOW AUTOMATION CAN SUPPORT ENERGY SUPPLY AND EFFICIENCY

Safe and efficient execution of these energy production, storage, and transmission approaches requires the use of proven automation technologies implemented by knowledgeable and skilled automation professionals. The International Society of Automation (ISA), a member association of automation professionals from across the globe, believes that the following automation-based approaches will be essential:

- Smart grid technologies incorporating digital communication and control technologies to optimize energy production and distribution, monitor grid conditions in real time and accommodate variable renewable energy inputs.
- Demand-response programs adjusting electricity consumption based on supply conditions, helping to manage peak demand and reduce strain on power grids.[13]
- Recognizing and following industry standards that facilitate interoperability and enhance safety throughout power grids.
- Adopting industrial automation and control systems cybersecurity standards and conformity assessment programs to protect energy production, storage and transmission systems against operational impacts from intentional and unintentional incidents.

WHAT DECISION MAKERS CAN DO WITH THAT UNDERSTANDING

Energy providers and other decision makers – including governments – can advance toward meeting their energy goals through several key steps, including:

- Supporting the ongoing development of industry standards addressing the people, processes and technology involved in the automation systems that will continue to be vital in energy production, transmission and usage.
- Supporting the development of energy reduction programs where automation plays a significant role.
- Encouraging educational institutions to increase the availability of courses and training aligned to prepare future automation professionals.
- Supporting the adoption of certification and certificate programs to strengthen the skills and knowledge of the automation professionals we all depend on.

WHERE TO START

As a non-profit, international professional association, ISA develops widely used safety and performance standards for automation; provides education, training and certification programs for automation professionals; publishes books and technical articles; and provides networking and career development programs for automation professionals worldwide.

ISA is the primary developer of a widely used series of international consensus standards addressing the security of industrial automation and control systems. The ISA/IEC 62443[14] standards provide a flexible and comprehensive framework to address and mitigate current and future security vulnerabilities in those systems. These standards are among numerous ISA standards and guidelines that support energy production, transmission and storage efficiency and safety.[15]

CONCLUSION

Energy production that is efficient, sustainable and safe depends upon automation technologies and people working together to bring the most creative and innovative solutions to bear. Energy producers and policymakers alike should be focused on preparing our workforce to meet the need for engineers and technicians.[16] This demand for qualified automation professionals is already high and will only continue to grow as technologies progress. We must educate enough people to be well versed

in automation technologies, as well as the industry standards and conformance programs that support the automation field.

As part of its commitment to the education and certification of automation professionals, ISA actively supports global efforts to establish competency programs for automation professionals. An example is the Automation Competency Model[17] developed by the U.S. Department of Labor. This model defines the key skills, knowledge, and abilities that automation professionals need from entry level to advanced career levels and is updated regularly to ensure that emerging technologies are included, recognizing that the automation profession is constantly evolving.

ABOUT ISA

The International Society of Automation (ISA) is a non-profit professional association founded in 1945 to create a better world through automation. ISA empowers the global automation community through standards and knowledge sharing, driving the advancement of individual careers and the overall profession. ISA develops widely used global standards; certifies professionals; provides education and training; publishes books and technical articles; hosts conferences and exhibits; and provides networking and career development programs for its members and customers around the world.

RESOURCES

isa.org/standards	138+ standards for automation, cybersecurity and more
isa.org/training	Unbiased, real-world training courses, personnel certifications, and certificates that help engineers and technicians take the next step in their automation career
isa.org/join	Membership in ISA offers unparalleled access to technical discussions and resources
isa.org/events	Network, hear best practices and be part of the automation community dialogue at ISA events – both in person and virtual

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