

Around the world, both governments and utilities are striving to reduce the greenhouse gas (GHG) emissions of the electricity sector through renewable and sustainable generation technologies. While these efforts have resulted in significant progress, there is still a substantial amount of work left to be done to fully decarbonize the grid while delivering affordable and reliable power to customers. As utilities continue to transition, they will also need to adapt their maintenance programs to a more

complex and varied environment. With more substations, new generation facilities, and a wide range of new technologies all spread across a wide geographic area, utilities need a cost-effective and proactive approach to maintenance and repairs.

This article will highlight some of the major green energy initiatives in Canada and the US before showing how utilities can leverage advanced thermal and visual sensors to monitor green energy infrastructure.

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The Role of Green Energy Today

Green energy initiatives such as wind, solar, and hydroelectric are primarily being implemented to reduce the GHGs produced by the electricity sector.

While the volume of carbon dioxide (CO₂) and carbon dioxide equivalent (CO₂e) depends on the fuel source, the power generation sector contributes a significant portion of total emissions in both Canada and the US.



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Transitioning to Green Energy How Utilities Can Leverage Thermal and Visual Monitoring



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Fossil fuels are still the primary source of electricity in the US, with natural gas and coal making up 61 percent of the total energy mix. Renewables, including wind, hydroelectric, and solar account for 19.8 percent, followed by nuclear at 18.9 percent.

Because of this heavy dependence on fossil fuels, electricity generation produces about 32 percent of the country's total CO₂ emissions, or about 1,552 million metric tons of CO₂ each year.

Canada, on the other hand, relies more heavily on renewable energy sources. Hydroelectric power contributes to 59 percent of total generation, while a further 15 percent comes from nuclear. As a result, the electricity sector in Canada only accounts for 8.33 percent of total CO₂e emissions, or 56 million metric tons of CO₂e per year.

Government Efforts to Lower Emissions

Governments in both Canada and the US are setting aggressive targets to reduce emissions.

Already, the US has reduced carbon emissions in the power sector by 40 percent since 2005, mostly attributed to the transition away from coal in favour of natural gas. Similarly, Canada has reduced electricity sector emissions by 52 percent in the same period, as provinces like Ontario retired coal-fired plants.

The Canadian Government has increased its 2030 targets to reduce total emissions by up to 45 percent from 2005 levels and has set a target to reach net-zero emissions by 2050. The US has been even more aggressive, with the Biden Administration aiming to slash utility emissions by 2030 and achieve full decarbonization by 2035.

The Role of Thermal and Visual Sensors

Advanced thermal and visual sensors provide continuous, real-time monitoring of utility infrastructure. As green energy initiatives become more prevalent, utilities can leverage these solutions to enhance reliability, reduce the cost of physical inspections, and allocate maintenance teams more effectively.

Inspecting Wind Turbines

Wind turbines pose a unique challenge when it comes to maintenance. Technicians require knowledge of both mechanical and electrical components, and they must be trained to work at heights and in cramped, tight environments. A single inspection can take a full day, require multiple technicians, and cost thousands of dollars.

With hundreds or thousands of individual panels, it can be difficult for maintenance teams to identify and pinpoint issues, especially as there is often no visual indicator of a problem.



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Instead, utilities can deploy thermal and visual sensor solutions that continuously monitor the turbine, reducing the time and budget needed for routine inspections. Crews can be dispatched in response to a known issue, allowing the utility to prioritize repairs and minimizing the time spent by teams in difficult conditions.

Monitoring Solar Farms

Like wind, solar generation facilities present their own challenges to technicians. With hundreds or thousands of individual panels, it can be difficult for maintenance teams to identify and pinpoint issues, especially as there is often no visual indicator of a problem.

Thermal sensors can be deployed to pan and tilt across multiple panels. Instead of looking for high temperatures, these sensors can detect cold spots that indicate that a panel is not working properly. Maintenance teams can quickly scan the site and detect problems for repair from a central location.

Remote Substation Monitoring

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Rather than adding to the already high burden on maintenance teams, utilities can deploy thermal and visual sensors to monitor the health of substation assets and automatically alert crews to a potential problem.

High Voltage Direct Current Converter Station Monitoring

High voltage direct current (HVDC) transmission lines are the most efficient ways to move power over large distances. The HVDC converter stations convert AC power to HVDC for transmission and DC power back into AC power for distribution and use by customers. Like substations,

they contain high-value assets such as transformers, switches, capacitors, thermistors, and filters that all need to be inspected and maintained despite the hazardous conditions.

Thermal and visual sensors can be deployed within the site and especially within the HVDC converter hall to continuously monitor the health of the station while reducing the time that crews spend on-site. Not only does this improve overall safety, but it also reduces the cost of inspections and frees technicians to focus on maintenance and repairs.

Transitioning to a Sustainable Power Grid

The push for sustainability is

transforming the way that we generate, transmit, and use power. But it is also adding complexity for utilities. As maintenance requirements change, utilities need a cost-effective alternative to physical inspections.

Thermal and visual sensors provide a continuous, real-time view of electricity infrastructure. In addition to remote substations, these sensors can be used to monitor wind turbines, photovoltaic solar panels, HVDC converter stations, and the transmission and distribution lines that link them all together. With the right technologies and approach to maintenance, utilities can modernize existing infrastructure and invest in new capabilities that support the transition toward green energy.

Photo: Systems With Intelligence

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