

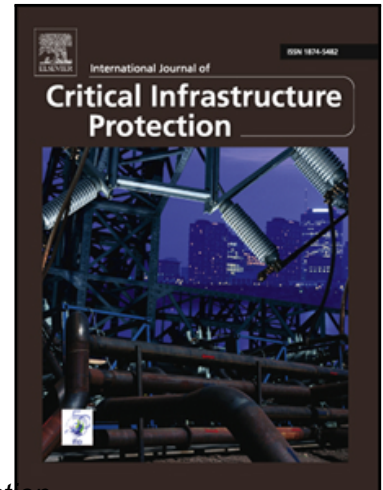
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Building resilience against cyber threats in the energy sector

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Building resilience against cyber threats in the energy sector

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Digitalization and the expansion of Internet-based services offer new opportunities for efficient power grid operation. Meanwhile, automation, real-time data, big data analytics and the Internet of Things are beginning to penetrate the energy sector. Technology provides improved situational awareness and faster, more efficient recovery after outages and failures. Innovations in industry and market dynamics push these developments, while regulatory authorities attempt to promote cyber security as increased technological dependence and emergent cyber risks become a reality. The Norwegian Water Resources and Energy Directorate (NVE) regulates security in Norway's hydroelectric and thermal power industries, as well as in the national grid. NVE promotes energy security and infrastructure resilience by improving regulations, guidelines and methods for revision.

Hydropower is the dominant energy source in Norway. Norway's mountainous regions have numerous interconnected water reservoirs. Regulating reservoir water levels and throughput are important to balancing electricity production and consumption, enhancing energy security, managing flood risks and preserving ecosystems and wildlife. Hydropower contributes about 142 000 GWh, 96% of Norway's total energy production while the remaining 4% is provided by thermal and wind power.

Water from Norway's reservoirs flows through tunnels inside mountains. The torrents move turbines that transform kinetic energy to electricity in massive generators located in power stations inside mountains or in the valleys below the reservoirs. Transmission lines crisscross valleys, mountains and fjords, connecting electricity generation sources to consumers.

Norway's energy consumers comprise about 5.3 million inhabitants and nearly half a million public and private enterprises.

Statnett SF, the Norwegian transmission system operator (TSO), is responsible for maintaining the balance of the nation's power grid. Managing the transmission grid involves solving an

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