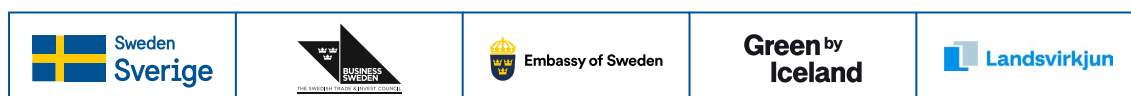




Iceland

Energy market report



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Executive summary

Iceland's energy sector is among the most distinctive in the world, operating an entirely renewable, isolated grid powered almost exclusively by hydropower and geothermal resources. This has historically provided industry with some of Europe's lowest electricity prices and a near-zero carbon footprint, attracting energy-intensive industries such as aluminium smelting and, more recently, data centres.

The sector is currently at an inflection point. After a prolonged period of limited new capacity development, demand growth is now outpacing supply, driven by expanding aquaculture, data centres, electrification of transport, and potential e-fuel production. Iceland's 2025 Energy Forecast projects total electricity consumption reaching between 25.4 TWh and 37.2 TWh by 2050, depending on the pace of industrial expansion and e-fuel development, up from approximately 20 TWh today.

To meet this growing demand, Iceland is embarking on a significant wave of new investment. Wind power is entering the generation mix for the first time at utility scale, with the Vaðalda wind farm currently under construction. Several hydropower and geothermal expansion projects are also underway or in advanced planning. In parallel, Landsnet is upgrading the national transmission grid, and longstanding bottlenecks that have limited the transfer of power between regions are being addressed.

The regulatory framework, shaped by EEA commitments and Iceland's own Energy Policy 2050, supports competitive generation while maintaining public oversight of transmission and distribution. Environmental considerations remain central to project approvals, with Iceland's Master Plan governing which sites may be developed, and public debate around wind development reflecting broader tensions between energy needs and landscape preservation.

Sweden's experience in grid modernisation, wind power integration, hydropower engineering, and energy efficiency positions Swedish companies well to contribute to Iceland's energy transition across multiple areas of the sector.

Market introduction

Iceland's energy sector is unique in the world: it is almost entirely powered by renewable energy and operates on a standalone grid in the middle of the North Atlantic. Abundant hydroelectric and geothermal resources have enabled Iceland to produce competitively priced, zero-carbon electricity on a large scale, which in turn has become a cornerstone of its economy. Thanks to this, Iceland is the largest producer of green electricity per capita globally, and electricity prices for industry have historically been among Europe's lowest, a key factor in attracting power-heavy industries to the country.

However, Iceland's geographic isolation means that its power system has no interconnections; it cannot import electricity if there is a shortage nor export surpluses (any excess energy not used domestically is simply unused). This isolation imposes a responsibility to carefully always balance domestic generation and demand. For decades, Iceland comfortably met its own demand with ample hydropower and geothermal projects, while keeping electricity nearly 100% renewable. In recent years, demand growth has accelerated, driven by new data centres investments, plans for hydrogen production, expansion of aquaculture facilities, and electrification efforts, brings the need for new capacity. Plans for increased amount of hydropower generation subsequently brings grid enhancements into sharp focus.

Today, the Icelandic energy sector stands at a crossroads: it has an unprecedented opportunity to leverage its renewable strengths to support new economic growth (and possibly even export power via subsea cable in the future) but must do so while safeguarding its unique environment and maintaining reliable, affordable supply at home. The following sections provide a detailed overview of the sector's structure, key players, regulatory environment, current conditions, upcoming investments, and a forward-looking outlook, including how Swedish expertise in power and grid technologies can contribute to Iceland's next chapter.

100% Renewable Power

Iceland generates virtually all its electricity from renewable hydropower and geothermal sources. This clean energy foundation has enabled world-leading energy prices.

Industry Fueled Demand

Power intensive industries (aluminium smelter and ferroalloy plants) consume about 80% of Iceland's electricity. Low-cost green energy has been the main attractor of these industries.

Isolated Grid Challenges

With no connections to other grids, Iceland must balance supply and demand internally. Rising demand from new industries such as data centers is pushing the need for new generation and grid upgrades to ensure stable and affordable power.

Icelandic energy sector overview

Iceland's electricity sector involves a mix of state-owned and privately-owned companies, with a state entity dominating generation and a few other producers and utilities playing significant roles. Below is a summary of the key market players:

Company Name	Role and Assets	Ownership
Landsvirkjun (National Power Company)	Generation: Largest electricity producer approximately 75% market share. Operates all major hydropower stations and some geothermal plants. Currently developing wind power.	100% State owned by the Icelandic state
Orkuveita Reykjavíkur (OR) ON Power	Second-largest producer approximately 15% market share. Runs geothermal plants Hellisheiði (303 MW) and Nesjavellir (120 MW) near Reykjavík. Distributes electricity, hot water, and cold water in the capital region.	Owned by City of Reykjavík and neighbouring municipalities
HS Orka	Third-largest producer, approximately 5–8 % market share. Operates Svartsengi (~75 MW) and Reykjanes (100 MW) geothermal power stations on Reykjanes peninsula. Also runs a small hydro plant (Brú) and sells power/water to industry and municipalities.	50% owned by Jarðvarmi (Icelandic pension funds) and 50% by Magma/Macarthur (Canada/UK)
Landsnet (TSO)	Owens and operates the national high-voltage grid (~3,300 km of lines, 70–80 substations). Ensures system balance and reliability. Transmits power from generators to regional distributors and large industrial users. Currently building a new 220 kV transmission ring to increase capacity.	Icelandic Government owns 93,2%, (acquired shares from Landsvirkju, RARIK AND Orkubú Vestfjarða in 2022) 6.8% Orkubú Vestfjarða (regional utility)
Regional Utilities	Several utilities have regional monopolies for low-voltage distribution to homes and businesses. Major ones: Veitur ohf, RARIK, HS Veitur, Orkubú Vestfjarða and Norðurorka. These firms deliver power locally and maintain distribution networks.	These firms have municipality ownership, apart from RARIK and Orkubú Vestfjarða (state-owned). HS Veitur is also partly privately owned
Large Consumers (Industrial)	Not power companies but essential to the market. Rio Tinto Alcan, Alcoa, Century Aluminum operate smelters that each use 4–5 TWh per year, under long-term contracts. Other big users: Elkem (ferrosilicon plant) and growing data centers e.g. Verne Global, which seek Iceland's competitively priced cheap renewable power.	Mostly foreign private ownership

The largest actor is Landsvirkjun, the state-owned National Power Company, which produces about 70-75% of the country's electricity through an extensive portfolio of hydro and geothermal plants. Other significant producers include Orkuveita Reykjavíkur (Reykjavik Energy), a municipal utility serving the capital region, and its subsidiary ON Power, as well as HS Orka, a privately owned company focused on geothermal generation in the southwest.

Transmission is managed by Landsnet, the national grid operator, which ensures system stability and connectivity across Iceland. Distribution is handled by several regional companies: RARIK serving rural areas, Veitur ohf primarily serving the capital region, and the privately owned HS Veitur are the largest once. Heavy industry, especially aluminium smelters, remains the largest electricity consumer, shaping the market's structure and pricing dynamics.

Regulatory environment and market structure

Iceland's electricity market operates under a regulatory framework that separates the natural monopoly functions (transmission and distribution) from the competitive segments (generation and retail supply).

Regulators and Policy Makers

The National Energy Authority (Orkustofnun) is an independent regulatory authority, that operates under the authority of the Ministry of the Environment, Energy and Climate. They are responsible for licensing energy projects, monitoring the electricity market, and advising on policy. Orkustofnun also conducts energy forecasting and administers the Master Plan for classifying power-plant sites. Overall policy is set by the Ministry of the Environment, Energy and Climate, which in 2022 was given an expanded mandate to also oversee energy pricing and market fairness. Environmental regulation (e.g. EIAs, water usage permits) involves the Environment Agency and local planning authorities – a critical factor, since new power projects (dams, wind farms, etc.) must satisfy strict environmental criteria and often face public scrutiny.

Laws and Market Liberalization

In line with EEA (European Economic Area) agreements, Iceland liberalized its electricity market in the early 2000s. The Electricity Act of 2003 opened generation and sale of power to competition, allowing consumers to freely switch suppliers starting in 2006. Transmission and distribution has however remained regulated monopolies (unbundled from generation per EU rules). Large industrial contracts are negotiated privately (often long-term 20–30 year deals indexed to aluminum prices), while the retail market for smaller consumers now has multiple sellers. Prices for retail customers are not state-controlled, but the government monitors them; in 2025 the minister proposed giving the regulator more power to prevent market manipulation and possibly to create a formal power exchange for transparency. There is no feed-in tariff or green certificate scheme domestically (since virtually all generation is already renewable), but Icelandic producers

can sell Guarantees of Origin for renewable electricity to European buyers – a practice that was briefly suspended in 2023 over accounting concerns.

Transmission Access and Grid Regulation

Landsnet, as TSO, must provide open access to the grid under non-discriminatory terms. It recovers its costs through regulated tariffs paid by distributors and large direct-connect users. Grid planning is coordinated with new generation proposals; notably, the system's islanded nature requires maintaining sufficient spinning reserves and stability. The grid frequency is 50 Hz and maintaining reliability can be challenging when integrating new variable generation like wind – which is why emphasis is placed on grid upgrades and stability measures as wind projects come online.

A Nordic Grid Code and cooperation exist in principle (through the Nordic TSOs' forum), but since Iceland is not interconnected, it mostly sets its own reliability standards.

In 2024, Landsnet received a \$50 million NIB (Nordic Investment Bank) loan to strengthen the grid, including building a 220 kV loop and installing Iceland's first SF6-free "green" substation, using new switchgear technology to cut greenhouse gas use.

Master Plan (Rammaáætlun)

Uniquely, Iceland uses a Master Plan for Nature Protection and Energy Utilisation to evaluate potential power projects. Dozens of proposed hydro and geothermal (and now wind) sites are assessed by experts for their economic feasibility and environmental impact, then categorized as either "utilization" (allowed), "waiting", or "protection" (no development). Parliament approves the Master Plan, giving political weight to decisions on which sites can be developed. As of late 2024, for example, wind projects were new to this process: about 30 wind farm proposals were being evaluated, with 10 in active review and two sites (Vaðalda and Blöndulundur) already approved for development. This process ensures that Iceland's treasured landscapes (waterfalls, geothermal areas, habitats) are considered before energy projects proceed, but it can also slow down the approval of new capacity.

Energy Policy 2050

In late 2020, the government introduced "A Sustainable Energy Future: Energy Policy to 2050" which sets long-term goals: maintain 100% renewables in electricity, decarbonize transport (e.g. by EV adoption and possible e-fuels production), and use renewables to fully replace fossil fuel usage in sectors like fishing and industry by 2050. The policy supports adding new energy sources (wind, solar) and pursuing innovation (such as hydrogen fuels and methane from renewable power). This strategic direction influences regulatory priorities – for instance, encouraging pilot projects in energy storage or mandating infrastructure for EV charging, etc. It also implies that any future interconnection (Icelink cable) would be for exporting surplus renewables or importing in emergencies, and not for integrating fossil energy.

In summary, Iceland's regulatory environment seeks to foster competition in generation and retail while safeguarding public interests (affordable household energy, sustainable natural resource use, and system reliability). The market structure has evolved from a single vertically-integrated utility to a more complex system with multiple players, but the government (state/municipal) still has a strong presence via ownership of major companies. As Iceland now pushes to approve new projects, regulators are adapting – streamlining permitting and ensuring fair grid access – to enable timely investments after a period of hesitation.

Current market conditions (supply, demand & prices)

Iceland's electricity production in 2023 was just under 20 TWh, while consumption was roughly the same, no imports or exports due to the country's isolation from other grids. Over the past decade, demand grew modestly as existing industries optimised usage; however, new projects are now straining the balance. By 2022–2024, spare capacity margins had tightened – essentially, most existing power stations were running near full output to meet contracted demand.

Total installed generation capacity is about 3,100 MW (mostly dispatchable hydro and geothermal), but winter peak demand and maintenance needs leave little excess at times. The Great Recession 2008–2009 and completion of Kárahnjúkar (in 2007) led to a big one-time jump in supply that exceeded demand for a while, but subsequent industrial expansions (e.g. a new aluminum smelter in the East, new data center loads) have since absorbed that surplus.

Renewables Generation Mix

In a typical year, hydropower contributes around 70% of electricity and geothermal around 30%. Small pilot wind turbines have existed since 2013, but wind remains <1% of generation (a few GWh). Virtually every year sees 99,9%+ renewable share; only isolated off-grid areas (like two small islands with diesel generators) and occasional backup at one power plant account for a tiny <0,05% fossil generation. Hydropower output can fluctuate with annual hydrology, but most Icelandic plants are fed by large glaciers and reservoirs that provide multi-month storage, giving a stable supply (Iceland did not suffer the variability issues common with rain-fed hydro systems). Geothermal plants provide steady baseload and combined heat for district heating, with high-capacity factors often above 90%. Unlike many countries, Iceland's electricity demand doesn't peak sharply in summer or winter – large industrial loads run year-round, and nearly all space heating needs are met by geothermal hot water, which means winter cold spells don't spike electrical heating demand as they might elsewhere. Thus, the load curve is relatively flat, making it easier for baseload geothermal and hydro to handle. This will only change marginally if number of electric vehicle grow, but for now industry dominates the load profile.

Rising Demand Segments

The data centre industry has become a notable new consumer in Iceland's energy market. International firms have built data centres in Iceland to exploit the cool climate and cheap renewable power. Orkuspa Íslands Energy Forecast 2025–2050 projects growth potential of up to 5 TWh from data centres over the forecast period.

Commercial greenhouse farming and fish farming operations are similarly scaling up, using electricity and direct geothermal heat to power pumps, lighting, and systems. The forecast also highlights aquaculture as a significant driver of future demand, with land-based fish farming transitioning from general consumers to large industrial users under new contracts in the coming years.

In the baseline scenario, total electricity consumption is projected to reach 25.4 TWh by 2050, while the high scenario – which assumes large-scale domestic e-fuel production and accelerated industrial expansion – points to 37.2 TWh, with annual growth peaking

at 3.7% in the 2030–2040 decade. General consumption, driven by EV adoption, population growth, and increased tourism, is expected to grow at around 2.1% annually through 2030 in both scenarios.

Meanwhile, traditional heavy industry remains at stable high usage. The three aluminium smelters alone use around 12–13 TWh/year combined (each smelter runs at 400–500 MW continuous load). These plants have occasionally reduced load for short periods when power was scarce e.g., during maintenance at a big power station, but generally they depend on uninterrupted supply. In 2024, some voluntary demand response programs were being discussed – for example, data centres that could curtail usage on short notice – but heavy industry contracts typically don't allow interruption except for emergencies.

Capacity Constraints and Projects Delays

A lack of political consensus in the late 2010s meant fewer new power plants were built after 2013. One of the exceptions was the Theistareykir geothermal plant (90 MW) in Northeast Iceland, commissioned in 2017–2018 to supply a new silicon metal factory. Beyond that, developers faced delays: e.g., Hvammsvirkjun (a proposed 95 MW hydro on the lower Þjórsá River) was stuck in licensing and legal disputes over water usage for years. Wind farm proposals were not even processed under the old Master Plan, effectively putting them on hold.

This cautious approach was due to environmental concerns, saving rivers from dams, preserving landscapes from wind turbines, and public debate. By 2021–2022, however, demand kept rising and the lack of new supply started impacting prices and potential investment – companies warned they could not expand in Iceland without more energy.

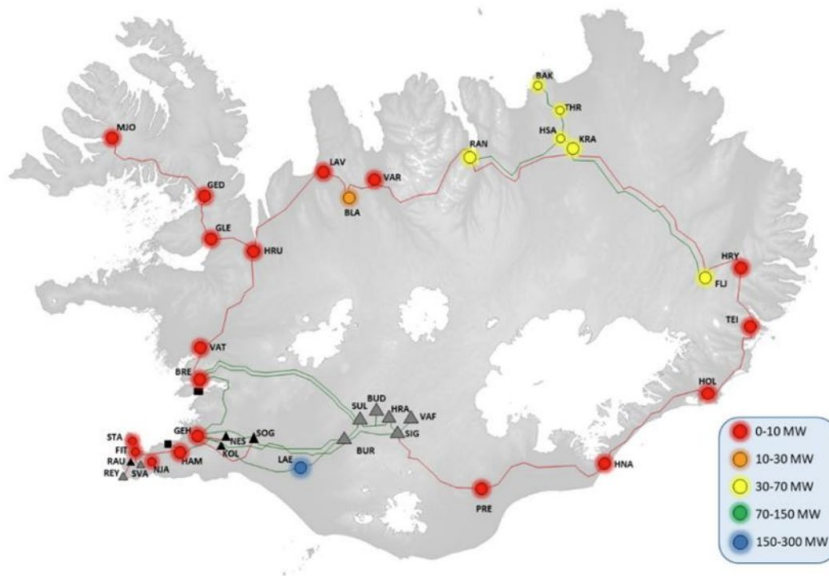
Electricity Prices

Thanks to the renewable resources, Iceland's wholesale generation costs are low, Landsvirkjun's cost of generation is among the lowest in Europe. Long-term contracts with industry are confidential but estimated around \$30–50/MWh range historically. Retail prices for households have been low as well, though taxes and fees add some costs. In 2023–2024, household electricity prices increased, about 13% in 2024, due to tight supply and the end of an era of surplus power. Even after the rise, retail rates were roughly \$0,12 – 0,14 /kWh, still below EU average. The government has been reluctant to intervene directly in pricing; instead, the strategy is to add supply to prevent scarcity pricing. Notably, there is a cross-subsidy in place: households that rely on electric resistive heating (a small minority, since most use geothermal hot water) receive a special lower rate, funded by other consumers, to keep their costs on par with geothermal heating costs.

Reliability

Iceland's grid has high reliability overall but is capacity-limited on some transmission corridors. For instance, moving power from the north and east (where new power stations exist) to the southwest (where demand centres are) is constrained by the current 132 kV lines. Landsnet's ongoing 220 kV upgrades aim to alleviate this bottleneck. Until that is finished, at times the system can't fully deliver all potential power from one region to another, creating a bottled generation situation. This was one factor in pushing forward wind development in the south and adding local generation near consumption centres. Rural reliability is also an issue in the far east and west, long radial lines that are weather-exposed can lead to outages. Landsnet as well as distribution companies have been adding underground cables in some areas for resilience.

As shown in the figure below, Iceland's transmission network faces capacity constraints that limit the transfer of electricity across regions. These bottlenecks reduce the ability to fully utilize available generation, including geothermal power in the north and hydropower in the east.



Environmental & Social Conditions

Public opinion in Iceland strongly favours renewables but is also very sensitive to environmental trade-offs. Large hydro projects have historically sparked controversy (the Kárahnjúkar project in 2002–2006 met with protests due to flooding of wilderness). Today, wind farms are inciting debate: on one hand, wind is carbon-free; on the other, dozens of 100m tall turbines could impact scenic views and bird life, threatening the pristine nature image important to tourism. The government's stance is that wind development is necessary but must be regulated – hence plans to strengthen the legal framework specifically for wind power in 2025. There are also current parliamentary discussions regarding a provision where local communities' benefit, through taxes or ownership shares, from new power projects, to improve public acceptance.

In summary, Iceland's current energy situation can be characterized as highly renewable and historically affordable but entering a period of rapid change. Demand growth is outpacing what the existing fleet can supply without new investment, and after years of inaction, the country is now mobilizing to build additional capacity. Ensuring this happens in time and in harmony with environmental values is the central challenge underpinning the next section on planned investments and future needs.

Planned investments and future needs

After a stillness in development, Iceland is now embarking on a wave of investments to expand its energy capacity. Both public-sector projects, led by Landsvirkjun and other state entities, and private-sector initiatives, from HS Orka and potential foreign investors, are on the table. These investments aim not only to meet the immediate demand growth but also to position the energy sector for long-term sustainability and flexibility e.g. integrating new renewables, improving grid resilience, and enabling new industries like hydrogen.

On the following page is an overview of some of the major planned or in-progress projects and the broader future needs they address:

Project (Type)	Capacity & Output	Status	Developers / Stakeholders
Vaðalda Wind Farm (Onshore Wind)	120 MW (28 turbines) – expected ~0.35 TWh/year output (capacity factor ~33%). Will become Iceland's first utility-scale wind farm, providing a new intermittent energy source.	Under Construction (started late 2024, with full commissioning expected by end of 2027). All key permits granted (the first-ever wind site approved by Parliament). Enercon turbines ordered, civil works ongoing.	Landsvirkjun Technical partner: AFRY providing design and owner's engineering.
Hvammsvirkjun (Hydropower)	~95 MW run-of-river hydro on lower Þjórsá River. Estimated annual generation ~0.7–0.8 TWh. Will include a dam and reservoir but designed to minimize environmental footprint.	Permitting / Early Execution: Environmental impact assessment approved. A provisional license (Aug 2025) allows preparatory works, while full construction permits expected soon. Some project components have already been tendered by Landsvirkjun.	Landsvirkjun Project in planning for over a decade; now moving forward after legal changes to water utilization rules. COWI will provide engineering design
Blöndulundur Wind Farm (Onshore Wind)	Blöndulundur – proposed wind farm in North Iceland. Exact capacity TBD (~100 MW range). Would leverage existing Blöndu hydro infrastructure for grid connection.	Utilization Category: Along with Vaðalda, this site was approved by Parliament for wind development. Still in early design, with no current construction, likely operational post-2027 if pursued.	Landsvirkjun (expected developer, as it owns the land near its Blöndustöð hydro plant). Awaiting corporate go-ahead.
Foreign-Led Wind Projects (Onshore Wind)	Proposals in West and South Iceland by independent developers. Sizes range 50 MW to 200+ MW. Cumulative over 1,000 MW of wind is in early proposal stages across ~30 projects.	Under Review: These projects are being evaluated under the Master Plan and by local municipalities. None built yet; earliest could start by late 2020s if classified for utilization and if grid capacity allows.	IPPs: Multiple independent and foreign-backed developers. Government is formulating rules for foreign investment in generation.

Sigalda Expansion (Hydropower)	A 65 MW expansion by adding a new unit to the existing 150 MW plant to increase capacity and flexibility.	Construction will start summer 2026: Scheduled for completion by the end of 2027 with operations starting in 2028.	Landsvirkjun COWI is responsible for the design, integration, and coordination of the project
Holtavirkjun (Hydropower)	Estimated capacity of the power plant is 57 MW with production of 415 GWh/yr	Utilization Category: Approved by the government in February 2026 to enter the utilization category. Will be constructed in the next 5 years.	Landsvirkjun Project in discussion for over a decade
Skrokkölduvirkjun Project (Hydropower)	Capacity of 30 MW and production of 215 GWh/yr	Utilization Category: Like Holtavirkjun it was approved by the government in February 2026 to enter the utilization category, and will be constructed in the next 5 years.	Landsvirkjun Project has also been in review for over a decade
Hvalárvirkjun Hydropower Project (Hydropower)	A 55 MW project designed to strengthen the power system in the Westfjords and result in energy production of around 320 GWh per year.	Utilization Category: Was awarded Gold certification under the Hydropower Sustainability Standards (HSS) in January 2026.	HS Orka The project is owned and run by VesturVerk, a subsidiary of HS Orka.
Future Hydropower Projects (Hydropower)	Planned further hydropower plant projects in the Westfjords. Skúfnavatnavirkjun (16 MW) and Hvanneyradalsvirkjun (13.5 MW), both located in the area called Ísafjarðardjúp.	Under Review: Both projects are under review in the fifth phase of the framework plan for the protection and utilization of land.	HS Orka: VesturVerk wants to continue investing in Hydropower
Hellisheiði Expansion (Geothermal)	Increase in thermal production capacity from 220 MWth to 345 MWth, as well as the drilling of a new production well that is expected to deliver a net electric output of 5MWe. A plan to build a new maintenance and storage facility exists.	Under Construction, expected to finish late 2026: Orkuveitan (Reykjavík Energy) and Nordic Investment Bank signed a 10-year loan agreement for EUR 32 million in April 2026.	Orkuveitan Owned and operated by ON Power, a subsidiary of Orkuveitan (Reykjavík Energy).
Krýsuvík (Geothermal)	50 Mwe Installed Power, 420 GWh Annual Production 100 MWth Hot water production	Research Phase: In the Master Plan, Krýsuvík is divided into four geothermal areas: Sveifluháls, Austurengjar and Sandfell, which are in the utilisation category, and Trölladyngja, which is in the pending category. If research yields the desired results, the aim is for a geothermal plant to be built at Sveifluháls.	HS Orka Since 2020, HS Orka has been systematically preparing for further research drilling in the Krýsuvík area.

The above projects collectively indicate a major diversification of Iceland's generation portfolio. The entry of wind power is particularly noteworthy – by 2027, wind could contribute a few percent of Iceland's electricity and grow thereafter, marking the first new energy source in decades.

For context, Landsvirkjun expects wind to become the “third pillar” of Iceland's power mix alongside hydro and geothermal. Wind farms can be built faster than large dams or geothermal plants, which require extensive drilling, so they offer a quicker route to add capacity once permitted. However, their intermittent nature means grid integration and possibly storage solutions or flexible backup will be a new challenge.

Transmission and Grid Investments

In parallel, Landsnet's grid expansion plan, through 2026 is crucial. Key elements include constructing a 220 kV “ring” backbone that loops the island, upgrading the Westfjords connection, and adding transformer capacity in the Reykjavík area to handle new power inputs from the south and highlands. Once complete, the transmission upgrade will raise transfer capacity between north/east and south by roughly 50% (security limits increasing from ~130 MW to 210–250 MW). This enables full use of power from new plants and provides reliability and redundancy if one line fails. Another need is to extend the grid to potential new industrial sites for example, if a data centre park is built in a currently remote area, lines and substations must be added. The Nordic Investment Bank loan in 2024 is helping fund these expansions. Landsnet is also deploying modern grid tech e.g., the first SF6-free substation, using an eco-friendly insulating gas to reduce greenhouse emissions.

Long-Term Vision

By 2030, if planned investments materialize, Iceland could have on the order of 2.5–3 TWh/year more generation than today, roughly adding 12–15%. This should comfortably meet domestic needs and allow some headroom. Looking further to 2040–2050, Iceland's abundant remaining renewable potential, especially wind and hydro, means it could almost double its generation if needed while still staying green.

The balance between preserving Iceland's unique nature and leveraging its energy riches will continue to shape policy. The trend suggests a carefully measured development: smaller-scale, ecologically mindful projects e.g., moderate-size wind farms, adding capacity at existing hydro sites, expanding geothermal in already utilized fields are favoured over mega-projects that inundate new wilderness. This approach aligns with the sustainability ethos, and it is an area where international best practices and technologies – such as those proven in Sweden and other Nordic countries – will be extremely valuable.

Outlook: Opportunities for Swedish competence and collaboration

Iceland's push to upgrade and expand its energy sector creates numerous opportunities for collaboration with Swedish companies and expertise. Sweden, with a highly developed power industry, has deep competence in exactly the areas Iceland is focusing on: high-voltage transmission systems, smart grid technologies, wind power development, hydropower engineering, and even geothermal innovation.

Power Transmission & Grid Modernization

Sweden has long-standing expertise in electrical grid infrastructure, from building robust national grids across challenging terrains to pioneering HVDC technology for long-distance links. Swedish firms also offer the latest in grid components (transformers, switchgear, protection systems) and techniques for hardening grids against harsh weather, suitable for Iceland's conditions. Notably, Sweden is at the forefront of adopting SF6-free substations and green grid tech for sustainability, which aligns with Landsnet's goals. Collaboration could range from contracting Swedish EPC (Engineering, Procurement, Construction) services for new substation builds to using Swedish-made monitoring and automation systems to implement Iceland's smart grid.

Smart Power Grid Systems

To manage an increasingly complex energy system, Iceland will benefit from smart grid solutions – an area where Swedish experience is rich. Sweden was one of the first countries in Europe to achieve a near 100% rollout of smart electricity meters to all customers (completed by 2009), and since then has implemented advanced metering data management and demand response programs. Swedish tech companies and utilities like Vattenfall and E.ON have developed sophisticated IT platforms for grid management, enabling real-time monitoring, outage management, and even automated demand-side management. Load balancing software and forecasting tools used in Sweden's smart grids can be adapted for Iceland's scenario of integrating wind and managing industrial loads. By leveraging Swedish know-how in automation and digitization of energy, Iceland can accelerate the modernization of its grid operations, improving reliability and efficiency.

Wind Power Development and Integration

Sweden has undergone a wind power boom in the last decade, reaching 16,4 GW of wind capacity by 2023 (producing ~21% of its electricity). Swedish developers, have extensive experience in permitting, constructing, and operating wind farms in Nordic conditions – experience that is directly applicable to Iceland's emerging wind sector. Additionally, Swedish expertise in cold climate wind operations, managing icing on blades etc., will be invaluable for Iceland's high-latitude, often icy, wind sites. From a grid integration standpoint, Sweden's experience handling rapid wind growth – including improving forecasting and using hydropower as a balancing resource – mirrors what Iceland will do on policy, Sweden's frameworks for community compensation and environmental assessment for wind farms could serve as models for Iceland to ensure local acceptance.

Hydropower Engineering and Upgrades

Sweden built out significant hydropower in the 20th century, and Swedish engineering firms have global expertise in dams, tunnels, turbine technology, and hydro optimization. While Iceland's hydro resources are already well-developed, upcoming projects like Hvammsvirkjun and potential smaller plants can benefit from state-of-the-art design to minimize environmental impact and maximize efficiency. Moreover, many of Iceland's existing hydro turbines and generators were sourced from international suppliers – going forward, Swedish manufacturers or contractors could be involved in refurbishment or capacity upgrades. In addition, Sweden's operational practice of flexible hydropower provides a knowledge base for Landsvirkjun to operate its hydro plants more dynamically.

Geothermal Technology and Innovation

Unlike hydro and wind, geothermal is not a resource Sweden uses for electricity. Nevertheless, Sweden is a global leader in geothermal heat pump technology and has innovative companies working on low-temperature power generation. One prominent example is Climeon, a Swedish company that created compact Organic Rankine Cycle units to generate electricity from low-temperature geothermal water.

Going forward, there may be more such opportunities, for instance in geothermal well efficiency Swedish engineers, provide world leading drilling equipment that can be used in Iceland's geothermal field development.

Additionally, Swedish investment could play a role, for example, Baseload Capital, a Swedish investment firm, has backed geothermal projects in Iceland.

Energy Efficiency and Demand Management

Swedish competence is not only in supply but also in energy efficiency and conservation programs, which will be useful as Iceland looks to ensure its existing capacity is used optimally. A recent collaborative analysis with Landsvirkjun identified substantial potential in improving electricity efficiency in Iceland. Sweden's experience in running national efficiency campaigns, conducting energy audits in industries, and implementing smart building management could help Iceland capture these "low-hanging fruits" while bigger projects come online. For example, Swedish companies specializing in industrial energy optimization might work with Icelandic smelters to reduce peak loads or recover waste heat for reuse.

To conclude, Iceland's current trajectory in the energy sector is very positive, but the execution of its plans will require technical ability and innovation. Swedish competence complements these needs well, from building the grid that will carry Iceland's future power, to ensuring that power is produced and used in the smartest possible way. Consequently, there is many avenues for Swedish companies to explore and partner with Icelandic counterparts.

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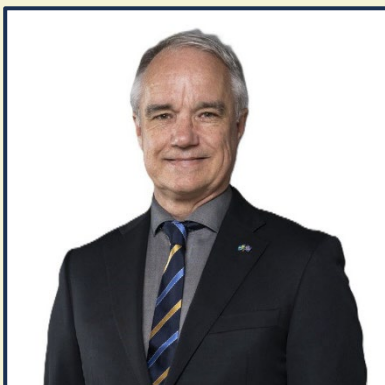
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