

Comprehensive Market Analysis for BESS Startup Entry into Iceland

Strategic Insights for Public-Private Partnership (PPP) Focused Ventures

Prepared for: Mechanical Engineer & Business Development Specialist Founders

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Executive Summary

This report provides a comprehensive market analysis for a new Battery Energy Storage System (BESS) startup focused on Public-Private Partnership (PPP) models for entry into the Icelandic market. Iceland presents a unique and compelling, albeit nascent, market for energy storage solutions. Despite generating nearly 100% of its electricity from stable renewable sources—primarily geothermal and hydropower—the nation faces a confluence of factors that create a strong business case for BESS deployment. These drivers include ambitious national climate goals aiming for carbon neutrality by 2040, the critical need to modernize and enhance the resilience of its isolated national grid, the rapid expansion of energy-intensive industries, and a strategic push to decarbonize the transport sector through electrification and green hydrogen production.

The regulatory environment, while not yet featuring a dedicated, standalone BESS policy, is evolving rapidly and is fundamentally supportive of the technologies required for the green transition. National strategies such as the 2024 Climate Action Plan, the 'Sustainable Development until 2030' strategy, and the 2024 Hydrogen and E-fuels Roadmap collectively create a powerful policy tailwind for energy storage. The framework for PPPs in infrastructure is well-established, offering a viable and strategic pathway for a new entrant to collaborate with key public stakeholders.

The competitive landscape is dominated by state-owned entities, namely Landsvirkjun, the national power company, and Landsnet, the transmission system operator (TSO). These entities are not barriers but rather essential potential partners for a PPP-focused startup. Landsnet's extensive grid modernization plan, detailed in its annual System Plan, reveals specific needs for grid stability, congestion management, and ancillary services that BESS are uniquely positioned to provide. Landsvirkjun's ventures into carbon capture, hydrogen, and international BESS projects signal a strategic interest in advanced energy technologies.

Specific market opportunities are identifiable and actionable. These include providing grid-scale ancillary services in partnership with Landsnet, co-locating BESS with new and existing renewable generation assets, developing behind-the-meter solutions for energy-intensive industries such as land-based fish farming and data centers, and providing critical grid support for the burgeoning EV charging and green hydrogen production infrastructure. A 6.5MW pilot project, with an estimated cost between \$3.71 million and \$4.88 million USD, represents a feasible entry point to demonstrate value and build credibility.

For a startup founded by a mechanical engineer and a business development specialist, success will hinge on leveraging technical expertise to deliver robust and reliable systems while forging strong strategic partnerships with public and private entities. A phased market entry, beginning with a targeted PPP pilot project and expanding into diversified applications, is the recommended approach. By aligning with Iceland's national energy objectives and addressing tangible grid and industrial needs, a

well-positioned BESS startup can establish a strong foothold and play a pivotal role in the next phase of Iceland's remarkable energy journey.

Introduction and Research Objective

Iceland stands as a global paragon of renewable energy utilization, having successfully harnessed its immense geothermal and hydroelectric resources to power its society. This achievement, however, marks not an end but a new beginning in its energy evolution. As the nation confronts the challenges of climate change, industrial growth, and the complexities of maintaining a modern, isolated power grid, the need for advanced energy management solutions has become increasingly apparent. Battery Energy Storage Systems (BESS) are emerging as a critical enabling technology, capable of providing the flexibility, reliability, and stability required to secure Iceland's sustainable energy future.

This report is prepared for the founders of a new BESS startup—a mechanical engineer with deep technical expertise in energy systems and a business development specialist with a focus on commercial and strategic growth. The primary objective of this analysis is to provide a comprehensive and actionable assessment of the Icelandic market for BESS, with a specific focus on identifying opportunities for ventures structured as Public-Private Partnerships (PPPs). The analysis delves into the specific market drivers, the intricate regulatory and policy environment, the competitive landscape dominated by key public entities, and the strategic positioning required for a successful market entry. By synthesizing detailed data on Iceland's energy strategy, grid infrastructure plans, and economic development trends, this document aims to equip the founders with the critical insights needed to navigate this unique market and build a thriving energy storage business.

Iceland's Energy Landscape and Transition Strategy

The Renewable Energy Powerhouse

Iceland's energy system is a testament to its unique geological and geographical characteristics. Situated on the Mid-Atlantic Ridge, the nation possesses vast geothermal resources, which, combined with its glacier-fed rivers ideal for hydropower, have enabled it to achieve a renewable energy profile that is unparalleled globally. Nearly 100% of Iceland's electricity is generated from these renewable sources, with hydropower contributing approximately 73% and geothermal power accounting for the remaining 27%. This has positioned Iceland as the world's largest green energy producer per capita. The primary state-owned entity, Landsvirkjun, the National Power Company of Iceland, operates a majority of the nation's power plants and is the principal electricity supplier. This foundation of clean, baseload power has historically provided a stable and low-cost energy supply, attracting significant energy-intensive industries and fostering a high standard of living.

The Imperative for Energy Storage

The very stability and abundance of Iceland's renewable baseload power raises a critical question: why is there a growing need for BESS? The answer lies in the evolving complexities and future ambitions of the Icelandic energy system. Firstly, the national grid, operated by Landsnet, is entirely self-sufficient and isolated, with no interconnections to other countries. This isolation makes grid stability and resilience paramount. Recent volcanic activity has tested the energy infrastructure, highlighting the need for robust backup power and rapid response capabilities to prevent outages, particularly in remote regions. BESS can provide near-instantaneous frequency and voltage support, enhancing overall grid resilience.

Secondly, while Iceland's energy mix is dominated by stable sources, the country is beginning to integrate more variable renewables, such as wind power, to diversify its portfolio. The connection of the

Búrfellslundur wind farm to the grid marks a significant step in this direction. BESS are essential for smoothing the intermittent output of wind generation, ensuring that this new capacity can be integrated seamlessly without destabilizing the grid.

Thirdly, Iceland's national strategy involves a profound energy transition in its transport and industrial sectors. The aggressive promotion of electric vehicles (EVs) and the development of a green hydrogen economy to decarbonize shipping and heavy transport will create significant new loads on the electricity grid. The high-power demand from fast-charging EV stations and energy-intensive electrolyzers for hydrogen production requires localized grid support that BESS can efficiently provide. Furthermore, the expansion of energy-intensive industries like land-based fish farming and data centers necessitates enhanced power quality and reliability, creating a strong business case for behind-the-meter BESS applications. Finally, BESS can help manage grid congestion in an increasingly strained transmission network, potentially deferring or optimizing the need for costly and time-consuming infrastructure upgrades, and can be used to store the country's estimated 10% annual energy surplus for later use.

National Energy and Climate Strategy to 2030/2040

Iceland's strategic direction is firmly anchored in ambitious climate and energy targets. The government has committed to achieving carbon neutrality before 2040 and reducing greenhouse gas emissions by 55% by 2030 compared to 2005 levels. These goals are operationalized through a series of comprehensive national plans. The updated 2024 Climate Action Plan outlines 150 specific actions across all sectors of the economy to meet these targets. Complementing this is the 'Sustainable Development until 2030' strategy, released in July 2024, which positions Iceland as an international leader in geothermal energy, renewables, and Carbon Capture, Utilization, and Storage (CCUS). This strategy explicitly emphasizes the "efficient use of multiple energy sources" and "energy efficiency," creating a direct policy link to the grid management and optimization services that BESS provide. These high-level national commitments translate into a powerful mandate for deploying technologies that enhance the efficiency and flexibility of the country's 100% renewable grid, making BESS a critical component of the national strategy.

The Hydrogen and E-fuels Roadmap (2024)

Published in early 2024, the "Hydrogen and E-fuels Roadmap for Iceland" provides a detailed blueprint for decarbonizing the nation's most challenging sectors: heavy-duty road transport, maritime applications, and aviation. The roadmap outlines a vision for leveraging Iceland's abundant renewable electricity to produce green hydrogen and derivative e-fuels like e-methanol and e-ammonia. While the focus is on the fuel itself, the implications for the electricity grid are profound. The roadmap estimates that meeting domestic decarbonization goals by 2030 could require an additional 3.2 TWh of electricity, equivalent to approximately 17% of Iceland's current annual power generation. This massive increase in demand, driven by energy-intensive electrolysis processes, will place immense strain on the grid. BESS are perfectly suited to support this transition by providing essential grid stabilization services to areas with large-scale electrolyzer facilities, managing the high and variable loads, and ensuring that the expansion of the hydrogen economy does not compromise the reliability of the national power supply. This makes BESS an indispensable enabling technology for one of Iceland's core energy transition pillars.

Regulatory and Policy Environment

Governing Bodies and Frameworks

The regulatory landscape for energy in Iceland is overseen by a well-defined set of public institutions. The highest authority is the Ministry of the Environment, Energy and Climate, which sets overarching

policy and strategy for the nation's energy and climate action. Executing and enforcing these policies is the National Energy Authority (Orkustofnun), which is responsible for the laws and regulations pertaining to the energy sector, including the critical task of reviewing and approving the grid development plans submitted by the TSO. Providing independent, expert advice to the government is the Icelandic Climate Council (Loftslagsráð). In 2024, this council was reappointed under a new regulation (no. 334/2024), which mandates that its members possess expertise in key areas including energy issues, innovation, and technological development. The council's explicit mandate to advise on "Energy issues in the context of energy exchange and carbon neutrality" directly implicates the strategic importance of energy storage in achieving national goals. Together, these bodies form a coherent institutional framework that, while not yet focused explicitly on BESS, is deeply engaged with the core drivers for its deployment: grid stability, renewable integration, and decarbonization.

Energy Storage Regulation

As of 2024, Iceland does not have a single, comprehensive piece of legislation specifically titled "Energy Storage Regulation." The regulatory environment for BESS is instead shaped by a mosaic of broader energy policies, grid codes, and climate action plans. This lack of a dedicated framework is not indicative of a lack of interest, but rather reflects the nascent stage of the market. Evidence suggests that this is a rapidly evolving area. One source refers to the development of Iceland's "latest energy storage policy saga," which is anticipated to become active in 2025. This strongly indicates that specific policies and regulations for battery storage are currently under active development within the government and regulatory bodies. For a new market entrant, this presents both a challenge and an opportunity. The challenge lies in navigating a landscape without explicit rules of the road, while the opportunity lies in the potential to engage with policymakers and help shape a favorable and efficient regulatory framework for BESS as it is being formulated.

Public-Private Partnership (PPP) Policy

The strategic model for a new BESS startup to enter the Icelandic market is heavily influenced by the nation's approach to infrastructure development. While there is no specific policy document for PPPs in the energy sector, the PPP model is a common and accepted mechanism for delivering large-scale infrastructure projects across various sectors in Iceland, including transport and energy. The infrastructure market relies heavily on a combination of government spending and PPP initiatives to address development needs. This established practice provides a clear and viable pathway for a private BESS company to collaborate with public entities like Landsnet or Landsvirkjun. However, the general challenges associated with Icelandic infrastructure projects, such as long project development timelines, complex administrative procedures, and financing constraints, would also apply to PPPs in the energy storage sector. Success in this model requires a deep understanding of these challenges and the ability to structure partnerships that are financially robust and aligned with the long-term objectives of public stakeholders. The presence of legal and advisory expertise on PPPs within Iceland confirms that the necessary ecosystem to support such ventures exists.

Incentives and Market Signals

The market signals for grid-scale energy storage in Iceland are nuanced. A key finding is that the country's historically low electricity prices, a direct result of its abundant hydro and geothermal resources, have meant that direct government incentives for new energy solutions, including large-scale BESS, have been limited. The economic case has not been as immediately compelling as in markets with high energy costs and a heavy reliance on fossil fuels. However, this is changing as the costs of BESS technology decline globally and the value of grid services becomes more apparent.

In stark contrast, the Icelandic government has provided significant and sustained incentives for the adoption of electric vehicles. These incentives, including purchase subsidies and tax benefits, have

made Iceland a world leader in EV market share. This policy is highly relevant to the BESS market, as it has fostered widespread public and commercial adoption of battery technology and created a massive, distributed fleet of energy storage on wheels. While not a direct incentive for stationary storage, it demonstrates a clear government commitment to battery technology as a cornerstone of its decarbonization strategy. The recent shift in 2024 to a kilometer-based road tax for EVs further indicates a sophisticated and evolving approach to managing the energy transition in transport. For a BESS startup, this signals a technologically progressive environment and opens future possibilities for vehicle-to-grid (V2G) integration.

Grid Infrastructure and Competitive Landscape

Landsnet's Grid Modernization Plan

The roadmap for Iceland's grid evolution is meticulously detailed in the annual "System Plan" (Kerfisáætlun) published by Landsnet, the national TSO. This document, which is legally required and subject to approval by the National Energy Authority (Orkustofnun), serves as the definitive guide to the future of the country's transmission infrastructure. It is a comprehensive strategy that outlines both a ten-year long-term vision and a detailed three-year implementation plan for investments. The core objectives driving this modernization are to enhance security of supply, improve the utilization of existing power resources across different regions, accommodate rising electricity demand from industry and electrification, and facilitate the connection of new renewable power plants, including Iceland's first utility-scale wind farms. This plan is the primary document that a BESS startup must analyze to identify specific grid needs and align its value proposition with the TSO's strategic priorities.

Key Grid Reinforcement Projects

Landsnet's System Plan details a portfolio of major capital projects designed to create a more robust, flexible, and high-capacity grid. A cornerstone of this effort is the construction of a new 220 kV ring network around Iceland, designed to increase transmission capacity to approximately 600 MW between key regions and significantly improve system stability. Other critical projects include the development of a new South-North-Connection (SNC) transmission line over Sprengisandur to better link the country's main generation and load centers, and the strengthening of lines in the north and east to create a more integrated national system. The plan also includes numerous substation upgrades and the construction of new ones, such as the Hryggstekk and Laugarbakki substations, which are targeted to support industrial loads and EV charging infrastructure, respectively. Notably, the investment program includes Iceland's first SF6-free green gas substation, demonstrating a commitment to environmentally advanced technologies. These specific projects create tangible opportunities for BESS deployment to address issues like grid congestion during construction, provide voltage support at new substations, and enhance the stability of the newly reinforced corridors.

The Competitive Landscape

The Icelandic energy market is characterized by the central role of state-owned enterprises, which function as the primary potential partners and clients for a PPP-focused BESS startup. Landsvirkjun, the National Power Company, generates the vast majority of the country's electricity. Its strategic initiatives, which include advanced carbon capture and storage (CCS) projects like Koldís, partnerships on green hydrogen production with international firms like Linde, and even participation in an international BESS project in Canada, demonstrate a forward-looking approach and an openness to new energy technologies. Landsnet, as the TSO, is the ultimate operator of the grid and the key offtaker for ancillary services. Its detailed System Plan is an open invitation for solutions that can help it achieve its modernization goals more efficiently and cost-effectively.

Given this structure, a direct competitive approach against these incumbents is unviable. The most strategic path to market entry is through collaboration and partnership. A BESS startup can position itself as a specialized technology and solutions provider, offering services that complement the core operations of these public giants. The market is also open to international collaboration, as evidenced by the involvement of firms like Siemens Energy in power plant modernization and the financing of grid projects by the Nordic Investment Bank (NIB) and the European Investment Bank (EIB). This indicates that a well-structured venture with a strong technical and financial case can successfully integrate into this established ecosystem.

Market Opportunities for a BESS Startup

Grid-Scale Ancillary Services (PPP with Landsnet)

The most direct and significant opportunity for a PPP-focused BESS startup lies in providing ancillary services to Landsnet. The TSO's core mandate is to maintain the stability and reliability of the isolated Icelandic grid, a task that is becoming more complex with rising demand and the integration of variable renewables. BESS can offer a suite of high-value services with near-instantaneous response times. These include frequency regulation to manage deviations from the standard grid frequency, voltage support to maintain power quality across long transmission lines, and congestion relief at known bottlenecks in the transmission system, which can defer the need for expensive line upgrades. Furthermore, BESS can provide black start capability, a critical service that allows for the rapid restoration of the power system following a major outage. A startup could propose a PPP model where it builds, owns, and operates a BESS facility under a long-term contract with Landsnet to provide these specific services, directly addressing the objectives outlined in the TSO's System Plan.

Co-location with Renewable Generation (PPP with Landsvirkjun/ Others)

Another prime opportunity involves partnering with power generation companies, chief among them Landsvirkjun, to co-locate BESS at generation sites. As Iceland develops its first utility-scale wind farms, such as the 120 MW Búrfellslundur project, BESS will be essential for firming the variable output, ensuring the power delivered to the grid is stable and predictable. This allows the wind farm to provide reliable capacity and better participate in energy markets. Similar opportunities exist at geothermal and hydropower plants, where BESS can help optimize plant output, provide rapid response to grid signals, and capture excess generation that might otherwise be curtailed. A PPP could be structured with Landsvirkjun or other independent power producers to develop these hybrid power plants, enhancing the value and dispatchability of their renewable assets.

Commercial & Industrial (C&I) Behind-the-Meter Solutions

Iceland's economic strategy includes the expansion of energy-intensive industries that leverage the country's low-cost renewable power. Sectors such as land-based fish farming, which is noted as a significant growth area, and the established aluminum smelting and data center industries, have stringent requirements for power quality and reliability. Any interruption or voltage sag can lead to significant financial losses. This creates a strong market for behind-the-meter BESS solutions. A startup can offer these C&I customers enhanced power quality, uninterruptible power supply (UPS) functionality for critical processes, and peak shaving capabilities to manage demand charges and reduce overall electricity costs. These projects could be pursued through direct business-to-business contracts or through PPPs with municipalities that operate industrial parks, providing a shared BESS resource for multiple tenants.

Supporting the EV and Hydrogen Transition

The national strategies for decarbonizing transport create a substantial, technology-driven market for BESS. The “Hydrogen and E-fuels Roadmap” forecasts a massive increase in electricity demand for green hydrogen production. Large-scale electrolyzers represent a new type of heavy, variable load that will require significant grid support to operate without causing instability. Strategically located BESS can provide this support, ensuring the smooth operation of hydrogen production hubs. Similarly, the rapid growth of EVs necessitates a robust fast-charging infrastructure. High-power charging stations can place extreme, short-duration stress on local distribution grids. BESS can be co-located with these charging hubs to manage the load, reduce the need for costly grid upgrades, and provide a buffer of stored energy to serve multiple vehicles simultaneously. A startup can partner with energy companies, fuel retailers, or municipalities to develop these BESS-enabled infrastructure projects.

Remote and Resilient Power Systems

Iceland’s geography includes many remote communities and critical infrastructure sites that are served by long, radial transmission lines, making them vulnerable to power outages, especially during severe weather. The World Energy Council report specifically highlights the need to improve the reliability of the distribution network in these remote areas. BESS can be deployed to create localized microgrids, providing a high degree of energy resilience and independence. In the event of an outage on the main transmission line, a BESS unit can power a local community or critical facility for a period of time. This application is particularly relevant given the acknowledged risk of disruption from volcanic activity. A BESS startup could partner with local municipalities or distribution system operators to develop these resilience-focused projects, offering a clear social and economic benefit by ensuring continuity of power for Iceland’s more isolated populations.

Strategic Positioning and Recommendations

Recommended Business Model: The PPP Focus

For a new entrant into the Icelandic energy market, the most strategic and viable business model is one centered on Public-Private Partnerships. The market’s structure, with dominant state-owned entities like Landsnet and Landsvirkjun controlling transmission and generation, makes direct competition impractical. A PPP approach transforms these incumbents from competitors into essential partners and clients. This model allows a specialized startup to bring its technical expertise, agility, and access to global BESS technology and supply chains to the table, while the public partner provides market access, long-term offtake agreements, and integration with national infrastructure planning. The startup should position itself as a dedicated energy storage solutions provider, capable of delivering turnkey projects that help public entities meet their strategic objectives, whether it be grid modernization for Landsnet or renewable energy optimization for Landsvirkjun. This collaborative positioning is key to de-risking market entry and building a sustainable business.

Phased Market Entry Strategy

A disciplined, phased approach is recommended to manage risk and build a strong foundation for growth. The initial phase should focus on securing and successfully delivering a pilot project. The 6.5MW project size identified by the founders, with an estimated cost of \$3.71M to \$4.88M, is an ideal scale for such a pilot. This first project should target a well-defined, high-value need identified within Landsnet’s System Plan, such as providing ancillary services or alleviating a specific transmission bottleneck. Successful execution of this pilot will be critical for establishing technical credibility and demonstrating the value of BESS to Icelandic stakeholders.

Following a successful pilot, the second phase should focus on growth and replication. The startup can leverage its proven track record to pursue larger grid-scale PPP projects with Landsnet and expand its offerings to include co-location projects with power generators. This phase should also see the initial exploration of the Commercial & Industrial (C&I) market, targeting energy-intensive customers with tailored behind-the-meter solutions.

The third phase should focus on diversification into emerging, high-growth areas. As the national strategies for transport decarbonization mature, the startup can pursue opportunities in supporting green hydrogen production hubs and deploying BESS for large-scale EV fast-charging infrastructure. This phase could also involve more advanced applications like participating in the development of microgrids for remote communities or exploring the potential of Vehicle-to-Grid (V2G) services, building on the country's high EV penetration.

Key Success Factors

Several critical factors will determine the success of the venture. For the mechanical engineer founder, technical excellence is paramount. This involves designing and delivering BESS solutions that are robust, highly reliable, and optimized for Iceland's unique operating environment, including its climate and specific grid code requirements. The implementation of sophisticated, AI-driven energy management systems will be a key differentiator.

For the business development specialist founder, the core task is forging strategic partnerships. Building strong, trust-based relationships with key decision-makers at Landsnet, Landsvirkjun, the relevant government ministries, and major industrial players will be essential. This requires a deep understanding of their needs and the ability to articulate a compelling value proposition within the PPP framework.

Both founders must remain agile and proactive in navigating the evolving regulatory landscape. Staying informed about the development of the anticipated 2025 energy storage policy and engaging constructively with regulators will be crucial. Finally, strong financial acumen is required. The initial project cost analysis provides a solid baseline, but developing detailed financial models to secure project financing will be critical. The active presence of international financial institutions like the NIB and EIB in funding Icelandic energy infrastructure presents a clear opportunity for securing the necessary capital for well-structured projects.

Conclusion

The Icelandic market for Battery Energy Storage Systems, while in its early stages, presents a significant and strategic opportunity for a well-prepared startup. The nation's unwavering commitment to a 100% renewable energy future is now evolving to address the second-order challenges of grid modernization, industrial expansion, and the complete decarbonization of its economy. This evolution creates a clear and compelling need for the flexibility, stability, and advanced services that BESS provide. The confluence of ambitious national climate targets, a comprehensive grid modernization roadmap led by Landsnet, and the growth of new energy-intensive sectors creates a powerful set of market drivers.

For a new venture founded on both technical engineering and strategic business development expertise, the path forward is clear. A focused strategy centered on Public-Private Partnerships, which leverages the strengths of a nimble private company in collaboration with established public entities, is the most effective model for market entry. By beginning with a targeted pilot project to demonstrate value and building a reputation for excellence, the startup can progressively expand into a diversified portfolio of grid-scale, industrial, and infrastructure-enabling applications. While the regulatory framework is

still developing, the overarching policy direction is unequivocally supportive. By aligning with Iceland's national vision and delivering tangible solutions to its emerging energy challenges, a PPP-focused BESS startup is well-positioned to not only achieve commercial success but also to become an integral part of the next chapter in Iceland's pioneering energy story.

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