UNLOCKING CARBON NEUTRALITY:

10 PROVEN STRATEGIES FOR UTILITIES TO INTEGRATE EVS AND FLEXIBILITY

true

a Landis+Gyr company

SUMMARY

The North Atlantic might not be your first option when searching for the future of energy. However, it would be a good choice. So good, in fact, that it was recently visited by EU Commission President Ursula von der Leyen on an energy fact finding mission.

During her visit, she witnessed how the rugged and remote Faroe Islands are turning roaring seas, powerful winds—and even the occasional ray of sunshine—into the energy that is propelling them toward carbon neutrality.

These efforts, driven by Sev in partnership with True Energy and Landis+Gyr, are transforming how energy is produced, managed, and consumed. Advanced EV smart charging, distributed energy resources (DERs), and real-time energy management are being deployed, with promising results for grids worldwide.

What the Faroe Islands have achieved:

- The total amount of renewable generation in 2021 was 161 GWh and in 2023 it was 230 GWh, equalling an increase of 42%.
- Record wind energy production in 2023, generating 126 GWh.
- 99.998% reliability with growing renewable energy share.
- Innovative grid-scale battery storage and tidal energy projects.
- Advanced EV smart charging that supports renewable energy and the grid.

Key Lessons for energy companies:

- Maximise energy flexibility: EV advanced smart charging and grid-scale storage support grid stability and renewable energy.
- Real-time data management: Advanced monitoring systems allow for more dynamic management of energy demand and supply.
- Vary energy resources: Complimentary energy sources and a distributed approach help create decentralised, resilient energy systems.
- Promote grid resilience: Grids require robust solutions and a holistic approach to handle fluctuations and varying demands.
- Collaboration is key: Partnerships between utilities and technology providers accelerate smart energy technology deployment.

CONTENT

INTRODUCTION

Discover practical lessons for energy companies, including utilities and grid operators, on optimising existing assets, boosting revenues, and achieving carbon neutrality.

This eBook delves into the Faroe Islands' ambitious journey toward carbon-neutral energy production. Key partnerships - like the one between True Energy, part of Landis+Gyr, and local utility Sev - are central to reaching these goals. Together, we are harnessing the power of energy flexibility and grid resilience in a "living laboratory" for the future of energy.

These projects have provided invaluable insights into advanced smart charging of electric vehicles (EVs), energy flexibility, grid resilience, distributed energy resources (DERs), and more.

Explore the carbon-neutral journey so far and the practical solutions that energy companies can apply to turn challenges into opportunities for growth and sustainability.

We hope the journey described in this eBook inspires all readers to rethink what is possible in the quest for our shared, sustainable energy future.

René Frederiksen
Managing Director
True Energy - a Landis+Gyr Company

SETTING THE SCENE

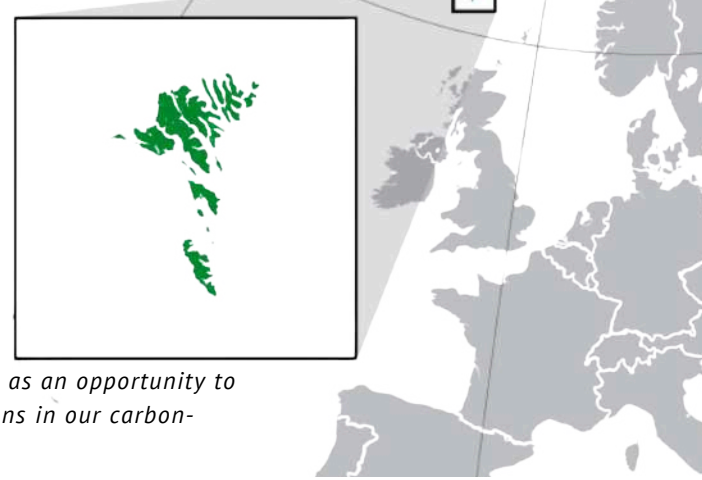
INTRODUCING THE FAROE ISLANDS

If you think a position in the North Atlantic is not the most straightforward starting point for achieving 100% carbon-neutral electricity production by 2030, you would be correct.

However, an overhaul of the Faroe Islands' energy landscape and innovative approach to energy management is putting that target within reach. From a reliance on oil-fired power plants, the islands are increasingly powered by wind, hydropower – and soon perhaps even tidal energy.
Sev, the islands' utility, is also implementing energy storage and enhancing grid flexibility by integrating electric vehicles (EVs) as a core asset for load balancing and using renewable energy when it is available.

Intro to the Faroe Islands

- Area: 1,399 square kilometres (540 square miles).
- Population: Around 55,000 residents on 18 islands.
- Capital: Tórshavn.
- Utility and grid operator: Sev.



"The Faroe Islands is electrically isolated. No cables go to neighbouring countries, which is a main challenge for ensuring grid stability when integrating a high share of variable, renewable energy. We see this, however, as an opportunity to develop smart solutions in our carbon-neutral ambitions."

Terje Nielsen,
Head of R&D,
Faroese utility Sev

THE FAROE ISLANDS

ENERGY LANDSCAPE AND AMBITIONS

The Faroe Islands and Sev's circumstances will sound familiar to many other regions and energy companies.

From a historic dependency on fossil-fuelled power plants, the islands are integrating increasing amounts of renewable energy. In 2022, renewable energy accounted for 52% of electricity production, a significant increase from 38% two years prior. The islands have about 1000 kilometres of high and medium voltage grid, with roughly 30,000 electricity metres, about 20,000 of which are found in homes.

Hydropower has been a long-time central energy pillar that is increasingly supported by wind farms, while solar plants will play a core role during the less windy summer months. The islands are also exploring cutting-edge energy solutions, such as tidal energy.

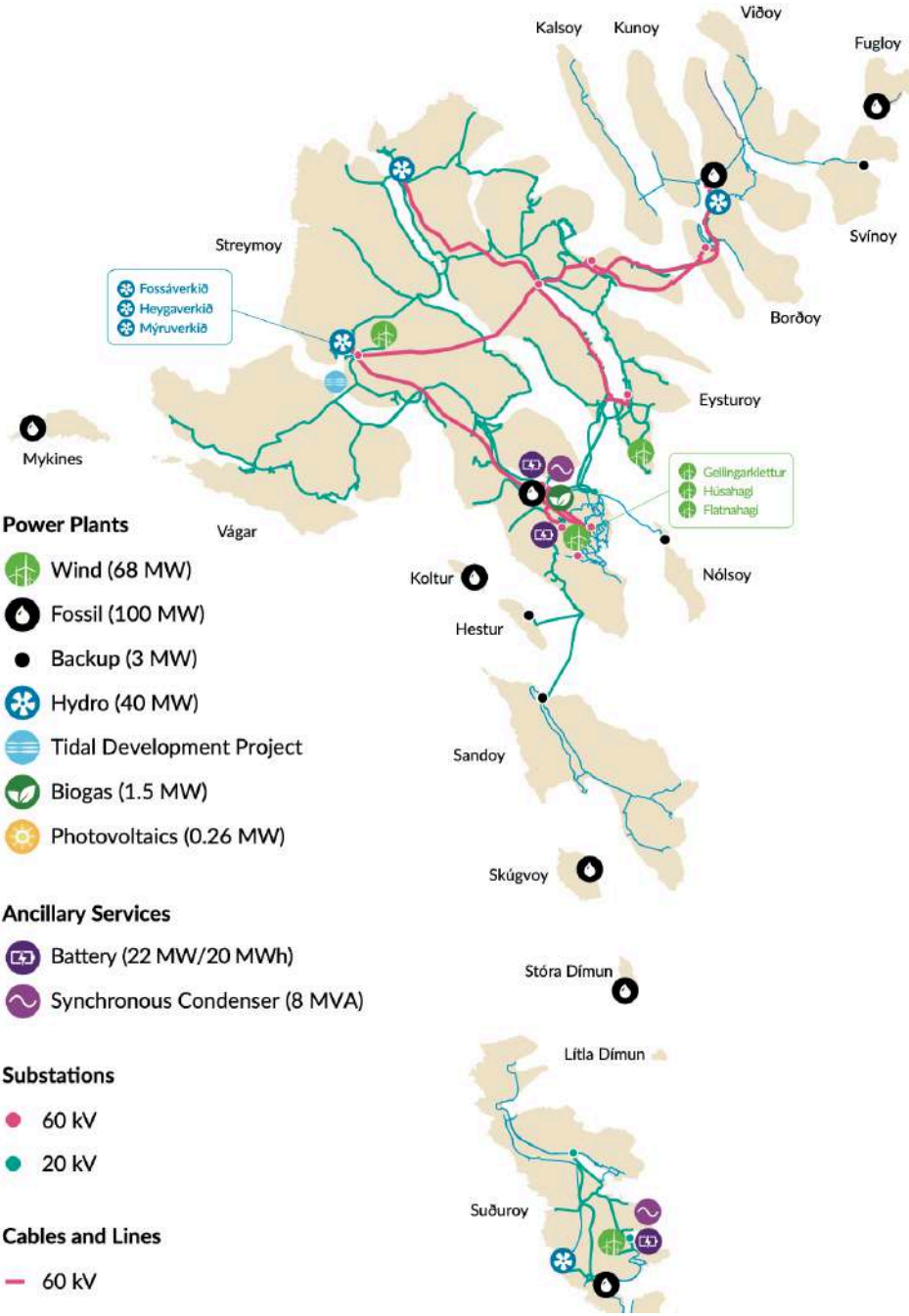
Sev: The energy steward

- Sev, short for Streymoy Eysturoy and Vaagar, is the sole energy utility company responsible for generating and distributing electricity across the Faroe Islands.
- Established in 1946, Sev operates 20 power plants across the islands.
- Sev manages a complex, closed-grid system that must remain entirely self-sufficient.

  The grid sees lowest demand at night (around 38–40 MW) and peaks at midday and early evening (up to 72 MW).

WATCH OUR WEBINAR ON THE FAROE ISLAND'S ENERGY AMBITIONS HERE:

https://www.trueenergy.io/sev-webinar/

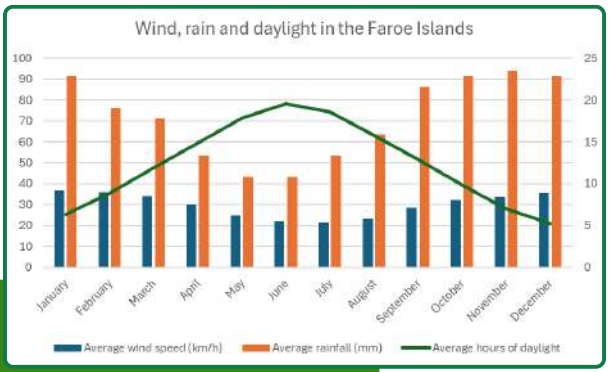

Kalsoy
Kunoy
Viðoy
Fugloy
Svínoy
Borðoy
Streymoy
Fossáverkið
Heygaverkið
Mýruverkið
Eysturoy
Mykines
Gellingarklettur
Húsahagi
Flatnahagi
Vágar
Nólsoy
Koltur
Hestur
Sandoy
Skúgvoy
Stóra Dímun
Lítla Dímun
Suðuroy
Power Plants
Wind (68 MW)
Fossil (100 MW)
Backup (3 MW)
Hydro (40 MW)
Tidal Development Project
Biogas (1.5 MW)
Photovoltaics (0.26 MW)
Ancillary Services
Battery (22 MW/20 MWh)
Synchronous Condenser (8 MVA)
Substations
60 kV
20 kV
Cables and Lines
60 kV

RENEWABLE ENERGY
CHALLENGES AND OPPORTUNITIES

The shift to renewable energy presents challenges and opportunities. One challenge is maintaining grid stability with intermittent energy sources like wind and solar. This has led the Faroe Islands to pursue a strategy of complementary energy sources, such as wind, solar, hydro and tidal energy.

Energy storage solutions, such as battery systems and hydropower dams, also play a core role, as do advanced grid management and real-time monitoring systems.

Growing popularity of EVs and electric heat pumps has initially been a challenge for the move toward more renewable energy. However, they are quickly becoming a unique opportunity.



Tidal power "kites"

- Constructed by Minesto, a Swedish company.
- Dimensions: Weight: approx. 28 tonnes. Turbine diameter: 3,5 m. LxWxH: 9.8 x 12 x 5.2 m. Energy production up to 1.2 MW per kite.
- Advantages: Provides a stable and predictable source of renewable energy.
- Operation: Driven by hydrodynamic lift. Autonomously follows a figure-eight path, speeding up the water flow around the turbine, powering a generator.

Learn more about the Minesto Tidal kites here: https://minesto.com

TRUE ENERGY

AN INNOVATION PARTNER

Today, roughly 2,000 out of 28,000 privately owned vehicles in the Faroe Islands are EVs. That number is set to rise exponentially. The same dynamic applies to the use of electric heat pumps.

Early on, Sev recognised the need to activate EVs in support of the grid and renewable energy.

This led to partnering with True Energy and activating EVs as flexible energy assets that support flexibility and grid needs. For example, EV charging sessions can be spread out over the night, when overall electricity consumption is at its lowest, and help Sev reduce grid strain.

One of the most powerful tools for Sev is the ability to automatically trigger EV charging when there is a surplus of renewable energy production.

Smart, managed charging

- True Energy's solutions can be used for managed charging, which allows energy companies to control when and how EVs charge.
- Advanced smart charging makes it possible for EV owners to set preferences for how and when their car should be charged and ready for use.
- Intelligent features ensure that EVs charge in ways that support grid balancing, frequency regulation and renewable energy.
- All this happens per owners' preferences.

Learn more about True Energy and managed charging here: https://www.trueenergy.io/

TRUE ENERGY

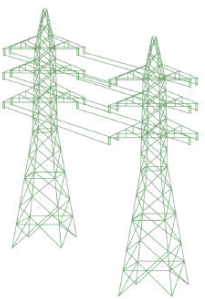
AN INNOVATION PARTNER

Introducing True Energy

- True Energy is part of Landis+Gyr, a global leader in energy management.
- We activate electric vehicles and other energy assets in support of grid stability, energy flexibility, and optimised energy consumption.
- By integrating advanced technologies, such as real-time data monitoring and automated charging, we help companies and regions manage grids and energy assets efficiently and sustainably.

"The growing electrification of transportation is a golden opportunity for the energy sector. With the right tools, EVs can be a cornerstone in the green transition,"

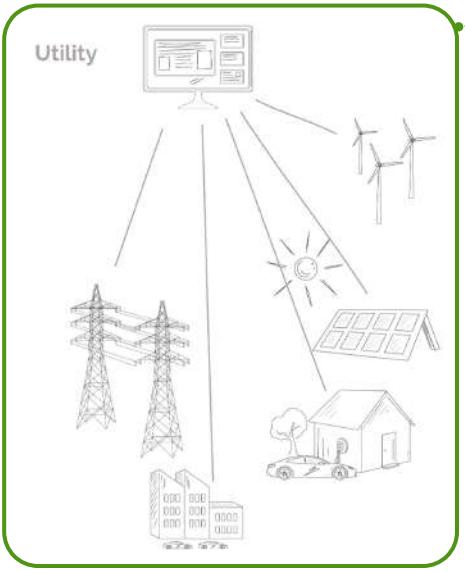
René Frederiksen
Managing Director
True Energy - a Landis+Gyr Company



www.trueenergy.io

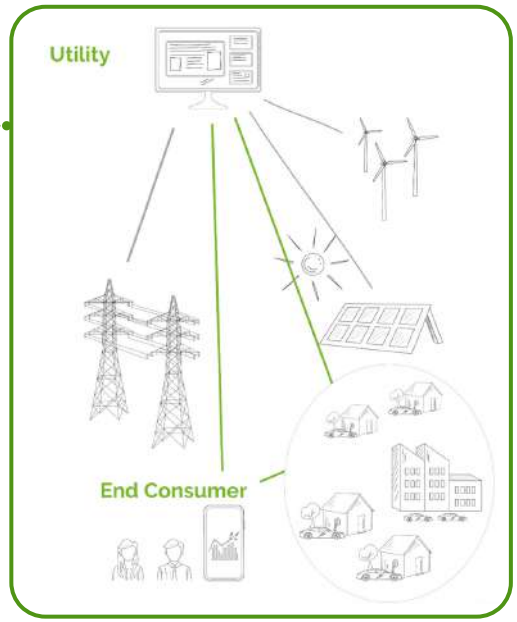
TRUE ENERGY

AN INNOVATION PARTNER



EV's as a challenge

- More unpredictable energy production.
- Rapid increase in energy-intensive units (EVs).
- Greater fluctuations in energy use.
- Increased need for load balancing, peak load shaving, and flexibility.



EV's as a solution

- Managing EV charging on city, district, or street level.
- Incentivizing consumers to change energy consumption patterns.
- Increasing grid flexibility, resilience, and cost-effectiveness.
- Supporting integration of more renewables and EVs

LEADING CHANGE
TOWARD CARBON-NEUTRALITY

The first phases of Sev and the Faroe Islands' journey toward carbon-neutral energy production are well underway.

Sev has deployed True Energy's advanced smart charge, will be integrated with distributed energy resource management systems (DERMS) and allow Sev to coordinate and manage distributed energy resources, including EVs, heat pumps, and other renewable assets, in real-time.

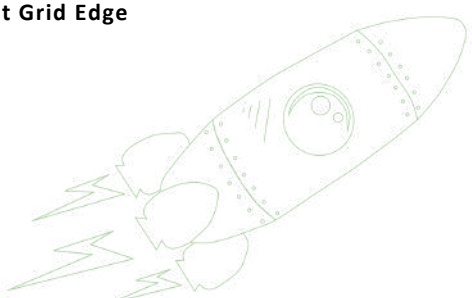
Integrating these energy assets into the grid as flexible resources makes it possible to dynamically adjust energy loads, thereby increasing stability, efficiency and resilience.

Sev and the Faroe Islands' results so far

- The total amount of renewable generation in 2021 was 161 GWh and in 2023 it was 230 GWh, so an increase of 42%.
- Record 126 GWh of wind energy in 2023.
- 99.998% reliability rate with growing renewable energy share.
- Introduction of battery storage, tidal energy and solar energy systems.

"The Faroe Islands' energy landscape mirrors what our utility clients across the world face. Lessons learned here are applicable on a global scale"

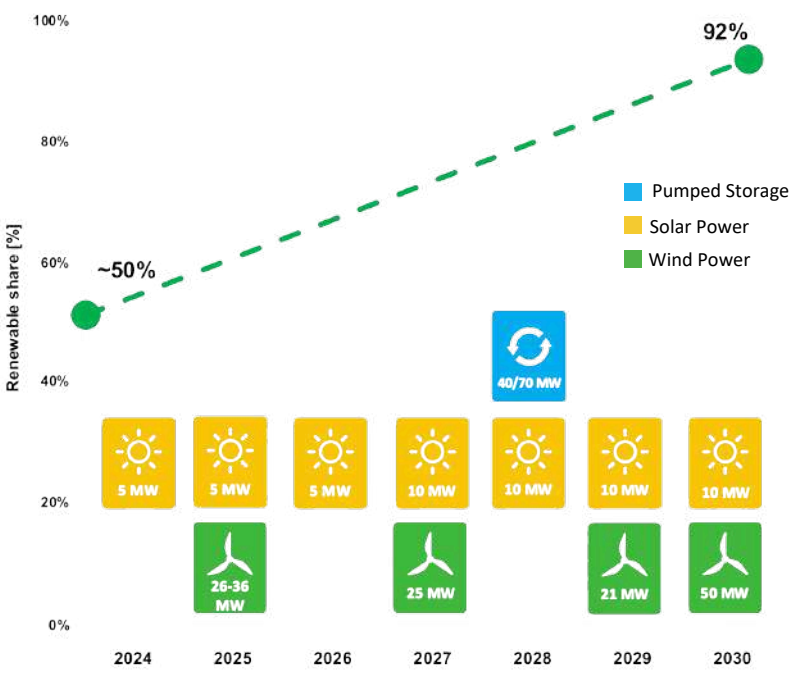
Ifigeneia Stefanidou
Head of Product Management Grid Edge
Landis+Gyr



LEADING CHANGE
TOWARD CARBON-NEUTRALITY

Lessons and next steps

- Thinking holistically of the **energy system has been core to Sev's success** so far.
- Similarly, **Sev has transparently engaged its consumers** early in the project process.
- Next steps include differentiated energy tariffs that **support renewable energy**.
- **The goals for Sev** include flattening out energy use across the 24 hours of the day.



SMART FLEXIBILITY
FOR THE FUTURE OF ENERGY

As described in the previous pages, **smart grid technology and energy flexibility** are crucial for the Faroe Islands achieving 100% carbon-neutral electricity by 2030.

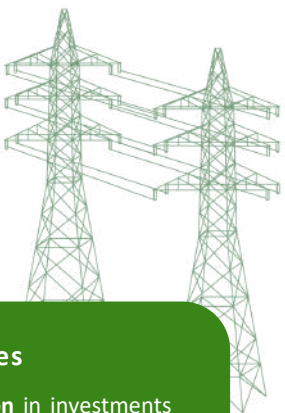
Similar needs apply across regions and for many - if not all - energy companies. With increasing energy shares coming from intermittent renewable sources, there is a need to adapt to better handle increasing energy supply and demand variations.

Intelligent flexibility and new energy assets like EVs have become central to this transformation, enabling energy companies to balance energy production more effectively, reducing the need for fossil fuel backup generators and improving overall system stability.

3.1 trillion in investments by **2030**

US **congestion costs** jumped **56%** in **2022**

EU balancing costs rising by **40% year-on-year.**



Why flexibility matters for energy companies

- According to analysis, **power grids require $3.1 trillion** in investments globally by **2030.**
- Grid planners forecast US peak demand growth of **38 gigawatts (GW) through 2028, with congestion costs jumping 56% to $20.8B in 2022.**
- **Balancing costs** in the EU are rising by **40% year-on-year**, while potential **cost savings** from **flexibility** could be **€30 billion** a year.
- Implementing grid and energy flexibility can **cut those costs significantly** and mitigate demand growth and grid congestion risks.

SMART FLEXIBILITY
FOR THE FUTURE OF ENERGY

Staying big or getting smaller
Expected structural changes in the energy system made possible by increased use of digital tools

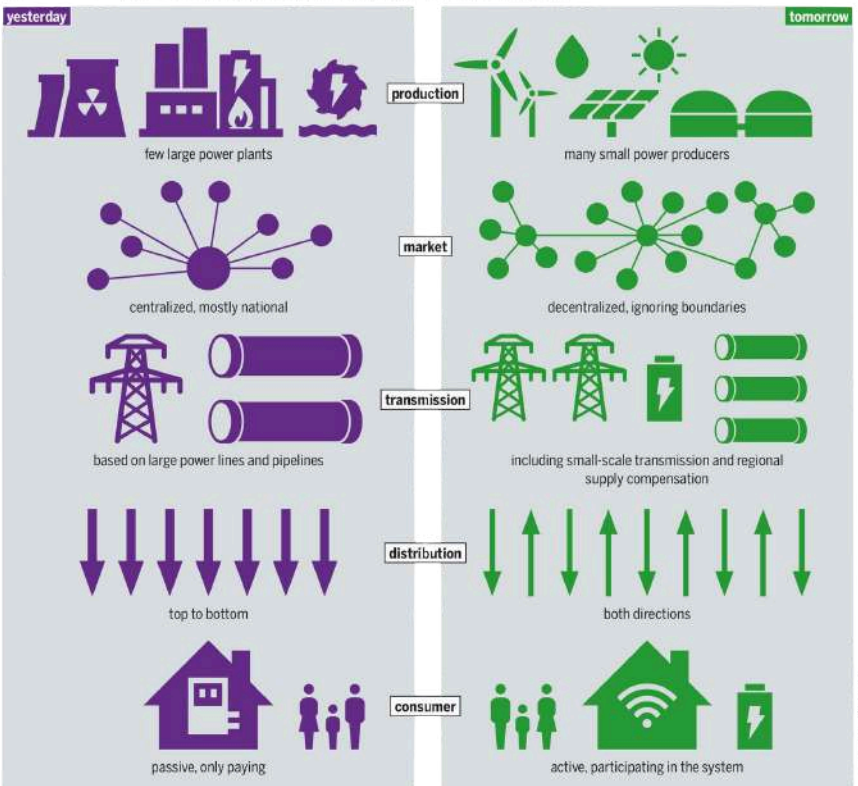


Image source

The smart grid future

- The smart, flexible grid can adapt to fluctuations in energy production and needs.
- They have the ability to adjust dynamically to energy use.

GLOBAL USE CASES
FOR ENERGY COMPANIES

The EU alone has 2,400 inhabited islands. Many of them face similar energy and grid situations to the Faroe Islands. Closed energy grids are not only an island phenomenon but are found in numerous locations worldwide.

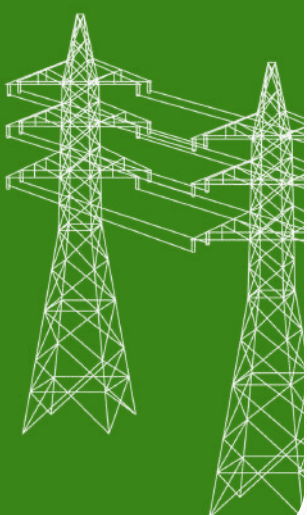
While closed-grid systems have specific needs for energy independence and balancing supply and demand, many of their challenges match those of energy companies and utilities across the world.

Fluctuating energy prices, increased energy demands, integrating renewable energy, and ensuring that grids can handle two-way energy needs are just some of the items on the list. Simultaneously, energy companies are looking to integrate a broad range of new types of energy-intensive units such as EVs, PVs, heat pumps and more.

Faced with this reality, there is a global need for increasing energy flexibility and turning new energy units like EVs into central energy assets.

Recognise these grid challenges?

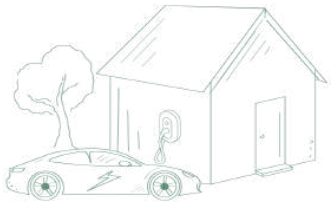
- **Grid stability:** Balancing increasingly complex supply and demand in real-time is critical to preventing blackouts and ensuring customer satisfaction.
- **Energy storage:** Renewable energy sources fluctuate. Solutions like storage and energy optimisation are increasingly critical to maintain stability.
- **Two-way traffic:** Grids must handle energy flowing to and from homes, as more people become “prosumers,” by investing in things like solar panels.
- **Infrastructure costs:** Increased overall energy demand and two-way traffic pressure infrastructure that is expensive to develop.



GLOBAL USE CASES
FOR ENERGY COMPANIES

"While we are unique in our position in the North Atlantic, I think that utilities and regions across the world face similar issues and see a similar future for energy."

Terji Nielsen,
Head of R&D,
Faroese utility Sev



62% to **86%** of **all cars sold in 2030** will be **EVs.**

4% global electricity demand growth for **2024.**

2 x wind and **solar power** by **2028,** compared to 2022.

Data source 1 Data source 2 Data source 3

A BLUEPRINT
FOR YOUR ENERGY FUTURE

TEN LESSONS AND RECOMMENDATIONS

As utilities and grid operators across the globe look to achieve carbon neutrality, the journey of the Faroe Islands offers valuable insights and strategies that can be replicated in other regions, including:

Lesson 1: Implement real-time data monitoring

Why it matters: Tracking energy demand and production in real time enables utilities to make dynamic adjustments, ensuring energy resources are efficiently distributed, match consumption, and support optimal grid performance and stability.

Strategies:

- **Deploy advanced data analytics tools** that integrate with the grid to collect real-time information on energy flows, demand, and renewable production levels.
- **Use predictive algorithms to forecast** demand surges and renewable output, enabling proactive grid management.
- **Integrate demand-response systems** and **DERMS** that can shift consumption patterns based on data insights.

Lesson 2: Adopt smart grid technologies

Why it matters: Smart grids can adapt to fluctuations in renewable energy production, distributing electricity more efficiently and helping maintain grid stability.

Strategies:

- **Upgrade legacy grid infrastructure** with smart meters and sensors that enable bi-directional communication between the grid, consumers, and DERs.
- **Enable distributed intelligence** by deploying edge computing at critical grid points to process data locally and rapidly adjust energy flows.
- **Invest in cybersecurity protocols** to protect smart grid systems from digital threats.

Lesson 3: Integrate distributed energy resources (DERs)

Why it matters: DERs such as solar panels, wind turbines, and battery storage decentralise energy production, increasing the resilience and flexibility of the grid while reducing reliance on centralised power plants.

Strategies:

- **Build a robust DER management platform** integrating various sources, including solar, wind, and battery systems, as flexible grid assets.
- **Implement virtual power plants (VPPs)** that aggregate DERs and manage them collectively, enabling smoother integration of renewable energy into the grid.
- **Offer financial incentives** or rebates to encourage consumers to adopt DER technologies, ensuring widespread participation in decentralised energy generation.

Lesson 4: Leverage advanced smart EV charging

Why it matters: Smart charging aligns EV demand with periods of high renewable energy generation or lower energy use, helping to balance the grid load and reduce stress on the system while maximising renewable energy use.

Strategies:

- **Integrate EV charging infrastructure** with demand-response programs that incentivise charging during off-peak hours or when renewable energy production is at its peak.
- **Develop or integrate solutions** that enable EV owners to set charging preferences to match preferences and participate in managed charging programmes.
- **Collaborate with relevant partners** to integrate advanced smart charging capabilities across EV models, ensuring broad participation in grid flexibility efforts.

Lesson 5: Invest in energy storage

Why it matters: Energy storage systems capture excess renewable energy during periods of high production and release it during demand surges or when renewable production is low, supporting a continuous and stable energy supply.

Strategies:

- **Prioritise investment in storage** facilities and solutions to store surplus energy.
- **Utilise multiple storage system types** that convert excess electricity into potential energy.
- **Integrate community or residential battery storage solution**s, along with EV batteries, as energy storage assets to relieve pressure on the central grid.

Lesson 6: Diversify the renewable energy mix

Why it matters: Relying on a single renewable source, due to its variability, can expose the grid to vulnerabilities. A diversified energy mix helps ensure a stable and consistent energy supply.

Strategies:

- **Invest in a mix of renewable energy projects**, such as wind farms, solar power installations, hydropower systems, and emerging technologies like tidal energy.
- **Conduct detailed environmental and feasibility studies** to determine the optimal mix of renewable resources based on local conditions.
- **Develop pilot projects** to test the viability of new renewable energy technologies, such as wave and tidal power, before committing to large-scale deployment.

Lesson 7: Create incentives for smart energy consumption

Why it matters: Engaging consumers in the energy transition is crucial for reducing peak demand, improving energy efficiency, and maximising the use of renewable energy.

Strategies:

- **Implement time-of-use pricing** that encourages consumers to use electricity during off-peak periods or when renewable energy production is highest.
- **Launch educational campaigns** to inform consumers about the benefits of participating in demand-side management programs, including financial and environmental savings.

- **Develop flexible billing plans** that allow consumers to participate in energy-saving initiatives and reward them for adjusting their usage patterns to support grid stability.

Lesson 8: Prioritise grid resilience

Why it matters: Increasing reliance on renewable energy can challenge grid resilience, making it critical to ensure stability in the face of risks like unpredictable weather or equipment failures.

Strategies:

- **Incorporate redundancy systems**, such as backup generators, energy storage, or additional power lines, to maintain grid operations during extreme events or unexpected surges in demand.
- **Deploy microgrids** that can operate independently of the main grid, providing power to critical facilities or isolated communities during emergencies.
- **Collaborate with emergency response agencies** and, if possible, utilities in neighbouring regions to develop coordinated response plans for restoring power quickly after grid disruptions.

Lesson 9: Foster collaboration across sectors

Why it matters: Increasing reliance on renewable energy means that grid resilience becomes critical to ensure stability in the face of risks like unpredictable weather or equipment failures.

Strategies:

- **Establish public-private partnerships** that unite governments, utilities, technology providers, and investors to fund large-scale energy projects.
- **Facilitate cross-sector collaboration** through joint ventures, research initiatives, and pilot projects that test new energy technologies and smart grid solutions.
- **Partner with international organisations** to share best practices and knowledge gained from other regions, accelerating the deployment of proven technologies and strategies.

Lesson 10: Encourage and support stakeholder engagement

Why it matters: Stakeholder engagement creates trust and buy-in, ensuring that communities, businesses, and policymakers are invested in the success of energy projects.

Strategies:

- **Hold regular consultations** and interactions that engage stakeholders, keep them informed about upcoming projects, and have a say in decision-making processes.
- **Create educational campaigns** that inform stakeholders about ongoing development, and highlight economic and environmental advantages to build widespread support.
- **Collaborate with local leaders** to demonstrate how the transition benefits all parties and help spread the message.

LOOKING AHEAD

THE FUTURE OF CARBON NEUTRALITY

As the Faroe Islands continue their journey towards achieving 100% carbon-neutral electricity by 2030, the lessons learned offer a roadmap for others looking to do the same.

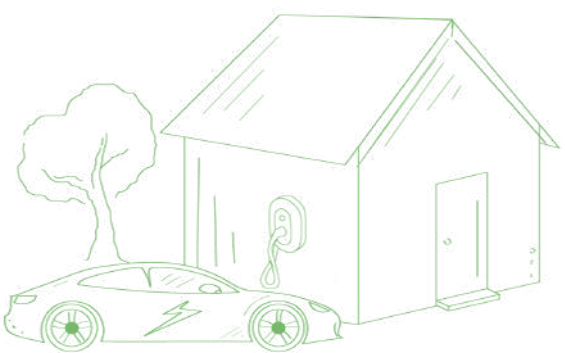
Integrating renewable energy sources, along with smart grid technologies and energy flexibility, demonstrates the potential even smaller, self-contained grids have for achieving remarkable sustainability milestones and goals through innovation, resilience, and collaboration.

For others, the opportunities for replicating this success are abundant.

Advances in smart grid management, distributed energy resources (DERs), and electric vehicle (EV) integration have made it easier for utilities worldwide to balance energy supply and demand dynamically.

By leveraging these technologies, companies and communities can maximise the use of renewable energy and build resilient, self-sufficient energy systems and grids that are ready for the future of energy.

Ifigeneia Stefanidou
Head of Product Management Grid Edge
Landis+Gyr



CONTACT US

True Energy – Part of Landis+Gyr

Together, True Energy and Landis+Gyr are pioneering smarter energy solutions, enabling sustainable grid operations and advanced energy flexibility services. We work hand-in-hand to provide energy companies with innovative technologies for electric vehicle smart charging and distributed energy resource management.

If you are looking to implement these solutions in your operations or simply want to learn more, we are here to help!

Looking to take the first step toward a greener future?
Reach out today and explore how our solutions can support your journey to carbon neutrality.

Name: True Energy
Adresse: Agern Alle 5A, 2970 Hørsholm, Denmark
E-mail: info@trueenergy.io

Name: Landis + Gyr
Adresse: Alte Steinhauserstrasse 18, 6330 Cham, Switzerland
E-mail: info@landisgyr.com

To learn more about **True Energy** & **Sev**'s projects,
watch the ondemand webinar here:

WATCH VIDEO

Stay up to date with the latest in smart energy, flexibility, and EV charging
Explore our webinars and blog posts to gain insights into the future of energy management, including advanced EV smart charging and grid optimization:
www.trueenergy.io

true
a Landis+Gyr company