English version

DUURZAAM AMELAND

An island in transition

Together we build the future of energy

The construction of Energy Park Ballumerbocht 2025

A booklet explaining why and how Ameland is working towards a smart energy system.

In October 2025 a group of interested people were shown round the construction of the Energy Park Ballumerbocht.

Published 2026

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In 2019, the municipal council of Ameland established the island's sustainability ambition: to become a leader in the energy transition and to meet the national climate targets fifteen years before the rest of the Netherlands will. Our goal is to complete the energy transition by 2035.

At the heart of achieving this 2035 ambition lies one key principle: the involvement of our inhabitants. They have a seat at our table. Without their active participation and input, a transition of this scale cannot succeed.

Our approach is pragmatic. As an island community, we decide together what is and is not possible, taking into account values such as feasibility, affordability and sustainability.

To gain insight into the possibilities – and to put them into practice; we work gratefully with our partners. On the island, across the Netherlands and beyond.

The transition to 100% renewable energy involves many challenges. There are no well-trodden paths. It requires searching for new solutions. Innovation is key: step by step, with trial and error, through experimenting, learning from those endeavours and, above all, by doing.

In recent years, we have already achieved a great deal, but we are not there yet. More is needed to prevent us from increasingly reaching the capacity of the electricity grid.

If we do nothing, grid congestion will stand in the way of achieving the 2035 ambition. That is why we are moving at full speed towards the smart integration of energy generation, storage and controlled consumption of electricity and heat. We believe that this is the key to success. It also creates opportunities to use energy generated on Ameland for Ameland.

This leaflet explains our approach to developing a smart energy system for the island and sets out why we are doing this and how. Together with the inhabitants partners and others, for Ameland.

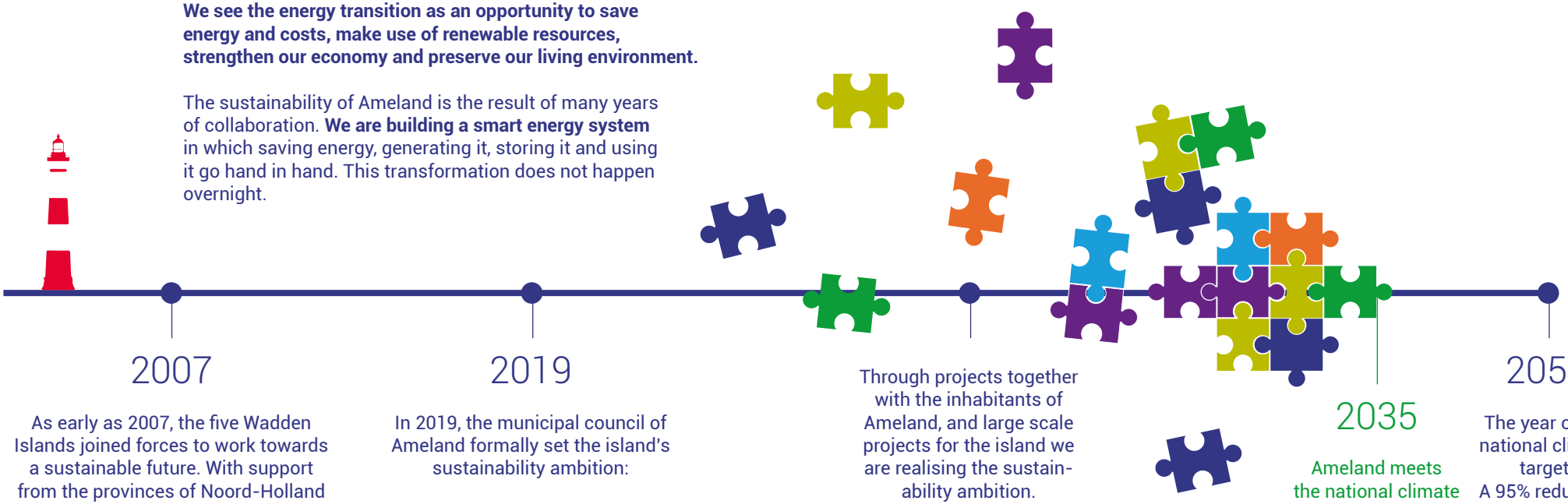
2035

2050

Ambition and vision

We see the energy transition as an opportunity to save energy and costs, make use of renewable resources, strengthen our economy and preserve our living environment.

The sustainability of Ameland is the result of many years of collaboration. **We are building a smart energy system** in which saving energy, generating it, storing it and using it go hand in hand. This transformation does not happen overnight.



2007

As early as 2007, the five Wadden Islands joined forces to work towards a sustainable future. With support from the provinces of Noord-Holland and Fryslân, Ameland developed into a testing ground for innovation, economic development and sustainable tourism.

2019

In 2019, the municipal council of Ameland formally set the island's sustainability ambition:

Ameland aims to have fully transitioned to renewable energy by 2035; fifteen years earlier than the rest of the Netherlands.

Through projects together with the inhabitants of Ameland, and large scale projects for the island we are realising the sustain-ability ambition.

2035

Ameland meets the national climate target for 2050.

2050

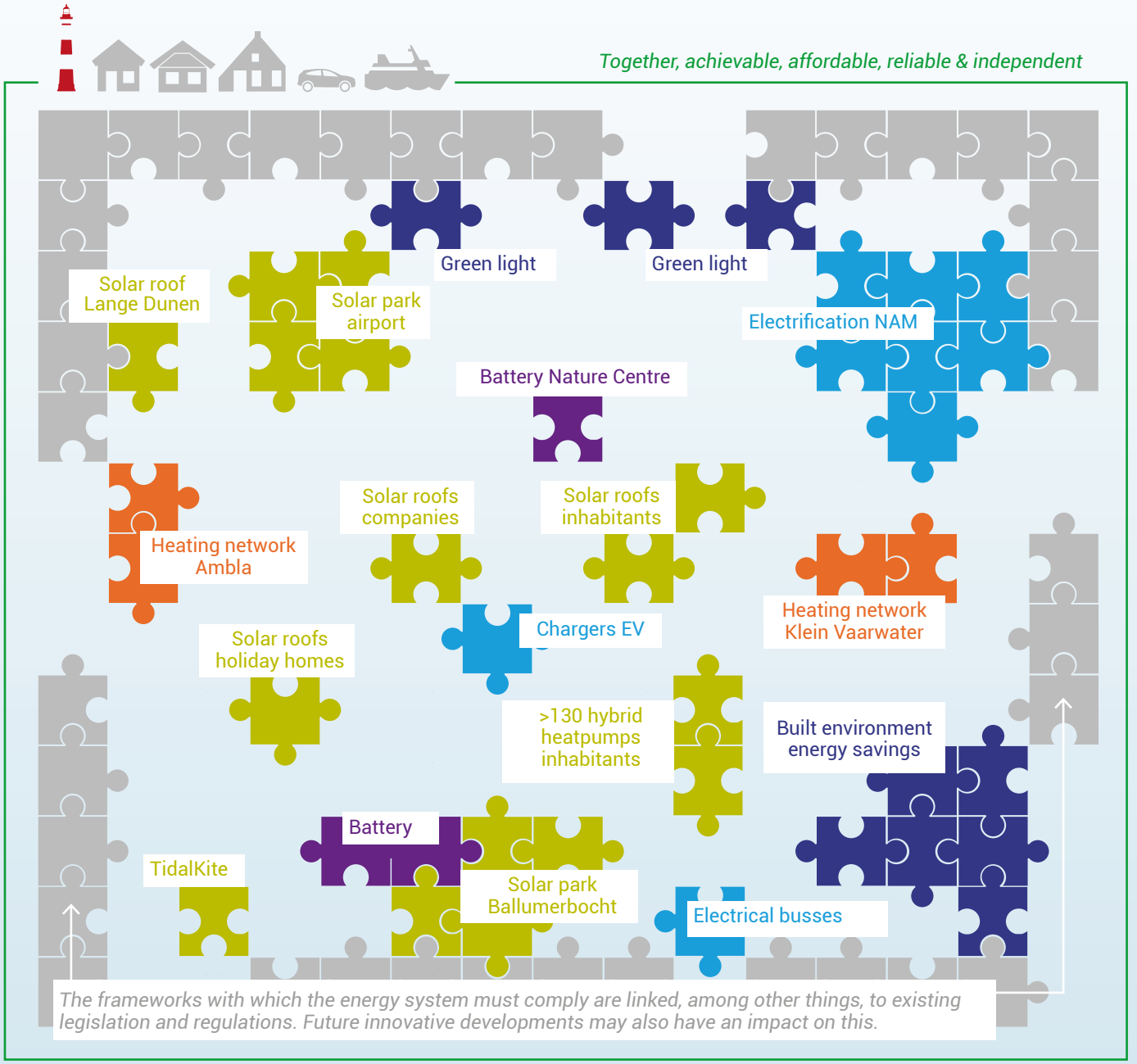
The year of the national climate target:
A 95% reduction in greenhouse gas emissions compared to 1990.

Sustainable energy suits our island well: sun, wind and water are available in abundance; its scale is manageable and the community is close-knit. Together with the inhabitants, entrepreneurs, the Ameland Energy Cooperative, four village interest groups, owners of recreational properties and various partners, we are working step by step on smart solutions.

Each piece of the puzzle represents an individual project. Put them altogether and these projects reinforce one another and strengthen the system as a whole.

The Ameland energy jigsaw

Together, achievable, affordable, reliable & independent



The frameworks with which the energy system must comply are linked, among other things, to existing legislation and regulations. Future innovative developments may also have an impact on this.

Ameland aims to complete the energy transition by 2035. This requires a smart mix of saving energy, energy generation, energy storage, and alternatives to natural gas and intelligent system control.

Which pieces of the puzzle do we add first, and which later?

Remaining pieces:

Energy saving
- Built environment

Electricity generation
- Additional TidalKites
- Solar panels on roofs
- Offshore wind
- Tidal, wave and current energy

Heat generation
- Geothermal energy (various depths)
- Aquathermal energy
- Ground-based heat
- Residual heat from wastewater treatment

Biogas production
- Gasification/digestion

Storage and/or conversion
- Individual or collective batteries
- Individual or collective boilers
- Hydrogen

Infrastructure
- District heating networks (village/street/area)
- Reinforcement of the electricity grid

Smart control and integration
- Energy system integration
- Cooperation
- Data and monitoring

How can we piece the jigsaw pieces together?

Ameland is developing a smart energy system that efficiently uses locally generated renewable energy, stores it during periods of surplus, and then aligns supply and demand. This reduces inefficiency and grid congestion and enables further sustainability. Obtaining answers to the below questions will help get to the right decisions.

Roderick Timmer
Trio Energy

Christy Schminnes
Advisor energy transition

What is our current energy demand (electricity, heat and fuels), and what additional demand will arise in the future?

Importance of monitoring

How much energy do we use today and how much will we use in the future? How much can we generate ourselves, and when is there actually too much or too little? How does Ameland use monitoring as a measurement and prediction tool?
Read more on pages 14-15.

What and where can we still save, and what will the remaining energy demand be?

Smart saving

Saving energy by changing behaviour, using smart technology or efficient controls is always a good thing, but it doesn't happen by itself. How is Ameland tackling this?
Read more on pages 12-13.

Frieda de Boer
Communications

Jacqueline van Druten
Communications

Erwin de Boer
Advisor energy transition

Hans Elward
Heat transition advisor

Johan Boekema
Project leader

What do we generate, at what moment, and what else will be needed to meet future demand? Which renewable sources do we use to meet this demand?

Generate more locally?

What is needed to meet future demand for heat and electricity? How will Ameland generate this locally, and how will Ameland make smart use of the limited space on the grid?
Read more on pages 16-25.

What can we store and/or convert, and how?

Storage and conversion

With more local generation, the need for smart storage and energy conversion is growing. Ameland is responding to this need with The Energy Roundabout.
Read more on pages 28-29.

How can we match supply and demand?

Smart connections

How is Ameland implementing a smart energy system that makes optimal use of local renewable energy, with an appropriate energy mix and smart alignment of supply and demand?
Read more on pages 30-31.

The resident is central

The energy transition will not happen overnight. We inform and involve residents as much as possible, even though it is sometimes technical and we as a municipality first have to figure things out ourselves before we can discuss them.
Read more on pages 10-11.

How?
Through joint projects, publications, discussion evenings, open days, site visits during construction, and one-on-one conversations.

Why?
Because it can only be done together.

Focusing on the inhabitants

From the very beginning, the municipality has taken the journey towards a renewable energy supply together with residents and other stakeholders. By engaging in conversation, insight is gained into what the inhabitants find important. Their questions, ideas and concerns form the basis for evaluating and analysing options.

Is there potential for geothermal energy?

What about hydropower?

And the old landfill, wouldn't that be a great spot for a second solar park?

Sustainability costs money.
Who is going to pay for it?

What the ideas lead to:

↓

We are currently exploring the potential of shallow and medium-depth geothermal energy.

A company called SeaQurrent is currently testing innovative underwater kites near Ameland. We welcome other viable initiatives with the goal of implementing them into our energy grid.

Energiepark Ballumerbocht is a reality. As of 2026, the solar park is operational and will, among other things, supply electricity directly to Wetterskip Fryslân's sewage treatment plant.

The municipal council of Ameland helps residents get started with free energy advice, subsidies, and financial schemes. Feasibility and affordability are central to the assessment of large-scale projects.

"Sustainability costs money initially but saves costs in the long run."

Marc Hulsebos
Sustainable Amelander

"After a period of research, we will engage with residents and other stakeholders again."

Jacqueline van Druten has been involved in the communication for Sustainable Ameland since 2015.

Smart saving
The Ameland approach

Ameland's approach to energy saving focuses on residents and owners of holiday homes. Whether people have already moved away from natural gas or have not yet started with sustainability measures, everyone makes their own choices. The municipality provides support tailored to individual situations.

Energy saving means responding to what people need.

"Residents can contact us with questions about saving energy. At their request, I look at what options are available in their homes. We also involve the more than 2,500 holiday homes in this approach."

"It is important that we meet people where they are. Every step, big or small, helps: it saves money, provides more comfort, is good for the climate, and prevents unnecessary strain on the Ameland electricity grid. This is extra important now that we, as a society, are increasingly using more electricity."

Christy Schminnes (energy transition advisor) helps residents and holiday home owners get started with energy-saving measures and financial support options.

Examples

We deploy various resources to draw attention to energy savings. A few examples:

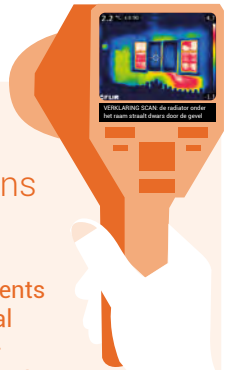
Sustainable Amelanders

Examples of energy savings from residents and holiday home owners inspire others to join in.

These can be found in *De Amelander* and on the *Duurzaam Ameland* website.

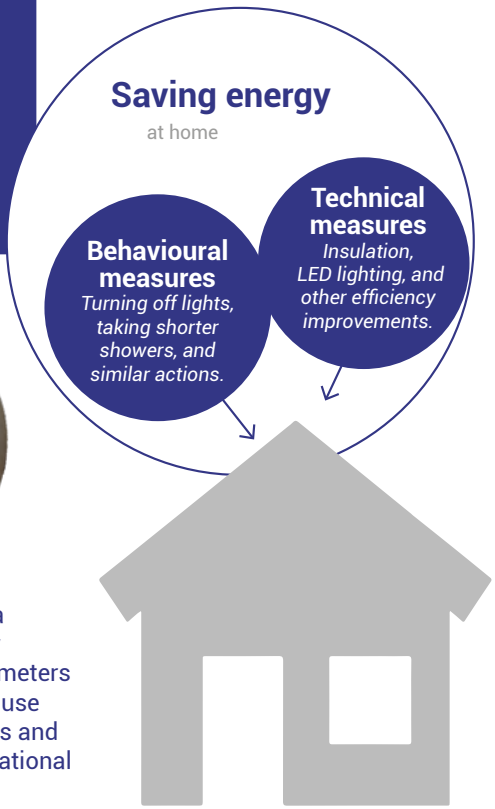
P1-meter

In 2023, the village councils offered a P1-meter to all residents, with nearly everyone choosing to take part. The meters provide real-time insight into energy use and enabling more conscious choices and cost saving. In 2025, dozens of recreational property owners followed.



Thermal imaging scans

Almost all home-owners and residents received a thermal scan and energy-saving advice report in 2021. These reports are still frequently discussed over coffee.



The importance of monitoring

To prepare Ameland for a smart and future-proof energy system, a clear understanding of the energy flows on the island is essential. By continuously monitoring how much power we generate and consume, we can see how usage patterns change, where peaks occur, and which measures are necessary for the 2035 ambition.

The current profiles of solar generation, electricity consumption and heat demand form the basis of the energy model developed specifically for Ameland. This model helps determine how the energy system should evolve as the island transitions to gas-free heating and further electrification of transport, the ferry and other sustainable applications. Monitoring does not just provide insight into the present; it is above all a guide for the future.

With increased local generation such as solar energy, TidalKites and potentially offshore wind, the need for smart storage grows. Batteries for electricity storage and thermal stores for heat storage help absorb differences between generation and consumption and reduce peaks.

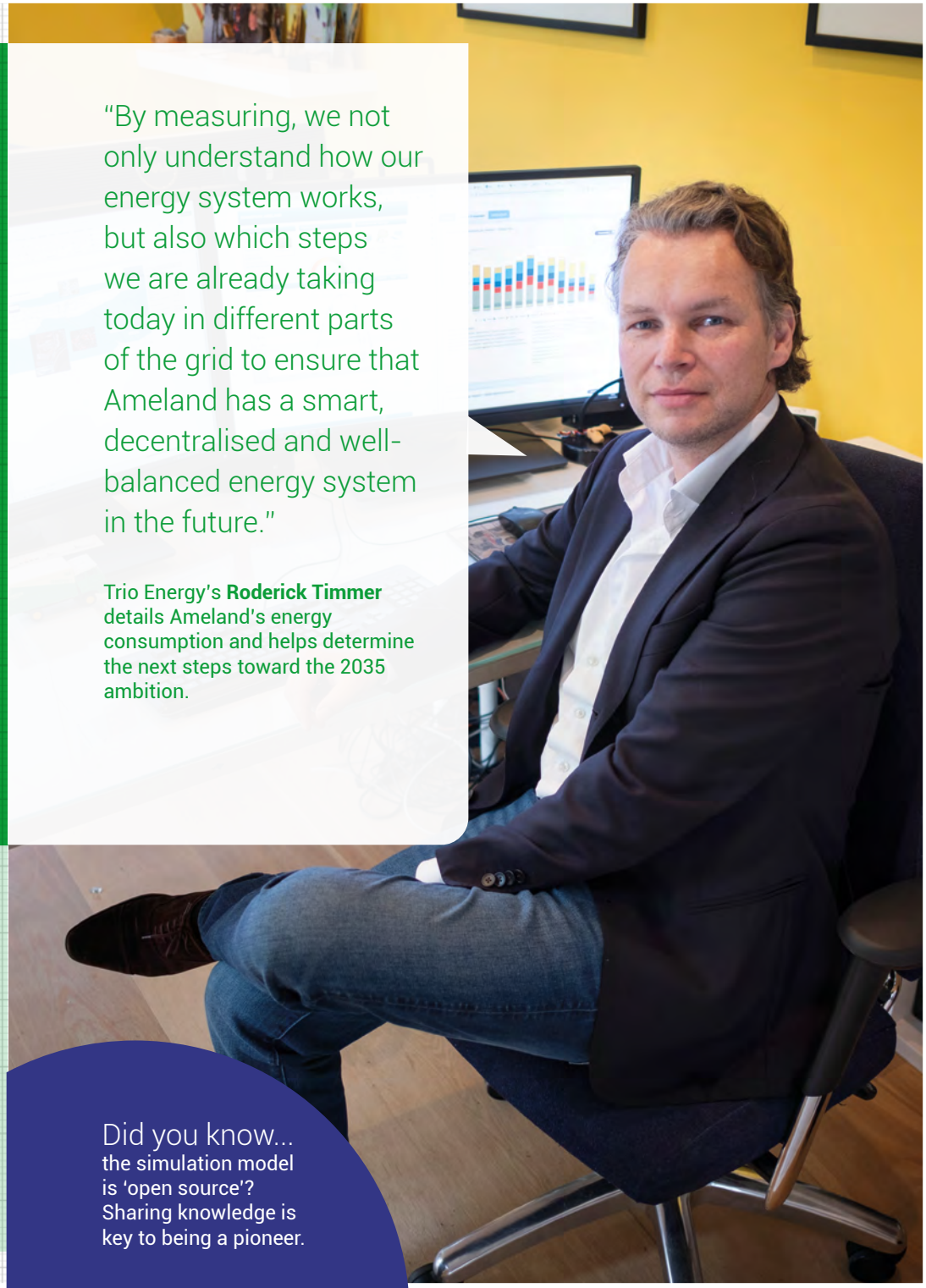
The first pilots are already underway. The town hall serves as a demo site for balancing the low-voltage grid, and the first battery on the medium-voltage grid will soon follow. Towards 2035, this will develop into a largely self-sufficient and intelligently balanced Ameland energy system.

"In 2019, we collaborated with Ameland to develop the island's first simulation model. It is great to see the model now being updated with real-time data, enabling Ameland to predict the impact that choices regarding generation, storage, or heating solutions will have on the energy system."

Richard Westerga from TNO has been involved as a partner in the energy transition on Ameland since 2013.

"By measuring, we not only understand how our energy system works, but also which steps we are already taking today in different parts of the grid to ensure that Ameland has a smart, decentralised and well-balanced energy system in the future."

Trio Energy's **Roderick Timmer** details Ameland's energy consumption and helps determine the next steps toward the 2035 ambition.



Did you know...
the simulation model is 'open source'? Sharing knowledge is key to being a pioneer.

Since 2017, gas consumption has fallen by 25%.

Reasons
- *high costs due to the energy crisis*
- *energy saving*
- *switch to other forms of heating*

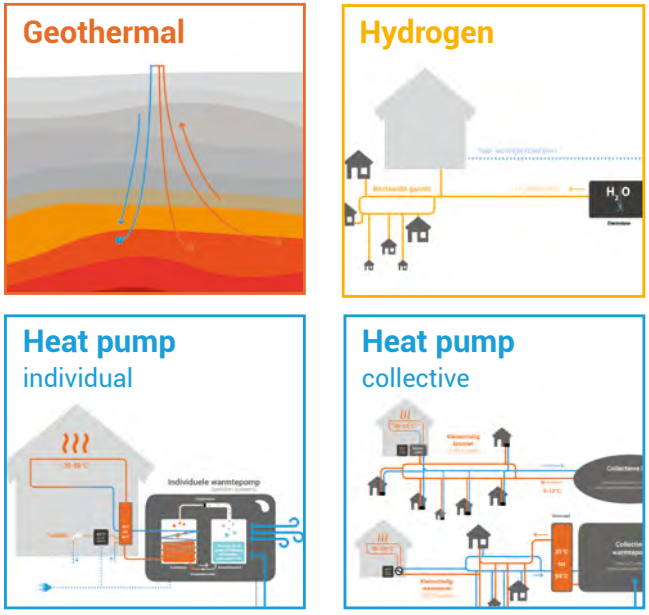
Heating without natural gas

Although natural gas consumption on Ameland has decreased in recent years, the island still faces a clear challenge.

We are therefore exploring four possible directions for renewable heating. What is feasible and affordable will be determined together with residents: their wishes and ideas are key. At present, collective heating networks powered by heat pumps, per village, per neighbourhood or at street level, appear to be the most promising option.
As a consequence of heating without natural gas, more electricity will be required. Our analyses therefore also take into account the limited capacity of the electricity grid.

Find out more about all four scenarios.

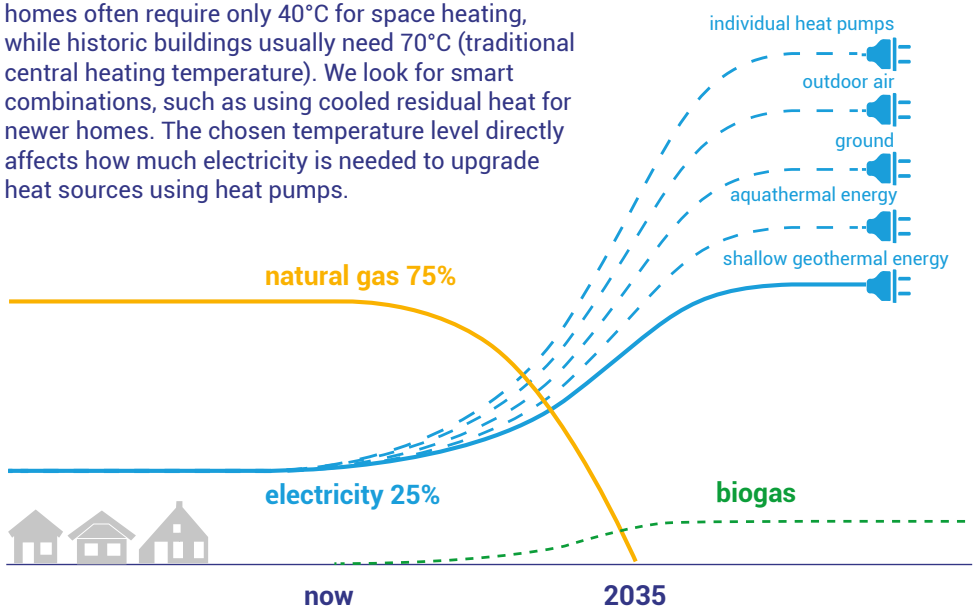
The Four Scenarios:



Opportunities for the Island
The transition from individual gas boilers to collective heat solutions requires adjustments, but it also creates opportunities. Ameland has access to various local heat sources, such as: heat from the ground, the Wadden Sea, outside air, wastewater treatment facilities. These sources can be used for the island itself. By combining them with local electricity generation, Ameland becomes less dependent on energy markets, aligning with the island's tradition of self-reliance.

Electricity demand with different sources

For each area on Ameland, we assess which heat temperature is most suitable. New, well-insulated homes often require only 40°C for space heating, while historic buildings usually need 70°C (traditional central heating temperature). We look for smart combinations, such as using cooled residual heat for newer homes. The chosen temperature level directly affects how much electricity is needed to upgrade heat sources using heat pumps.



"The way heat is organised has a direct impact on the entire energy system of Ameland. Heat and electricity are closely connected: changes in the heat supply affect electricity demand and grid load."

Hans Elward
Heat transition advisor for Ameland

Engaging with the community

Through conversations with inhabitants we aim to reach a collective solution. To facilitate this, we organise community discussion evenings. Residents can also call or email us with their questions, ideas, and feedback.

Discussion evening on the transition to gas-free heating

High-temperature heating network
With deep geothermal energy as asource
This option has been ruled out: the geological layer is unsuitable and the risks are too high.

Hydrogen via the gas grid
With deep geothermal energy as a source
This option has been ruled out: at present it is too expensive for end users.

Individual heat pumps
Using outside air or ground heat
Not an ideal option due to grid congestion, noise nuisance and the visual impact of outdoor units.

Collective heat pumps
With one or multiple sources
A promising option that is being further investigated and discussed with residents.

What we are researching:
- Utilisng waste heat from the sewage treatment plant as a heat source for a district heating network in Ballum.
- Geothermal energy as a source and storage of heat in the earth for Hollum (and/or Nes/Buren).
- Utilising seawater as a source for Nes/Buren.
- The ideal combination of storage (heat/electricity) for maximum contribution to reducing grid congestion.

Discussion evening on the transition to gas-free heating.

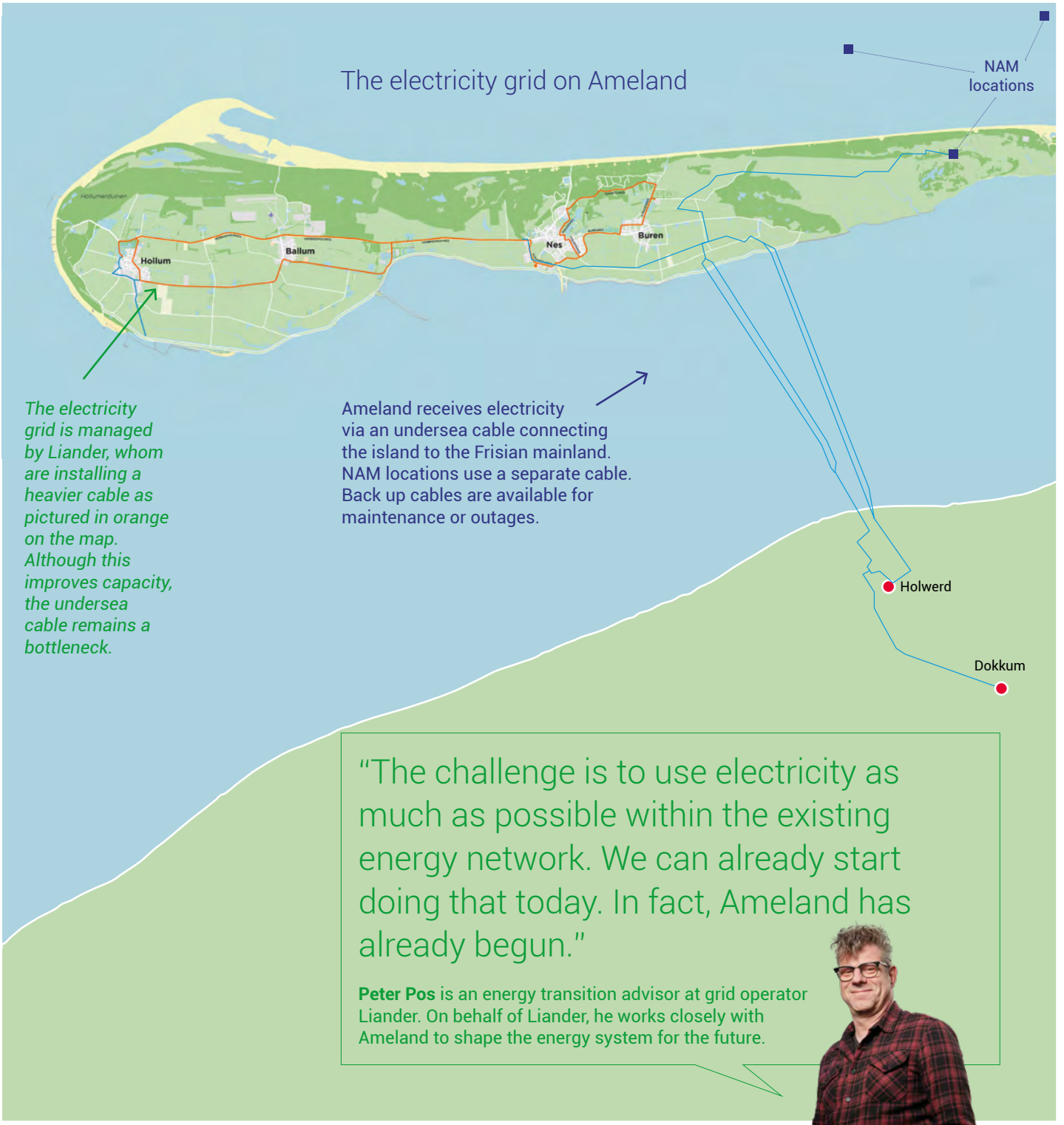
Grid congestion
A challenge and an opportunity

A large share of Ameland's electricity is generated locally through solar panels. At the same time, electricity demand is increasing due to the electrification of heating and transport. With only one connection to the mainland, the electricity network on Ameland increasingly reaches its limits. Sudden peaks in solar generation or electricity demand cannot always be handled simultaneously, leading to grid congestion.

Grid congestion is both a challenge and an opportunity. It forces innovation in local energy management and helps accelerate the transition to a stable and smart energy system.

By better matching electricity demand and supply, we use the available grid capacity more intelligently. For example, by using household appliances such as washing machines or boilers when the sun shines. Smart energy management systems (EMS) connected to P1 meters can automate this process. This way, energy is used more efficiently, stored for later use, and grid load is reduced , without residents having to actively manage it themselves. At the same time, residents gain greater control over their energy bills by using locally generated energy within their homes.

This results in a more robust system and makes Ameland more independent from the mainland grid. Energy generated on the island stays on the island.



"The challenge is to use electricity as much as possible within the existing energy network. We can already start doing that today. In fact, Ameland has already begun."

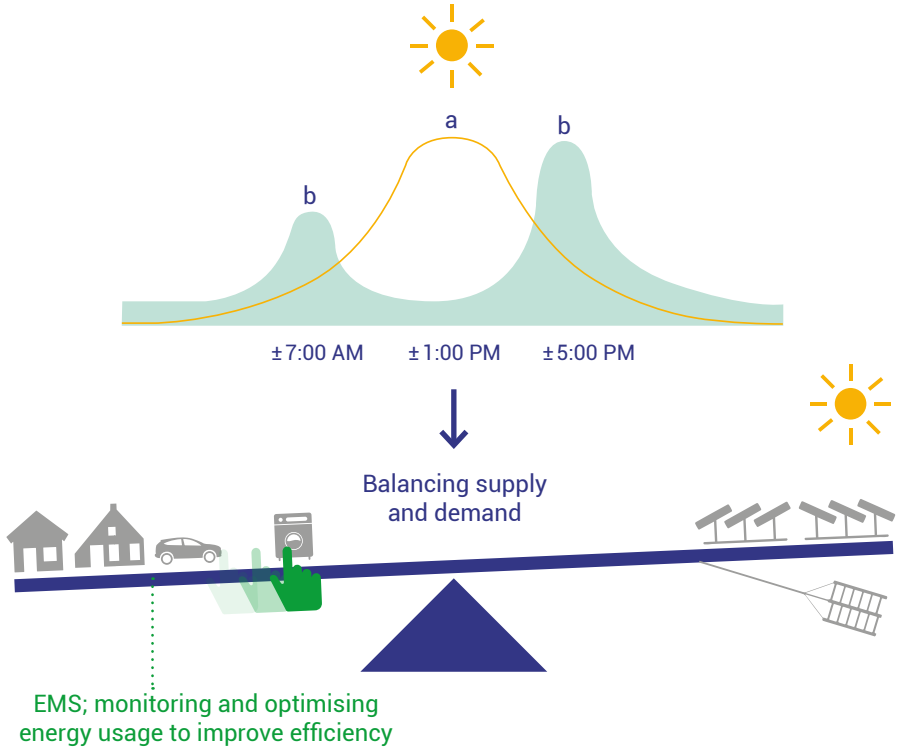
Peter Pos is an energy transition advisor at grid operator Liander. On behalf of Liander, he works closely with Ameland to shape the energy system for the future.

"We are used to an electricity grid that almost always works. We want to keep it that way, especially as we move towards a gas-free island and need more electricity. Grid congestion pushes us to develop a smart energy network more quickly. In that sense, it is also an opportunity."

As an energy transition advisor for the municipal council of Ameland, **Erwin de Boer** is exploring technical options for a smart energy system on Ameland.

Balancing demand and supply

As more solar panels generate electricity, a major production peak occurs around midday (see graph a). In the morning and evening, electricity consumption is highest (shown as b), while solar output is low or absent. These differences create consumption peaks that place additional strain on the electricity grid and make it harder to maintain stability and reliability.



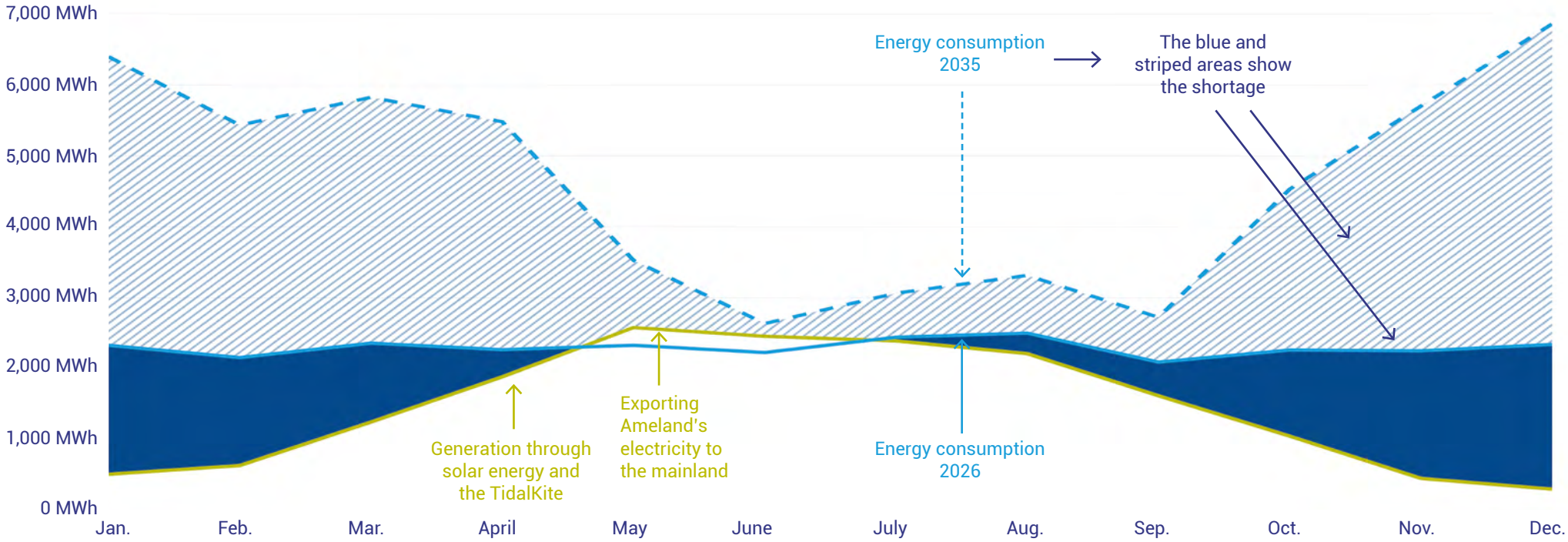
Ameland responds by increasing the use of locally generated solar power when it becomes available, bringing supply and demand into better balance. Additionally, a smart energy mix can help, such as east-west oriented solar panels combined with wind or water energy. As well as the storage of surplus electricity for later use. Or, conversion into other forms of energy. Through smart control systems, supply and demand are increasingly aligned.

Electricity demand and supply Ameland **2026 and 2035**

The image below shows how the electricity demand will be met in 2026 on a monthly basis and shows the expected demand profile for 2035. In 2026, part of the demand will be generated locally using solar energy and the TidalKite, while the rest will be supplied via the Wadden Sea cable. In the summer months, solar generation exceeds demand and electricity is fed back to the mainland (white area). The dark blue areas show the opposite: these are the times when Ameland needs electricity from the mainland to meet local demand.

The expected demand profile for 2035 shows that due to the increasing demand for electricity (electrification of heating and electric charging of the ferry), there will be more frequent and longer periods of local generation shortages (see the blue and striped areas). In order not to be dependent on the (expansion of) the Wadden Sea cable, this means that in the future, additional forms of local generation will also be needed, particularly sources that are available when the sun is not shining. The right energy mix: a combination of different forms of generation that complement each other in terms of time and availability.

Generation and consumption throughout the year



About the above model: the figures are modeled data based on actual consumption and the 2024 solar and TidalKite profiles. 2035 is modeled including the electrification of heating and the ferry (which is charged at night).

From late November 2022 to early January 2023, a trial with a hydrogen fuel cell took place on Ameland. With this trial, Ameland aimed to demonstrate that it is possible to store and release a portion of the solar park's output in a way that prevents the park from contributing to local grid congestion. The pilot was part of the European H2Watt project, in which local installers from Ameland were closely involved.

Scan the QR code for more information.

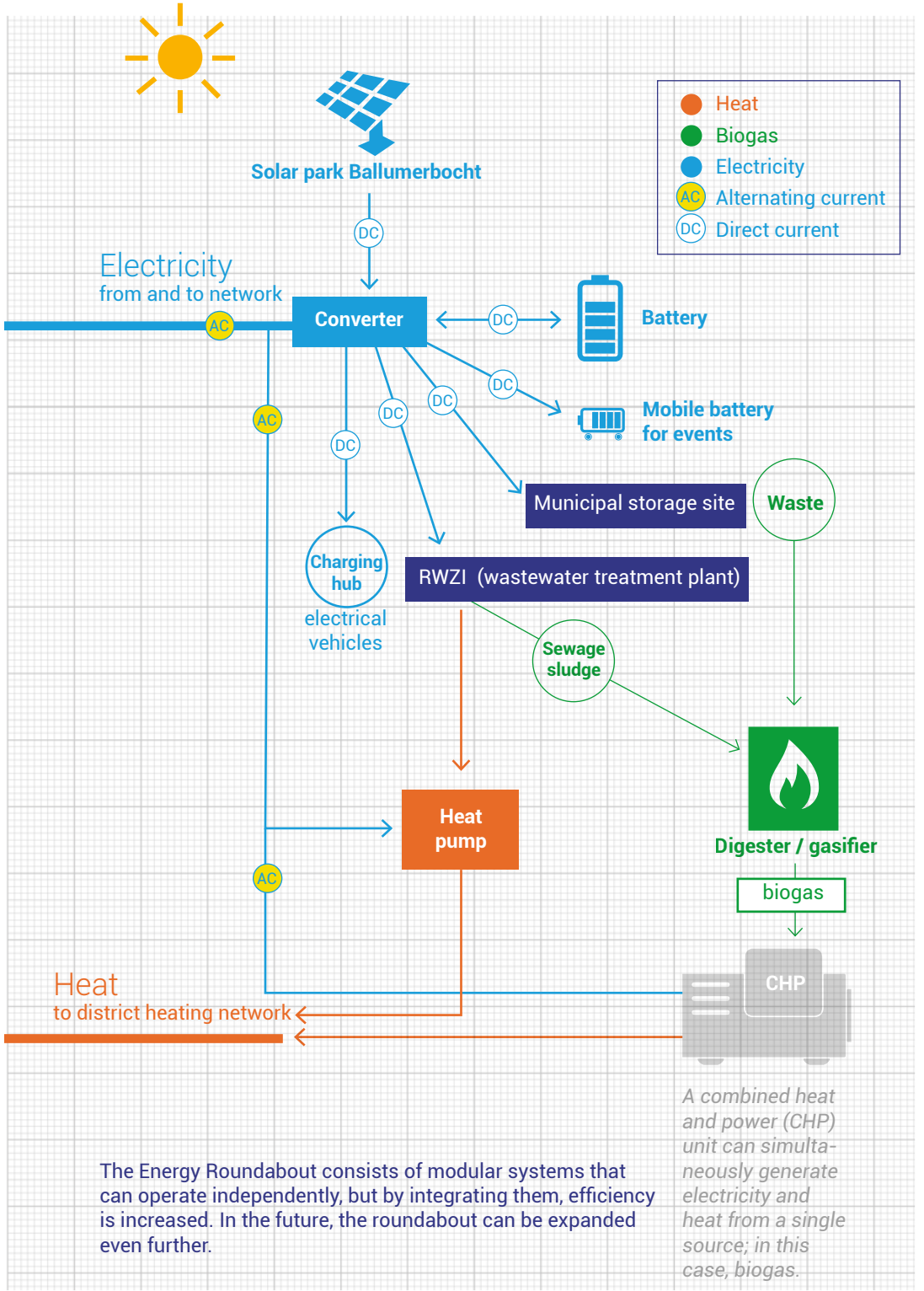
Storage, conversion, and connectivity in practice
The Energy Roundabout

A vital step in solving Ameland's energy jigsaw is the smart integration of various technologies and systems. By linking these components, we can better align and utilise energy supply and demand. The Energy Roundabout on Ameland is the first implementation of this approach: a network in which multiple renewable energy sources and storage technologies converge and reinforce one another.

The various components of The Energy Roundabout are planned for the municipal storage site at Ballumerbocht, which is near the connections to all networks. Additionally, the intended location is directly adjacent to the Wetterskip Fryslân a wastewater treatment plant (which can provide sewage sludge for gasification/digestion) and right next to the Energiepark Ballumerbocht solar park. This solar park will be equipped with a battery storage system, another essential part of the hub.

"The roundabout ensures that as much locally generated energy as possible on and around the island is also used on the island, by responding flexibly to supply and demand and by making smart choices in storage and conversion. As a result, the island is becoming less and less reliant on energy from elsewhere."

Erwin de Boer
Energy transition advisor



The Energy Roundabout consists of modular systems that can operate independently, but by integrating them, efficiency is increased. In the future, the roundabout can be expanded even further.

A combined heat and power (CHP) unit can simultaneously generate electricity and heat from a single source; in this case, biogas.

Smart connectivity

Smart saving, monitoring, heating, generating, storing, converting, and connecting... To coordinate these effectively, oversight is essential. An energy management system (EMS) plays a crucial role in this. This digital system directs and distributes energy from various sources to ensure that supply and demand remain in balance. Ameland has gained extensive experience with this through the European IANOS project.

PHOTO Kevin Kiewiet, MLND

Key insights from IANOS for Ameland:

1 Integration

Solar panels, heat pumps, and batteries only work optimally together when it is clear which components are linked, how they are connected, and for what purpose.

2 Insight

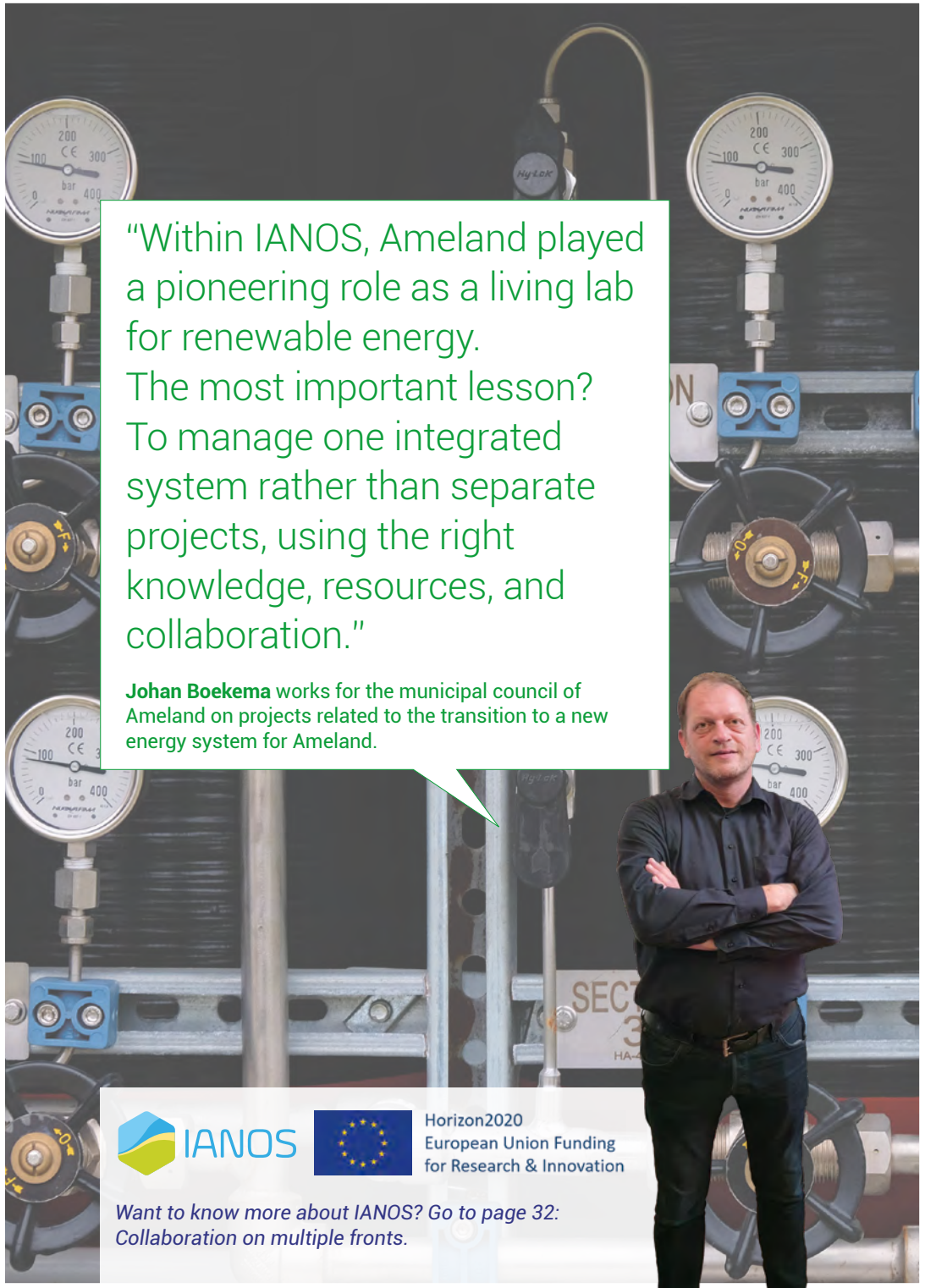
Insight into how much energy is available at any given time, and where it is needed, is essential for a balanced system.

3 Evolving legislation

Energy regulations are constantly changing. New concepts, such as shared grid connections, must either fit within existing frameworks or require legislative adjustments.

4 People and data

Technology is important, but collaboration and data sharing are equally crucial, privacy and data security therefore receive significant attention.



"Within IANOS, Ameland played a pioneering role as a living lab for renewable energy. The most important lesson? To manage one integrated system rather than separate projects, using the right knowledge, resources, and collaboration."

Johan Boekema works for the municipal council of Ameland on projects related to the transition to a new energy system for Ameland.

IANOS

Horizon2020
European Union Funding
for Research & Innovation

Want to know more about IANOS? Go to page 32: Collaboration on multiple fronts.

Collaboration
on multiple fronts

Together with partners in the region and across Europe, Ameland develops and tests smart energy solutions. We share what we learn so that everyone can move forward without reinventing the wheel. Here are a few highlighted examples.

Clean Energy for European Islands (CE4EUI)

Ameland collaborates with 30 other pioneering European islands, including Samsø, to generate all energy locally and renewably – faster than the official European climate targets. Through this program, Ameland receives support and expertise, specifically regarding heating networks.

IANOS

In IANOS, Ameland worked with partners from across Europe on ways to reduce dependency on fossil fuels. The project demonstrated how crucial a smart, well-coordinated energy system is for the entire island.

Interreg North Sea — Co-funded by the European Union

NESSIE

NESSIE helps train new technicians, such as installers and electricians, to address the major shortage of skilled professionals. Ameland acts as a connecting link to increase the number of experts available to install sustainable solutions, such as home batteries and energy management systems (EMS).

provinsje fryslân / provincie fryslân

Grid congestion is increasing. The Province of Fryslân aims to accelerate a solution by deploying energy hub coordinators. The coordinator on Ameland guides companies in coordinating their electricity usage, enabling the available grid capacity to be utilised smarter and collectively.

H2Watt

Within H2WATT, research was conducted on Ameland into how hydrogen can contribute to a more flexible and self-sufficient energy system. This included using a fuel cell to support electricity demand in part of a village.

REGIO DEAL WADDENEILANDEN

Through the Region Deal, the National Government, the provinces of Noord-Holland and Fryslân, and the island municipal councils invest in the broad prosperity of the islands. Funding from the Region Deal The Wadden Islands has been made available to accelerate the further sustainability of the Ballumerbocht on Ameland.

"Through my role in IANOS, I have seen firsthand how Ameland demonstrates that a smart energy system is not just technical, but primarily revolves around collaboration, trust, and local ownership."

Mark de la Vieter works for New Energy Coalition and, on behalf of the NEC, is a project leader for European projects in which Ameland works with other European parties to accelerate the energy transition.

The road ahead

The coming years will focus on making choices, running pilot projects and taking concrete steps towards a smart energy system for Ameland. Our priorities include:

What is our current energy demand (electricity, heat and fuels), and what additional demand will arise in the future?

With continuous and precise insight into generation and consumption, we can make increasingly targeted choices for generation, storage, and flexibility. It helps us track developments, make timely adjustments, and provide a sound basis for decisions.

Monitoring remains essential in 2026.

What can we still save, and what demand will remain?

Energy conservation remains one of the simplest ways to reduce the strain on the system.

We support property owners and tenants with advice and practical measures, such as information, tailored energy advice, and financial schemes.

What do we generate, at what moment, and what else is needed to meet future demand? Which renewable sources are we using to achieve this?

In 2026, Energiepark Ballumerbocht provides solar power.

We are exploring the possibilities for other forms of renewable generation of electricity and heat (from the ground, air, and (waste)water).

What can we store and/ or convert, and how?

We are working on large-scale storage of solar power at Energiepark Ballumerbocht.*

Through the European project NESSIE, we are taking steps in the field of home batteries. We are also exploring the feasibility of large-scale thermal energy storage in the ground.

** The pace of installing the battery at Energiepark Ballumerbocht depends in part on obtaining the necessary connection from the grid operator.*

How do we bring supply and demand together?

With Energiepark Ballumerbocht, we demonstrate how balancing supply and demand works in practice.

Through the European project NESSIE, we are focusing on home energy management systems (EMS). We are also researching what further steps are needed to smartly integrate energy flows on an island-wide scale.

Want to now more, interested in other projects or ideas?
Visit our website:
www.duurzaamameland.nl
Or send an email to:
duurzaamameland@ameland.nl

"We are working together towards a future in which Ameland can generate and use its own energy.
For Ameland, by Ameland.
Renewable and independent.
That aligns with what the inhabitants are asking for and that is what I remain committed to."

Luc van Tiggelen has been involved in the energy transition on Ameland for about 15 years. As the central figure at the heart of it all, he connects stakeholders and brings vision and implementation together with a keen eye for the practical reality on Ameland.

Gemeente Ameland

DUURZAAM AMELAND