VEKS

Annual Review 2023

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The photo series of the year *illustrates the preliminary work of VEKS' first electric boiler at Hvidovre Hospital. New exchangers and technical installations will be installed and all adjustments will be made. Furthermore, electrical supply, transformers, etc. will be put into operation.*

Photo: *Claus Peuckert Fotografi*

Preface, VEKS' Annual Review 2023

District heating – a shortcut to the green transition

"Fast, efficient and wise transition to green heat." This is the headline in the national energy crisis staff's (NEKST) recommendations to the Government regarding how we get the citizens to deselect natural gas.

The recommendations come at a critical moment in time where there is a need for maintain momentum of the green transition. In 2023, the price of fossil natural gas dropped and ended close to the level before Russia invaded Ukraine. The capital costs for district heating projects are still high due to a heated market. Besides, the biomass prices have been high in 2023 and the power prices have been very fluctuating. All in all, this means difficult framework conditions when it comes to converting the country's gas boilers to district heating.

The competitiveness of district heating must stand the test in these years. Therefore, the central recommendations from NEKST are important – including the fact that a clear message should be sent to the citizens with regard to when the gas system will be terminated. They should also be offered temporary heat supply if the gas boiler breaks down before the district heating arrives. Moreover, it is a key point that the framework conditions for district heating will be transparent and predictable. The recommendation for continuous use of the district heating pool to keep the green transition going is of particular importance. Furthermore, it is important to have a longer amortisation period for district heat pipes corresponding to the actual life – and more leeway when it comes to borrowing over a long-term period. Thus, a fair price for the customer is ensured.

A competitive and stable heating price must cohere with the reliability of supply. Therefore, VEKS has prepared a strategic plan: "Supply Plan 2050". One of the main topics is to show the way to a financially responsible phasing out of biomass-fired CHP and a reduction the waste-based CHP as with the oldest units being phased out. This is a wish from VEKS' owners and it adheres to VEKS' owner strategy.

As part of this strategy, VEKS has negotiated two agreements in 2023 on utilising surplus heat at a data centre and a carbon capture plant (CC) where it has been ensured that VEKS will obtain an attractive heating price. In 2024, we expect to start renegotiating the heat contracts for the large CHP plants, e.g. Avedøre CHP Plant and the waste-to- energy facilities, to ensure a good and fair distribution of risk and price between VEKS and the producers up until a phase-out takes place. The Supply Plan 2050 contains a very specific action plan for the future 4-5 years of effort which, among other things, will result in VEKS making the necessary and essential decisions in 2027 on heat pumps as a replacement for a large part of the biomass-based CHP which is to be phased out in the beginning of the 2030s.

In this way, more diversity is obtained – and thereby also more financial robustness – in district heating supply. Ultimately, this contributes to maintaining and improving the competitiveness of the district heating for the benefit of the green transition.

Steen Christiansen
Chairman, VEKS

A competitive and stable heating price must cohere with the reliability of supply. Therefore, VEKS has worked out a strategic plan: "Supply Plan 2050".

MANAGEMENT REVIEW 2023

When the hospital's *peak load central is going to be rebuilt from gas to power, it includes a number of instructions and documentation tasks which Project Quality Coordinator Niels Larsen (left) and Maintenance Engineer Christian Bergmann discuss here.*

Object and main activity

VEKS, Vestegnens Kraftvarmeselskab I/S, is an inter municipal general partnership which is operated as a non-profit enterprise. VEKS includes production, transmission and distribution of district heating in Vestegnen (Western Copenhagen) in the capital area. 12 municipalities with a total of 500,000 inhabitants are jointly and severally liable to VEKS' economy. The 12 municipalities are: Albertslund, Brøndby, Glostrup, Greve, Hvidovre, Høje-Taastrup, Ishøj, Køge, Roskilde, Rødovre, Solrød and Vallensbæk. VEKS was founded in 1984 and the primary objective of the company is to utilize heat from the CHP plants and surplus heat from waste-to-energy plants, major industrial enterprises, etc.

Mission: VEKS delivers secure, efficient and environmentally sound district heating.

Vision: VEKS will speed up the green transition and deliver efficient and sustainable energy solutions through partnerships for the benefit of our customers.

VEKS' district heating system

A total of 135km twin pipes have been laid with 62 heat exchange stations and 18 pumping stations transmitting heat to the local district heating systems. Most of the heat is supplied to VEKS from Avedøre CHP plant and the other CHP plants in Copenhagen and from the

A filter *ensures that the district heating exchanger is always supplied with purified water.*

waste-to-energy facilities ARGO and Vestforbrænding. The transmission system is controlled, adjusted and monitored from a 24-hour manned operations centre located in VEKS' headquarters in Albertslund. The supply reliability is high in the transmission company's area, as 26 local boiler stations can be used as reserves and for peak load during periods which are particularly cold.

Economy and organisation

VEKS consists of five separate areas within the same legal entity:

The name VEKS covers the consolidated activity within the given areas which are fully separated financially under the same CVR number.

Transmission

VEKS Transmission supplies 19 local district heating companies with heat in Vestegnen. The local district heating companies manage the redistribution to private customers, business customers and institutions. The heat supplied is equal to the consumption of 170,000 families.

Production

Køge CHP Plant produces electricity for the grid, steam for Junckers Industrier A/S and sells (internally) district heating to VEKS Transmission.

VEKS Gasmotor, Solrød, produces electricity for the grid and sells (internally) district heating for VEKS Transmission based on biogas delivered from Solrød Biogas A/S.

Distribution

Køge District Heating handles the distribution of district heating to customers in Køge. The heat is purchased internally from VEKS Transmission.

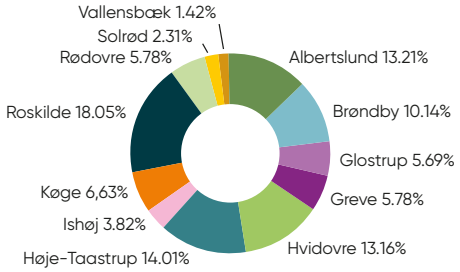
Tranegilde District Heating handles the distribution of district heating to customers in Tranegilde's industrial area in Ishøj and Greve. The heat is purchased internally from VEKS Transmission.

Legislation

VEKS is governed by S60 of the Danish Act on Local Government (Lov om kommunernes styrelse). Moreover, VEKS must, as a collaborative heat supply company, observe the rules of the Danish Heat Supply Act.

For instance, this means that VEKS is subject to a financial non-profit principle which implies that VEKS in its pricing of heat must allow for income and expenses of the partnership to balance over a number of years.

The ownership interest of the partners



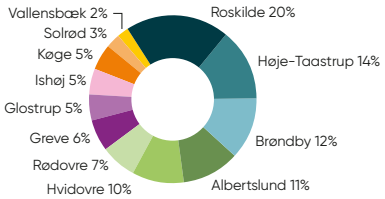
Key figures

The company's development over the past five years can be described as follows:

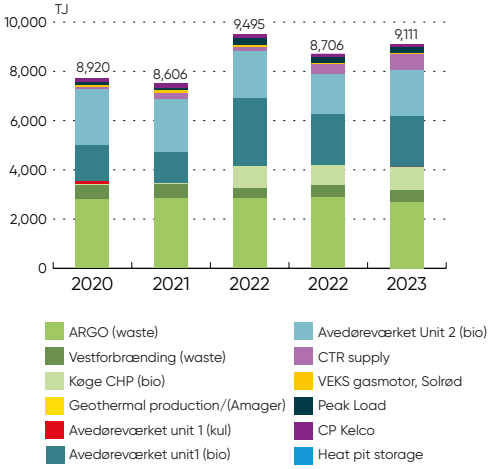
(mio. kr.)	2023	2022	2021	2020	2019
Net turnover	1,468	1,380	1,343	1,227	1,345
Operating profit or loss	-242	-73	-9	-21	30
Financial income and expenses, net	-38	-19	-18	4	-19
Net profit or loss for the year	-227	-56	86	14	23
Equity, end of year	120	82	104	15	-9
Assets, total	2,732	2,375	2,298	2,329	2,333
Debt, fixed assets	2,154	1,838	1,832	1,897	1,854
Number of employees as at 31 December	112	98	88	86	82
Net finance costs in relation to debt, fixed assets in %	2.0	1.1	1.0	1.0	1.1

The year's total result in VEKS is a deficit of DKK 227 million, which is primarily due to additional costs in relation to heat purchase. This results in a shortfall payment in relation to VEKS' customers, which must be collected over the coming year. VEKS is in dialogue with the Danish Supply Authority about extending the recovery over up to 5 years.

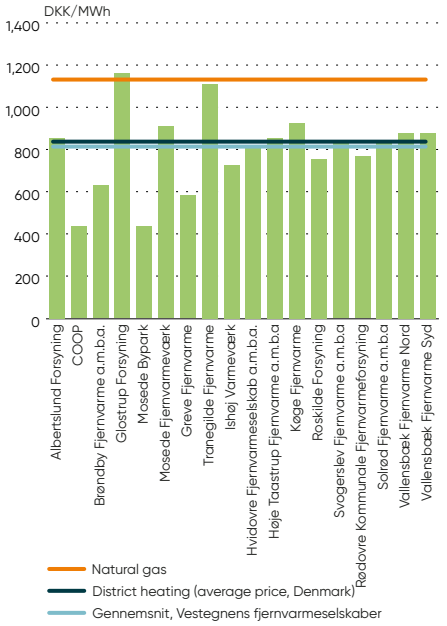
Purchase of heat in the municipalities



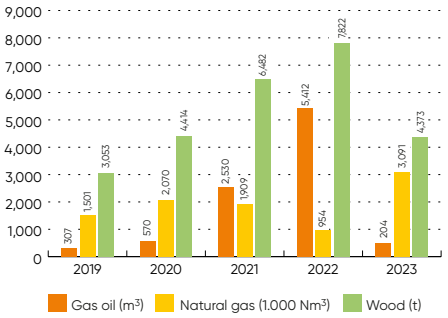
Development in heat production (TJ)



Heating prices with the customer



Fuel consumption, peak- and reserve load

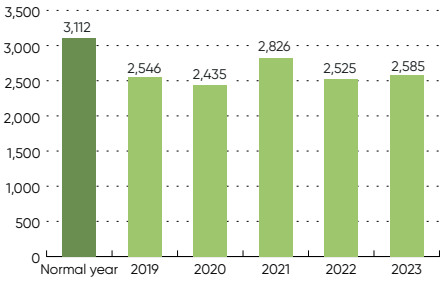


Heating prices paid by the district heating customers in Vestegnen

Pre-requisites:

- Prices according to the price statistics of the Danish Energy Regulatory Authority reported by the local district heating companies, December 2023. If the prices were not reported, the public prices are used – stated in the district heating comapnies respective websites.
- The average heating price is based on calculations made by the Danish District Heating Association for a "standard home" of 130 m² with an annual consumption of 18.1 MWh.
- There is no guarantee that all companies supply the type of "standard home" mentioned.
- The price is exclusive of connection fees.
- The price of heating with natural gas is provided by the Danish District Heating Association.
- The prices are inclusive of VAT.

Degree days



Expectations for 2024

Contract negotiations Ørsted

VEKS receives approx. 40-45% of the heat from the plant at Avedøre (units 1 and 2 and the straw-fired boiler) - owned by Ørsted. The agreement of buying heat from unit 2 of the Avedøre CHP Plant and the straw-fired boiler expires in 2027. Therefore, together with CTR VEKS will initiate negotiations with Ørsted about the future for unit 2 of the Avedøre CHP Plant and the straw-fired boiler, including CO_2 capture from here.

Contract negotiations ARGO and Vestforbrænding

VEKS receives approx. 35-40% of the heat from waste-to-energy plants. In 2023, it was adopted by way of a new bill that a competition exposure of the incineration suitable waste will be realised and that the waste-to-energy facilities have to be separated company-wise. It calls for new contracts between VEKS and ARGO and Vestforbrænding which have to be negotiated during 2024 so they are ready on 1 January 2025 where the Act will become effective.

Heat supply agreements

Together with the district heating companies VEKS has delivered heat to, initiated dialogues and negotiations of agreements which are to ensure that we get a solid contract foundation for the future district heating with the new technologies which we are going to use.

Surplus heat, etc.

On an ongoing basis, VEKS enters into negotiations on buying surplus heat from different suppliers. At the latest, an agreement was entered with Microsoft on buying surplus heat from their data centre in Høje Taastrup. In 2024, VEKS will continue negotiations with relevant parties on buying extra surplus heat. Likewise, VEKS will continue working on calculation to find out whether a heat pit storage in Roskilde will be profitable and maturing a project about a potential establishment of a electric boiler at Hovedcentralen in Roskilde.

Four cases

The cases of the year focus on the VEKS Supply Plan and projects stemming from VEKS' strategy efforts. They illustrate VEKS' commitment to the green transition and supply reliability.

Case 1

From where will we get the district heating? One of the many important questions which VEKS Supply Plan 2050 – issue 2023 focuses on and for which an action plan has been outlined. The goal of the supply plan is to emphasise paths in VEKS' continued green transition, obtain competitive heating prices and ensure supply reliability.

Case 2

When the chips are down, both procedures and experience form the basis for being able to act quickly and rationally. Case 2 *Emergency response: In theory, in practice – and in the future* describes VEKS' emergency response, however, also that the utilities sector is met by new requirements when it comes to emergency response, not least in relation to IT security.

Case 3

District heating – also based on power is the subject of case 3. The future district heating will to an increasing extent be related to power, either directly or indirectly. The case explores the potential of surplus heat from enterprises and from new sector connection technologies – e.g. CO_2 harvest and PTX factories – and the increasing importance of heat pit storages.

Case 4

In Case 4, *Present strategy*, challenges are described by way of strategic work the overall goal of which is to streamline and future-proof VEKS' Production. The department has decided to transform VEKS Strategy 2025 to specific focus areas so that they will be relevant to the employees of the department. However, it does not always go as planned.

Case **1**

From where will we get the district heating?

In Supply plan 2025, VEKS estimates how new technologies, among other things, may contribute to future district heating.

Where should the future heat come from when unit 1 of Avedøre CPH Plant most likely will be phased out in 10 years' time? Can we support the use of biomass when the sustainability of which has been discussed for a number of years both at home and abroad?

What are the consequences if the heat production from waste incineration is reduced?

How does VEKS operate in a world affected by a supply crisis as well as very fluctuating energy prices?

This is some of the questions which VEKS Supply Plan 2050 – issue 2023 focuses on and devises an action plan to. The goal of the Supply Plan is to emphasise paths in VEKS' continued green transition, obtain competitive heating prices and ensure supply reliability.

CO_2 emission

VEKS has reduced their CO_2 emission by more than 80% from 1990 to 2022. VEKS will work on obtaining further reductions, however, cannot reach the goal of becoming CO_2-neutral in 2025 which was the original plan. The reason is that both peak and reserve load and waste are still not CO_2-neutral heat production. In the future work with implementing action plans VEKS will assess

A new and far more *powerful power supply for Hvidovre Hospital's new electric boiler has been established. VEKS' maintenance engineers have replaced and installed electrical panels – and the brain of the system: The PLCs (Programmable Logic Controller)*

Case 1

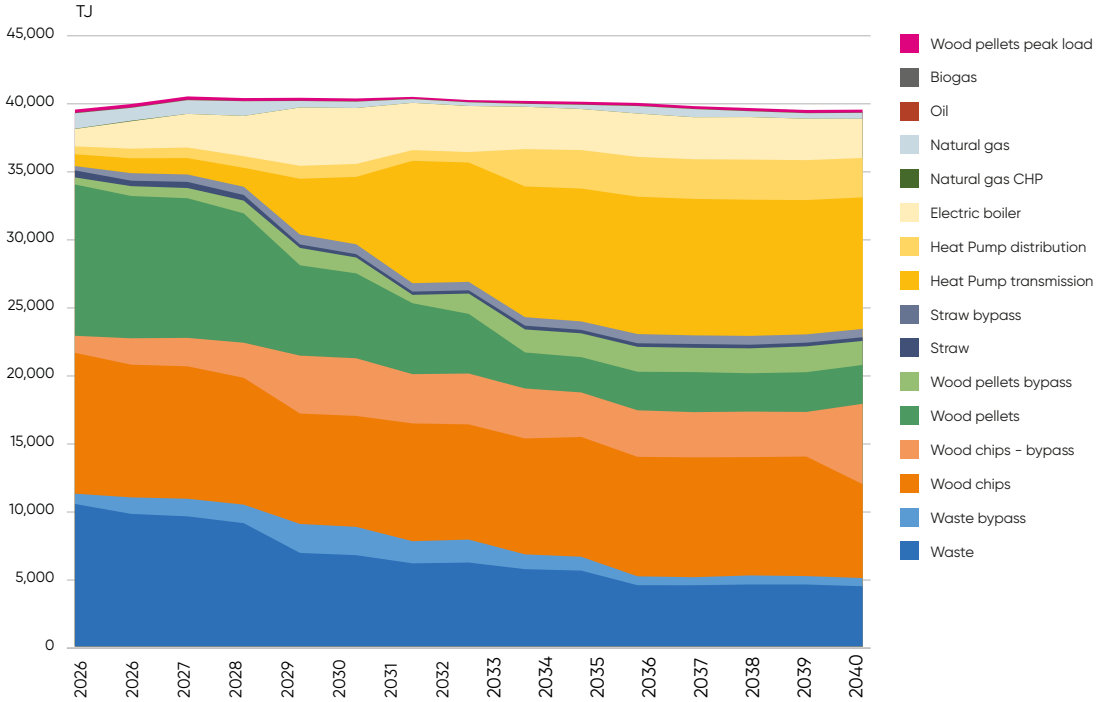
when it will be possible to become 100% CO_2- neutral – according to the Supply Plan, it cannot happen until 2030 at the earliest.

Reduced biomass and waste

At the CHP plants, the transition away from coal has resulted in large quantities of biomass being used. Biomass is considered a transition fuel and several players, including the owners of VEKS, have expressed their wish to reduce the consumption of biomass.

It is an extensive transition which must be implemented as 69% of the heat production in the Greater Copenhagen area was based on biomass in 2022. Consequently, the hypothesis in the projections of the heat production is that both unit 1 of the Avedøre CPH Plant and unit 1 of Amager CPH Plant will be closed down before 2034. Unit 2 of Avedøre CPH and unit 4 of Amager CPH Plant are expected to be operating up until 2040/45.

The combination of heat production in the Greater Copenhagen Area over the years in the basic scenario, including Vestforbrænding's own area



Development of heat requirements

As a result of the many conversions from heating with natural gas to district heating, the heat requirements in the VEKS area are expected to increase markedly up until 2028. However, the prognoses for the expansion of district heating are uncertain, especially when it comes to how fast the expansion will take place. This uncertainty must be analysed more closely and not least compared with the need for new base load.

Plan and Project Manager Lars Grundahl has, among other things, participated in the preparation of VEKS' Supply Plan 2050, in renegotiations of heat supply agreements and working groups in Varmelast. Lars was employed by VEKS in 2022

For VEKS the replacements of unit 1 at Avedøre CPH Plant will in particular be a big job in the years ahead when it comes to planning – please see the figure: The combination of heat production in the Greater Copenhagen area.

The Supply Plan contains a number of action plans – negotiations with CTR and Ørsted about the future of the two CHP plant units at Avedøre CHP Plant has first priority. As regards the discussions about the operation at AVV2 after 2027, one of the subjects is for how long such an agreement should be made.

At the same time, the frames for waste heat are changed when the waste-to-energy facilities are privatised and have to compete for the incineration suitable waste. This may add to the incentive of the waste-to-energy companies to increase the heating price. Consequently, the negotiations with ARGO and Vestforbrænding have high priority.

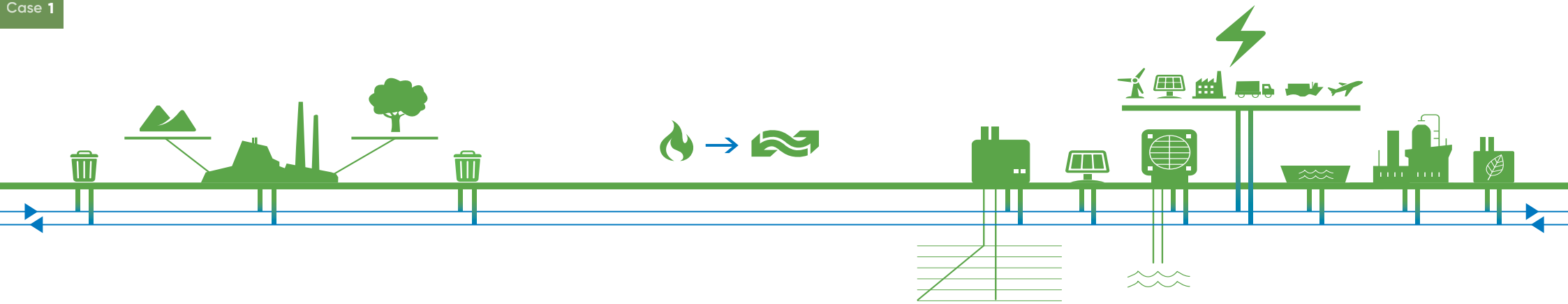
New technologies

Pursuant to the Supply Plan, large parts of the existing base load capacity from the central CHP plants will be phased out towards 2050. This is both due to the wish for furthering the green transition and because the individual plants are at the end of their working life. Therefore, new plants must take over the production of base load heat and heat pumps based on different energy sources are expected to become the central point in the changed production.

A number of technologies are undergoing development and testing. However, it is still uncertain when they will be fully mature for the market. For instance, this applies to some types of large heat pumps, geothermics, Carbon Capture and Storage (CCS) and Power to X (PtX).

According to VEKS' Supply Plan, there is a potential of 100-300MW local energy sources for heat pumps in the

Case **1**



VEKS area. The surplus heat from data centres constitutes approx. 50% of this potential, whereas the potential for industrial surplus heat is limited and the rest comes from sewage treatment plants and water treatment plants. Together with the distribution companies VEKS will assess how big a part of the potential is realisable – and ensure that it will be realised up until the closing of unit 1 at Avedøre CHP Plant.

The present prognosis covers from 10% to 40% of the present base load heat in VEKS.

Other types of large heat pumps are also being considered. It is assessed that large seawater heat pumps will be able to deliver up to 67% of the present base load need in VEKS if the whole potential can be realised. Another district heating source through heat pumps is geothermal energy. In the Greater Copenhagen area, potential and price tests pertaining to geothermal energy are initiated in cooperation with Innargi CTR and HOFOR.

New sector connection technologies, which can also deliver surplus heat, will soon be part of the Danish energy system. Ørsted is installing a CO_2 capture plant connected to the straw-fired boiler. VEKS has entered into an agreement with CTR on utilising the surplus heat from the new plant.

In the long term – if PtX plants are established in the Greater Copenhagen area – it will also be possible to utilise surplus heat for district heating.

Surplus heat from CO_2 capture at the waste-to-energy facilities can also become a future heat source, however, the time frame is uncertain. In one of the action plans for the Supply Plan, renegotiation of heat purchase agreements with Vestforbrænding as well as ARGO is included. The new technologies will also be included as negotiation objects.

Reliability of supply

As we have already mentioned, VEKS' district heat is to a great extent based on unit 1 of Avedøre CPH Plant today. Apart from a low heating price, VEKS also needs to ensure the continued supply reliability when the unit is phased out – among other things to comply with the demand to reduce the use of biomass.

Energy Planner Thomas Hartmann has contributed to VEKS' Supply Plan 2050 and participated in a number of negotiations with distribution customers and producers and partners in relation to VEKS' heat pit storage, EUDP application, etc.
Thomas has been employed with VEKS since 2017.

Sector connection

The future energy system will increasingly require interaction between the various sectors – all driven by the green transition with the desire to integrate renewable energy sources.

The sectors must be able to handle large fluctuations in the production of renewable energy. To carry out the transition as efficiently as possible, the synergies between the utilities sectors are utilised – and between supplies and customers.

However, with increasing sector connection the energy is moved between the sectors, e.g. you can speed up or postpone the consumption. All in all, with an increased connection between the sectors you may build up a competitive system with a robustness, flexibility and efficiency which would not be possible to obtain in separate sectors.

Case **1**

A number of future scenarios predict that an increasing part of the district heating will be produced by way of power – by means of heat pumps and electric boilers.

At the same time, the electricity sector is expected to become 100% CO_2-neutral up until 2030 as power will only be based on sustainable energy sources. As a consequence, hereof, the part of district heating being produced by way of power will also be CO_2-neutral. When the sun does not shine and there is no wind, VEKS needs to have a back-up capacity and heat depots to maintain the reliability of supply. Of course, this is also a focus area in the Supply Plan.

Close connection to power

As we have already mentioned, it is expected that VEKS' future base load capacity will rest on a foundation where the district heating is a bigger power consumer than power generator. This means that the heat price will depend more directly on the power price and the supply reliability of heat will become more closely connected to the power system. This makes demands of VEKS when it comes to being able to utilise fluctuations in the electricity market for producing power when the price of power is high – and consuming power when the price is low. For instance, this is supported by the need for heat pit storages in the grid. Heat pit storage is a low-priced way to store energy: It may save peak load during winter, increase the possibility of producing heat on waste during summer and optimise the heat production at CHP plants, heat pumps and electric boilers held up against the power price. Case 3 describes VEKS' heat pit storage projects, etc.

Moreover, there are limits to how much the district heating system can depend on electric boilers for peak and reserve load. This especially applies if the electric boilers can be turned off because of the electricity net-

Reduced temperature

If you wish to reduce the heat loss and increase efficiency in future production technologies, a reduction of future production technologies in the transmission network and distribution networks are important parameters. Therefore, an assignment in VEKS' action plan for 2025 is to clarify how much and when the temperature can be reduced. The construction of hydraulic models in VEKS – for the purpose of conducting the analyses - has already been initiated.

***Several external** cooperative partners are involved in the installation of the new exchangers. Here, Welder Casper Bryde from Wicotec Kirkebjerg is cutting a pipe for welding.*

work. VEKS adheres to Energinet's plans on reinforcing the electricity network in the Greater Copenhagen area and the challenges with the direct connection to the power system will be analysed in the future supply plans. A multi-stringed heat production which does not only depend on one energy source is required. This transition is also found in the basic scenario where power-based heat production will deliver an increasing share of the heat.

Action plans

One thing is words and plans – another thing is action. An essential element of the Supply Plan is to point out the way for what needs to be done and when it needs to be done.

Below, the overall "Outline of action plan" is shown. It appears from this action plan which decisions need to be made to reach the goals in question.

Outline of action plan

Foundation

According to VEKS' Supply Plan 2050, district heating will form the basis of the total transition of the energy system to renewable energy. District heating is an important player in different sector connections.

Case **2**

Emergency response: in theory, in practice and in the future

Real incidents and exercises contribute continuously to the development of VEKS' emergency response. At the same time, the supply sector is met with new emergency response requirements pertaining to not least cyber security.

When the chips are down, intuitive understandable procedures and experience from drills are prerequisite for being able to act rationally and fast.

Alarming overpressure

On 20 June, VEKS' emergency response in practice stood the test when an unintentional operational incident occurred – in VEKS' world it was named "30 bar in the Transmission System". The system is designed for a maximum pressure of 25 bar.

Case **2**

In connection with large-scale planned maintenance work, a pressure build-up occurred during shut-down. A coincidence of unfortunate incidents caused a pressure rise in the transmission system. The consequence was a partially flooded construction where only material was damaged. No persons were affected or influenced in any way.

The reason for the disproportionately high overpressure in the system was that two errors occurred simultaneously. One valve in a distributing construction was unintentionally shut and its position could not be read in the operation centre due to reprogramming work at the station in question. Consequently, the operation centre did not receive any error messages. There was no indication that the valve was not open.

Secondly, the increasing pressure in the system did not result in a "normal and expected" downward regulation. At another place in the system, an excess pressure release which should automatically stop the pumps contributing to the pressure build-up was missing due to reconstruction. The pumps continued to run. All in all, a hydraulic imbalance causing the pressure to become even higher until someone intervened.

The primary damages from the pressure impact were a partially flooded station in Vallensbæk when a pipe packing was shot out. Moreover, several safety valves lifted at a number of stations.

Team Leader of Maintenance Jonas Olesen has been project manager of the strategy project Asset Management and Risk Governance in VEKS. Jonas was employed by VEKS in 2017

DPO, Information Safety Coordinator Niels Laursen has implemented VEKS' GDPR rules, VEKS' security policies and strategy, training of VEKS' employees, emergency drills and works as project manager of the NIS2/CER project. Niels was employed by VEKS in 2017

Concurrently with preventing further damage, communication had first priority. The local district heating companies in question were continuously informed, however, they had also close contact to Varmelast and VEKS' producers of heat.

VEKS re-established the district heating supply in 1.5 days. In the meantime, local district heating customers were only affected briefly as alternative supply could be created.

It costed many primarily internal personnel resources to repair the damage. Having reestablished the system and repaired the damage, the whole situation was evaluated to, not least, find chains of causation. How did the system and components react? Were our machines/equipment working properly and was our emergency response functioning? Everything was checked to identify causes, list experience and thus achieve learning in order to prevent similar situations in the future.

Of course, the incident "30 bar in the Transmission System" was also held up against VEKS' emergency response. Is VEKS' manual for emergency response working? Are elements missing in light of what was needed in the real world?

Full-scale crisis management drill

Later that year, VEKS' emergency response organisation carried out a theoretical drill which involved many colleagues from a number of departments. The superior goal of the drill was to check whether the laid-down procedures were followed, and that people understood the roles and responsibilities.

The scenario of the drill was that an alarm came into the operation centre about a fire arisen in the ventila-

Case **2**

tion system at Hyrdehøj in Roskilde and that the fire had spread. An important aspect of the drill was also that the outdoor temperature was minus 12 degrees. In this drill, the consequence was acute lack of district heating: Hyrdehøj could neither supply the Svogerslev central nor Hovedcentralen in Roskilde.

The theoretical crisis escalated along the way when the exchanger in Svogerslev sprang a leak resulting in a steamy central. Maybe there was also an area close to Hyrdehøj with vulnerable citizens, e.g. a residential home?

When the crisis occurs in VEKS Transmission, there are three units in VEKS' emergency response: The operations managers at the main central, the emergency response group which analyses and acts and the crisis staff with the strategic and communicative responsibility.

Many questions were raised along the way in the crisis drill and everybody tested their roles, responsibilities, reporting requirements, cooperation, development tendencies of the crisis, time perspectives, etc.

All colleagues found the right auxiliary tools, not least by way of practical cards which are found physically and online at VEKStra (VEKS' intranet).

The drill was finished by scaling down the crisis. Svogerslev's supply was reestablished and Hyrdehøj would be able to start the heat supply within – the fictive – 8-10 hours.

Important and safe learning along the way was that the emergency response system, practical cards, alert lists, etc. functioned as intended.

Maintenance Engineer Christian Bergmann *reports back to the control room regarding process signals. After Hvidovre Hospital, we may, in the long term, consider adapting the peak load boilers at Hovedcentralen in Roskilde, Brøndby Strand and Albertslund.*

Case **2**

The emergency response group agreed that plans and organisation were followed and there was good communication in the form of chronological logbook and listing of focus areas. The crisis staff requested new contact lists, map overview (e.g. GIS maps which are online) and had a focus on communication from the beginning.

An offshoot of the drill is that emergency response could be an obvious subject at a meeting in VEKS' customer forum.

The future emergency response– NIS2

During 2024, a new Danish preparedness act will be passed in which connection the Danish Energy Agency will set out executive orders and guidelines. The national initiatives will be based on a "NIS2 directive" which will be a joint instruction for improved and uniform cyber security in the EU.

In May 2023, cyber security became frightening present to the supply sector when 22 supply enterprises were hit. At the same time... If the attack had succeeded, it would have affected 100,000 power and district heating customers.

Due to its size, VEKS will be covered by the future Danish Preparedness Act NIS2 (Net and Information Security). The new Act especially focuses on how to protect one's information and industrial technology against hacking, physical overload, theft, etc.

Moreover, supply enterprises the size of VEKS must comply with a new EU Directive CER (Critical Entities Resilience) where the enterprises must document their resistance: Preventive measures and which plans exist for establishment after an attack/crisis against the physical assets of a supply enterprise.

There are a wide range of threats which may hit supply enterprises. For instance, threats could be fire in a technical system, extreme rain, technical attacks on critical infrastructure, etc. Based on risk analyses they must assess whether the required initiatives are implemented compared to the critical infrastructure, however, also assess measures to minimize the probability of a negative incident. In case of a critical incident despite VEKS' defence, VEKS is working with contingency plans ensuring continued supply.

For a number of years, VEKS has worked with information security relative to technical protection, training of employees, emergency response drills and supplier agreements.

Furthermore, a project has been initiated to ensure that VEKS observes the new directives. There is a great deal of work ahead of us, however, as mentioned before, the work with information security is not new. Therefore, the foundation is good when it comes to assessing whether VEKS lives up to miscellaneous standards within information security and protection of the physical assets required when it comes to supply reliability.

The NIS2 Directive contains minimum requirements to

- Risk management of cyber security risks, including requirements to the management's inspections and control of risk assessments, minimum measures, management of supply, reporting obligations, etc.
- Reporting obligations, including informing customers and partners respectively and inspection of important current and potential security incidents. There is a time limit of notifying inspection of 24 hours for early notification and 72 hours for incident notification.
- Inspection authority and sanctions, including extended audit and control authorities and possible sanctions. This includes suspension of and responsibility for members of management, obligation to publish missing compliance with obligations and penalties of up to DKK 75 million or 2% of the revenue of the enterprise.

Source: Kromann Reumert

Case **3**

District heating - also based on electricity

The electric boiler *at Hvidovre Hospital will be in operation from 2025. When the electrical panels are installed, there will be a number of tasks involving quality assurance. Project Quality Coordinator Niels Larsen has had the task of handling the overall coordination of the large-scale electrical work.*

In the future, district heating will to a greater extent either be based on or related to power. For instance, this could be surplus heat from establishments or other energy sources which are utilised through heat pumps or surplus heat from new sector connection technologies, e.g. CO_2 capture and PTX plants. In this connection, the heat pit storage will play a considerable role.

CHP was an absolute cornerstone in the development of the district heating system all over the Greater Copenhagen area. Joint production of heat and power at the CHP plants has at one and the same time resulted in large resource savings and thus a reduced environmental impact. Therefore, there has been a close cooperation between the power and district heating systems through many years.

When the future district heating will also be based on electric heat pumps and electric boilers in the future it will affect the division of roles. The district heating sector will to a greater extent draw on the power system as power consumer than power generator which has so far been the case. This is realised through the present co-production at the CHP plants.

Case **3**

In the long term, VEKS' strategy is to withdraw from the present, primary utilisation of biomass which requires time as well as analyses to find alternative forms of production. The projects relating to the "electrified district heating" are related to VEKS' superior Supply Plan 2050 – see case 1 page 10.

It is not only about scanning, intentions and analyses on the drawing table. Several projects are already initiated.

Dependency

The district heating sector is also facing big changes in the years to come, as the heating price will be more directly dependent on the prices of the electricity market and the supply reliability of heat will be closer connected to the power system. This is due to the fact that a large part of society is being electrified and that there are extensive plans for expansion with wind power and solar power cells.

The electrification offers a number of possibilities, however, also challenges to district heating production, transmission and distribution. It requires that we have a flexible and solid district heating sector which is adjustable to the fluctuating power prices and power production.

The expansion with wind power and solar power cells – and the expansion rate of PtX – will play an important role in the development of the power price and thus the heating price. An electricity sector based on renewable energy should entail a sufficiently low power price for enough hours in order for an increase in the electrification of the heat systems to really pay off. It should be possible to use wind and sun for green, however, also low-cost heat supply for district heating customers.

We need a multi-stringed district heating supply that is robust when it comes to fluctuations in the various energy prices. There must be a balance between the various heat production technologies so that the district heating can utilise the hours where the power prices are low to operate heat pumps, etc. On the other hand, when the power prices are high, the central plants can produce CHP and thus district heating.

Monitoring of the power market will to a high degree be a future task for the district heating sector. It is partly about promoting the green transition, partly ensuring a stable and competitive heat supply to VEKS' customers. It requires dialogue with politicians, authorities as well as power generators on how the total sector adjusts best to the green power market and the changed framework conditions for the district heating.

Surplus heat

Utilisation of surplus heat has long been part of VEKS' supply strategy which has always been characterised by no heat being wasted! Financial barriers could be in the way, as the projects should make sense and be profitable for all parties involved.

Most often, VEKS' own projects are realised in close cooperation with external parties, i.e. energy companies and enterprises. And some supply companies have collected surplus heat by way of local commitments.

Since 2017, VEKS has cooperated with CP Kelco on utilising industrial surplus heat from previously noisy cooling towers. The surplus heat corresponds to the heating of 2,200 residences – *please see box Surplus heat from CP Kelco.*

Many new energy technologies enter the market: seawater heat pumps, CO_2 capture, PtX, geothermics, etc. Some of the new technologies will contribute to surplus heat which may be utilised in the district heating systems.

Surplus heat from CP Kelco

The noise problems stemming from the cooling towers of the pectin factory CP Kelco were originally the reason for further analysis. Instead of building giant noise deflection walls it turned out that it was no longer necessary to blow the heat away, as it was actually possible to utilise the energy in the district heating.

At one and the same time, a noise problem stemming from the cooling towers of CP Kelco was solved by way of an environmentally sound, resource saving and profitable project.

From a technical point of view, a heat exchanger utilising the waste heat and heating the district heating water up from 47 to 72 degrees was installed at CP Kelco's factory in Lille Skensved. The effect represents approx. 1.5% of VEKS' total heat purchase and the surplus heat heats approx. 2,200 residences.

District heating pipelines were already established in the transport centre in Køge which is close to CP Kelco. Thus, it was only necessary to establish a relatively short district heating pipeline from CP Kelco to the existing district heating system – this factor has been important to the economy of the project.

The project which was put into operation in 2017 has gained national as well as international attention.

Team leader for Plan Anders Rosenkjær Andersen has, among other things, helped preparing agreements regarding the new green technologies and contributed to VEKS' Supply Plan 2050, version 2023 – see case 1.
Anders was employed by VEKS in 2022

Case **3**

The most recent examples are VEKS' contracts about utilising surplus heat from data centres. Microsoft and VEKS have entered into an agreement on reusing surplus heat from a data centre in Høje-Taastrup the building of which Microsoft is engaged in. The surplus heat from the data centre will be able to heat 6,000 residences – probably from 2025. Yet another agreement with a data centre is probably on its way.

As examples of local commitment, Høje Taastrup District Heating has for instance entered into agreements on utilisation of surplus heat from data centres owned by Nordea as well as Global Connect. Moreover, FORS in Roskilde utilises the surplus heat from a wastewater heat pump.

VEKS and CTR have also agreed on utilising surplus heat from Ørsted's future CO_2 capture plants on the straw-fired boiler at Avedøre CHP Plant. The CO_2 capture plant will capture 150,000 tonnes of CO_2 on an annual basis. The plant uses straw from the local fields in Zealand to produce power and heat for the Greater Copenhagen Area and the biogenic CO_2 from the chimney will captured and stored.

When the future CO_2 capture plant is up and running, large amounts of surplus heat are created which generate low-cost, green district heating. The surplus heat can heat up 16,000 households in the Greater Copenhagen area.

Heat storage

A pit heat storage is a low-priced way to store energy: It may save peak load during winter, increase the possibility of producing heat from waste during summer and optimise the heat production at CHP plants, heat pumps and electric boilers up against the power price. The heat storage has special value as it renders extraordinarily high heat production possible at the power producing CHPs when the power price is high and extra

Electric boiler in Hvidovre

At Hvidovre Hospital, VEKS is working on rebuilding the peak load unit from gas to power. Firstly, more units had to be pulled down and the central emptied to make room for the future electric boiler.

As the photo series of the year illustrate, they are working on installing new exchangers, technical installations and all adjustment. Furthermore, the electrical supply, transformers, etc. are commissioned.

While the reconstruction takes place, the hospital is of course supplied with an emergency supply. VEKS uses its mobile exchanger, and the boilers are standby at Lejerbo Varmecentral.

In VEKS' Peak and Reserve Load Strategy electric boilers are actually assessed as being the best alternative to the transition to green peak load capacity. Electric boilers are also part of VEKS' Supply Plan as an important tool for phasing out the use of fossil fuel for peak load (now oil & gas) for the benefit of a more environmentally friendly production.
The reconstruction of the peak load unit at Hvidovre Hospital is VEKS' first electric boiler project. The harvested experience from the project will form the basis of the future replacements of VEKS' peak and reserve load boilers. Besides Hvidovre, it might be possible to adapt the boilers at Hoved Centralen (Roskilde), Brøndby Strand and Albertslund.

The electric boiler at Hvidovre Hospital is expected to be commissioned in 2025 with a total expected capital expenditure of DKK 97 million.

Case **3**

heat on power consuming heat pumps when the power price is low.

Together with Høje Taastrup District Heating, VEKS has established a heat pit storage with 30MW charging and de-charging effect - with an energy content of 3,300MWh.

The storage is in practice an expression of sector connection between electricity and district heating. When district heating is produced on power to a greater extent in the future, and in a world with substantially fluctuating power prices during a day, the value of heat pit storages will increase. You add and take heat energy depending on price, supply and demand.

Both the heating companies and the producers benefit from the project which is why the producers have also contributed financially to the storage. For instance, Ørsted will benefit from being able to store the heat when the power price is high.

Waste-to-energy plants, such as Vestforbrænding and ARGO, benefit from the storage, especially in the summer where the heat can be difficult to sell due to low heat consumption. CTR and VEKS benefit further from the heat pit storage, as the storage can also save peak load in the winter and in some cases reserve load. Today, such local boilers are typically based on fossil fuels.

The heat pit storage is a development project and has moreover received a subsidy of DKK 13 million (for testing new materials and a measuring programme, etc.) from EUDP which is the Danish Energy Agency pool the aim of which is to support development projects.

All in all, the project will contribute to speed up the development within heat pit storage which is a fast growing field within the entire district heating sector.

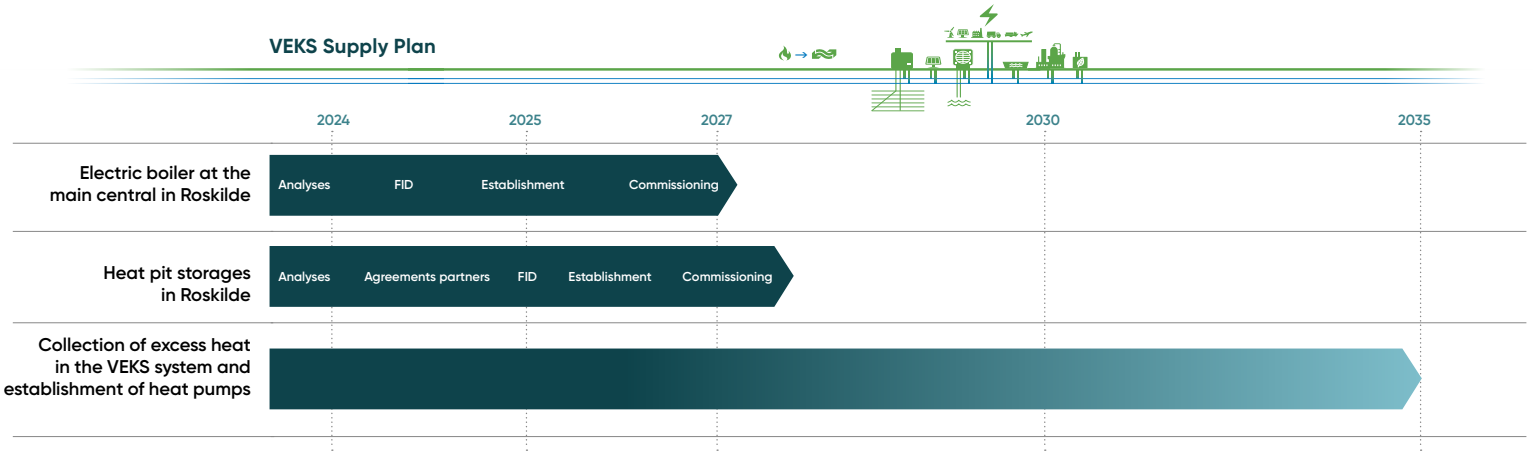
VEKS has analysed the value of yet another heat storage in Roskilde which is approx. 3 times as big as the one in Høje-Taastrup. Therefore, Roskilde Municipality has reserved a site for the storage in cooperation with VEKS. The analyses are expected to be finished in 2024.

Timeline

Below, you find an example from VEKS' Supply Plan 2050 where the subjects of this case are turned into action over time:

Finn Bruus is project manager at Høje Taastrup District Heating and VEKS' heat pit storage – and is specialist coordinator for project management/the project model in VEKS. Finn was employed by VEKS in 2018.

Timeline for electric boilers, heat pit storages and collection of excess heat and heat pumps



For the electric boiler and heat pit storage in Roskilde it is expected that FID (Final Investment Decision) should be taken at the end of 2024 and beginning of 2025. Decisions should be made on an ongoing basis as regards collecting excess heat and establishing heat pumps.

Case **4**

Present strategy

VEKS Production has decided to transform VEKS Strategy 2025 to specific focus areas so that they will be relevant to the employees of the department. However, it does not always go as planned.

The overall target is to streamline and safeguard the future of VEKS Production which includes Køge CHP Plant and VEKS Gasmotor in Solrød. However, how does the individual colleague consider themselves in an overall business strategy? The management decided to revise VEKS' Strategy 2025 to make it more concrete for this exact department.

Vivid and relevant

The power plant manager and team leader have worked on "translating" VEKS' Strategy 2025. In this management team the intention was very clear: "We want to make VEKS' strategy vivid, relevant and present to the employees in VEKS Production."

Seven focus areas from the superior strategy were re-written – please the figure on the right, where main subjects from VEKS Strategy are "translated" into VEKS Production.

VEKS Production Strategy 2025

Ensure the future of production

Core business

Daily operation of KKV and VGM

- Competitive heating price
- Control of the economy
- Good cooperation with partners
- Daily ad hoc assignments
- Audit
- Training new employees
- Increased focus on sale of power and Varmelast
- Transfer of gas engine for team operation
- Finishing commissioning of the flue gas condensation

New green sustainable heat production

Future-proof

We put our own house in order "Green for real"

Great focus on the environment

Organisational development and culture

Good working environment

Asset Management

Projects in the production

Data control, analysis and artificial intelligence

Data

Asset Management

Projects in maintenance

We take care of data

Process controlled business

Case **4**

In operation

The strategy work in VEKS Production did not stop at the superior themes. The management team researched it further and added 43 projects under the individual strategy initiatives and 9 extra projects under the Core Business which is the daily operation of VEKS Production.

Some of the listed projects were already ongoing, others were on their way. At the same time, there was a notable variation in the nature and scope of the projects, as some projects required in-depth analyses and perhaps a multi-annual effort. Other projects could be handled by way of a prioritised, focused effort, e.g. wastewater permissions and noise measurements.

Good intentions

The management team took leadership and ownership in the roll-out of the strategy for VEKS Production. "Then it was all clear as daylight." In the end it did not go quite as planned and as the managers admit: However, it went exactly as planned when it comes to challenges in communication and change management... From the managers' perspective the whole strategy with the relating projects was ready to be rolled out. You see, the management team had defined the frame and content themselves. On the other hand, the employees saw the strategy, focus areas and projects for the first time when it was introduced on a nice, informative poster.

The headline form of the projects in the poster turned out to give rise to a number of new questions for some employees. What do the individual words mean to me?

A recognition that some employees could almost "hurt themselves on the strategy" spread in the management team.

For instance, one individual project No night work received disproportionately much focus and resulted, unfortunately, also in several misunderstandings. Was it about an improved working environment? Would people get fired? All in all, they agreed on removing the project completely in connection with the update of the strategy projects. This was an example of the fact that a headline may cause more worries than be of benefit.

Unfortunately, the project "Storage" also gave rise to erroneous conclusions: Was it about a whole new storage building, employing a new storehouse clerk or...? First of all, we must determine the framework and requirements in order to be able to prepare an action plan.

A long-term project regarding establishing a flue gas condensation system at KKV is now finished and put into operation – please read more about it in the side story Energy in hot smoke.

Fortunately, a parked project has yet again seen the light of day. Due to lacking resources, Køge CHP Plant's visitor service for schoolchildren had come to a standstill. VEKS has now engaged a part time employee who is trained as a teacher and who is in the middle of planning and carrying out lessons and tours at the plant together with local teachers.

"You could hurt yourself on the strategy"

To make the strategy work vivid and operational, we need to discuss what the individual words mean to me – and to you.
Quote Henrik Lindhardt

Henrik Lindhardt is Team Leader within power and has been part of the team since VEKS took over Køge CHP Plant in 2012. Henrik was already employed as an industrial electrician at the plant which was owned by Dong Energy back then.

The Future

Although, the road in the roll-out of the strategy work has been bumpy, the process does not stop. In the most recent auditing of VEKS Production's own strategy, a number of new projects have been added which can either be launched now or have a planned start up. The new projects go to great lengths. There are plans on checking the possibility to optimise and integrate an electric boiler as emergency supply. Perhaps it is also time to check if it would be an advantage to have a new wood chip transport?

All in all, many resources were spent on explaining the content of the project in the first strategy version.

The learning is that the employees are included in the update of the strategy for VEKS Production at an early stage to ensure co-determination and commitment. Consequently, the strategy becomes vivid and present to VEKS Production's employees – and reflects everyday tasks.

Case **4**

Energy in hot smoke

Today, Køge CHP Plant has only one unit which was built in 1998. The life is estimated to year 2040. Originally, unit 8 did not produce district heating, as there was not even a local district heating system. It did not see the light of day until VEKS established Køge District Heating. The unit was rebuilt as a back pressure plant with a combined power and heat production as one of the first things when VEKS took over in 2012.

A large-scale energy saving project was initiated in 2019: A flue gas liquefaction plant was installed which can utilise the energy in hot smoke for district heating.

In brief, flue gas condensation makes it possible to recover large amounts of heat from flue gas. The temperature has been lowered in the gas from 130-140 degrees to approx. 40-45 degrees. They hope that it will be possible to lower the temperature to 35 degrees over time. Finally, the cooled gas is sent out through the chimney.

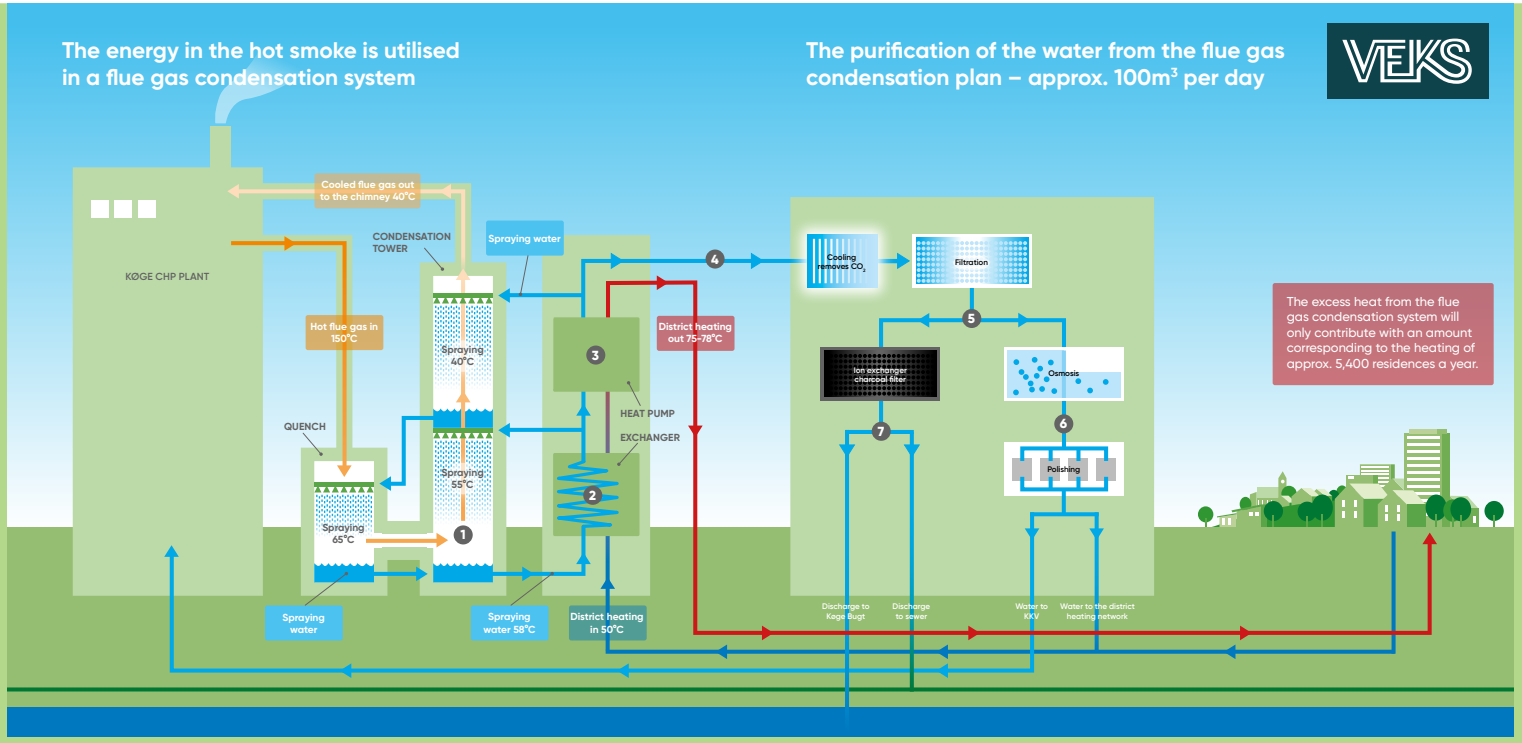
From a practical point of view, the condensation in the tower takes place as follows: the hot gas is sprayed with water which is collected and pumped through a heat exchanger whereby the energy is exchanged over into the district heating water. Literally, the "watering" takes place by way of two gigantic showers.

The heat in the gas is converted into hot water which is of benefit to VEKS' customers. The fact is that you will gain a lot - both financially and environmentally. The CHP plant will produce more heat with the same amount of fuel. The surplus heat from the new flue gas plant will alone contribute to what corresponds to heating of approx. 5,400 residences per year. Thus, the project also reduces the district heating price in overall terms.

A profitable added value of the project is the production of process water. The flue gas contains water vapours which are out condensed by cooling. Instead of discharging the water to a drain as a residual product, VEKS has decided to reuse the water for boiler and district heating systems. For this process, a complicated purification plant had to be established which in return has resulted in a profusely reduced consumption of drinking water. Moreover, the production of process water through the flue gas condensing plant can be produced far cheaper than the closest alternative.

The environment also wins as the gas is better purified than previously thanks to the new cooling system.

The whole flue gas condensing plant was commissioned by the turn of the year 2022/2023. The price is DKK 85 million with a repayment period of approx. five years..



ACCOUNTS

The gained experience *with reconstruction, tests, expenses, etc. will contribute to converting several of VEKS' peak load boilers from gas to power. In VEKS' Peak and Reserve Load Strategy exactly the electric boilers are assessed as being the best alternative to the transition to green peak load capacity. Here, Maintenance Engineer Peter Calundan is testing the manual closing of a shut-off valve.*

VEKS - Profit and loss account

1.000 kr.	2023	*Budget* 2023	2022
Net sales	1,468,311	1,766,058	1,379,633
Production and heat purchase costs	-1,524,016	-1,590,489	-1,291,414
Gross profit	**-55,705**	**175,568**	**88,218**
Transmission costs	-86,990	-81,850	-72,180
Distribution costs	-42,961	-41,402	-36,125
Administrative costs	-56,833	-50,915	-52,982
Result from primary operations	**-242,489**	**1,401**	**-73,069**
Other operating income	53,692	55,690	36,246
Other operating expenses	-324	-83	-140
Result before financial items	**-189,120**	**57,008**	**-36,963**
Financial income	1,119	351	1,125
Financial costs	-39,422	-24,030	-19,724
Year-end result	**-227,423**	**33,328**	**-55,562**

Statement of profit or loss balance pursuant to the Danish Heat Supply Act

Adjustments			
VEKS Køge CHP Plant, production	0	0	-7,972
VEKS Køge District Heating, distribution	5,560	25,545	-16,972
VEKS Tranegilde, distribution	10,434	15,730	-2,472
VEKS Gasmotor Solrød	0	0	0
VEKS Transmission	-243,417	-7,946	-28,146
	-227,423	**33,328**	**-55,562**
Adjustments			
Reversal of small acquisitions recognised as an expense in accordance with the above-mentioned information	1,468	1,320	2,000
Reversal of operating depreciation	122,284	123,277	119,061
Reversal of financial income and expenses, net as stated above	38,303	23,680	18,599
Reversal of allocated holiday pay, flex time and public servant pension	-591	0	-714
Depreciation under the Danish Heat Supply Act	-161,038	-161,038	-98,003
Year-end result pursuant to the Danish Heat Supply Act	**-265,301**	**-3,113**	**-33,218**
Working balance reserve (excess cover) until 2012.	87,727	0	87,727
Surplus/deficit transferred from previous years	8,935	3,113	42,152
Profit or loss balance, year-endpursuant to the Danish Heat Supply Act	**-168,639**	**0**	**96,662**

VEKS– Comments on the year's results

VEKS' net loss for the year amounts to DKK 227 million which is DKK 261 million poorer than expected.

The revenue amounted to DKK 1,468 million which is DKK 298 million lower than budgeted. The reduced sale is primarily due to the fact that power has been sold for DKK 76 million less than budgeted at Køge CHP Plant. Moreover, the sale to CTR is DKK 162 million less than budgeted. The sale to CTR has no impact on VEKS Transmission's customers, as the sale is at cost and the production and costs related to heat purchase are thus correspondingly higher than budgeted. Furthermore, a reduced sale to VEKS Transmission's customers of DKK 41 million was made.

In overall terms, the gross profit is DKK 231 million less than budgeted. The heat purchase costs have risen considerably which is due to several conditions. There have been large reductions in income on the sale of electricity combined with a considerable price increase on biomass. This implies high prices on heat from Avedøre CHP Plant and Køge CHP Plant. Moreover, breakdowns have occurred on the same plants which meant considerably lower earnings on electricity, however also implied extra running on peak load plants.

The operating expenses total DKK 13 million over budget. Acute servicing of the transmission system amounted to DKK 2 million more than budgeted. Moreover, an additional consumption occurred in a wide range of areas due to a high level of activity and increasing prices.

VEKS in total in 2023 compared to 2022

The net profit in 2023 is DKK 172 million lower compared to 2022. The gross profit was DKK 143 million lower due to the higher heat purchase costs in 2023. The operating expenses are DKK 25 million higher in 2023 compared to 2022. The most significant explanation is the fact that Høje Taastrup is up and running. Moreover, the storage adjustment was DKK 4 million higher in 2023 compared to 2024. The increasing activity level within the distribution areas of VEKS meant an increase in expenses of DKK 7 million. The remaining part of the increase is due to a generally higher activity level and price development.

Other operating income is DKK 17 million higher than in 2022 which is a result of the fact that more CO_2 quotas were sold in 2023.

The financial costs have increased by DKK 20 million which is due to rising interest rates. The large deficit which occurred in 2023 has to be charged with the customers in the years to come. VEKS will request the Danish Utility Regulator permission to charge the deficit over a period of up to 5 years instead of 1-2 years as the law dictates.

During the last 15 years, VEKS has taken an active part in the development of geothermal heat and is co-owner of a geothermal test plant in Amager (HGS). For various reasons, the plant has been on hold since 2018, however, although the plant is put on hold, it is expected that the plant may contribute to test and development of geothermics in the future. At present, there is ongoing dialogue with interested parties that may be interested in taking over the plant. Therefore, there is some uncertainty about the value at which the plant is entered in the accounts. The book value amounts to DKK 29 million as at 31 December 2023 (pursuant to the Danish Heat Supply Act DKK 1 million).

Expectations for 2024

VEKS budgets with an overall profit of DKK 41 million in 2024 made up as cost-based accounts. However, there is some uncertainty regarding the fluctuating power prices which may have a negative impact on the heat purchase costs. Moreover, it will be necessary to charge a larger share of the deficit from 2023 provided that the Danish Utility Regulator will not approve a longer collection period. In the Budget of 2024, a deficit of DKK 50 million were originally recognised from 2023.

Balance sheet as at 31 December

1.000 kr.	2023	2022
Assets		
Tangible fixed assets		
Intangible fixed assets		
Captacity rights	308,527	326,382
Immaterielle anlægsaktiver i alt	**308,527**	**326,382**
Tangible fixed assets		
Land and buildings	13,096	13,210
Production facility	281,816	209,380
Transmission facility	637,692	574,939
Administration facility	8,674	4,368
Distribution facility	772,072	728,538
Ongoing projects	123,383	162,413
Tangible fixed assets, total	**1,836,733**	**1,692,848**
Financial fixed assets		
Securities	25	25
Long-term debts, VEKS' loan scheme	5,460	4,710
Financial fixed assets, total	**5,485**	**4,735**
Fixed assets, total	2,150,745	2,023,965
Current assets		
Stocks		
Fuel stocks	34,533	30,814
Spare part stocks	8,281	8,969
Stocks, total	**42,813**	**39,782**
Debtors		
Amounts owed from sales and services	329,585	261,823
Other debtors	24,968	19,073
Deficit– intermediate result with the consumers	168,639	0
Prepaid costs	15,516	30,258
Debtors, total	**538,708**	**311,153**
Current assets, total	581,522	350,936
Assets, total	**2,732,266**	**2,374,901**

1.000 kr.	2023	2022
Liabilities		
Capital and reserves		
Invested capital	10,669	10,217
Net loss for the year (profit or loss balance)		
pursuant to the Danish Heat Supply Act	168,639	-96,662
Accumulated profit in relation to the Cost accounting	-59,229	168,194
Capital and reserves, total	**120,078**	**81,749**
Provisions		
Public servant pension liabilities	2,313	2,313
Provisions, total	**2,313**	**2,313**
Creditors		
Long-term liabilities		
Loan capital and construction credit	1,717,097	1,544,357
Long-term liabilities, total	**1,717,097**	**1,544,357**
Short-term debts		
Loan capital and construction credit, short-term share	437,233	293,153
Credit institutions	25,852	19,454
Suppliers of goods and services	413,632	309,434
Provisions for holiday allowance and flex time	7,890	8,481
Excess cover – balance, consumers	0	96,662
Other creditor	8,171	19,299
Short-term debts, total	**892,779**	**746,483**
Creditors, total	2,609,875	2,290,840
Liabilities, total	**2,732,266**	**2,374,901**

VEKS Transmission - Profit and loss account

1.000 kr.	2023	*Budget* 2023	2022
Transmission, fixed tariff	414,624	414,775	388,077
Transmission, variable tariff	638,364	679,511	574,335
Transmission, sales CTR	227,491	389,399	201,717
Transmission, other income	37,141	20,067	45,883
Revenues, in total	**1,317,620**	**1,503,753**	**1,210,012**
Production costs, excl, depreciation	-80,085	-151,724	-104,458
Production costs, depreciation	-45,221	-46,392	-42,119
Heat purchase costs	-1,358,259	-1,235,615	-1,004,563
Production and heat purchase costs	**-1,483,565**	**-1,433,731**	**-1,151,140**
Gross profit	**-165,945**	**70,022**	**58,873**
Transmission costs, excl, amortisation	-52,565	-47,348	-44,841
Transmission, amortisation	-34,425	-34,502	-27,339
Administrative expenses	-28,941	-40,454	-40,852
Net profit or loss for the year	**-281,876**	**-52,282**	**-54,159**
Other operating income	52,883	54,639	34,882
Result before financial items	**-228,993**	**2,357**	**-19,277**
Financial income	2,904	452	809
Financial costs	-17,329	-10,754	-9,678
Year-end result	**-243,417**	**-7,946**	**-28,146**

Statement of profit or loss balance pursuant to the Danish Heat Supply Act

Year-end result	**-243,417**	**-7,946**	**-28,146**
Adjustments			
Reversal of small acquisitions recognised as an expense	366	950	1,113
Reversal of operating depreciation	80,799	81,434	71,097
Reversal of allocated holiday pay, flex time and public servant pension	270	0	-1,258
Depreciation under the Danish Heat Supply Act	-74,438	-74,438	-66,026
Year-end result pursuant to the Danish Heat Supply Act	**-236,420**	**0**	**-23,220**
Working balance reserve (excess cover) until 2012,	87,727	0	87,727
Surplus/deficit transferred from previous years	12,842	0	36,062
Profit or loss balance, year-end pursuant to the Danish Heat Supply Act	**-135,851**	**0**	**100,569**

VEKS Transmission - Comments on the year's results

The net profit for 2023 was a loss of DKK 243 million which is DKK 235 million worse than budgeted. The outcome is DKK 215 million lower compared to 2022.

The sale to VEKS Transmission's customers was 8,732 TJ against the budgeted 9,173 TJ and a sale of 8,417 TJ in 2022. The deviations are due to ordinary deviations on degree days.

The sale to CTR was DKK 162 million lower than budgeted. The sale to CTR has no impact on VEKS Transmission's customers, as the sale is at cost and the production and costs related to heat purchase are thus correspondingly lower than budgeted.

The variable production and heat purchase costs (pool price) for VEKS Transmission's customers amounted to DKK 97.42/GJ in 2023 relative to a budget of DKK 73.91/GJ which results in additional costs of DKK 205 million. Large reductions in income on sale of electricity combined with a considerable price increase on biomass occurred. This implies extra high prices on heat from Avedøre CHP Plant and Køge CHP Plant. Moreover, breakdowns have occurred on the same plants which has involved considerably lower earnings on electricity as well as extra running on peak load plants which has contributed to making the heat purchase more expensive. In 2022, the pool prices amounted to DKK 70.53/GJ.

The gross profit for 2023 is all in all DKK 236 million lower than budgeted. The incremental value of the heat purchase of DKK 205 million as described above. Moreover, payment relating to tax rate benefit to Avedøre CHP Plant from variable heat purchase to fixed heat purchase which explains the remaining part of the deviation in the gross profit.

In 2023, the transmission costs amounted to DKK 5 million higher than budgeted and DKK 8 million higher compared to 2022. As regards the budget, the most significant explanation is that acute maintenance was DKK 2 million higher. As regards 2022, the increase was due to the fact that the heat pit storage in Høje Taastrup is now up and running which has cost DKK 4 million. Moreover, the storage adjustment was DKK 4 million higher in 2023 compared to 2022.

In 2023, the administration costs were DKK 11 million under budget in 2023 and DKK 12 million lower compared to 2022. In 2023, the transmission has drawn less upon the overhead costs than expected and has, in general, experienced a lower consumption compared to 2022.

Other operating income is DKK 18 million higher compared to 2022 which is the result of the fact that more CO_2 quotas were sold in 2023.

The financial income and expenses turned out to be DKK 4 million lower than budgeted and DKK 6 million lower than in 2022 which was due to a higher interest rate level.

Køge CHP Plant - Profit and loss account

1.000 kr.	2023	Budget 2023	2022
Sale of electricity	28,283	104,083	117,707
Sale of heating, fixed tariff	59,107	53,832	49,406
Sale of heating, variable tariff	78,442	-937	-17,368
Revenues, in total	**165,832**	**156,978**	**149,745**
Fuel	-99,542	-94,566	-92,425
Amortisation	-9,807	-9,798	-17,366
Other production costs	-41,678	-46,640	-42,349
Production and heat purchase costs	**-151,028**	**-151,004**	**-152,140**
Gross profit	14,804	5,973	-2,395
Administrative costs	-12,142	-5,047	-4,869
Result from primary operations	**2,663**	**926**	**-7,264**
Other operating income	809	1,051	1,364
Result from primary operations	**3,472**	**1,977**	**-5,899**
Financial income	10	0	22
Financial costs	-3,482	-1,977	-2,094
Year-end result	**0**	**0**	**-7,972**

Statement of profit or loss balance pursuant to the Danish Heat Supply Act

Year-end result	**0**	**0**	**-7,972**
Adjustments			
Reversal of small acquisitions recognised as an expense	318	350	406
Reversal of operating depreciation	9,807	9,798	17,366
Reversal of allocated holiday pay, flex time and public servant pension	-1,009	0	122
Depreciation under the Danish Heat Supply Act	-9,456	-9,456	-10,271
Year-end result pursuant to the Danish Heat Supply Act	**-340**	**692**	**-349**
Surplus/deficit transferred from previous years	-497	-692	-148
Profit or loss balance, year-end pursuant to the Danish Heat Supply Act	**-838**	**0**	**-497**

Køge CHP Plant - Comments on the year's results

The net profit for the year for Køge CHP Plant is as budgeted, as the earnings from VEKS Transmission and Junckers are always adjusted in relation to the amount of expenses available for producing the heating sold. A decreased/additional consumption of fixed expenses will be adjusted in the regular charging to VEKS Transmission and a deviation of the variable costs/income will be adjusted in the variable contribution.

In 2023, the electricity production has been off from August - December due to breakdown. In 2023, the sale of electricity was 26,621MWh compared to a budgeted sale of 61,166MWh and a sale of 67,890MWh in 2022. In 2023, the average price of the sale of power was DKK 782.52/MWh which is DKK 917.48/MWh lower than budgeted and DKK 906.48/MWh lower compared to 2022. All in all, this resulted in the fact that the revenues on selling power were DKK 75.8 million lower than budgeted and DKK 89.4 million lower compared to 2022.

The sale of heat to VEKS Transmission was 1.077TJ which is 87TJ more than budgeted and 132TJ less compared to 2022. The changes are due to the fact that the plant has been prioritised more by Varmelast in 2023 than expected.

The low revenues on electricity mean that the total average price per GJ which is charged by VEKS Transmission and Junckers in 2023 totals DKK 116.27/GJ relative to the budgeted DKK 48.26/GJ and a price of DKK 30.17/GJ in 2022.

Other production costs amount to DKK 4.9 million under budget which is primarily due to a reduced consumption of maintenance costs.

The administration costs were DKK 7.1 million over budget and DKK 7.3 million higher compared to 2022. The increase is due to an increased draw up-on VEKS' group functions and moreover a more correct distribution of VEKS' administrative overheads compared to previously.

VEKS Gasmotor, Solrød - Profit and loss account

1.000 kr.	2023	*Budget* 2023	2022
Sale of electricity	10,865	48,437	14,120
Sale of heating, variable tariff	3,013	8,652	5,623
Revenues, in total	**13,878**	**57,089**	**19,743**
Fuel	-9,760	-52,497	-15,506
Amortisation	-1,578	-1,578	-1,578
Other production costs	-1,223	-2,130	-1,659
Production and heat purchase costs	**-12,561**	**-56,205**	**-18,743**
Gross profit	1,317	884	1,000
Administrative costs	-492	-478	-537
Result from primary operations	**825**	**406**	**463**
Other operating income	-37	-20	-25
Result from primary operations	**789**	**386**	**438**
Financial costs	-789	-386	-438
Year-end result	**0**	**0**	**0**

Statement of profit or loss balance pursuant to the Danish Heat Supply Act

Year-end result	**0**	**0**	**0**
Adjustments			
Reversal of operating depreciation	1,578	1,578	1,578
Depreciation under the Danish Heat Supply Act	-1,578	-1,578	-1,574
Year-end result pursuant to the Danish Heat Supply Act	**0**	**0**	**4**
Surplus/deficit transferred from previous years	-0	0	-4
Profit or loss balance, year-end pursuant to the Danish Heat Supply Act	**0**	**0**	**0**

VEKS Gasmotor Solrød - Comments on the year's results

In 2023, the heat and power production were below half the budgeted amount which was primarily due to the lack of gas as Solrød Bioenergi has benefited more from selling it for upgrading and the fact that the primary products were also more expensive to get hold of. In addition, there have been technical problems with the engine after the new one was installed.

In 2023, the production was therefore 40,230GJ (56%) less than budgeted for 2023. At the same time, the power prices were 63% lower than budgeted. The reduced operation resulted in a revenue of DKK 37.5 million lower than budgeted and DKK 3.2 million lower compared to 2022.

The lower revenues will be counterbalanced by a lower settlement price to Solrød Biogas for the purchase of fuel. As regards the budget, the settlement was thus DKK 42.7 million lower than budgeted in 2023 and the settlement was DKK 5.7 million lower compared to 2022.

Tranegilde Fjernvarme - Profit and loss account

1.000 kr.	2023	*Budget* 2023	2022
Net sales	49,317	53,894	26,641
Production and heat purchase costs	-19,218	-20,627	-15,644
Gross profit	**30,099**	**33,267**	**10,998**
Distribution costs	-2,949	-3,909	-1,877
Administrative costs	-3,258	-1,712	-1,414
Depreciation	-8,121	-8,468	-7,681
Result from primary operation	**15,770**	**19,178**	**25**
Other operating expenses	-36	-30	-24
Result before financial items	**15,734**	**19,148**	**1**
Financial income	29	15	121
Financial costs	-5,329	-3,433	-2,593
Year-end result	**10,434**	**15,730**	**-2,472**

Statement of profit or loss balance pursuant to the Danish Heat Supply Act

Year-end result	**10.434**	**15.730**	**-2.472**
Adjustments			
Reversal of small acquisitions recognised as an expense	261	0	0
Reversal of operating depreciation	8.121	8.468	7.681
Depreciation under the Danish Heat Supply Act	-27.120	-27.120	-5.668
Year-end result pursuant to the Danish Heat Supply Act	**-8.303**	**-2.922**	**-458**
Surplus/deficit transferred from previous years	3.797	2.922	4.255
Profit or loss balance, year-end pursuant to the Danish Heat Supply Act	**-4.506**	**0**	**3.797**

Tranegilde District Heating - Comments on the year's results

The net profit for 2023 was a profit of DKK 10.4 million which is DKK 5.3 million lower than budgeted and DKK 12.9 million better compared to 2022. 2023 was a bit colder than 2022 – measured on degree days it was 2% colder in 2023 compared to 2022. In 2023, the sale was 44,125MWh compared to a budgeted sale of DKK 47,197MWh and DKK 44,117MWh in 2022.

In 2023, the gross profit was DKK 3.2 million lower than budgeted which implied that more customers moved from the high gas price tariff to the lower cost driven price. Compared to 2022, the gross profit is DKK 19.1 million better which was primarily the result of the fact that customers being settled relative to the gas price tariff have received a price increase of approx. 100% in 2023 compared to 2022. The increase was due to the fact that the gas price tariff is calculated based on historical statistical prices.

The increase in distribution and administration expenses is due to the fact that Tranegilde District Heating has increased the number of employees and activities. At the end of 2022, Tranegilde District Heating had approx. 600 customers.

Køge Fjernvarme - Profit and loss account

1.000 kr.	2023	*Budget* 2023	2022
Net sales	108,087	110,702	54,368
Production and heat purchase costs	-44,067	-45,280	-34,626
Gross profit	**64,020**	**65,422**	**19,742**
Distribution costs	-9,913	-7,026	-5,228
Administrative costs	-12,000	-3,223	-5,310
Depreciation	-21,978	-21,998	-21,339
Result from primary operations	**20,129**	**33,174**	**-12,134**
Other operating expenses	-251	-33	-91
Result before financial items	**19,878**	**33,141**	**-12,226**
Financial income	13	0	436
Financial costs	-14,331	-7,596	-5,183
Year-end result	**5,560**	**25,545**	**-16,972**

Statement of profit or loss balance pursuant to the Danish Heat Supply Act

Year-end result	**5.560**	**25.545**	**-16.972**
Adjustments			
Reversal of small acquisitions recognised as an expense	523	20	481
Reversal of operating depreciation	21.978	21.998	21.339
Reversal of allocated holiday pay, flex time and public servant pension	148	0	422
Depreciation under the Danish Heat Supply Act	-48.446	-48.446	-14.464
Year-end result pursuant to the Danish Heat Supply Act	**-20.237**	**-883**	**-9.194**
Surplus/deficit transferred from previous years	-7.207	883	1.988
Profit or loss balance, year-end pursuant to the Danish Heat Supply Act	**-27.444**	**0**	**-7.207**

Køge District Heating- Comments on the year's results

The net profit for 2023 was a profit of DKK 5.6 million which is DKK 20 million lower than budgeted, and DKK 22.5 million better compared to 2022.

2023 was a bit colder than 2022 – measured on degree days it was 2% colder in 2023 compared to 2022.

The sale ended at 103,341MWh compared to a budgeted sale of DKK 116.539MWh. The reduced revenue is the result of the fact that fewer new customers were connected than expected. In 2022, the sale was 98,935MWh.

In 2023, the gross profit was DKK 1 million under budget and DKK 44 million better compared to 2022. The increase compared to 2022 was the result of the fact that customers being settled relative to the gas price tariff had received a price increase of approx. 100% in 2023 compared to 2022. The increase was due to the fact that the gas price tariff is calculated based on historical statistical prices.

The big increase in the distribution and administration expenses is due to the overall higher activity in connection with the extension project in Køge. This is due to the fact that up to 7,000 premises in Køge must be converted from gas to district heating, compared to the fact that there were approx. 630 customers in 2023.

ORGANISATION

The characteristic three-pipe-chimney of Hvidovre Hospital will not be demolished although the new electric boiler does not emit any smoke! The hospital still has a gas boiler as backup and a boiler for the production of process steam.

Organisation

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Albertslund:
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Marianne Burchall (A) & Claus Rasmussen (V)

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Jens Klindt & Malik Basoda

Fjernvarmecentralen Avedøre Holme:
Thomas Ahlmann Jensen

Brøndby Fjernvarme a.m.b.a.:
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COOP Danmark A/S:
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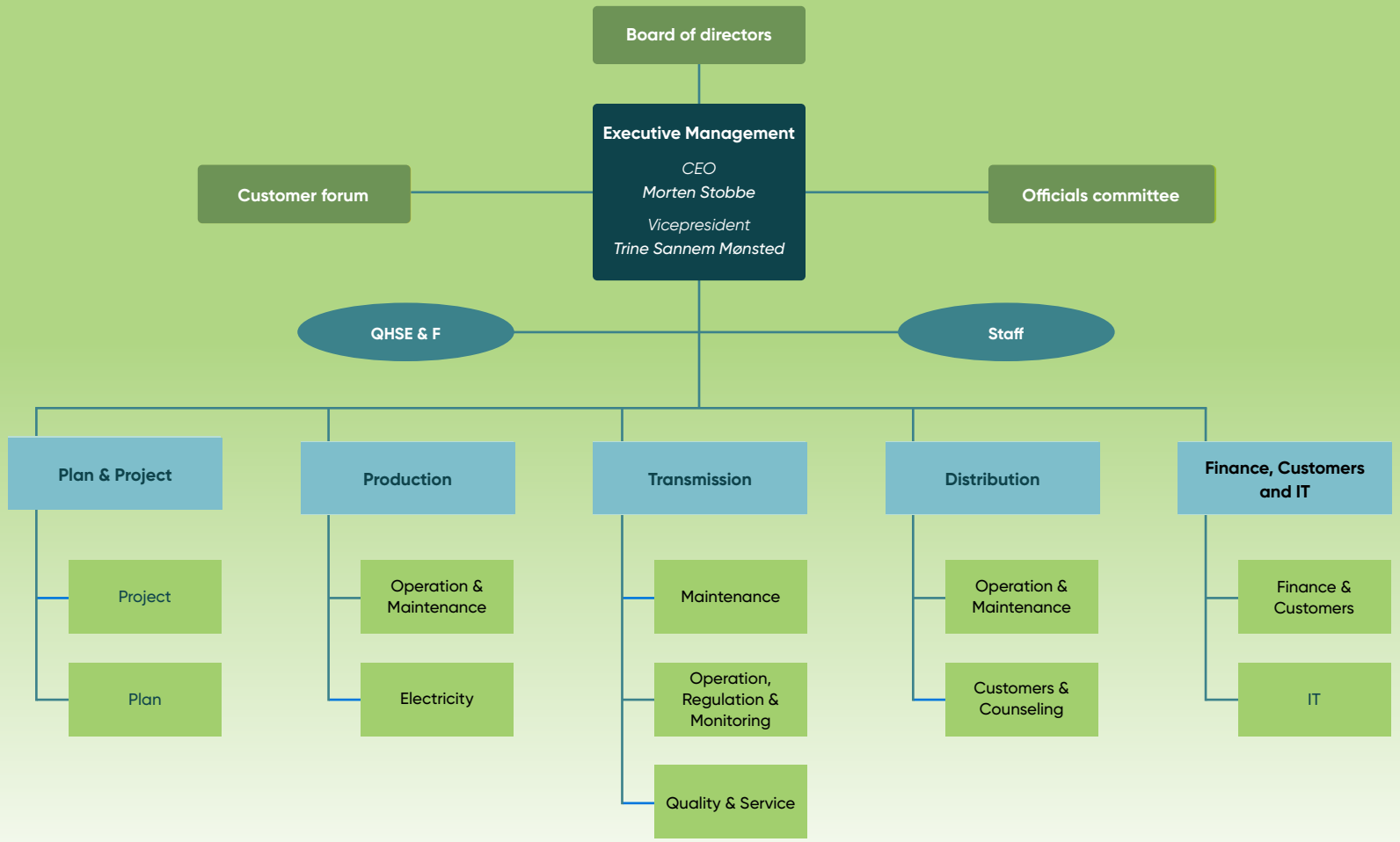
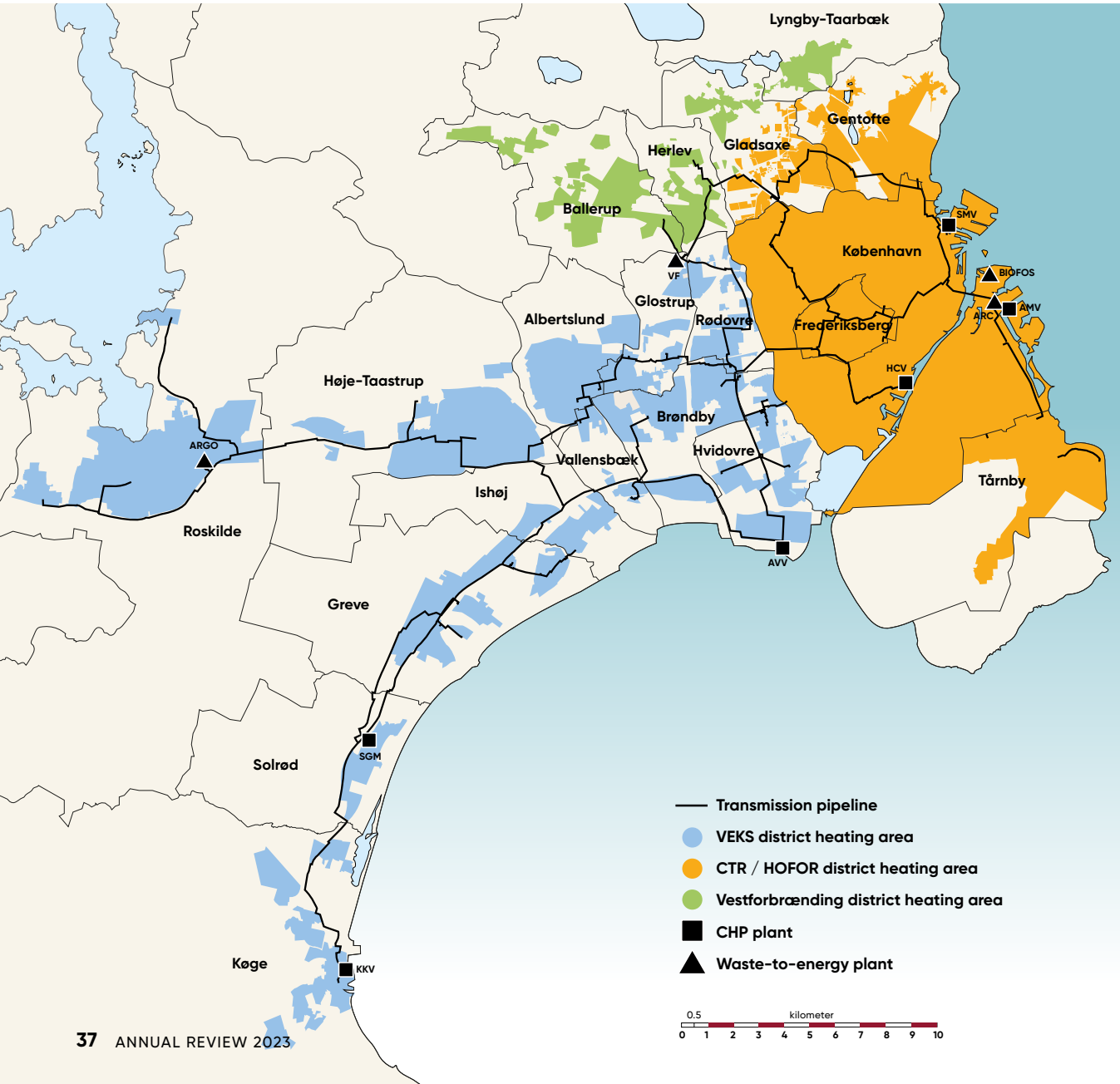
Vallensbæk Fjernvarme Syd:
Ruth Sloth Frederiksen, Niels Okstoft,
Søren Slothsberg, Helle Ullum & Erik Lütken

VEKS' organisation



DH in the Copenhagen Area



Units and definitions

TJ	= Terajoule
GJ	= Gigajoule
MWh	= Megawatt hour
1 TJ	= 1,000 GJ
1 MWh	= 3.6 GJ
MJ/s	= Megajoule per second (heat output)
MW	= Megawatt (power output)
1 MJ/s	= 1MW = 1,000 kW

Average energy consumed for heating and hot water amounts to approximately:

- 60 GJ/year for single-family houses (120 m^2)
- 40 GJ/year for apartments in multi-storey buildings (75 m^2)

Degree days

Degree days are applied in connection with the assessment of the heat required in buildings. The number of degree days per 24 hours is an indication of how cold it was and thus how much energy has been needed for space heating.

Degree days are calculated as the difference between mean outdoor temperatures and the 17 degree Celsius indoor temperature. Days during which the temperature exceeds 17 degrees Celsius are not included. The degree days of a normal year are established on the basis of the average of degree days throughout a number of years.

In VEKS' system, the number of degree days is, for instance, 3,112 per year. Degree days and heating consumption are interlinked, ie the higher degree days, the higher consumption. The degree day summation for one year can be compared with the normal year. This renders it possible to assess for the year in question whether heating consumption has been high or low irrespective of the climatic conditions of the year.

Emissions

CO_2 (carbon dioxide) is a greenhouse gas released from the burning of fuels.

SO_2 (sulphur dioxide) is released from the burning of coal and oil.

NO_x (nitrogen oxide) is released when nitrogen in the air and oxygen are combined on burning of fuels.

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