Upgrading the performance of district heating networks in Europe

Project No: 785014

Study tours to district heating best practice examples

WP 2 – Task 2.4/D2.4 Report on the study tours

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Content

Introduction

Originally the report of “Study tours for target country stakeholders to best practice examples” should contain the major study tours in Denmark and Germany only. But during the first project meetings it became quite clear that it is worth to report on the additional site visits, as part of the project progress meetings, too. As the responsible project partners managed to involve their local demonstration cases and best practice examples the site visits were opened for external participants. The following report will give some overview of the agenda, the participants, the site visit destination, and cooperating partners. Finally, a short summary and some pictures of the site visits will complete each individual report.

1 Site visit Vilnius, Lithuania

The project progress meeting (10-12. October 2018) in Lithuania was hosted and organised by the Upgrade DH project partners:

Lithuanian District Heating Association
(Lietuvos Silumos Tiekeju Asociacija), Lithuania
Audrone Nakrosiene [audronenakrosiene@gmail.com]
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During the afternoon of the second meeting day a visit at Salcininkai DH Company (site visit to the DH network) and a visit of the municipality of Salcininkai was offered.

1.1 Extract of the Agenda (Site visits)

11th of October 2018, Thursday

Site visit – Slcininkai region

	Site visit
11:30 - 12:00	**Travelling to Manor house of Balinsky, Jasiunai, Salcininkai region**
12:00 - 12:05	**Welcome and short introduction to the Upgrade DH project** a. Welcome words, presentation of participants b. Overview of the project Speaker Elena Pumputienė, SSTINKLAI
12:05 - 12:15	**General information about Salcininkai region** Speaker Beata Petkevič, Salcininkai municipality
12:15 – 12:25	**Heating Sector in the region: current situation and future challenges** Speaker Erika Sudnicka, Salcininkai municipality

12:25 - 12:35	**Overview of The DH supplier Salcininku silumos tinklai (SSTINKLAI)** a. Key indicators b. Inefficient DH network c. Future challenges Speaker Elena Pumputienė, SSTINKLAI
12:35 - 12:40	**Best practice project** Biofuel fired boiler house at the plant Salcininkai Speaker Artur Danulevič, SSTINKLAI
12:40 – 12:50	**Discussion**
12:50 – 13:40	**Lunch**
13:40 – 14:30	**Visit to Salcininkai Biofuel boiler house**

1.2 Participants

Participating project partners: 19

External participants of the site visits: 7

1.3 Summary

The purpose of the meeting, which took place on 11th of October in Jasiunai Balinsky Palace, was to present the Salcininkai region, to introduce an overall district heating sector situation and challenges and to establish collaboration between project partners and local stakeholders.

After the meeting the representatives of Salcininku silumos tinklai organised an additional site visit to biofuel fired boiler house in Salcininkai. According Artur Danulevic, manager of Salcininku silumos tinklai, the retrofitting measures were applied to power plant in the city of Salcininkai, where problems with high costs of heat generation, dependence on fossil fuel were identified. The technical step involved the solutions that had to be applied to the retrofitting process, which involved the installation of 5.0 MW biofuel fired boiler with 1.25 MW condensing economiser and other equipment. The target was to increase energy efficiency, reduce carbon emission and increase use of renewable source of fuel. After the retrofitting solution was implemented, the heat is produced mainly from power plant that use woodchips as main source with 98 % (2018) of total heat production in Salcininkai.

Image 1: Meeting at the Jasiunai Balinsky palace

Image 2: Participants at the Salcininkai boiler house

Image 3: Salcininkai boiler house

mage 4: Salcininkai boiler house

The positive example of very rapid replacement of natural gas with renewable biofuels in the Lithuanian district heating sector was presented to project consortium. The participants of the meeting were provided with information on regulatory and pricing incentives and state support measures that have been and continue to be used to motivate the expansion of renewable energy in Lithuanian DH sector.

Project participants visited Vilnius district heating CHP plant Nr. 2, where they were introduced with the biofuel technology used in the production of heat and electricity.

Image 5: Impressions from Vilnius CHP plant

Several participants of the project visited the Lithuanian District Heating Association, where they discussed the development of district heating, the latest technologies and challenges that is faced in different countries. The participants of the meeting discussed further steps of the project.

2 Site visit Sarajevo and Tuzla, Bosnia and Herzegovina

The project progress meeting (10-12. April 2019) in Bosnia and Herzegovina was hosted and organised by the Upgrade DH project partner:

JP Elektroprivreda BiH d.d.-Sarajevo, Bosnia-Herzegovina
Anes Kazagic [a.kazagic@elektroprivreda.ba]
www.elektroprivreda.ba

2.1 Extract of the Agenda (Site Visits)

11th of April 2019, Thursday

Site visit - TPP Tuzla & DHS Tuzla

	Site visit
08:30 - 11:00	**Travelling to City of Tuzla**
11:00 - 11:30	**Welcome at TPP Tuzla**
11:30 - 12:45	**Site visit of TPP Tuzla as heat generation side in the DHS Tuzla**
12:45 - 13:45	**Lunch**
13:45 - 14:00	**Travelling to DH company Tuzla - *Centralno grijanje d.d. Tuzla***
14:00 - 14:30	**Welcome at DH Company Tuzla - *Centralno grijanje d.d. Tuzla***
14:30 - 16:00	**Site visit of DHS Tuzla**
16:00 - 18:30	**Travelling back to Sarajevo**

2.2 Participants

Participating project partners: 20

External participants of the site visits: 9

2.3 Profile of the best practice retrofitting measure in the DHS Tuzla

Name/ Designation	District Heating Company “Centralno grijanje” d.d. Tuzla
Short description	Energy Efficiency Improvement and Optimal Management of CHP District Heating System in city of Tuzla
City, Country	Tuzla, Bosnia and Herzegovina
Year:	The retrofitting action was finalised in 2016
Type of retrofitting:	☒ technical ☒ economical ☐ organisational ☐ managerial
Targets of the retrofitting measure	☒ substantial primary energy savings ☒ efficiency gains ☐ increase share of renewables ☐ use of residual/ surplus heat ☒ Economic improvement ☐ displacement of fossil fuels ☐ other:
Effected Areas	☒ primary grid ☒ secondary grid ☐ Power plants ☐ Business models ☒ Heat transfer station ☒ others: Control and management of DHS (SCADA, Termis)
Benefit	Total energy savings up to 90 MWh per heating season
Additional information	‘’Centralno grijanje’’ d.d. Tuzla decided to develop and utilize technical solutions by which the total thermal, temperature and electrical losses in the district heating distribution systems can be further reduced. Besides technical solutions, it was necessary to develop sustainable development strategy and optimal management of the district heating system. Implementation of new technical solutions based on the first time analysis and new methodology in the system management made these results possible. *Optimization of the DHS primary side*

	In November 2010, ‘’Centralno grijanje’’ d.d. Tuzla started with the first activities on the heating substations reconstruction. In April 2011, the company built in heat meters in order to collect all necessary data. Reviewing the data, differences between operating and required flow have been noticed. The required flow is set for the outdoor temperature of -17°C. The lack of required flow was substituted with circulating pumps on the primary side. All these circulating pumps have been switched off at the measuring time. The second activities were to replace all of the pipe connections after analysing all measurements. First results were obtained at the beginning of the heating season 2011/2012, when the circulating pumps on the primary side of heating substations were eliminated. In January 2012, the company finished the second phase of the reconstruction of heating substations – replacing shell and tube heat exchangers with plate ones. The detailed analysis of working conditions and measurement data after the reconstruction of the heating substations (replacement of pipe connections, heat exchangers and circulating pumps) showed positive effects. Higher available pressure, increase of available operating flow, increase of inlet temperature (cold side), decrease of negative influence temperature outlet temperature (hot side), electric energy savings and control of heating substations were obtained. *Optimization of the DHS secondary side* ‘’Centralno grijanje’’ d.d. Tuzla started activities in reconstructing heating substations at the secondary side, along with analysis of the primary side in the part of the district heating system Tuzla called ‘’Sjenjak’’. The main activity was analysing potential of electric energy savings. After detailed analysis, the company decided to make a reconstruction – replacing all circulating pumps with pumps with electronic regulations. All these pumps had big nominal power for required capacity, flow and heat.
Relevant Links	https://www.danfoss.com A.Karabegović (2014.) Energy Efficiency Improvement and Optimal Management of CHP District Heating System – Case City of Tuzla, Chemical engineering transactions, Vol.42. A.Karahmetović, M.Mulabdić, A.Bedić (2018), Systematic approach in order to improve operation - what we need for reengineering of district heating system, International Conference on District Energy 2018, Portorož (Slovenia), 18.-20. March 2018.

2.4 Summary

The technical director *Izet Delalic* and his team welcome the Upgrade DH consortium and the external participants at the thermal power plant Tuzla (≈ 120 km North-East from Sarajevo). The site visit starts with some short presentation, giving all participants an overview of the lignite and brown coal based thermal power plant (800MW) of Tuzla and the structure of the owner - public enterprise “Elektropriverda”.

Image 6: Welcome speach and introduductionof the technical director of TPP Tuzla (Source: Rutz, WIP)

Before the guided tour through the power plant followed, some mandatory safety instructions were presented. The participants receive rare views and impressions of the technical, operational and organisational processes inside a combined heat and power plant. The following pictures give some impressions:

Image 7: Coal storage (Source: Rutz, WIP)

Image 8: Pumping station (Source: AGFW)

Image 9: Inside the main building of the CHP (Source: AGFW)

Image 10: Inside the main control room (Source: Rutz, WIP)

Image 11: Cooling tower (Source: AGFW)

Image 12: Front view of the TPP (Source: AGFW)

The tour ended with some lunch before the participants start to visit the main office of the local district heating company “Centralno grijanje d.d. Tuzla”. After some more detailed information regarding the district heating system in Tuzla and some impressions of the comprehensive monitoring of the DH system, the tour stops at the “cultural center” Tuzla to see there a modernised substation, see Image 13. The site visit ended with some summarising information on the district heating system in Tuzla, accompanied by a local “TV Slon extra”, see Image 14.

Image 13: Modernized substation of Tuzla DHS (Source: EPBiH)

Image 14: Anes Kazagic (EPBiH) during the TV interview (Source: Rutz, WIP)

3 Innovation Workshop and Study Tour Denmark – Day 1

The project progress meeting (8-10. October 2019) in Denmark was hosted and organised by the Upgrade DH project partners:

COWI A/S, Denmark
Reto Michael Hummelshøj [rmh@cowi.com]
www.cowi.com

The first day of the study tour in Denmark (9th October 2019) was divided in two sessions. During the morning an innovation workshop was held at COWI Denmark's headquarter, where participants from the two EU projects UPGRADE DH and COOL DH had the possibility to present and share the innovative solutions introduced by the projects.

The second session was reserved for the study tour, which took place in the city of Lund in Sweden. Here, the new Örtofta Biomass CHP Plant was visited followed by the demonstration site of COOL DH project in Brunnshög district.

3.1 Extract of the Agenda – Day 1

9th of October 2019, Wednesday

Innovation workshop: COWI Headquarters, Parallelvej 2, 2800 Kgs. Lyngby, Denmark

Study tour: COOL DH demonstration site, Lund, Sweden

08:30 - 9:00	**Registration and coffee – Innovation workshop**	
09:00 - 9:15	COOL DH project - Welcome and Intro	Reto M. Hummelshøj, COWI DK
9:15 - 9:35	New DH plastic pipes	Klaus G. Lauridsen, Logstor
9:35 - 9:55	Solutions against Legionella contamination	Per-Olof Johansson Kallioniemi, Lund University
9:55 - 10:15	Local integration of RES / Waste heat	Emanuele Zilio, COWI DK
10:15 - 10:40	Discussion	Markus Paulsson, Lunds Kommun
10:40 - 11:00	*Coffee Break*	
11:00 - 11:15	UPGRADE DH project - Intro	Dominik Rutz, WIP
11:15 - 11:35	Best Practice in Albertslund	Thomas Andreas Østergaard, COWI DK

11:35 - 11:55	Tools overview	Matteo Pozzi, OPTIT and Carlo Winterscheid, SIG Solites
11:55 - 12:10	Discussion	
12:10 - 12:30	*LUNCH Break and Departure to Lund – Study tour*	
13:30 - 15:00	Visit of Örtofta Power Plant and Kraftringen Energi AB: - Introduction to Kraftringen, DH grid and LTDH grid - Visit of Örtofta biomass plant	Peter Rodenstam, Kraftringen AB
15:00 - 16:30	COOL DH demonstration site: Brunnshög, Lund: - Visit of Brunnshög - Science Village Scandinavia - Visit of the energy central of MAX IV - Showroom with demos	Sara Kralmark, Kraftringen AB
16:30 - 17:45	*Travelling back to Copenhagen*	
19:30 - 22:00	*DINNER*	

3.2 Participants

Participating project partners: 17

External participants of the Study Tour: 22

The participants at the event represented a large variety of organizations (energy utilities, universities, research institutes, energy consultants, industrial manufacturers, DH associations) from 10+ countries in Europe.

3.3 Summary

The day began with a welcome to the Workshop and study tour by Reto M. Hummelshøj, project manager at COWI Denmark, which also introduced COOL DH project to all the participants. The following presentations focused on the innovative solutions introduced in the project, such as, the new plastic pipes, the Legionella research regarding the problem in low-temperature district heating (LTDH) and the integration of renewable energy sources (RES) for domestic hot water production (DHW) in LTDH networks.

In the second part of the workshop, some participants of UPGRADE DH project presented best practice examples and innovative tools used in the project, as innovation inputs for the participants.

As part of the workshop, sometimes was reserved for the discussion between the participants, which had the possibility to exchange ideas and considerations about the innovations. In this

way, the dissemination of the innovative solutions was facilitated, in order to allow people to get ideas, which can be applied in the different participants' countries.

Image 15: Welcome speech and introduction to the workshop at COWI (Source: COWI)

Image 16: Presentation of the new plastic pipes introduced in COOL DH project (Source: COWI)

Image 17: Presentation of the solutions for integration of RES for domestic hot water production (Source: COWI)

The first stop of the study tour was at Örtofta power plant, which is located few kilometers north from the city of Lund (Sweden). This new biomass power plant produces electricity and heat from wood chips (90 MW heat, 38 MW electricity). The participants had a guided tour through the different sections of the plant, from the boiler room to the turbine and generator room (Image 19, Image 20 and Image 21).

Image 18: Bus reserved for the study tour (Source: COWI)

Image 19: Introduction to the Örtofta power plant (Source: COWI)

During the tour, it was possible to ask question to the responsible of the plant in order to get further information and a better overview of the system.

Image 20: Overview of the electricity production system at Örtofta power plant. From the left, it is possible to see the generator, the gear box and the turbine (Source: COWI)

Image 21: Overview of the electricity production system at Örtofta power plant, showing also the steam pipes and other relevant installations (Source: COWI)

The second destination of the study tour in Sweden was the demonstration site of COOL DH project, which is in the new district of Lund called Brunnshög. The district is under construction and, when ready, it will host a series of research facilities (ESS and MAX IV), residential buildings and offices (Image 22 and Image 23).

Image 22: Introduction to the new development plan of Brunnshög district and the new low-temperature district heating network (Source: COWI)

Image 23: MAX IV research facility in Brunnshög seen from the bus (Source: COWI)

As part of COOL DH project, the research center MAX IV (synchrotron light) will be used as heat source for the newly developed low-temperature district heating network. The facility produces a high amount of surplus heat, due to the high cooling demand of its installation. The heat can exploited by a heat pumps system to produce hot water for the district heating (Image 24 and Image 25).

Image 24: Heat pumps system at MAX IV to produce hot water for the low temperature district heating network (Source: COWI)

Image 25: Heat pumps system to produce hot water for the low temperature district heating network for Brunnshög (Source: COWI)

4 Study Tour Denmark– Day 2

The project progress meeting (8-10. October 2019) in Denmark was hosted and organised by the Upgrade DH project partners:

COWI A/S, Denmark
Reto Michael Hummelshøj [rmh@cowi.com]
www.cowi.com

On the 10th of October, the study tour continued in Denmark. During the morning the participants assisted to the presentation of HOFOR A/S, the district heating company that operates in Copenhagen Municipality, followed by a guided tour of some of the power plants operated by the company.

In the afternoon, the tour continued in Høje Taastrup (suburbs of Copenhagen), where the local district heating company was presented. Afterwards, the second demonstration site of COOL DH project in Østerby district was the destination of the tour, in order to see the innovations introduced by the project. Lastly, a solar collector plant connected to the DH network was visited.

4.1 Extract of the Agenda

10th of October 2019, Thursday

Study tour: Copenhagen and Høje-Taastrup, Denmark

08:30 - 8:40	**Meeting point:** **DGI-Byen - North entrance, *Tietgensgade 65, 1704 Copenhagen, Denmark***	
08:40 - 08:45	*Bus departure*	
09:00 - 9:30 *(Bus 9:30-40)*	Visit to HOFOR's headquarter - Presentation of HOFOR	Sannah Grüner, HOFOR
9:45 - 10:45 *(Bus 10:45)*	Visit of a large heat pump system for district heating production - SVAF wastewater/seawater heat pump visits in groups	Magnus Elborough, HOFOR
11:15 - 11:30 *(Bus 11:40)*	Visit of district heating production plant - Outside view of Amagerværket (AMV) and Amager Ressourcecenter (ARC)	Reto M. Hummelshøj, COWI DK
11:50	Stop by Islands Brygge Metro Station	-

12:00 - 12:40 *(Bus 12:40)*	*Working lunch:* Visit of Høje Taastrup District Heating - Introduction to HTF, system and plants	Tom Jensen (Chief of Operations), Høje Taastrup Fjernvarme
12:45 - 13:15 *(Bus 13:15)*	COOL DH-demonstration site: Østerby, Høje Taastrup - Østerby and demo house (if possible) - City 2 Mall (basement at the cooling unit, if possible)	Bjarne Eilersen and Jean Honoré, HTF, and Steen Gravenslund Olesen, COWI DK
13:30 - 13:55	Visit of solar heating plant for district heating	Morten Kusk, Høje Taastrup Fjernvarme
13:55 *(Bus 14:00)*	*End of the day* *Bus departure for Kastrup airport or in alternative Høje Taastrup Train Station* - Train departure to CPH central station and airport (a train change can be required) at 14:29 - 14:46 - 15:01 - 15:19	Reto M. Hummelshøj, COWI DK
15:45	***Arrival at the airport***	

4.2 Participants

Participating project partners: 17

External participants of the Study Tour: 22

4.3 Summary

The second day of the study tour started with a presentation of the district heating company called HOFOR A/S, which operates in Copenhagen Municipality. The visit continued to a new district heating production plant owned by HOFOR, which supplies the district heating network through a heat pumps system that recovers heat from sewage water or alternatively from sea water (Image 26 and Image 27).

Image 26: Coal storage (Source: COWI)

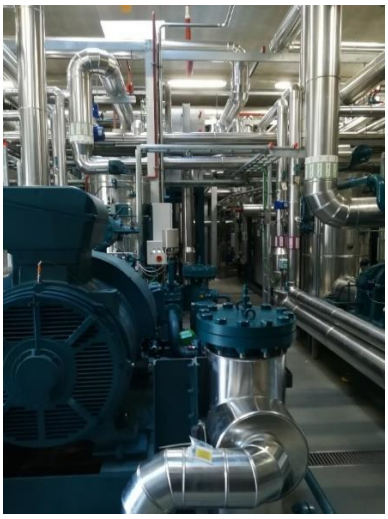

Image 27: Pumping station (Source: COWI)

Afterwards, the tour stopped by the two newest power plants in Copenhagen area (ARC Ressource center and BIO4) operated by HOFOR. The first power plant produces electricity and hot water from the incineration of municipal waste (247 MW heat and 63 MW electricity), while the second one is a biomass plant that uses wood chips (500 MW heat and 150 MW electricity). The two plants are interesting both from the technical point of view and from the architecture/design point of view. In particular, the ARC plant has a ski-slope built on it, where people can ski or try a different range of sports (Image 28 and Image 29).

Image 28: View of the last part of the ski-slope placed on the ARC power plant (Source: COWI)

Image 29: People can walk/hike to the top of the ARC power plant and get a stunning view of surrounded area and the city of Copenhagen (Source: COWI)

Image 30: BIO4 new woodchip-based cogeneration plant serving Copenhagen (Source: COWI)

Afterwards, the study tour moved to Høje Taastrup, in the suburbs of Copenhagen. The local district heating company (Høje Taastrup District Heating) was presented with an overview of the network and the solution adopted in the area. Furthermore, the company has a showroom, where it is possible to see an example of different district heating unit (DHU) that can be implemented in single-family houses or apartments (Image 31 and Image 32)

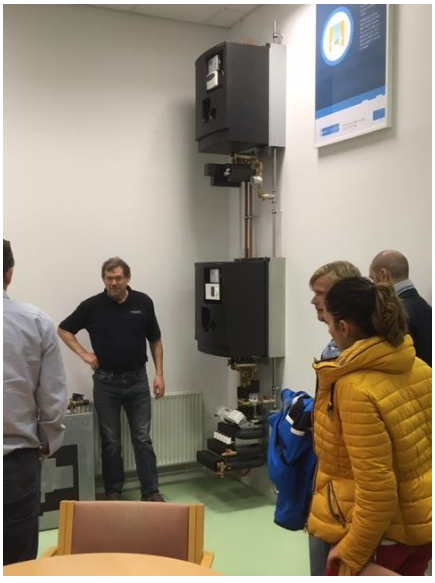

Image 31: Presentation of the showroom at Høje Taastrup District Heating company. The units can be applied in single-family houses and apartments (Source: COWI)

Image 32: Example of district heating unit equipped with two small heat exchangers, the first one for space heating supply and the second one for domestic hot water production (Source: COWI)

Lately, the tour continued to the demonstration site related to COOL DH project. Here, a new LTDH network is implemented in an existing district in order to replace the old existing network. In this case, the innovative solutions developed during the project are implemented in the demonstration site, such as the new plastic pipes (

Image 33 and Image 34).

Image 33: Installation of the new pipes for the DH network in Østerby (Source: COWI)

Image 34: Examples of the new PE-RT plastic pipes implemented in Østerby (Source: COWI)

As last step of the study tour, a solar collector plant was visited. This installation directly supplies the district heating network when the solar energy is available. A funny fact regarding the plant is that 10 goats were released inside the fenced area in order to eat the grass and reduce the maintenance work (Image 35 and Image 36).

Image 35: Solar collector plants that supplies the district heating network (Source: COWI)

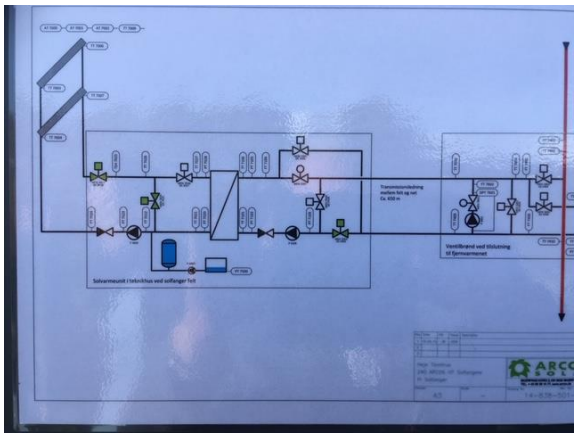

Image 36: Diagram of the solar collector plants (Source: COWI)

5 Study Tour Germany

Due to the Corona pandemic, the study tour originally planned by AGFW for October 2020 could not take place. After a corresponding time delay was not sufficient to overcome the pandemic situation, alternatives were sought. Multiple opportunities were discussed with Vattenfall Berlin, which already supported the Upgrade DH project as a national best practice partner. At the end, the option of a virtual power plant tour was chosen to give the participants the opportunity to visit one of the largest and most innovative power plant sites in Europe – Berlin Reuter West. Even the project meeting in Germany was switched to an online meeting (in October 2020) the necessary preparation time was too short to integrate the study tour directly into the virtual project meeting.

However, the project partners were able to gain an insight into solar thermal heat generation in Potsdam, in line with a virtual event held in German at a solar thermal power plant.

5.1 Small virtual study tour at the virtual project web meeting

The virtual tour and the presentation of the solar thermal energy supply of “Energie und Wasser Potsdam” was a highlight of the AGFW event "Solnet 4.0 - Online Workshop Solar Heat Networks - Market Status Today and Approaches for Sustainable Development Tomorrow (Solare Wärmenetze – Marktstand heute und Ansätze für eine nachhaltige Entwicklung morgen)" on 23.09.2020.

This was a perfect match for the best practice examples from Germany selected in D2.1, so AGFW decided to provide a subtitled version for an integration to the Upgrade DH project. After the project partners saw the video there came up the idea to publish that video via social media, too. Today the video is available on YouTube and linked from the Upgrade DH website.

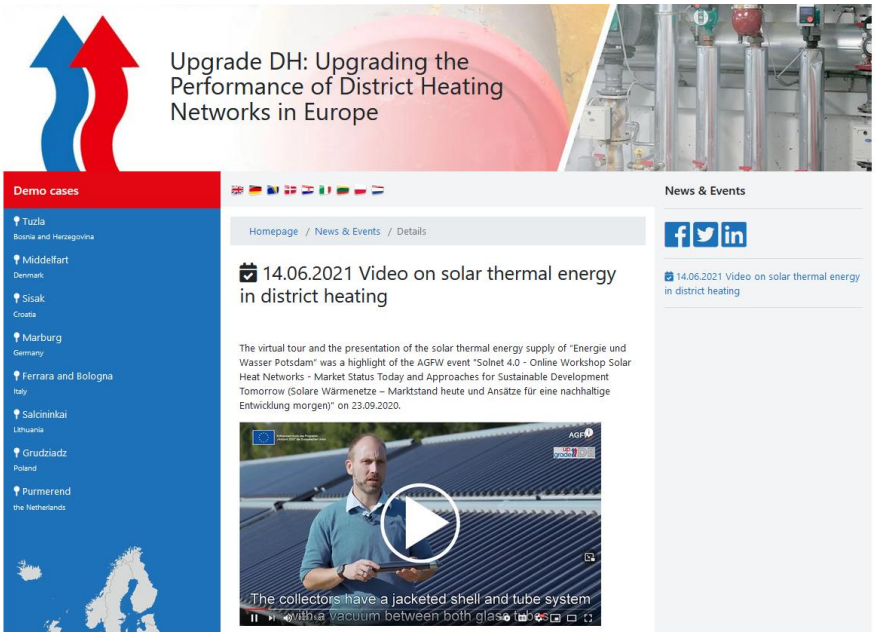

Image 37: News at Upgrade DH Website and direct link https://www.youtube.com/watch?v=UBOr6CZ7-tc

5.2 Main study tour and Webinar

For the presentation of the virtual power plant tour on the 16th of June, an attractive webinar program was developed, which, in cooperation with the EU H2020 research project RES-DHC (grant agreement No. 952873), focused on efficiency and renewable district heating networks.

The event program:

Programme details for 16.06.2021

Feiern Sie mit uns! 50 JAHRE AGFW

10:00 **Welcome**

10:10 **General introduction to the project Upgrade DH**
Dominik Rutz, Project Coordinator, WIP Renewable Energies

10:25 **Upgrade DH Best practice Examples**
Lithuanian DH sector transition to biomass - LDHA

10:45 **Upgrade DH Demo Case - Tuzla**
Overview on the demo case and focus on the integration of a solar thermal plant – Tandem presentation EPBiH, Steinbeis Research Institute Solites

11:20 **Coffee Brake**

11:30 **Upgrade DH recommendations to support national District Heating & Cooling Action Plans**
Aksana Krasatsenka, Euroheat & Power

11:45 **RES-DHC – Increasing the RES share in Urban DH Systems**
Improved local processes and framework conditions for facilitating the transformation
Steinbeis Research Institute Solites

12:00 **EU-level Survey on Renewable Energy Sources in District Heating and Cooling**
Jack Corscadden, Euroheat & Power

12:15 **Virtual Study Tour Vattenfall/ AGFW**

13:00 **Farewell and giving introduction to explore the virtual power plant model**

13:15 **End of the event & time to explore the virtual power plant**

Please visit the following homepages for more information:

upgrade DH **www.upgrade-dh.eu**

RES DHC **www.res-dhc.com**

5.3 The Webinar

With experts from the two European project consortia the start of the online event gave a good overview on the research activities and the current project status and outcome. A public accessible recording will be available on the Upgrade DH Website.

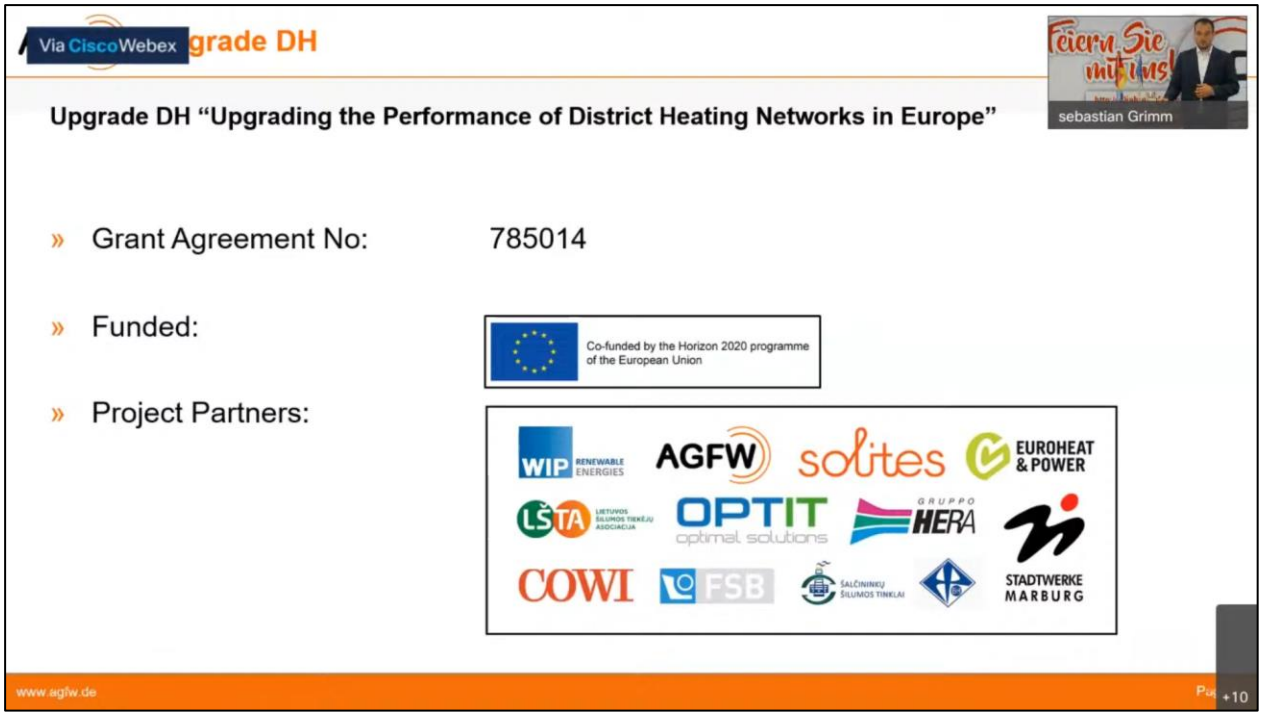

Image 38: Screenshot at the Welcome presentation by Sebastian Grimm (AGFW)

5.3.1 Information on Reuter West CHP Plant

Information from https://powerplants.vattenfall.com/reuter-west/

Located in the northwest of Germany's capital Berlin, Vattenfall operates the combined heat and power plant Reuter West commissioning in 1987 and 1989. The two identical heat and power plant units generate electricity (installed capacity of 564 MW_{el}) and heat (installed capacity of 878 MW_{th}) simultaneously according to the principle of cogeneration. Despite the age of the CHP of 30-years, the fuel utilization efficiency amounts to 80 percent due to ongoing efficiency and optimisation measures. Equipped with efficient flue gas cleaning systems the generation units still represent a highly efficient hard coal plant.

To reach the climate goals and supporting the heat transition Germany decided to have a coal phase out during the next years. As a result, heat and power generation needs to find some alternatives and Vattenfall Berlin has already been driving this process for several years. In September 2019 for example, Vattenfall connected Europe's largest power-to-heat plant (120 MW_{th}) to the district heating network at Reuter West power plant area in Berlin.

As general optimisation, upgrade process and transformation to higher shares of renewable energies are also targets of European (H2020) research activities the virtual study tour is embedded in an online webinar from Upgrade DH and RES-DHC.

5.3.2 Overview of the plant location

With an area roughly equal to that of the Vatican, you need a good general map of Reuter West to get your bearings.

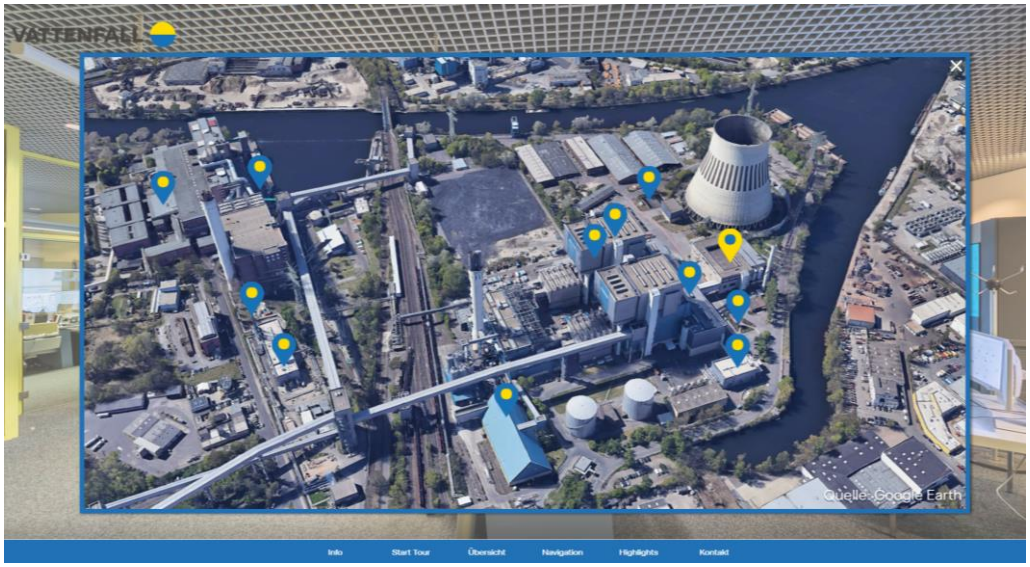

Image 39: Orientation map for the virtual model of Berlin Reuter West

5.3.3 Tour Start

The tour started with some welcome and introduction information at the brain of the power plant site, the control room (see Image 40).

Image 40: Tour start at the control room

5.3.4 Information points

Information points are distributed over the entire 3D model, which can be clicked on to obtain further details, component drawings and additional images or background information. In the following figures you can see the control room where you get details about the implementation of the virtual model (Image 41) and the P2H plant area with some technical details on the electrode boiler (Image 42).

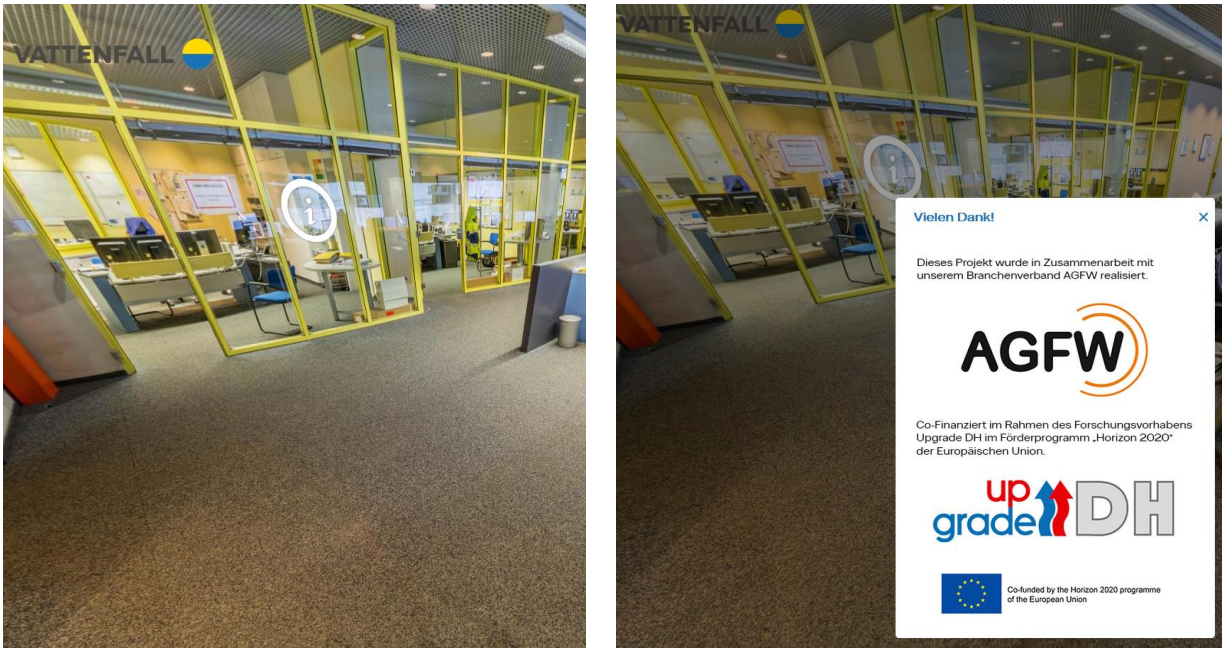

Image 41: Information points at the 3D model

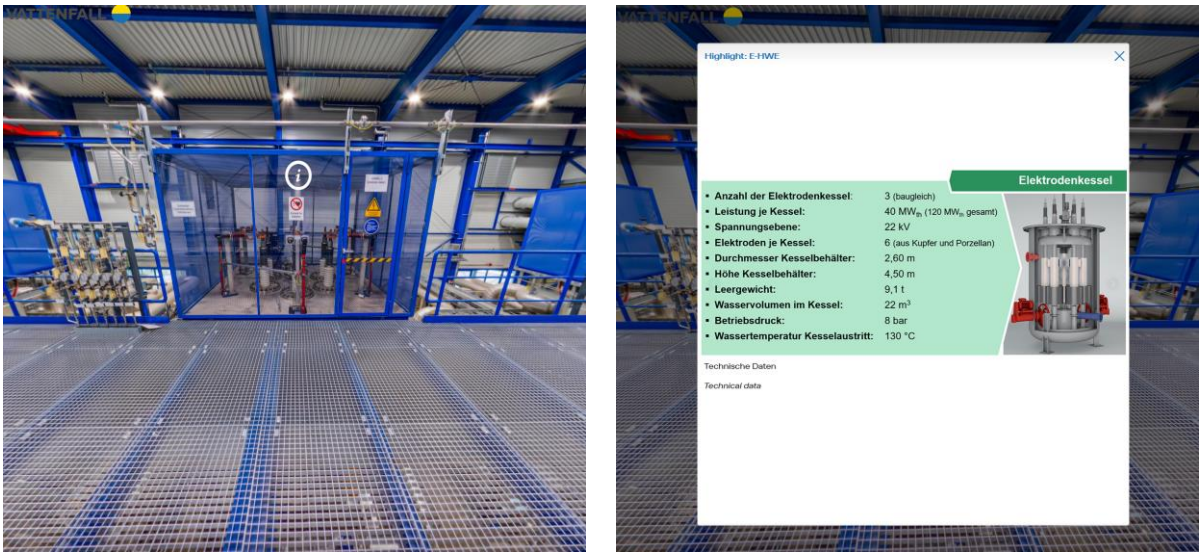

Image 42: Details on the P2H plant area

On the highest lookout on top of the 69 m high boiler house you get a view all over the area and can also see some landmarks. Most relevant points were marked in the model, e.g. in Image 43 the waste incineration plant (Müllverbrennungsanlage).

Image 43: View from the top of the boiler house

5.4 Participants

Registered accounts from project partners of Upgrade DH: 19

Registered external participants: 29

The 3h online live stream was opened 50 times during the event and at peak 27 people followed the live stream at the same time.

5.5 Summary

Even if a virtual event cannot replace a face-to-face meeting and the international exchange of experience that goes beyond the pure agenda, the event was able to create an attractive Study Tour program. This is also confirmed by positive feedback received afterwards from speakers and participants.

In addition to presenting exciting project results, not all of which would have been available in October 2020, the cooperation with RES-DHC also made it possible to address a broad audience. The audience was given a comprehensive insight into the ongoing research activities of the H2020 program, which was also made possible by thematic synergies of the two projects.

A special highlight was the first part of the guided study tour, which was conducted by a Berlin expert of the power plant site. Due to the sheer size of the power plant site, only a small part of the power plant railings could have been explored during an on-site presentation event. Due to virtually possible jumps between individual highlights at the site, participants could get much more insight into the situation on site. After the guided tour, all participants had the opportunity to move freely through the model for about 48 hours and to learn many more details and look around using the information points.