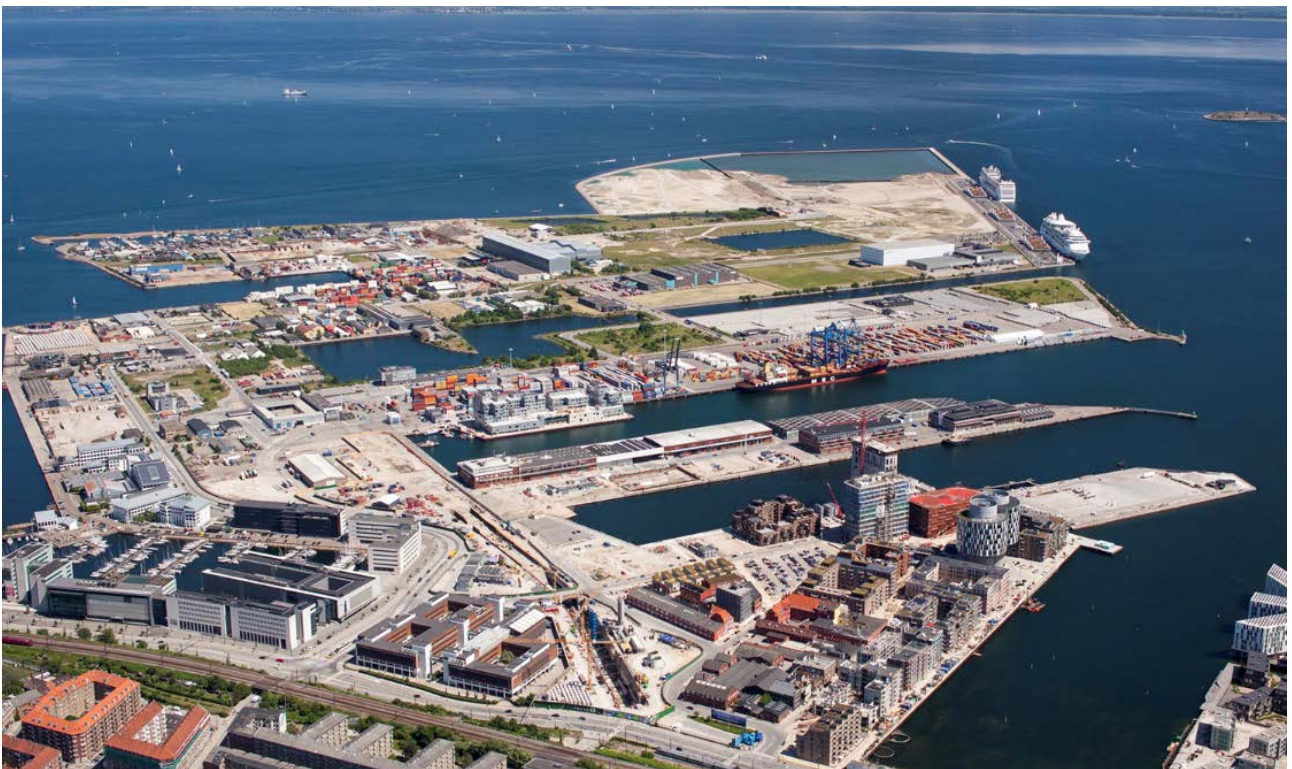


**Deliverable no.: D.2.4**  
**SAT test report. Automated meter readings are validated, according to specification from T2.1 and reach the data collection system as specified in T2.1**



*Photo: By & Havn / Ole Malling*

**HOFOR**  
**Author, Morten Skov**  
Date, March, 20, 2019

**Public deliverable**   
**Confidential deliverable**

## **Preface**

*EnergyLab Nordhavn – New Urban Energy Infrastructures* is an exciting project which will continue until the year of 2019. The project will use Copenhagen's Nordhavn as a full-scale smart city energy lab, which main purpose is to do research and to develop and demonstrate future energy solutions of renewable energy.

The goal is to identify the most cost-effective smart energy system, which can contribute to the major climate challenges the world are facing.

Budget: The project has a total budget of DKK 143 m (€ 19 m), of this DKK84 m (€ 11 m) funded in two rounds by the Danish Energy Technology Development and Demonstration Programme (EUDP).

## **Forord**

*EnergyLab Nordhavn* er et spændende projekt der løber til og med 2019. Projektet vil foregå i Københavns Nordhavn, og vil fungere som et fuldskala storbylaboratorium, der skal undersøge, udvikle og demonstrerer løsninger for fremtidens energisystem.

Målet er at finde fremtidens mest omkostningseffektive energisystem, der desuden kan bidrage til en løsning på de store klimaudfordringer verden står overfor nu og i fremtiden.

Budget: Projektets totale budget er DKK 143 mio. (EUR 19 mio.), hvoraf DKK 84 mio. (EUR 11 mio.) er blevet finansieret af Energiteknologisk Udviklings- og Demonstrationsprogram, EUDP.

## Project Information

**Deliverable no.:** D2.4

**Deliverable title:** SAT test report. Automated meter readings are validated, according to specification from T2.1 and reach the data collection system as specified in T2.1.

**WP title:** Data and measurements

**Task Leader:** Morten Skov

**WP Leader:** Benny S. Hansen

**Comment Period:** March, 22<sup>nd</sup> , 2019 to April, 4<sup>th</sup> , 2019

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## Table of Contents

<b>1. TEST OF DATA FROM HOFOR SERVER TO DTU DMS FOR DATA FROM NORDHAVN</b>	<b>7</b>
<b>2. DATA IN THE HOFOR DOMAIN</b>	<b>7</b>
<b>3. TEST</b>	<b>8</b>
<b>4. CONCLUSION</b>	<b>20</b>

## **Executive Summary**

HOFOR is for the EnergyLab Nordhavn project (ELN) providing measurements/data from the relevant areas and customers in the district heating system in Nordhavn.

Measurement/data is collected from the district heating energy meters in every single building via HOFOR's remote metering system, and transferred to HOFOR's energy management system, called EnergyKey. The measurements/data is made available for the Data Management System (DMS) at DTU via a secure file transfer protocol (sFTP-) server at HOFOR. The measurements/data is monitored and validated during the whole project period.

This document describes the System Acceptance Test (SAT) of the automated measurements/data delivery from HOFOR's EnergyKey system to DTU's DMS in ELN. The SAT report documents that the automated meter readings are validated, and approved according to the requirements of ELN.

If (or when) you find a mismatch between what you observe and what is described, please notify Morten Skov, [mosk@hofor.dk](mailto:mosk@hofor.dk) from HOFOR.

### Version Control

Version	Date	Author	Description of Changes
v1	2019-02-27	Morten Skov	First released version (based on a detail version of similar doc)
v2	2019-03-21	Kristian Honoré	Executive Summary and clarifications

### Quality Assurance

Author	Reviewer	Approver
Morten Skov	Kristian Honoré	WPL group

Status of deliverable		
Action	By	Date/Initials
Sent for review	Morten Skov, HOFOR	20 <sup>th</sup> of March 19
Reviewed	Kristian Honoré, HOFOR	21 <sup>st</sup> of March 19
Verified		
Approved	WPL group	10-04-2019

## 1. Test of data from HOFOR server to DTU DMS for data from Nordhavn

This document describes the data flow from the district heating energy meters in Nordhavn obtained from the remote metering system into HOFOR's energy management system, EnergyKey, and sent to a sFTP server at HOFOR. From this server DTU access data (by username and password) to their DMS (Data management system).

Datasets are defined according to the specifications defined in the documents "Energydata.dk – data model" and "Datastructure for data in EnergyLab Nordhavn" to be found on [www.energylabnordhavn.dk](http://www.energylabnordhavn.dk).

## 2. Data in the HOFOR domain

Data from HOFOR is available in HOFOR's energy management system called EnergyKey. Data for energy consumption the previous day is made available the next day. Data is available from 1th. January 2017. The energy meters are read every hour and the following data is available:

Data element	Explanation
Date and time	Time for reading (UTC time)
Installation number	The id number for installation
Meter number	The id number for the meter, will change if the meter is replaced
Energy	MWh
Volume	m <sup>3</sup>
Duration	h
inlet temperature	°C
return temperature	°C
temperature difference	°C
actual power	kW
actual flow	l/h
forwarded energy*	m <sup>3</sup> *°C (volume * temperature)
returned energy*	m <sup>3</sup> *°C (volume * temperature)

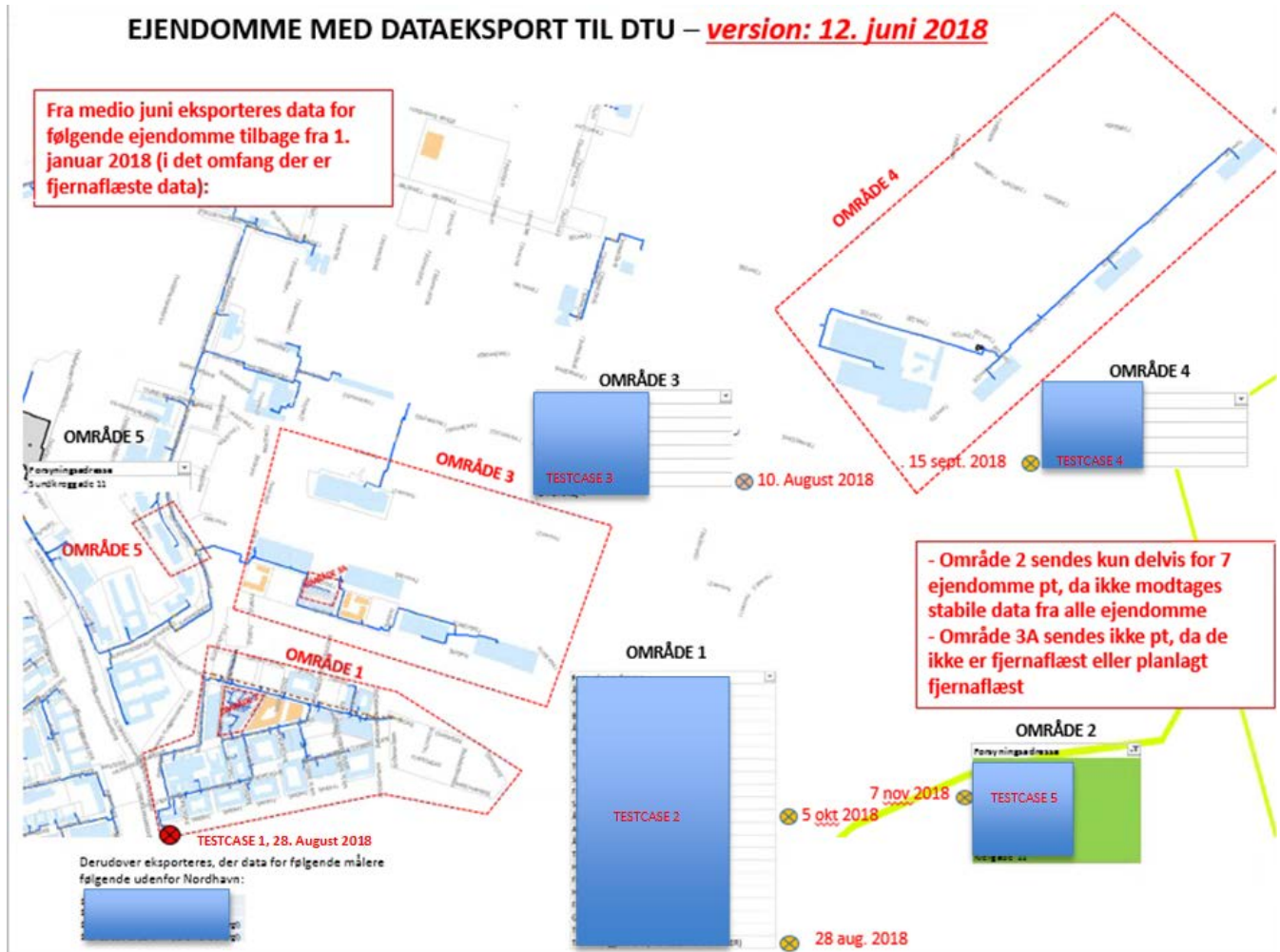
*Table 1 HOFOR energy meter reading data*

\*Forwarded and returned energy are only available on some energy meters.



### 3. TEST

The test consists of the following: Out of 43 currently active energy meters HOFOR has selected 5 meters from which DTU must extract data from DMS.



HOFOR has the 21th of November 2018 chosen 5 different dates for the 5 different meters:

- TESTCASE 1, 28<sup>th</sup> august 2018
- TESTCASE 2, 5<sup>th</sup> of October 2018
- TESTCASE 3, 10<sup>th</sup> of August 2018
- TESTCASE 4, 15<sup>th</sup> of September 2018
- TESTCASE 5, 7<sup>th</sup> of November 2018



It is possible to find the 5 test cases specific addresses in a confidential appendix. If you got approval to see it, you can get access to this document by contacting HOFOR or DTU.

DTU has the 22th of November 2018 returned data in comma-separated values (CSV) files from the 5 meters on the specific dates.

It must be noted, that “time stamp” in the data export from DMS (energydata.dk) is in Universal Time Coordinated (UTC), equal to Greenwich Mean Time (GMT) and Zulu time (Z).

The “time stamp” in the data export from EnergyKey is local Danish time, Central European Time (CET) / Central European Summer Time (CEST), i.e. with daylight offset. This means that during the summer period, the time in EnergyKey is 2 hours ahead and in the winter period 1 hour ahead of DMS / energydata.dk time stamp.

### TEST CASE 1:

Test case 1, 28<sup>th</sup> August 2018:

**The data below is data from the DTU DMS.** The 28<sup>th</sup> of August 2018 time stamp 28-08-2018 00:00.000Z(GMT+00) is the same as HOFOR EnergyKey 28-08-2018 02:00 local time.

*Check example: 28-08-2018 01:00 (GMT), Energy:18.494,80 MWh, volumen: 477.015 m3, inlet temp.: 71,50, return temp.: 38,57, flow 9.000 l/h*

timestamp	postal code	duration	energy	actual flow	temperature difference	return temperature	actual power	volume	inlet temperature
2018-08-28T00:00:00.000Z			18.494,40	9.000		36,12		477.005	71,66
2018-08-28T01:00:00.000Z		16.454	18.494,80	9.000	32,93	38,57	340	477.015	71,50
2018-08-28T02:00:00.000Z		16.455	18.495,30	18.900	28,84	41,43	620	477.027	70,27
2018-08-28T03:00:00.000Z		16.456	18.495,80	19.800	28,92	41,48	660	477.043	70,4
2018-08-28T04:00:00.000Z		16.457	18.496,30	11.700	30,05	40,3	400	477.057	70,35
2018-08-28T05:00:00.000Z		16.458	18.496,70	13.500	28,36	42,63	440	477.071	70,99
2018-08-28T06:00:00.000Z		16.459	18.497,20	21.600	27,37	43,62	670	477.087	70,99
2018-08-28T07:00:00.000Z		16.460	18.498,00	18.900	32,37	37,97	700	477.109	70,34
2018-08-28T08:00:00.000Z		16.461	18.498,50	13.500	33,12	37,34	510	477.123	70,46
2018-08-28T09:00:00.000Z		16.462	18.499,10	9.900	33,22	37,1	370	477.137	70,32
2018-08-28T10:00:00.000Z		16.463	18.499,60	9.900	29,56	40,26	330	477.152	69,82
2018-08-28T11:00:00.000Z		16.464	18.499,90	11.700	30,28	39,45	400	477.159	69,73
2018-08-28T12:00:00.000Z		16.465	18.500,30	10.800	30,89	38,89	380	477.172	69,78
2018-08-28T13:00:00.000Z		16.466	18.500,70	10.800	29,35	40,2	360	477.182	69,55
2018-08-28T14:00:00.000Z		16.467	18.501,00	12.600	28,06	41,59	400	477.193	69,65
2018-08-28T15:00:00.000Z		16.468	18.501,50	13.500	29,06	40,26	450	477.206	69,32
2018-08-28T16:00:00.000Z		16.469	18.501,90	13.500	32,08	41,85	500	477.217	73,93
2018-08-28T17:00:00.000Z		16.470	18.502,30	14.400	30,88	41,4	510	477.228	72,28
2018-08-28T18:00:00.000Z		16.471	18.502,80	12.600	39,99	42,17	580	477.241	82,16
2018-08-28T19:00:00.000Z		16.472	18.503,40	10.800	41,47	42,11	510	477.253	83,58
2018-08-28T20:00:00.000Z		16.473	18.503,90	10.800	41,84	40,22	520	477.265	82,06
2018-08-28T21:00:00.000Z		16.474	18.504,40	9.900	42,6	38,46	480	477.274	81,06
2018-08-28T22:00:00.000Z		16.475	18.504,70	5.400	42,15	38,26	260	477.281	80,41
2018-08-28T23:00:00.000Z		16.476	18.505,10	8.100	41,59	38,59	390	477.288	80,18

## TEST CASE 1:

Test case 1, 28<sup>th</sup> August 2018:

**Data from HOFOR EnergyKey** – time stamp in EnergyKey is the actual time in Denmark the 28<sup>th</sup> of August 2018.

*Check example: 28-08-2018 01:00 (GMT), 03:00 (local time), Energy: 18.494,80 MWh, Flow: 477.015,00 m<sup>3</sup>, inlet temp.: 71,50, return temp.: 38,57, flow 9.000 l/h*

Aflæsningsdato	Energi	Forventet	Flow	Afkøling	Timer	Fremløb	Returløb	Temp. forakel	Aktuel effekt	Aktuel flow
28-08-2018 00:00	18.493,70 MWh	---	476.988,00 m <sup>3</sup>	34,4 °C	16.451,00 t	72,31 °C	35,67 °C	36,64 °C	490,00 kW	11.700,00 l/t
28-08-2018 01:00	18.494,10 MWh	---	476.996,00 m <sup>3</sup>	43,0 °C	16.452,00 t	73,13 °C	35,66 °C	37,47 °C	420,00 kW	9.900,00 l/t
28-08-2018 02:00	18.494,40 MWh	---	477.005,00 m <sup>3</sup>	28,7 °C	---	71,66 °C	36,12 °C	---	---	9.000,00 l/t
28-08-2018 03:00	18.494,80 MWh	---	477.015,00 m <sup>3</sup>	34,3 °C	16.454,00 t	71,50 °C	38,57 °C	32,93 °C	340,00 kW	9.000,00 l/t
28-08-2018 04:00	18.495,30 MWh	---	477.027,00 m <sup>3</sup>	35,8 °C	16.455,00 t	70,27 °C	41,43 °C	28,84 °C	620,00 kW	18.900,00 l/t
28-08-2018 05:00	18.495,80 MWh	---	477.043,00 m <sup>3</sup>	26,9 °C	16.456,00 t	70,40 °C	41,48 °C	28,92 °C	660,00 kW	19.800,00 l/t
28-08-2018 06:00	18.496,30 MWh	---	477.057,00 m <sup>3</sup>	30,7 °C	16.457,00 t	70,35 °C	40,30 °C	30,05 °C	400,00 kW	11.700,00 l/t
28-08-2018 07:00	18.496,70 MWh	---	477.071,00 m <sup>3</sup>	24,6 °C	16.458,00 t	70,99 °C	42,63 °C	28,36 °C	440,00 kW	13.500,00 l/t
28-08-2018 08:00	18.497,20 MWh	---	477.087,00 m <sup>3</sup>	26,9 °C	16.459,00 t	70,99 °C	43,62 °C	27,37 °C	670,00 kW	21.600,00 l/t
28-08-2018 09:00	18.498,00 MWh	---	477.109,00 m <sup>3</sup>	31,3 °C	16.460,00 t	70,34 °C	37,97 °C	32,37 °C	700,00 kW	18.900,00 l/t
28-08-2018 10:00	18.498,50 MWh	---	477.123,00 m <sup>3</sup>	30,7 °C	16.461,00 t	70,46 °C	37,34 °C	33,12 °C	510,00 kW	13.500,00 l/t
28-08-2018 11:00	18.499,10 MWh	---	477.137,00 m <sup>3</sup>	36,8 °C	16.462,00 t	70,32 °C	37,10 °C	33,22 °C	370,00 kW	9.900,00 l/t
28-08-2018 12:00	18.499,60 MWh	---	477.152,00 m <sup>3</sup>	28,7 °C	16.463,00 t	69,82 °C	40,26 °C	29,56 °C	330,00 kW	9.900,00 l/t
28-08-2018 13:00	18.499,90 MWh	---	477.159,00 m <sup>3</sup>	37,0 °C	16.464,00 t	69,73 °C	39,45 °C	30,28 °C	400,00 kW	11.700,00 l/t
28-08-2018 14:00	18.500,30 MWh	---	477.172,00 m <sup>3</sup>	26,4 °C	16.465,00 t	69,78 °C	38,89 °C	30,89 °C	380,00 kW	10.800,00 l/t
28-08-2018 15:00	18.500,70 MWh	---	477.182,00 m <sup>3</sup>	34,4 °C	16.466,00 t	69,55 °C	40,20 °C	29,35 °C	360,00 kW	10.800,00 l/t
28-08-2018 16:00	18.501,00 MWh	---	477.193,00 m <sup>3</sup>	23,5 °C	16.467,00 t	69,65 °C	41,59 °C	28,06 °C	400,00 kW	12.600,00 l/t
28-08-2018 17:00	18.501,50 MWh	---	477.206,00 m <sup>3</sup>	33,1 °C	16.468,00 t	69,32 °C	40,26 °C	29,06 °C	450,00 kW	13.500,00 l/t
28-08-2018 18:00	18.501,90 MWh	---	477.217,00 m <sup>3</sup>	31,3 °C	16.469,00 t	73,93 °C	41,85 °C	32,08 °C	500,00 kW	13.500,00 l/t
28-08-2018 19:00	18.502,30 MWh	---	477.228,00 m <sup>3</sup>	31,2 °C	16.470,00 t	72,28 °C	41,40 °C	30,88 °C	510,00 kW	14.400,00 l/t
28-08-2018 20:00	18.502,80 MWh	---	477.241,00 m <sup>3</sup>	33,1 °C	16.471,00 t	82,16 °C	42,17 °C	39,99 °C	580,00 kW	12.600,00 l/t
28-08-2018 21:00	18.503,40 MWh	---	477.253,00 m <sup>3</sup>	43,1 °C	16.472,00 t	83,58 °C	42,11 °C	41,47 °C	510,00 kW	10.800,00 l/t
28-08-2018 22:00	18.503,90 MWh	---	477.265,00 m <sup>3</sup>	35,8 °C	16.473,00 t	82,06 °C	40,22 °C	41,84 °C	520,00 kW	10.800,00 l/t
28-08-2018 23:00	18.504,40 MWh	---	477.274,00 m <sup>3</sup>	47,8 °C	16.474,00 t	81,06 °C	38,46 °C	42,60 °C	480,00 kW	9.900,00 l/t

**DATA FROM THIS CHECK IS APPROVED.**

## TEST CASE 2:

Test case 2, 5<sup>th</sup> October 2018:

**The data below are data from the DTU DMS.** The 5<sup>th</sup> of October 2018 time stamp 05-10-2018 00:00.000Z(GMT+00) is the same as HOFOR EnergyKey 05-10-2018 02:00 local time.

*Check example: 05-10-2018 04:00 (GMT), Energy:2.186,23 MWh, volumen: 50.443,42 m<sup>3</sup>, inlet temp.: 82, return temp.: 36, flow 590 l/h*

timestamp	postal code	actual flow	actual power	temperature difference	volume	forwarded energy	returned energy	duration	inlet temperature	return temperature	energy
2018-10-05T00:00:00.000Z		830,0	46,1	48,1	50.440,15			30.151	83	35	2.186,05
2018-10-05T01:00:00.000Z		850,0	45,9	46,5	50.440,88			30.152	83	36	2.186,09
2018-10-05T02:00:00.000Z		550,0	29,8	46,7	50.441,63			30.153	82	36	2.186,13
2018-10-05T03:00:00.000Z		840,0	43,5	45,1	50.442,66			30.154	83	38	2.186,19
2018-10-05T04:00:00.000Z		590,0	31,7	46,4	50.443,42			30.155	82	36	2.186,23
2018-10-05T05:00:00.000Z		1400,0	83,6	51,6	50.444,38			30.156	82	31	2.186,28
2018-10-05T06:00:00.000Z		1780,0	113	54,8	50.445,80			30.157	83	28	2.186,37
2018-10-05T07:00:00.000Z		810,0	48,5	52,0	50.447,16			30.158	83	31	2.186,45
2018-10-05T08:00:00.000Z		630,0	37,5	51,7	50.447,99			30.159	83	31	2.186,50
2018-10-05T09:00:00.000Z		890,0	52,6	51,3	50.448,94			30.160	82	31	2.186,56
2018-10-05T10:00:00.000Z		750,0	47,4	54,6	50.449,60			30.161	83	29	2.186,60
2018-10-05T11:00:00.000Z		530,0	32,5	52,6	50.450,27			30.162	84	31	2.186,64
2018-10-05T12:00:00.000Z		710,0	42	51,4	50.450,98			30.163	83	31	2.186,69
2018-10-05T13:00:00.000Z		780,0	46,2	51,3	50.451,66			30.164	83	31	2.186,73
2018-10-05T14:00:00.000Z		760,0	44,9	51,1	50.452,37			30.165	82	31	2.186,77
2018-10-05T15:00:00.000Z		930,0	57	53,5	50.453,16			30.166	84	30	2.186,82
2018-10-05T16:00:00.000Z		670,0	40,2	51,6	50.454,02			30.167	83	31	2.186,87
2018-10-05T17:00:00.000Z		720,0	42,8	51,6	50.454,56			30.168	82	31	2.186,90
2018-10-05T18:00:00.000Z		750,0	47	53,9	50.455,44			30.169	83	29	2.186,96
2018-10-05T19:00:00.000Z		770,0	49,3	55,1	50.456,19			30.170	83	28	2.187,00
2018-10-05T20:00:00.000Z		440,0	25,1	48,9	50.456,80			30.171	83	35	2.187,04
2018-10-05T21:00:00.000Z		1070,0	67,1	54,3	50.457,58			30.172	82	28	2.187,09
2018-10-05T22:00:00.000Z		710,0	42,8	51,8	50.458,26			30.173	82	30	2.187,13
2018-10-05T23:00:00.000Z		910,0	54,8	52,1	50.458,92			30.174	83	30	2.187,17

## TEST CASE 2:

Test case 2, 5<sup>th</sup> October 2018:

**Data from HOFOR EnergyKey** – time stamp in EnergyKey is the actual time in Denmark the 5<sup>th</sup> of October 2018.

*Check example: 05-10-2018 04:00 (GMT), 05-10-2018 06:00 local time, Energy:2.186,23 MWh, volumen: 50.443,42 m<sup>3</sup>, inlet temp.: 82, return temp.: 36, flow 590 l/h)*

Aflæsningsdato	Energi	Forventet	Flow	Afkøling	Timer	Fremløb	Returløb	Temp. forakel	Aktuel effekt	Aktuel flow
05-10-2018 00:00	2.185,96 MWh	---	50.438,66 m <sup>3</sup>	50,3 °C	30.149,00 t	83,00 °C	32,00 °C	50,50 °C	39,30 kW	670,00 l/t
05-10-2018 01:00	2.186,01 MWh	---	50.439,45 m <sup>3</sup>	50,1 °C	30.150,00 t	83,00 °C	33,00 °C	49,30 °C	40,60 kW	710,00 l/t
05-10-2018 02:00	2.186,05 MWh	---	50.440,15 m <sup>3</sup>	48,2 °C	30.151,00 t	83,00 °C	35,00 °C	48,10 °C	46,10 kW	830,00 l/t
05-10-2018 03:00	2.186,09 MWh	---	50.440,88 m <sup>3</sup>	48,0 °C	30.152,00 t	83,00 °C	36,00 °C	46,50 °C	45,90 kW	850,00 l/t
05-10-2018 04:00	2.186,13 MWh	---	50.441,63 m <sup>3</sup>	47,0 °C	30.153,00 t	82,00 °C	36,00 °C	46,70 °C	29,80 kW	550,00 l/t
05-10-2018 05:00	2.186,19 MWh	---	50.442,66 m <sup>3</sup>	47,9 °C	30.154,00 t	83,00 °C	38,00 °C	45,10 °C	43,50 kW	840,00 l/t
05-10-2018 06:00	2.186,23 MWh	---	50.443,42 m <sup>3</sup>	47,2 °C	30.155,00 t	82,00 °C	36,00 °C	46,40 °C	31,70 kW	590,00 l/t
05-10-2018 07:00	2.186,28 MWh	---	50.444,38 m <sup>3</sup>	47,8 °C	30.156,00 t	82,00 °C	31,00 °C	51,60 °C	83,60 kW	1.400,00 l/t
05-10-2018 08:00	2.186,37 MWh	---	50.445,80 m <sup>3</sup>	52,6 °C	30.157,00 t	83,00 °C	28,00 °C	54,80 °C	112,60 kW	1.780,00 l/t
05-10-2018 09:00	2.186,45 MWh	---	50.447,16 m <sup>3</sup>	51,6 °C	30.158,00 t	83,00 °C	31,00 °C	52,00 °C	48,50 kW	810,00 l/t
05-10-2018 10:00	2.186,50 MWh	---	50.447,99 m <sup>3</sup>	53,0 °C	30.159,00 t	83,00 °C	31,00 °C	51,70 °C	37,50 kW	630,00 l/t
05-10-2018 11:00	2.186,56 MWh	---	50.448,94 m <sup>3</sup>	53,7 °C	30.160,00 t	82,00 °C	31,00 °C	51,30 °C	52,60 kW	890,00 l/t
05-10-2018 12:00	2.186,60 MWh	---	50.449,60 m <sup>3</sup>	53,1 °C	30.161,00 t	83,00 °C	29,00 °C	54,60 °C	47,40 kW	750,00 l/t
05-10-2018 13:00	2.186,64 MWh	---	50.450,27 m <sup>3</sup>	52,5 °C	30.162,00 t	84,00 °C	31,00 °C	52,60 °C	32,50 kW	530,00 l/t
05-10-2018 14:00	2.186,69 MWh	---	50.450,98 m <sup>3</sup>	53,2 °C	30.163,00 t	83,00 °C	31,00 °C	51,40 °C	42,30 kW	710,00 l/t
05-10-2018 15:00	2.186,73 MWh	---	50.451,66 m <sup>3</sup>	51,2 °C	30.164,00 t	83,00 °C	31,00 °C	51,30 °C	46,20 kW	780,00 l/t
05-10-2018 16:00	2.186,77 MWh	---	50.452,37 m <sup>3</sup>	50,8 °C	30.165,00 t	82,00 °C	31,00 °C	51,10 °C	44,90 kW	760,00 l/t
05-10-2018 17:00	2.186,82 MWh	---	50.453,16 m <sup>3</sup>	51,8 °C	30.166,00 t	84,00 °C	30,00 °C	53,50 °C	57,40 kW	930,00 l/t
05-10-2018 18:00	2.186,87 MWh	---	50.454,02 m <sup>3</sup>	52,5 °C	30.167,00 t	83,00 °C	31,00 °C	51,60 °C	40,20 kW	670,00 l/t
05-10-2018 19:00	2.186,90 MWh	---	50.454,56 m <sup>3</sup>	50,3 °C	30.168,00 t	82,00 °C	31,00 °C	51,60 °C	42,80 kW	720,00 l/t
05-10-2018 20:00	2.186,95 MWh	---	50.455,44 m <sup>3</sup>	53,1 °C	30.169,00 t	83,00 °C	29,00 °C	53,90 °C	46,80 kW	750,00 l/t
05-10-2018 21:00	2.187,00 MWh	---	50.456,19 m <sup>3</sup>	55,0 °C	30.170,00 t	83,00 °C	28,00 °C	55,10 °C	49,30 kW	770,00 l/t
05-10-2018 22:00	2.187,04 MWh	---	50.456,80 m <sup>3</sup>	53,6 °C	30.171,00 t	83,00 °C	35,00 °C	48,90 °C	25,10 kW	440,00 l/t
05-10-2018 23:00	2.187,09 MWh	---	50.457,58 m <sup>3</sup>	53,9 °C	30.172,00 t	82,00 °C	28,00 °C	54,30 °C	67,10 kW	1.070,00 l/t

**DATA FROM THIS CHECK IS APPROVED.**

### TEST CASE 3:

Test case 3, 10<sup>th</sup> of August 2018

**The data below are data from the DTU DMS.** The 10<sup>th</sup> of August 2018 time stamp 10-08-2018 00:00.000Z (GMT+00) is the same as HOFOR EnergyKey 28-08-2018 02:00 local time.

*Check example: 10-08-2018 08:00 (GMT), Energy: 724,67 MWh, volumen: 25924,1 m3, inlet temp.: 70,94, return temp.: 43,21, flow 264 l/h)*

timestamp	postal code	duration	actual flow	energy	volume	inlet temperature	returned energy	forwarded energy	actual power	return temperature
2018-08-10T00:00:00.000Z		14515	0	724,58	25920,90	66,07	147232	210218	0	50,49
2018-08-10T01:00:00.000Z			0	724,59	25921,20	67,72	147233	210220		52,23
2018-08-10T02:00:00.000Z			4008	724,59	25921,30	68,90	147234	210221		47,36
2018-08-10T03:00:00.000Z			0	724,60	25921,40	67,35	147234	210221		52,07
2018-08-10T04:00:00.000Z			0	724,60	25921,70	67,22	147236	210223		52,90
2018-08-10T05:00:00.000Z			0	724,61	25922,10	70,15	147237	210226		51,70
2018-08-10T06:00:00.000Z			0	724,62	25922,50	69,17	147239	210229		49,96
2018-08-10T07:00:00.000Z			0	724,64	25923,30	70,91	147243	210235		50,81
2018-08-10T08:00:00.000Z			264	724,67	25924,10	70,94	147246	210240		43,21
2018-08-10T09:00:00.000Z			0	724,69	25924,50	70,27	147248	210243		49,87
2018-08-10T10:00:00.000Z			0	724,70	25924,80	70,27	147249	210245		50,75
2018-08-10T11:00:00.000Z			0	724,70	25925,10	69,95	147251	210248		50,89
2018-08-10T12:00:00.000Z			0	724,71	25925,40	70,35	147252	210250		50,81
2018-08-10T13:00:00.000Z			3984	724,72	25925,50	72,20	147252	210250		40,61
2018-08-10T14:00:00.000Z			0	724,73	25926,00	71,67	147255	210254		51,90
2018-08-10T15:00:00.000Z			0	724,73	25926,00	68,08	147255	210254		51,15
2018-08-10T16:00:00.000Z			3984	724,75	25926,50	72,35	147257	210258		40,27
2018-08-10T17:00:00.000Z			1584	724,78	25927,30	72,45	147260	210263		39,61
2018-08-10T18:00:00.000Z			0	724,78	25927,50	68,93	147261	210265		42,11
2018-08-10T19:00:00.000Z			120	724,80	25928,00	71,33	147263	210268		43,50
2018-08-10T20:00:00.000Z			1632	724,82	25928,60	72,30	147266	210273		45,80
2018-08-10T21:00:00.000Z			0	724,82	25928,60	68,55	147266	210273		45,35
2018-08-10T22:00:00.000Z			0	724,83	25929,00	71,30	147268	210276		48,13
2018-08-10T23:00:00.000Z			120	724,83	25929,00	66,89	147268	210276		46,40



### TEST CASE 3:

Test case 3, 10<sup>th</sup> of August 2018

**Data from HOFOR EnergyKey** – time stamp in EnergyKey is the actual time in Denmark the 10<sup>th</sup> of August 2018.

*Check example: 10-08-2018 08:00 (GMT), 10-08-2018 10:00 local time, Energy: 724,67 MWh, volumen: 25924,1 m<sup>3</sup>, inlet temp.: 70,94, return temp.: 43,21, flow 264 l/h)*

Aflæsningsdato	Energi	Forventet	Volumen	Afkøling	Timer	Fremløb	Returløb	Temp. forskel	Aktuel effekt	Aktuel flow	Fremført energi	Tilbageført energi
10-08-2018 00:00	724,57 MWh	---	25.920,30 m <sup>3</sup>	21,5 °C	---	65,74 °C	48,91 °C	---	---	0,00 l/t	210.214,00 m <sup>3</sup> °C	147.229,00 m <sup>3</sup> °C
10-08-2018 01:00	724,58 MWh	---	25.920,60 m <sup>3</sup>	28,6 °C	---	65,88 °C	49,79 °C	---	---	0,00 l/t	210.216,00 m <sup>3</sup> °C	147.230,00 m <sup>3</sup> °C
10-08-2018 02:00	724,58 MWh	---	25.920,90 m <sup>3</sup>	---	14.515,00 t	66,07 °C	50,49 °C	15,58 °C	0,00 kW	0,00 l/t	210.218,00 m <sup>3</sup> °C	147.232,00 m <sup>3</sup> °C
10-08-2018 03:00	724,59 MWh	---	25.921,20 m <sup>3</sup>	28,6 °C	---	67,72 °C	52,23 °C	---	---	0,00 l/t	210.220,00 m <sup>3</sup> °C	147.233,00 m <sup>3</sup> °C
10-08-2018 04:00	724,59 MWh	---	25.921,30 m <sup>3</sup>	---	---	68,90 °C	47,36 °C	---	---	4.008,00 l/t	210.221,00 m <sup>3</sup> °C	147.234,00 m <sup>3</sup> °C
10-08-2018 05:00	724,60 MWh	---	25.921,40 m <sup>3</sup>	86,4 °C	---	67,35 °C	52,07 °C	---	---	0,00 l/t	210.221,00 m <sup>3</sup> °C	147.234,00 m <sup>3</sup> °C
10-08-2018 06:00	724,60 MWh	---	25.921,70 m <sup>3</sup>	---	---	67,22 °C	52,90 °C	---	---	0,00 l/t	210.223,00 m <sup>3</sup> °C	147.236,00 m <sup>3</sup> °C
10-08-2018 07:00	724,61 MWh	---	25.922,10 m <sup>3</sup>	21,2 °C	---	70,15 °C	51,70 °C	---	---	0,00 l/t	210.226,00 m <sup>3</sup> °C	147.237,00 m <sup>3</sup> °C
10-08-2018 08:00	724,62 MWh	---	25.922,50 m <sup>3</sup>	21,5 °C	---	69,17 °C	49,96 °C	---	---	0,00 l/t	210.229,00 m <sup>3</sup> °C	147.239,00 m <sup>3</sup> °C
10-08-2018 09:00	724,64 MWh	---	25.923,30 m <sup>3</sup>	21,6 °C	---	70,91 °C	50,81 °C	---	---	0,00 l/t	210.235,00 m <sup>3</sup> °C	147.243,00 m <sup>3</sup> °C
10-08-2018 10:00	724,67 MWh	---	25.924,10 m <sup>3</sup>	32,3 °C	---	70,94 °C	43,21 °C	---	---	264,00 l/t	210.240,00 m <sup>3</sup> °C	147.246,00 m <sup>3</sup> °C
10-08-2018 11:00	724,69 MWh	---	25.924,50 m <sup>3</sup>	43,0 °C	---	70,27 °C	49,87 °C	---	---	0,00 l/t	210.243,00 m <sup>3</sup> °C	147.248,00 m <sup>3</sup> °C
10-08-2018 12:00	724,70 MWh	---	25.924,80 m <sup>3</sup>	28,8 °C	---	70,27 °C	50,75 °C	---	---	0,00 l/t	210.245,00 m <sup>3</sup> °C	147.249,00 m <sup>3</sup> °C
10-08-2018 13:00	724,70 MWh	---	25.925,10 m <sup>3</sup>	---	---	69,95 °C	50,89 °C	---	---	0,00 l/t	210.248,00 m <sup>3</sup> °C	147.251,00 m <sup>3</sup> °C
10-08-2018 14:00	724,71 MWh	---	25.925,40 m <sup>3</sup>	28,8 °C	---	70,35 °C	50,81 °C	---	---	0,00 l/t	210.250,00 m <sup>3</sup> °C	147.252,00 m <sup>3</sup> °C
10-08-2018 15:00	724,72 MWh	---	25.925,50 m <sup>3</sup>	84,8 °C	---	72,20 °C	40,61 °C	---	---	3.984,00 l/t	210.250,00 m <sup>3</sup> °C	147.252,00 m <sup>3</sup> °C
10-08-2018 16:00	724,73 MWh	---	25.926,00 m <sup>3</sup>	17,2 °C	---	71,67 °C	51,90 °C	---	---	0,00 l/t	210.254,00 m <sup>3</sup> °C	147.255,00 m <sup>3</sup> °C
10-08-2018 17:00	724,73 MWh	---	25.926,00 m <sup>3</sup>	---	---	68,08 °C	51,15 °C	---	---	0,00 l/t	210.254,00 m <sup>3</sup> °C	147.255,00 m <sup>3</sup> °C
10-08-2018 18:00	724,75 MWh	---	25.926,50 m <sup>3</sup>	34,2 °C	---	72,35 °C	40,27 °C	---	---	3.984,00 l/t	210.258,00 m <sup>3</sup> °C	147.257,00 m <sup>3</sup> °C
10-08-2018 19:00	724,78 MWh	---	25.927,30 m <sup>3</sup>	32,3 °C	---	72,45 °C	39,61 °C	---	---	1.584,00 l/t	210.263,00 m <sup>3</sup> °C	147.260,00 m <sup>3</sup> °C
10-08-2018 20:00	724,78 MWh	---	25.927,50 m <sup>3</sup>	---	---	68,93 °C	42,11 °C	---	---	0,00 l/t	210.265,00 m <sup>3</sup> °C	147.261,00 m <sup>3</sup> °C
10-08-2018 21:00	724,80 MWh	---	25.928,00 m <sup>3</sup>	34,4 °C	---	71,33 °C	43,50 °C	---	---	120,00 l/t	210.268,00 m <sup>3</sup> °C	147.263,00 m <sup>3</sup> °C
10-08-2018 22:00	724,82 MWh	---	25.928,60 m <sup>3</sup>	28,7 °C	---	72,30 °C	45,80 °C	---	---	1.632,00 l/t	210.273,00 m <sup>3</sup> °C	147.266,00 m <sup>3</sup> °C
10-08-2018 23:00	724,82 MWh	---	25.928,60 m <sup>3</sup>	---	---	68,55 °C	45,35 °C	---	---	0,00 l/t	210.273,00 m <sup>3</sup> °C	147.266,00 m <sup>3</sup> °C

**DATA FROM THIS CHECK IS APPROVED.**

## TEST CASE 4:

Test case 4, 15<sup>th</sup> of September 2018

**The data below are data from the DTU DMS.** The 15<sup>th</sup> of September 2018 time stamp 15-09-2018 00:00.000Z (GMT+00) is the same as HOFOR EnergyKey 15-09-2018 02:00 local time.

*Check example: 15-09-2018 14:00 (GMT), Energy: 4.276,91 MWh, volumen: 254.660,11 m<sup>3</sup>, inlet temp.: 69,35 return temp.: 39,18 flow 1380 l/h)*

timestamp	postal code	volume	inlet temperature	energy	temperature difference	forwarded energy	returned energy	return temperature	actual power	actual flow
2018-09-15T00:00:00.000Z		254.640,80	68,68	4.276,11				29,29		1380
2018-09-15T01:00:00.000Z		254.642,50	67,95	4.276,18				38,17		1860
2018-09-15T02:00:00.000Z		254.644,11	66,05	4.276,24				36,45		1920
2018-09-15T03:00:00.000Z		254.645,70	72,95	4.276,31				31,42		1200
2018-09-15T04:00:00.000Z		254.647,70	72,25	4.276,39				37,57		2280
2018-09-15T05:00:00.000Z		254.649,41	72,62	4.276,47				37,65		1620
2018-09-15T06:00:00.000Z		254.651,00	72,12	4.276,54				30,53		1800
2018-09-15T07:00:00.000Z		254.653,00	72,55	4.276,62				35,32		1080
2018-09-15T08:00:00.000Z		254.654,20	71,73	4.276,68				38,6		1500
2018-09-15T09:00:00.000Z		254.655,00	70,8	4.276,71				29,14		480
2018-09-15T10:00:00.000Z		254.655,91	70,57	4.276,74				32,52		840
2018-09-15T11:00:00.000Z		254.657,00	69,42	4.276,79				36,7		1860
2018-09-15T12:00:00.000Z		254.658,30	70,12	4.276,84				34,72		120
2018-09-15T13:00:00.000Z		254.658,91	69,25	4.276,86				31,74		900
2018-09-15T14:00:00.000Z		254.660,11	69,35	4.276,91				39,18		1380
2018-09-15T15:00:00.000Z		254.661,11	59,83	4.276,95				31,57		1680
2018-09-15T16:00:00.000Z		254.664,00	71,22	4.277,02				41,46		2400
2018-09-15T17:00:00.000Z		254.665,11	70,06	4.277,07				29,7		840
2018-09-15T18:00:00.000Z		254.666,80	71,74	4.277,15				37,03		2220
2018-09-15T19:00:00.000Z		254.669,50	71,37	4.277,26				38,57		3240
2018-09-15T20:00:00.000Z		254.672,11	71,35	4.277,36				35,79		1980
2018-09-15T21:00:00.000Z		254.674,41	68,5	4.277,44				37,35		2880
2018-09-15T22:00:00.000Z		254.676,91	69,77	4.277,54				35,87		2820
2018-09-15T23:00:00.000Z		254.679,70	71,73	4.277,65				33,86		2520



## TEST CASE 4:

Test case 4, 15<sup>th</sup> of September 2018

**Data from HOFOR EnergyKey** – time stamp in EnergyKey is the actual time in Denmark the 15<sup>th</sup> of September 2018.

*Check example: 15-09-2018 14:00 (GMT), 15-09-2018 16:00 local time, Energy: 4.276,91 MWh, volumen: 254.660,11 m<sup>3</sup>, inlet temp.: 69,35, return temp.: 39,18, flow 1.380 l/h)*

Aflæsningsdato	Energi	Forventet	Flow	Afkøling	Timer	Fremløb	Returløb	Temp. forskel	Aktuel effekt	Aktuel flow
15-09-2018 00:00	4.276,01 MWh	---	254.638,20 m <sup>3</sup>	40,0 °C	---	70,18 °C	38,51 °C	---	---	1.800,00 l/t
15-09-2018 01:00	4.276,06 MWh	---	254.639,41 m <sup>3</sup>	35,9 °C	54.513,00 t	69,82 °C	34,80 °C	35,02 °C	53,40 kW	1.320,00 l/t
15-09-2018 02:00	4.276,11 MWh	---	254.640,80 m <sup>3</sup>	30,8 °C	---	68,68 °C	29,29 °C	---	---	1.380,00 l/t
15-09-2018 03:00	4.276,18 MWh	---	254.642,50 m <sup>3</sup>	35,3 °C	---	67,95 °C	38,17 °C	---	---	1.860,00 l/t
15-09-2018 04:00	4.276,24 MWh	---	254.644,11 m <sup>3</sup>	32,1 °C	---	66,05 °C	36,45 °C	---	---	1.920,00 l/t
15-09-2018 05:00	4.276,31 MWh	---	254.645,70 m <sup>3</sup>	37,9 °C	---	72,95 °C	31,42 °C	---	---	1.200,00 l/t
15-09-2018 06:00	4.276,39 MWh	---	254.647,70 m <sup>3</sup>	34,4 °C	---	72,25 °C	37,57 °C	---	---	2.280,00 l/t
15-09-2018 07:00	4.276,47 MWh	---	254.649,41 m <sup>3</sup>	40,2 °C	---	72,62 °C	37,65 °C	---	---	1.620,00 l/t
15-09-2018 08:00	4.276,54 MWh	---	254.651,00 m <sup>3</sup>	37,9 °C	---	72,12 °C	30,53 °C	---	---	1.800,00 l/t
15-09-2018 09:00	4.276,62 MWh	---	254.653,00 m <sup>3</sup>	34,4 °C	---	72,55 °C	35,32 °C	---	---	1.080,00 l/t
15-09-2018 10:00	4.276,68 MWh	---	254.654,20 m <sup>3</sup>	42,6 °C	---	71,73 °C	38,60 °C	---	---	1.500,00 l/t
15-09-2018 11:00	4.276,71 MWh	---	254.655,00 m <sup>3</sup>	32,7 °C	---	70,80 °C	29,14 °C	---	---	480,00 l/t
15-09-2018 12:00	4.276,74 MWh	---	254.655,91 m <sup>3</sup>	28,3 °C	---	70,57 °C	32,52 °C	---	---	840,00 l/t
15-09-2018 13:00	4.276,79 MWh	---	254.657,00 m <sup>3</sup>	39,5 °C	---	69,42 °C	36,70 °C	---	---	1.860,00 l/t
15-09-2018 14:00	4.276,84 MWh	---	254.658,30 m <sup>3</sup>	33,0 °C	---	70,12 °C	34,72 °C	---	---	120,00 l/t
15-09-2018 15:00	4.276,86 MWh	---	254.658,91 m <sup>3</sup>	28,3 °C	---	69,25 °C	31,74 °C	---	---	900,00 l/t
15-09-2018 16:00	4.276,91 MWh	---	254.660,11 m <sup>3</sup>	35,6 °C	---	69,35 °C	39,18 °C	---	---	1.380,00 l/t
15-09-2018 17:00	4.276,95 MWh	---	254.661,11 m <sup>3</sup>	34,4 °C	---	59,83 °C	31,57 °C	---	---	1.680,00 l/t
15-09-2018 18:00	4.277,02 MWh	---	254.664,00 m <sup>3</sup>	20,9 °C	---	71,22 °C	41,46 °C	---	---	2.400,00 l/t
15-09-2018 19:00	4.277,07 MWh	---	254.665,11 m <sup>3</sup>	38,6 °C	---	70,06 °C	29,70 °C	---	---	840,00 l/t
15-09-2018 20:00	4.277,15 MWh	---	254.666,80 m <sup>3</sup>	40,8 °C	---	71,74 °C	37,03 °C	---	---	2.220,00 l/t
15-09-2018 21:00	4.277,26 MWh	---	254.669,50 m <sup>3</sup>	35,0 °C	---	71,37 °C	38,57 °C	---	---	3.240,00 l/t
15-09-2018 22:00	4.277,36 MWh	---	254.672,11 m <sup>3</sup>	33,0 °C	---	71,35 °C	35,79 °C	---	---	1.980,00 l/t
15-09-2018 23:00	4.277,44 MWh	---	254.674,41 m <sup>3</sup>	30,0 °C	---	68,50 °C	37,35 °C	---	---	2.880,00 l/t

**DATA FROM THIS CHECK IS APPROVED.**

## TEST CASE 5:

Test case 5, 7<sup>th</sup> of November 2018

**The data below are data from the DTU DMS.** The 7<sup>th</sup> of November 2018 time stamp 07-11-2018 00:00.000Z (GMT+00) is the same as HOFOR EnergyKey 07-15-2018 01:00 local time (winter time).

*Check example: 07-11-2018 18:00 (GMT), Energy: 27,62MWh, volumen: 698,41 m3, inlet temp.: 62,84 return temp.: 35,75, flow 10 l/h)*

timestamp	postal code	forwarded energy	returned energy	volume	actual flow	inlet temperature	energy	return temperature
2018-11-07T00:00:00.000Z		52911	29007	697,95	28	68,37	27,61	34,09
2018-11-07T01:00:00.000Z				697,98	14	65,76	27,61	34,53
2018-11-07T02:00:00.000Z				698,01	18	60,83	27,61	34,26
2018-11-07T03:00:00.000Z				698,04	10	65,84	27,61	36,68
2018-11-07T04:00:00.000Z				698,08	36	68,91	27,61	39,31
2018-11-07T05:00:00.000Z				698,12	25	68,89	27,61	32,90
2018-11-07T06:00:00.000Z				698,15	14	65,95	27,62	34,42
2018-11-07T07:00:00.000Z				698,21	61	70,53	27,62	47,46
2018-11-07T08:00:00.000Z				698,23	18	67,27	27,62	34,92
2018-11-07T09:00:00.000Z				698,26	14	65,53	27,62	33,70
2018-11-07T10:00:00.000Z				698,27	14	66,14	27,62	33,86
2018-11-07T11:00:00.000Z				698,30	10	70,00	27,62	47,40
2018-11-07T12:00:00.000Z				698,30	18	46,83	27,62	38,73
2018-11-07T13:00:00.000Z				698,31	0	44,73	27,62	36,58
2018-11-07T14:00:00.000Z				698,33	18	64,05	27,62	35,53
2018-11-07T15:00:00.000Z				698,35	14	63,01	27,62	35,62
2018-11-07T16:00:00.000Z				698,37	36	65,14	27,62	46,51
2018-11-07T17:00:00.000Z				698,39	14	60,05	27,62	34,65
2018-11-07T18:00:00.000Z				698,41	10	62,84	27,62	35,75
2018-11-07T19:00:00.000Z				698,43	0	63,42	27,62	35,58
2018-11-07T20:00:00.000Z				698,44	0	64,65	27,62	26,41
2018-11-07T21:00:00.000Z				698,46	0	66,91	27,63	32,03
2018-11-07T22:00:00.000Z				698,49	14	68,19	27,63	32,86
2018-11-07T23:00:00.000Z				698,51	28	68,54	27,63	42,27

## TEST CASE 5:

Test case 5, 7<sup>th</sup> of November 2018

**Data from HOFOR EnergyKey** – time stamp in EnergyKey is the actual time in Denmark the 7<sup>th</sup> of November 2018.

*Check example: 07-11-2018 18:00 (GMT), 15-09-2018 19:00 local time, Energy: 27,62 MWh, volumen: 698,41m<sup>3</sup>, inlet temp.: 62,84, return temp.: 35,75, flow 10,00 l/h)*

Aflæsningsdato ↓	Energi	Forventet	Volumen	Afkøling	Timer	Fremløb	Returløb	Temp. forskel	Aktuel effekt	Aktuel flow
07-11-2018 00:00	27,60 MWh	---	697,92 m <sup>3</sup>	---	---	69,64 °C	47,09 °C	---	---	18,00 l/t
07-11-2018 01:00	27,61 MWh	---	697,95 m <sup>3</sup>	57,3 °C	27.871,00 t	68,37 °C	34,09 °C	0,00 °C	0,00 kW	28,00 l/t
07-11-2018 02:00	27,61 MWh	---	697,98 m <sup>3</sup>	28,6 °C	---	65,76 °C	34,53 °C	---	---	14,00 l/t
07-11-2018 03:00	27,61 MWh	---	698,01 m <sup>3</sup>	28,8 °C	---	60,83 °C	34,26 °C	---	---	18,00 l/t
07-11-2018 04:00	27,61 MWh	---	698,04 m <sup>3</sup>	57,3 °C	---	65,84 °C	36,68 °C	---	---	10,00 l/t
07-11-2018 05:00	27,61 MWh	---	698,08 m <sup>3</sup>	21,5 °C	---	68,91 °C	39,31 °C	---	---	36,00 l/t
07-11-2018 06:00	27,61 MWh	---	698,12 m <sup>3</sup>	43,1 °C	---	68,89 °C	32,90 °C	---	---	25,00 l/t
07-11-2018 07:00	27,61 MWh	---	698,15 m <sup>3</sup>	57,3 °C	---	65,95 °C	34,42 °C	---	---	14,00 l/t
07-11-2018 08:00	27,62 MWh	---	698,21 m <sup>3</sup>	28,6 °C	---	70,53 °C	47,46 °C	---	---	61,00 l/t
07-11-2018 09:00	27,62 MWh	---	698,23 m <sup>3</sup>	43,0 °C	---	67,27 °C	34,92 °C	---	---	18,00 l/t
07-11-2018 10:00	27,62 MWh	---	698,26 m <sup>3</sup>	28,8 °C	---	65,53 °C	33,70 °C	---	---	14,00 l/t
07-11-2018 11:00	27,62 MWh	---	698,27 m <sup>3</sup>	---	---	66,14 °C	33,86 °C	---	---	14,00 l/t
07-11-2018 12:00	27,62 MWh	---	698,30 m <sup>3</sup>	28,6 °C	---	70,00 °C	47,40 °C	---	---	10,00 l/t
07-11-2018 13:00	27,62 MWh	---	698,30 m <sup>3</sup>	---	---	46,83 °C	38,73 °C	---	---	18,00 l/t
07-11-2018 14:00	27,62 MWh	---	698,31 m <sup>3</sup>	---	---	44,73 °C	36,58 °C	---	---	0,00 l/t
07-11-2018 15:00	27,62 MWh	---	698,33 m <sup>3</sup>	43,0 °C	---	64,05 °C	35,53 °C	---	---	18,00 l/t
07-11-2018 16:00	27,62 MWh	---	698,35 m <sup>3</sup>	---	---	63,01 °C	35,62 °C	---	---	14,00 l/t
07-11-2018 17:00	27,62 MWh	---	698,37 m <sup>3</sup>	43,2 °C	---	65,14 °C	46,51 °C	---	---	36,00 l/t
07-11-2018 18:00	27,62 MWh	---	698,39 m <sup>3</sup>	43,0 °C	---	60,05 °C	34,65 °C	---	---	14,00 l/t
07-11-2018 19:00	27,62 MWh	---	698,41 m <sup>3</sup>	---	---	62,84 °C	35,75 °C	---	---	10,00 l/t
07-11-2018 20:00	27,62 MWh	---	698,43 m <sup>3</sup>	43,0 °C	---	63,42 °C	35,58 °C	---	---	0,00 l/t
07-11-2018 21:00	27,62 MWh	---	698,44 m <sup>3</sup>	---	---	64,65 °C	26,41 °C	---	---	0,00 l/t
07-11-2018 22:00	27,63 MWh	---	698,46 m <sup>3</sup>	43,0 °C	---	66,91 °C	32,03 °C	---	---	0,00 l/t
07-11-2018 23:00	27,63 MWh	---	698,49 m <sup>3</sup>	28,8 °C	---	68,19 °C	32,86 °C	---	---	14,00 l/t

**DATA FROM THIS CHECK IS APPROVED.**

## PRESSURE MEASUREMENTS.

Besides the energy meters HOFOR also deliver data for pressure in the district heating network. At present HOFOR can not send pressure data automatically via the sFTP server. HOFOR is therefore delivering data on request via the sFTP server manually. DTU access the data on the sFTP server and send the data directly to the Master Student or Ph.D./P.D. directly in the below format:

Aflæsningsdato	Værdi [bar]	Kommentar	Status	Info	Modtaget	Ændret	Gyldig
31-12-2018 23:45	5,02		Godkendt		01-01-2019 01:46		Ja
31-12-2018 23:30	5,27		Godkendt		01-01-2019 01:46		Ja
31-12-2018 23:15	5,27		Godkendt		01-01-2019 01:46		Ja
31-12-2018 23:00	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 22:45	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 22:30	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 22:15	5,39		Godkendt		01-01-2019 01:46		Ja
31-12-2018 22:00	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 21:45	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 21:30	4,9		Godkendt		01-01-2019 01:46		Ja
31-12-2018 21:15	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 21:00	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 20:45	5,02		Godkendt		01-01-2019 01:46		Ja
31-12-2018 20:30	4,9		Godkendt		01-01-2019 01:46		Ja
31-12-2018 20:15	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 20:00	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 19:45	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 19:30	4,9		Godkendt		01-01-2019 01:46		Ja
31-12-2018 19:15	5,02		Godkendt		01-01-2019 01:46		Ja
31-12-2018 19:00	5,15		Godkendt		01-01-2019 01:46		Ja
31-12-2018 18:45	4,78		Godkendt		01-01-2019 01:46		Ja
31-12-2018 18:30	4,9		Godkendt		01-01-2019 01:46		Ja
31-12-2018 18:15	4,9		Godkendt		01-01-2019 01:46		Ja
31-12-2018 18:00	4,78		Godkendt		01-01-2019 01:46		Ja
31-12-2018 17:45	5,02		Godkendt		01-01-2019 01:46		Ja
31-12-2018 17:30	5,02		Godkendt		01-01-2019 01:46		Ja
31-12-2018 17:15	4,66		Godkendt		01-01-2019 01:46		Ja
31-12-2018 17:00	5,02		Godkendt		01-01-2019 01:46		Ja
31-12-2018 16:45	5,02		Godkendt		01-01-2019 01:46		Ja
31-12-2018 16:30	4,9		Godkendt		01-01-2019 01:46		Ja

***In this case there is nothing to test because the data-file is sent directly to the energy management system server.***

#### **4. Conclusion**

For the SAT approximately 10 percent of the HOFOR energy meters in ELN have been selected and tested with a wide range of measurement points.

The SAT has proven that the automated energy meter readings are validated and that the data transfer from HOFOR's energy management system to DTU's DMS is working according to the requirements of ELN.