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INSIGHTS ON DOMESTIC HOT WATER CONSUMPTION FOR MULTI FLAT BUILDINGS

- Jan Eric Thorsen (*), Danfoss A/S
- Frederik Stjernholm Busk, TREFOR Varme A/S
- Firat Günyel, Hillerød Forsyning
- Mikko Wahlroos, Danfoss Leanheat

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Background for looking into DHW data

- Load shift and peak load management is a way to optimize the DH/Energy system by shifting or avoiding peaks
- For building level mainly focus has been on the heating system flexibility
- Insight in DHW load is essential to get the picture of the load shift potential
- Load shift for DHW can be applied where storage tanks for DHW are installed

But what is the load shift potential for DHW ?

To answer this question DHW data (*) from 5 multi flat buildings have been measured and analyzed.

*) DHW tapping flow, Cold water temperature, DHW temperature and energy, 10 sec resolution

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The 5 multi flat buildings investigated:

Location No:	Located:	Nos. Flats	Ownership:
1	CPH DK	22	Private
2	Kolding DK	31	Association
3	Kolding DK	47	Association
4	Hillerød DK	42	Association
5	Hillerød DK	30	Association

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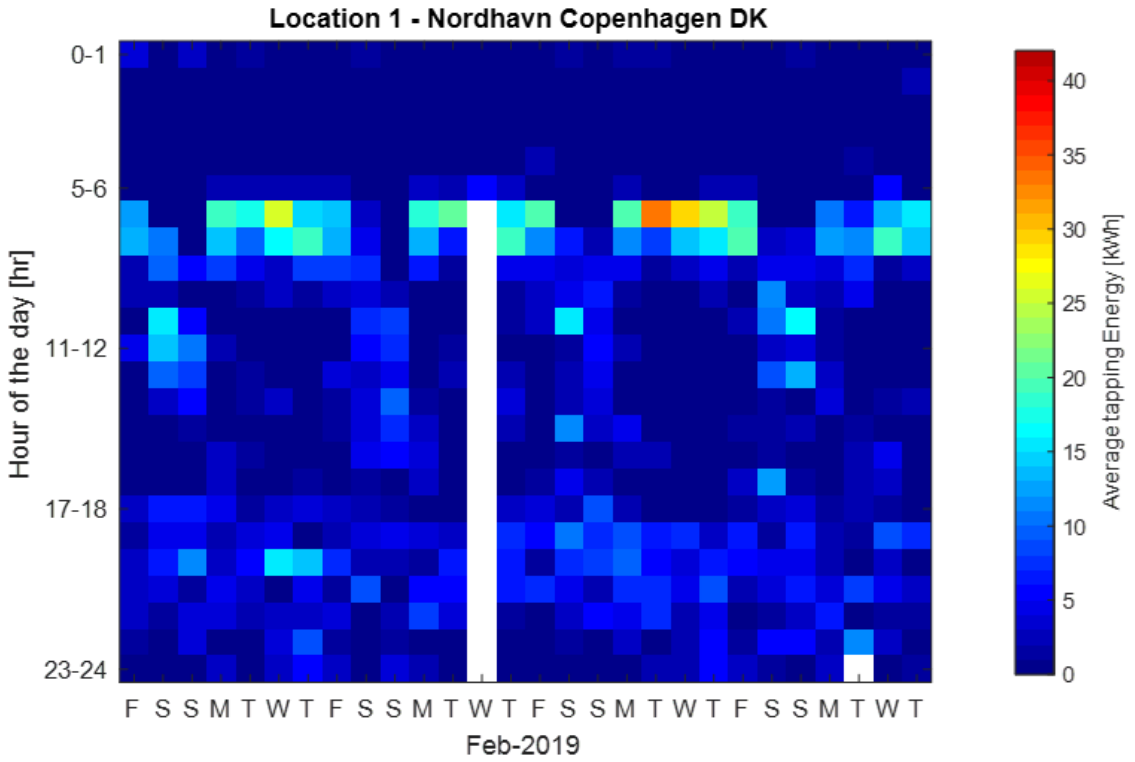
General presentation of DHW data:



Aggregated data on hourly level
A color plot is representing a month

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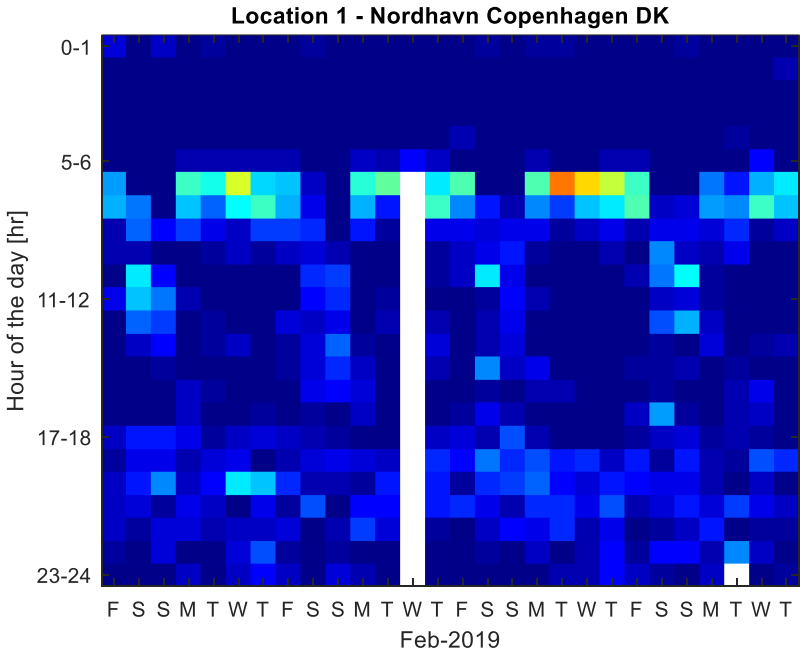

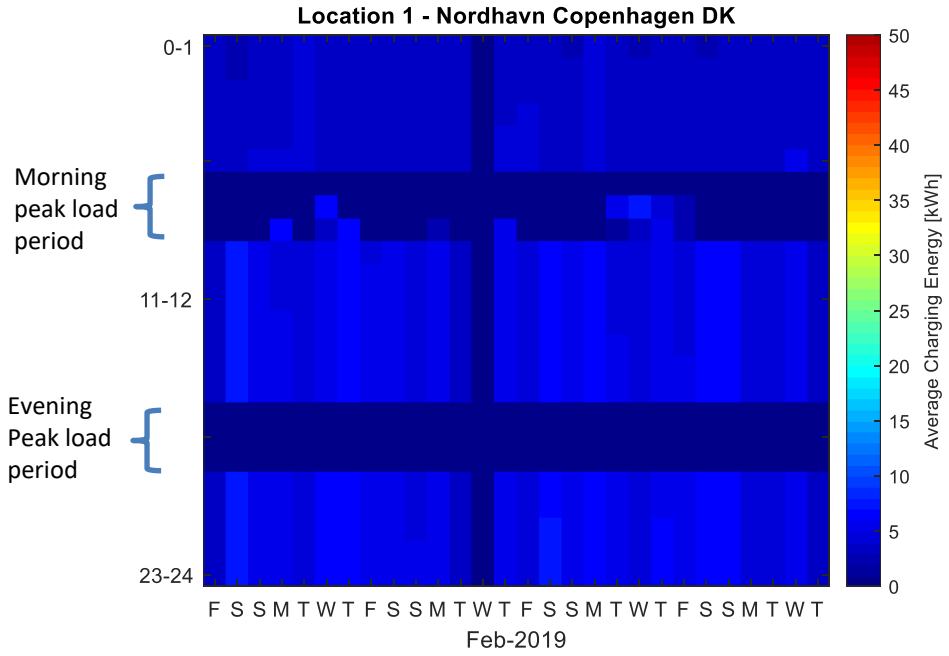

Instantaneous DHW load

Charging load of DHW storage tank

Morning peak load period: 6-9 o'clock (3 hrs.)
Evening peak load period: 16-19 o'clock (3 hrs.)

Load shift potential within peak load period is the difference between the diagrams !

Location 1:

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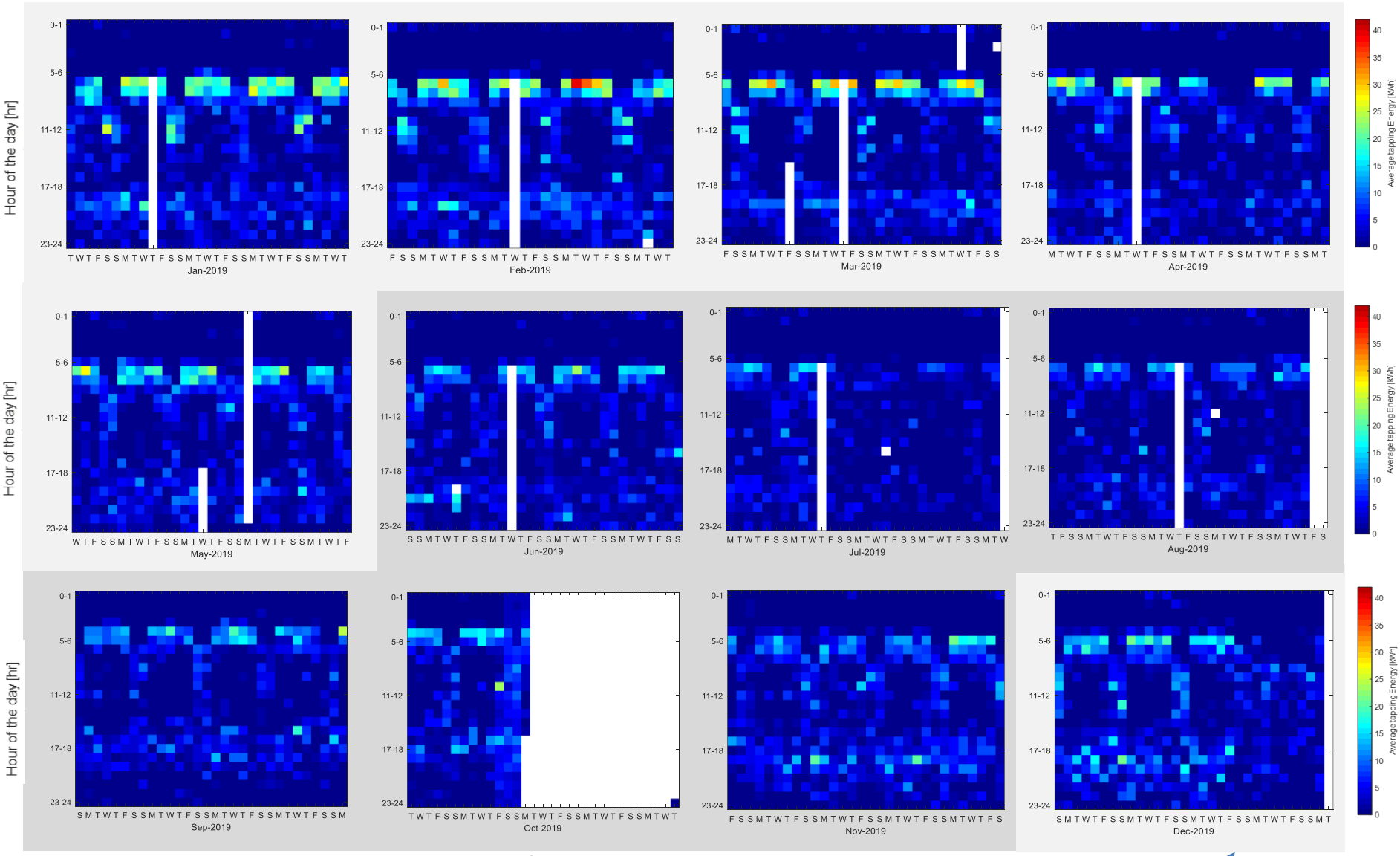

DHW Low Season (Dark Grey)

DHW High Season (Light Grey)

Location 2:

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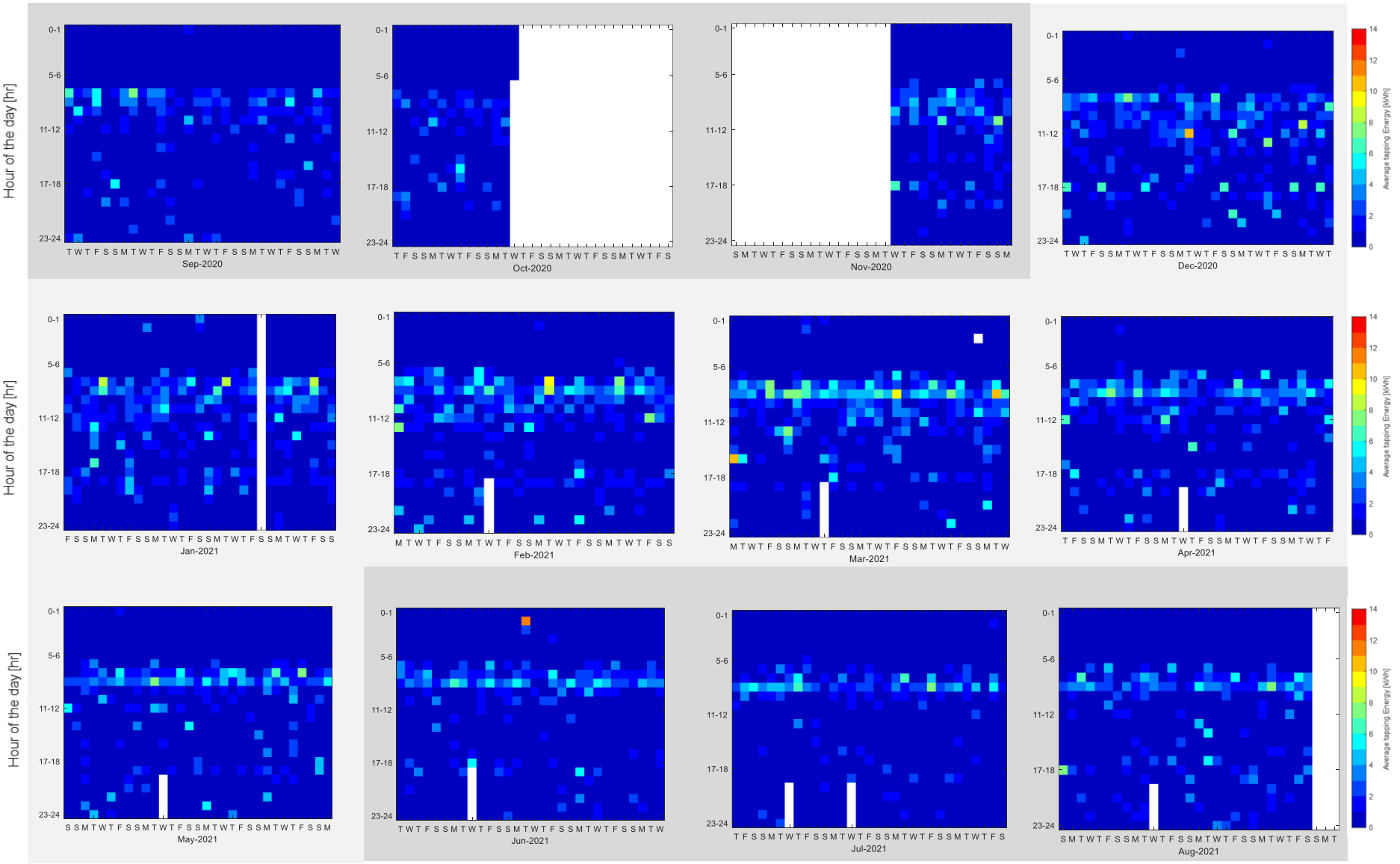

Location 3:

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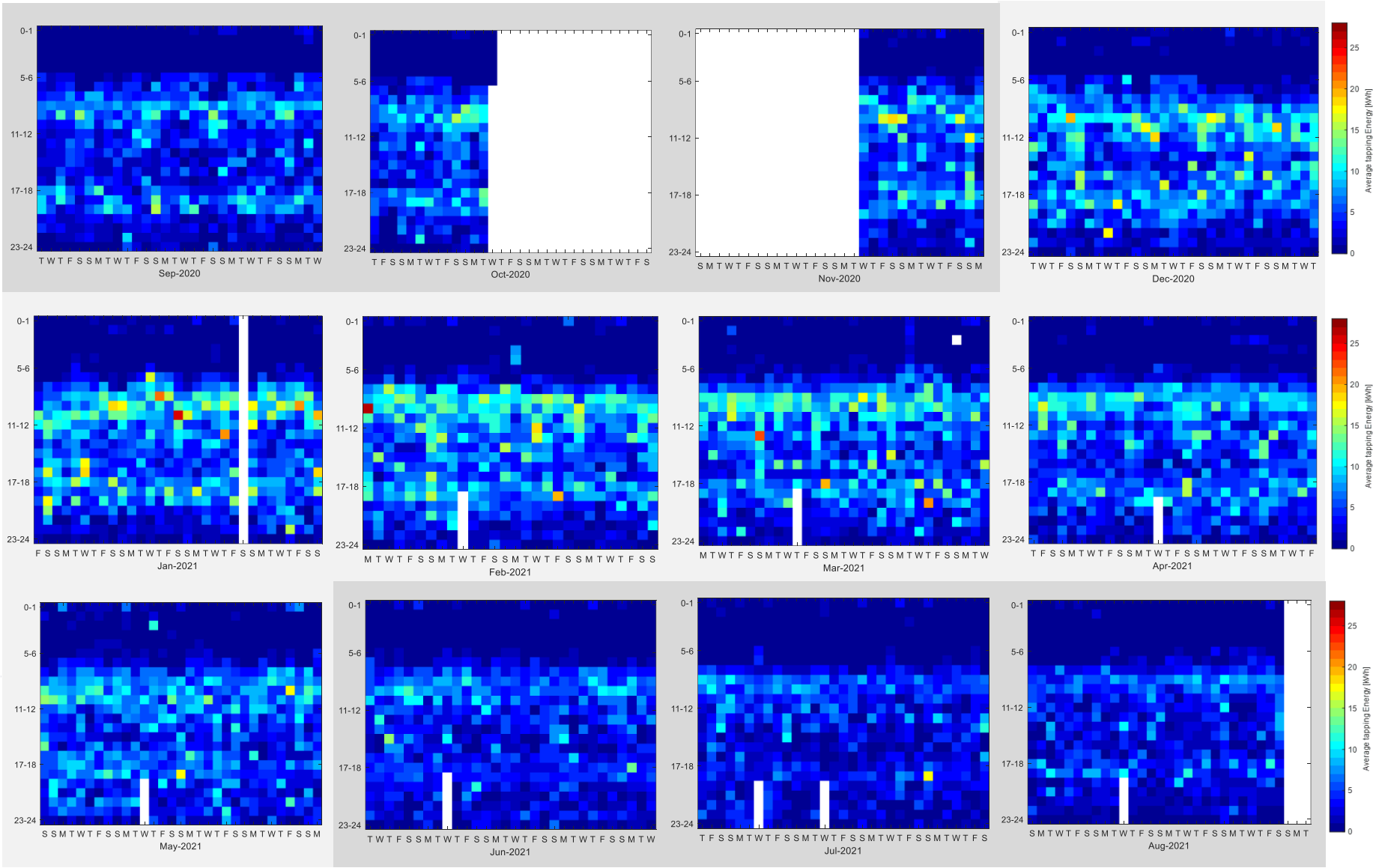

Location 4:

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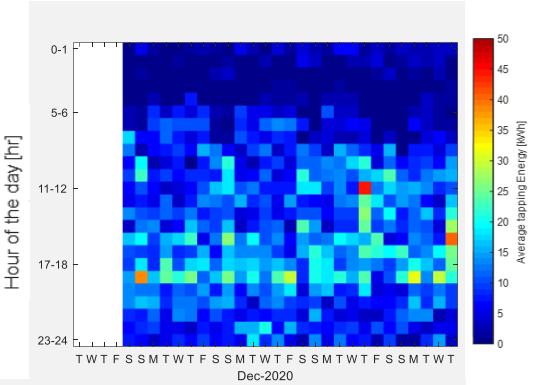

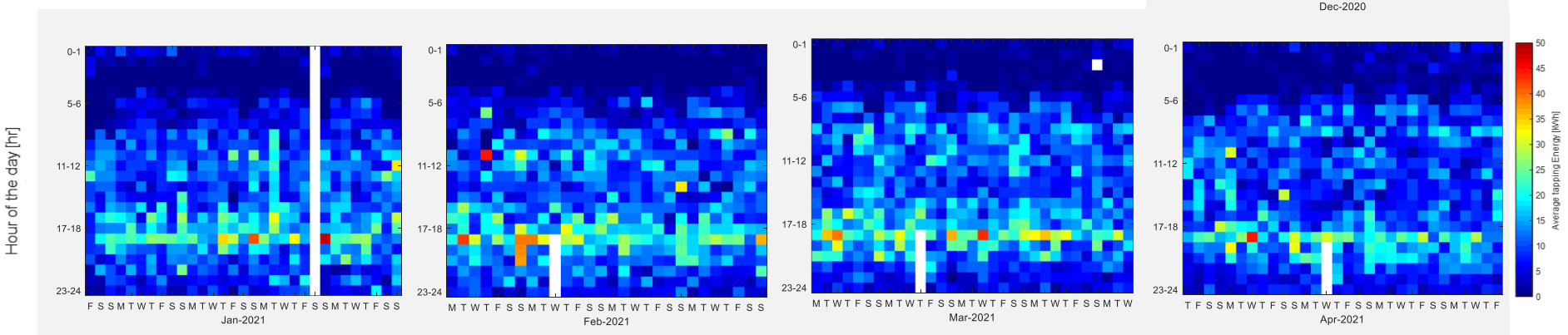

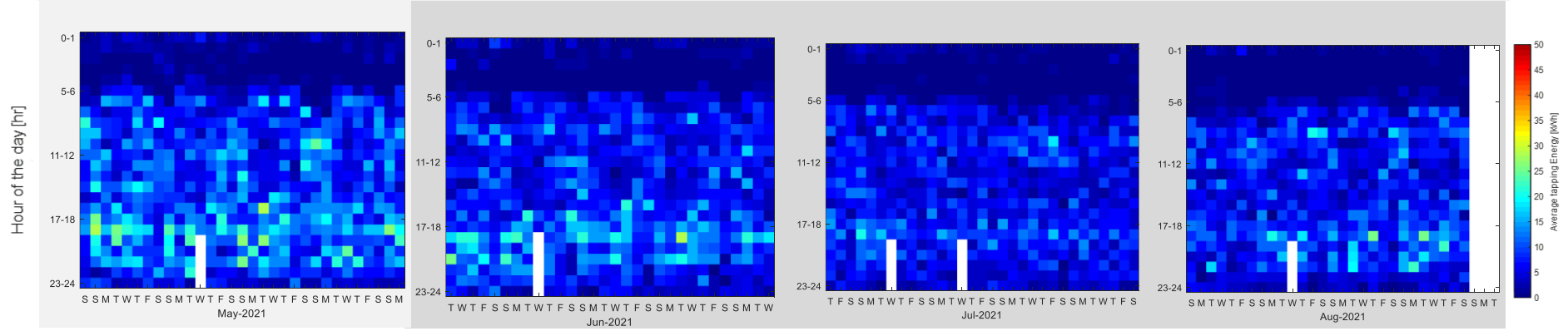

Location 5:

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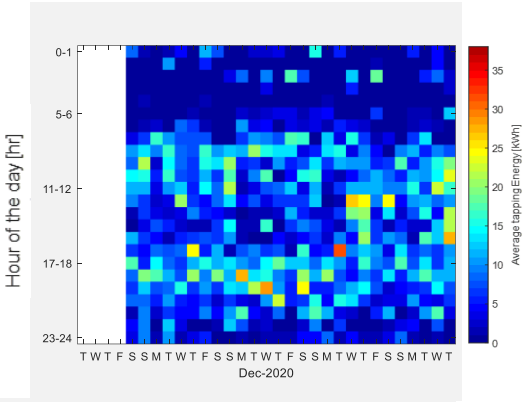

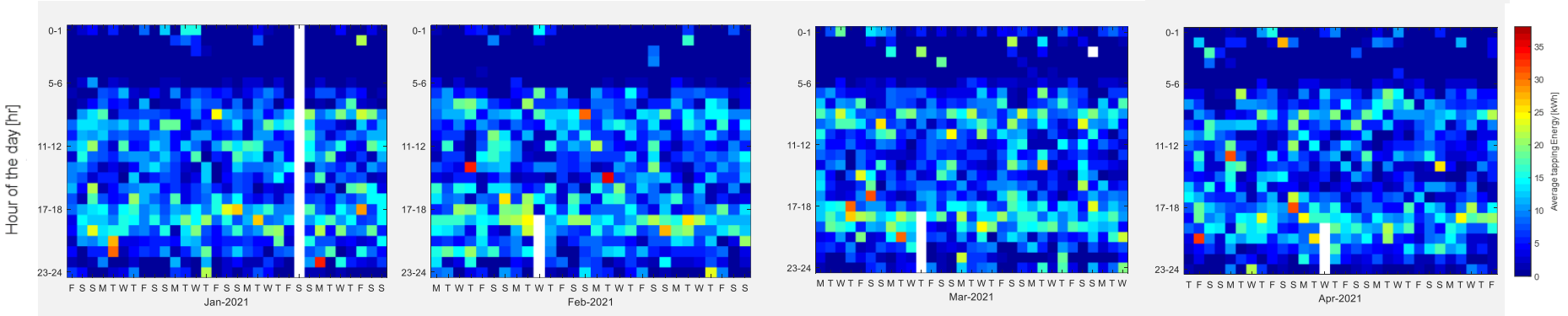

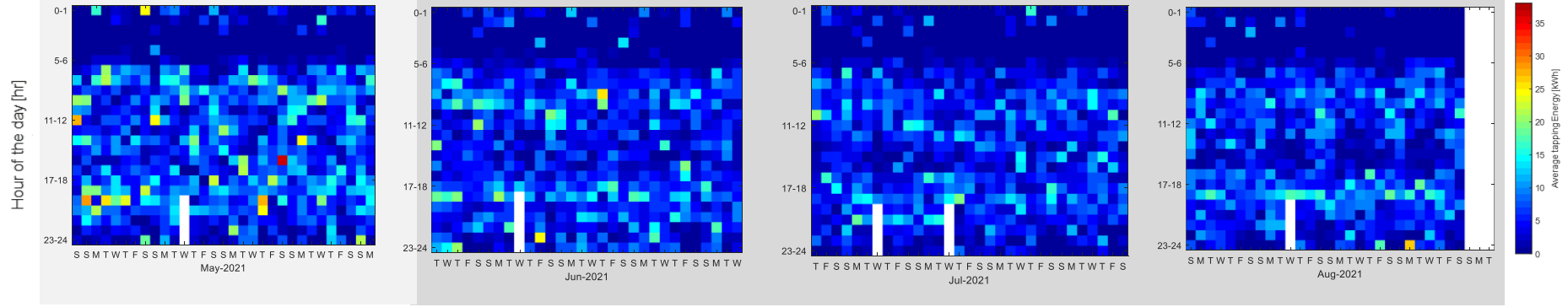

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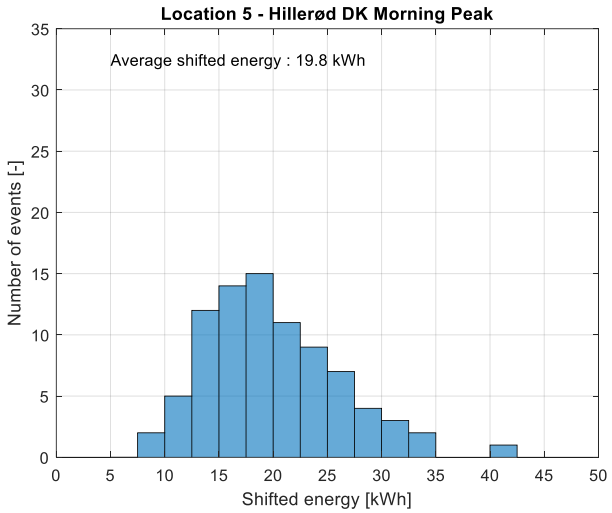
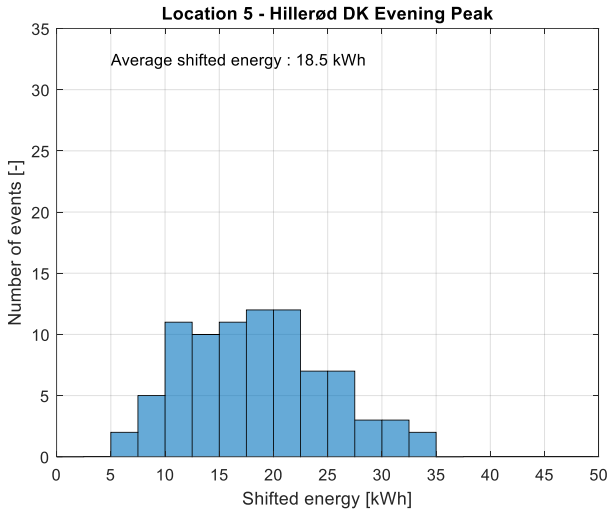
Location 5:

Morning peak:

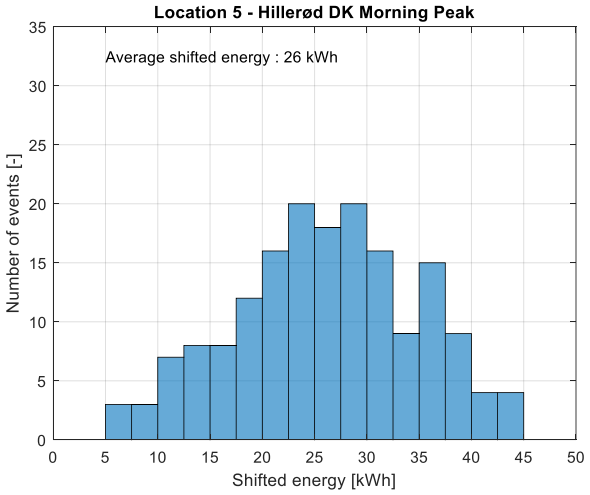
Evening peak:

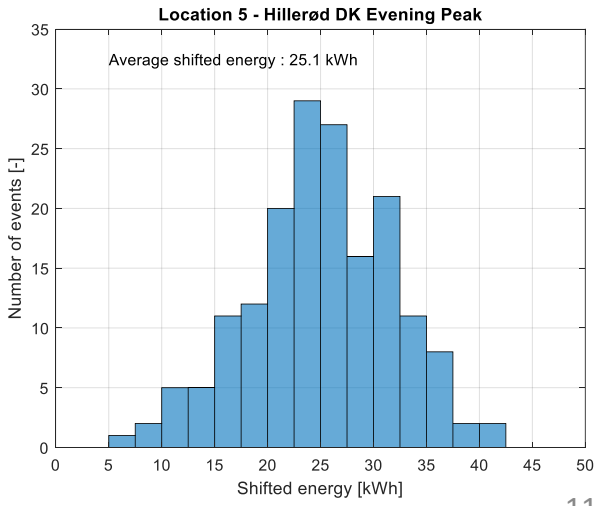
Low season:





High season:





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The load shift potential for the 5 locations:

			Low Season				
Location No:	Located:	Nos. Flats	Load shift morning [kWh]	%of daily DHW energy [-]	Load shift evening [kWh]	%of daily DHW energy [-]	daily DHW energy [kWh]
1	CPH DK	22	15,0	24%	8,4	13%	63,2
2	Kolding DK	31	7,5	30%	2,9	11%	25,4
3	Kolding DK	47	16,1	18%	12,3	13%	91,3
4	Hillerød DK	42	22,0	14%	23,1	15%	155,5
5	Hillerød DK	30	19,8	16%	18,5	15%	126,6
		Average	16,1	20%	13,0	14%	

			High Season				
Location No:	Located:	Nos. Flats	Load shift morning [kWh]	%of daily DHW energy [-]	Load shift evening [kWh]	%of daily DHW energy [-]	daily DHW energy [kWh]
1	CPH DK	22	27,4	30%	9,4	10%	90,2
2	Kolding DK	31	9,3	27%	3,9	11%	34,8
3	Kolding DK	47	20,5	16%	16,6	13%	127,2
4	Hillerød DK	42	26,8	12%	27,6	12%	232,0
5	Hillerød DK	30	26,0	15%	25,1	15%	172,4
		Average	22,0	20%	16,5	12%	

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Conclusions

- The load shift potential depends on the daily DHW consumption profile:
  Is there a major DHW consumption within the chosen peak load periods or not ?
- With the chosen peak load periods, the average DHW load shift potential is 12 to 30% of the daily DHW consumption for the morning peak
- and 10 to 15% of the daily DHW consumption for the evening peak
- But for both with a large day to day variation
- The absolute load shift potential is larger in the high DHW season
- The morning peak has a clear high load shift potential for two of the locations, where two locations have similar load shift potentials for morning and evening peak. One location is in between
- The relative load shift potential is basically independent if its low season or high season for DHW consumption season
- The value of load shift in terms of energy but also capacity has to be estimated in each case. But if AI based control is already in place in the building the added costs for DHW load shift is limited
- The value cost/value will be investigated more as a next step

Thank You for the Attention…

Contact information
Jan Eric Thorsen
Director, Danfoss Climate Solutions Application Centre
Mail: jet@danfoss.com

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Hillerød Forsyning

TREFOR Varme




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