How low can the heating supply temperature be in single family houses in Norway?

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www.4dh.eu www.reinvestproject.eu www.heatroadmap.eu

Typologies

Age classes:

1) Built before 1955
2) 1956 – 1970
3) 1971 – 1980
4) 1981 – 1990
5) 1991 – 2000
6) 2001 – 2010
7) 2011 – 2050

Building types:

- Single family house (SFH)
- Small house (TH)
- Apartment block (MFH/AB)

	Region	Construction Year Class	Additional Classification	SFH Single-Family House	TH Terraced House	MFH Multi-Family House	AB Apartment Block
1	National (not region specific)	… 1955	generic	 NO.N.SFH.01.Gen	 NO.N.TH.01.Gen		 NO.N.AB.01.Gen
2	National (not region specific)	1956 … 1970	generic	 NO.N.SFH.02.Gen	 NO.N.TH.02.Gen		 NO.N.AB.02.Gen
3	National (not region specific)	1971 … 1980	generic	 NO.N.SFH.03.Gen	 NO.N.TH.03.Gen		 NO.N.AB.03.Gen
4	National (not region specific)	1981 … 1990	generic	 NO.N.SFH.04.Gen	 NO.N.TH.04.Gen		 NO.N.AB.04.Gen
5	National (not region specific)	1991 … 2000	generic	 NO.N.SFH.05.Gen	 NO.N.TH.05.Gen		 NO.N.AB.05.Gen
6	National (not region specific)	2001 … 2010	generic	 NO.N.SFH.06.Gen	 NO.N.TH.06.Gen		 NO.N.AB.06.Gen
7	National (not region specific)	2011 …	generic	 NO.N.SFH.07.Gen	 NO.N.TH.07.Gen		 NO.N.AB.07.Gen

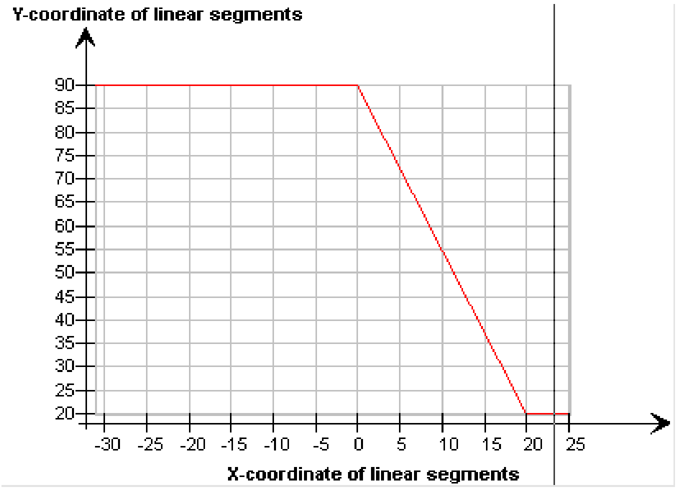
Source: EPISCOPE prosject (Intelligent Energy Europe) Energy Performance Indicator Tracking Schemes for the Continuous Optimization of Refurbishment Processes in European Housing Stocks (http://episcope.eu)

SFH 1971 – 1980

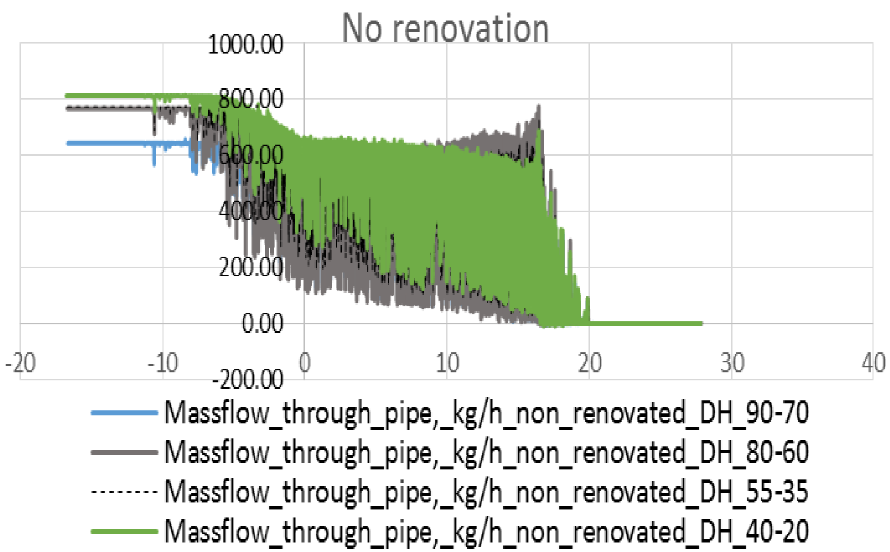
	Initial standard		Renovated standard		Tek10 standard	
Component	Specification	U-value initial built (W/m^2K)	Specification	U-value standard renovation (W/m^2K)	Specification	U-value TEK10 renovation (W/m^2K)
Windows	Double-glazed window, regular glass, air	2.60	Double-glazed window, one LE-coating, air	1.90	50 mm additional min wool in cold attic	0.16
Roof	48x198mm beam 200mm min wool	0.20	50 mm additional min wool in cold attic	0.16	150 mm additional min wool on the outside	0.19
External wall	Light timber framework,48x98	0.41	50 mm additional min wool on the outside	0.29	TEK10-window	1.20
Floor	48x148mm beam 150mm min wool	0.22	50 mm additional min wool in cold basement	0.20	100 mm additional min wool in cold basement	0.15
Fixed infiltration (ACH)	-	4	-	2	-	0.6

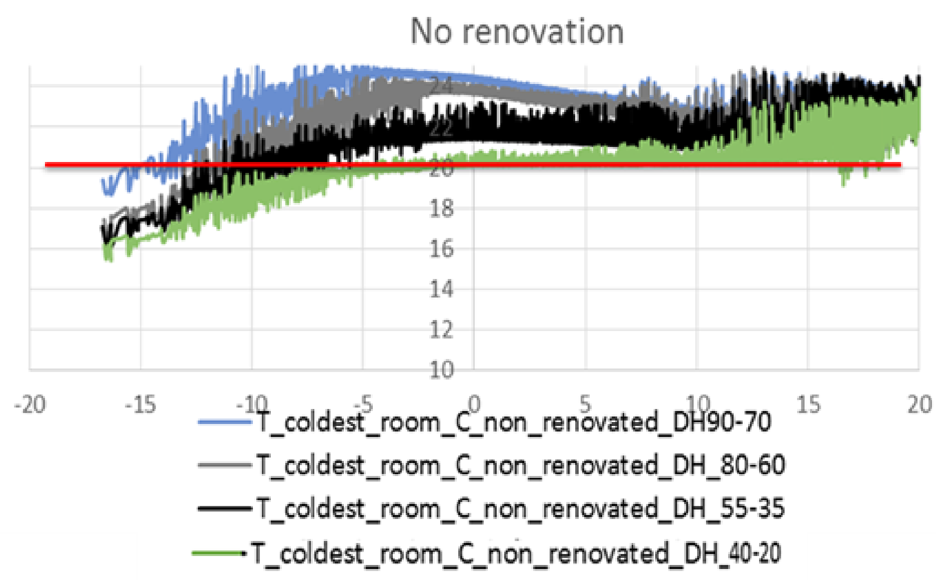
Limitations

- 4 occupants
- Only space heating : double string system
- Oslo climate
- Dimensioning for a normal year without internal heat loads
- No outdoors temperature compensation of DH
- Maximal water flow rate 800 kg/h



Impact of DH temp. reduction in older buildings without adaptation (focus on heating)

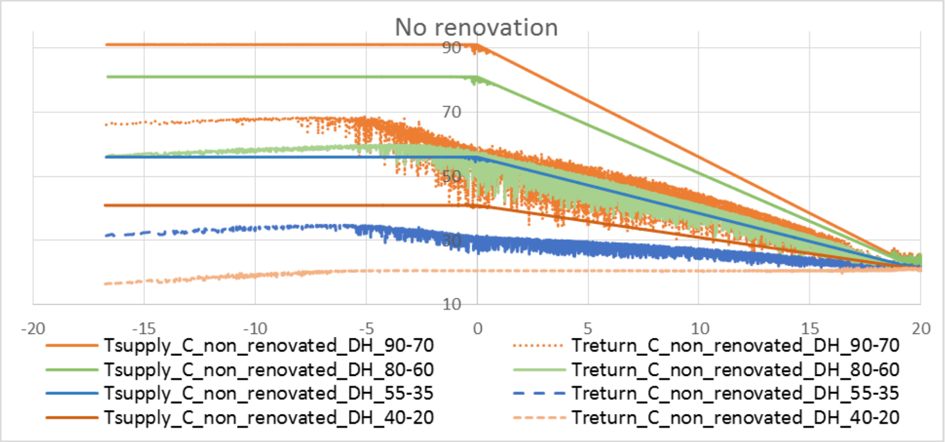




Impact of DH temp. reduction in older buildings without adaptation (focus on heating)

Non-renovated building

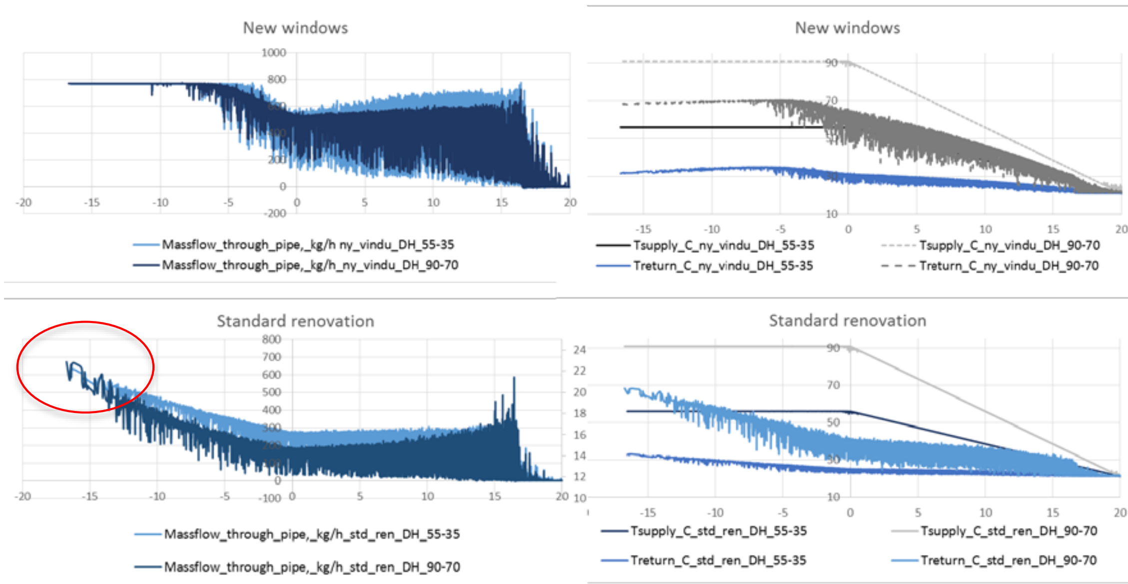
- Radiator area not increased, limitation on the supplied water -> comfort temperature 20 degrees not achieved
- With the original radiator we need to increase supply temperature (local) about 10-15 degrees
- Otherwise increase water flow rate (almost doubling) to achieve 20 degrees



Use of low temperature DH, new window and standard renovation

Renovated building

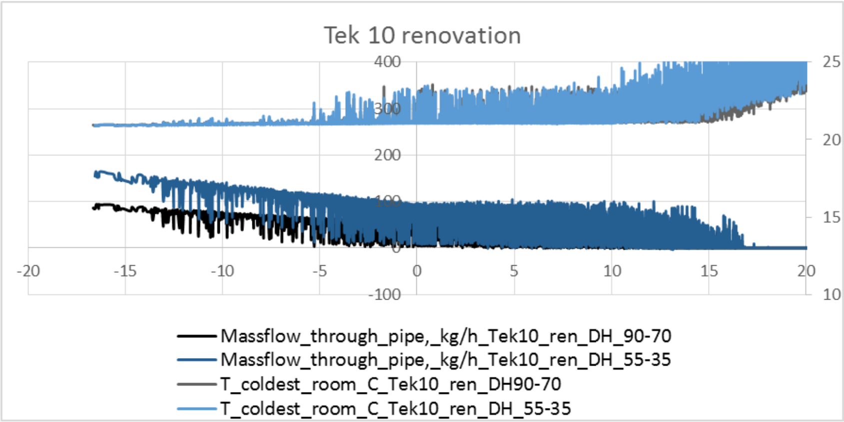
- Return temperature profile varies
- Return temperature to the net is most affected of renovations on the building envelope, windows and airtightness

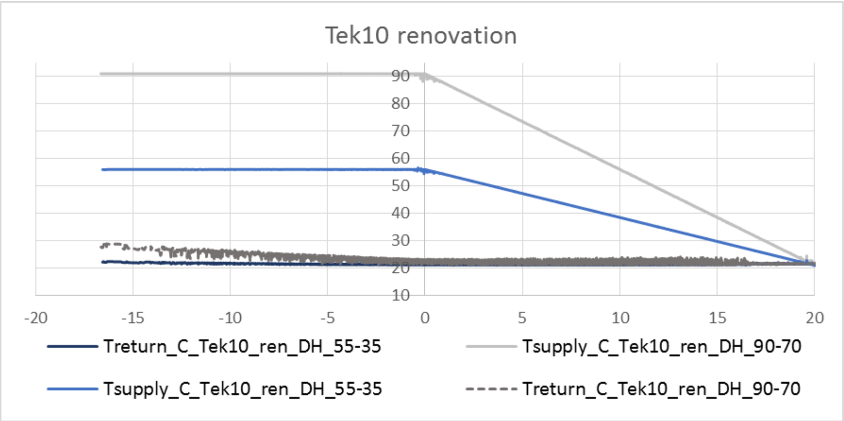


Use of low temperature DH in Tek10 renovation

Building that are adapted to low temperatures

- Reduced heating demands
- Return temperature can be highly reduced





Limitations

- People are not happy with "only 20 degrees "=>want higher temp in certain rooms. Especially after renovation
- Water quantity and pipe diameter
- Investing in networks

Possible solutions

- Local supply in buildings to avoid increase on DH pipe
- Local networks connected to DH
- Connections in supply and return

Conclusions

- Simulations of several types of buildings still remain
- Capacity:
  - Low supply temperature → Low return even more important
  - If the building is not renovated and the temperature is reduced in the net, local peak load systems are needed
  - If the house is renovated, return temperature to the grid can increase and it becomes more important to check if the house can be connected to supply or return

Thank you for your attention!