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Reduction of total energy consumption in hospitals

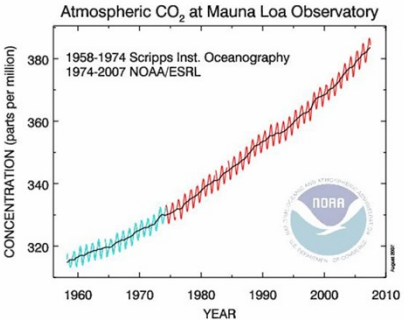
The optimisation of large diagnostic imaging equipment results in a 10% reduction of hospital energy consumption

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Why Low Energy Hospitals?

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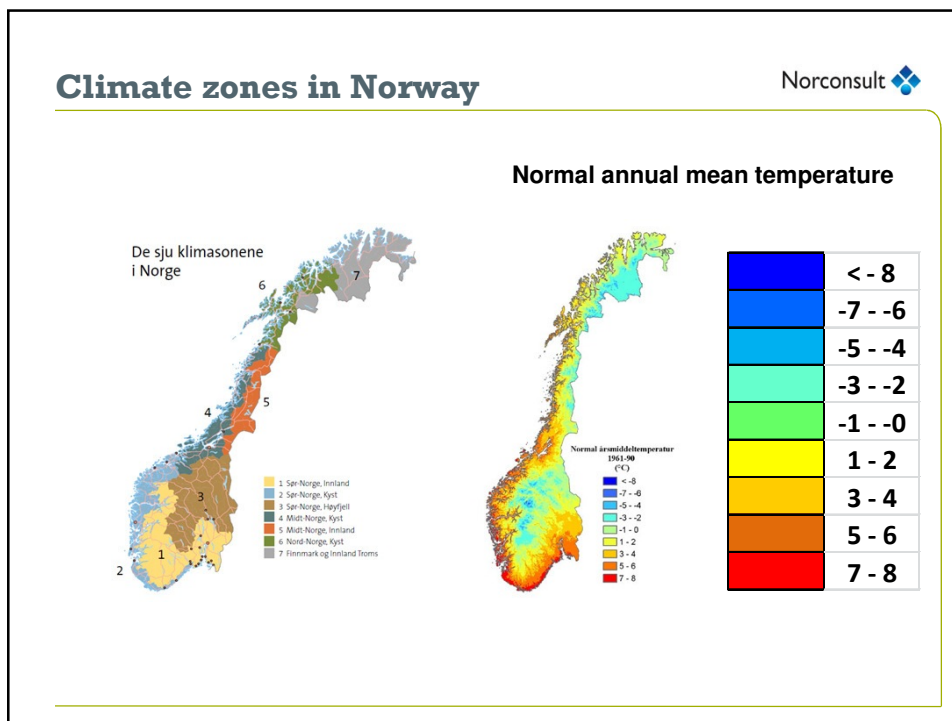
The historical perspective (Future requirement including hospitals!)




Zero emission buildings from 2019

Ifølge et nylig fattet vedtak i Europaparlamentet må alle bygg, oppført etter 31. desember 2018, produsere like mye energi som de forbruker. Vedtaket er en endring av direktivet om bygningers energibruk fra 2002. EUs medlemsland skal sette nasjonale, etappevise mål for hvor stor andel av de eksisterende bygningene som skal være nullenergibygg innen 2015 og 2020. (ILMN)

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Hospital energy consumption in focus

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- Hospitals represent 10% of the total heated area of commercial buildings in Norway
- Large university hospital buildings use double as much energy than of other commercial buildings
- 20 % of total energy consumption for commercial buildings is related to hospitals in Norway.

Project participants

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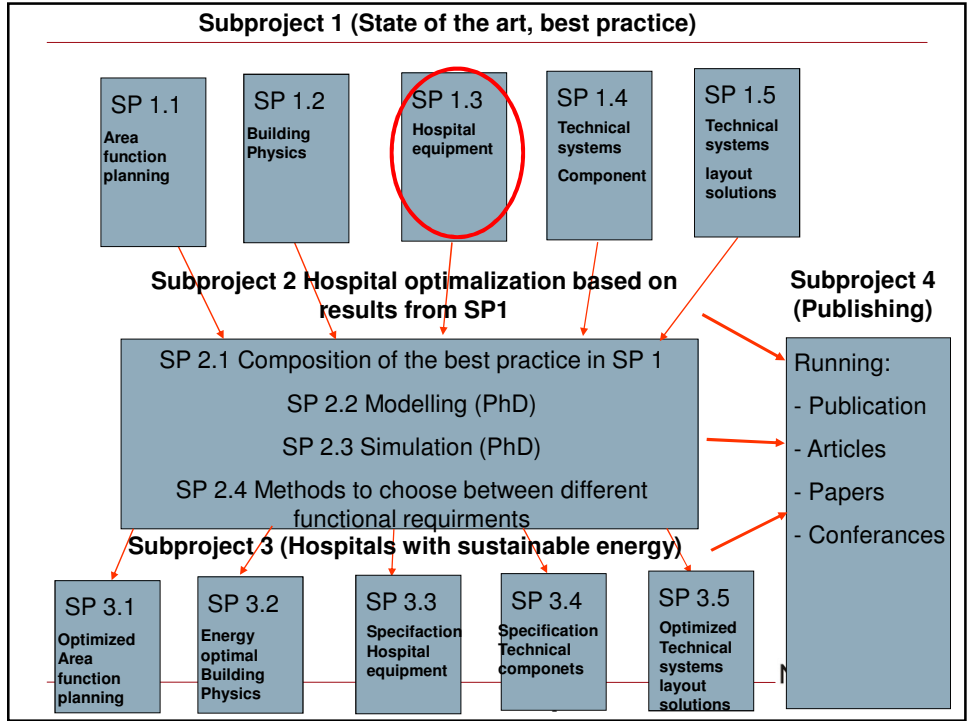
Aim of the study and targets

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Aim: 50% reduced energy consumption in relation to new hospitals today (400-500 kWh/m²)

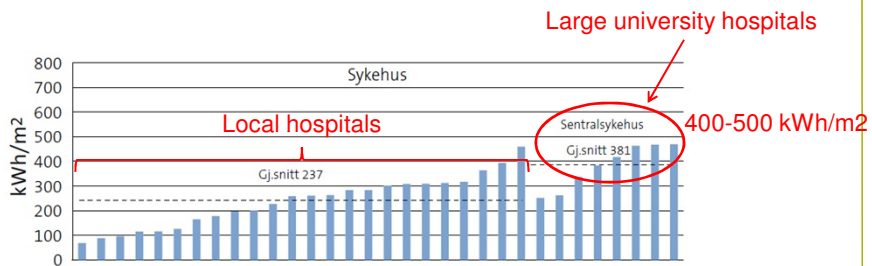
Targets:

- 20 % - Reduce energy consumption to a minimum
Insulation, infiltration, climate system / lightning, heat recovering, integration of technical system, DCV
- 10 % - Medical equipment, Diagnostic imaging equipment
- 10 % - Moving energy – using surplus heat from cooling
- 10 % - Environmentally friendly energy production
- 1 PhD position to develop simulation models



Hospital energy consumption in focus

- Specific energy consumption for hospitals



Requirement of technical regulations and energy label

Building Category	Total net energy - maximum values (kWh/m2 heated BRA per year)					
	TEK-10	TEK-07	Diff Tek10- Tek07	Energy label A	Energy label B	Energy label C
Small Houses, holiday homes of 150 m ² oppv.BRA	120+1600m ²	125+1600m ²	-5	79	118	158
Apartment building	115	120	-5	67	100	134
Children's garden	140	150	-10	90	135	180
Office building	150	165	-15	84	126	168
school building	120	135	-15	79	118	158
University / College	160	180	-20	95	143	191
Hospital	300(335)	325	-25	179	268	358
Nursing homes	215(250)	235	-20	136	203	271
Hotels	220	240	-20	135	202	269
Sports building	170	185	-15	109	164	218
Business Buildings	210	235	-25	129	194	258
Culture Building	165	180	-15	105	158	210
Light industrial / garage	175(190)	185	-10	106	159	212
						tilsv. TEK07?

Healthcare equipment - energy consumption

- Hospital building category with the largest specific energy consumption
- The energy consumption is spread on the following categories

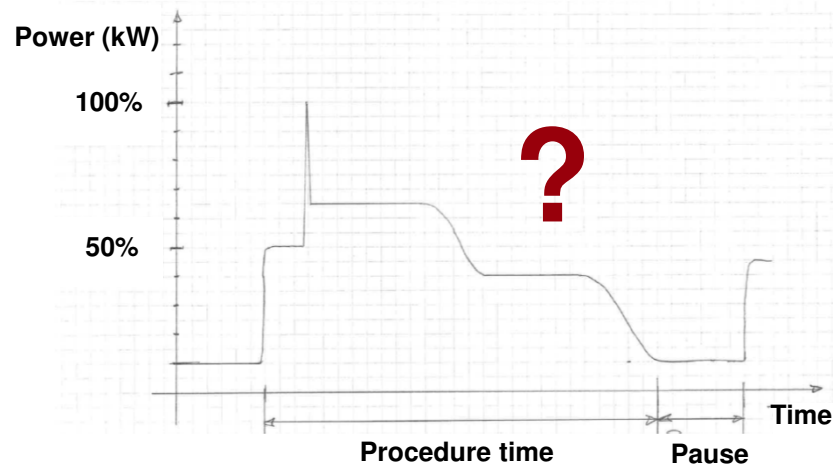
		kWh/year	kWh/m ²	%
Electrical power	Ventilation Fans	632 667	40	9,6 %
	Light	1 470 095	92	22,3 %
	Equipment	1 483 725	93	22,5 %
Thermal cooling	Ventilation cooling	167 453	10	2,5 %
	Room cooling	566 822	35	8,6 %
Thermal heating	Ventilation heating	1 828 830	114	27,7 %
	Room heating	443 297	28	6,7 %
	Sum	6 592 889	412	100,0 %

Energy distribution - healthcare equipment

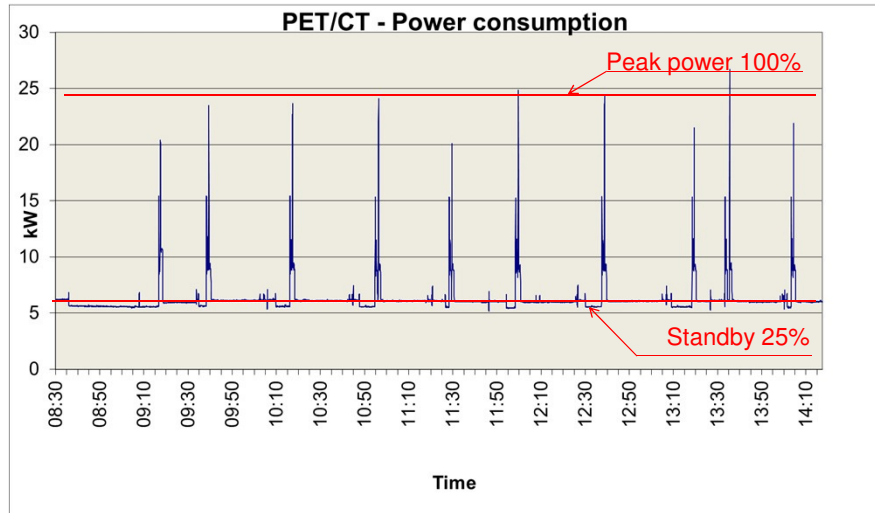


- **Large medical imaging equipment: 50%** of total energy utilization for healthcare equipment
- **Small healthcare medical equipment: 50%** of total energy utilization for healthcare equipment

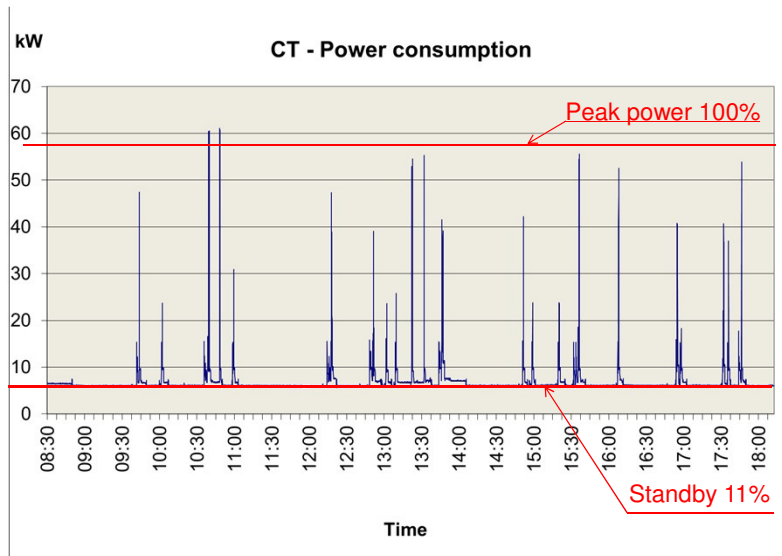
Power Flow - Hospitals specific equipment



PET/CT scan- Power consumption

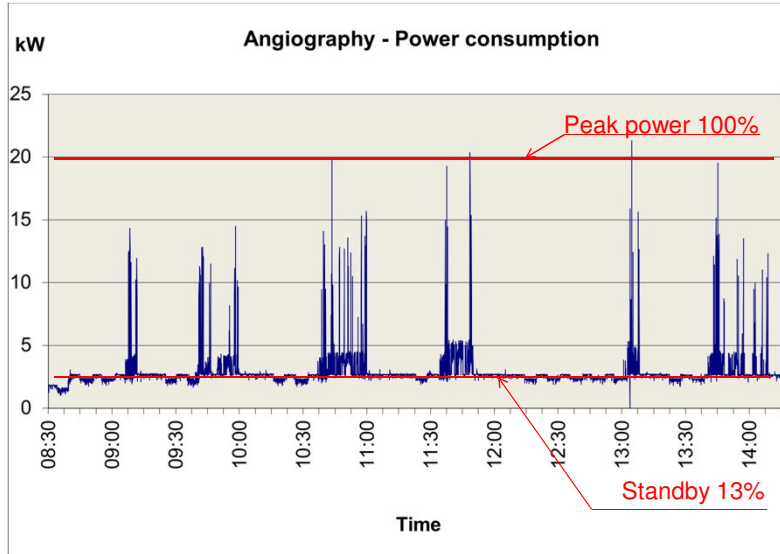


CT scan - Power consumption

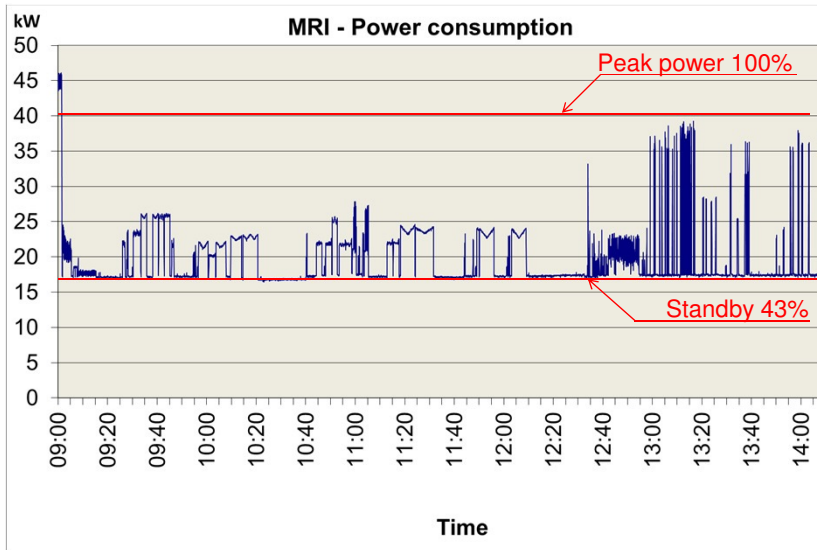


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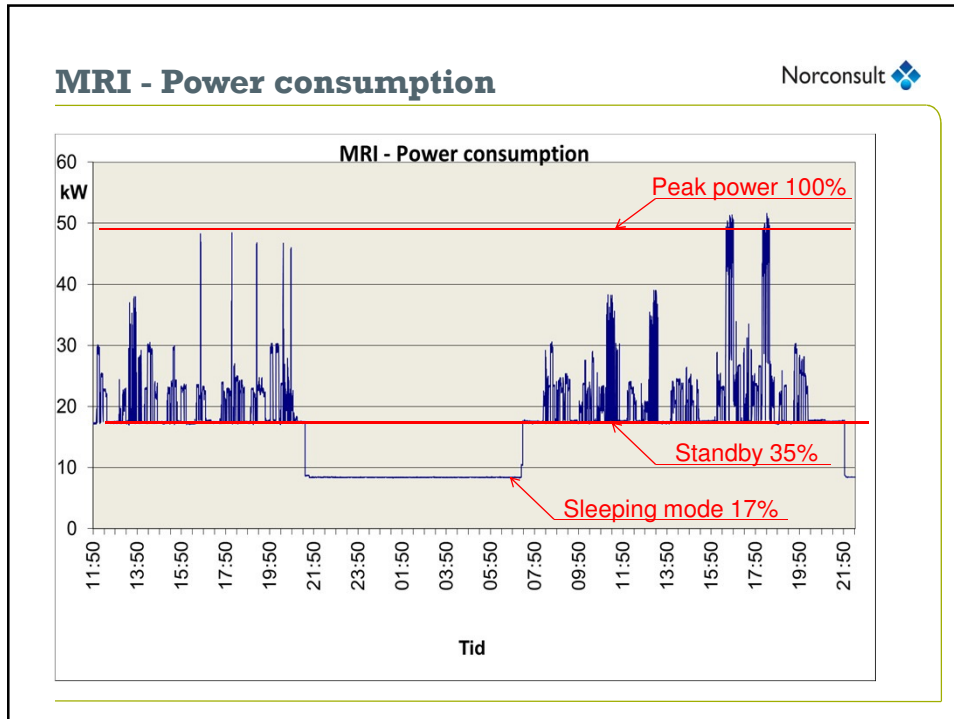
Angiography - Power consumption



MRI - Power consumption



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Conclusions

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- Large medical imaging equipment accounts for 50% of the energy consumption related to all medical equipment in acute hospitals
- The relatively lower share of energy consumption for large medical imaging equipment is due to the fewer number of devices, more limited duty schedules, and higher heat recycling rates due to water cooling systems.
- Further research is recommended for suppliers of large imaging devices to reduce scan times, lower standby power level, introduce hibernate functionality, shorten start-up times, and expanded use of water cooling instead of air cooling.
- Suppliers of smaller medical equipment should implement energy-saving measures for the IT components in their devices, especially power-save modes for screens.



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Thank you for your attention

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