

# EFFICIENT ENERGY MANAGEMENT OF BUILDINGS

**CITIES - SECOND GENERAL CONSORTIUM MEETING**

Gorm Elikofer, VP HOFOR A/S

26.05.15



# THE COMPANY TODAY



VAND



SPILDEVAND



FJERNVARME



FJERNKØLING



BYGAS



VIND



AMAGERVÆRKET

- ▶ Denmark's largest utility company within our core areas
  - ▶ Drinking water
  - ▶ Waste water
  - ▶ District heating
  - ▶ District cooling
  - ▶ Town gas
- ▶ +1.000 employees
- ▶ More than a million customers in Greater Copenhagen
- ▶ More than 700 mill. euro in gross turnover
- ▶ 200-250 mill. euro invested annually in pipelines, cables and wind turbines
- ▶ Total fixed assets: 2,3 billion euro





# SUSTAINABLE UTILITY



- ▶ Green district heating is a cornerstone in achieving City of Copenhagen CO<sub>2</sub> neutral capital by 2025.
- ▶ 30 percent CO<sub>2</sub> neutral biogas in town gas
- ▶ Open water bathing in harbor due to underground waste water basins
- ▶ Clean and untreated drinking water from pure groundwater
- ▶ District cooling saves up to 40% cost and reduce CO<sub>2</sub> emissions by up to 70% compared with traditional cooling
- ▶ Growing windturbine business: 62 MW in 2015 and 360 MW in 2025

# INTELLIGENT ENERGY MANAGEMENT BEFORE INTELLIGENT INVESTMENTS

- NIRAS rapport based on study of 13 buildings covering 100.000 m<sup>2</sup>:  
*Energy renovation leads to change in heating consumption from 39 % less to 18 % higher*
- Energy renovation is not a guarantee for lower heating consumption!



- Apartment building awarded with Danish energy renovation price 2013.
- Calculated reduced heating consumption of 75 %!
- Measured reduced heating consumption of 29 %!!



# MANAGEMENT ATTENTION FIRST - THEN TOOLS AND OPERATIONAL KNOW-HOW

- Simple heat label with focus on consumption, benchmark and effect of initiatives.
- Based on very detailed knowledge of the use of the building and smart meters.



### Varmemærkning 2014

Varmemærkning for følgende ejendom

**Folketinget**  
Christiansborg Slot - Søndre Fløj  
1218 København K

**Varmeforbrug**  
Varmeforbrug i 2013:  
**84 kWh/m<sup>2</sup>**

Forbruget er korrigeret til normalår

**Forbrugsudvikling fra 2012-2013:**  
Faldende tendens

**Trafiklys forklaring**

HØJT  
 ● Forbrug over 130 kWh/m<sup>2</sup>  
 ● Forbrug mellem 100 - 130 kWh/m<sup>2</sup>  
 ● Forbrug mellem 70 - 100 kWh/m<sup>2</sup>  
 ● Forbrug under 70 kWh/m<sup>2</sup>  
 LAVT

**Forbrugsudvikling**

Stigende tendens  
 Uændret tendens  
 Faldende tendens

**Energilindsættelser gennemført i 2013**

Der anvendes timeligning af fjernvarmeforbrug til brug for intelligent energistyring

**Bygningsinformation**

Anvendelse: Kontor  
 Opvarmet areal: 21.274 m<sup>2</sup>  
 Opførelsesår: 1906  
 Forsyning: 100 % fjernvarme

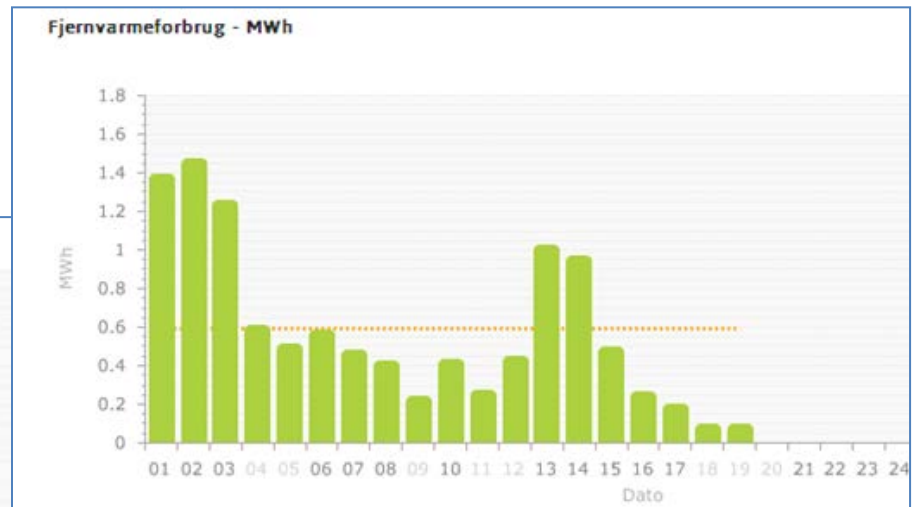
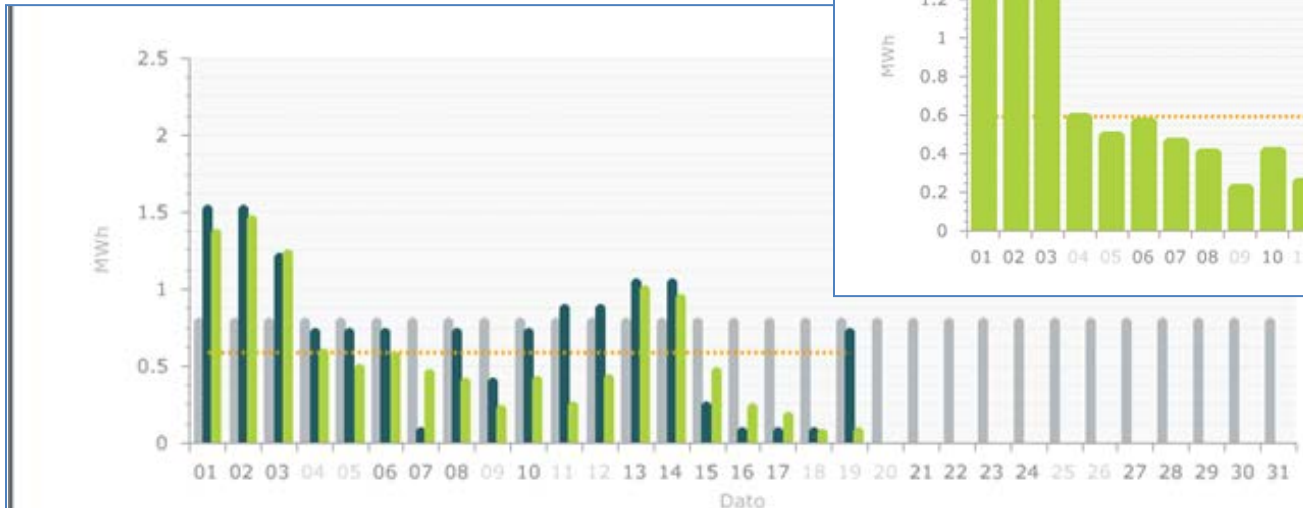
Varmemarket udarbejdes på baggrund af det seneste års forbrug

### Varmemærkningsordning

Ejendom	Adresse	Mærke	Forbrug	Tendens	Areal	Link
	Frd. holms Kanal 21 K 1220 København K		112 kWh/m <sup>2</sup>		1.636 m <sup>2</sup>	Se mærket her!
	Frd. holms Kanal 21-23 1250 København K		174 kWh/m <sup>2</sup>		4.350 m <sup>2</sup>	Se mærket her!
	Frd. holms Kanal 25-27 1220 København K		95 kWh/m <sup>2</sup>		10.693 m <sup>2</sup>	Se mærket her!
	Rigsarkivet Rigsdagsgården 5, 9 - 13 1218 København K		61 kWh/m <sup>2</sup>		8.414 m <sup>2</sup>	Se mærket her!
	Slotsholmsgade 10 1213 København K		103 kWh/m <sup>2</sup>		5.884 m <sup>2</sup>	Se mærket her!
	Slotsholmsgade 8 - 10 1216 København K		131 kWh/m <sup>2</sup>		6.535 m <sup>2</sup>	Se mærket her!
	Slotsholmsgade 12 1216 København K		112 kWh/m <sup>2</sup>		20.416 m <sup>2</sup>	Se mærket her!
	Slotsholmsgade 2 - 6 1216 København K		85 kWh/m <sup>2</sup>		6.167 m <sup>2</sup>	Se mærket her!
	Adelgade 11-13 1304 København K		89 kWh/m <sup>2</sup>		5.653 m <sup>2</sup>	Se mærket her!
	Holmans Kanal 20 1060 København K		93 kWh/m <sup>2</sup>		9.861 m <sup>2</sup>	Se mærket her!
	Holmans Kanal 42 1060 København K		89 kWh/m <sup>2</sup>		9.374 m <sup>2</sup>	Se mærket her!

# SIMPLE AND CORRECT FOLLOW-UP & KNOW-HOW

- Data from smart meters, consumption budgets and degree days based reporting ensures the right knowledge and focus.
- Training of operational staff is essential!



# DOES IT MATTER?

## EXAMPLE – DANISH PARLIAMENT

- **Close Cooperation with Bygningsstyrelsen and the operational staff**
- **15 % reduced heat consumption after 3 years with Intelligent Energy Management**
- **Heat consumption per m<sup>2</sup> ‘has no age’...**

Build in 1966  
Renovated in 2007  
Now: 115 kWh/m<sup>2</sup>

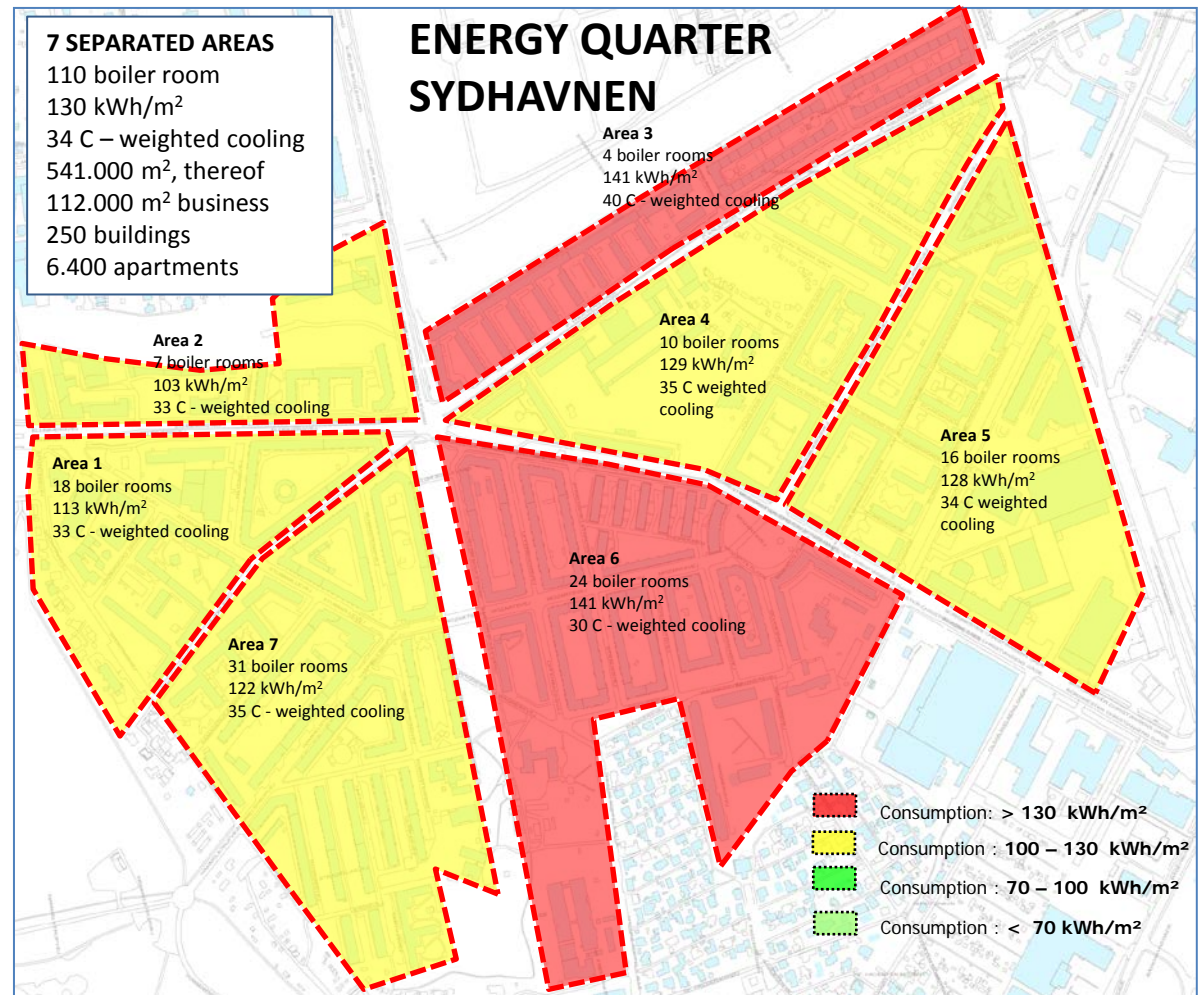


Build in 1720  
Now: 85 kWh/m<sup>2</sup>



# NEXT STEPS.....ENERGY QUARTER ‘SYDHAVNEN’

- 250 buildings combined business and apartments divided in 7 separate areas
- Using our experience with simple traffic light indicators, simple tools, training of the operational staff and consistent follow up
- If this is a success we will roll it out in larger scale





# HEAT CONSUMPTION IN BUILDING SEGMENTS

Let's ensure better correlation between calculations and measurements!

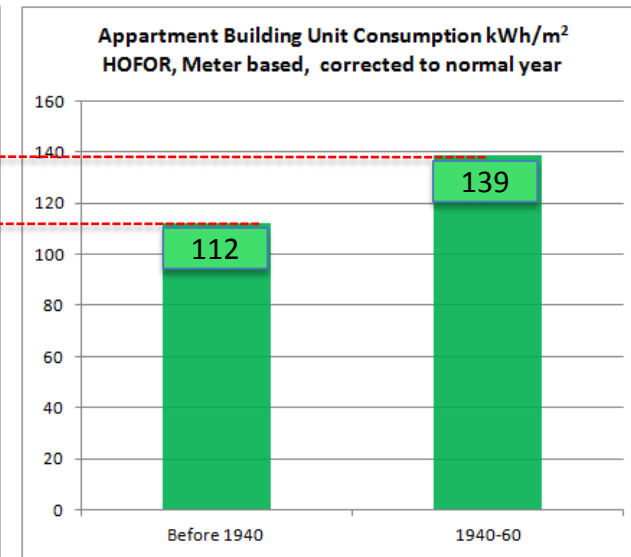
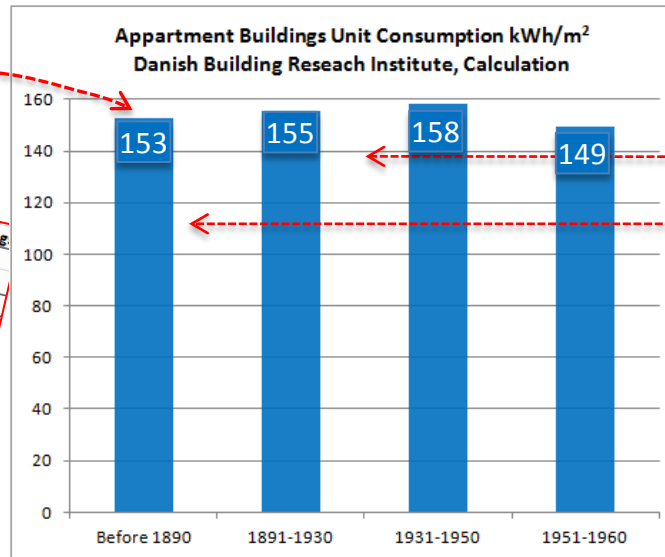
## Segment: Apartment Buildings

Calculations!



Measurements!

(in Copenhagen)



14,6 mio. m<sup>2</sup>  
App. 7.600 stk inst.

2,3 mio. m<sup>2</sup>  
App. 550 stk inst.

SBI 2013:08  
Varmebesparelse ved løbende  
byggningsrenovering frem til 2050  
Netværk for energirenovring

*"Heat savings by continuously  
building renovation 2050"*

Tabel 5: Calculated net unit consumption for heating and hot water in building

kWh/m <sup>2</sup> pr år	Before 1890	1890-1930	1931-1950	1951-1960	1961-1972	1973-1978	1979-1998
Single Family Home	171,6	166,1	165,5	156,2	135,7	121,1	106,7
Chain House	159,5	159	150,6	144,1	121,2	114,1	98,1
Appartment Building	152,5	155,3	158,3	149,4	133,9	122,5	109,8



Statens Byggeforskningsinstitut  
AALBORG UNIVERSITET

'OFFICIAL' DATA INDICATES 10-30% HIGHER CONSUMPTION THAT REALITY (IN COPENHAGEN)

# **ENERGY EFFICIENCY – WHAT DO WE NEED**

**Motivate decision-makers and educate technical staff to create a demand for energy efficiency systems as a tool for generating savings without loss of comfort**

**Accept that valid data is essential for valid decisions**

**It's all about people - focus on small achievements to generate a large success, and make it simple**

**Create national uniform rules for degree days, standards and norms to ensure consistency, comparable calculations and prevent misinformation**

**Generate new services based on valid remote metering data and energy efficiency systems – there is great potential !**

**- HOFOR -**  
**WE CREATE SUSTAINABLE TOWNS AND CITIES**

