OPEN ENERGY DAYS, Århus / 23-25. september 2016

# ‘Digitalt LTP-værktøj’

**Albertslund** overgår til 4. generations-fjernvarme i 2025

Varmekilderne skal herefter komme fra vedvarende energi som sol, varmepumper og geotermi = **LAVTEMPERATUR**(LT)KILDER

Bygningerne skal derfor være **LT-parate**, dvs. efterisolerede og med velegnede (store) varmeflader, når der sænkes til 60 grader

DERFOR behøver boligejerne et nemt **digitalt redskab** til at se om netop deres bygning er parat - og hvad de kan/skal gøre

Albertslund Kommune

NIKOS ! (Nikolaos Andreas Gkoufas, ingeniør, M.Sc./energi)
CHRISTIAN ! (Christian Oxenvad, energirådgiver+arkitekt)


Albertslund er en
totalplanlagt, grøn
fjernvarmeforstadsby

KRIMI

# Skyderi i Albertslund

11. MAJ 2008 - 0:43 | OPDATERET 12. SEP. 2012 - 12:44

Del

## Rockerdrab: Det viser obduktione det parterede lig

Obduktionen af den 25-årige Satudarah-rocker Kevin Andersen viser, at ha med kniv

Af: Thea Pedersen

## Skudangreb på åben gad Albertslund

# Bølgen af bilbrande fortsætter: Ni biler i brand i Albertslund og på Amager – ilden truede folks boliger

06. SEP. 2016 KL. 17.44

## Politiet: Lig fra Albertslund er 25-årig med forbindelser

...tioner til rockergruppen Satudarah er

ALBERTSLUND POSTEN
...en del af lokalavisen.dk



## Fodboldkamp sluttede i voldsorgie

Lørdag sluttede fodboldkampen mellem FC Alberts... dommeren og gæsterne blev overfalde...

AF MORTEN THORNTO...

tusinde asylansøgere ...

28.000 borgere

40 % ejer- og andelsboliger

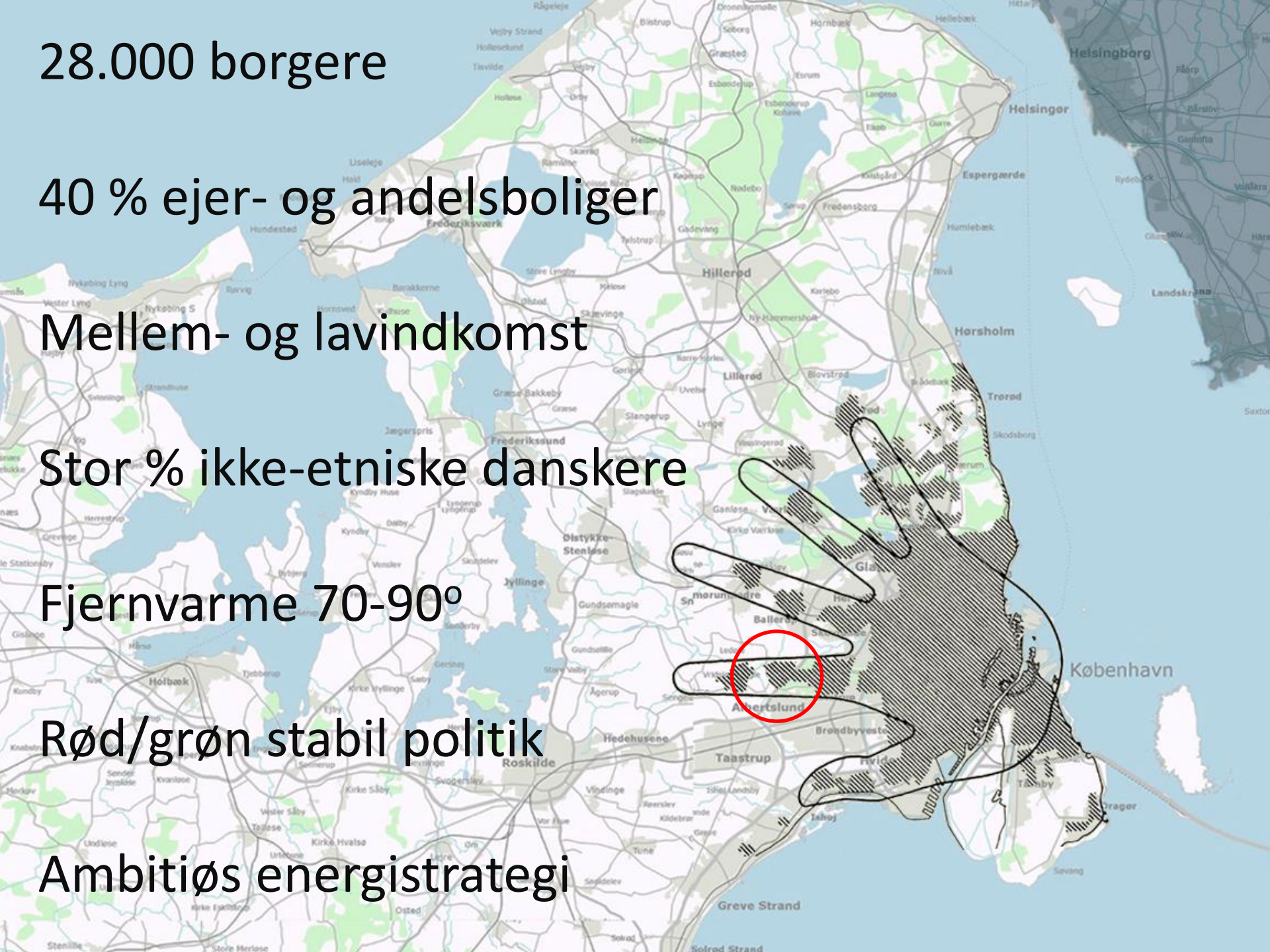
Mellem- og lavindkomst

Stor % ikke-etniske danskere

Fjernvarme 70-90°

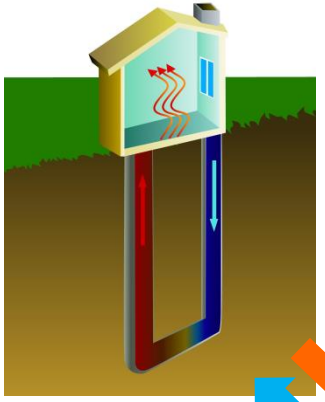
Rød/grøn stabil politik

Ambitiøs energistrategi



Kraftvarme + affaldsforbrænding

Geotermi

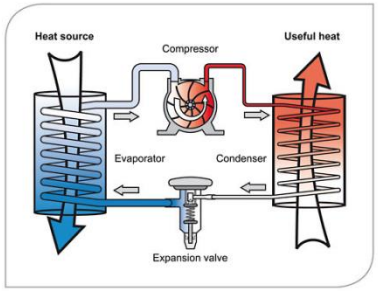


Solvarme med sæsonlagring

90° C

55-60° C

55-60° C




Store varmepumper

55-60° C

Ringe isolering

2015……2025

God efter-isolering

**Index = 100 % forbrug**

**Fremtid = 40-50 %**

Albertslund Kommune

vores by

# Hvad betyder lavtemperatur (LT) for husene?

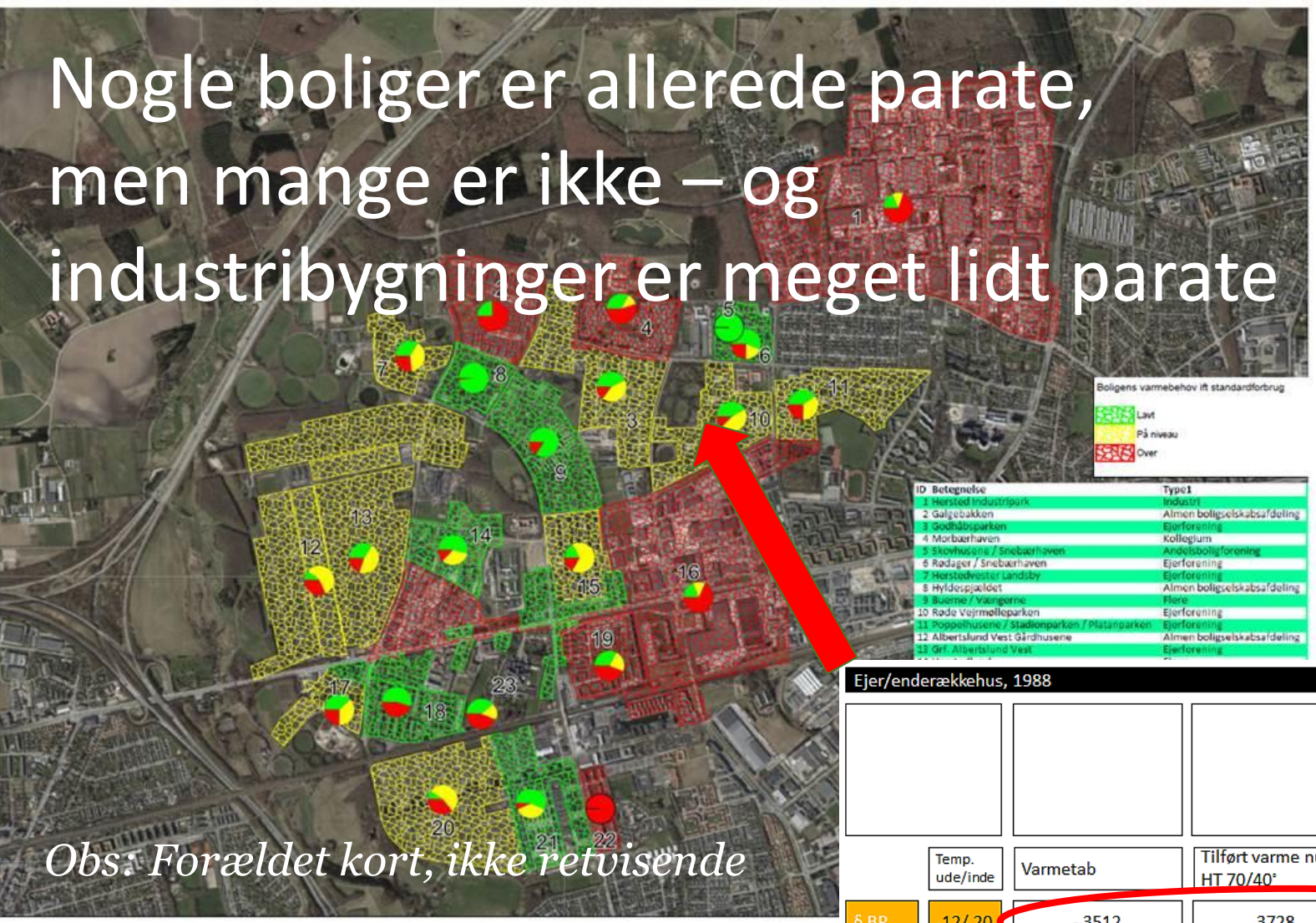
- **Status**: En del ældre bygninger vil få et vist investeringsbehov for at blive lavtemperaturparate (LTP)

- **Årsager**: udeblevet energirenovering, borttagning af radiatorer samt spareprojekterede 80'er-bygninger

- Gode **muligheder** for LTP-tiltag: både prisbillige minimumsløsninger og løsninger, der samtidig indfrier fælles energisparemål

- **DET MANGLER! :** Borgerne behøver et redskab for at planlægge rigtigt (og økonomisk fornuftigt) i netop deres bygning

# Nogle boliger er allerede parate, men mange er ikke – og industribygninger er meget lidt parate




*Obs: Forældet kort, ikke retvisende*

| Ejer/enderækkehus, 1988 | | | | Radiatorer |
|---|---|---|---|---|
| | | | | |
| | Temp. ude/inde | Varmetab | Tilført varme nu HT 70/40° | Tilført varme, 2025 LT 60/35° |
| § BR | -12/ 20 | - 3512 | 3728 | 2748 |
| Komfort-temp. | -12/ 22 | - 3802 | 3461 | 2497 |
| 'Normal-vinter' | -5 / 20 | - 2856 | 3728 | 2748 |
| | -5 / 22 | - 3147 | 3461 | 2497 |
| Eksist. efteriso eller ændr. varmeflader: Energirude og 200 mm loftisolering | | | | |
| Skal gøres for at være LTP: | | | | Pris: |

Albertslund Kommune


# Energiruder i eksisterende rammer
# - eller nye energivinduer

Ekstra isolering på parcelhusloftet
fra 100 mm til 400 mm…

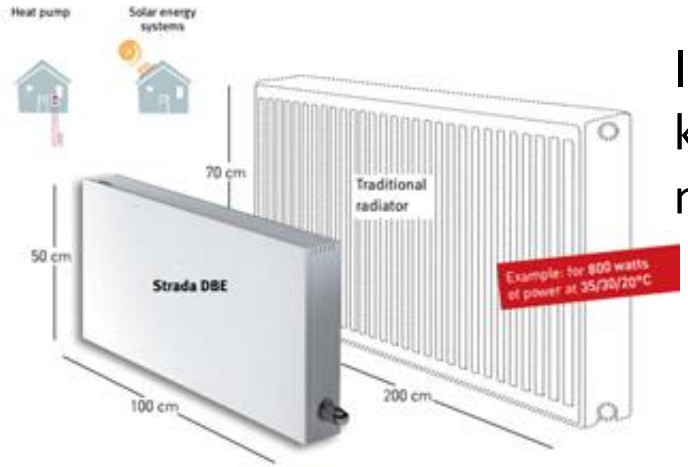
Virkemidler

Eller ny tagdug + isolering på rækkehuset

# eller udvendig indpakning af kolde betongavle


2-lags LT-radiator med konvektorer

3-lags LT-radiator med konvektorer




Importerede kompakte LT-radiatorer med blæserboost


Retrofit-blæsere = fordobler varmeeffekten fra alm. tynde 60’er radiatorer

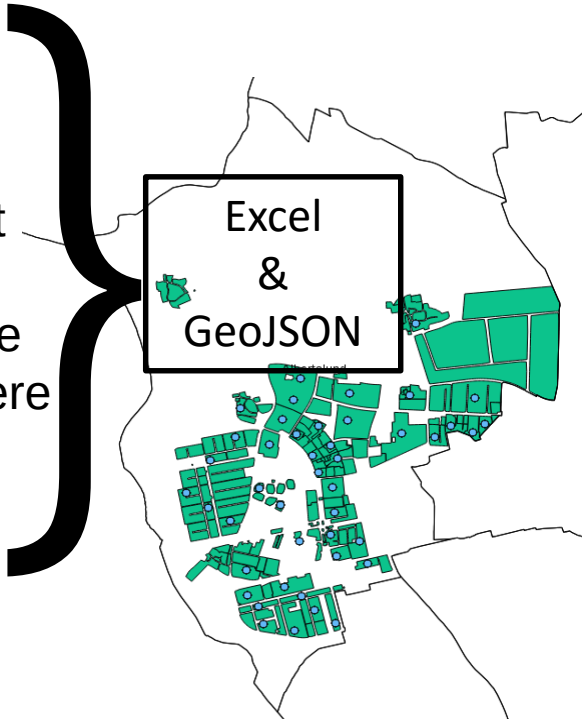
## Virkemidler til LTP

| | Minusser | Plusser |
|---|---|---|
| Efter**isolering** | ● Dyr<br>● Tilbagebetalingstid<br>● Kan kræve nabosamarbejde (tage) | ● Det vi gerne vil i kommunen+DK+EU = nedsætte energiforbruget<br>● God langtidsinvestering<br>● Kan kombineres med andet vedligehold |
| Ombyggede **varmeanlæg** | ● Sparer ikke på varmen<br>● Giver ikke øget komfort i en kold bolig<br>● Fylder, støjer, bruger el, kræver rengøring | ● Relativt billigt<br>● Hurtigt og nemt<br>● Imødekommer andels- og ejerboliger med lille økonomi<br>● Kan imødekomme afkølingskrav<br>● Overgangsløsning |

**Data til rådighed til problemløsning:**

- G/F områder
- Alder
- Boligstørrelser
- Husstandsindkomst
- Uddannelse
- Fraflyttere / tilflyttere
- Ikke etniske danskere

- Vejrdata




**Grønt regnskab:**

- Årlige gennemsnitlige forbrug med data områdevis

- Årligt forbrug data pr. hus, 2011 til 2015

ALBERTSLUND FORSYNING

- Månedlige forbrugsdata fra fire konkrete parcelhuse

- **Andre kilder**:

WebLager®

Boligejer

Albertslund Kommune

Kortservice

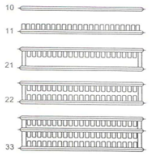
# Hjælpeværktøjer

- Energiberegningsprogram til klimaskærm og varmeflader

| Temperature selection: | | | |
|---|---|---|---|
| $t_s$ | $t_r$ | ti | ΔT |
| 60 | 35 | 23 | 24,5 |

| Detailed selection | | | | | |
|---|---|---|---|---|---|
| Heat output from: | 100 | W | up to | 1000 | W |
| Height from: | 255 | h | up to | 955 | mm |
| Length from: | 200 | mm | up to | 3000 | mm |

Heat outputs according to EN 442




| | Type 10 | | | | | | | Type 20 | | | | | | | Type 30 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length | Height [mm] | | | | | | Length | Height [mm] | | | | | | Length | Height [mm] | | | | | |
| [mm] | 255 | 355 | 455 | 555 | 655 | 955 | [mm] | 255 | 355 | 455 | 555 | 655 | 955 | [mm] | 255 | 355 | 455 | 555 | 655 | 955 |
| 200 | 20 | 28 | 35 | 42 | 49 | 69 | 200 | 35 | 47 | 59 | 72 | 84 | 115 | 200 | 56 | 69 | 86 | 73 | 84 | 118 |
| 300 | 31 | 43 | 53 | 63 | 73 | 103 | 300 | 53 | 70 | 89 | 107 | 125 | 173 | 300 | 83 | 104 | 130 | 110 | 127 | 177 |
| 400 | 41 | 57 | 70 | 83 | 97 | 138 | 400 | 71 | 94 | 119 | 143 | 167 | 231 | 400 | 111 | 138 | 173 | 146 | 169 | 236 |
| 500 | 51 | 71 | 88 | 104 | 121 | 172 | 500 | 88 | 117 | 148 | 179 | 209 | 289 | 500 | 139 | 173 | 216 | 183 | 211 | 295 |
| 600 | 61 | 85 | 105 | 125 | 146 | 206 | 600 | 106 | 141 | 178 | 215 | 251 | 346 | 600 | 167 | 207 | 259 | 220 | 253 | 354 |
| 700 | 72 | 100 | 123 | 146 | 170 | 241 | 700 | 124 | 164 | 208 | 251 | 293 | 404 | 700 | 194 | 242 | 302 | 256 | 296 | 413 |
| 800 | 82 | 114 | 140 | 167 | 194 | 275 | 800 | 141 | 188 | 237 | 286 | 335 | 462 | 800 | 222 | 277 | 345 | 293 | 338 | 472 |
| 900 | 92 | 128 | 158 | 188 | 218 | 309 | 900 | 159 | 211 | 267 | 322 | 376 | 519 | 900 | 250 | 311 | 389 | 330 | 380 | 531 |
| 1000 | 102 | 142 | 175 | 209 | 243 | 344 | 1000 | 177 | 235 | 297 | 358 | 418 | 577 | 1000 | 278 | 346 | 432 | 366 | 422 | 590 |
| 1100 | 113 | 157 | 193 | 230 | 267 | 378 | 1100 | 194 | 258 | 326 | 394 | 460 | 635 | 1100 | 306 | 380 | 475 | 403 | 464 | 650 |
| 1200 | 123 | 171 | 210 | 250 | 291 | 413 | 1200 | 212 | 282 | 356 | 430 | 502 | 693 | 1200 | 333 | 415 | 518 | 439 | 507 | 709 |
| 1300 | 133 | 185 | 228 | 271 | 316 | 447 | 1300 | 230 | 305 | 386 | 465 | 544 | 750 | 1300 | 361 | 449 | 561 | 476 | 549 | 768 |
| 1400 | 143 | 199 | 245 | 292 | 340 | 481 | 1400 | 247 | 328 | 415 | 501 | 586 | 808 | 1400 | 389 | 484 | 604 | 513 | 591 | 827 |

General Data

| Add New Room | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Room Name | Floor Level | Floor Area [m²] | Ceiling Height [m] | Length of External Walls | | | | | | Floor | Windows | | | | | | | Doors | | | | | | Heating Systems | | |
| | | | | | Type | North [m] | East | [m] | South [m] | West [m] | Type | Type | Height [m] | North [m] | East [m] | South [m] | West [m] | Type | Height [m] | North [m] | East [m] | South [m] | West [m] | Primary | 2nd | 3rd |
| Room 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Room 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Delete Last Room | | | | | | | | | | | | | | | | | | | | | | | | | | | |

- Tre eksempler på LTP cases med rigtige huse fra Albertslund, men anonymiserede

| Ejer/enderækkehus, 1988 | | | | Radiatorer |
|---|---|---|---|---|
| | | | | |
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Albertslund Kommune

Hjælp denne mand, der nu er enlig pensionist i et parcelhus, som i dag ikke er særligt godt isoleret og stadig har de oprindelige tynde 60'er radiatorer til højtemperaturfjernvarme

Hjælp også gerne hans medborgere i Albertslund med et digitalt LTP-værktøj hvadenten disse mennesker er unge, ældre, enlige, familier, velhavende, ikke så velhavende, IT-nørder, IT-skeptiske, aktive i grundejerforeningen, totalt passive eller bare helt almindelige borgere, der synes at begrebet fjernvarme er kedeligt…

Hjælp Albertslunds borgere med et digitalt LTP-værktøj til at blive

# parat til lavtemperatur!

Nikolaos Andreas Gkoufas nikolaos.andreas.gkoufas@albertslund.dk
Christian Oxenvad christian.oxenvad@albertslund.dk

Albertslund Kommune

vores by

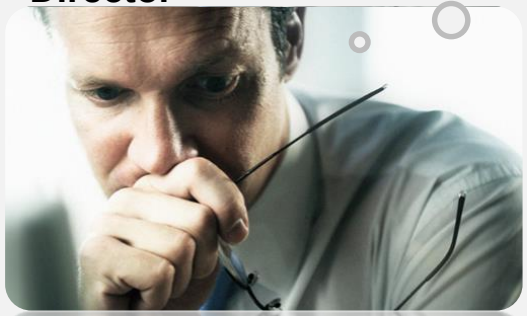

# E.ON challenge:
# How can we optimise energy production and consumption of the municipality through open data and new technology?

Open Energy Days Hackathon 2016, 23 Sep 2016

e·on

How can I optimise our energy production and consumption most efficiently to meet cost and climate targets, and take advantage of latest technologies in sustainable heating, electricity and transport?

**Director**



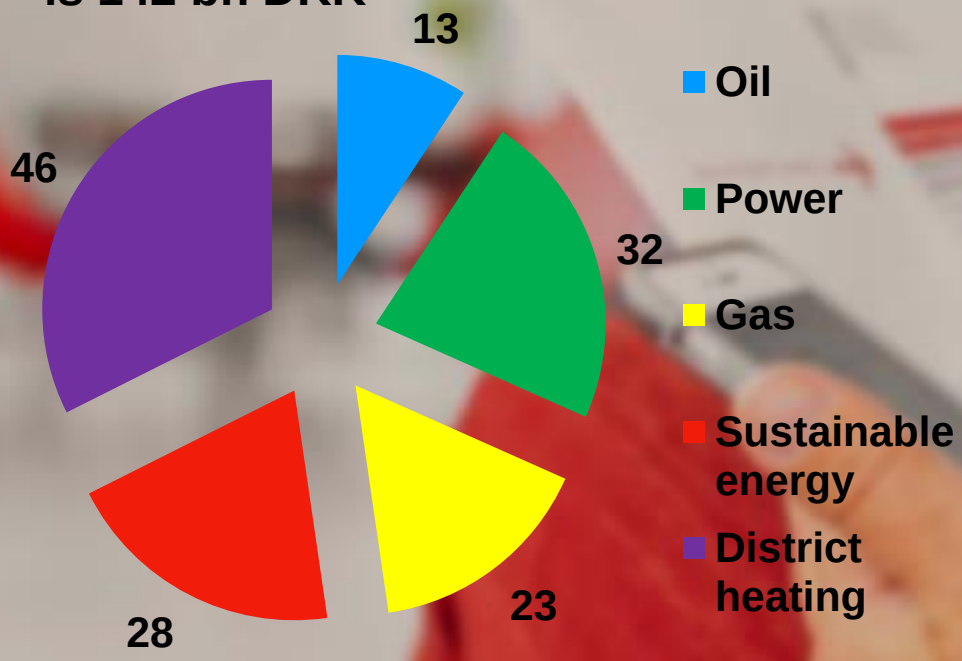
**Budget frame-work**

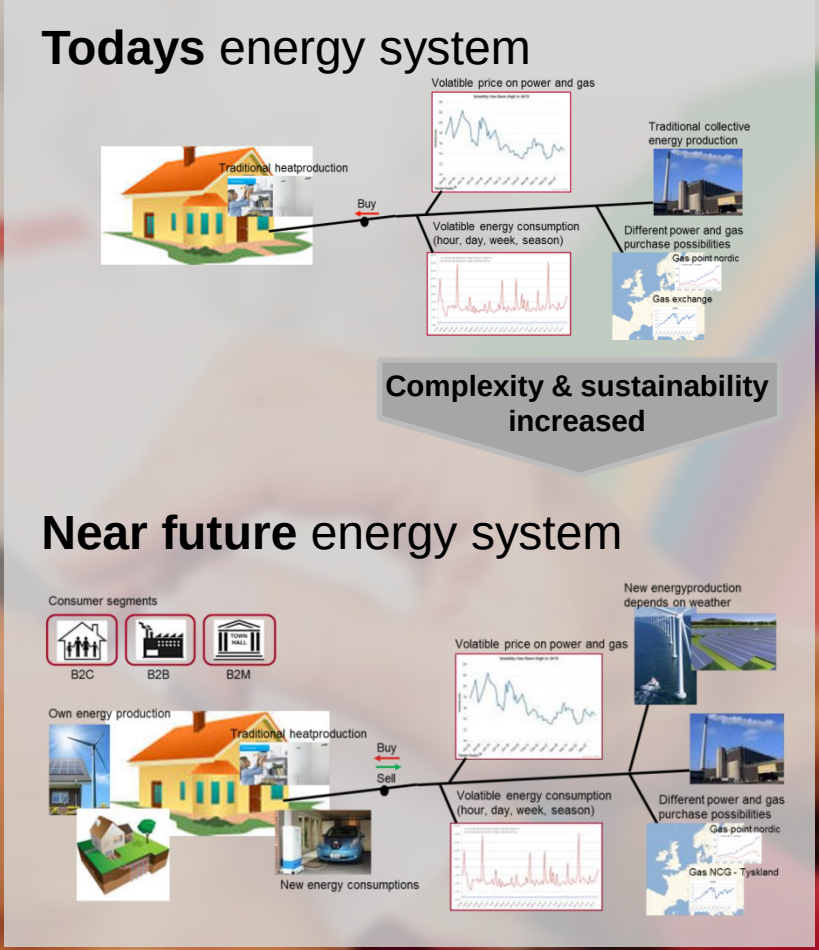
**Climate targets**

**Strategy**

# HUGE opportunities for new ideas

**The Danish Energy market is 142 bn DKK***




*Households and business segment

# There are many opportunities in new solutions – and more to come

## Network solutions

Network optimisations

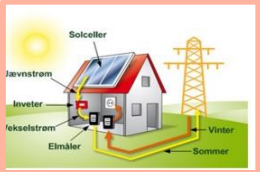


## Cluster solutions

Optimise within cluster



## Unit solutions




# Expected outcome

- Develop a solution that overall addresses the case question and thereby **identify what and where new energy solutions can be beneficial**
- Develop a solution that can **cope with open data**
- Develop a **scalable solution** that can handle different sizes of municipalities
- Develop a solution that can **handle complexity of network connections and multiple energy solutions**

FREDERIKSBERG KOMMUNE

Open Energy Days 2016

# The Frederiksberg Case

Energy Advisor
Rasmus Rohlff
hero03@frederiksberg.dk
2898 4380

# The challenge

How can Frederiksberg transform raw data about water- and energy consumption into ’nudging’. To motivate users into changing their habits or to take immediate action, and thereby become more sustainable?

# What?

- Users only react to immediate needs.
  - E.g. No light => turn on light…but no need for turning the light off, when leaving af room.

- Bills are now centralised so users don’t see costs or think of consequences.

- We need to nudge the user back to energy efficient behaviour.

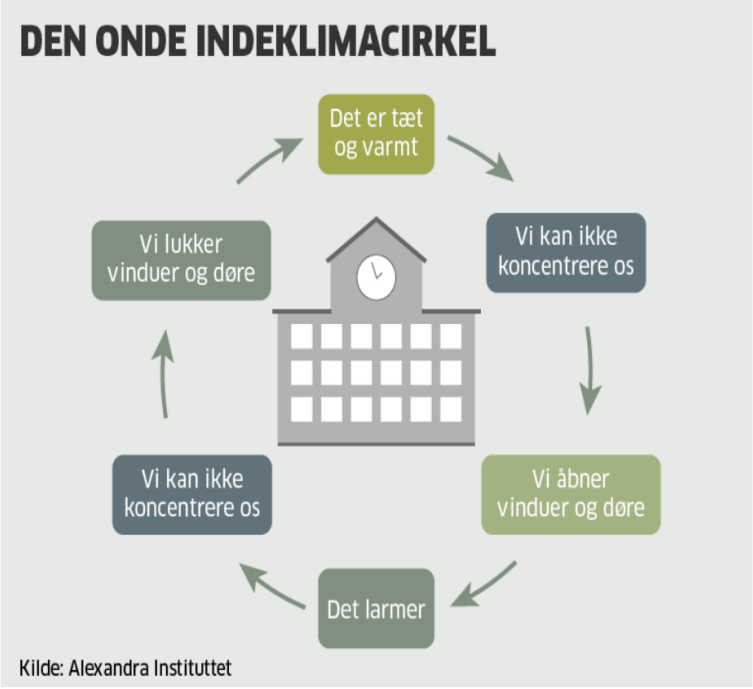
# Goals

- Good indoor climate
  - CO2, temperature and relative humidity
  - no wasteful consumption

- Happy users ☺

# How?

- Use data from building and energy meters to nudge the users in the right direction.
- Some examples:
  - Too high room temperature => turn down thermostat
  - Too high humidity => open window (more ventilation)
  - Too high CO2 => open window (more ventilation)
  - Too low CO2, too high energy consumption => close window.
  - Too low CO2 and no ventilation => turn off light
- But how do we communicate it to the user?



# Data

- Heat energy meter: water heat in and out of buildings
- BMS (Building Management system)*: CO2, ventilation and temperature per room
- Optimal temperature and CO2 levels for work and learning environments

* In danish: CTS=‘Central tilstandskontrol og styring’

# Questions?

PS: If you choose our case, we can setup more measurements as you require.

FREDERIKSBERG KOMMUNE

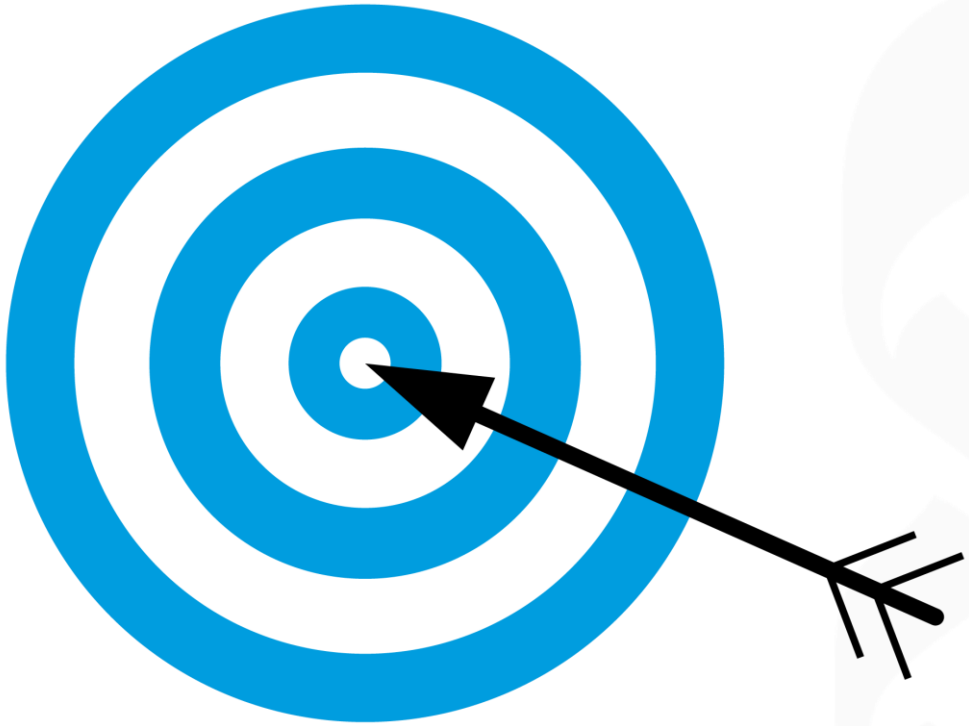
# OPEN ENERGY DAYS

Friday, September 23 2016

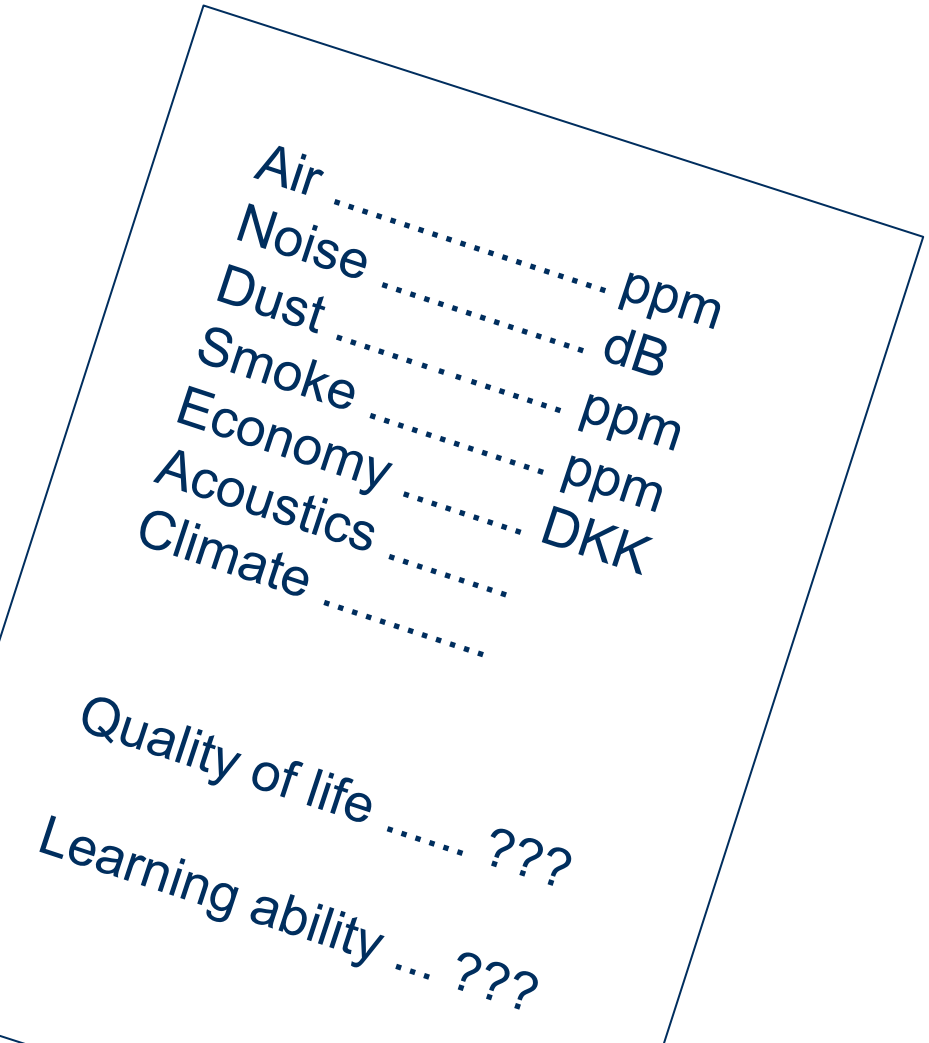
Thomas Østergaard Jørgensen

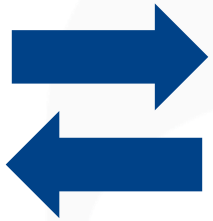
Head of Department, City of Odense

ODENSE KOMMUNE



traditional thinking vs. innovation



behavioural change

# What do YOU know about your own consumption?

- How much water do you use daily?
- Could a more pedagogic presentation of data change consumption and behavior?
- How? What works?

- Question: Per Rygaard mobile 5120 7843

OPEN ENERGY DAYS

midt regionmidtjylland

# Case presentation

22. september 2016

# Case description

How can climate- and energy accounts be made more visually "delicious" and be coupled with other data, to tell new stories and show new opportunities, as well as being easier to present to policy and decision makers, and thereby contribute to greater knowledge and commitment?

# Background

- Central Denmark Region and the 19 municipalities in the region have since 2007 developed climate and energy accounts every two years.

- Energy accounts uncovers the energy consumption of each municipality, but also shows which sources the energy comes from and whether it is renewable.

- The Energy accounts are used to follow developments in the transition to renewable energy, to plan new energy initiatives and investments and be used as inspiration on how other Municipalities/Regions performs.

# Data

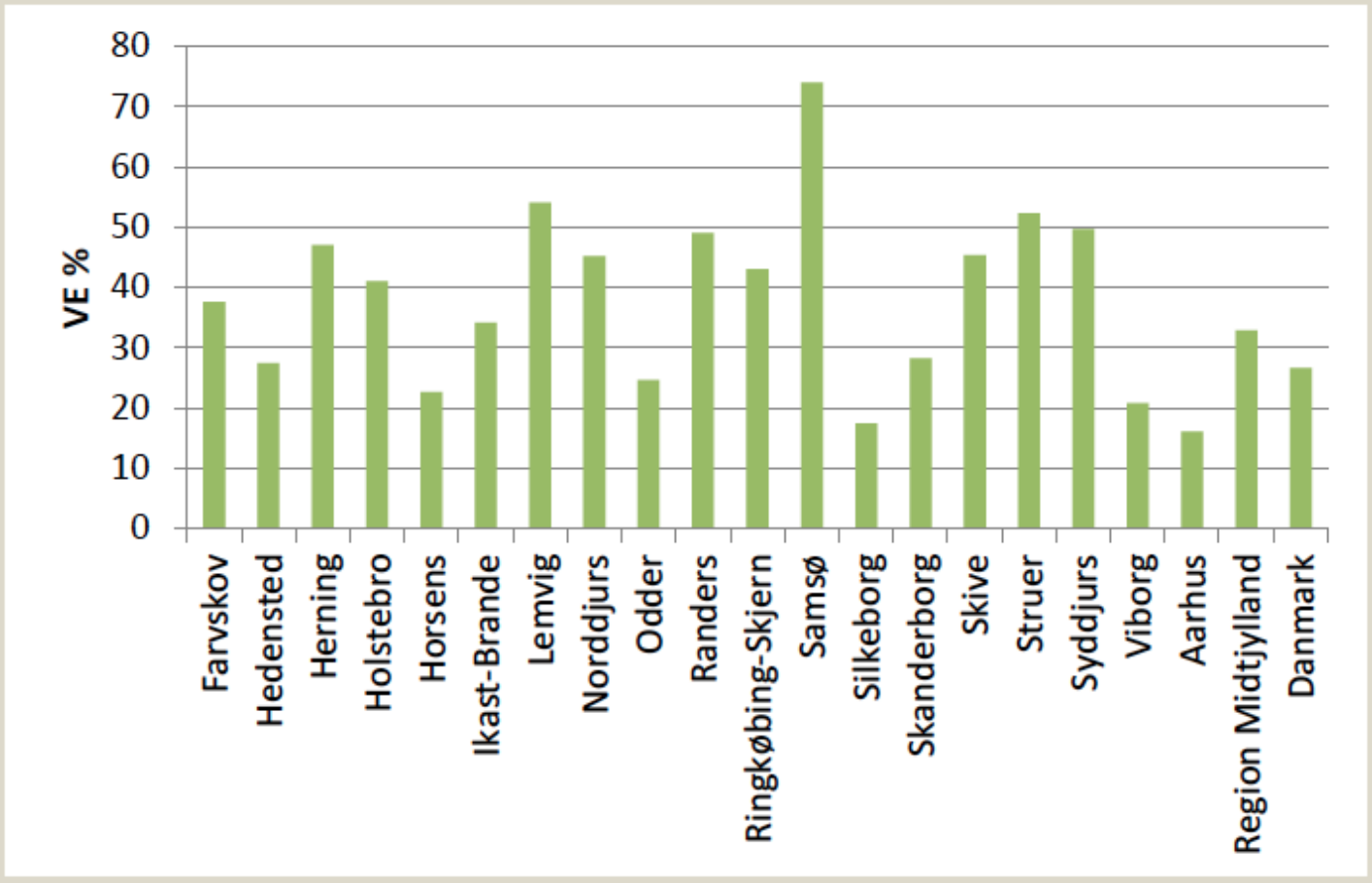
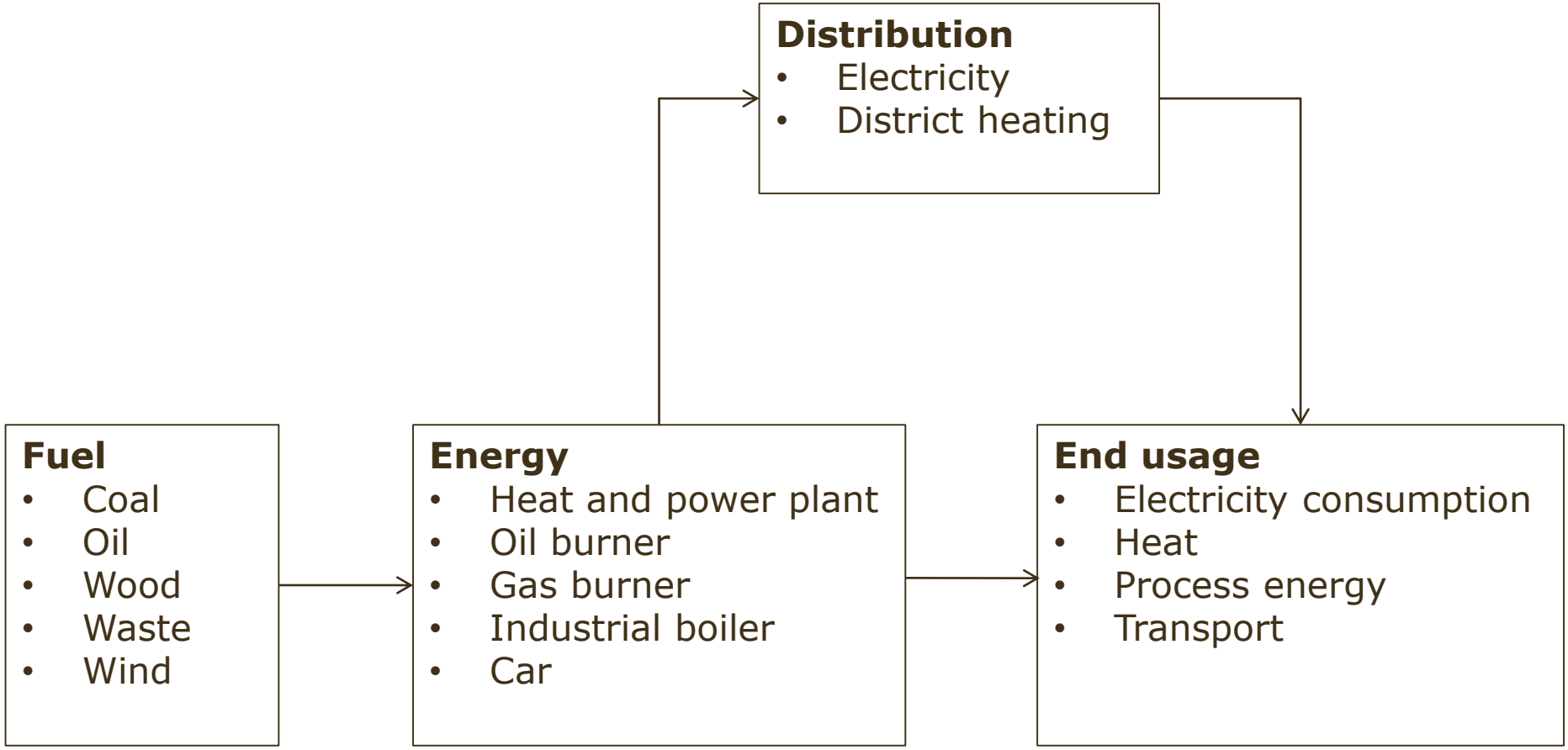



Figure 6: Percentage of renewable energy in the municipalities in Central Denmark Region

Source:http://www.rm.dk/siteassets/regional-udvikling/energi/strategisk-energiplanlagning/forside-sep/slutrapport-midt-energistrategi-15august2015.pdf

# Data


Distribution
• Electricity
• District heating
Fuel
• Coal
• Oil
• Wood
• Waste
• Wind
Energy
• Heat and power plant
• Oil burner
• Gas burner
• Industrial boiler
• Car
End usage
• Electricity consumption
• Heat
• Process energy
• Transport

# Case Aalborg Kommune

Aalborg Kommune

# Case questions

How do we maintain a lower energy consumption amongst the citizens of Sulsted, using open data about the town’s energy consumption?

Aalborg Kommune

# Background

- We know that it is not enough just to display data on energy
- We know that economic it one factor, but not the only one
- We know that a key driver is that you care about the environment - you want to make a difference.
- The hope is that the right communication can form the basis for saving energy, and create lasting change

Aalborg Kommune

# Background - why do we care?

- We need to save energy - in 2050 we shall be free of oil, coal and gas. This applies throughout Denmark.
- I Aalborg vil vi være selvforsynende med vedvarende energi.
- If we are to be self-sufficient, we need to reduce energy consumption between 40 and 50%!

Aalborg Kommune