

# Smart readiness indicator for indeklima, effektivitet og energifleksibilitet

Søren Østergaard Jensen, Seniorprojektleder, [sdj@teknologisk.dk](mailto:sdj@teknologisk.dk)  
Konference om Intelligent Bygningsdrift. 27. november 2017.  
Teknologisk Institut, Taastrup

# Smart readiness indicator

- Hvad er det?
- Hvorfor det?

Det er en "enhed" der skal beskrive, hvor parat en bygning er til at opretholde et godt indeklima, med et lavt energiforbrug og om bygningen er parat til at indgå i fremtidens smarte energisystem (el, fjernvarme og gas).

EU påtænker at indføre en sådan enhed i den kommende revision af EPBD for at øge komforten og energieffektiviteten i europæiske bygninger samt for at sikre omstillingen fra fossile brændstoffer til vedvarende energi

A smartness indicator will reflect the ability of buildings to

- (i) adjust to the needs of the user and empower building occupants providing information on operational energy consumption (complementing the energy performance information provided in the EPCs),
- (ii) ensure efficient and comfortable building operation, signal when systems need maintenance or repair, and
- (iii) readiness of the building to participate in demand response, charge electric vehicles and host energy storage systems.



TEKNOLOGISK  
INSTITUT

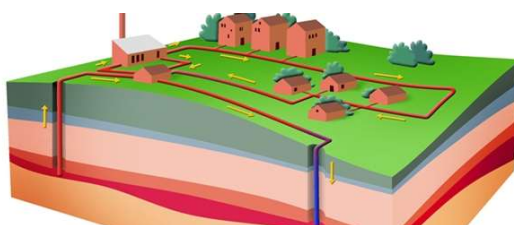
<http://www.rehva.eu/publications-and-resources/rehva-journal/2017/022017/the-smartness-indicator.html>

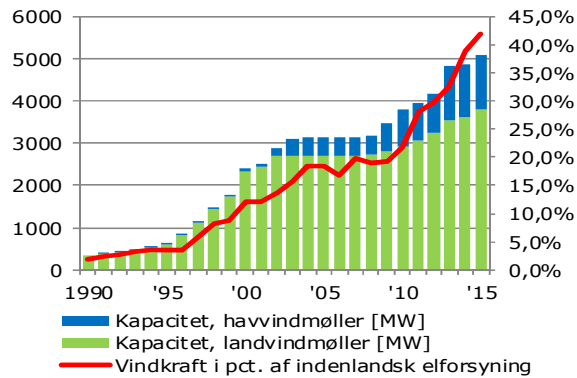
Energimærke

IEA EBC Annex 67  
Energy Flexible  
Buildings

annex67.org

Fælles forståelse af, at vi er nødt til at gå fra fossile brændsler til vedvarende energi



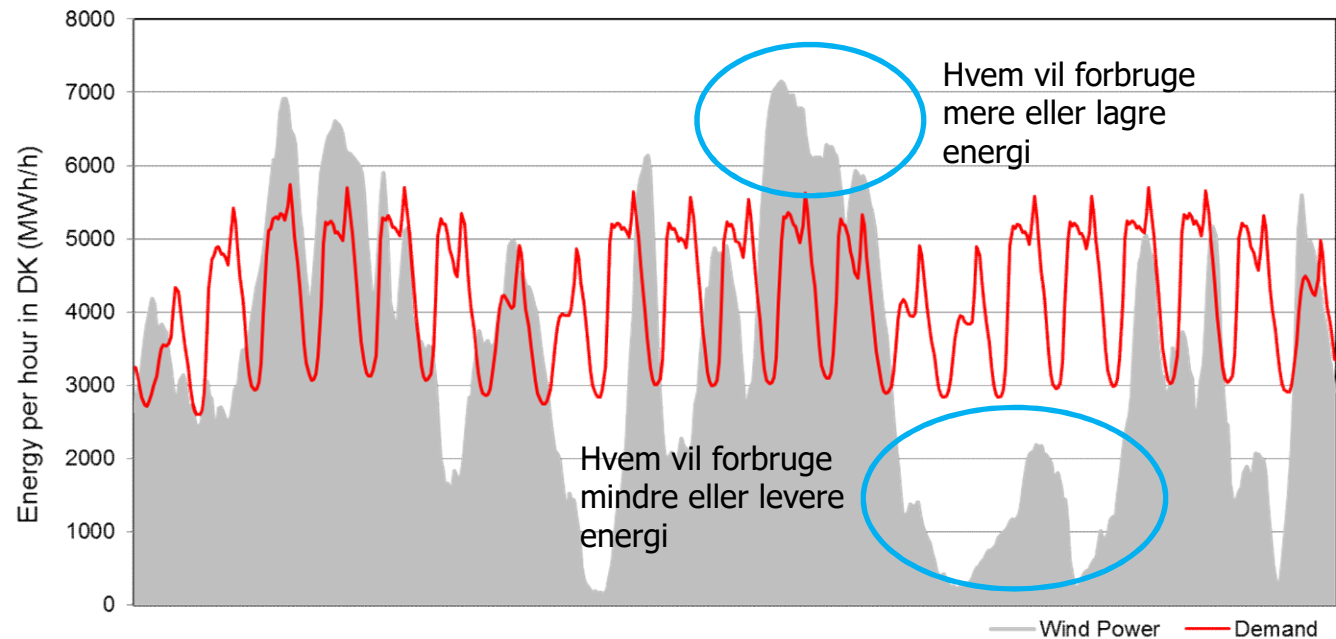


Mål for det danske elsystem:

- 50 % el fra vind i 2020
- 100 % el fra vedvarende energi i 2035



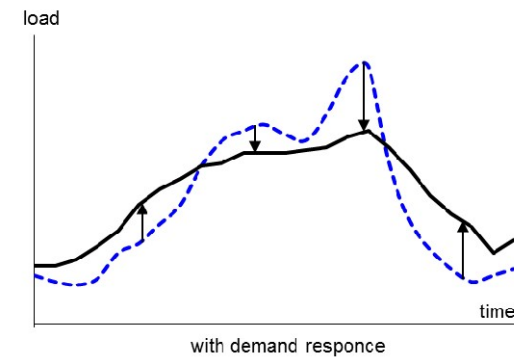
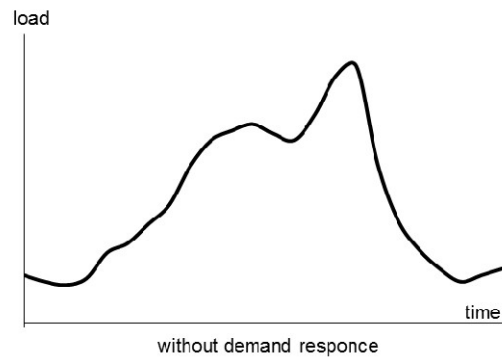
TEKNOLOGISK  
INSTITUT

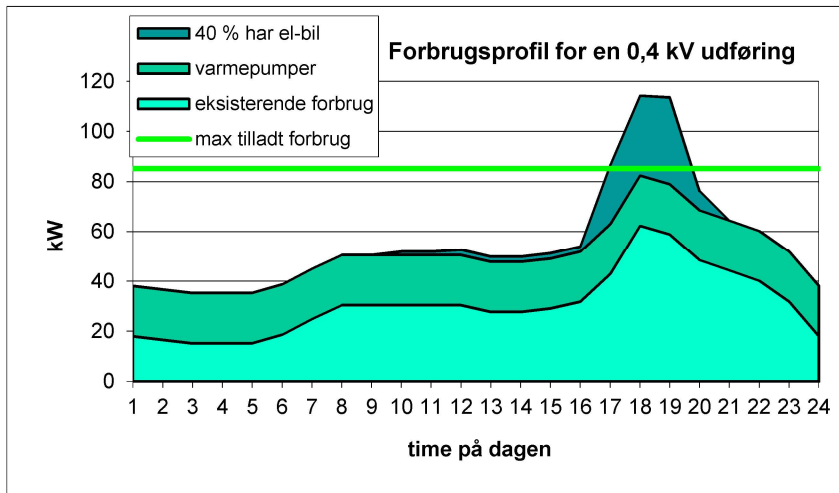
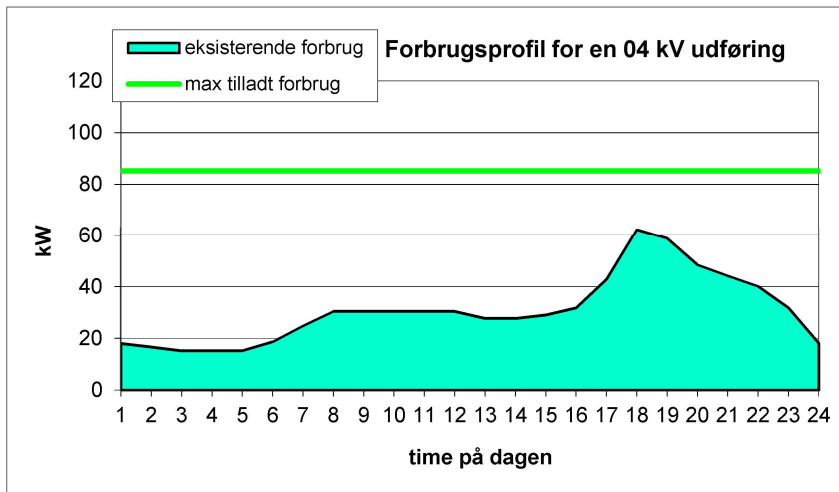


# Bygninger kan gøres energifleksible



TEKNOLOGISK  
INSTITUT

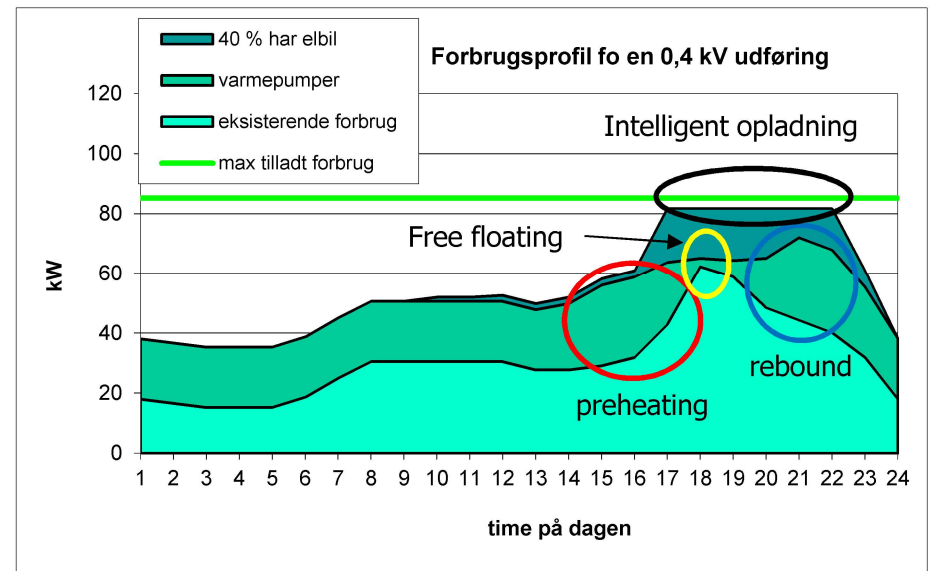




# Et eksempel



TEKNOLOGISK  
INSTITUT



# Smart Readiness Indicator (SRI)

- EU har igangsat en undersøgelse, der skal danne baggrund for udformningen af en SRI i EPBD
- Problem: vurderingen af en bygnings SRI må kun koste:
  - 15€ for beboelse
  - 100€ for andre bygninger
- Dette kan let føre til en simpel optælling af dimser i stedet for en reel vurdering af, om en given bygning har mulighed for at være smart
- Dimser leder ikke nødvendigvis til god komfort, lavt energiforbrug og mulighed for fleksibelt energiforbrug – de skal bruges rigtigt



Function list and assignment to energy performance classes (section from table 1 of the EN 15232:2007 [D])



TEKNOLOGISK  
INSTITUT

# EN 15232 Energy performance of buildings – Impact of Building Automation, Controls and Building Management

	Heating / Cooling control	Ventilation / Air conditioning control	Lighting	Sun protection
A	<ul style="list-style-type: none"> <li>– Individual room control with communication between controllers</li> <li>– Indoor temperature control of distribution network water temperature</li> <li>– Total interlock between heating and cooling control</li> </ul>	<ul style="list-style-type: none"> <li>– Demand or presence dependent air flow control at room level</li> <li>– Variable set point with load dependant compensation of supply temperature control</li> <li>– Room or exhaust or supply air humidity control</li> </ul>	<ul style="list-style-type: none"> <li>– Automatic daylight control</li> <li>– Automatic occupancy detection manual on / auto off</li> <li>– Automatic occupancy detection manual on / dimmed</li> <li>– Automatic occupancy detection auto on / auto off</li> <li>– Automatic occupancy detection auto on / dimmed</li> </ul>	<ul style="list-style-type: none"> <li>– Combined light/blind/ HVAC control</li> </ul>
B	<ul style="list-style-type: none"> <li>– Individual room control with communication between controllers</li> <li>– Indoor temperature control of distribution network water temperature</li> <li>– Partial interlock between heating and cooling control (dependent on HVAC system)</li> </ul>	<ul style="list-style-type: none"> <li>– Time dependent air flow control at room level</li> <li>– Variable set point with outdoor temperature compensation of supply temperature control</li> <li>– Room or exhaust or supply air humidity control</li> </ul>	<ul style="list-style-type: none"> <li>– Manual daylight control</li> <li>– Automatic occupancy detection manual on / auto off</li> <li>– Automatic occupancy detection manual on / dimmed</li> <li>– Automatic occupancy detection auto on / auto off</li> <li>– Automatic occupancy detection auto on / dimmed</li> </ul>	<ul style="list-style-type: none"> <li>– Motorized operation with automatic blind control</li> </ul>
C	<ul style="list-style-type: none"> <li>– Individual room automatic control by thermostatic valves or electronic controller</li> <li>– Outside temperature compensated control of distribution network water temperature</li> <li>– Partial interlock between heating and cooling control (dependent on HVAC system)</li> </ul>	<ul style="list-style-type: none"> <li>– Time dependent air flow control at room level</li> <li>– Constant set point of supply temperature control</li> <li>– Supply air humidity limitation</li> </ul>	<ul style="list-style-type: none"> <li>– Manual daylight control</li> <li>– Manual on/off switch + additional sweeping extinction signal</li> <li>– Manual on/off switch</li> </ul>	<ul style="list-style-type: none"> <li>– Motorized operation with manual blind control</li> </ul>
D	<ul style="list-style-type: none"> <li>– No automatic control</li> <li>– No control of distribution network water temperature</li> <li>– No interlock between heating and cooling control</li> </ul>	<ul style="list-style-type: none"> <li>– No air flow control at room level</li> <li>– No supply temperature control</li> <li>– No air humidity control</li> </ul>	<ul style="list-style-type: none"> <li>– Manual daylight control</li> <li>– Manual on/off switch + additional sweeping extinction signal</li> <li>– Manual on/off switch</li> </ul>	<ul style="list-style-type: none"> <li>– Manual operation for blinds</li> </ul>



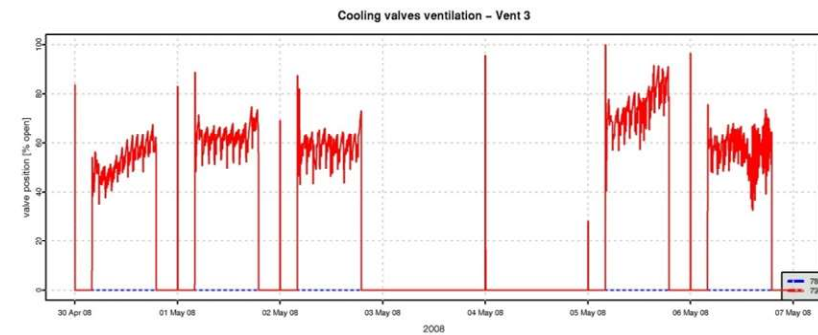
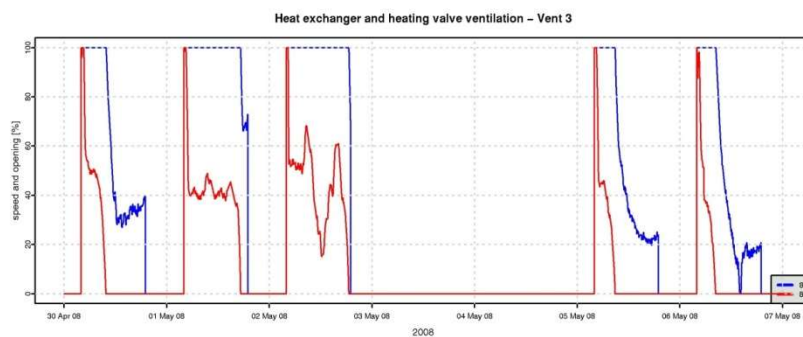
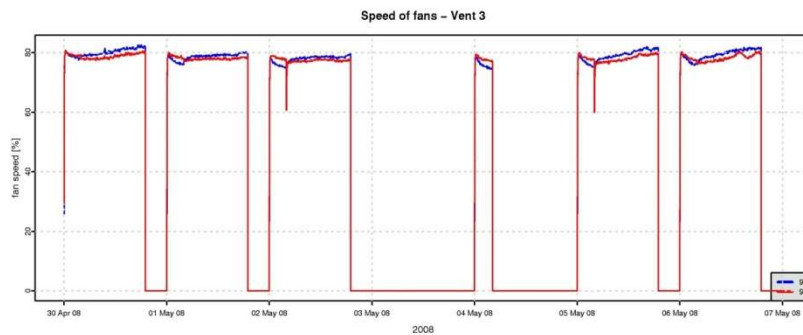
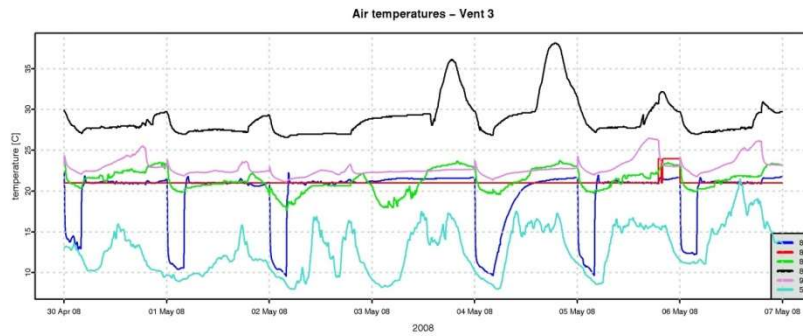
Building Automation and Control (BAC) efficiency classes to EN 15232	Efficiency factor for thermal energy			Efficiency factor for electrical energy		
	Office	School	Hotel	Office	School	Hotel
<b>A</b> High energy performance building automation and control system (BACS) and technical building management (TBM)	0.70	0.80	0.68	0.87	0.86	0.90
<b>B</b> Advanced BACS and TBM	0.80	0.88	0.85	0.93	0.93	0.95
<b>C</b> Standard BACS	1	1	1	1	1	1
<b>D</b> Non energy efficient BACS	1.51	1.20	1.31	1.10	1.07	1.07

[http://www04.abb.com/global/seitp/seitp202.nsf/0/d0bbe587cf46edc6c125777500401d30/\\$file/extract from ABB brochure 2CDC500060M0201 p 6 7.pdf](http://www04.abb.com/global/seitp/seitp202.nsf/0/d0bbe587cf46edc6c125777500401d30/$file/extract%20from%20ABB%20brochure%202CDC500060M0201_p%206%207.pdf)

# Et eksempel



TEKNOLOGISK  
INSTITUT



<http://www.elforsk.dk/elforsk/Projects/339-032/339-032-slutrapport.pdf>

# Styring anvender energi!



TEKNOLOGISK  
INSTITUT

- I en Be15 beregning skal al energi til bygningens drift medregnes. Typisk bliver ventilation, pumper, mm. medregnet
- Men hvor tit medregnes elforbruget til komponenterne i et CTS-anlæg eller intelligente kontakter i boliger? Overset forbrug?
- Dette energiforbrug kan sandsynligvis udgøre 10-20 % af bygningens energiforbrug
- Der er brug for en undersøgelse af størrelsen af dette forbrug

# Er en Smart Readyness Indicator en god eller dårlig ting

Både – og:

- God, hvis det øger fokus på korrekt styring af bygninger
- God, hvis den får brugere og ejere af bygninger til at efterspørge bedre komfort og energieffektivitet samtidigt med, at energiforbruget til styringen ikke bliver for stort
- Dårlig, hvis opfattelsen bliver, at en god SRI automatisk betyder, at bygningens komfort og energieffektivitet er i top
- Dårlig, hvis en bygning automatisk for tildelt en reduktionsfaktor, hvis bygningen har en god SRI



TEKNOLOGISK  
INSTITUT

Tak for jeres opmærksomhed