AIA Provider: Northeast Sustainable Energy Association

Provider Number: G338

Lessons from Scandinavia – SWEDEN & DENMARK

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Andy Shapiro
Heather Nolen
Tom Hartman

March 5th, 2015

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Course Description

The band got back together, with another singer.

Think Abba.

Learning Objectives

At the end of the this course, participants will be able to:

1. Assess the state of the art in Denmark and Sweden with respect to climate change development.

2. Identify trends in construction codes towards energy efficiency and how the evolution occurred.

3. Describe the social context in Scandinavia and how it compares to the United States.

4. Determine what strategies we found can work for projects here in the US.

Tom Intro- 2:00 (5 minutes)

BE 2015

Lessons from Scandinavia - DENMARK

Introduction and Context

NESEA Travelers


Norwegian Sea
Sweden
Gulf of Bothnia
Norway
Finland
Baltic Sea
Estonia
Latvia
North Sea
Denmark
Lithuania
United Kingdom
Ireland
Belarus
Netherlands
Poland
Belgium
Germany
Czech Rep
Slovakia
Ukraine
Austria
Moldova
Hungary
France
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Bergen
Oslo
Drammen
Stavanger
Fredrikstad
Karlstad
Örebro
Eskilstuna
Västerås
Uppsala
Stockholm
Södertälje
Norrköping
Linköping
Kristiansand
Gothenburg
Jönköping
Borås
Vendsyssel
Aberdeen
Klitmøller
Aalborg
Växjö
Halmstad
North Sea
Aarhus
Horsens
Helsingborg
Copenhagen
Malmö
Esbjerg
Denmark
Sjælland
Odense
Flensburg
Middlesbrough
Leeds
Hull
Sheffield
Norwich
Kiel
Neumünster
Rostock
Stralsund
Lübeck
Hamburg
Schwerin
Groningen
Leeuwarden
Bremerhaven
Bremen
Berlin
Szczecin
Gorzów Wielkopolski
Pila
Bydgoszcz
Poland
Slupsk
Gdańsk
Elblag
Koszalin
Swinoujscie
Kolobrzeg
Tczew
Olsztyn
Grudziadz
Kaliningrad
Калининград
Klaipėda
Lithuania
Šiauliai
Mažeikiai
Liepāja
Jūrmala
Jelgava
Rīga
Latvia
Gotland
Baltic Sea
Saaremaa
Pärnu
Estonia
Tallinn
Helsinki
Turku
Hyvinkää
Ziemeļvidzemes biosfēras rezervāts
Strenči
Kaunas
Vilnius
Marijampolė
Alytus
Suwałki
Elk
Grodno
Гродна
Lida
Ліда
Lomza
Białystok
Baranavichy
Баранавічы

BE 2015

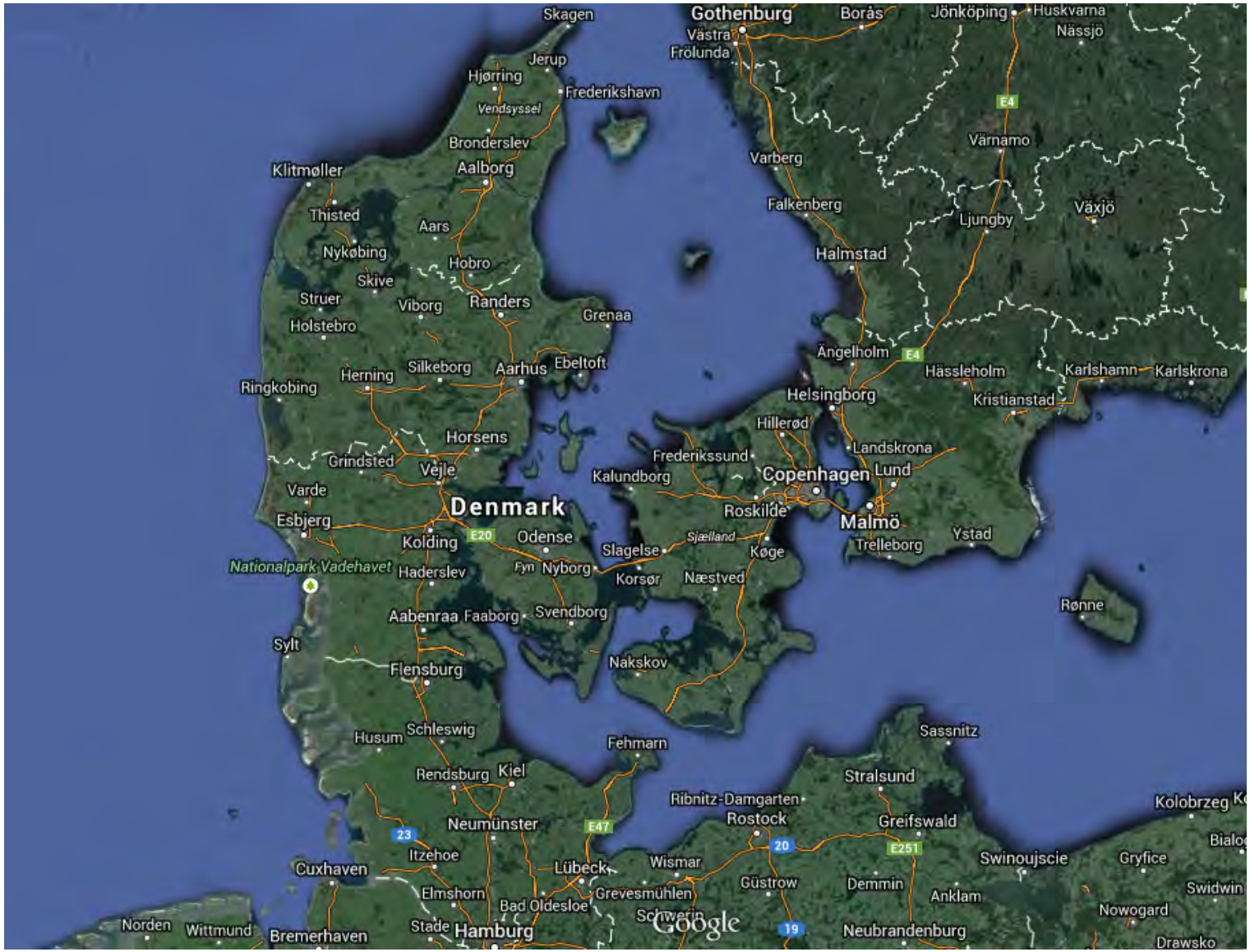
Lessons from Scandinavia - DENMARK

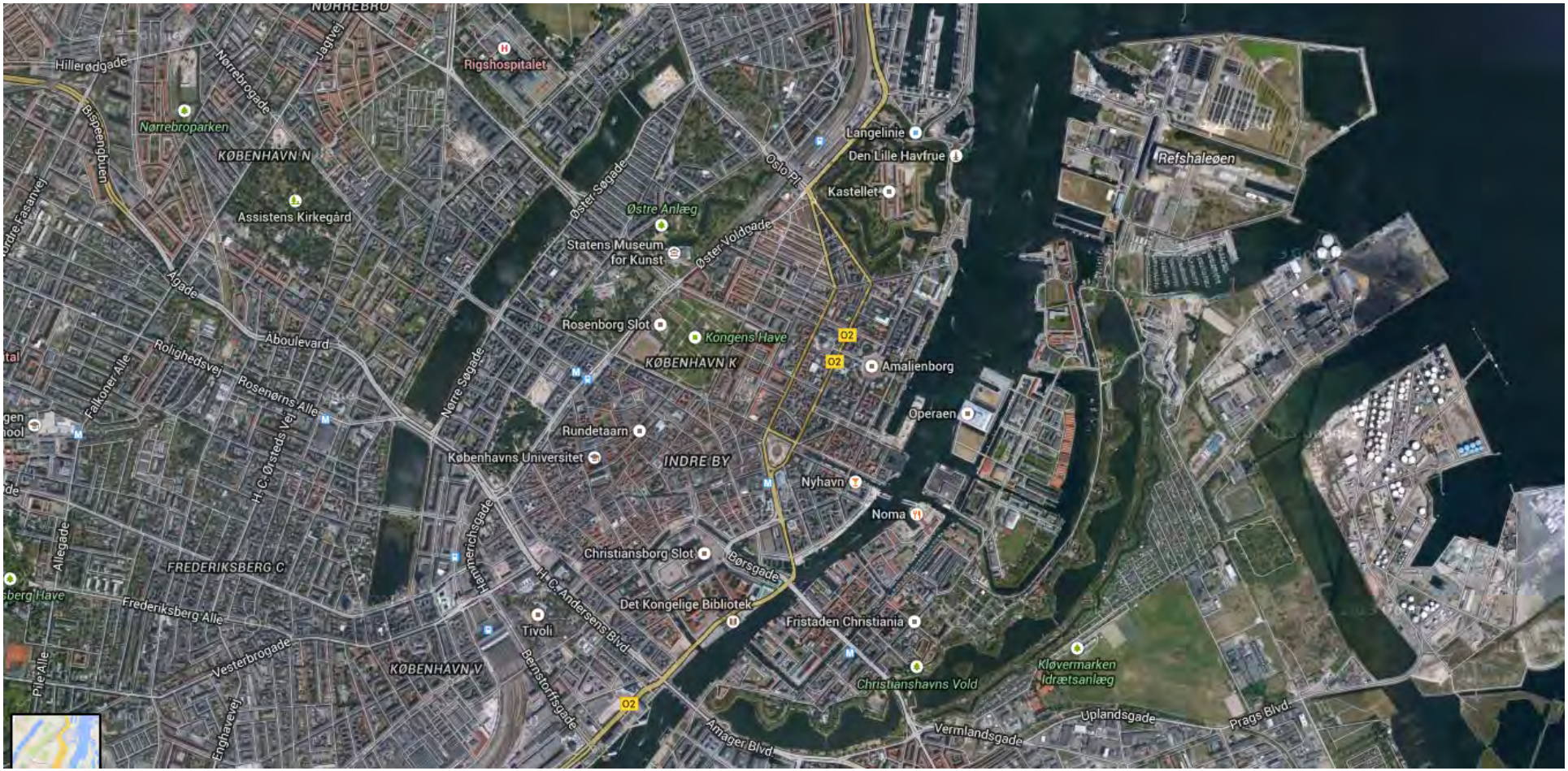
26-Oct			ferry to Frederikshavn, Denmark Stena Line			
Sunday						
		Afternoon	Bofællesskabet Sol & Vind Byagervej 245 8330 Beder email: info@sologvind.dk	Near Aarhus, Beder		Visit cohousing community that Tom and Kristin studied in 1995, http://sologvind.dk
27-Oct	morning		Ekolab with Klaus Ellehauge Vestergade 48 H, 2. tv DK-8000 Aarhus C		26 Oct to 28 Oct Store Torv 4 Arhus, 8000 Denmark	
		8:30 - 9:45	Direkte +45 40 38 66 43	Aarhus, Denmark	+4586120011	http://www.langenkamp.dk
			drive 45 minutes to Ebeltoft to meet with Olav Langenkamp **4pm?**			
Monday	afternoon	12:30	Lagenkamp Office 12:30, Nørreport 4F, 8400 Ebeltoft, then to Aarhus to see 32 PH rowhouses **6:30pm**			
	dinner		Olav? **12 midnight**			
28-Oct	morning		TRAVEL TO COPENHAGEN			
	afternoon	13:00	Krydsrum Arkitekter with Niels Jakubiak Andersen, Kigkurren 8M, 1. sal, then tour of 30 Ryesgade Renovation **7pm**	Copenhagen, Denmark	28 Oct to 1 Nov IBSENS HOTEL VENDERSGADE 23 COPENHHAGEN, 1363 Denmark +4533131913	http://www.krydsrum.dk
Tuesday	dinner		DINNER WITH ANDERS (via Paul)Anders and Thea Drachen; Carl Jacobsens Vej 21A, 2. floor, door 3 2500 Valby Denmark Anders: +45 29390604			http://www.dac.dk/en/dac-cities/sustainable-cities/all-cases/buildings/copenhagen-renovation-has-reduced-energy-consumption-by-73-in-ryesgade/
29-Oct	morning	9:00	UNIVERSITY MEETING?? HEATHER- IBC Euroforum conference tradeshow, and/or visit the Danish National Maritime Museum **3pm**	Copenhagen, Denmark		http://buildinggreen.eu/en/
Wednesday	lunch					http://www.theguardian.com/artanddesign/2013/oct/27/danish-maritime-museum-ingels-review
	afternoon	15:00	15:00 meeting with Niels Arne Jensen from the City Nyropsgade 1, 6.sal 1602 København V Telefon 2630 9496 E-mail njense@kff.kk.dk **9pm**			
30-Oct	morning	9:00	PENDING Go see 8 House by BIG, orDanish Museum of Art and Architecture?? **3pm**	Copenhagen, Denmark		http://www.archdaily.com/63464/in-progress-8-house-big/
Thursday	lunch					http://architizer.com/projects/8-house/
	afternoon	13:00	Henning Larsen Architects, with Signe Kongebro, Louis Becker, Vesterbrogade 76 THEN a project **7pm**			http://www.henninglarsen.com/people/s-u/signe-kongebro.aspx?catId=&sortBy=firstname
31-Oct	morning	9:00	Per Thomas Dahl, Director for Building Materials, Danish Construction Agency Dansk ByggeriNørre Voldgade 1061358 København KTelefon 72 16 00 00	Copenhagen, Denmark	PAUL's contact	
Friday	lunch		OPEN			

Schedule

NESEA Travelers

Arrival from Sweden


Skagen
Gothenburg
Borås
Jönköping
Huskvarna
Nässjö
Västra Frölunda
Jerup
Hjørring
Frederikshavn
Vendsyssel
Brønderslev
Aalborg
Klitmøller
Thisted
Aars
Nykøbing
Hobro
Skive
Struer
Viborg
Randers
Grenaa
Holstebro
Herning
Silkeborg
Aarhus
Ebeltoft
Ringkobing
Horsens
Grindsted
Vejle
Varde
Esbjerg
Kolding
Odense
Nationalpark Vadehavet
Haderslev
Fyn
Nyborg
Aabenraa
Faaborg
Svendborg
Sylt
Flensburg
Husum
Schleswig
Rendsburg
Kiel
Neumünster
Itzehoe
Cuxhaven
Elmshorn
Bad Oldesloe
Stade
Hamburg
Norden
Wittmund
Bremerhaven
Denmark
Varberg
Värnamo
Falkenberg
Ljungby
Växjö
Halmstad
Ängelholm
Hässleholm
Karlshamn
Karlskrona
Helsingborg
Kristianstad
Hillerød
Landskrona
Frederikssund
Kalundborg
Copenhagen
Lund
Roskilde
Malmö
Trelleborg
Ystad
Slagelse
Sjælland
Køge
Korsør
Næstved
Rønne
Nakskov
Fehmarn
Sassnitz
Stralsund
Ribnitz-Damgarten
Rostock
Greifswald
Kolobrzeg
Wismar
Lübeck
Grevesmühlen
Schwerin
Güstrow
Demmin
Anklam
Swinoujscie
Gryfice
Swidwin
Nowogard
Neubrandenburg
Drawsko
Google


NØRREBRO
Hillerødgade
Nørrebrogade
Jagtvej
Rigshospitalet
Nørrebroparken
Blegdamsvej
KØBENHAVN N
Assistens Kirkegård
Østre Anlæg
Statens Museum for Kunst
Øster Søgade
Øster Voldgade
Oslo Plads
Langelinie
Den Lille Havfrue
Kastellet
Refshaleøen
Rosenborg Slot
Kongens Have
KØBENHAVN K
Amalienborg
Operaen
Åboulevard
Rolighedsvej
Falkoner Alle
Rosenørns Allé
H.C. Ørsteds Vej
Nørre Søgade
Rundetaarn
Københavns Universitet
INDRE BY
Nyhavn
Noma
Christiansborg Slot
Børsgade
Det Kongelige Bibliotek
Fristaden Christiania
Christianshavns Vold
Kløvermarken Idrætsanlæg
FREDERIKSBERG C
Allégade
Frederiksberg Have
Frederiksberg Allé
Vesterbrogade
Tivoli
H.C. Andersens Blvd
Bernstorffsgade
KØBENHAVN V
Pile Allé
Enghavevej
Amager Blvd
Vermlandsgade
Uplandsgade
Prags Blvd
O2

Copenhagen

BE 2015

Lessons from Scandinavia - DENMARK

Monarchy since 1300's, 5.6M people with 600,000 in Copenhagen

NESEA Travelers

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Lessons from Scandinavia - DENMARK

Architectural History

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Lessons from Scandinavia - DENMARK

Fearless integration of the new and the old

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Design details

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Lessons from Scandinavia - DENMARK

Chairs!

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Environmental Goals:

Copenhagen-Carbon Neutral by 2030
Denmark- Fossil Free by 2050

Social Welfare society with long history of “Commune”

Cycling Infrastructure

NESEA Travelers

A Bridge for only bicycles and pedestrians

BE 2015

Lessons from Scandinavia - DENMARK

Bicycle congestion

NESEA Travelers

BIG- 8 House- 2007- Award winning

BIG- 8 House- Cycling ramp in figure 8

BIG- 8 House- glass cleaning!

Sol og Wind- 20 years later

BE 2015

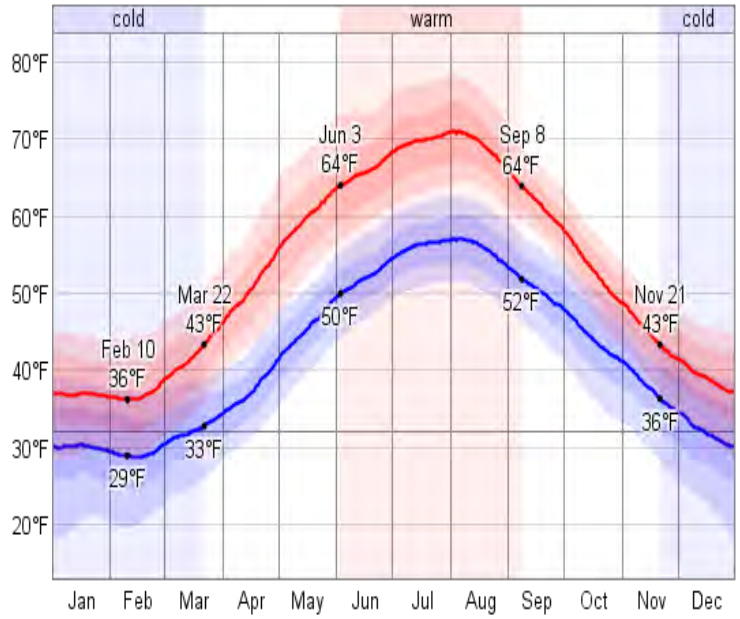
Lessons from Scandinavia - DENMARK

End intro

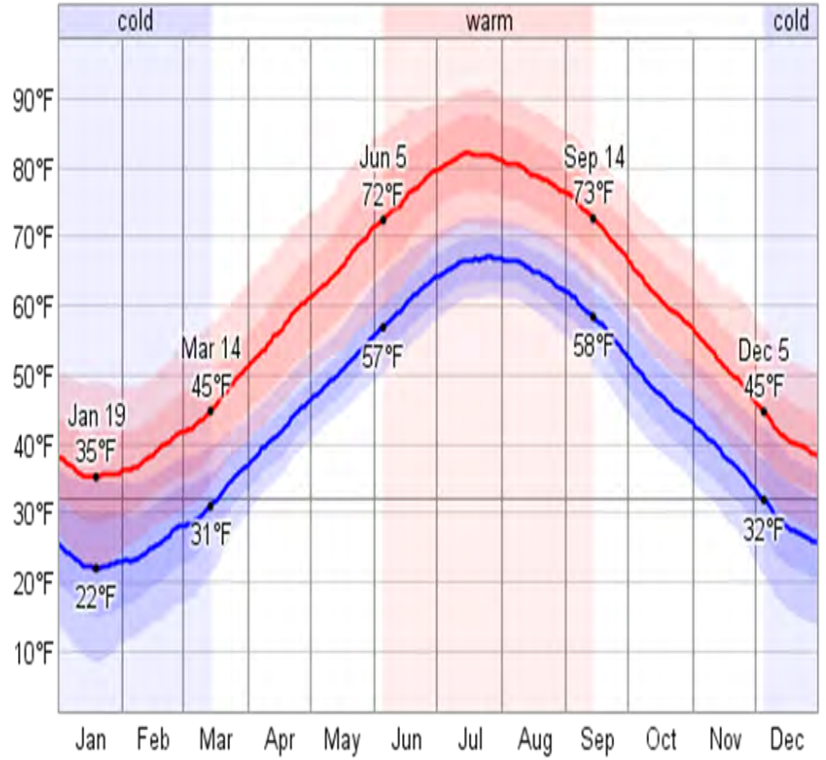
NESEA Travelers

Daily High and Low Temperature

Copenhagen



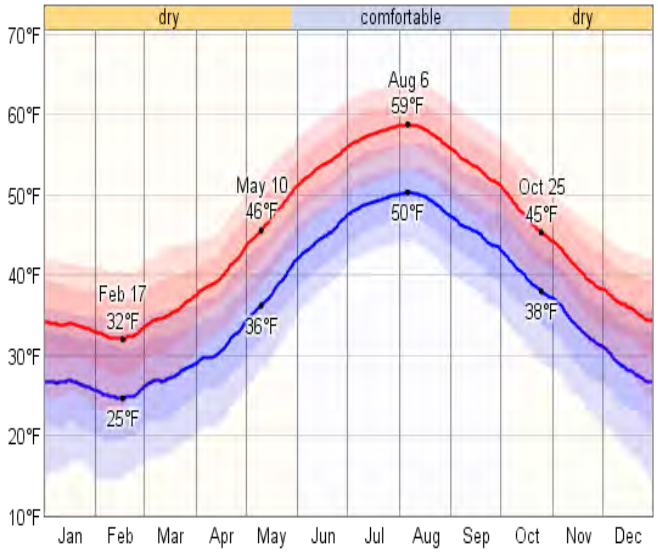
Boston



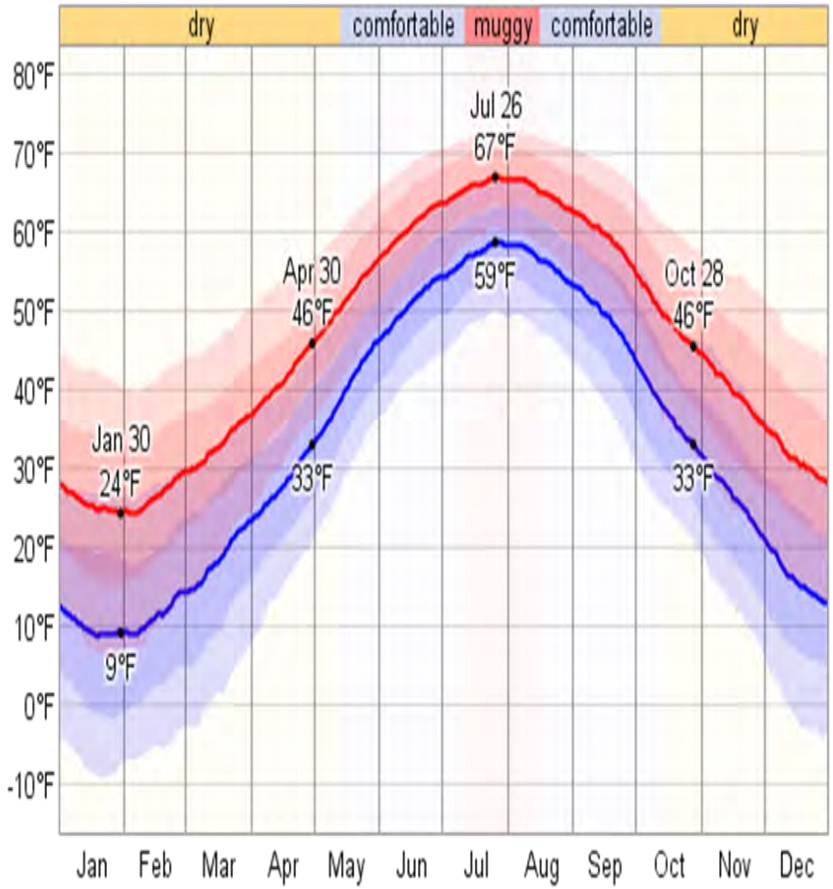
The daily average low (blue) and high (red) temperature with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile).

Dewpoint

Copenhagen



Boston



The daily average low (blue) and high (red) dew point with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile).

Summer average high temperature and dewpoi

- Copenhagen 71F DB and 59F dewpoint: RH 49%, enthalpy 25.7 Btu/lb
- Boston 82F DB and 67F dewpoint: RH 61%, enthalpy 35.2 Btu/lb

- To cool 1,000 cfm of outside air
  - For inside conditions of 74F, 50% RH, enthalpy 27.5
  - Copenhage: conditions already cool – 0 Btu/hr
  - Boston: **34,000 Btu/hr**

Average high temperature and dewpoint conditi

- Copenhagen 71F DB and 59F dewpoint: RH 49%, enthalpy 29.8 Btu/cu.ft.
- Boston 82F DB and 67F dewpoint: RH 61, enthalpy 35.2

- To cool 1000 cfm of outside air
  - For inside conditions of 74F, 50% RH, enthalpy 27.5
  - Copenhagen: no need to cool
  - Boston: **34,000 Btu/hr**

Translating the Swedish Building Energy Standard

Primary Energy	Sweden Energy Standard ***does not inlcude light and pug loads***	kWh/sq.m-yr	**95**	**75**	**55**	**45**	**35**	**25**
		kBtu/sq.ft.-yr	30	24	17	14	11	8
Site Energy	Energy Standard with fossil fuel with Primary Energy Factor of 1.1	kWh/sq.m-yr	86	68	50	41	32	23
		kBtu/sq.ft.-yr	27	22	16	13	10	7
Site Energy	1800 sq.ft. home, using 4000 kWh/yr -- ***lights and plug loads only***	kWh/sq.m-yr	24	24	24	24	24	24
		kBtu/sq.ft.-yr	8	8	8	8	8	8
Site Energy	Total Energy to meet standard with fossil fuel	kWh/sq.m-yr	110	92	74	65	56	47
		kBtu/sq.ft.-yr	**35**	**29**	**23**	**21**	**18**	**15**
Site Energy	Total Energy to meet standard with ASHP COP 2.3 and Primary Energy Factor of 3.0	kWh/sq.m-yr	34	32	30	29	28	27
		kBtu/sq.ft.-yr	**11**	**10**	**9.5**	**9.1**	**8.8**	**8.4**

Translating the Swedish Building Energy Standard

Primary Energy	Sweden Energy Standard ***does not inlcude light and pug loads***	kWh/sq.m-yr	**95**	**55**	**25**
		kBtu/sq.ft.-yr	30	17	8
Site Energy	Energy Standard with fossil fuel with Primary Energy Factor of 1.1	kWh/sq.m-yr	86	50	23
		kBtu/sq.ft.-yr	27	16	7
Site Energy	1800 sq.ft. home, using 4000 kWh/yr -- ***lights and plug loads only***	kWh/sq.m-yr	24	24	24
		kBtu/sq.ft.-yr	8	8	8
Site Energy	Total Energy to meet standard with fossil fuel	kWh/sq.m-yr	110	74	47
		kBtu/sq.ft.-yr	**35**	**23**	**15**
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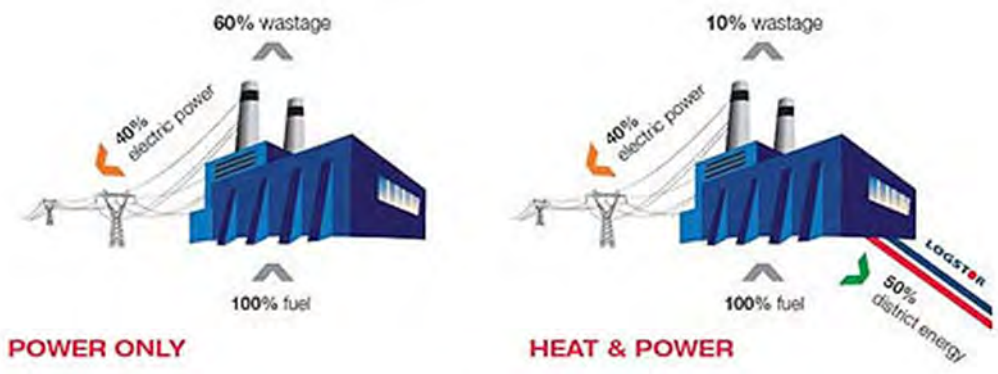
		kBtu/sq.ft.-yr	**11**	**9.5**	**8.4**

District Heating in Stockholm and Copenhagen

Stockholm District Heating

- Market share ~80% of load
- Fossil fuel ~20% -- 80% renewable
- CHP produces ~1/5th of Stockholm electricity
- District supplies about 5,700 GWh/yr of heat
  - 2 x 10^{16} BTU
  - Avoids ~150 MM gallons oil burned



Stockholm District Heating

- Serves ~7 MM sq.m. commercial s
- Implementing district cooling

Stockholm District Heating

- Private companies operate the systems
- Fortum plant uses direct seawater cooling, and HP's to lower water temperature in Fall when seawater warms
  - 220MW of capacity provide 350 MWh/yr
- HP's also provide heating with combustion fuel boost in colder weather
- Total HP heating capacity 600 MW
  - Used at night to charge DHW tanks
  - Low cost electricity at night
  - Sweden has 40% nuclear + 40 %hydro
    7% Wind
- Single stage, dual stage, can share heat and cool in swing season

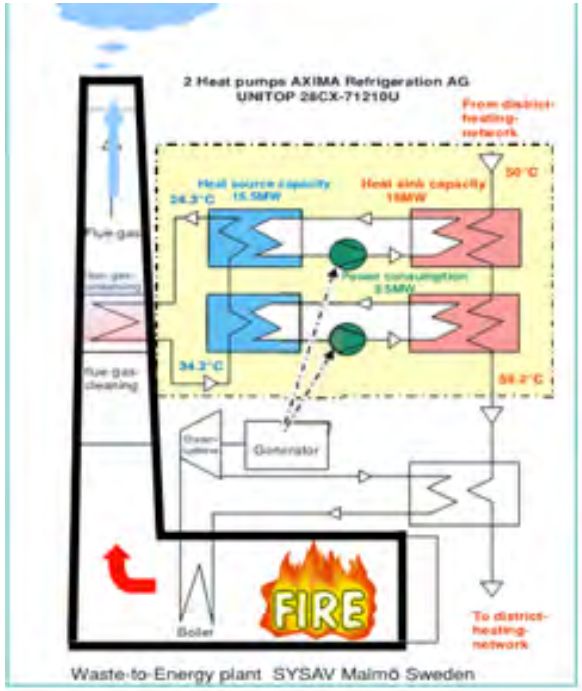
Stockholm District Heating

Working hard to optimize systems

- Waste burning CHP plant In Malmo

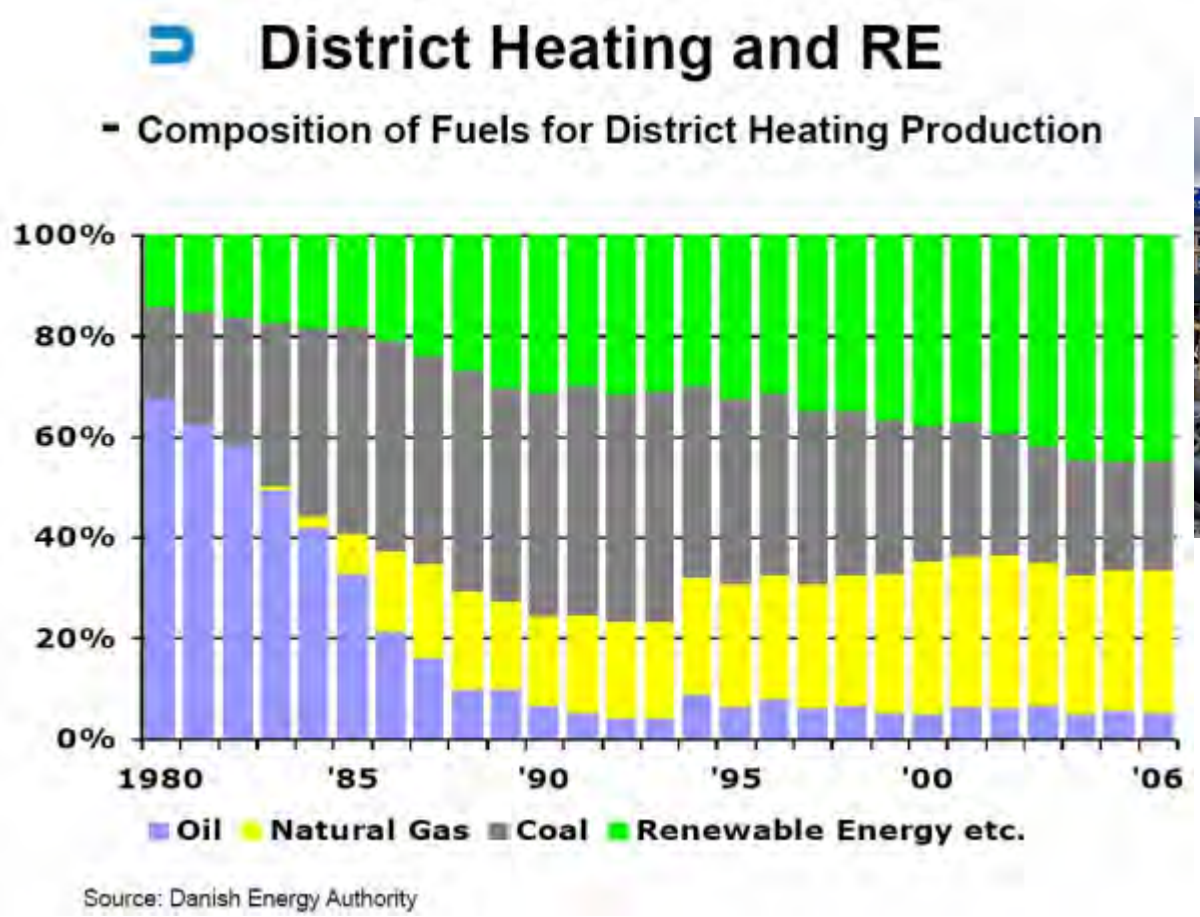
Flue gas heat recovery

- Boosts return water from 50C (122F) to 59C (138F) in district heat
- COP ~5 – 6
- 19 MW heating



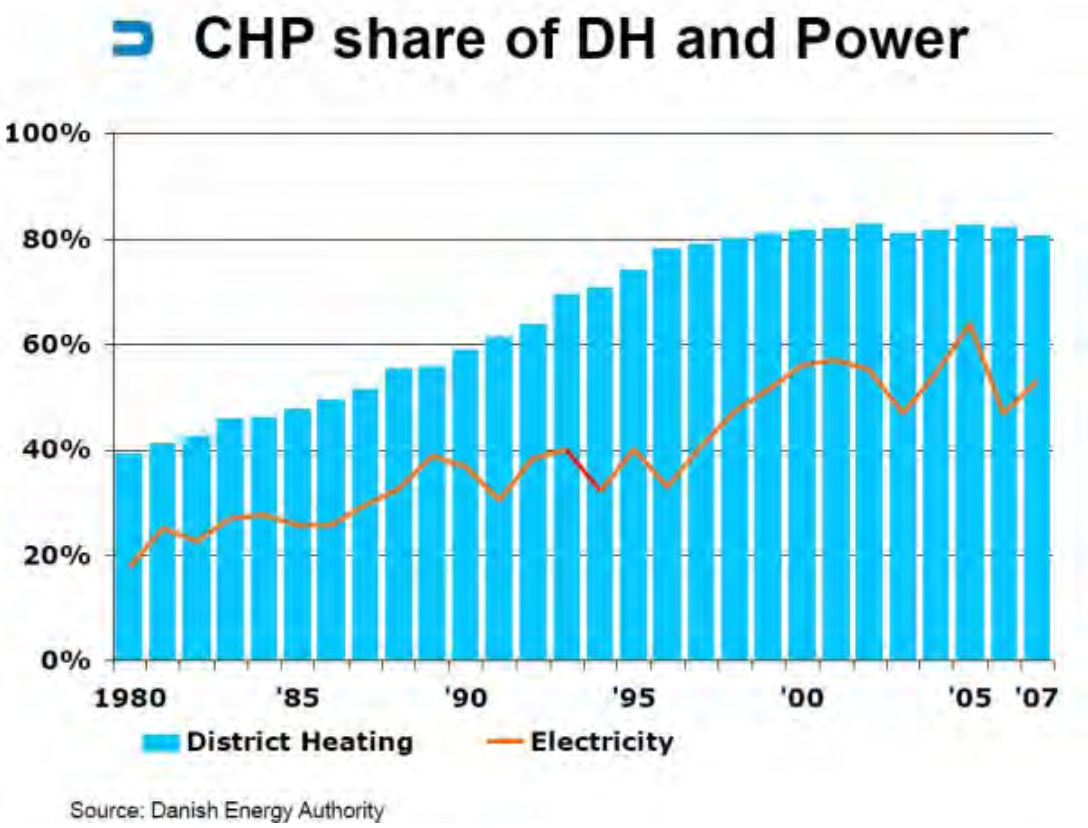
Copenhagen -- Fossil fuels

- Coal and oil in CHP/district heating being replaced
- 100% renewable sources by 2025



Copenhagen -- Fossil fuels

- CHP/district increased share of heat and power production
- 98% of heat from district heating by 2025



District Heating

Danish modern CHP plant

Copenhagen – Fossil to be replaced by

- Biofuels and heat pumps in CHP/District heating
- seawater and sewage heat sources for 180 MW heat pumps!
- Wood pellets from Baltic region. Another plant to be wood chip by 2020
- Researching deep earth geothermal

HP plant

Copenhagen

- Plastics in trash burned in district heat plants
- Will take plastic out from waste burning which will reduce energy content of trash by 45%
- 3rd party audits are done of biomass sources for sustainable management
- “Wild forest makes more CO2 than managed forest”
- At present not accounting for fossil fuel input into biomass fuel

Lykke Leonardson,
Head of Climate Unit
for the city of Copenhagen

THE ROAD TO COPENHAGEN 2025

COMMITMENT

- Strong political commitment in the City Council
- Financial support to new initiatives

COLLABORATION

- Broad stakeholder involvement
- New partnership models

COORDINATION

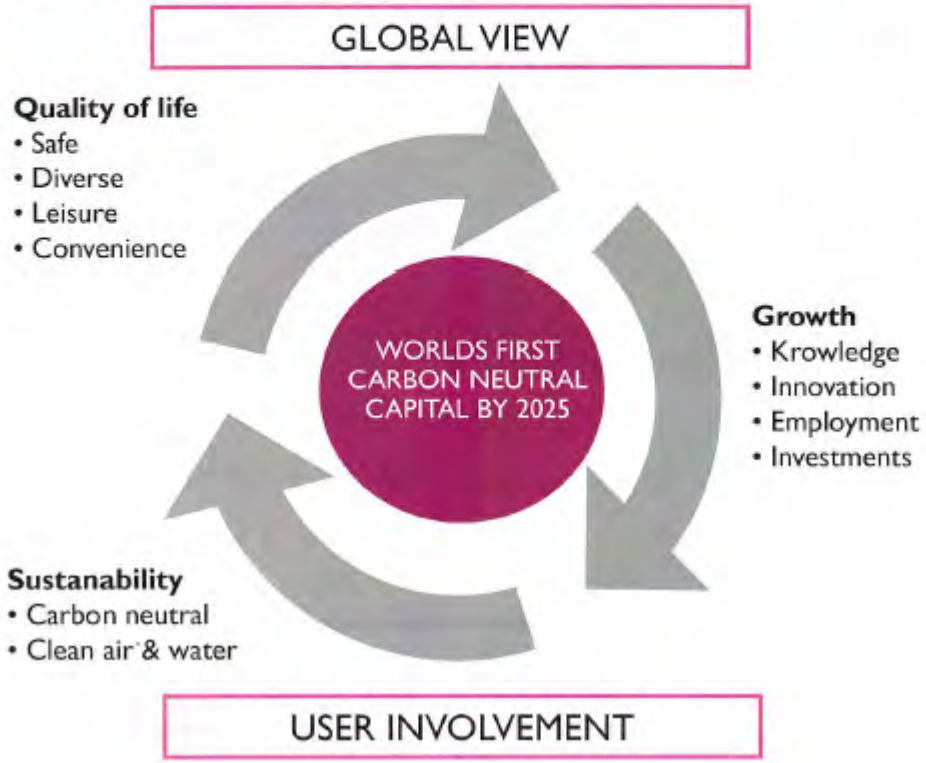
- Common business plans

COMMUNICATION

CPH 2025 CLIMATE PLAN

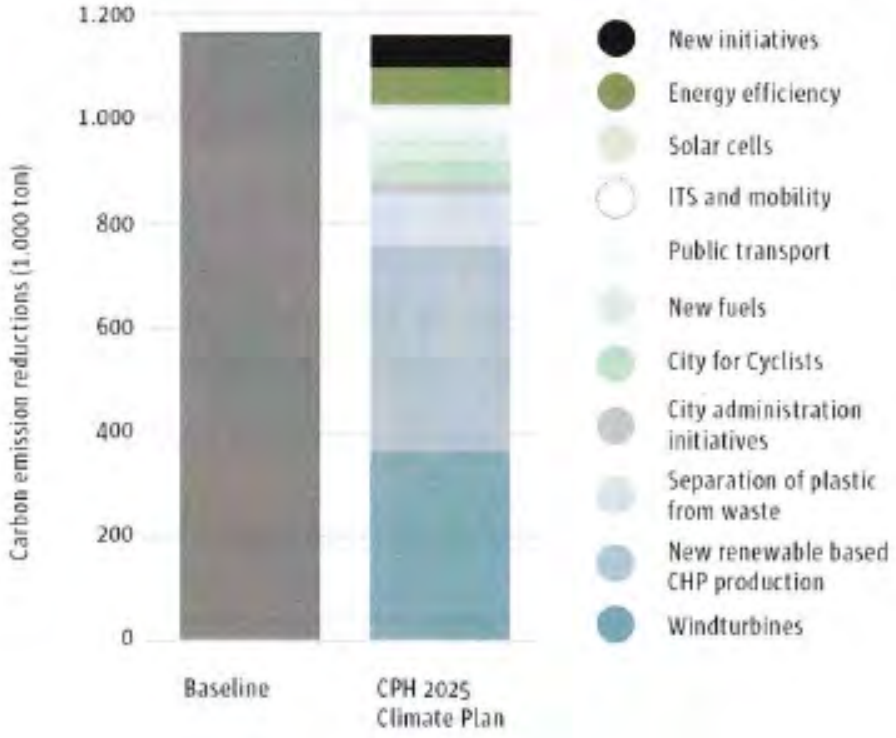
Copenhagen Carbon Neutral by 2025

THE COPENHAGEN STORY



CARBON NEUTRAL IN 2025

CARBON EMISSION REDUCTIONS



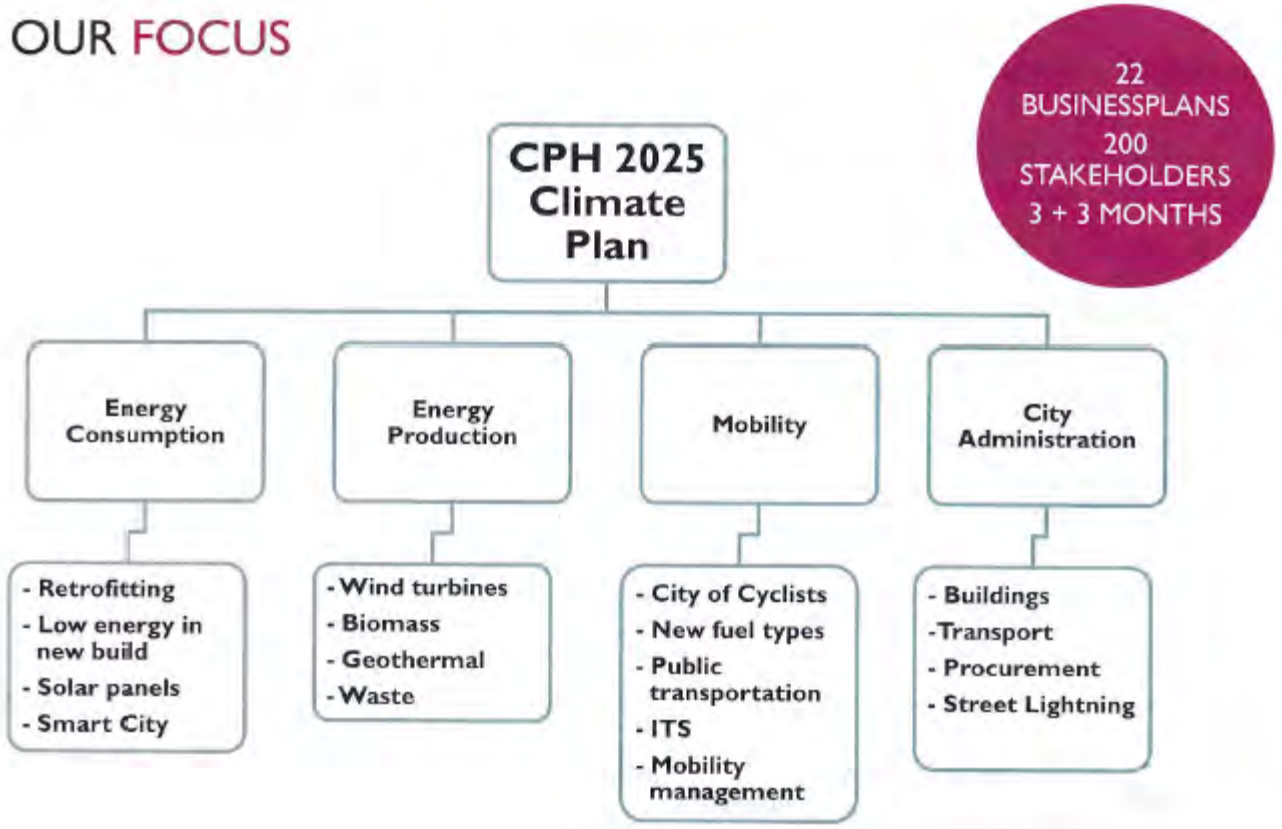
Ambitious but realistic!

24 % CO2-reduction in 2012

CPH 2025 CLIMATE PLAN

Copenhagen Carbon Neutral by 2025

OUR FOCUS



ENERGY COMSUMPTION

MAJOR GOALS FOR 2025

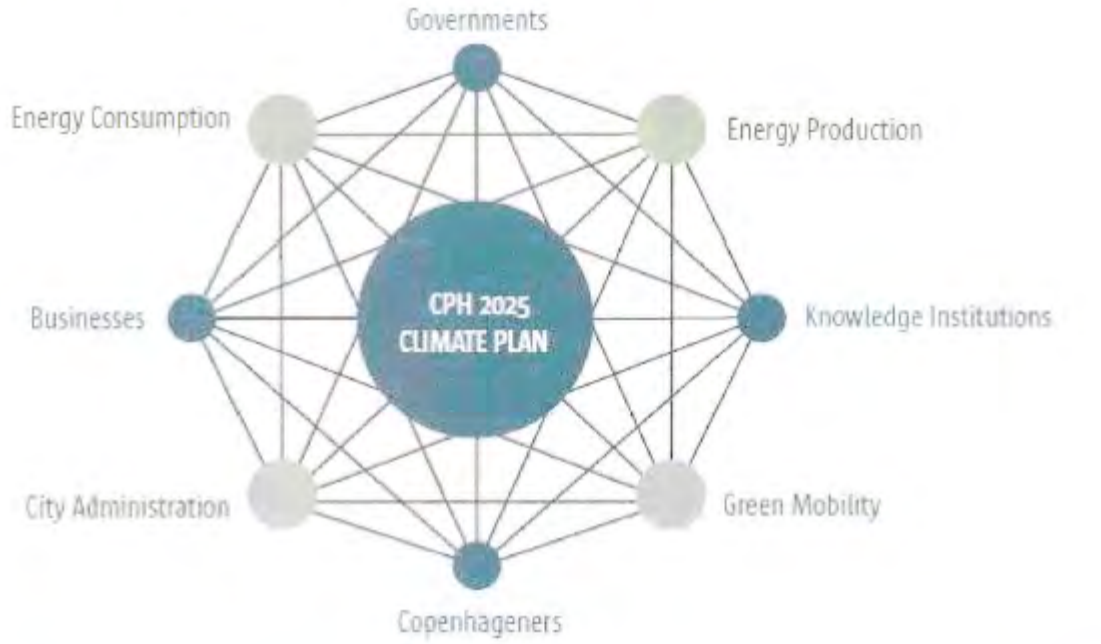
- 20 pct. reduction in heat consumption
- 20 pct. reduction of electricity consumption in commercial and service companies
- 10 pct. reduction of electricity consumption in households
- Installation of solar cells

ENERGY PRODUCTION

MAJOR GOALS FOR 2025

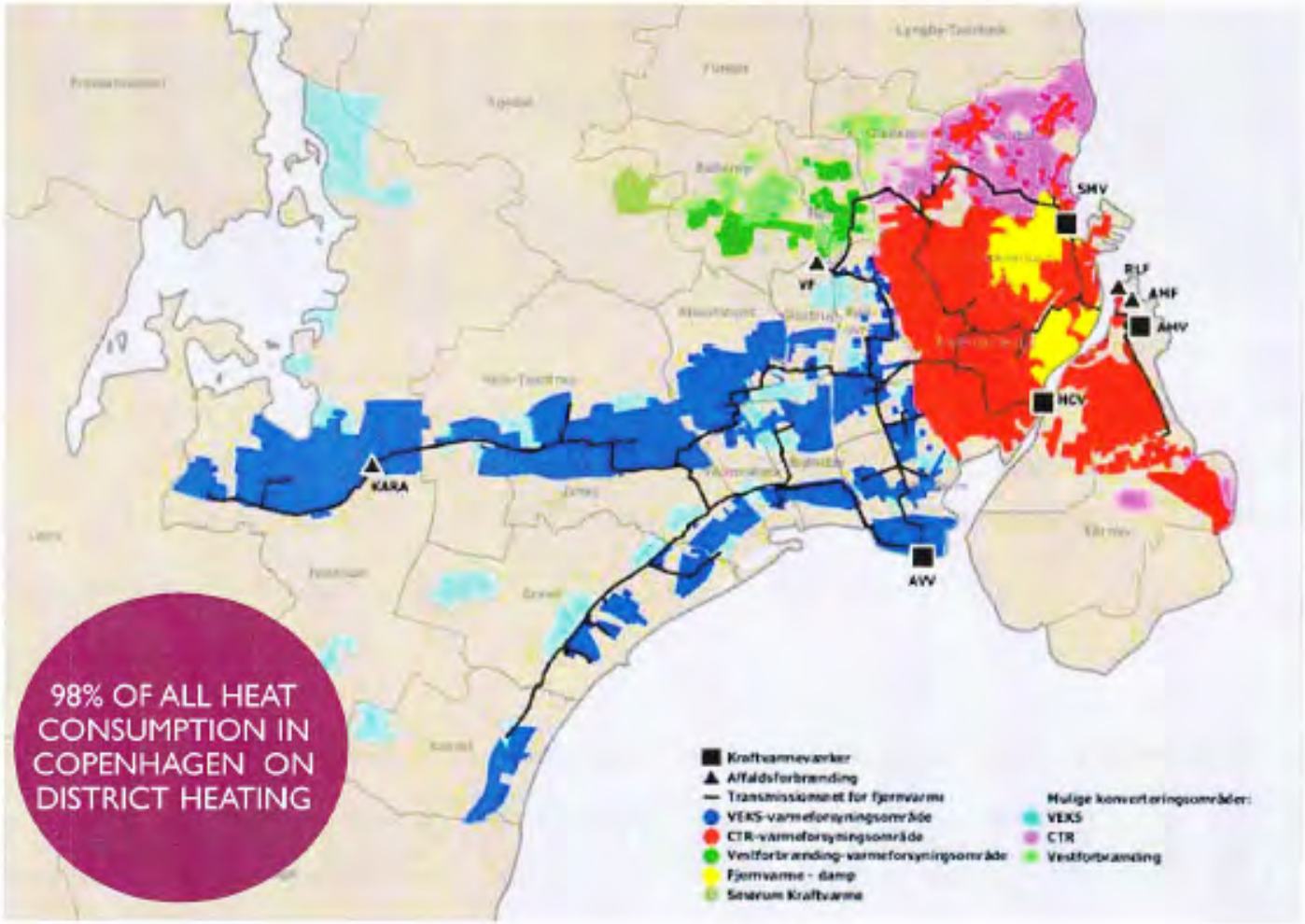
- Carbon neutral district heating in CPH
- Electricity production is based on wind and biomass
- Plastic waste is separated.
- Biogasification of organic waste

STAKEHOLDER INVOLVEMENT



Focus areas and stakeholders contributing to the CPH 2025 Climate Plan.

DISTRICT HEATING IN GREATER COPENHAGEN



District heating

- 60-65% of Denmark
- 98% of Copenhagen

Carrot and the Stick

Lykke's own home

- $10,000 total
- $5,000 cash, rest subsidies
- Law requiring hook up, 9 year notice

Codes

- Energy part of the new construction building code in 1961
- Performance standard increasing
- 2015, 2020 codes started as voluntary
  - 70-75% of people elected to use voluntary code
  - 25% using 2020

Financing

- Energy audit requirements

Biking - *Not a political statement, convenient, practical*

- 40%+ commuters
- Facilitate increase in biking with population
- Congestion in bike lanes
- 20-30% decrease in poor weather
  - Bike lanes cleaned first

BE 2015

Lessons from Scandinavia - DENMARK

Set street lights
Designed trash
baskets, ramps

NESEA Travelers


Copenhagen
Carbon Neutral
by 2025
COPENHAGEN
CLIMATE ADAPTATION
PLAN

COPENHAGEN MUST BE EQUIPPED FOR THE WEATHER OF THE FUTURE

METHOD 1: WE MUST HAVE LARGER SEWERS, UNDERGROUND BASINS AND PUMPING STATIONS

METHOD 2: WE MUST MANAGE RAINWATER LOCALLY INSTEAD OF GUIDING IT INTO THE SEWERS

METHOD 3: WE MUST ENSURE THAT FLOODING TAKES PLACE ONLY WHERE IT DOES LEAST DAMAGE – SO-CALLED "STORMWATER PLAN"

THE PLAN FOR COPENHAGEN

Rainwater should be managed locally throughout the whole municipality, so the strain on the sewer system is kept to a minimum. The problem of floods from heavy rain is to be solved by channelling the water into areas where it causes no damage. A number of studies will be conducted in the coming years checking closely each individual neighbourhood to find the best local solutions. These solutions must be incorporated in the City of Copenhagen's Waste Water Plan.


GASVÆRKSVEJ – CLOUDBURST BOULEVARD AND
SHARED SPACE

The city's green spaces and blue areas have many life-giving functions and are important for an ongoing high quality of life in Copenhagen.

The green options

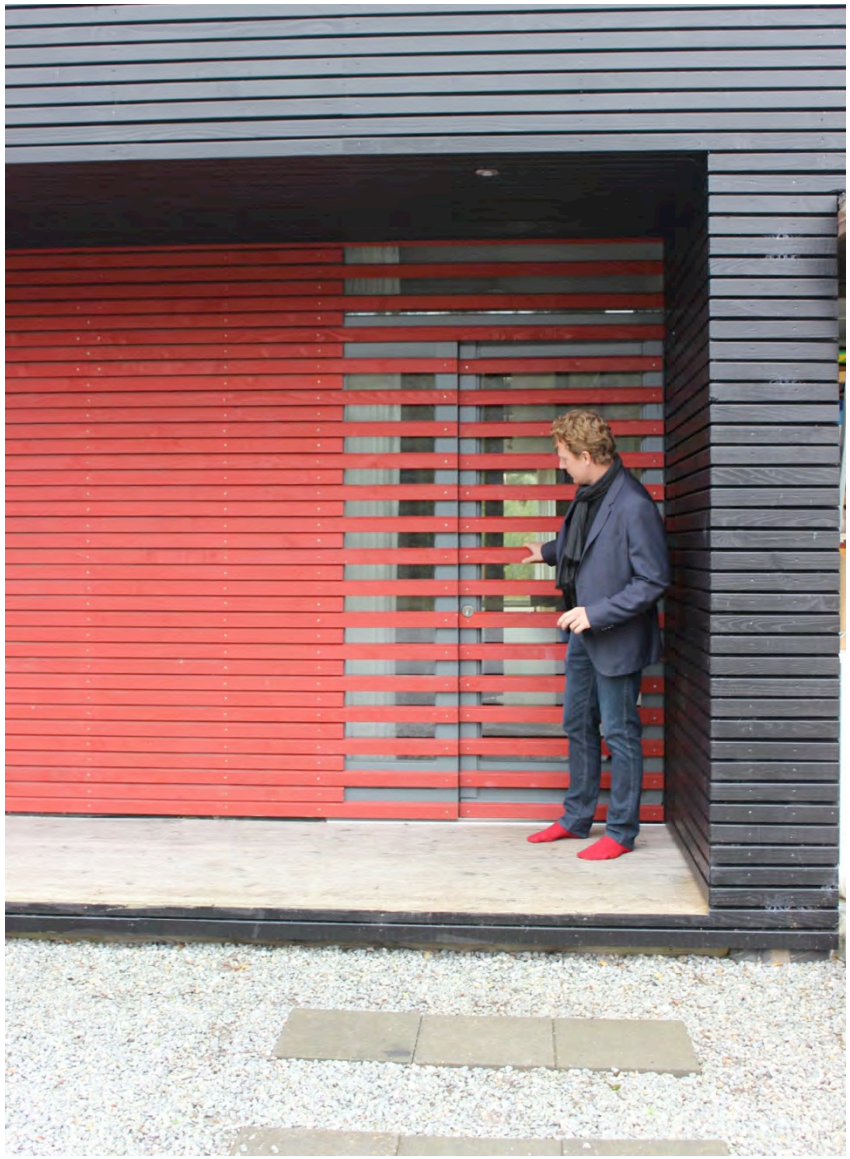
- reducing and preventing storm water flooding by absorbing and holding rainwater
- moderating and balancing temperature
- providing shade and air circulation, which helps reduce the city's future energy consumption on cooling buildings
- addressing and reducing air and noise pollution
- preventing stress and allowing for recreational experiences
- providing a home for animals and plants

THE PLAN FOR COPENHAGEN

Trees and green surfaces, together with water can have a cooling effect. If the green and blue, such as trees, green roofs and facades, parks, gardens, lakes and streams have more space in the city, it helps keep the city's surface temperatures at an acceptable level.

In further work on adapting the climate of Copenhagen, it is important to track how the temperature develops as well as the city's surface temperatures. At the same time the 'level of greenness' in Copenhagen must be checked to meet and prevent the challenges that may follow with more frequent, longer and more intense heat waves.

Villa Lagenkamp, Ebeltoft Denmark



Olav Lagenkamp, Architect & Owner

Built in 2008, First certified Passive Haus in Denmark

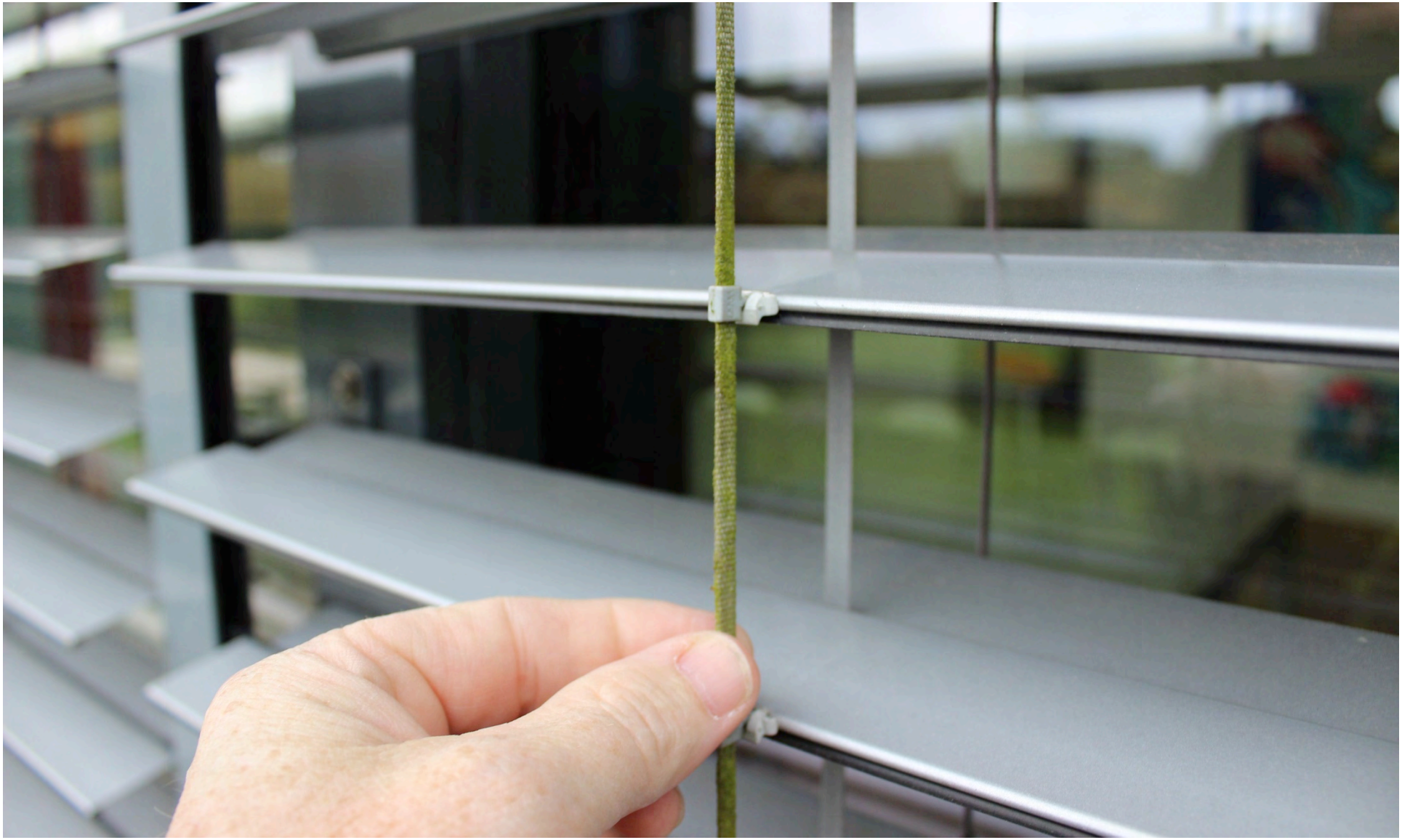
BE 2015

Lessons from Scandinavia - DENMARK

3 bedroom, 175 m2 (1,883 sf) floor heated floor area

NESEA Travelers

Exterior Shades- closed



Exterior Shades

All windows have exterior shading

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Lessons from Scandinavia - DENMARK

Authorized through:
Passivhaus Institut
Dr. Wolfgang Feist
Rheinstr. 44/46
D-64283 Darmstadt

Passivhus.dk
Passivhus.dk - Passivhus.fi
+45 69 91 81 33
+358 44 50 22 32 4
info@passivhus.dk

Certificate

Principal: Olav Langenkamp & Lotte Dahl Andersen, Tigervej 26, 8400 Ebeltoft

Architect: Architect ETH-MAA Olav Langenkamp, Tigervej 26, 8400 Ebeltoft

Passivhus.dk - Passivhus.fi awards the building
Villa Langenkamp, Tigervej 26, DK-8400 Ebeltoft

the qualification of

Quality-Approved Passive House

The planning of this building meets the criteria for Passive Houses formulated by the Passive House Institute and with appropriate execution it will conform to the following standards:

- The building features excellent heat insulation throughout and top grade component joint details with regard to building physics. External sun protection has also been considered. Heat requirements are limited to

15 kWh per m² living area and year

- The building shell features excellent draught sealing, which is proven according to EN 13829 regulations and is guaranteed draught-free and low in energy consumption. The air exchange rate of the building shell at a differential pressure of 50 Pa is limited to

0,6 h^{-1}, with reference to the building's volume

- The building features a controlled ventilation system with high class filters and efficient heat recovery, combined with a low electricity demand, thereby achieving excellent air quality together with low energy consumption.
- With standard usage, the primary energy demands for heating, warm water, ventilation and household electricity amount to less than

120 kWh per m² living area and year

This certificate is only to be used in conjunction with the certification documents, from which the precise data of the building can be obtained.

Passive Houses offer high comfort in both summer and winter conditions and can be heated with little effort, e.g. by heating the supply air. The building shell of a Passive House is uniformly warm on the inside, with interior surface temperatures closely matching those of room air temperature. Due to the high grade draught sealing, the development of draughts is practically impossible under normal use. The ventilation system continually provides good air quality. Heating costs in a Passive House are very low due to their low energy consumption. Therefore, Passive Houses offer economic security against future increases in both energy prices and shortages. Moreover, the environment is optimally protected because of the cost-effective consumption of energy resources, thereby causing minimal emissions of carbon dioxide (CO_2) and other contaminants.

Issued
Århus, 13th May, 2006

Søren Pedersen
Executive director, M.Sc. (eng.)
Passivhus.dk - Passivhus.fi

Wall corner mockup

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Mechanical Systems- Heat pump and ERV with ground pre-heat

Northeast corner

Active southern openings

Dining Room

Interior Blinds

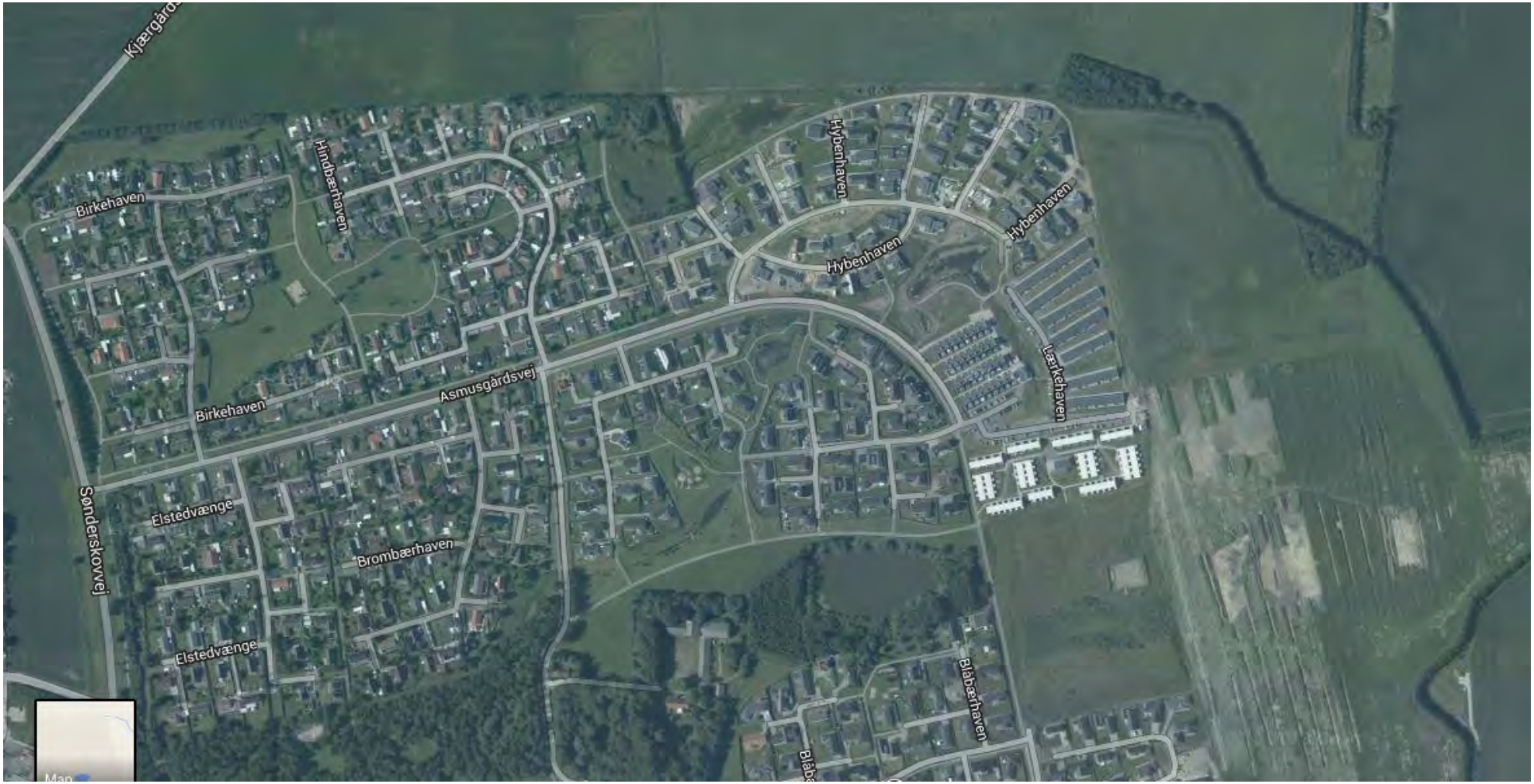
Refined interiors

Grunddaten	
Land:	Dänemark
Region:	Region Midtjylland
Ort:	Ebeltoft
PLZ:	8400
Objektname:	**villa langenkamp**
Objekt Status:	fertiggestellt
Baubeginn:	2008
Fertigstellung:	2008
Objekttyp:	Freistehendes Einfamilienwohnhaus
Bautyp:	Neubau
Energetische Gebäudekategorie:	Passivhaus
Konstruktion:	Leichtbau
Anzahl Wohneinheiten:	1
Anzahl Nutz-Einheiten:	1
Bruttogeschossfläche:	226 m^2
Objektbeschreibung:	villa langenkamp is the first certified passive house in Denmark, built by the architect Olav Langenkamp (www.langenkamp.dk).
Kennzahlen gemäß Passivhausnachweis	
Qualitätsgeprüftes Passivhaus, Dr. Wolfgang Feist:	yes
Zertifizierer:	DK Passivhus.dk
Passivhausnachweis:	PHPP - Passivhaus Projektierungs Paket,(Passive House Planning Package)
Energiebezugsfläche:	147 m^2
Heizwärmebedarf:	11 kWh/(m^2a)
PE-Bedarf ges.: (WW, Heizung, Kühlung, Hilfs- und Haushaltsstrom):	105 kWh/(m^2a)
PE-Bedarf: (WW, Heizung, Hilfsstrom)	49 kWh/(m^2a)
Heizlast:	11 W/m^2
Luftdichtheit (geplant lt. PHPP):	0.6 1/h
Luftdichtheit (gemessen):	0.6 1/h

Heating demand

Primary Energy Demand

Laerkehaven, Lystrup Denmark



Site context

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Passivhus
32 to-plans rækkehuse
Boligtyper:
3-rumsboliger på 100 m²
4-rums boliger på 110 m²
Færdigopført juli 2010
Arkitekt: schmidt hammer lassen architects
Passive house
32 two-storey terraced houses
Size of dwellings:
3-room dwellings 100 m²
4-room dwellings 110 m²
Construction finished July 2010
Architect: schmidt hammer lassen architects
Lærkehaven III
Passivhus med aktiv energibesparelse
Passive house with active energy saving
Et landskabeligt bindeled mellem de tre bebyggelser er det store vådområde, hvor regnvandet opsamles.
The large wetland, which catches rainwater, forms a scenic connection between the three complexes.
Vi sætter pris på den friske luft i boligen – især den friske morgenluft i soveværelset.
Beboer i Lærkehaven III
We appreciate the fresh air in the house – in particular the fresh morning air in the bedroom.
Resident in the Larch Garden III

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Lessons from Scandinavia - DENMARK

32 Rowhouses

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Entry courtyards, Built in 2009-2010

Developer : Boligforeningen Ringgarden

3,500 m2 total, 109 m2 (1,175 sf) per apartment

Garden Storage

Glazing

Combined ERV/Heat Pump

Diagram from Heather

Annual energy consumption is 30kWh / (m2a)

Copenhagen green building conference (Denmark's "Building Energy" show)


FORUM
DANISH MUSIC AWARDS 2014:
MEDINA, MØ
LUKAS GRAHAM
S!VAS, LARS H.U.G.
UKENDT KUNSTNER
JULIAS MOON, HED
OG MA
FORUM 8. NOVEMBER
BILLETLUGEN.DK
PLAY
2014
ifpi
koda
TV2
FORUM
i weekenden
Danmarks bedste
ANTIK & GENBRUGS
Lørdag & søndag
kl. 10 - 17
Columbia


BUILD
KONGSBRO
GLAPOR
WE INSULATE THE FOUNDATION FOR YOUR FUTURE!
Cembrit
InVentilate
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16

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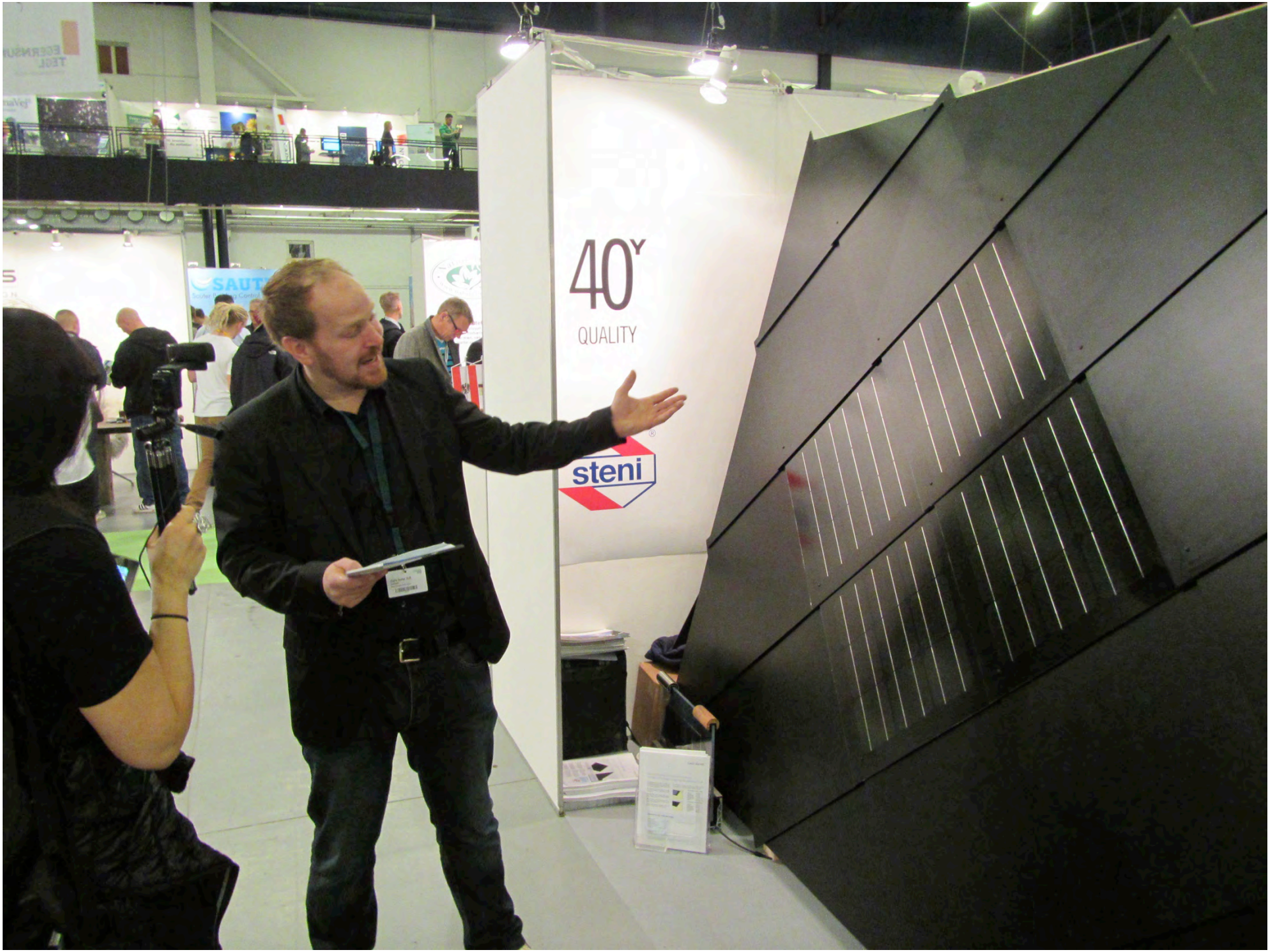
Besøg os på www.germansolar.dk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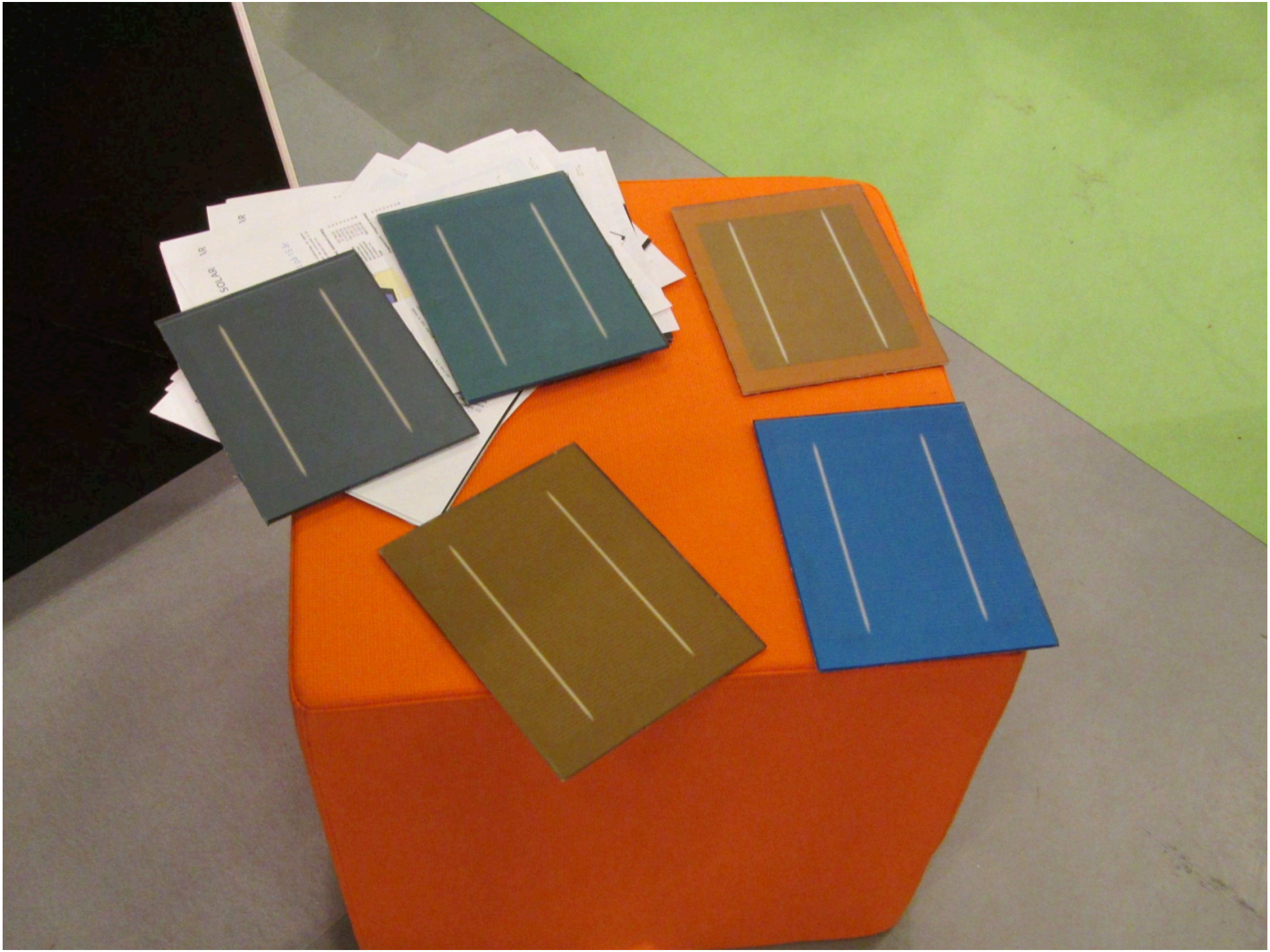

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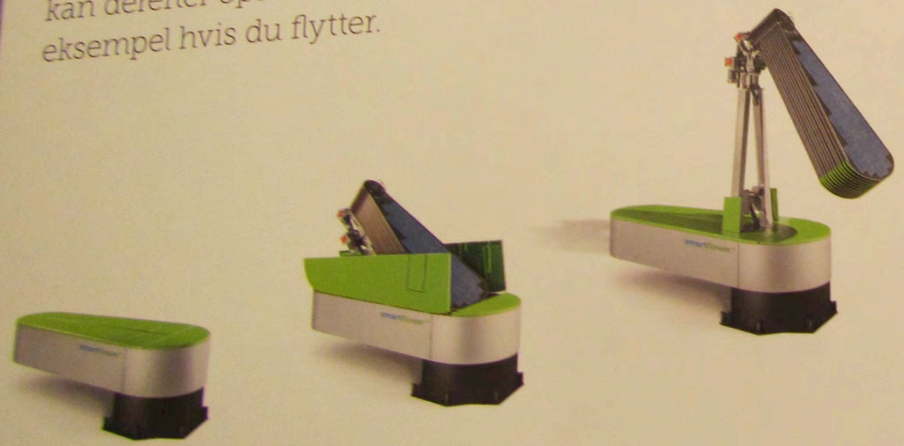
SÅ ENKELT SOM SOLOPGANGEN

Glem bare alt, hvad du har læst om den grundige planlægning, dimensionering og installation, der kræves i forbindelse med montage af solcellesystemer. Du vil modtage smartflower™ som et komplet anlæg. Alt er inkluderet: solcellemoduler, styresystem og vekselretter – fuldkommen parat til start i løbet af nul komma fem. Placer anlægget der, hvor du ønsker at installere det, og efter kun en enkelt time vil smartflower™ være installeret og klar til brug! smartflower™ nedtages akkurat lige så hurtigt og enkelt, og anlægget kan derefter opstilles et andet sted. For eksempel hvis du flytter.

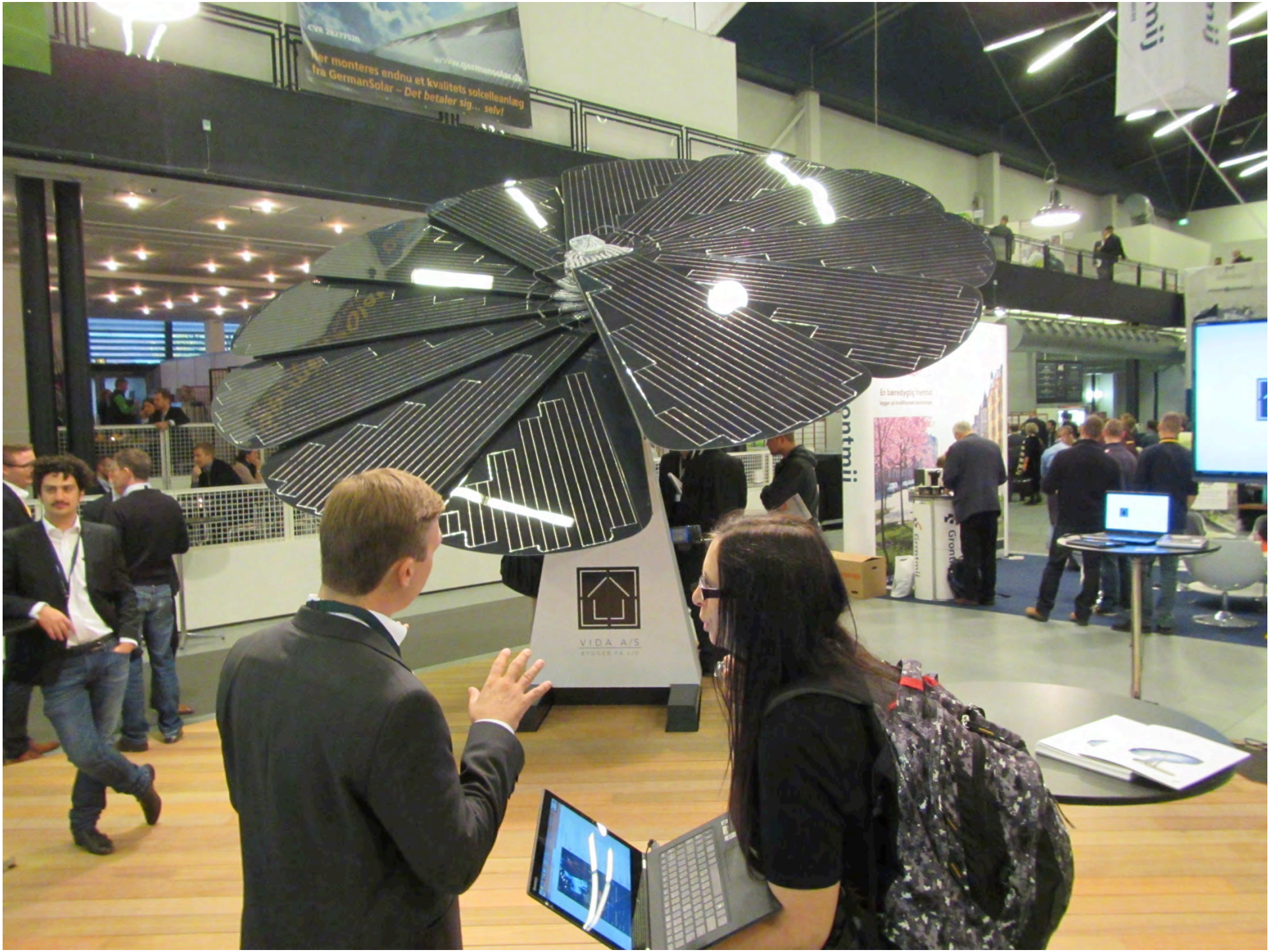


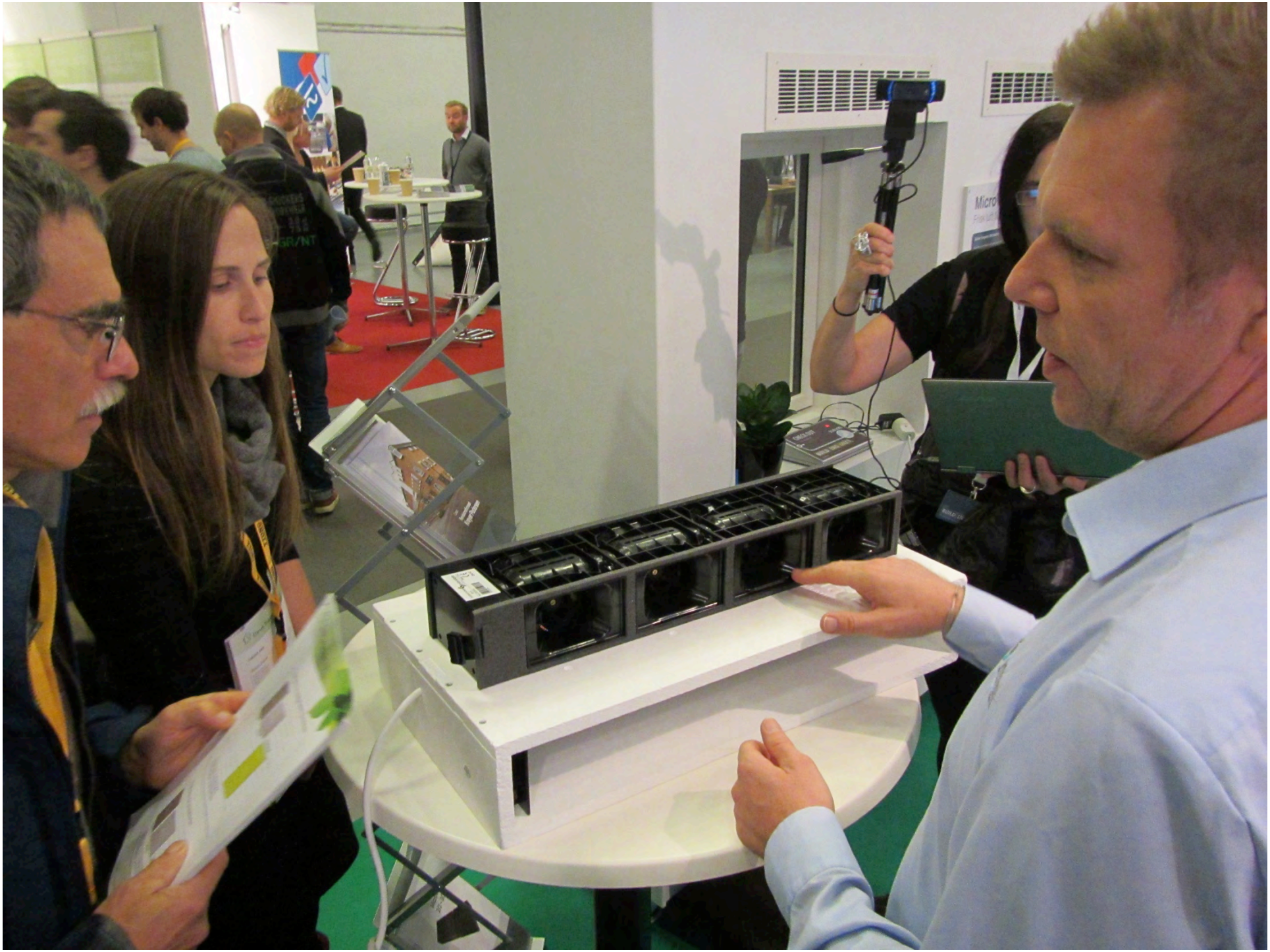
SMART MOBILITY

smartflower™ er mobil! Og det er en væsentlig fordel sammenlignet med konventionelle systemer. Flytter man, medtager man blot sit eget private solcelleanlæg. Anlægget nedtages lige så nemt, som det sættes op: Man løsner ganske enkelt forankringsbeslagene, hvorefter smartflower™ er klar til, at man kan tage det med sig. En yderligere mobilitetsfordel: smartflower™ kan leases.

SMART OPTIONS

Med smartflower™ bekender man kulør som trendsætter inden for solcelleteknologien. Om lågen og bladspidserne vises i grønt, blåt, antracit eller sort, er et spørgsmål om individuel stil.
Yderligere valg: Vælg mellem fastgørelse med jordbolte eller betonfundering. Beskyttelsesbøjle til nedsænkning af smartflower™ i jorden.
Energistyresystem til oplagring af ubrugt energi.
Forsikrings- og vedligeholdelseskontrakt.


Her monteres endnu et kvalitets solcelleanlæg
fra GermanSolar – Det betaler sig... selv!
VIDA A/S




InVentilat
SUSTAINABLE VENTILATION
MicroVent
Frisk luft til glæde for dig og dit hjem


MicroVent
Frisk luft til glæde for dig og dit hjem
Sådan fungerer MicroVent
MicroVent er et mikroventilationssystem fra danske InVentilate.
Med mikroventilation skiftes luften direkte gennem ydermuren – uden pladskrævende rør. Det giver en langt billigere og mere miljøvenlig ventilation.
Enhederne fra MicroVent bygges ind i væggen, og du ser kun de diskrete ventilationsriste.
MicroVent fungerer ved, at to enheder arbejder sammen – mens den ene enhed fjerner luft fra lokalet, suger den anden frisk luft ind udefra.
Undervejs bliver varmen fra indendørsluften optaget i MicroVents unikke varmelager.
Derefter bytter enhederne blaseretning, og varmen overføres til den kølige indsugningsluft.
På den måde giver MicroVent den mest behagelige ventilation med luft, der er både frisk og lun.
Fordele ved MicroVent:
MicroVent er et dansk produkt.
MicroVent er en af de allermest støjsvage ventilationsmodeller.
Ventilationen leveres med det intelligente styresystem MicroVent Comfort Control, som modvirker træk.
MicroVent har ventilationsmarkedets laveste elforbrug.
MicroVent genanvender 85 % af varmen fra boligen – til gavn for miljøet, dit velvære og din varmeregning.
MicroVent har et yderst diskret design – det eneste, du ser, er de indvendige inddækningsriste.
I soveværelset bliver MicroVent installeret med en styringsknap (potentiometer), så du kan skrue ned eller slukke for ventilationen, når du ønsker det.
MicroVent er nærmest vedligeholdelsesfri og installeres med 5 års garanti.
Størrelser:
Den viste udstillingsmodel er MicroVent 4V med 4 ventilatorer. Det er den størrelse, der bliver installeret i stuen. I soveværelset vil der blive installeret en mindre og endnu mere lydsvag model.
MicroVent er udviklet og produceret af danske InVentilate. Har du spørgsmål, så tøv ikke med at kontakte os på telefon 72 30 10 24.
Morten Lundehøj
Adm. direktør
MicroVent vandt Ingeniørens Produktpris 2012
InVentilate

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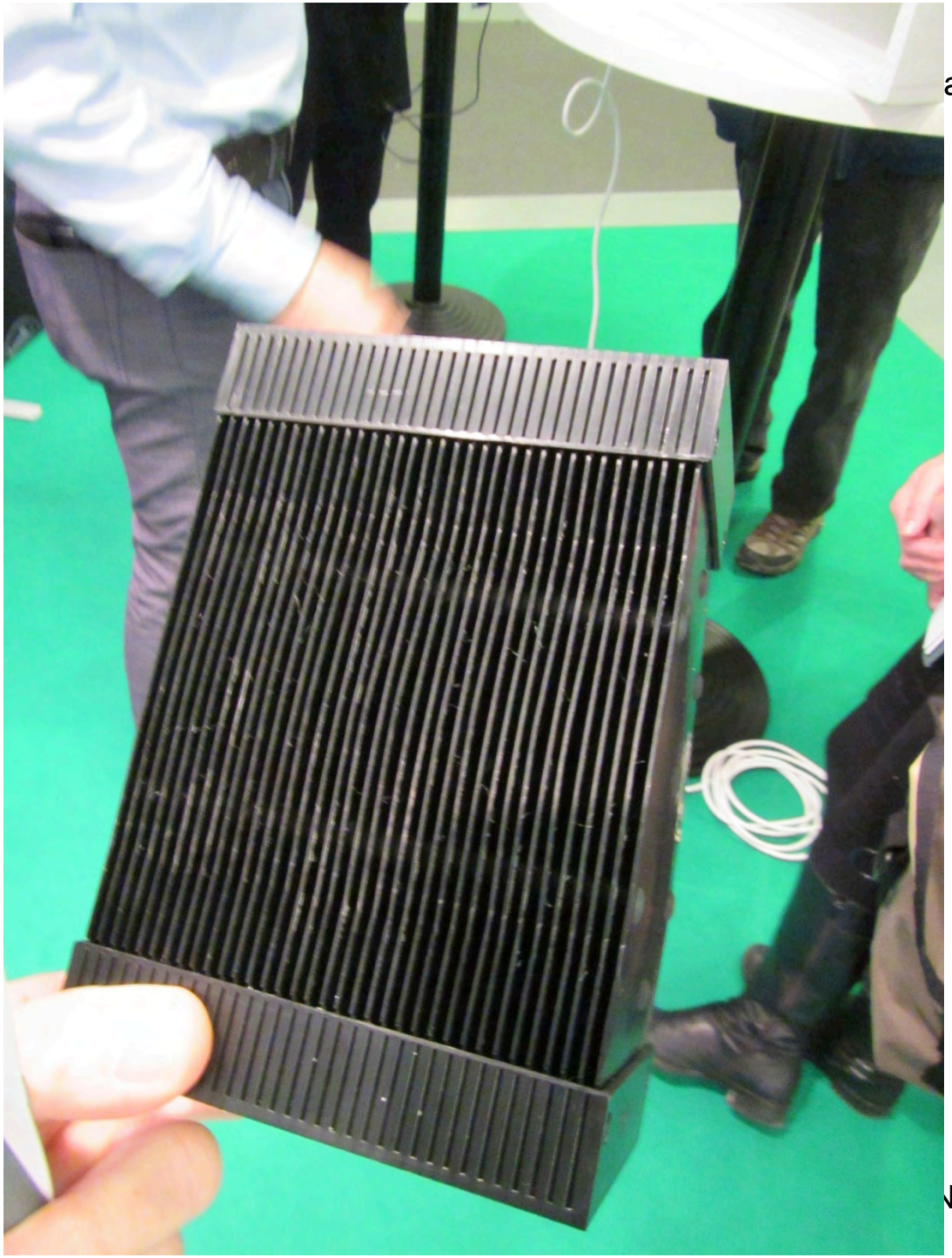

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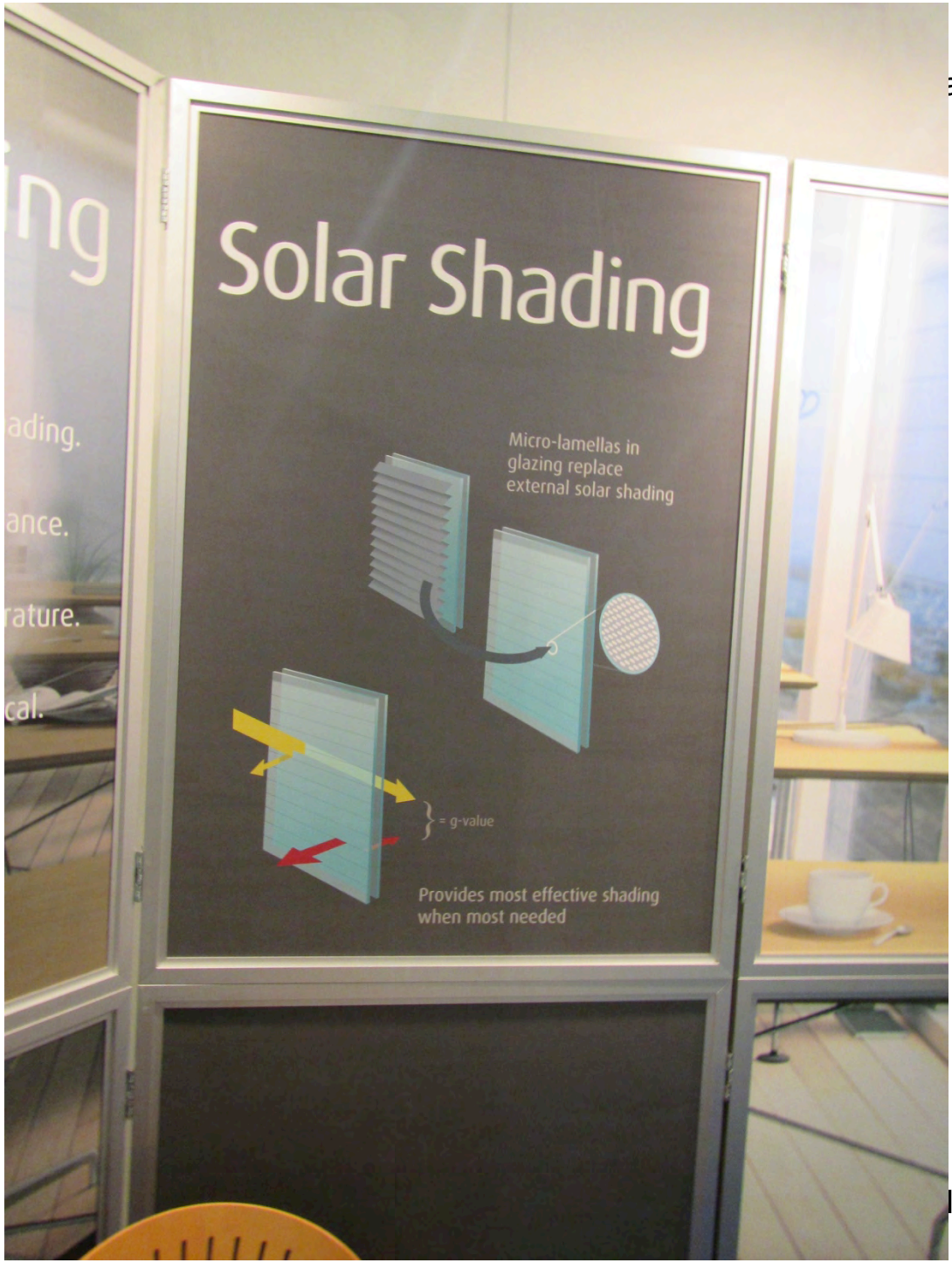
g-value: Down to 0.11
Light transmission: 60%!
Micro
Shade™
-Redefining solar shading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Solar Shading
Micro-lamellas in
glazing replace
external solar shading
= g-value
Provides most effective shading
when most needed

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KRÜGER AQUACARE
CAFÉ
ico pal
www.solarfocus.eu
Biomass heating
Solar systems
Storage technology
Fresh water technology
Free energy from the sun and the power of biomass.
Everything from one supplier!
SOLARFOCUS
makes you independent
SOLARFOCUS


idealcombi
idealcombi
PANELBYG
ege
AIR MASTER
ENERGIEFFEKTIV
DECENTRAL
VENTILATION
Intelligent isolering
Better Living
Concept
BYG SUNDT

Det printede hus

1:1 tilbyder som den første danske virksomhed "Det printede hus". Det printede hus integrerer idé, design, produktion og montage i ét. En sammenhængende, gennemskuelig og optimeret byggeproces, der sikrer dig et bæredygtigt hus med arkitektonisk kvalitet til en konkurrence dygtig pris. Et led - fra idé til færdigt hus. Vores huse leveres indenfor 3 hovedlinier: PREMIUM BYG, STANDARD BYG og RÅHUS BYG.

Sunde materialer kend dit hus

Vi mener man skal kende og forstå hvad ens hus består af. Vores huse består af sunde genanvendelige materialer, der giver et naturligt indeklima. Huset består af semi-modulære trækassetter - lokalt fabrikeret på eget værksted. Kassetten består udelukkende af PEFC certificeret træ skovet i Finland. Træfiber-isolering indblæses i modulerne under tryk er lig 25% bedre isoleringsevne. Jordskrue fundering - den mest skånsomme metode på markedet. Ingen brug af beton - mindre CO2 aftryk. Vi benytter ingen dampspærre - naturlig ventilation og bedre indeklima.





brug træ. pdf

Kolonihavehus Kastrup | 45 m² fritidsbolig

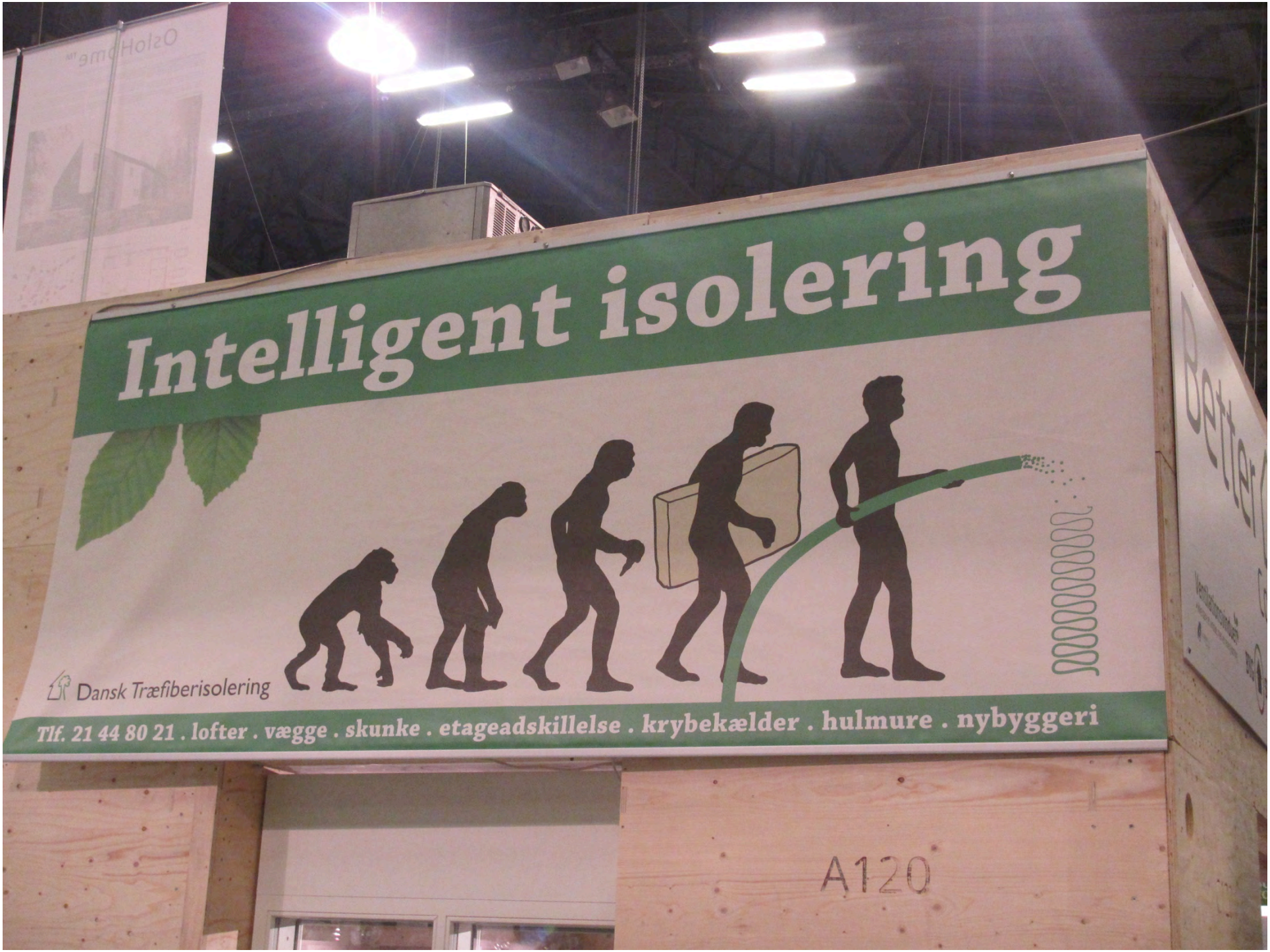
Eentileen har fået muligheden for at give et bud på det danske kolonihavehus bygget af egne træmoduler. I dette projekt tæt på Kastrup Fortet har ønsket været at opnå en moderne minimalbolig der skaber rum på begge sider af husets facade og dermed udnytter den typiske kolonihave grund der består af en mindre have omgrænset af fire hække, hvor livet foregår i sommermånederne i have og hus.

Bag om projektet

Kolonihavehus Kastrup | 45 m² fritidsbolig

Eentileen har fået muligheden for at give et bud på det danske kolonihavehus bygget af egne træmoduler. I dette projekt tæt på Kastrup Fortet har ønsket været at opnå en moderne minimalbolig der skaber rum på begge sider af husets facade og dermed udnytter den typiske kolonihave grund der består af en mindre have omgrænset af fire hække, hvor livet foregår i sommermånederne i have og hus.

Bag om projektet


Intelligent isolering
Dansk Træfiberisolering
Tlf. 21 44 80 21 . lofter . vægge . skunke . etageadskillelse . krybekælder . hulmure . nybyggeri
A120


QUALITE
CTB
CERTIFIEE

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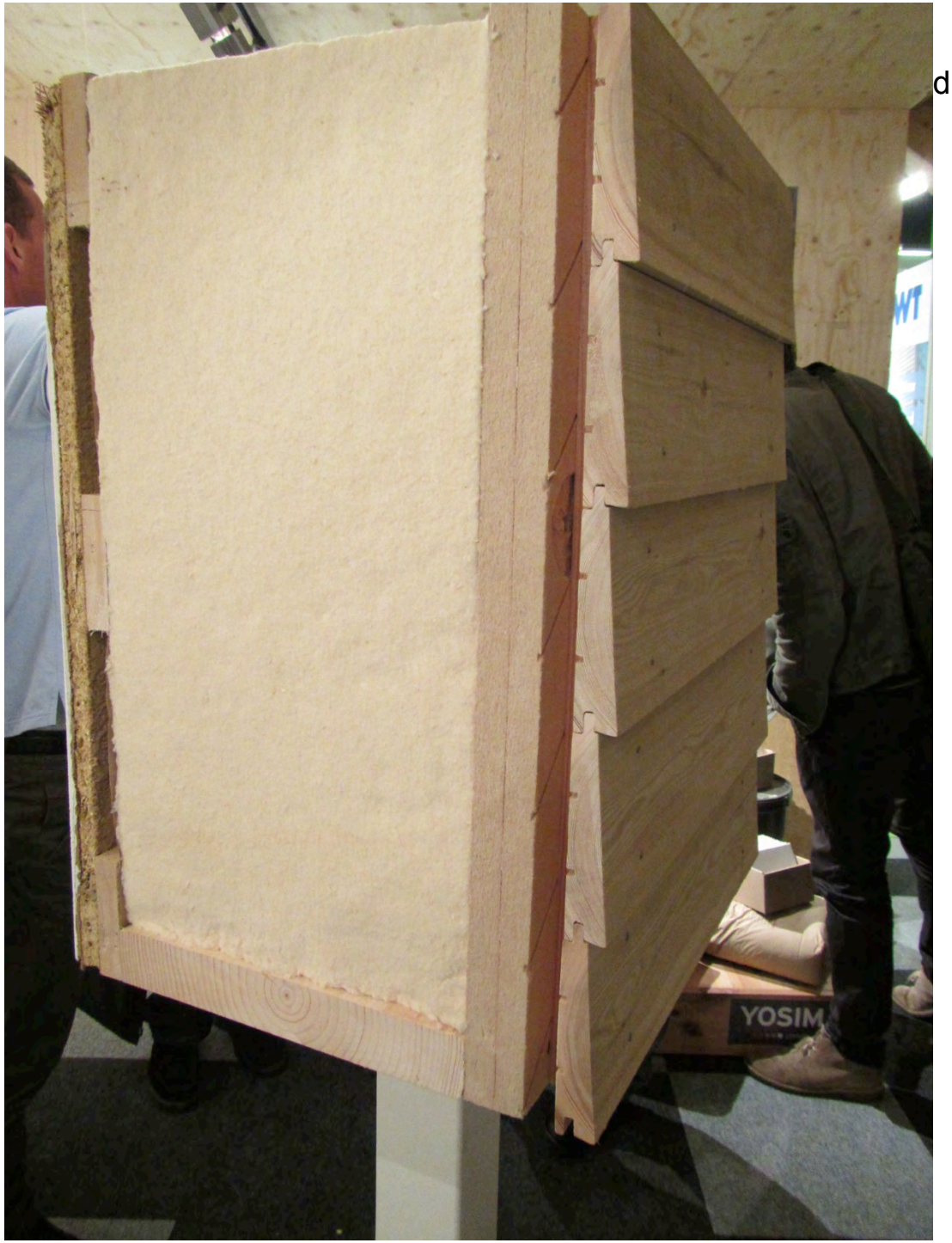

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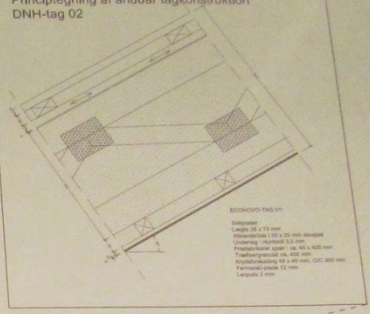
Concept

Unik åndbarhed

Dansk træfiberisolering gør det muligt, at lave åndbare huse. Dette kan gøres bl.a. fordi træfiberisoleringen har uovertrufne hygroskobiske egenskaber. Det, som træfiberisoleringen kan til perfektion, er, at den både kan optage og afgive fugt. Når du så kombinerer træfiberisolering med vores tæthusprodukter, opnår du optimale åndbare konstruktioner.

Ved brugen af diffusionsåben dampbremse undgår du at skulle bo i en plastikpose, da du med træfiberisolering ikke behøver dampspærre (plastik). Når fugten afgives fra træfiberisoleringen, transporteres den ud gennem bygningen. Dette er den helt store forskel på mineraluld og træfiberisolering i det mineraluld kun ophober fugten.

Principtegning af åndbar tagkonstruktion
DNH-tag 02



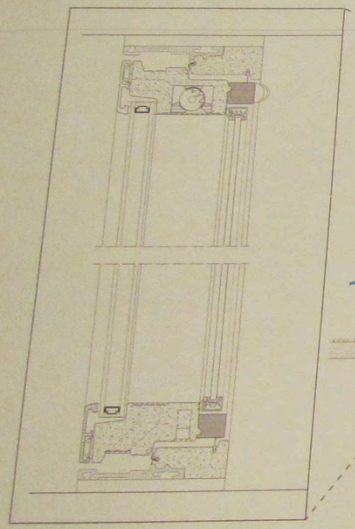
Fugtopbevarende

Når der laves mere fugt i huset, end der kan ventileres væk, vil lerpladen optage restfugten og afgive den igen, når rummet/huset er mere tørt.

Stabilt fugtniveau

Vægkonstruktionen at udført med lerpuds/lerplader, fugtbremse og træfiberisolering. Er fugtpåvirkningen stor, kan konstruktionen optage noget af fugten og afgive den til det fri.

Det betyder at fugtniveauet bliver meget stabilt over året og dermed en væsentlig forbedring af indeklimaet i forhold konventionel byggeri.



Naturlig fugt

Ventilationsvinduet tilfører huset naturlig fugt. Meget af fugten, der laves i huset ved bad, køkken og soveværelse, ventileres til afkast.

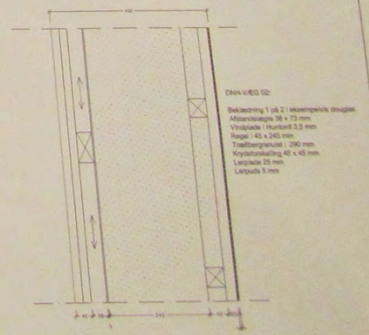
Træfiber isolering

Lerpuds/Lerplader

Ventilations system

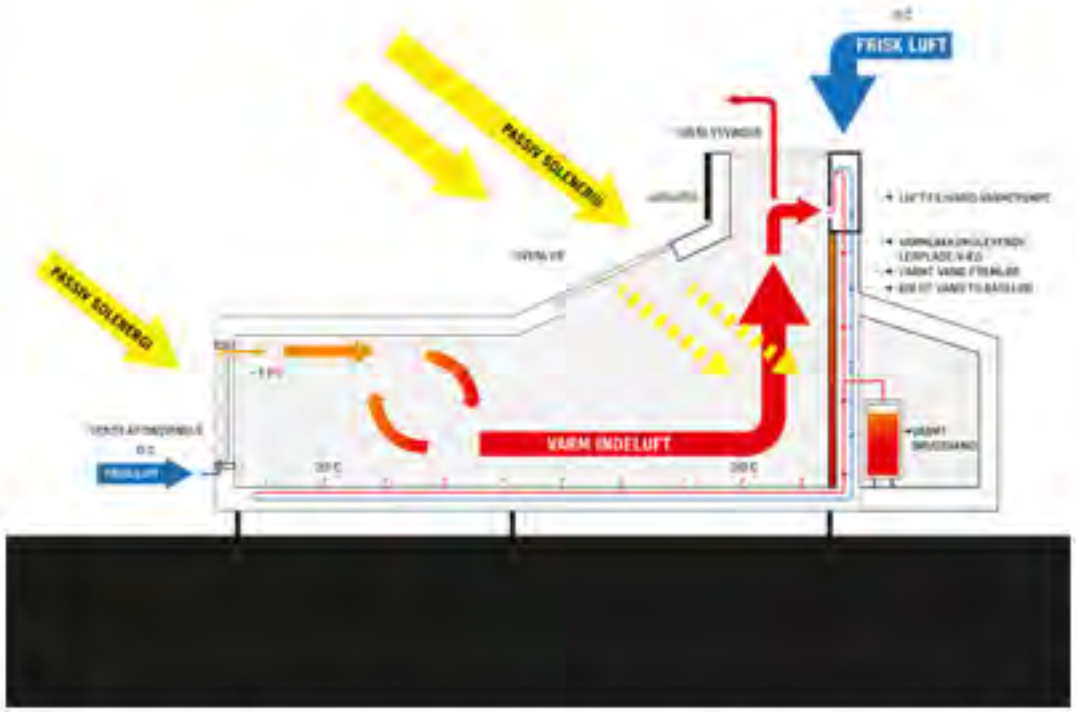
Materiale - ikke defineret

Principtegning af åndbar vægkonstruktion
DNH-væg 02



B RK

Oslo Home | Et moderne skandinavisk passivhus



OsloHome™ har fokus på bæredygtige elementer, som gør noget aktivt for dig og din familie. Bæredygtighed skal kunne opleves og skal medvirke til at påvirke vores dagligdag positivt. Luften er frisk, energien er grøn, materialerne er sunde, regn- og spildevand er en ressource. Boligen lever op til passivhus standard og er designet efter "cradle to cradle" principperne, så dit hus er sikret både økonomisk og bæredygtigt mange år frem.

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114
112
Landsforeningen
Økologisk Byggeri

Landsforeningen Økologisk Byggeri (LØB)
(National Association for Ecological Construction)

- Low energy consumption in the manufacture of products.
- Other resource consumption in the manufacture of materials is minimized: e.g. problems with sewage or large waste production.
- Low consumption of electricity, water and heat in the life of the building.
- Materials properties that ensure a healthy indoor climate
- Care regarding the disposal/recycling/reuse of materials from the construction process and from when the building demolished.
- Low-energy transportation of materials and crew
- The building's architectural ideas, including building size relation; its function, and its relationship to the environment.
- The preparation and use of the materials and the construction process itself is sustainable.
- Building site consumption of electricity, water and heating is minimized.

From LØB website

- Interessen var stor fra både studerende, håndværkere og rådgivere – ja endda fra den anden side af Atlanten, hvorfra en gruppe fra en "søsterorganisation" til LØB, Northeast Sustainable Energy Association, kom forbi med videokamera og stor glæde.
- *"The interest was great from both students, craftsmen and consultants - yes even from the other side of the Atlantic, where a group from a "sister organization" to LØB, the Northeast Sustainable Energy Association, came up with her video camera and great joy."*

This concludes The American Institute of Architects
Continuing Education Systems Course

NESEA™
NORTHEAST SUSTAINABLE ENERGY ASSOCIATION