Trondheim

September 2012

ECO-City

Joint ECO-City developments in Scandinavia and Spain
Supported by the EC **CONCERTO** Initiative

COWI SINTEF Heimdal Heimdal Gruppen SVARTLAMON & CO Trondheim Energi TOBB – kom inn TRONDHEIM KOMMUNE

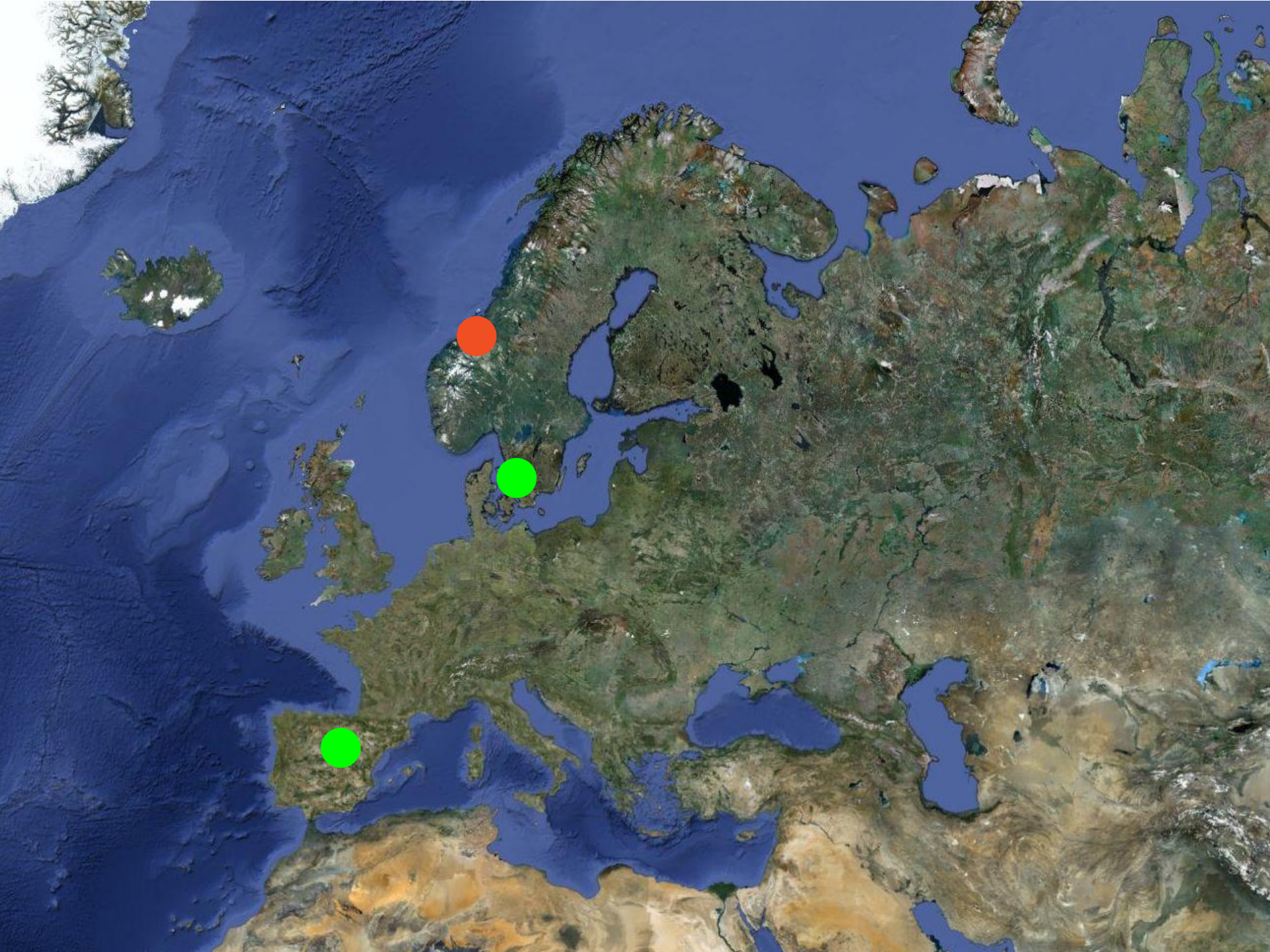
ECO-City Trondheim

Tudela

2012.09.20

Dagfinn Bell

COWI



Trondheim

Trondheim

- Third largest city in Norway:
  - 177 500 inhabitants
  - 341 km^2
- Cold Nordic climate: 63,5 °N
  - HDD_{17} 4 465
  - Average temperature: 4,8 °C
  - Outdoor design temperature (heating) : - 19 °C
- Historic importance – founded in 997
- Regional capital and a center for commerce and administration
- Center for technological education and research:
  - NTNU & SINTEF
  - 30 000 students


START
MÅL
START


Canon
VISA


TAFJORD

Trondheim → ECO-City

Trondheim's municipal climate action plan

- Reduce greenhouse gas emissions by 20% from 1999 levels by 2010

- Objective related to stationary energy consumption:
  - Increase the amount of renewable sources in the energy system
  - Reduce energy demand by improved energy efficiency
  - Sustainable utilization of local resources for energy production

- This shall be accomplished through:
  - Municipal energy planning & active use of legislation
  - Implementation of energy conservation initiatives
  - Giving priority to sustainable use of renewable energy sources
  - District heating supply in all parts of the city

Partners

Partners

- Trondheim kommune
  Municipality of Trondheim
  MUN-NO
  - Department of Environment
  - Manages 1 140 000 m^2

  www.trondheim.kommune.no

Partners

- Trondheim Energi AS → **Statkraft Varme AS**
  Utility company
  UTIL-NO
  - District Heating
  - National leader

www.statkraftvarme.no

Partners

- Heimdal Gruppen AS → *Property developer*
  BUILD-NO
  - regions largest developer
  - 30 year history of inovation

www.heimdalgruppen.no

Heimdal

Heimdal Bolig

Partners

- TOBB
  Housing cooperative
  HOUSE-NO
  – over 12 300 homes in Trondheim
  – management, technical & administrative services

www.tobb.no

Partners

- Svartlamoen boligstiftelse
  Non-profit organization
  TRUST-NO
  - city ecological area
  - manages areas dwelling

www.svartlamon.org

Partners

- SINTEF
  Research organization
  RTD-NO
  - over 2 100 employees
  - over 7 000 research projects annualy

  www.sintef.no

Partners

- COWI Norway
  Consulting
  IC-NO
  - multidisiplinery engineering consulting
  - 870 employes & part of the COWI group

www.cowi.no

Annex I: Our Goals

- Develop and demonstrate good energy solutions in buildings
- First reduce the energy demand, then choose the appropriate energy supply
- 5 year project – total budget 55 MNOK (7,5 MEuro)
  - about 20 MNOK (2,7 MEuro) in EU support
- Annual savings for Trondheim:
  - 3,5 GWh electricity
  - 52,2 GWh heating

  } ≈ energy consumption of 2 100 dwellings

  - 11 890 tonns reduced CO_2 emissions ≈ emissions from 6000 cars

Trondheim - 2006

- Slow start
- Lay of the land had changed:
  - District Heating development
  - Municipality new strategy for schools
  - legal issues with property development
  - Polygeneration – Phase one completed

- Communication with the EU Commission

Fall 2008

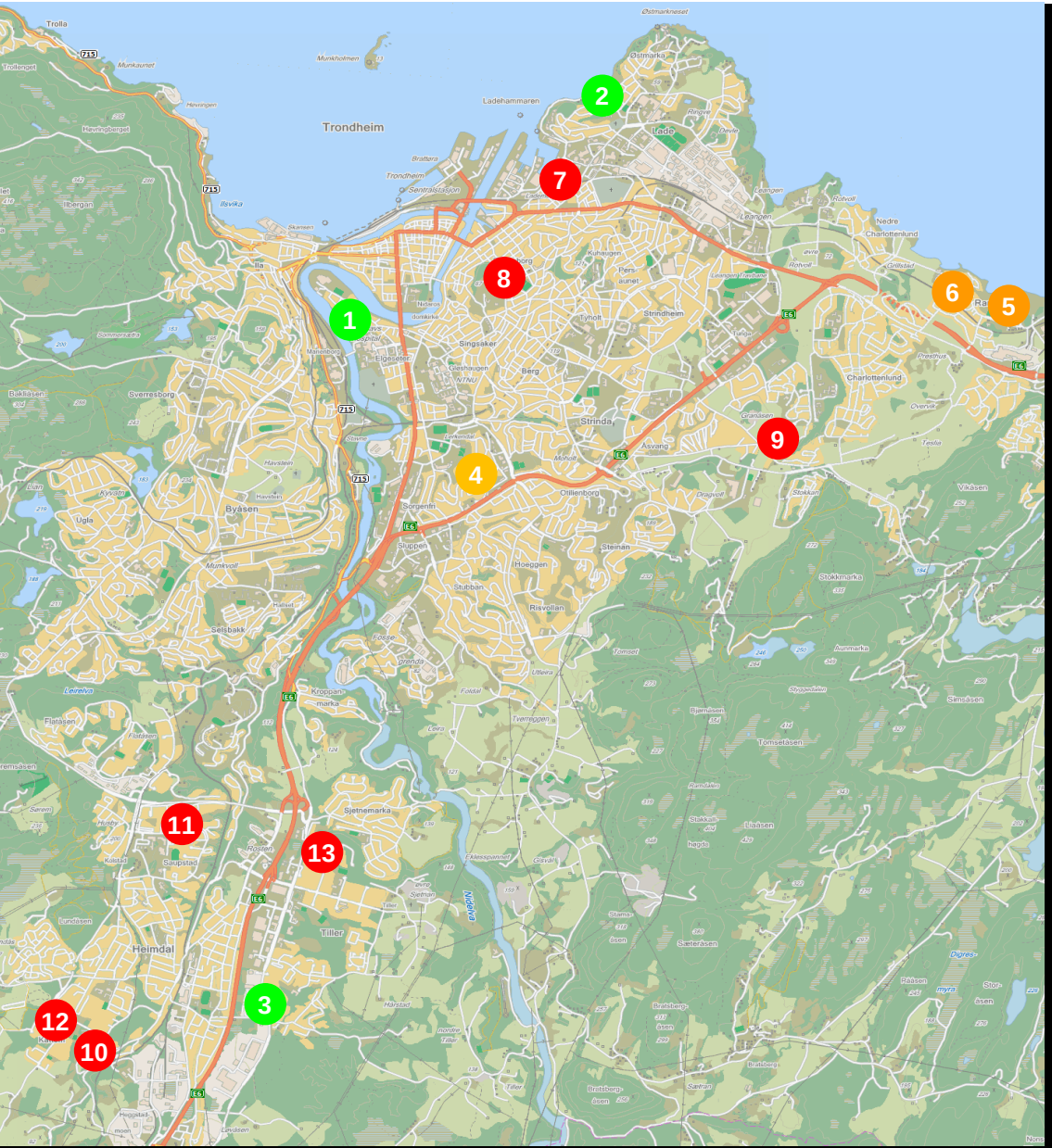
- Financial crisis
- Pragmatic EU Commission

Problem focused → Solution orientated

Trondheim economy – “Post crisis”

- 2009: Business as usual
- 2010: Building sector grows
  Stricter building code (TEK 2010)
- 2011: Building sector continues to grow
  «Green» buildings → BREEAM
- 2012: Housing shortage !!!

Demonstrations Today



RES

1. St. Olavs Hospital: Polygeneration
2. Ladehammeren: Biogas boiler
3. District Heating: Seasonal storage

RES/RUE

4. Nardo School: Eco new build + HP
5. Ranheim School: Eco new build + HP
6. Ranheimsveien 149: Eco new build + Solar

RUE

7. Svartlamoen: Eco rehab
8. Rosenborg skole: Eco new build
9. Miljøbyen Granåsen: Eco new build
10. Ustmyra Borettslag: Intelligent metering
11. Kolstadflaten Borettslag: Intelligent metering
12. Torvsletta Borettslag: Eco rehab
13. Tonstad Borettslag: Eco rehab

Absorption cooling at St. Olav hospital

Absorption cooling at St. Olav hospital

- New St. Olav Hosptial:
  - 200 000 m2 new building
  - built in 2 phases (2001 – 2013)
  - Utility company contracted to deliver cooling
- Optimize cooling
  - free cooling from river
  - compressor chillers
  - absorption chillers
- Two 3 MW absorption chillers

Rosenborg School – eco new build

Ranheim School – new eco build & HP

Nardo School – eco new build & HP

Nardo School – eco new build & HP

- New primary school and kindergarden

- Area: 6800 m2
- BEST goal: 118 kWh/m2y
- Project goal: 107 kWh/m2y
- Completed: Summer 2008
- Measured: 78 kWh/m2y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LECTO FOTO
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Grupperom

Trondheim kommunes

Byggeskikkpris 2008

tildeles

Byåsen Skole

ved Madsø Sveen arkitekter AS og Asplan Viak AS






Hedrende omtale - Nardo Skole

Trondheim kommunes

Energisparepris 2009

tildeles

Nardo skole og barnehage

ved Trondheim eiendom og byggets brukere



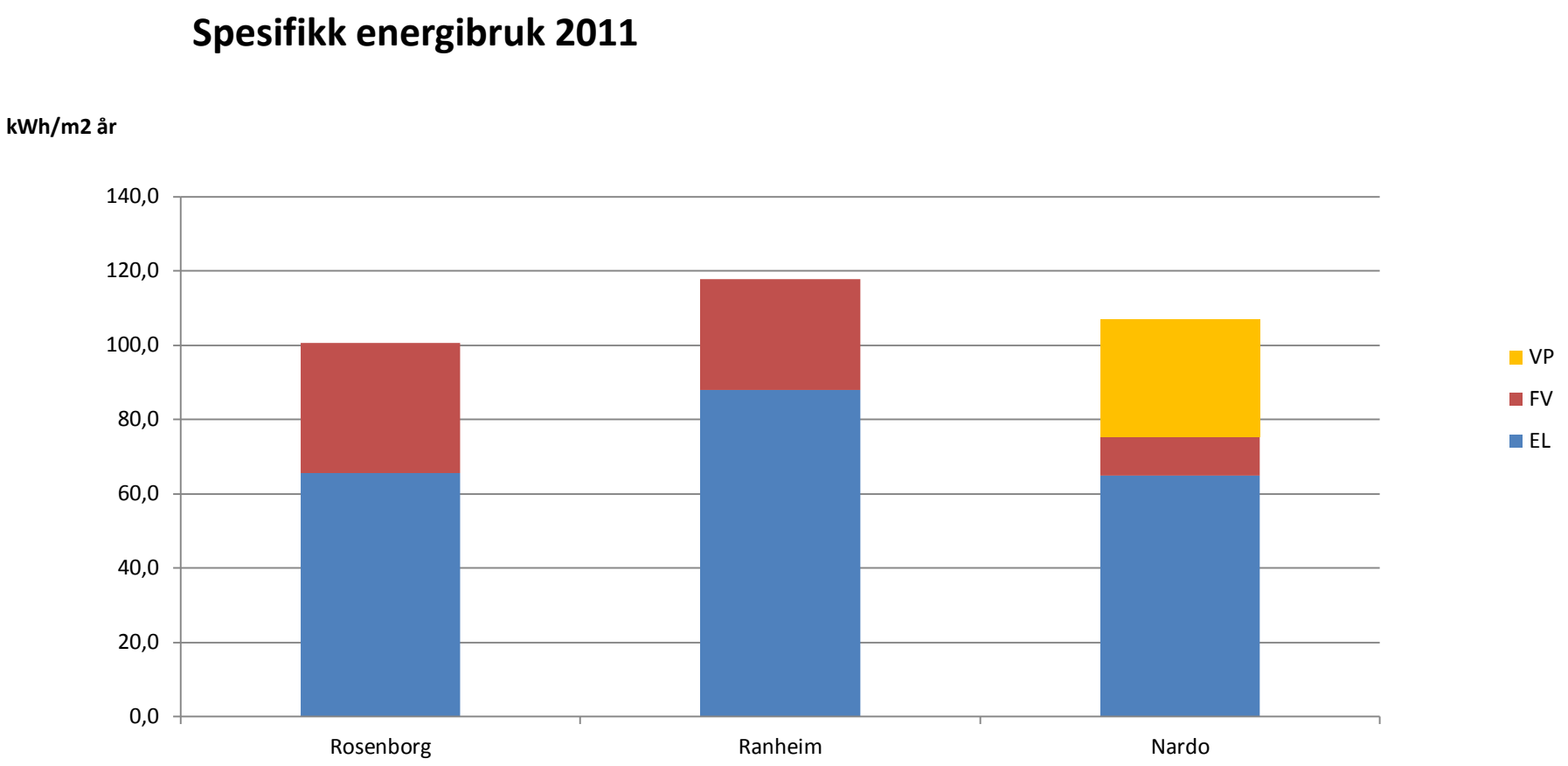



Hedrende omtale

Ustmyra borettslag


E2
E1

Schools 2011



Miljøbyen Granåsen – new eco build

Miljøbyen Granåsen – new eco build

- Plans started 2005
- Building permits ready late 2010
- Sales good
- Construction started spring 2011
- Phase 1:
  - 17 houses → 170-180 m^2
  - 45 row houses → 145 m^2
  - 54 apartments

Ambitions have grown with time

- 2005: ECO-City goals
- 2007: Norwegian Low Energy standard
- 2009: Norwegian Passive house standard

Miljøbyen Granåsen – august 2010

Miljøbyen Granåsen – august 2011

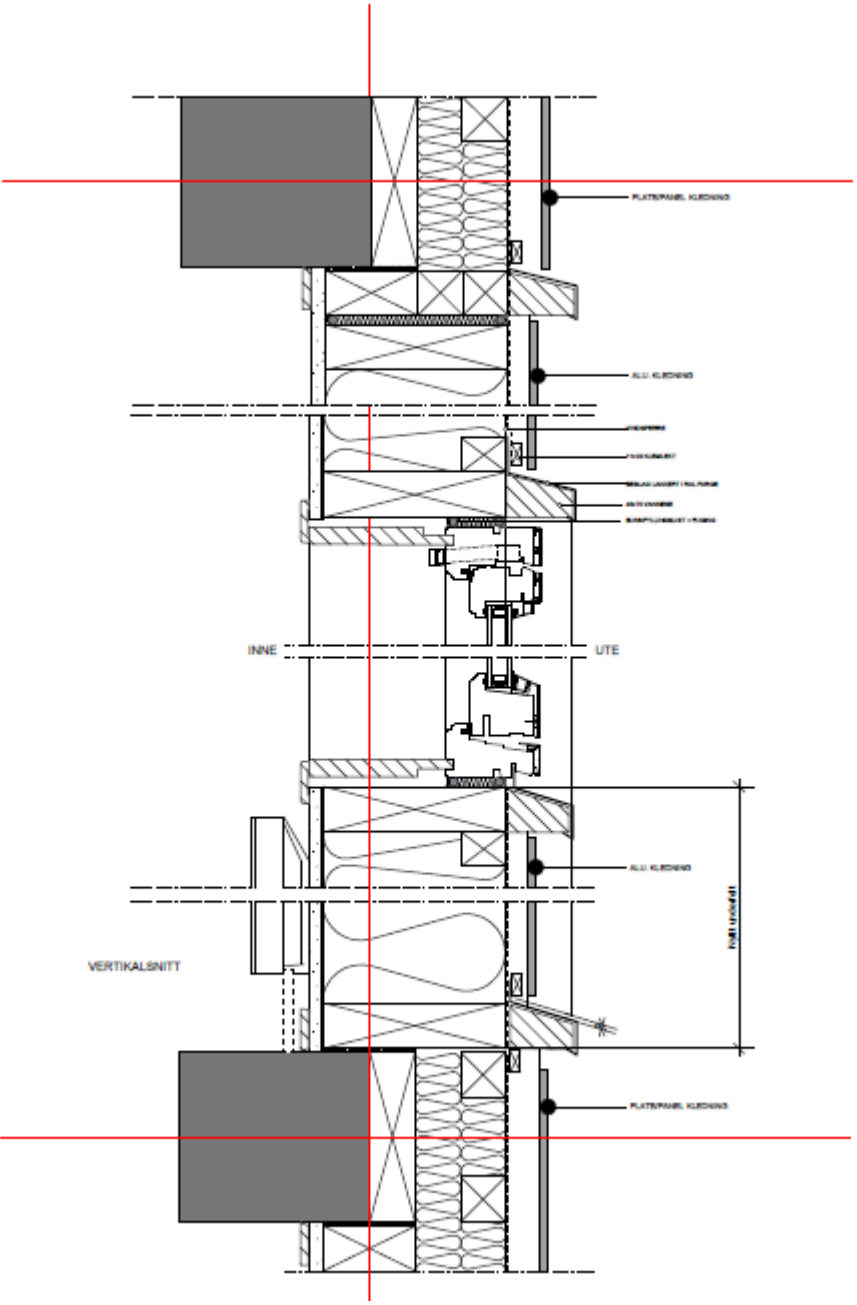
Miljøbyen Granåsen – august 2012

First buildings finished march 2012

Torvsletta – eco rehab dwellings

Torvsletta – eco rehab dwellings

- Extra insulation facades → total = 22 cm
- Extra windproofing
- New facade cladding
- Nyew windows and doors → U-value = 0,9
- Extra insulation of lofts → 15 cm cellulose
- Common lighting LED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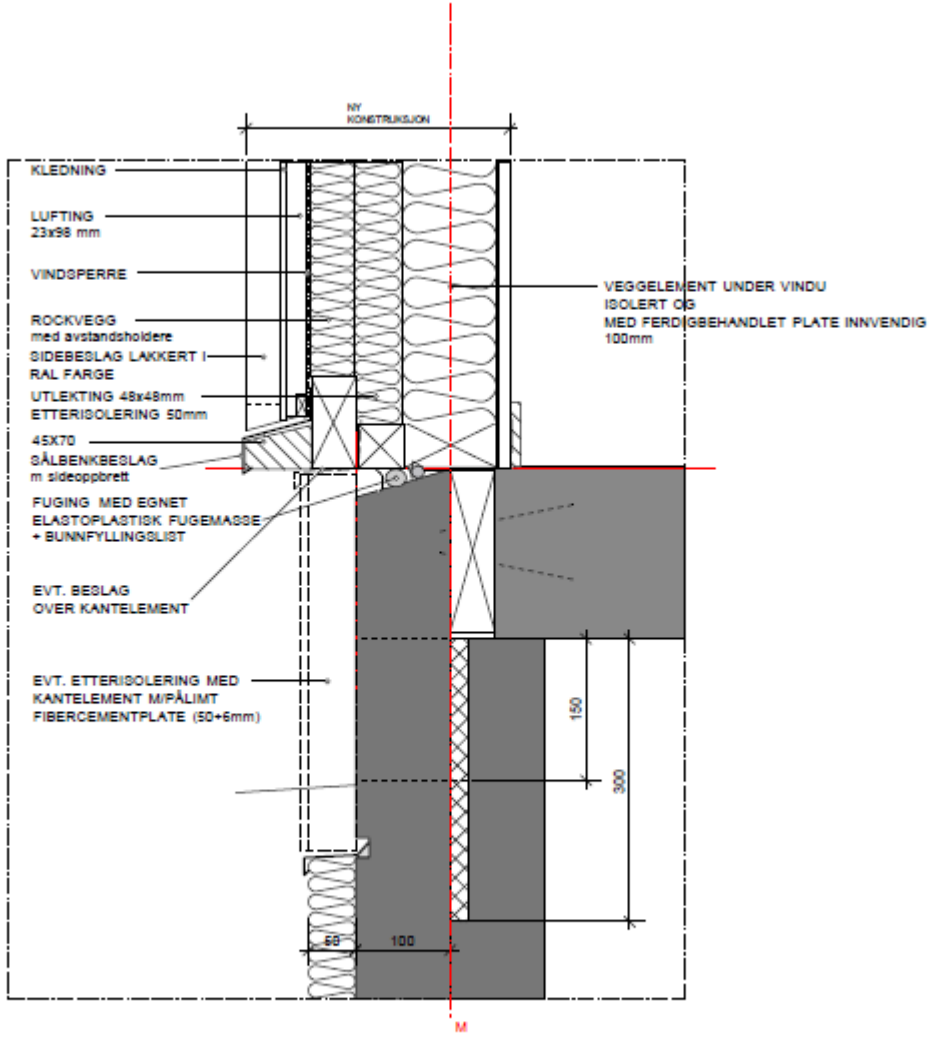
NY
KONSTRUKSJON
KLEDNING
LUFTING
23x98 mm
VINDSPERRE
ROCKVEGG
med avstandsholdere
SIDEBESLAG LAKKERT I
RAL FARGE
UTLEKTING 48x48mm
ETTERISOLERING 50mm
45X70
SÅLBENKBESLAG
m sideoppbrett
FUGING MED EGNET
ELASTOPLASTISK FUGEMASSE
+ BUNNFYLLINGSLIST
EVT. BESLAG
OVER KANTELEMENT
EVT. ETTERISOLERING MED
KANTELEMENT M/PÅLIMT
FIBERCEMENTPLATE (50+6mm)
VEGGELEMENT UNDER VINDU
ISOLERT OG
MED FERDIGBEHANDLET PLATE INNVENDIG
100mm
150
300
50
100
M

Ustmyra – intelligent metering

Ustmyra – intelligent metering

- Intelligent metering: District Heating
- Puls meter on every radiator and flow meters for domestic hot water

- Before:
  - central meter and you pay according to flat size

- In addition considerable rehab, but not part of ECO-City


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Energy reduction rehab dwellings

- Ustmyra →33 %
  - with individual metering of district heating
- Torvsletta → 25 %
  - no individual metering of district heating

Svartlamoen – eco rehab

Dissemination

- Meetings
  - 25 Local Steering Meetings
- Tradeshow
- Common Meetings
- CONCERTO+
- Regional Meetings
- National Meetings
- International Conferences
- Brochures
- Press

Have we reached our goals?

- ✓ Seasonal storage
- ✓ Absorption chiller→ 3 MW
- ✓ Biogas boiler → 1 mW
- ✓ 3 New schools → 22 500 m2
- ✓ 1 Institutional building passive house → 800 m2
- ✓ 62 new passive house dwellings → 7 500 m2
- ✓ 3 Heat pumps: 450 kW
- ✓ 15 m2 solar collector
- ✓ Intelligent metering: 688 dwellings EL and DH
- ✓ 350 dwellings eco-reahb → 33 000 m2

Partner experiences

- Slow start
- Money an initial incentive
- Technical know how and a «meeting arena» more important as project progressed
- National – not so much international

- Overall positive
- But too many forms and regulations

Lessons Learned

- 2003 – 2010 is a long time – **a lot can happen**
- Motivate your troops – maintain **momentum**
- Have (make) **contingency plans**

- Money (support) should not be "driving focus"
- Brand/Image building important

Where is Trondheim heading?

- New municipal climate action plan → 2020
  - Financial « environmental package »
    - roads, transport, bike paths
- New projects
  - Brøset : Sustainable development with a goal of 75% CO2 reduction
- All new build
  - Must be LOW ENERGY CLASS
  - Also PASSIVE HOUSE CLASS