Main Title: Norwegian Build Up Skills Project
Acronym: NBUSP

- Project number: IEE/11/BWI/478/SI2.604614
- Project Duration: 11.11.2011 - 11.05.2013 (18 months)
- Date – Update slides: 10.07.2013
- All documents can be downloaded from
  - The European website of the build up skills project
  - The website of the Norwegian Low-Energy Program

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ENERGY TRAINING FOR BUILDERS

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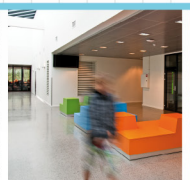
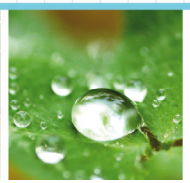
Summary of NBUSP

- **Background**: A highly skilled building workforce is necessary in order to contribute to the energy and climate 20-20-20 targets

- **Goal:** Identify actions for education, training and life long learning in the building workforce on energy efficient building and use of renewable energy

- **Organized** by the Norwegian Low-Energy Program:
  - A national co-operation program between public authorities and the construction industry to increase competence on energy efficient building and the use of renewable energy
  - Hosted by the Federation of Norwegian Construction Industries



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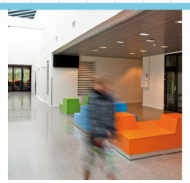
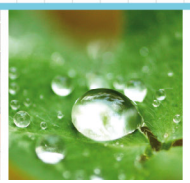
Background

- **The Norwegian construction industry**
  - Approx. 40 000 companies (96% have less than 20 employees)
  - Approx. 200.000 employees (No system for systematic life-long learning)
  - Turnover new buildings: 1-2 %
- **European targets affecting the construction industry**
  - The energy and climate 20-20-20 targets
  - The European 2020-strategy to promote smart, sustainable and inclusive growth
  - EPBD goal: nearly zero energy buildings as standard for new buildings by 2020
- **The building workforce needs to be educated and trained to deliver new nearly zero energy buildings and high-energy performance renovations**



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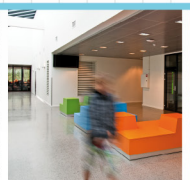
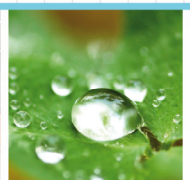
Objectives and main steps

- **Objectives**
  - Promote a highly skilled, sustainable and competitive construction industry
  - Promote energy efficiency, use of renewable energy and secure energy supply
- **Main steps / deliverables**
  - A status quo analysis, describing the current situation in the building workforce, new necessary skills to deliver on energy and climate targets and barriers
  - Roadmap towards 2020, describing actions and measures necessary to secure a highly skilled building workforce on energy issues, hence promoting smart, sustainable and inclusive growth in the construction industry
  - Endorsement report, describing how the proposed actions can be implemented
- **EU Exchange Activities will provide valuable input to the work, by sharing experiences on education, training and life-long learning**



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Expected results

- **Short term results**
  - Common understanding on necessary actions and measures to improve education, training and life-long learning in the construction industry
  - Common understanding on resources, responsibilities and roles, to endorse the actions in the educational system and create structures for life-long learning
  - Input to European and national strategies on for instance energy efficiency, renewable energy and green skills and jobs
- **Long term results**
  - Increased energy efficiency and use of renewables in buildings (as trained craftsmen and blue collar workers will become even more efficient)
  - Less building flaws (as highly skilled craftsmen and blue collar workers will make less construction errors)

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Organization and structure of NBUSP

Coordinator: The Norwegian Building Authority
- Contact towards the Commission
- EU Exchange Activities

Steering Group: Board of Low-Energy Program
- Quality assurance.
- Input to the work packages.

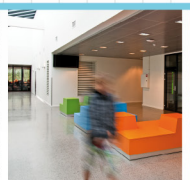
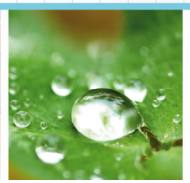
Consortium:
- Deliverance of reports.
- EU Exchange Activities.
- Reporting and documentation of costs.
- Project manager: The Low-Energy Program.

EU Exchange Activities:
- Experience sharing.
- Networking.
- Contact points.

Communication:
- Webpage.
- Seminars.
- Workshops.

Reference group:
- Input to the work packages.
- Participants from the entire construction industry, labour unions, public bodies, etc.



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Status quo analysis (11.05.12)

1. **Competence of craft workers is identified as a barrier against rapid energy efficiency and use of renewable energy in the construction industry.**

2. **Surveys that have been carried out, show that the present day competence level in the field of energy among tradesmen and skilled workers is variable and in some cases lacking altogether.**

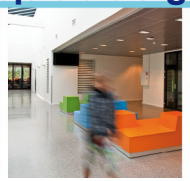
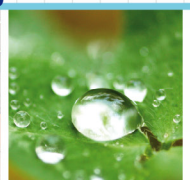
3. **Highly skilled construction workers, with a good knowledge of energy measures, could provide advise and guidance to consumers on energy efficiency, where maintenance or renovation of existing houses is undertaken in any case.**

4. **The construction industry is less involved in formal further education, continuing education and learning-intensive work than many other industries. Lack of time, high costs and centralised courses appear to be the biggest barriers to achieving organised learning among tradesmen.**

5. **Widespread willingness in the building and construction industry to acquire more competence in the energy field.**

6. **Creation of competence goals in the framework of the status quo analysis.**



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Build Up Skills Norway: Status Quo Analysis 11.05.2012

1. The Norwegian Construction Industry

A. Turnover

- The construction industry in Norway is perceived as a relatively attractive and solid industry with regard to criteria such as pay, operating margins and return on investment.
- Turnover in building and construction has more than doubled over the last 10 years.
- Vulnerable to economic conjunctures.

B. Structure

- Around 190,000 employees in 2011, distributed around approximately 50,000 companies.
- High percentage of small and medium sized companies. 90% of the companies have fewer than 10 employees, while 96% have fewer than 20 employees.
- Craft workers represented less than 60% of the total employed in the building and construction industry. The number of tradesmen employed went down by about 20,000 from 2008 until 2010. (due to the economic turndown that occurred in building and construction during these years).

Employed tradesmen in selected vocational groups

Vocation	Total employed Q4 2010
Bricklayers etc.	6,370
Concrete/foundation workers, building	3,340
Carpenters/joiners	56,850
Roofers	1,170
Insulators	1,300
Glass workers	1,460
Plumbers and HVAC fitters	16,660
Tinsmiths	3,590
Electricians and similar	32,670
Auxiliary workers in building, construction, maintenance, etc.	11,530

- Increase of foreign craft workers and hired-in workers in recent years.
- High proportion of undeclared work for building worker services, especially painters, bricklayers and carpenters in the housing market.
- Lower proportion of undeclared works with higher risks related to incorrect execution.

2. Norwegian goals on renewable energy and energy efficiency in Buildings

- The Norwegian government has adopted an objective of a 30TWh increase in renewable energy production and energy efficiency measures between 2001 and 2016.
- The government will also introduce the passive building level as the building standard in 2015, near zero energy level as the building standard in 2020 and component requirements for existing buildings.
- It has been estimated that it is possible to save 10 TWh by energy efficiency measures in buildings by 2020 and to achieve a halving of energy consumption in buildings by 2040

Example: Energy consumption at different ambition levels for buildings.

Ambition level	Non-residential building	Residential building
Average existing buildings	283 kWh/m2	201 kWh/m2
Estimated energy consumption after conventional renovation	215 kWh/m2	160 kWh/m2
Present regulatory level (TEK 10)	150 kWh/m2	120 kWh/m2
Low-energy level (according to NS 3700 and NS 3701)	115 kWh/m2	95 kWh/m2
Passive building level (according to NS 3700 and NS 3701)	80 kWh/m2	70 kWh/m2
Near zero energy level	60 kWh/m2	55 kWh/m2

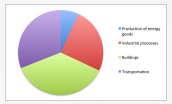
3. Norwegian building stock and energy use in buildings

A. Building stock

- The total (gross) built-up area in Norway is estimated to be about 385 million m2.
- 256 million m2 is residential, of which about 3.5 million m2 is public sector. 129 million m2 is non-residential, of which 44 million m2 is public sector.
- The greater part of Norway's buildings is owned by private individuals. About half of the built-up area is wholly owned by private individuals (detached and terraced houses).
- Low demolition and refurbishment rate.

B. Energy use

- The consumption of energy in homes and non-residential buildings in 2009 was 83 TWh.
- This equals 37% of total energy consumption in mainland Norway (222 TWh).



- Energy consumption in buildings was made up of 46 TWh in housing and leisure buildings, 29 TWh in non-residential buildings in the service industries, about 4 TWh in industrial buildings and 4 TWh in non-residential buildings in the primary industries and construction sector.
- Electricity is the dominant form of energy in both households and non-residential buildings. In 2009, electricity represented about 80% of energy consumption in buildings.
- The long-term trend for energy consumption is that fuel for transport and electricity for the energy sector are increasing, while energy consumption in other sectors is levelling off.

4. Need for labour towards 2020

Projections of workforce needs in building and construction.

Scenario	Annual need for new employees 2010-2014	Annual need for new employees 2015-2017	Annual need for new employees 2018-2020	Number employed in 2020
Continued growth	+8,000	+12,000	+9,000	260,000
Stability	+4,000	+4,000	+4,000	197,000
Decline	+1,200	-5,000 / -6,000	+1,500	145,000

- Increased need for building and construction workforce towards 2020/2030, including the need for skilled craft workers.
- Important to get the oldest workers to remain in the industry until retirement age while recruiting in the younger age groups.
- High dropout rate among students in upper secondary schools taking building, construction and electrical subjects, compared with many other lines of study.

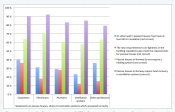
5. Skills and gaps analysis

A. Skills analysis

- There are defined competence goals for what various executing professionals in the building industry must know so as to erect new buildings to passive/near-zero energy levels, renovate existing buildings to a very high energy standard, install renewable heating and cooling systems.
- Work in existing buildings will be more demanding in execution than new building to passive/near-zero energy levels.
- The most important competence goals are connected to the following working operations:
  - Planning risk-reducing measures to avoid damp damage to buildings.
  - Tasks intended to achieve low leakage figures.
  - Tasks connected with insulation and avoiding thermal bridges.
  - Insulating heat generating pipes and components so as not to give off excessive heat.
  - Adjustment of air volumes in ventilation systems and executing ducting systems so as to achieve the lowest possible Specific Fan Power (SFP) factor.
  - Design, execution and adjustment of heating systems.
  - Extending and post-insulating existing structures.

B. Gaps

- Surveys carried out among skilled construction workers tend to indicate that knowledge relevant to passive building is varied and in some cases lacking.
- Compared with normal energy standards, buildings with high ambitions for energy consumption must have particular attention paid to the indoor climate and securing against damp
- It is important to reduce the risk of high temperatures, ensure that no damp enters the structures, limit air leakage and avoid cold bridges.



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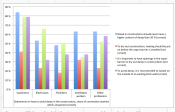
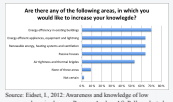


Source: Eidset, I., 2012: Awareness and knowledge of low energy and passive houses. Respons Analyse AS. Poll conducted amongst 600 workers/project managers on construction site.

6. Participation in life-long learning

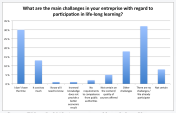
- According to the Federation of Norwegian Construction Industries, craft workers are the group of employees in the building industry who currently have the poorest opportunities for further education or in-service training.
  - No national system or offer of systematic education or craft or journeyman's certificates.
  - No official approval, accreditation or certification of courses offered or any national goals for content, quality or evaluation.
- Falling participation in both training and further education; Less than half of all those employed now take part in courses or training during the course of a year.
  - Building and construction scores lower for all forms of lifelong learning than a number of other sectors.
- However many tradesmen and skilled workers interested in acquiring more knowledge in the energy field.
- Preferred ways of raising competence are courses organised by building supplies companies and industry organisations, as well as the use of the construction details from SINTEF Building and Infrastructure (national research institute).



Source: Eidset, I., 2012: Awareness and knowledge of low energy and passive houses. Respons Analyse AS. Poll conducted amongst 600 workers/project managers on construction site.

7. Barriers

- Generally low and sometimes zero attention given to energy use and energy related measures.
- A low energy price will tend to maintain that barrier.
- Potential for energy efficiency in buildings depends on whether the owners of buildings and homes consider these measures to be financially beneficial.
- Important for triggering the potential for owners open to renovating or upgrading their buildings. It is therefore important to reach the home owners or owners of non-residential buildings who are preparing for renovation or upgrade activity.
- Lack of competence might prevent energy measures from being taken: Craft workers who come into contact with households must have knowledge to sell up to ambitious renovation at low-energy or passive building level instead of simple renovation.
- Lack of knowledge and competence might also affect the financial, technical and practical conditions that next prevent energy efficiency measures, especially in non-residential buildings.
- Lack of time and high course costs stand out as the most important barriers to tradesmen's participation in courses. Other factors that may be mentioned in previous studies are a lack of motivation and that the courses are mainly found in cities rather than locally.



Source: Eidset, I., 2012: Awareness and knowledge of low energy and passive houses. Respons Analyse AS. Poll conducted amongst 600 workers/project managers on construction site.

8. Conclusions

- Competence among craft workers in the construction industry in passive house building, renovation with ambitious energy goals and installation of renewable heating is a barrier to achieving more rapid energy efficiency and energy remodelling of buildings.
- Surveys that have been carried out show that the present day competence level in the field of energy among craft workers is variable and in some cases lacking altogether.
- Workers in the building and construction industry are less involved in formal further education, continuing education and learning-intensive work than many other industries. It is still positive however that there is a widespread willingness among craft workers in the building and construction industry to acquire more competence in the energy field.
- Lack of time, high costs and centralised courses appear to be the biggest barriers to achieving organised learning among craft workers. The Norwegian building industry is however solid and profitable, with expectations of further growth. This gives opportunities to invest in increasing the competence in the construction workforce and to achieve higher course attendance.
- Worker immigration into the building and construction industry has increased rapidly in recent years and this will continue to be needed in future, given a continued high level of activity. This may require measures to increase knowledge of Norwegian building practice among immigrant workers so as to ensure quality of execution.
- More work also needs to be done on recruitment from the school system, so as to meet the building industry's workforce needs. This involves both getting more students to choose building as their course of study and reducing the numbers dropping out of vocational training.
- Since few seem to spend much time in further education and training in the building industry, it could be a good competence-raising measure to ensure that those who are undertaking education are given knowledge about passive building and energy-efficient building solutions.
- There is currently no system for monitoring the level of knowledge in the building industry or measuring the effect of competence-raising measures. Neither is there any system for achieving systematic continuing education and training for craft workers in the building industry or schemes for ensuring the quality of the courses offered.

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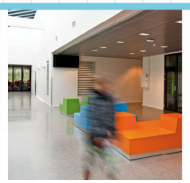
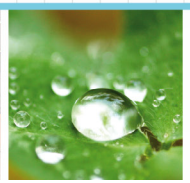
Contacts Build Up Skills Norway Mathieu Veulemans (co-ordinator): mathieu.veulemans@dibk.no Guro Hauge (project manager): guro@lep.no



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Roadmap (11.11.12)

1 Strategic document for reaching energy efficient buildings.

2. Describing all relevant measures for vocational education, formal further education and post qualifying education.

3. Need to focus on a few strategic measures.

4. Positive economical and societal effect of competence enhancement of craft workers in energy efficient buildings after a 14-years period

5. Draft competence indicator.

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Roadmap BUSP Norway

To enhance competence at all levels – Agreement from the construction industry – Participation of relevant institutions – Socio-economic effects over a 14-years period

EDUCATION AND TRAINING	FORMAL FURTHER EDUCATION	POST-QUALIFYING EDUCATION
Passive building knowledge in education and training • Establish several pilot projects where many stakeholders (vocational schools, local authorities, construction companies) collaborate to get knowledge about passive building into education and training for building trades.	**Updating subject plans for vocational college/master's certificate** • Review the curricula for building and climate, energy and environment to include competence goals for energy, where these do not currently exist. • Extension of building trades with a teaching module including technical goals for climate and energy to be included when the content is developed.	**Force preparation of building details and guidance material** • Force the development and updating of building details, guidance material etc. at passive building level, for both new building and existing buildings. • Further develop existing course material to give specific detailed knowledge for every single trade and to cover practical use of the knowledge on the building site.
Good recruitment		
Increased competence in the area of energy among teachers and instructors in building trades • Establish more schemes in which vocational teachers can spend more time in companies that have energy ambitious building. • Increase participation in further and post-qualifying education in the area of energy by teachers of vocational students. • Establish collaboration between the building industry and county councils to develop special teaching modules for instructors on building at passive building level, renovation with ambitious energy goals and the use of renewable energy.	**Certification for tradesmen – the Renewables Directive** • Consider establishing other qualification/certification schemes for tradesmen with regard to passive building or renovation with ambitious energy goals. **Further education in the area of energy for tradesmen** • Establishing a pilot project on energy to define specific formal training for tradesmen who wish to continue in their own vocational subject. • Establish a pilot project to see how implementing courses with documented real expertise for tradesmen could be specifically related to curricula.	**Ensuring the quality of courses about energy in buildings** • Organise courses for instructors so as to ensure the capacity of qualified course holders and to give a geographical spread of course holders, making it easier to take courses locally. **Increased course participation among tradesmen** • Relevant incentives could be competence requirements for receiving subsidies for building projects with ambitious energy goals, or establishing a training fund.
Updated teaching aids and materials • Include renewed updated knowledge about passive building, energy-efficient renovation and the use of renewable energy for heating and ventilation in the next revision of teaching aids and materials.		**Better product knowledge** • Integrating courses on energy efficiency in buildings, use of renewable energy and energy-efficient building products into the building goods chains' internal training.

OVERALL STRATEGY

01 The trades with the greatest significance for buildings' energy efficiency and energy supply will be prioritised in the development of course material (carpenters, plumbers, electricians and ventilation fitters)

02 Main target group for course participation is foremen and site managers

03 Get knowledge of passive building into training by prioritising post-qualifying education of vocational teachers and to develop new teaching aids that cover energy-efficient building and renovation

04 Measures are being initiated to ensure that tradesmen with documented expertise in energy respond to a demand from the market

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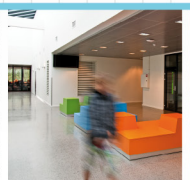
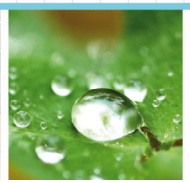

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Implementation plan/endorsement (11.05.13)

1. Describes measures that on a concrete level contributes to the implementation of the roadmap.
2. Gives an overview of measures for better coordination.
3. Meetings with the Ministry of Education and Research and the Education directorate with the view of changing education plans.
4. Endorsement letters from relevant stakeholders.

Contact information and partners

- **Coordinator:** Mathieu Veulemans, The Norwegian Building Authority
  - Email: mathieu.veulemans@dibk.no
  - Phone: +47 452 74 207
- **Project manager: Christine Karlsen**, The Low-Energy Program
  - Email: christine@lavenergiprogrammet.no
  - Phone: + 47 951 67 814
- **Platform for project website:**
  - http://lavenergiprogrammet.no/lavenergi-i-eu/build-up-skills/
- **Partners:** The Norwegian Building Authority, ENOVA SF, The Federation of Norwegian Construction Industries (also hosting the Low-Energy Program), The Norwegian Association of Building Constructors, The Norwegian Association of Building Contractors, The Norwegian Association of Plumbing, Heating and Ventilating Contractors, The Norwegian Association of Masons and Bricklayers.