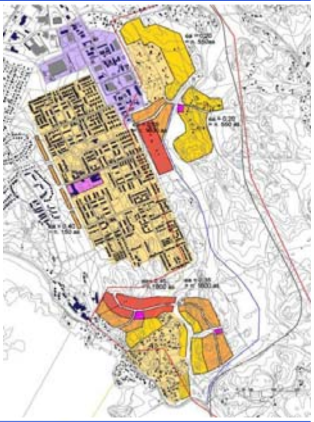
FINPRO

Urban Planning and District Heating Development



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FINPRO, June 6, Helsinki, Finland

I

URBAN PLANNERS WITH RENEWABLE ENERGY SKILLS - *UP-RES*

II

BUILDING LEVEL SUBSTATIONS IN MODERN DISTRICT HEATING

(EXAMPLE OF UP-RES TRAINING)

Climate Change Challenging Urban Planning

- Need to reduce heat consumption in buildings;
- Need to reduce fuel consumption in transportation;
- Need to reduce electricity consumption in lighting, cooling, heating;
- Need to turn from fossil to renewable energy;
- Need to reduce overall emissions to atmosphere; and,
- Need to circulate material flows of waste and energy supplies (use of ash, waste to energy,..).

Barriers to Overcome

- At present, urban areas tend to be scattered rather than compact, which sometimes means higher energy consumption and emissions!
- Therefore:
  – Urban planners should know the importance of spatial plans to energy and emissions;
  – Urban planners should understand the consequences of their spatial plans to energy and emissions;
  – Planning guidelines should include energy as a new and essential planning parameter;
  – Renewable energy requires a new way of thinking in urban and spatial planning that is emerging now.

Urban Planners not aware of DHC

- Energy and emission issues are not taught to urban planners, neither in planning schools nor in continued education programmes in general;
- Only four (!) universities were identified in Northern America and the EU that have integrated energy and emissions with their urban planning syllabus!

Energy Efficiency Starts from Urban Planning

Urban planning shall include quantitative energy planning, because:

Without an energy and emission analysis the communal decision makers are not aware of the impact of their planning decisions on environment.

Such decisions have long-term impacts, up to 100 years ahead.

Example: Porvoo, Finland (1)

Steps

1. Local urban and energy planners were put together to co-operate to develop a new sustainable city expansion area (Skaftkärr);
2. As reference case the city plan of year 2007 was used but with passive energy housing for the city expansion area;
3. Four alternative energy efficient green field plans were created to the city expansion area;
4. An external consultant (Pöyry Ltd) was hired to analyse the reference plan and the four plans, and to calculate the energy consumptions, emissions and costs.

Example: Porvoo, Finland (2)

Results

1. All four alternatives provided lower energy consumptions and emissions than the reference case;
2. Life-cycle costs of three of four alternatives were lower than the one of the reference case;
3. Therefore, co-operation of urban and energy planners provided a win-win benefit to the Porvoo city.
4. The best energy option was district heating (DH) together with combined heat and power (CHP) based on biomass. Solar heating expected to come as well.

Objectives of UP-RES…

… are to identify and review barriers and best practices for sustainable development of RES in urban planning processes in order to:

- Facilitate an expansion of RES systems in order to increase the global energy efficiency,
- Mitigate climate change through reduced carbon dioxide emissions, and
- Increase national security of supply.

Focus of UP-RES

- Renewable Energy Directive: to promote RES in heating, cooling and powering of communities at high energy efficiency.
- EU coverage: Experience from 5 training pilots to be extended to European level through European level associations and meetings.

Structure of Long Training Course

- 9 months duration: Oct 2011 – June 2012
- Has been piloted in Spain, Hungary, and Finland and is underway in Germany
- Home work has been designed for students in such a way that it integrates energy issues to his/her normal work;
- An excursion abroad (voluntary) of 3-5 days will take place in June 2012;
- 8-12 training modules (seminars of two days each) have been organised including local excursions.

Modules of Training

M1	SUSTAINABILITY CONCEPTS IN REGIONAL AND URBAN PLANNING: A HOLISTIC VISION
M2	ENERGY. FORMS - TRANSFORMATION - MARKET OUTLOOK
M3	ENERGY DEMAND REDUCTION STRATEGIES: POTENTIAL IN URBAN PLANNING
M4	ENERGY DEMAND REDUCTION STRATEGIES: POTENTIAL IN NEW BUILDINGS AND REFURBISHMENT
M5	ENERGY RESOURCES AND RENEWABLE ENERGY TECHNOLOGIES
M6	ENERGY DISTRIBUTION: DISTRICT HEATING AND COOLING
M7	THE RIGHT SCALE FOR EVERY ENERGY CONCEPT: HEAT AND COOL DENSITY (DEMAND SIDE), POTENTIAL ON SUPPLY SIDE
M8	NEW MANAGEMENT CONCEPTS IN THE ENERGY MARKET
M9	ENERGY PLANNING
M10	NEW TRANSPORT MODELS AND INTERURBAN AND INTERURBAN MOBILITY

Main Deliverable of UP-RES

Compact training material consisting of introduction texts for 10 modules and of 300 slides;

Designed to 200 planning schools in Europe;

Translation to 10 EU languages underway; and,

Freely downloadable in July 2012.

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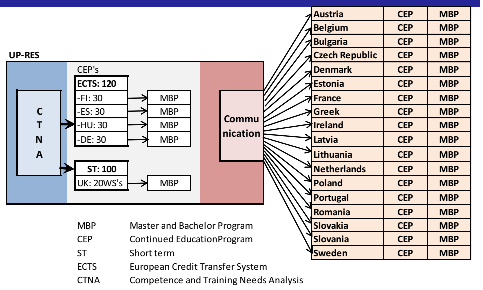
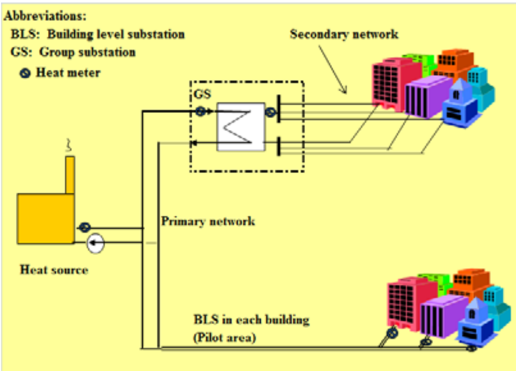


II
Building Level Substations
(Example of UP-RES Training)

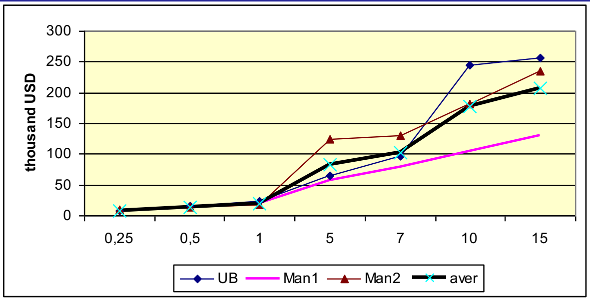
Two Types of Substations

Group substations (GS) serve 10-30 buildings through secondary networks

Building level substations (BLS) serve one building only



Investment Costs of Substations



- Small substations are standardized and prefabricated (< 1 MW).
- Large substations are individual with different configurations: number of pumps, heat exchangers, valves, water treatment, expansion tanks, which increase both costs and cost difference

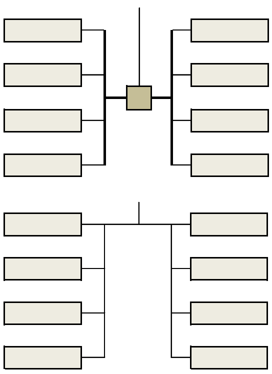
BLS: Less Piping – Easier Connection Planning

GS :

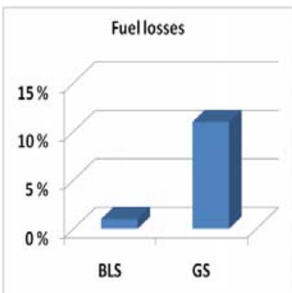
- Long pipes
- Large pipes
- Difficult to expand

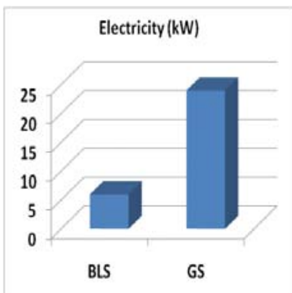
BLS :

Superior, Optimized :
- Short pipes
- Small pipes
- Easy extension



BLS Uses Less Heat and Electricity





- Energy savings 5-15%
- Pumping Savings to 75%

Experience from Other Countries

- In Central Europe, conversion of old GS systems to modern BLS systems has reduced heat consumption by 15% on average.
- In China (Weihai, Shandong province), there are indications that BLS systems use heat energy 12% less than GS systems.
- The main reason: good balancing of heating with BLS system !

International Trends

- Countries using GS
  - Russia, Belarus, Denmark, Ukraine
- Countries using BLS
  - Germany, Switzerland, Finland, France, Austria, Bulgaria, Norway, Croatia
- Countries moving from GS to BLS
  - Poland, Lithuania, Serbia, Estonia, Czech Republic
- Countries moving from BLS to GS
  - NONE!

Final Decision of Substation Options…

… Shall be based on life-cycle cost analysis that is based on optimal design of both options.

UP-RES Consortium

- **Finland : Aalto University School of science and technology**
  www.aalto.fi/en/school/technology/
- **Hungary : University Debrecen**
  www.unideb.hu/portal/en
- **Spain : Sabaté associats Arquitectura i Sostenibilitat**
  www.saas.cat
- **United Kingdom: BRE Building Research Establishment Ltd.**
  www.bre.co.uk
- **Germany :**
  AGWF - German Association for Heating, Cooling, CHP
  www.agfw.de
- **Universität Augsburg** www.uni-augsburg.de/en
  Technische Universität München http://portal.mytum.de