16th „Building Services, Mechanical and Building Industry Days" International Conference, 14-15 October 2011, Debrecen, Hungary

REHABILITATION STRATEGY OF DISTRICT HEATING

Arto Nuorkivi, D. Sc. (Tech)
Aalto University
Espoo, Finland

email:energy@nuorkivi.fi

DH Rehabilitation as Part of ***UP-RES*** Project

1. **UP-RES: Urban Planners with Renewable Skills;**
2. **Objective: Improve access of RES in urbans and regions through education of urban planners;**
3. **Partners: universities, associations and consultants from Finland, Hungary, Spain, U.K. and Germany;**
4. **Pilot training courses during Oct 2011 – June 2012 in five partner countries;**
5. **Communication of the training models and materials to other EU countries in 10 languages by Dec. 2012;**
6. **Financially supported by Intelligent Energy Europe.**

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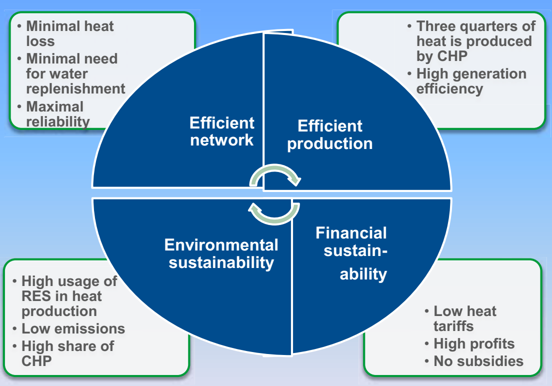
Would you like to have the World Best DH system?



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… And how about a DH System with excellent Key Performance Indicators?

Key Performance Indicators	Finland (200 companies on average)	Transition Economies
Network **heat losses** of production	6-9%	15-40%
Make-up **water replenishment** need per year	1	10-50
CHP share of DH production	76%	30-60%
DH generation **efficiency annually**	93%	60-90%
RES share of DH production	38%	0-10%
Staff **productivity** (GWh / employee)	20	1-4
Profitability % of turnover	10-20%	Low or negative

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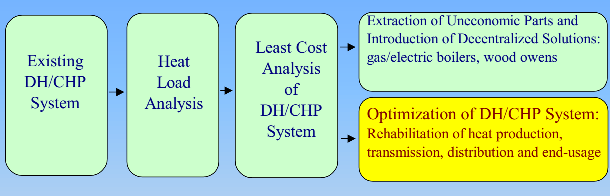
Rehabilitation Process



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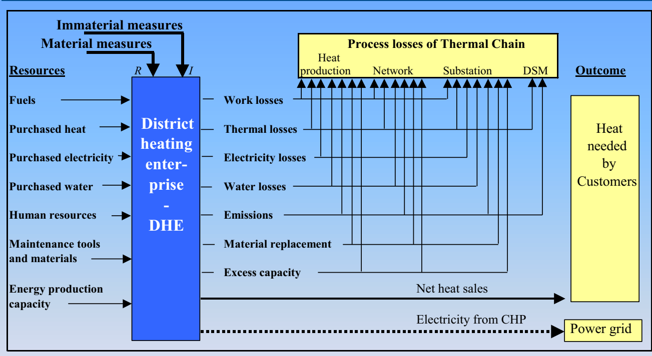
Resource Losses to be Minimized



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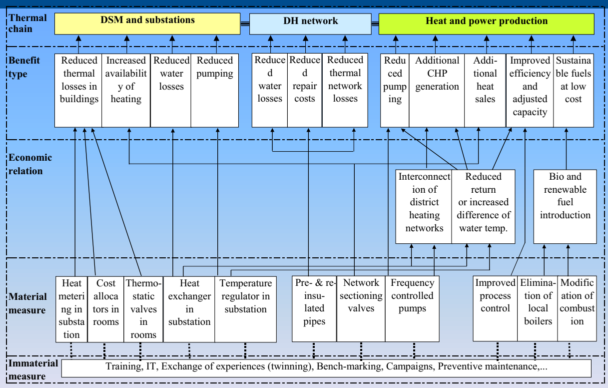
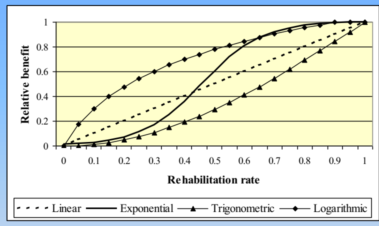
Benefits Related to Measures



Non-linear Relations between Measures and Benefits

Examples:

- Substation investments provide expontial EE but linear water consumption benefits
- Network rehab provides logarithmic EE benefits
- All investments provide trigonometric benefits in man power (human resources)



Formulas:

- Trigonometric: $\Theta(c,t) = 1 - \cos(\frac{1}{2} \pi R(c,t))$
- Logarithmic: $\Theta(c,t) = \lg(10 R(c,t) + 1)$
- Exponential: $\Theta(c,t) = 0.1/(0.1 + 10 e^{(-10 R(c,t))})$

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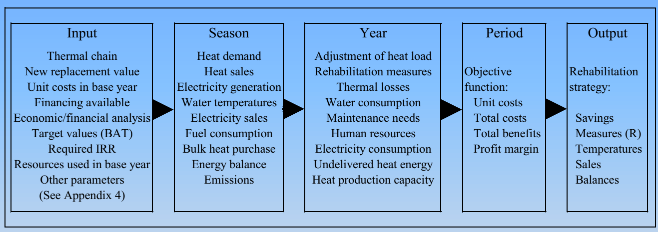
Structure of Dynamic Rehabilitation Model



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Materialized Outcome of Rehabilitation

1. DH network losses reduced by half if 10-20% of worst pipelines replaced with preinsulated pipes;
2. DH water losses reduced by 30-70% depending on the substation rehabilitation rate;
3. Remaining lifetime of all DH network assets extended by 3-6 years at minimum;
4. Maintenance cost reduced even 90% due to both reduced amount of damages and smaller unit costs of their repair;
5. Need of man power reduced by 10-20%;
6. Electricity consumption in DH pumping reduced by 40-70% due to variable speed drives, new pipes and temperature control systems;
7. And finally: The costs of DH reduced by 30-60 % in the real terms (see the last slide).

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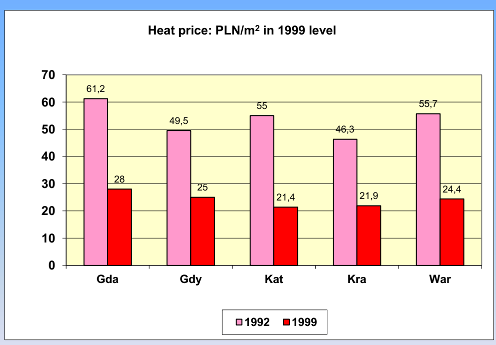
Pioneering Example: Poland 1992-1999



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