

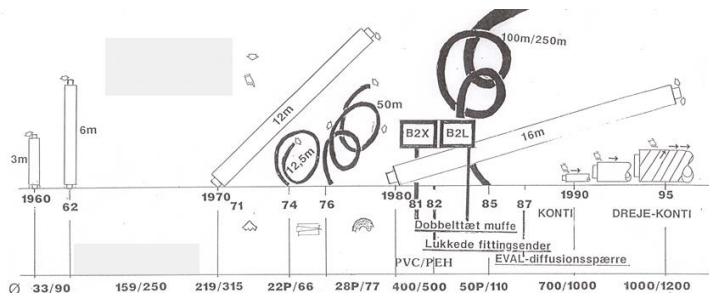


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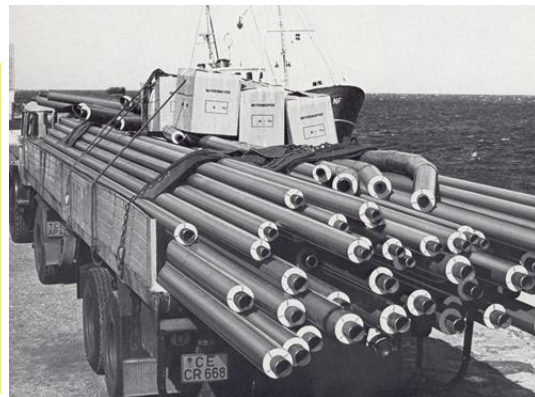
Advance Hot Water Piping

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December 6, 2017

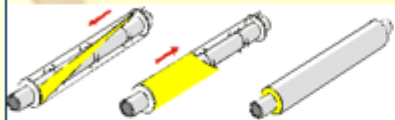
LOGSTOR's concept for DHC



- We invented the buried pre-insulated pipe technology



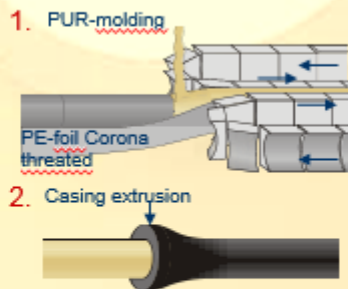
Traditional



All sizes

$$\lambda = 0,027 \text{ W/mK}$$

Axial Conti & flexible



Max ø315 mm casing

$$\lambda = 0,023 \text{ W/mK}$$

Spiral Conti / Opti-pipes



Casing

Spiral > ø315 mm

Opti > ø500 mm

$$\lambda = 0,025 \text{ W/mK}$$

Standardized and complete pipesystem with all elements included



With: Preinsulated straight pipe
Preinsulated bends
Preinsulated branches
Preinsulated valves
Connected with joins



Low CAPEX

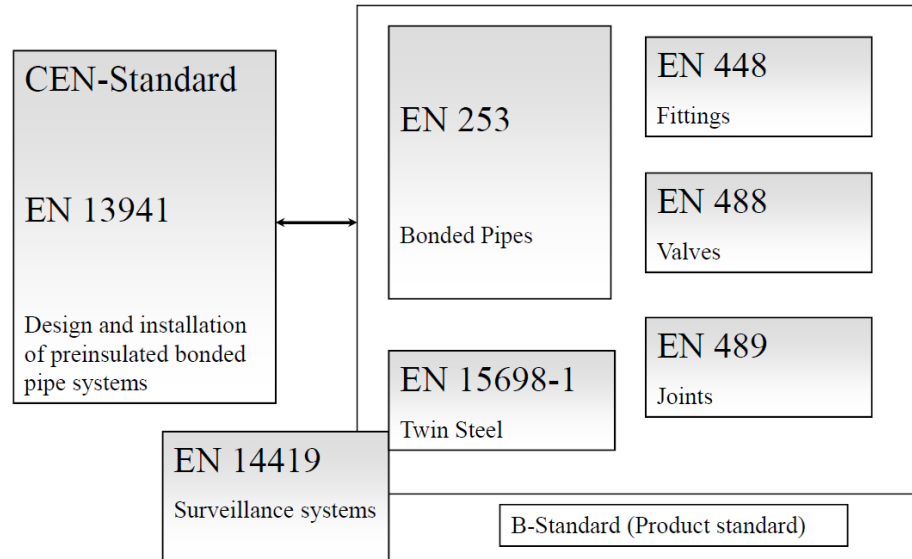
- Standardized industrial products, development based on +50 years of experience
- Established and proven EN standards, products, design & install, EN253, EN13941
- Simplification and optimization of design and installation
- Integrated fittings & joint solutions, savings by pipe & joint philosophy
- Robust and durable solutions
- Reduced installation costs
- Shallow trenching
- Quick & easy pipe installation



Design of Bonded Pipe Systems

LOGSTOR

- European Standards



EN 253 Piping in NA

Why choose EN over traditional steel systems?

- The **thin wall steel** results in reduced overall stress versus conventional schedule 40 steel—allowing numerous laying methods often saving in number of expansion loops and welds. Thin walled steel is also more flexible allowing for fewer fittings.
- **Design.** EN systems are **shallow bury** (min cover 2 ft) saving in excavation and civil costs.
- **Quality and 30 year service life.** The EN 253 system is a fully welded system (no flanges). It comes complete a with **five year warranty** (NA systems have one year warranty)
- **Leak detection.** Simple and effective central surveillance that constantly monitors the pipe network for faults (and precise location). Even minor irregularities can be detected providing basis for preventative maintenance.

Our Innovative design : more flexibility



Innovation in Service Connexion

INTRODUCING A NEW GENERATION OF PRE-INSULATED FLEXIBLE PEX PIPING - REINFORCED WITH KEVLAR - SHIPPED IN COILS.

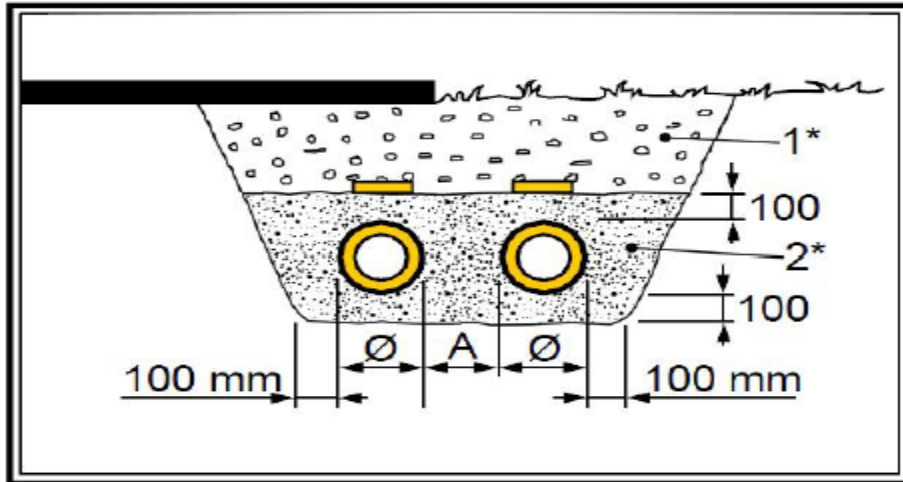
- **Larger sizes and higher temperatures:** up to 160 mm (6 in) at 115°C (240°F) @ 16bar (230psi). Custom temperature/pressure configurations available.
- Ideal for FAST installations in remote locations or busy urban cores - industrial or hydronic applications.
- Due to reduced carrier pipe wall thickness, these pipes have smaller ODs compared to conventional flexible plastic solutions – making them easier to handle and install.
- Full range of supporting press fittings and joints.



Civil work represent 60% of the Total project cost

The Trench

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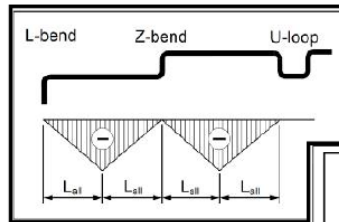


Casing $\varnothing$ mm	Distance A mm
90-180	150
200-560	250
630-900	300

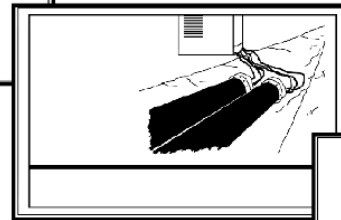
3 Methods to Reduce Axial Stresses

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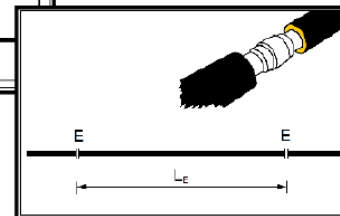
Stress reduction with bends



.. by prestressing



.. with E-Comp



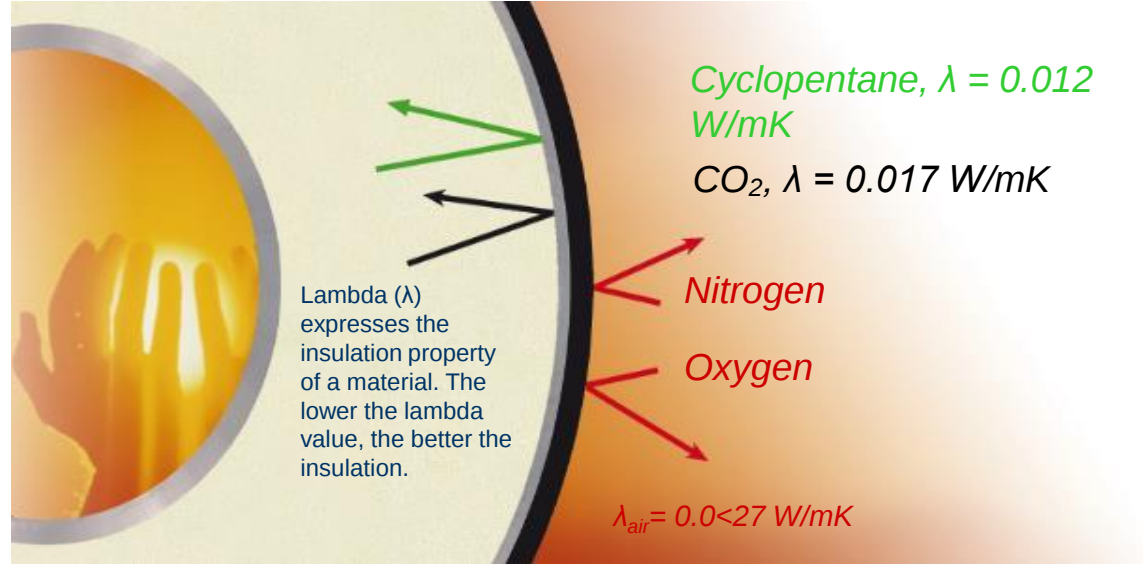
Design manual section 1 10

Energy Efficiency / Heat Loss

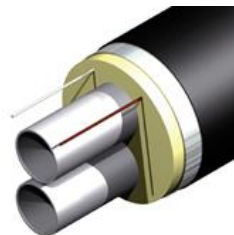
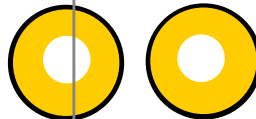
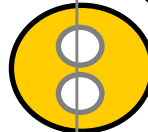
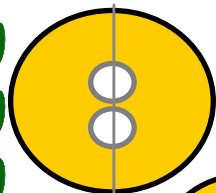
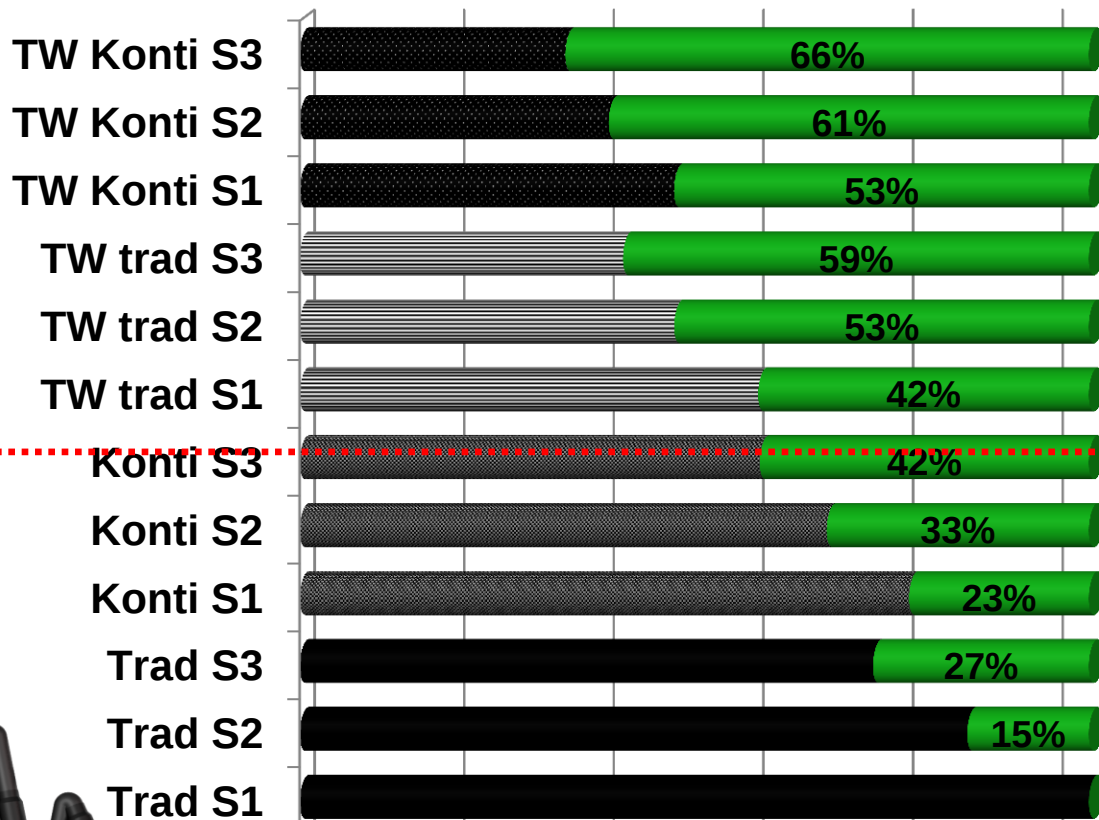
- Lower operating costs
- Less environmental impact

Our diffusion barrier

- Prevents ageing of insulation
- Reduces energy losses
- Implemented in pipes & joints



OPEX optimization, type of pipe system



Example:
Heat loss
- 1000 m
DN 80 –
average
30 years

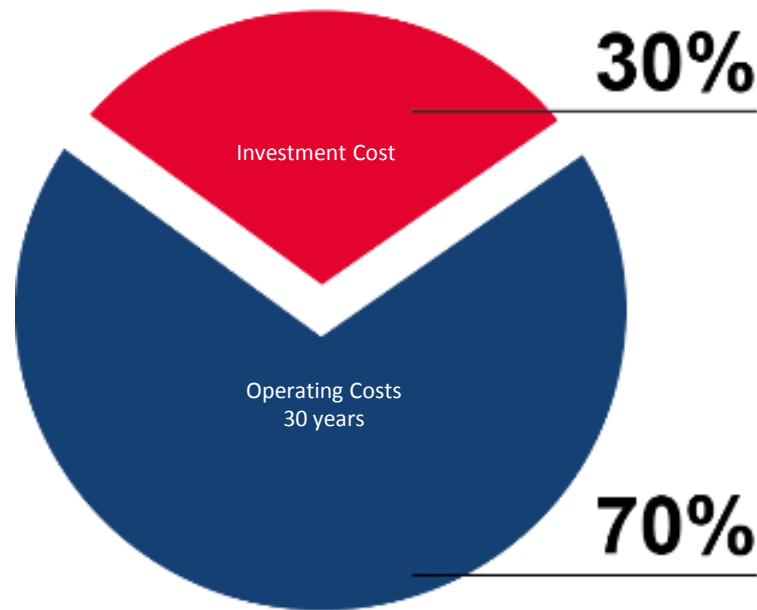
0 MWh/year 20 MWh/year 40 MWh/year 60 MWh/year 80 MWh/year 100 MWh/year 120 MWh/year

What can we do today?

Total Cost of Ownership / Lifetime costs

1. **Investment costs**
2. Purchase costs, components
 - Installation costs
 - Costs of planning and commissioning
3. **Operating costs** (annual costs)
 - Costs of energy & heat loss
 - Costs of maintenance
 - Costs of repairs
 - Costs of poor quality

4. Total costs of the solution



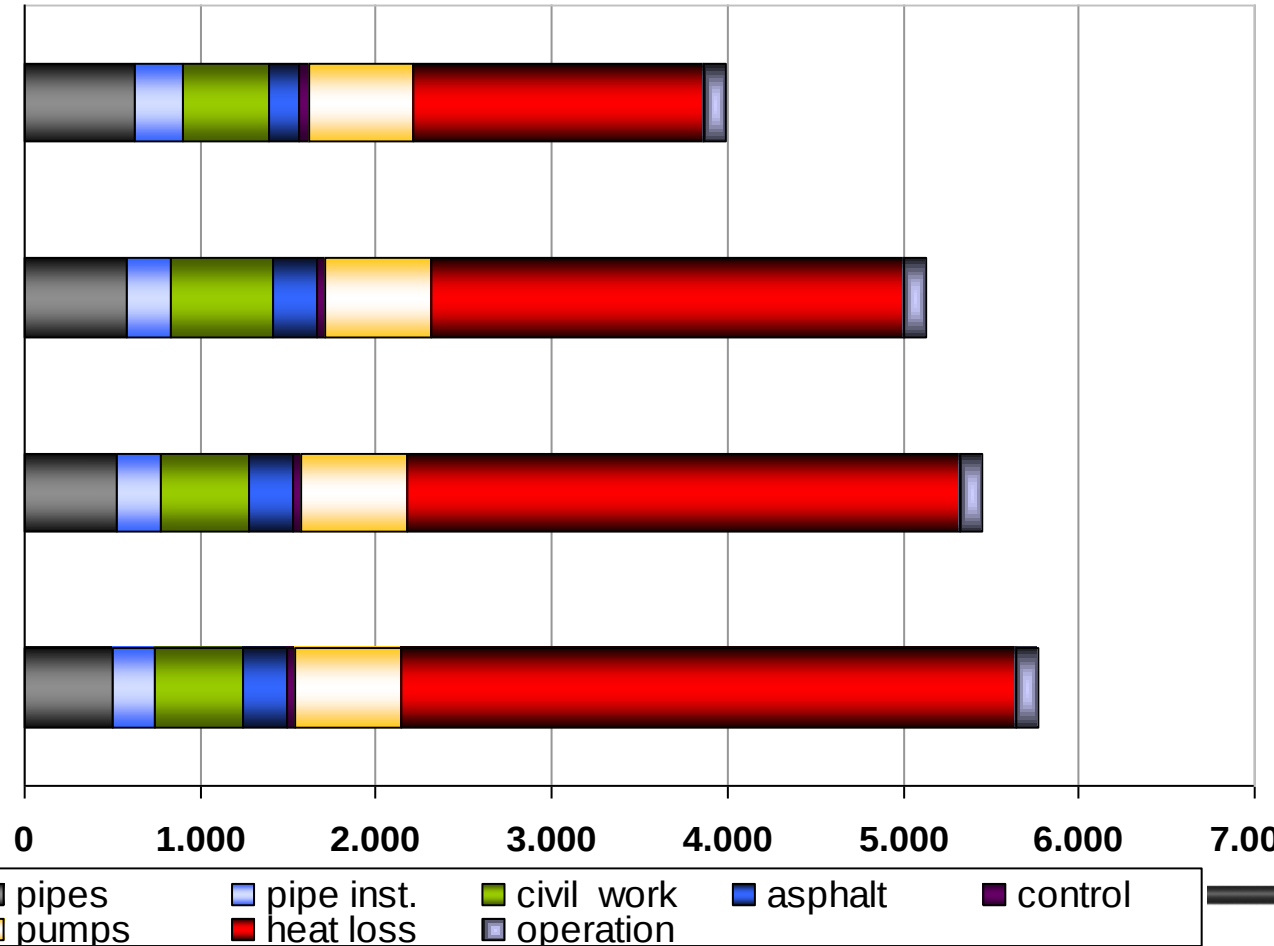
OPEX savings

Twin S2 conti
w. barrier

Series 2 conti
w. barrier

Series 1 conti
w. barrier

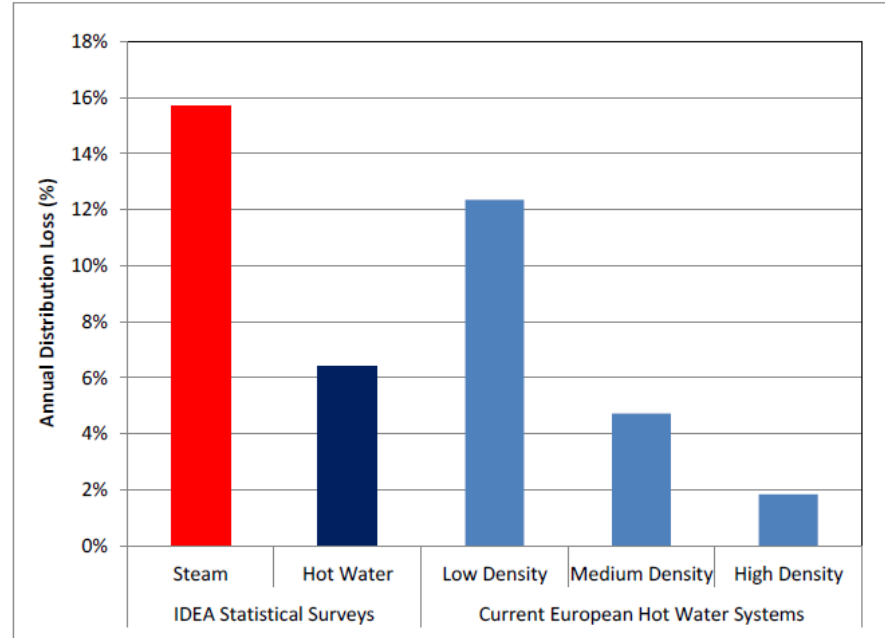
Series - 1 pair
traditional
no barrier



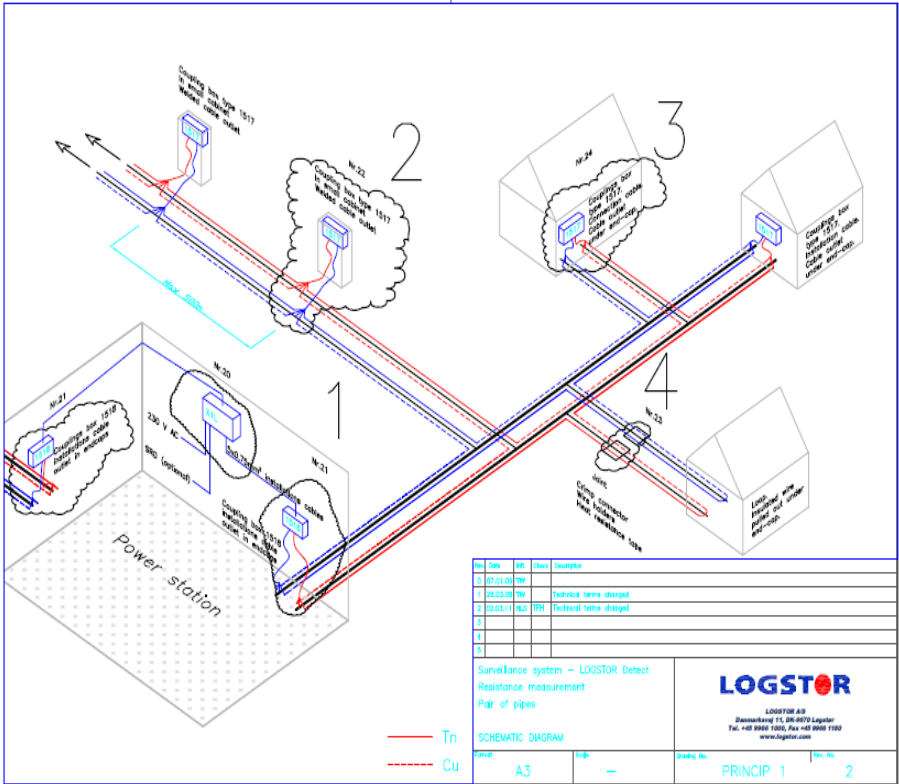
Hot water vs. steam distribution

- Lower capital costs
- Low distribution losses
- Reduced maintenance costs
- Enables access to a wider range of renewable and waste heat thermal resources
- Storable, thus facilitating technically or economically intermittent resources

Distribution Losses



System longevity secret : alarm system- quality joint- water treatment



LOGSTOR Value Proposition to campuses, references

- **Stanford University**
 - Part of Stanford Energy System Innovations program
 - Meet growing energy needs while cutting costs and emissions
 - New CHP energy center, production of power, heat and cooling
 - Steam to hot water conversion
 - 24 miles of preinsulated pipes in dn50-dn600
 - Installed in 2013-14
- **University of British Columbia**
 - Establish a sustainable and energy efficient energy system
 - Steam to hot water conversion project
 - Combination with CHP based on renewable energy sources
 - 20 km of preinsulated pipes in dn32-dn400
 - Installation during 2014-2016

