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ASOCIACIJA

Heat transmission networks in Lithuanian DH sector

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Length of district heating tranches

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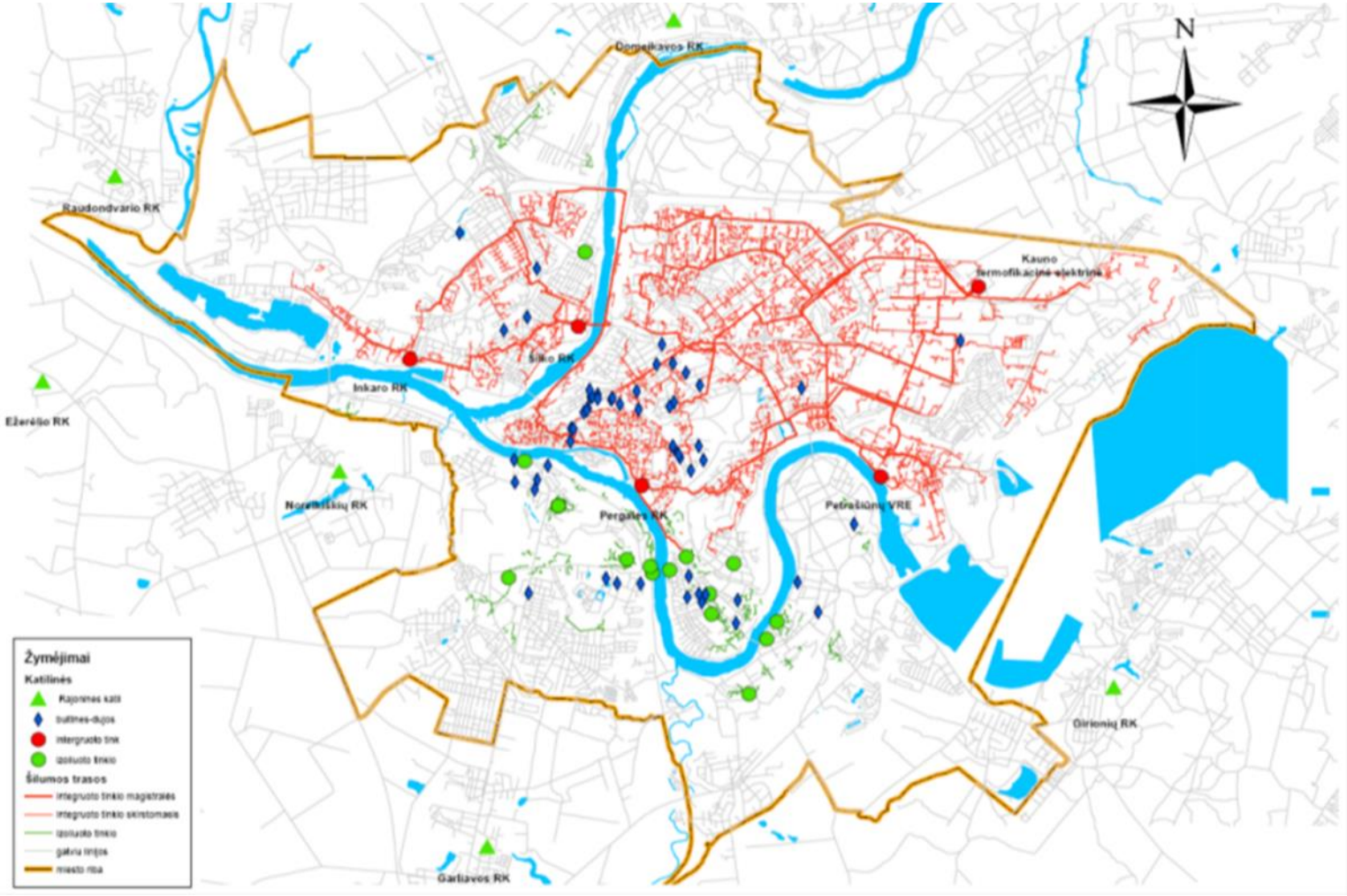
District heating in Lithuania

Annual DH production	**~ 9 TWh**
Heat losses in DH networks	**~14 %**
Used heat production capacity	**~ 3200 MW**
The length of DH pipelines	**3053 km**



DH networks have been installed in all cities and towns

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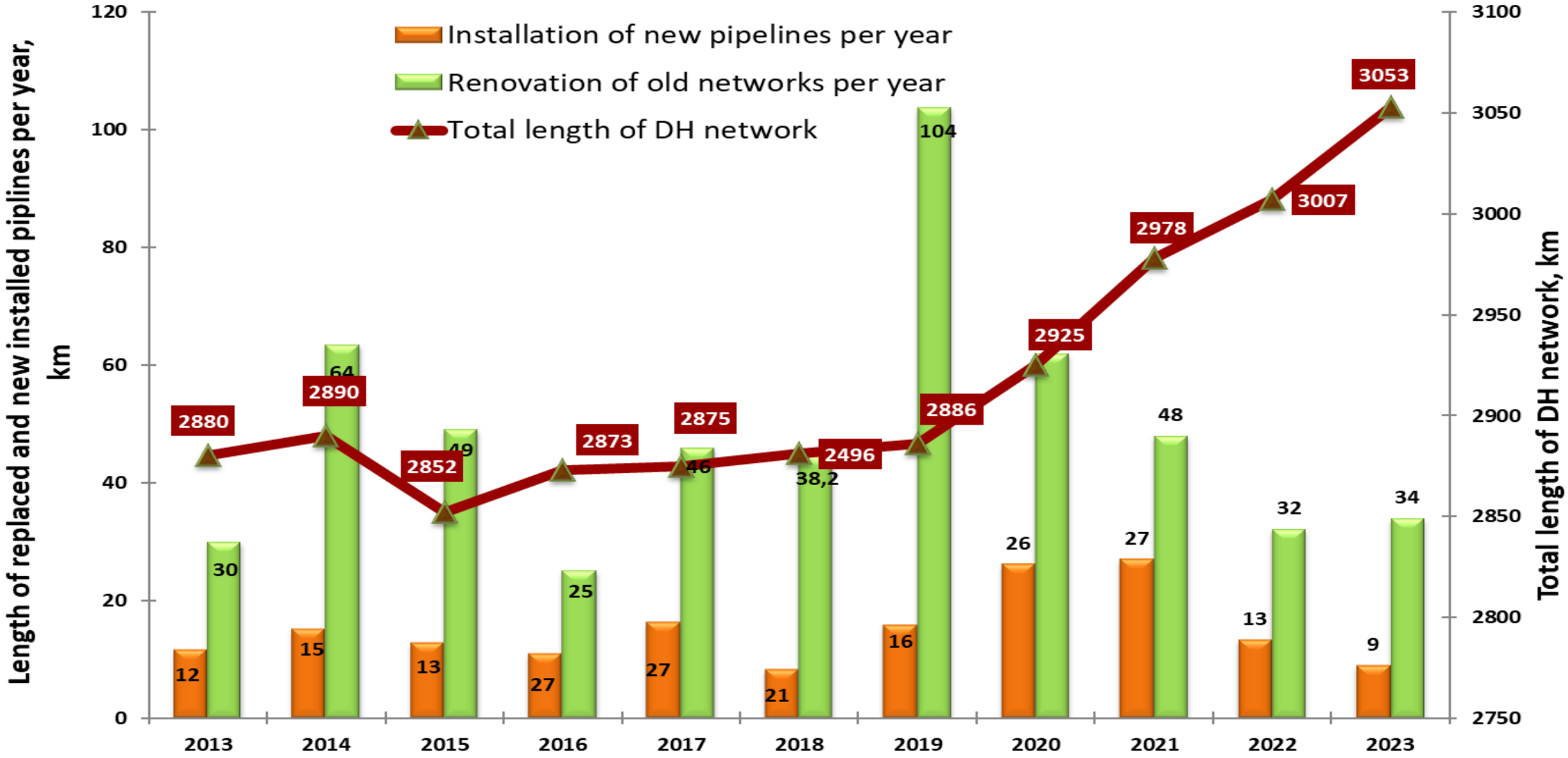
DH network in Lithuania



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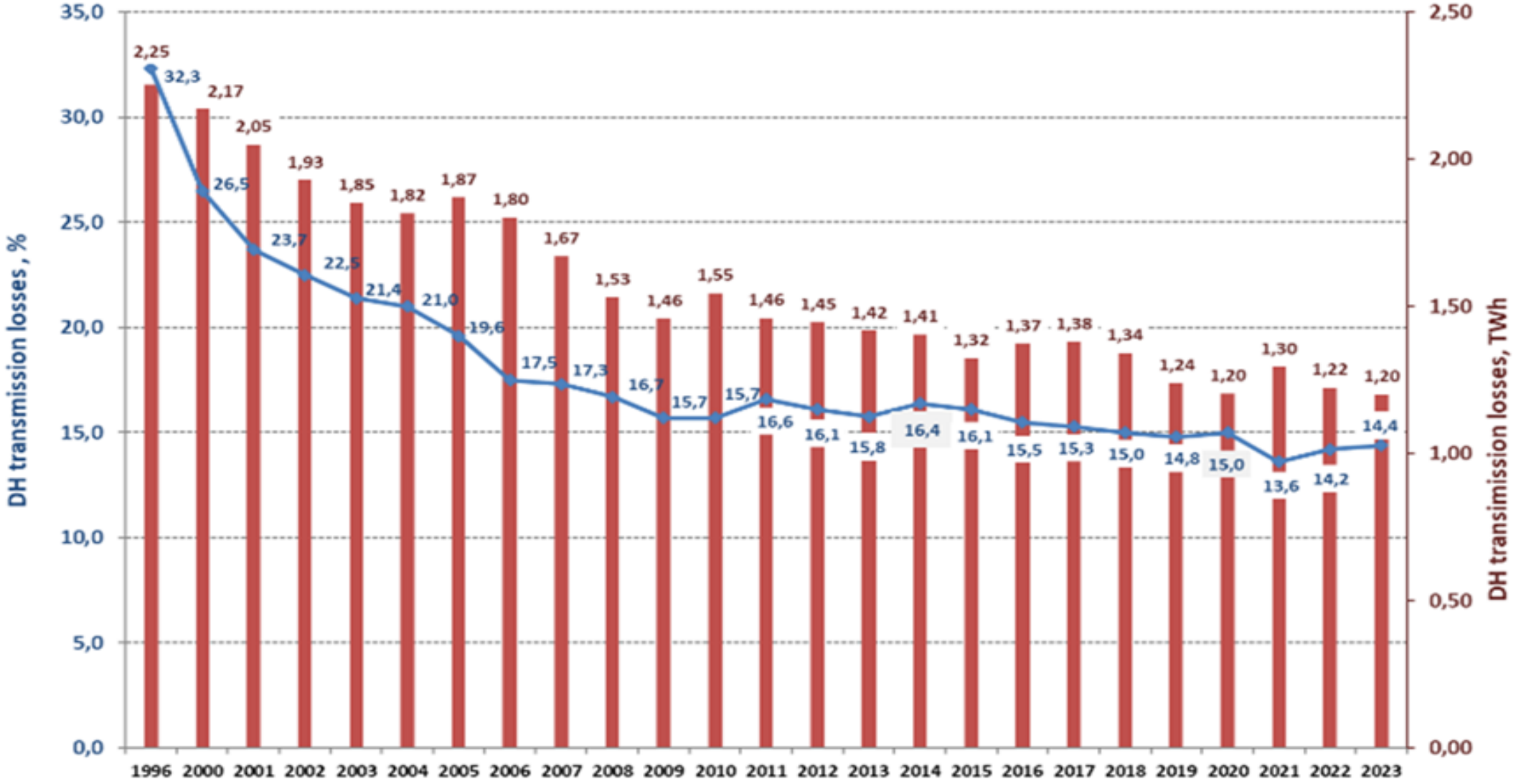
Heat losses in the DH networks



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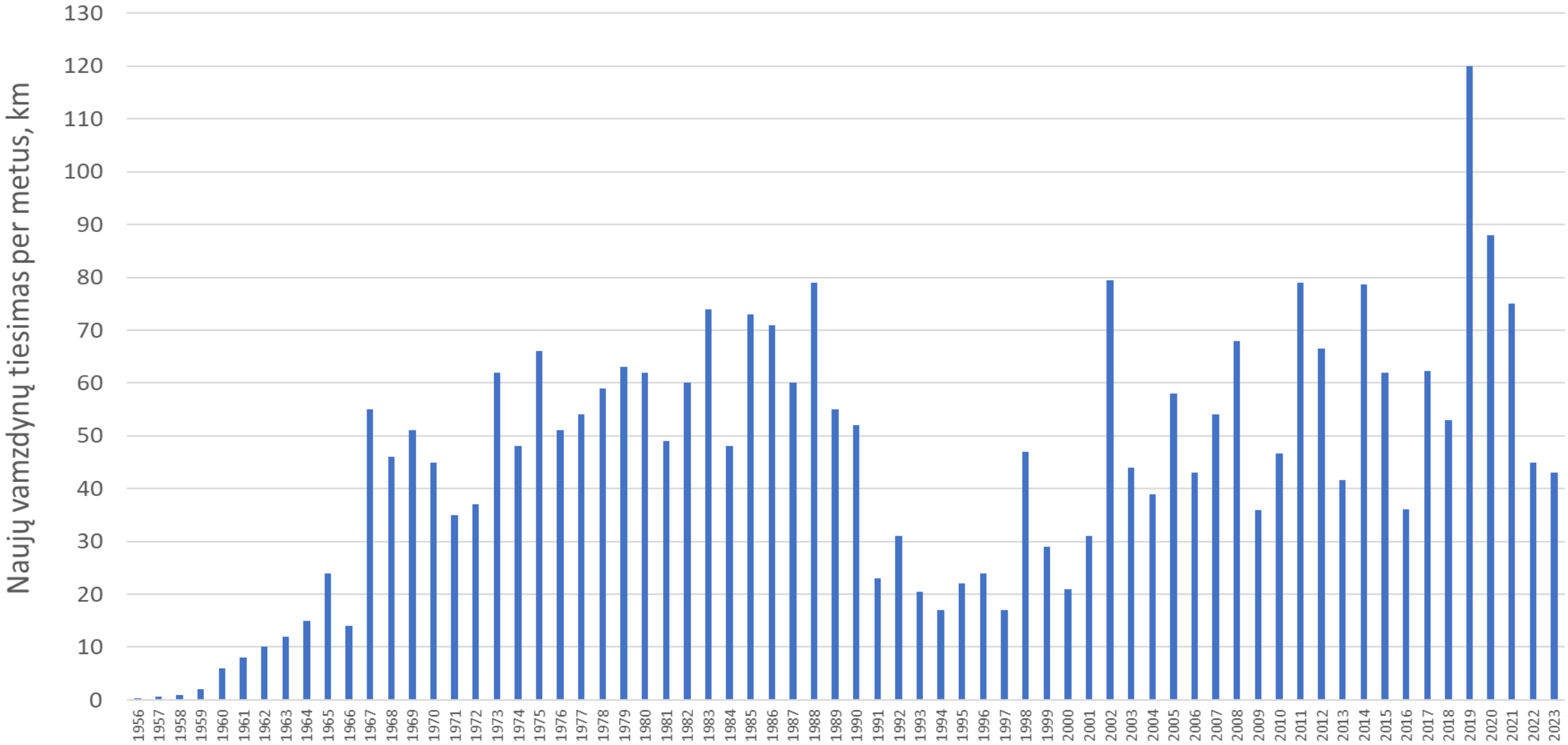
Annual replacement and expansion of DH networks, km



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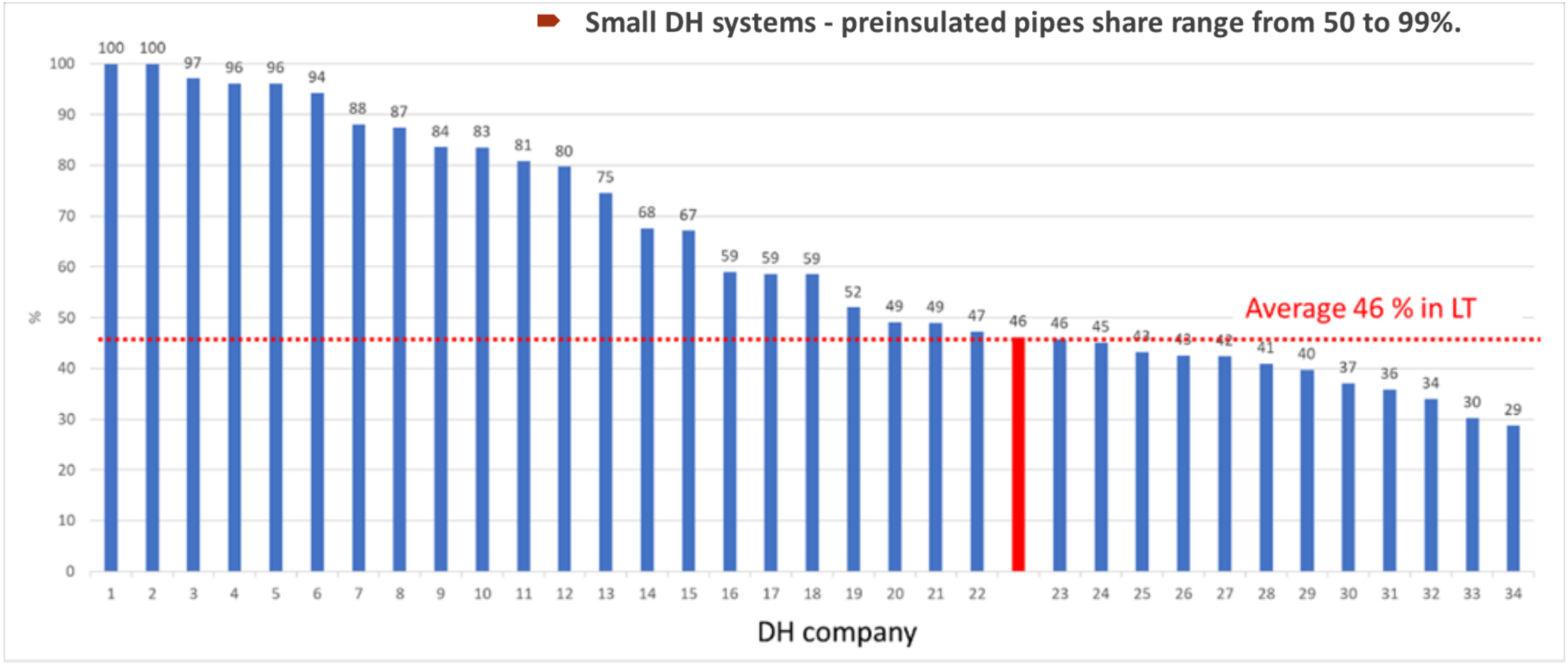
Share of new pipelines in separate DH company, %

- Large DH networks - preinsulated pipes share range from 35 to 50%.
- Small DH systems - preinsulated pipes share range from 50 to 99%.



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Management of DH supply reliability

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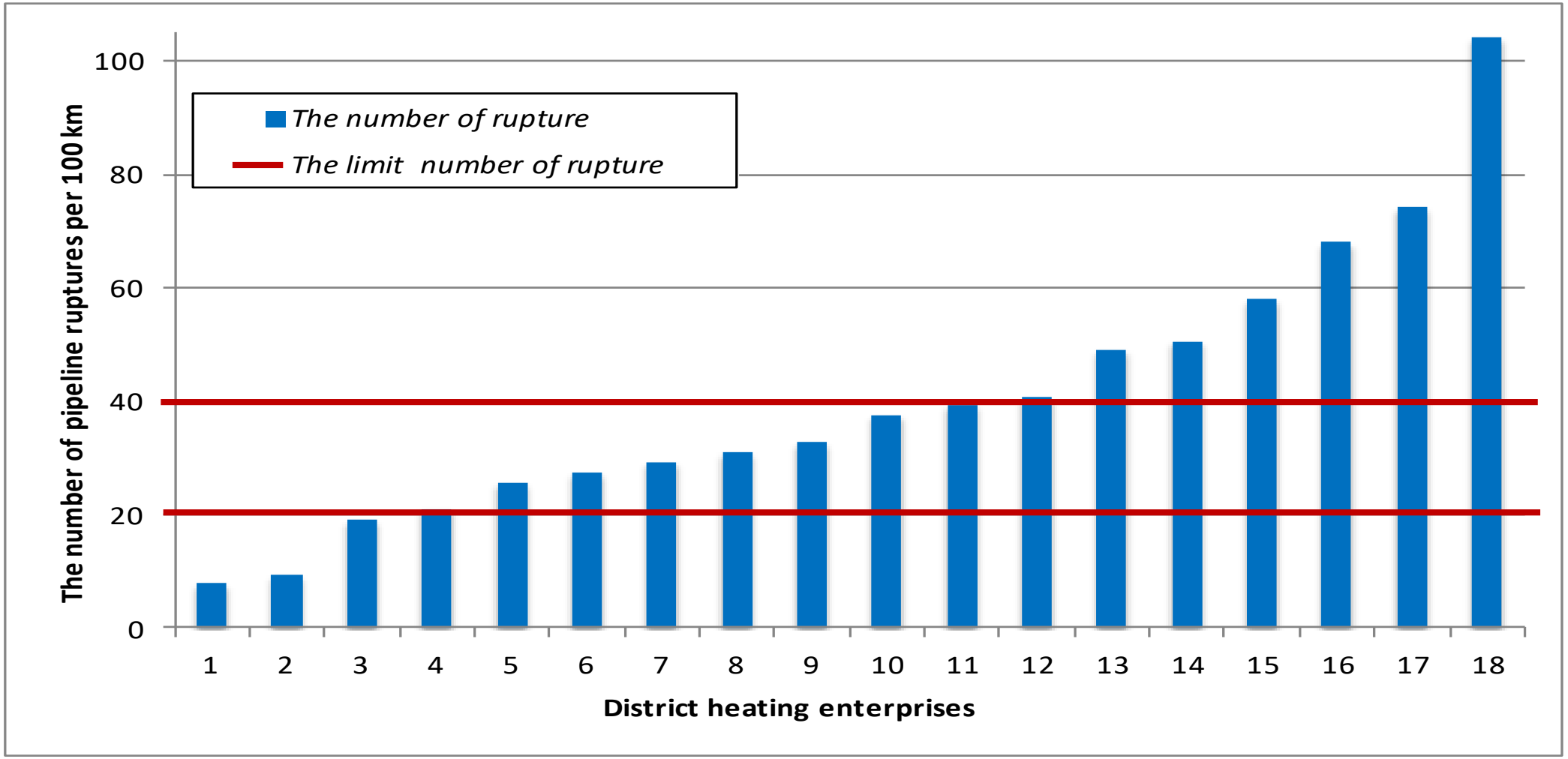
Most failures caused by external corrosion



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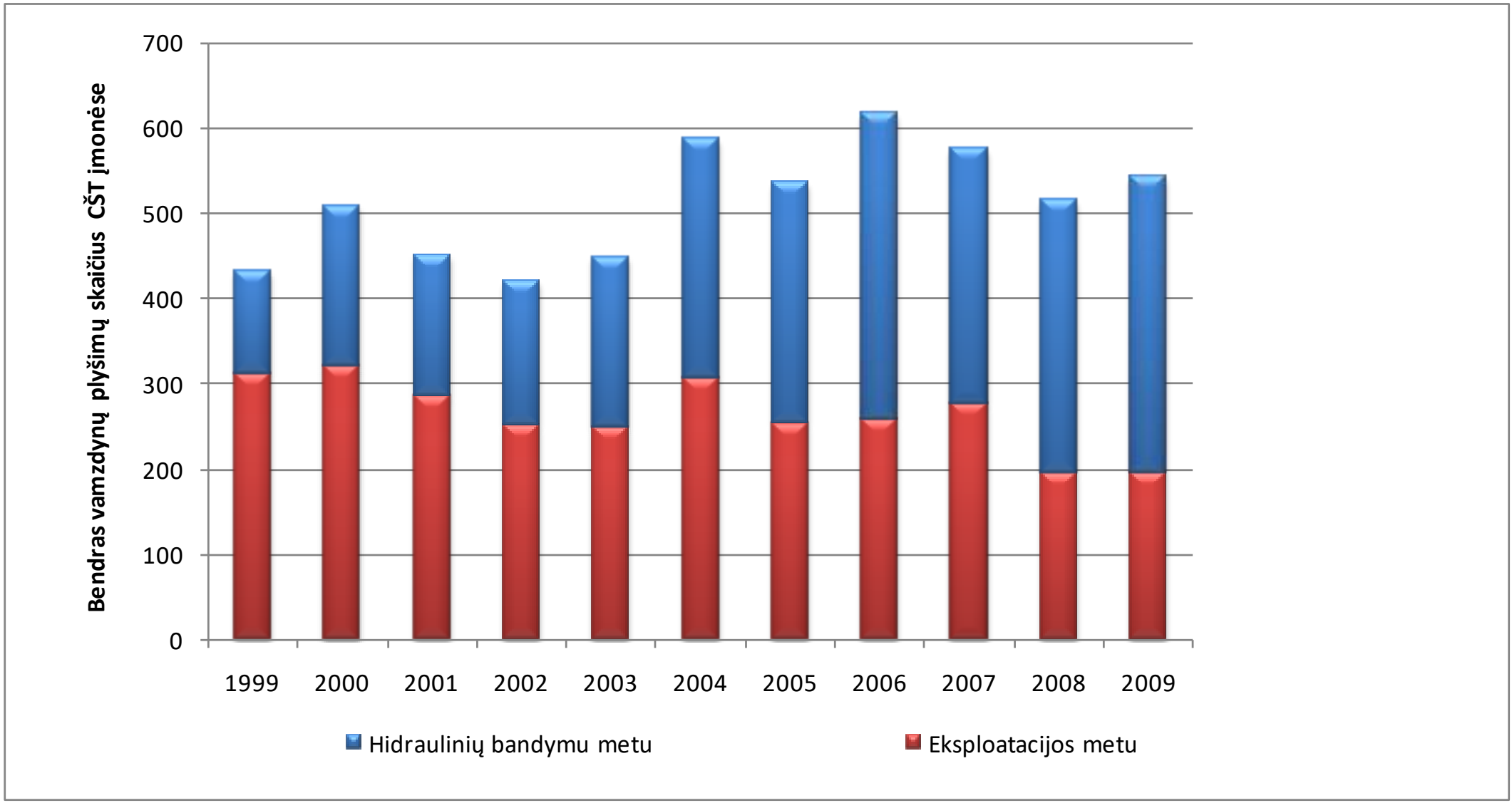
Cracks of tubes during testing period (blue) and in the following years (red)



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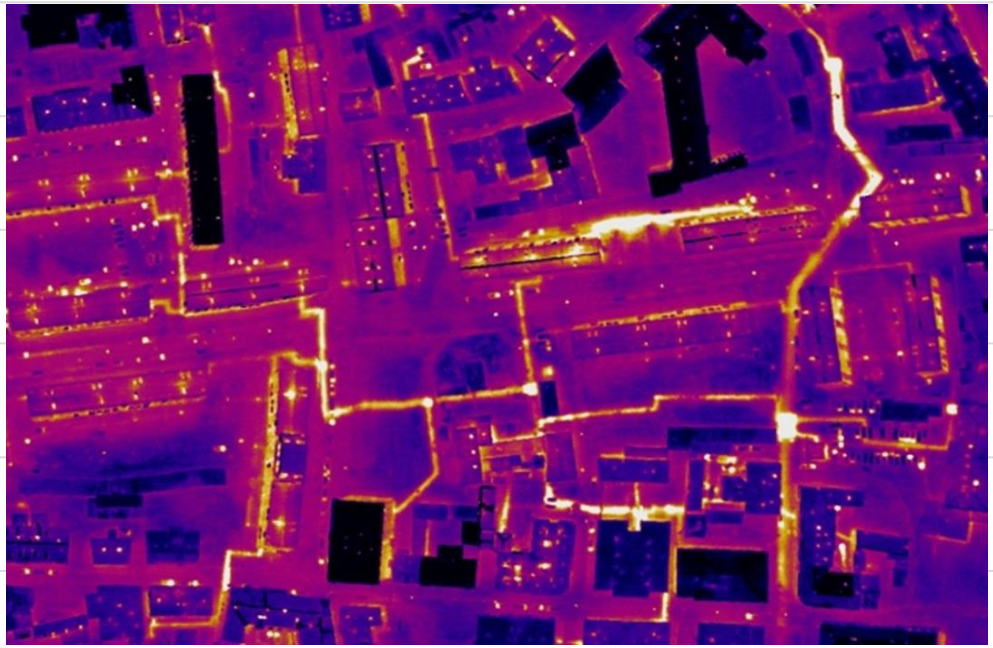
RELATIVE NET WATER LOSSES IN THE DH NETWORKS



Regulation of pressure testing

- The reliability of underground pipelines is assessed according to the results of the annual hydraulic tests.
- Pressure test **must** be carried out **annually** in each DH network
- **Prior to the start of the heating season**, repaired networks must be hydraulically tested for leaks and strength.
- Each section of the district network must be tested at a pressure of **1.25 working pressure**, **but not less than 16 bar**.
- **The first hydraulic test** for preinsulated pipelines is performed after **10 years after their start-up**

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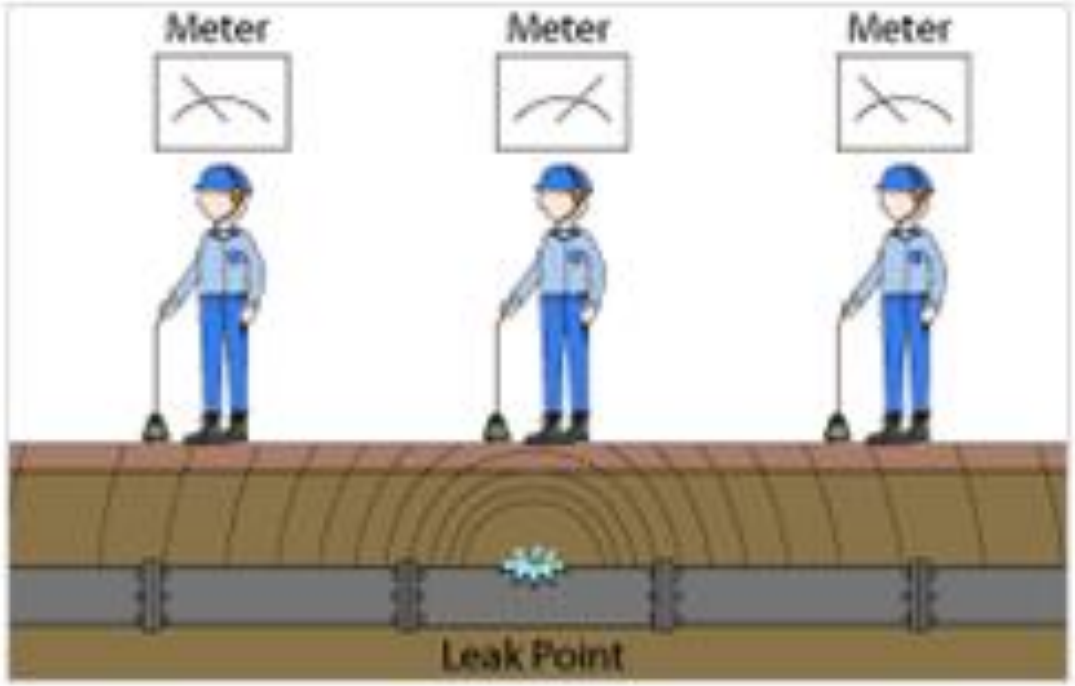
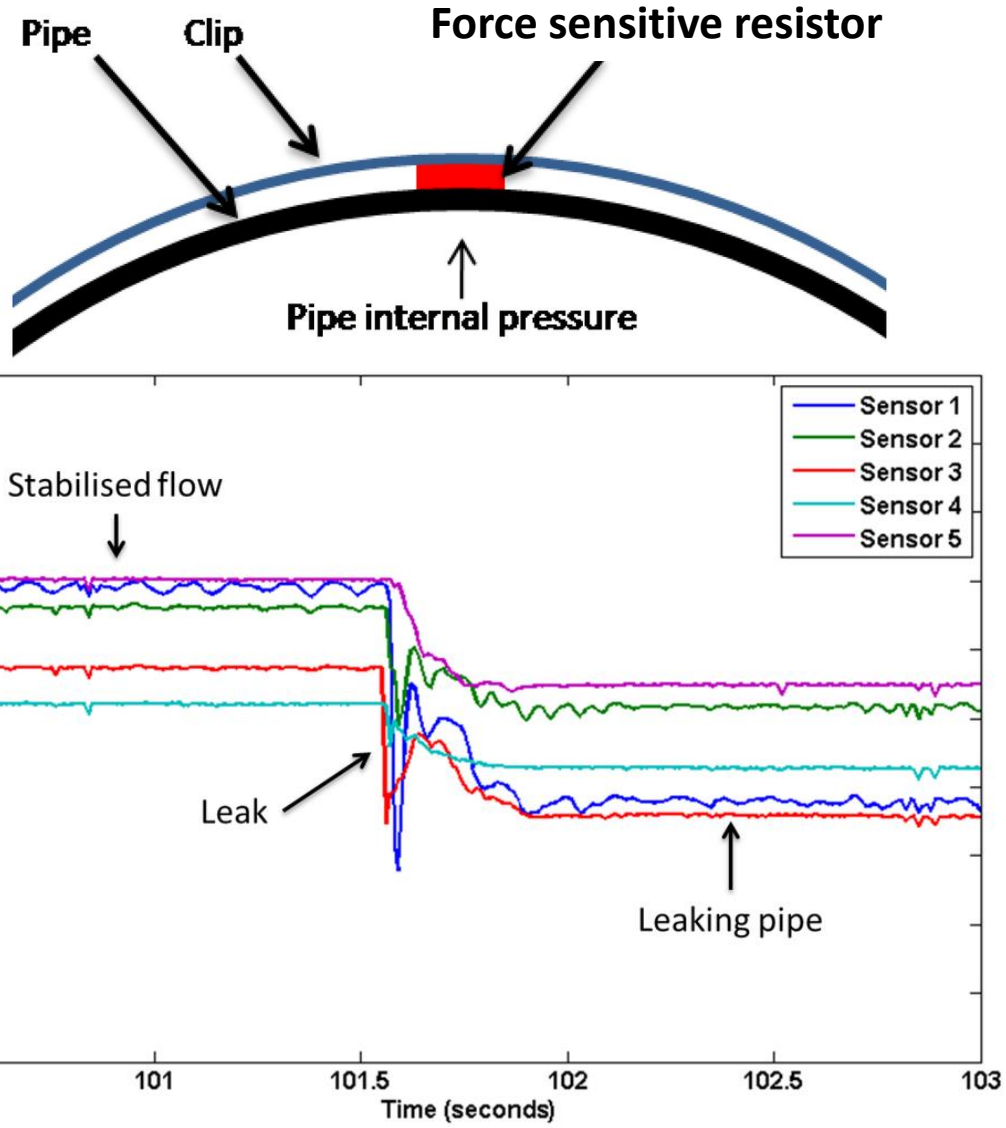
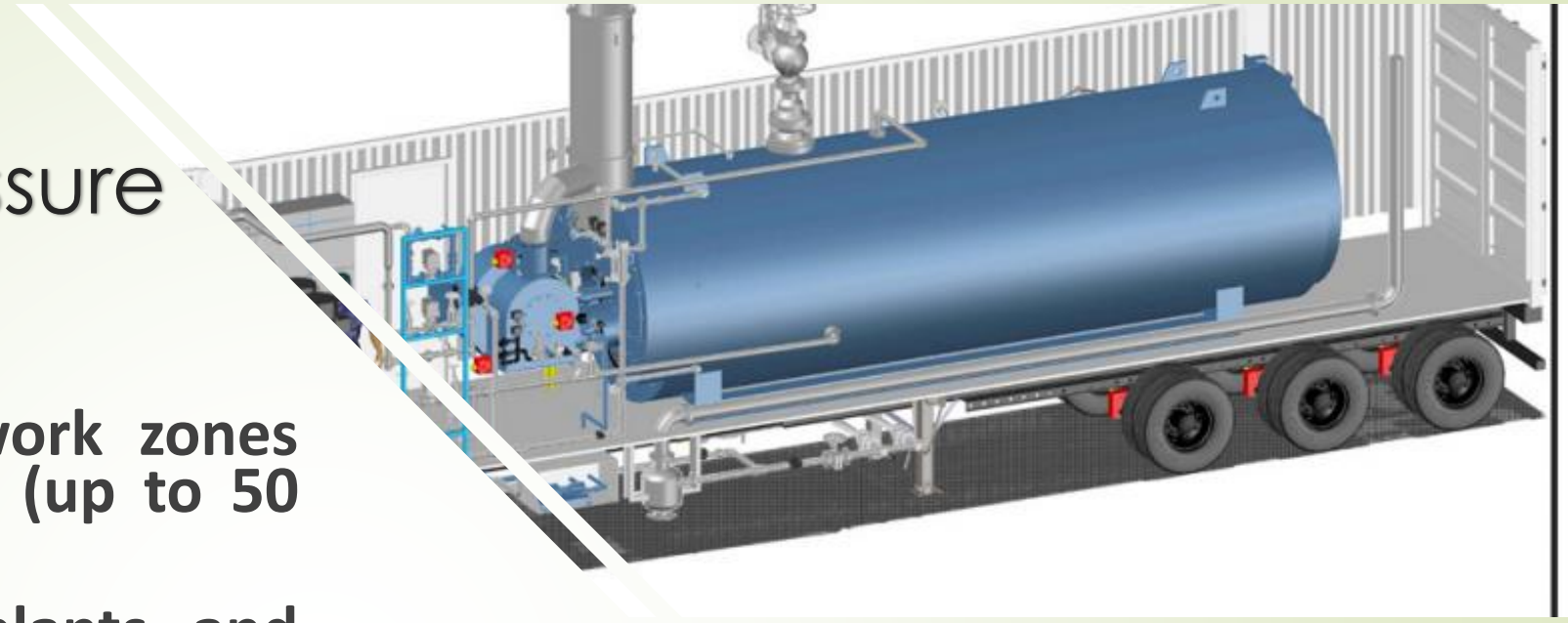
LEAK DETECTION
(acoustic devices, pressure monitor)





Optimization of pressure testing process

- Pressed separate DH network zones using mobile water pumps (up to 50 zones)
- Usage of mobile boiler plants and heat generators
- Temporary heat pipelines
- Hot water disconnection during testing periods in most companies ranges from 1 to 5 days
- Modern mobile devices applied for leakage detection



Replacement of old tubes

MANAGEMENT OF LIFETIME

prevention of scaling, corrosion...

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Lithuanian DH water quality norms

		Requirements for make-up water	Requirements for net water
pH		8.5-9.5	8.5-9.5
Free carbon dioxide		0	0
Oxygen	$\mu g/l$	<50	<20
Suspended solids	mg/l	<5	<5
Oil products	mg/l	<1	<1
Iron concentration	$\mu g/kg$	unregulated	<50
Hardness	$\mu g - ekv/dm^3$	unregulated	unregulated
Ammonia concentration	mg/kg	unregulated	unregulated
Copper concentration	$\mu g/kg$	unregulated	unregulated

*The required pH of water is maintained by dosing ammonia.

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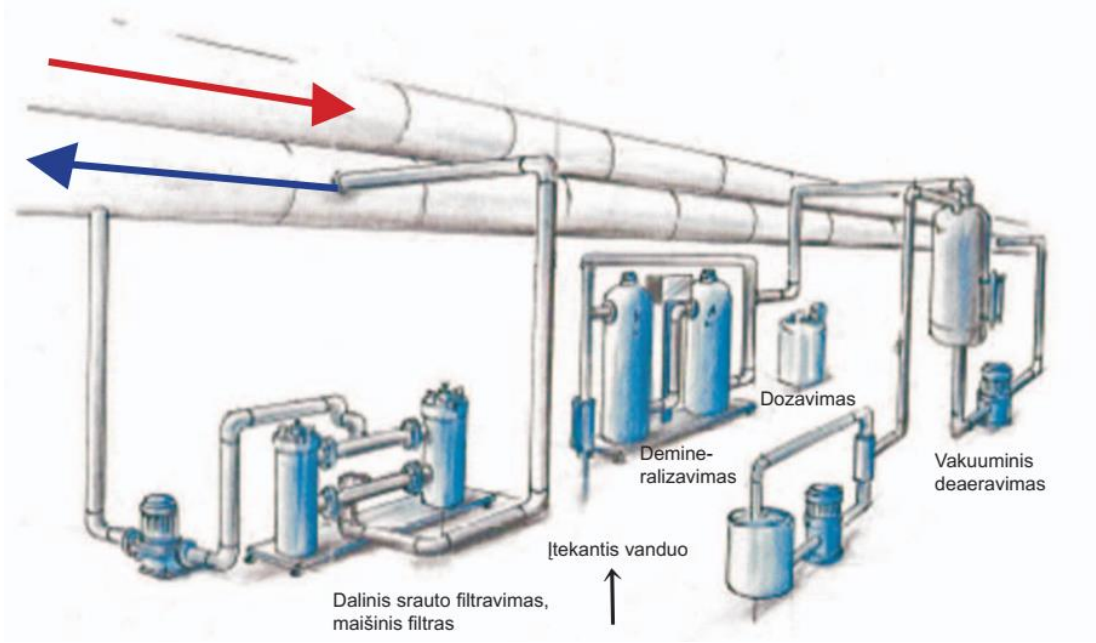
Technologies applied for water treatment in DH systems



Filtration – Primary filtration, coagulation-filtration, fine filtration, etc.
Water softening – Na or H cation exchange filters.
Demineralization - Reverse osmosis (RO) device.
Atmosferic, vacuum or membrane type deaerators
Dosage – additives for passivation layer, pH value maintained 9.8 ± 0.2, oxygen removal, descaling...
Additives of water treatment chemical complexes to water in small DH networks.

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MONITORING OF NET WATER QUALITY

- **Constant monitoring -** dissolved oxygen, water pH, electrical conductivity?
- **Periodic measurements:**

- Dissolved oxygen
- pH
- iron content
- hardness
- free carbon dioxide
- petroleum products
- suspended solids
- oxidation

- **Corrosion rate?**

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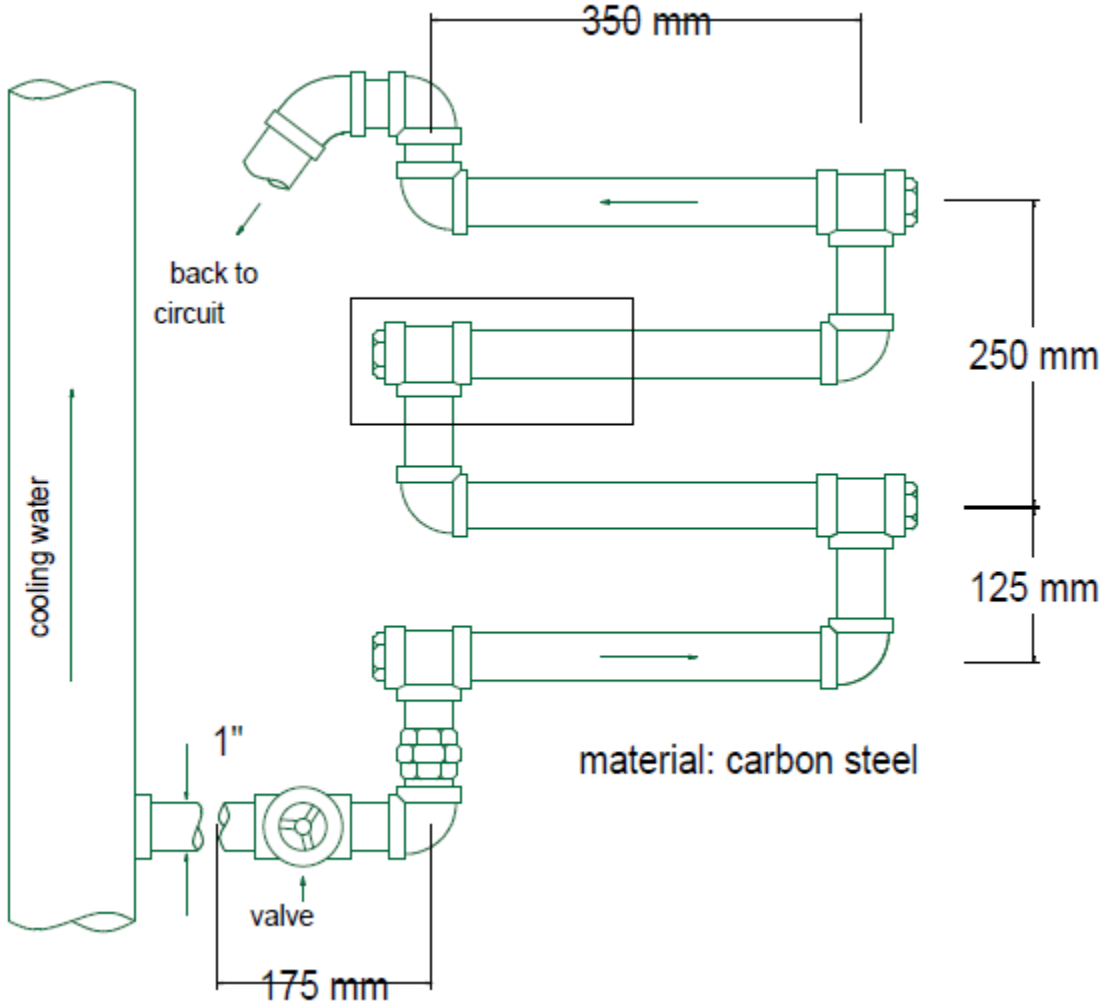
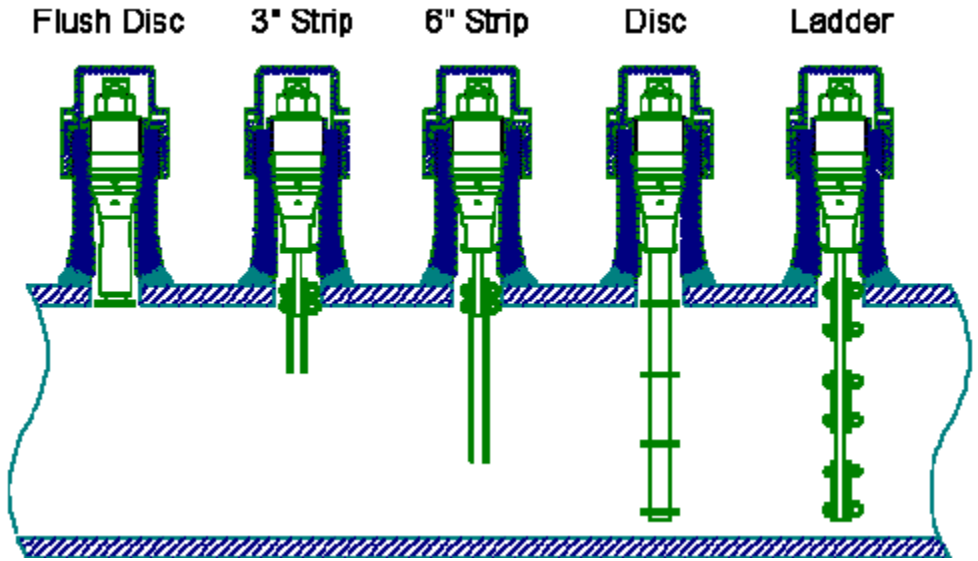
Corrosion RATE MEASUREMENT
simplest - most popular method





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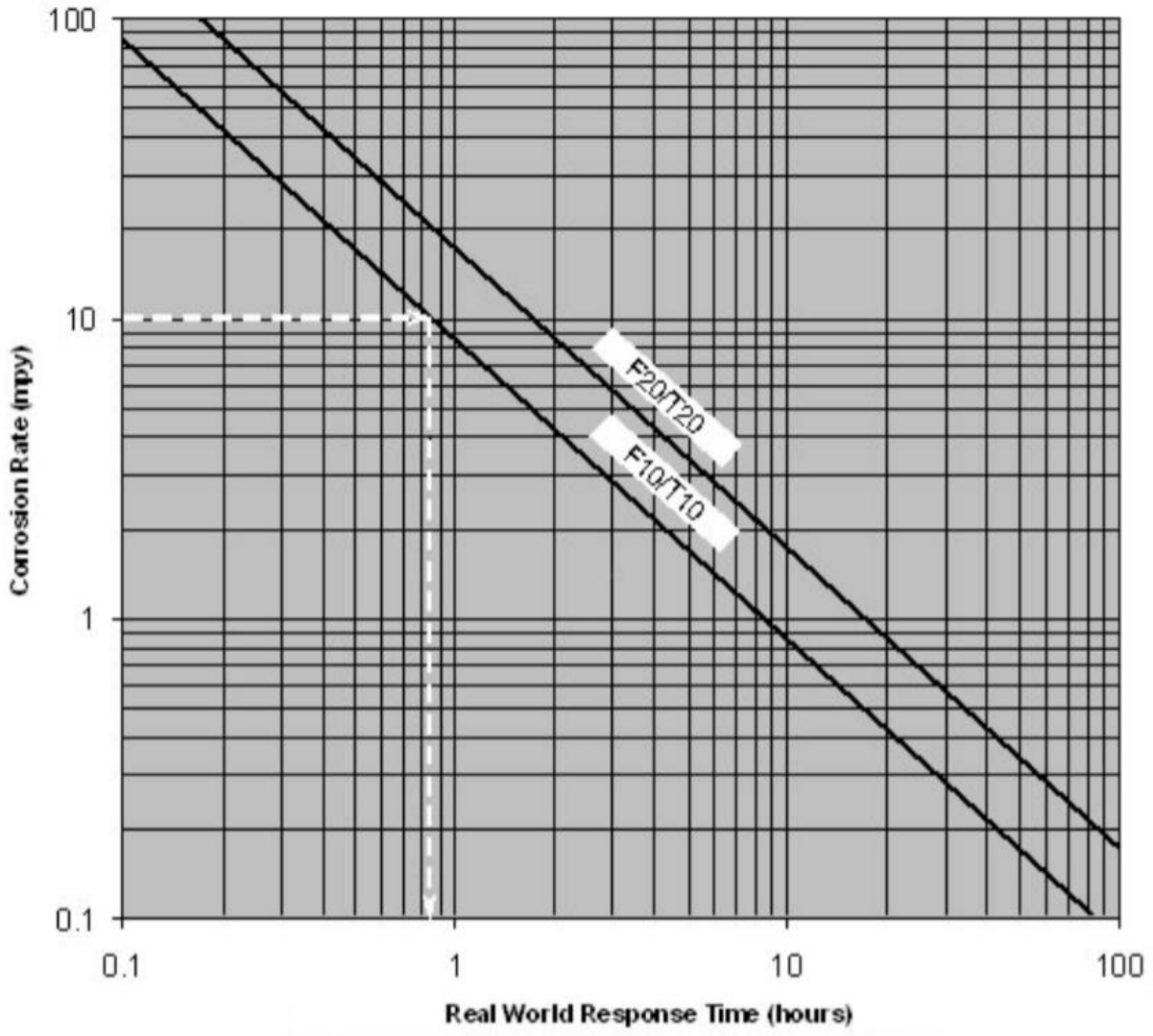
Continuous measurement on-line of steel corrosion rate



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Relation between operational temperature and ageing of steeltubes

1 - Expected thermal life (L), days;

2 - Expected thermal life (L), years;

3 - 50 years; 4 - 30 years;

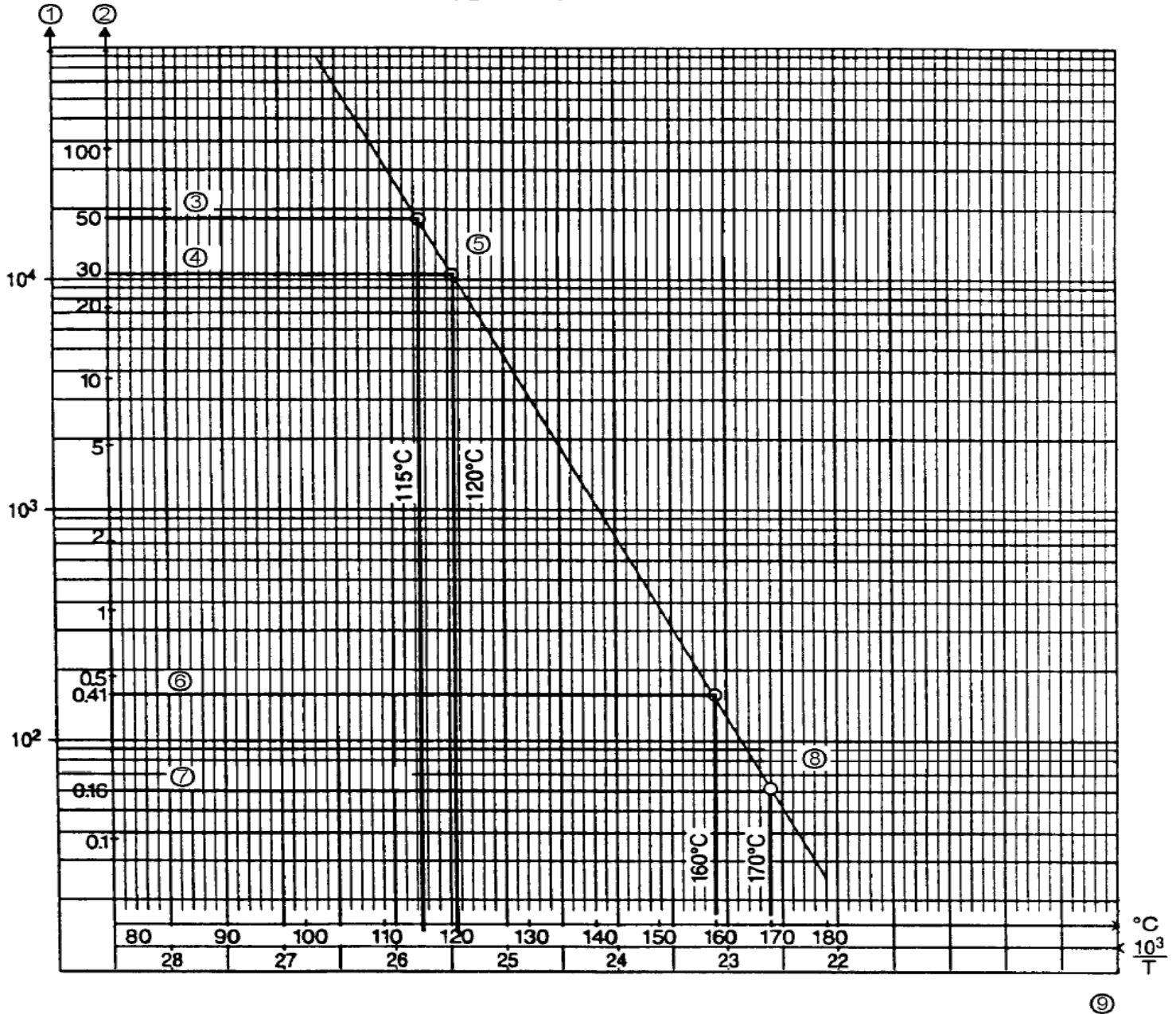
5 - Actual operation conditions;

6 - 3 600 h; 7 - 1 450 h;

8 - Ageing test conditions;

9 - Continuous operating temperature (Θ)

Reducion of water temperature regimes – typically 90°C/65°C



Replacement of group heat substations to individual ones
2 pipelines instead of 4

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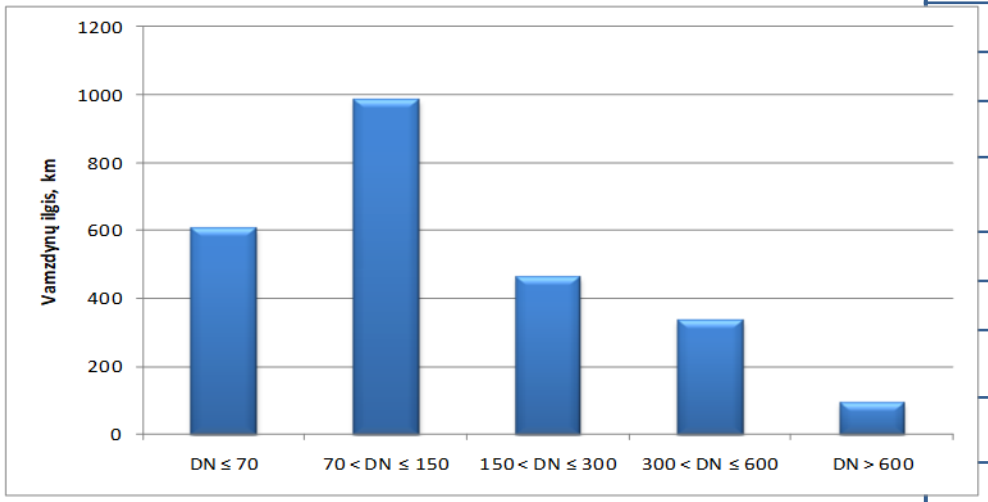
Critical tubes wall thickness at 110 °C & 16 bar simulated by 3 methods



DN, mm	$s_{krit.,16\ bar}$, mm, V. Feodosjevo "Medžiagų atsparumas"	$s_{krit.,16\ bar}$, mm, EN 13480	$s_{krit.,16\ bar}$, mm, AutoPIPE
15	0,14	0,12	0,14
20	0,18	0,17	0,19
25	0,23	0,21	0,25
32	0,27	0,25	0,29
40	0,32	0,30	0,35
50	0,40	0,38	0,44
65	0,53	0,50	0,58
80	0,61	0,59	0,68
100	**0,74**	**0,72**	**0,82**
125	0,91	0,88	1,01
150	1,09	1,05	1,21
200	**1,49**	**1,45**	**1,66**
250	1,87	1,81	2,07
300	**2,21**	**2,15**	**2,47**
350	2,57	2,50	2,86
400	2,88	2,82	3,23
450	3,24	3,18	3,64
500	3,57	3,51	4,02
600	4,25	4,17	4,77

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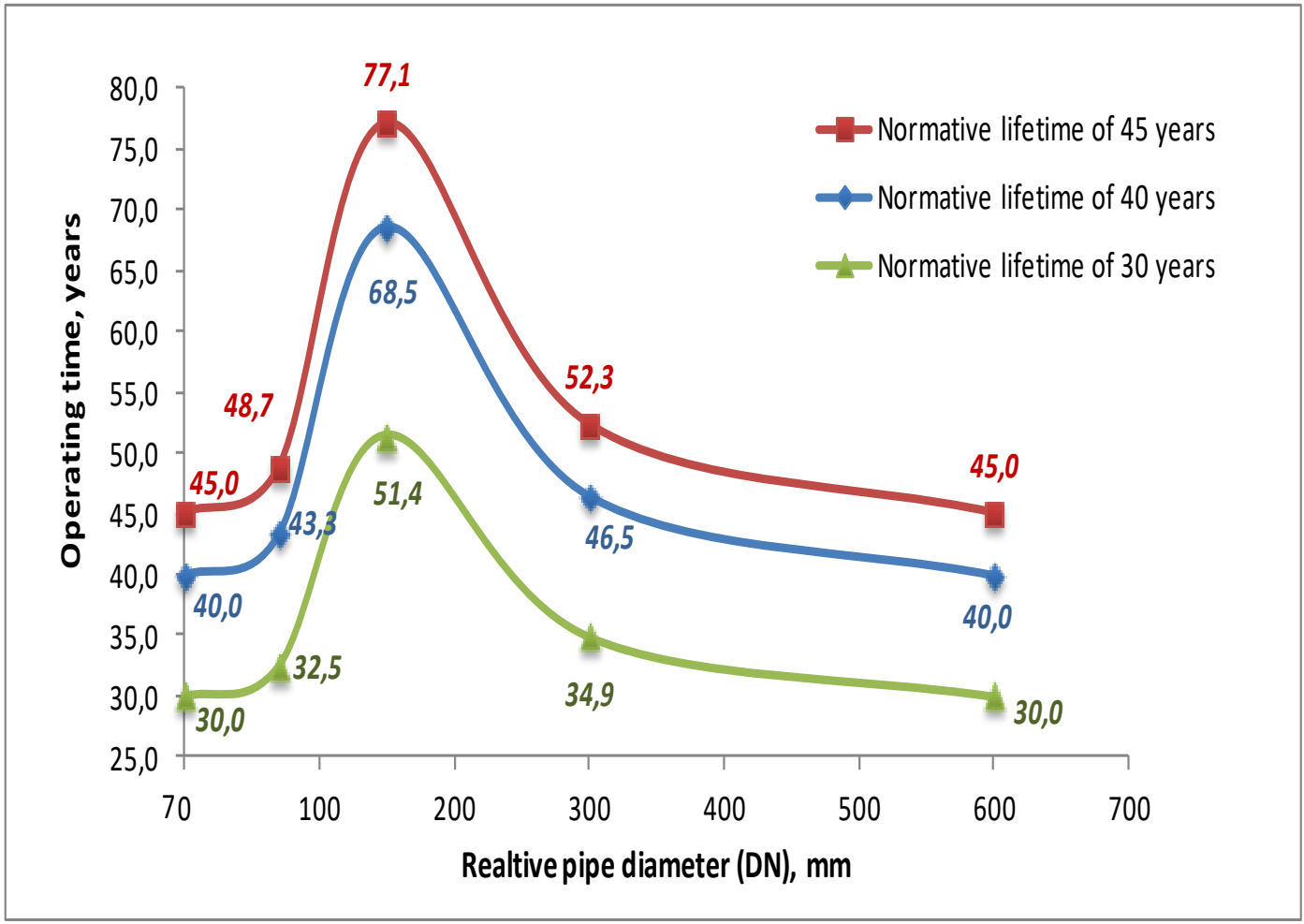
Expected lifetime of „soviet time“ tubes at 110 °C and 16

Corrosion intensity	Steel corrosion rate, mm/year
None	0-0,02
Low	0,02-0,04
Medium	0,04-0,05
High	0,05-0,2
Emergency	>0,2



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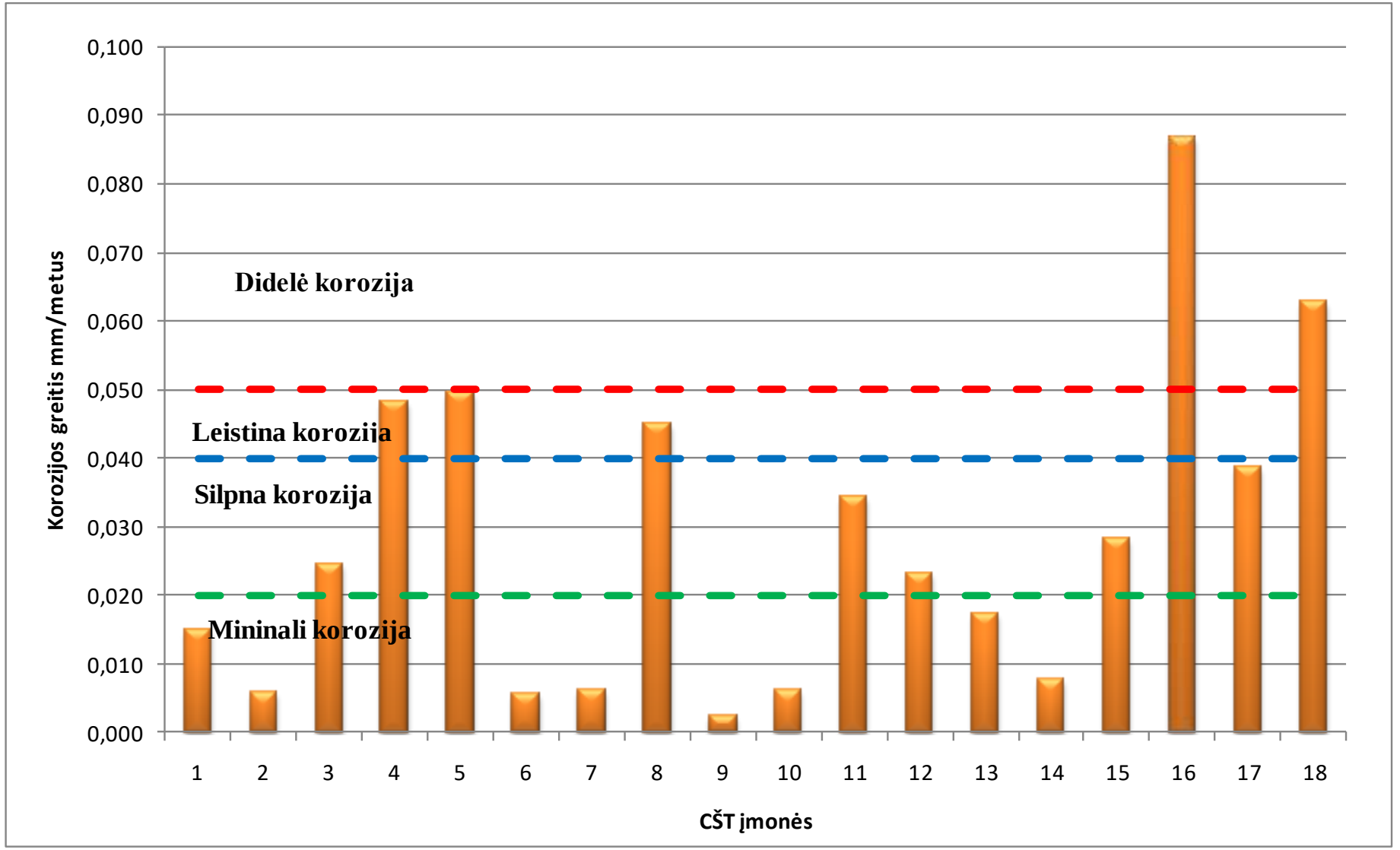
Corrosion rate in the certain DH networks



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MONITORING OF REALIABILITY AND LIFETIME OF TUBES

- Technology applied for water treatment
- Parameters of water maintained in the DH network
- Heat supply regime (temperature, interruptions)
- Inner corrosion velocity
- Annual volume of filled make-up water (dynamic)
- Statistics on ruptures in the tube system
- Typical life time of pipelines
- Statistics on tubes failure reasons
- Share of renewed pipelines in the DH network
- Other related information

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IMPROVEMENTS REQUIRED

- Monitoring of DH networks
- Fast identification of leaking tubes
- Prevention of leakages due to external reasons
- Water treatment program and minimization of inner corrosion risk
- Diagnostic, forecast and planning of tube replacement
- Lowering of temperature regimes in the DH networks
- Innovative technologies, new type devices and materials

UNINTERRUPTED SUPPLY OF HEAT AND HOT WATER

Thank you…

Valdas