DANUBE WATER PROGRAM

IAWD

Smart policies, strong utilities, sustainable services

DWP KNOWNOW

WEBINAR

THE RISING COST OF INACTION

HOW THE ENERGY CRISIS IMPACTS THE WATER SERVICE SECTOR IN THE DANUBE REGION

2 March 2022, 13:30 – 14:45 (CET)

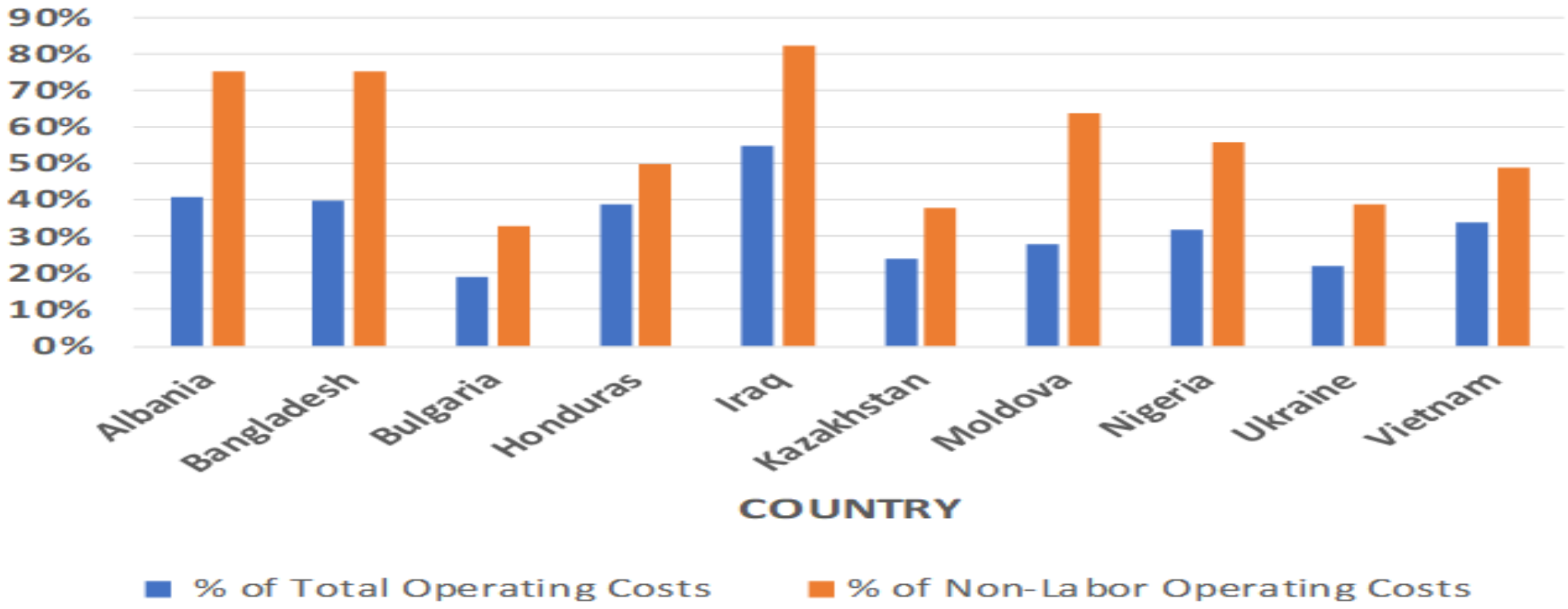
Anecdotes on Water and Energy

- **Panama:** The National Water Utility is the largest consumer of energy in the country.
- **Philippines:** The Manila Water Company serves over 6 million people and has never done a comprehensive energy audit.
- **Ethiopia:** 30 percent of the energy for Addis Ababa is consumed by the water utility (AAWSA).

Status of energy efficiency in water utilities

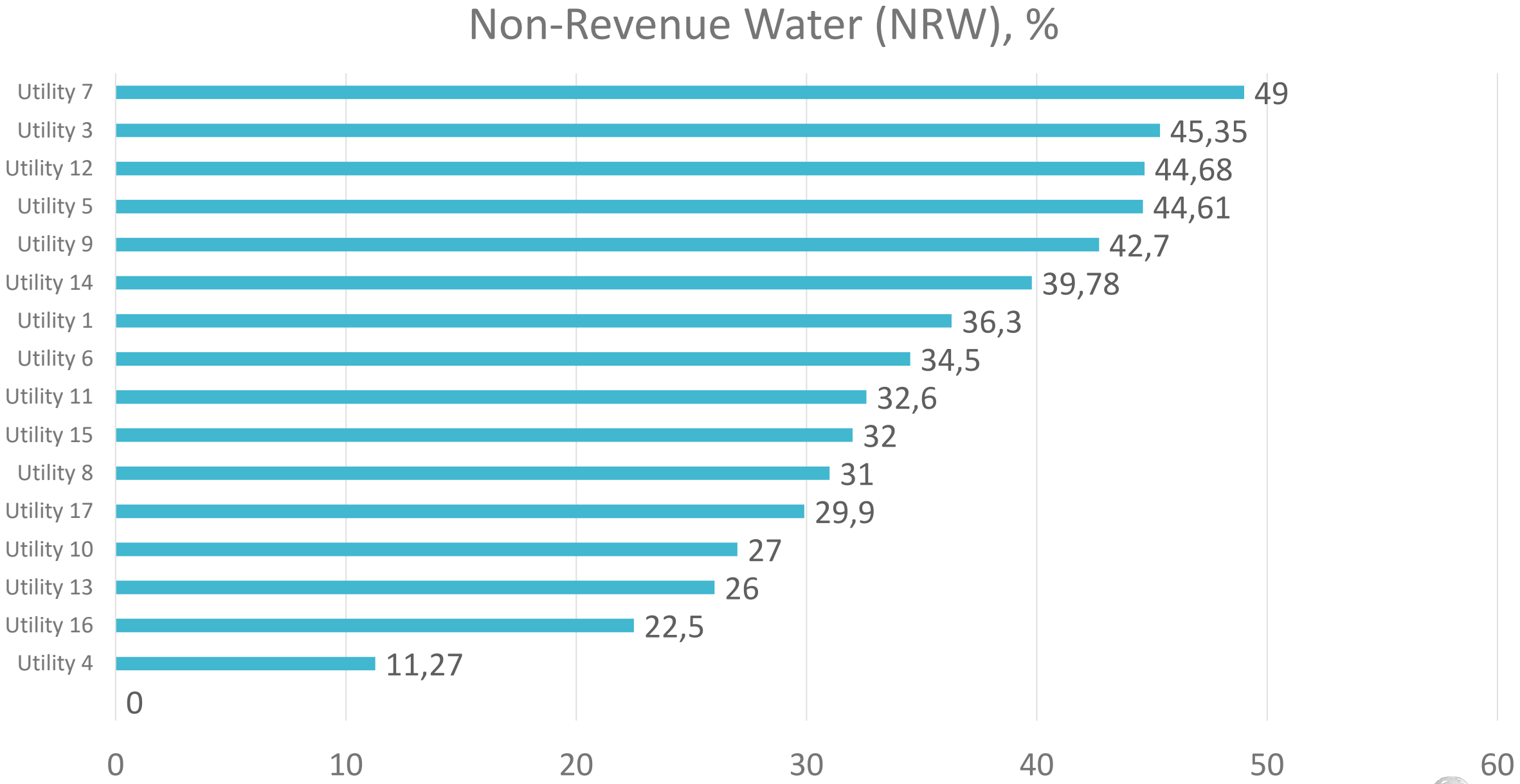
Estimating Energy Use

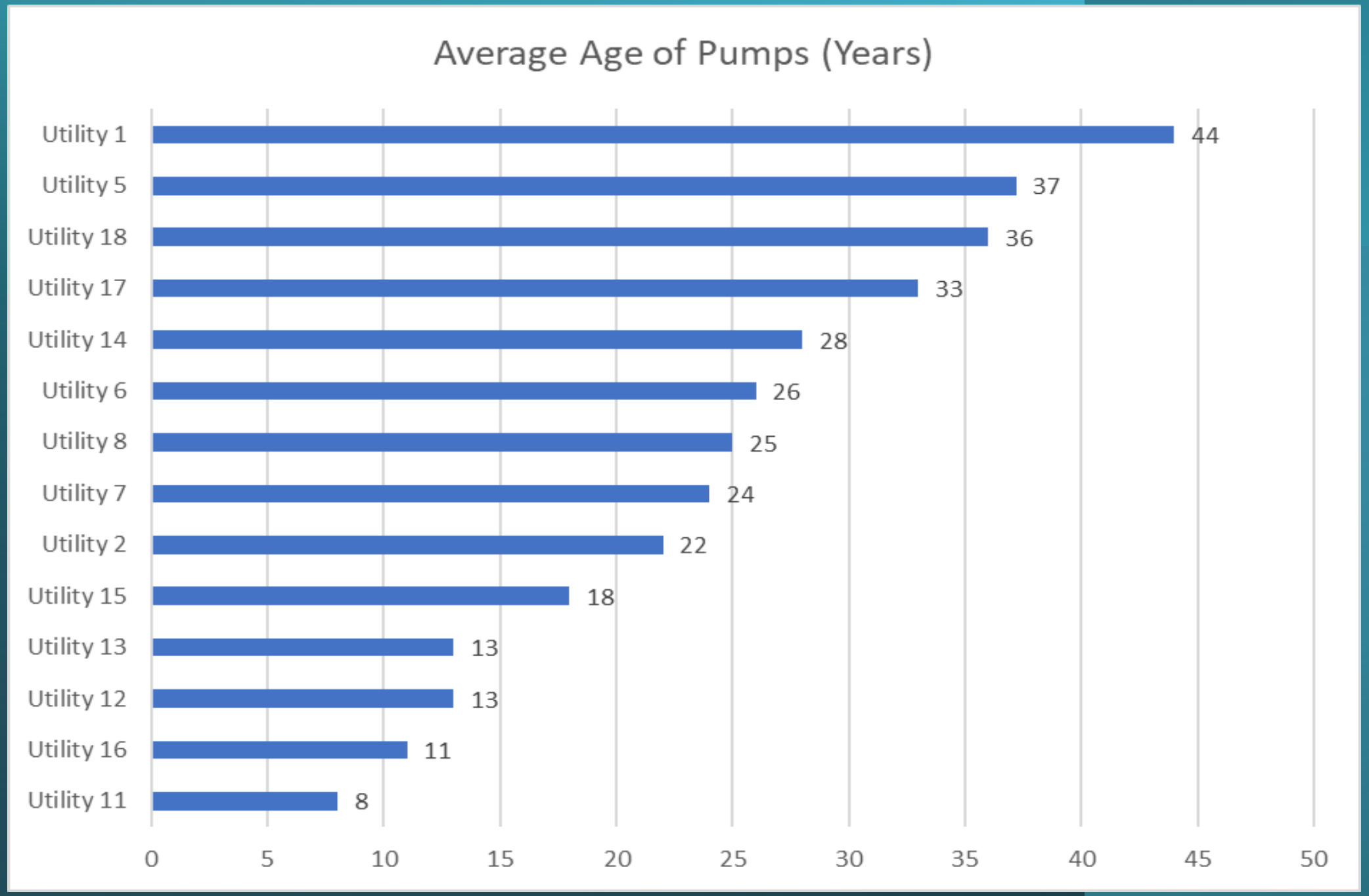
Electricity costs range from 33-82% of nonlabor operating costs.

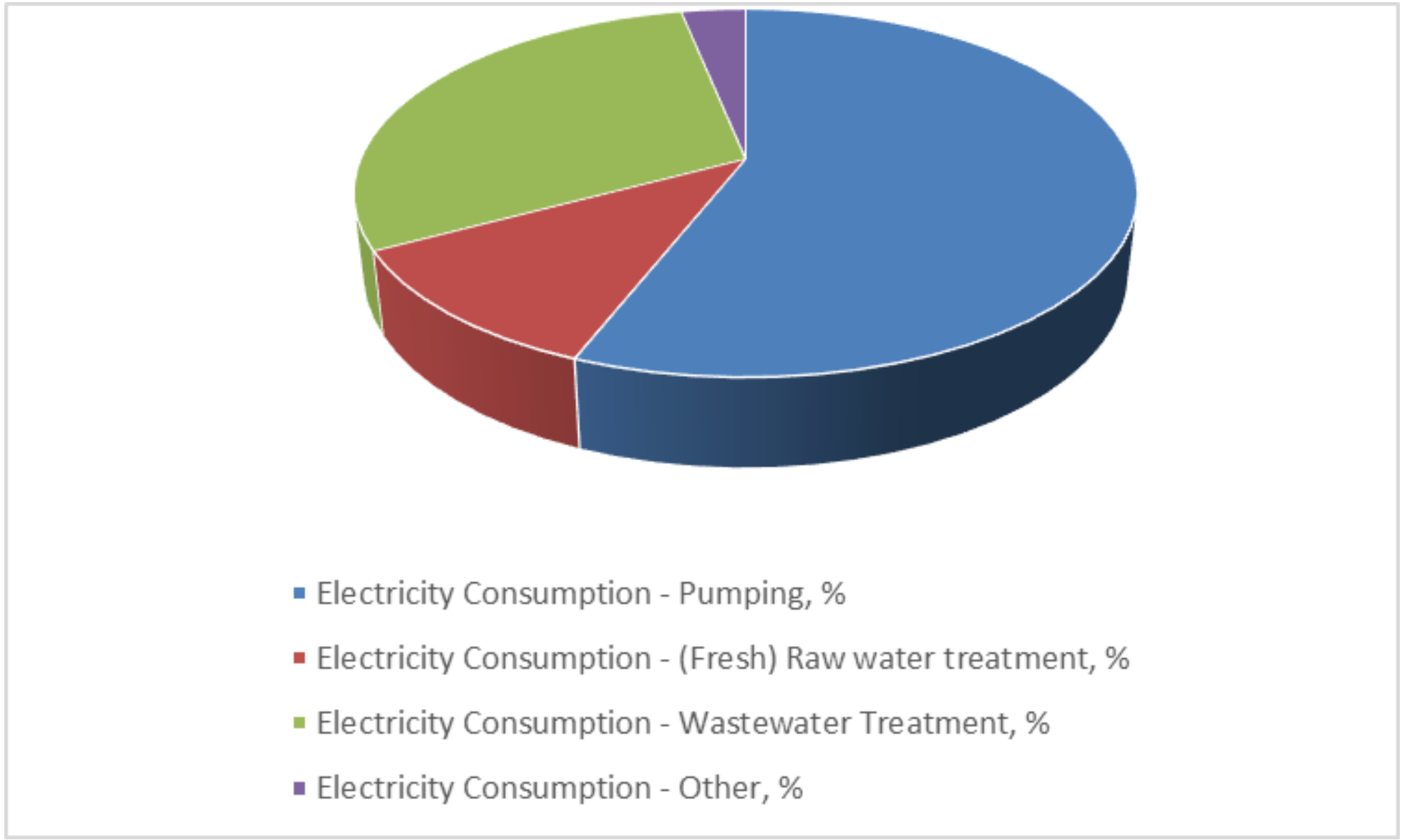


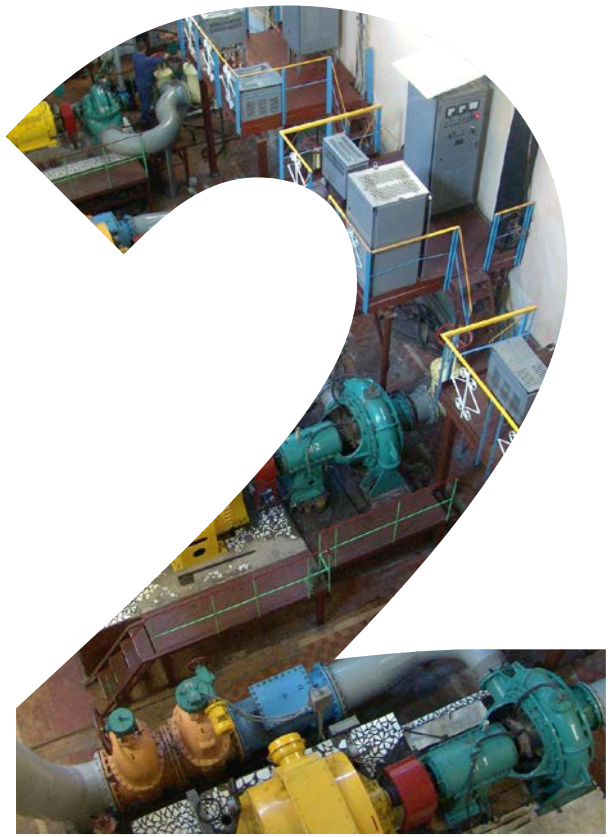
Data on Energy Efficiency

- Collected: November 2021
- 17 utilities in Ukraine
- Rising energy prices
- Old pumping systems

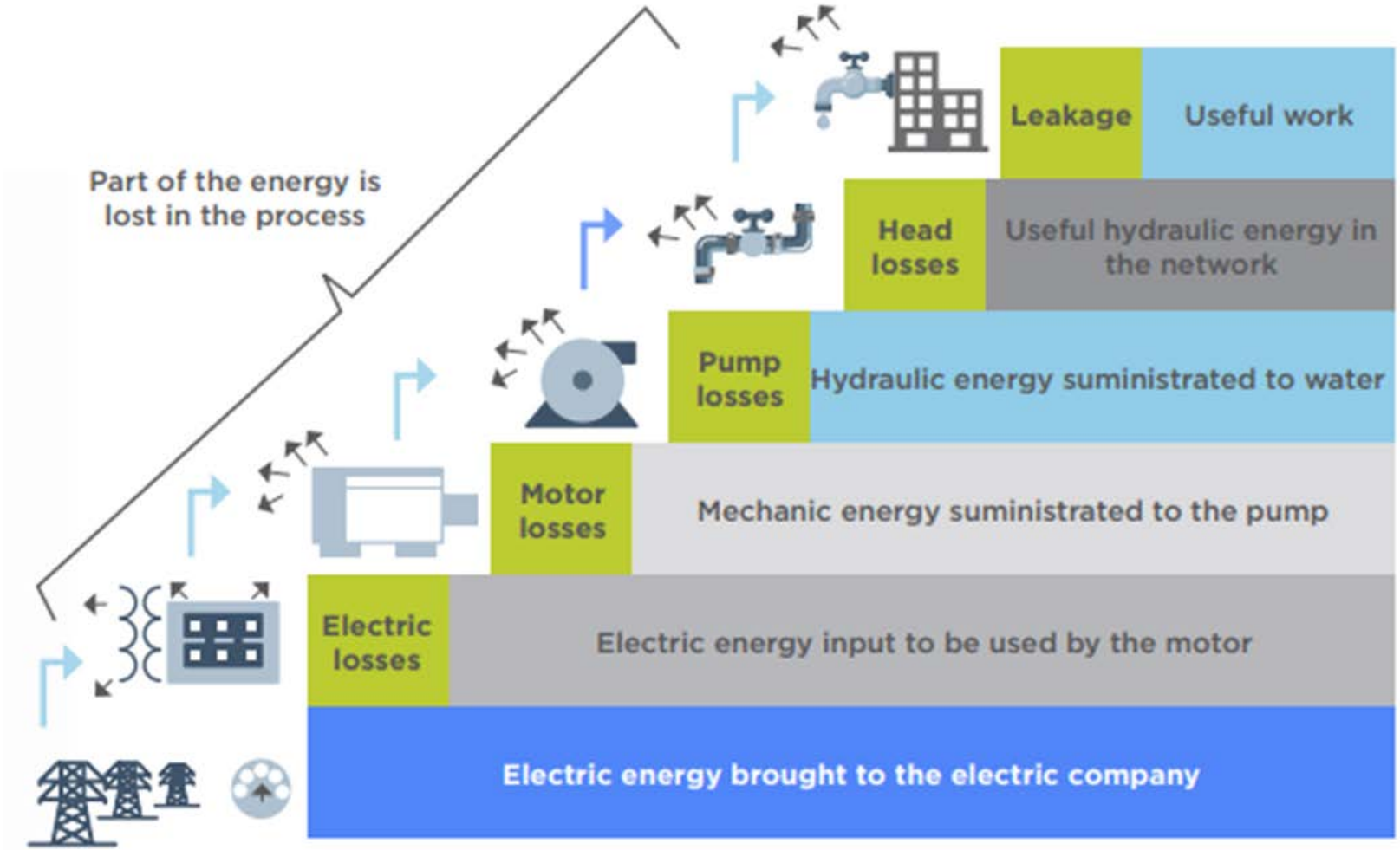

Non-Revenue Water (NRW), %
Utility 7
Utility 3
Utility 12
Utility 5
Utility 9
Utility 14
Utility 1
Utility 6
Utility 11
Utility 15
Utility 8
Utility 17
Utility 10
Utility 13
Utility 16
Utility 4
49
45,35
44,68
44,61
42,7
39,78
36,3
34,5
32,6
32
31
29,9
27
26
22,5
11,27
0
0
10
20
30
40
50
60


Average Age of Pumps (Years)
Utility 1
Utility 5
Utility 18
Utility 17
Utility 14
Utility 6
Utility 8
Utility 7
Utility 2
Utility 15
Utility 13
Utility 12
Utility 16
Utility 11
44
37
36
33
28
26
25
24
22
18
13
13
11
8
0
5
10
15
20
25
30
35
40
45
50


Electricity Consumption - Pumping, %
Electricity Consumption - (Fresh) Raw water treatment, %
Electricity Consumption - Wastewater Treatment, %
Electricity Consumption - Other, %



Energy efficiency measures



Source: IDB, 2011

Energy Efficiency Measures

Pumps and pumping system operations

- **Pump replacement**
- Install variable frequency drives
- Power factor correction
- Optimize pumping system operation and maintenance

Water loss management technologies

- Leak reduction
- Pressure management

Modern technologies

- Implement supervisory control and data acquisition (SCADA) systems
- Install smart pumps

Wastewater treatment

- Improve efficiency of anaerobic digestion etc.
- Use efficient activated sludge processes
- THP

Demand-side efficiency measures to reduce water consumption

Investments in energy efficiency typically have a **simple payback between 2 months and 5 years.**

THE SYSTEMS APPROACH

15 kW motor
efficiency = 91%

Combined motor &
pump efficiency = 59%

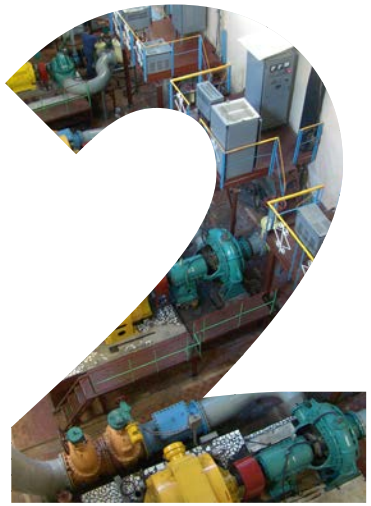
System efficiency = 13%

Pump efficiencies can vary a lot: From 0% to 85%, depending on where it operates on its curve

Energy Efficiency in the Water Sector

1. Electricity costs are the largest “controllable” operating costs for most Water Utilities: 30-80% of non-labor OPEX
2. Reductions of 20-50% possible, return on investments (1-5 years)
3. A low-cost or negative-cost measure for reducing GHG
4. The Water Sector is a high consumer of energy

Estimating EE Investment Potential



- **Some funding has been provided for implementing EE projects as sub-components in larger water infrastructure investment projects.**
- **While such funding has been limited, the results have demonstrated the enormous potential for projects with attractive paybacks.**

Approach for Estimating EE Investment Potential

1. **Review Results of Studies and Energy Audits**
2. **Assess potential energy and cost savings**
3. **Extrapolate to National Level**

Estimated EE Investment Potential in Selected Countries

Bulgaria

Number of WSS Utilities and Electricity Consumption

	Units	Value
Number of WSS Utilities	#	51
Total Electricity Consumption	Million kWh	595
No. of Utilities Assessed	#	6
Electricity Consumption	Million kWh	187
% of Total	%	31.4%

Results for 6 utilities based on Preliminary Assessment

Average % Energy Savings	%	35%
Energy Savings	Million kWh	65
Electricity Price	USD/kWh	0.15
Energy Cost	Million USD	28.1
Estimated Energy Cost Reduction	Million USD	9.8
Estimated Simple Payback	Years	5
Investment Needed	Million USD	49.1

Extrapolation to All Utilities

Average % Energy Savings	%	35%
Estimated Energy Cost Reduction	Million USD	31.2
Estimated Simple Payback	Years	5
Investment Needed	Million USD	156

Ukraine

Number of WSS Utilities and Electricity Consumption

	Units	Estimates	
		Low	High
Number of WSS Utilities	#	2,593	
Total Electricity Consumption	Million kWh	3,242	
No. of Utilities Providing Data	#	17	
Electricity Consumption	Million kWh	1,071	
% of Total	%	33.0%	

Results for 17 utilities based on Preliminary Assessment

Potential % Energy Savings	%	25%	35%
Energy Savings	Million kWh	268	375
Average Electricity Price	USD/kWh	0.083	0.083
Energy Cost	Million USD	88.9	88.9
Estimated Energy Cost Reduction	USD	22.2	31.1
Estimated Simple Payback	Years	5	5
Investment Needed	Million USD	111.1	155.6

Extrapolation to All Utilities

Average % Energy Savings	%	25%	35%
Estimated Energy Cost Reduction	Million USD	67.3	94.2
Estimated Simple Payback	Years	5	5
Investment Needed	Million USD	336	471

Projected EE Investment Potential in ECA

INVESTMENT POTENTIAL FOR ENERGY EFFICIENCY IN WATER AND WASTEWATER UTILITIES IN ECA					
Calculating Investment Potential		Units	Estimates		Source
			Low	High	
A	World Electricity Consumption in 2019	TWh	25,027		IEA World Energy Statistics 2021
B	ECA Electricity Consumption in 2019 (estimated)	TWh	1,604		IEA World Energy Statistics - Non-OECD Europe and Eurasia, 2021
C	Electricity consumption in the Water Sector as % of total	%	4.0%		IEA Report on Water-Energy Nexus, 2016
D	Electricity consumption in the Water Sector in ECA	TWh	64.2		Calculated (B x C)
E	Electricity use in water and wastewater utilities (WWUs) as % of total	%	69.0%		IEA Report on Water-Energy Nexus, 2016
F	Electricity use in ECA for WWUs	TWH	44.3		Calculated (D x E)
G	Energy savings potential in WWUs	%	20%	35%	Based on energy audits conducted in several ECA countries
H	Energy savings potential in WWUs	TWh	8.9	15.5	Calculated based on % savings (F x G)
I	Typical electricity prices	$/kWh	0.05	0.15	Based on energy audits conducted in several ECA countries
J	Typical paybacks for private energy efficiency investments	Years	7	5	Based on energy audits and willingness of private sector to invest
K	Potential investment needs	Billion USD	3.1	11.6	Calculated (H x I x J)

The projected investment potential in ECA (Eastern Europe and Central Asia) is between USD 3.1 and 11.6 Billion

The investment paradox

Water utilities are energy inefficient

Investments in energy efficient have short payback periods = win-win investments

Utilities have limited cash flow and borrowing capacity to invest in energy efficiency

“Nothing” happens

What should we do?

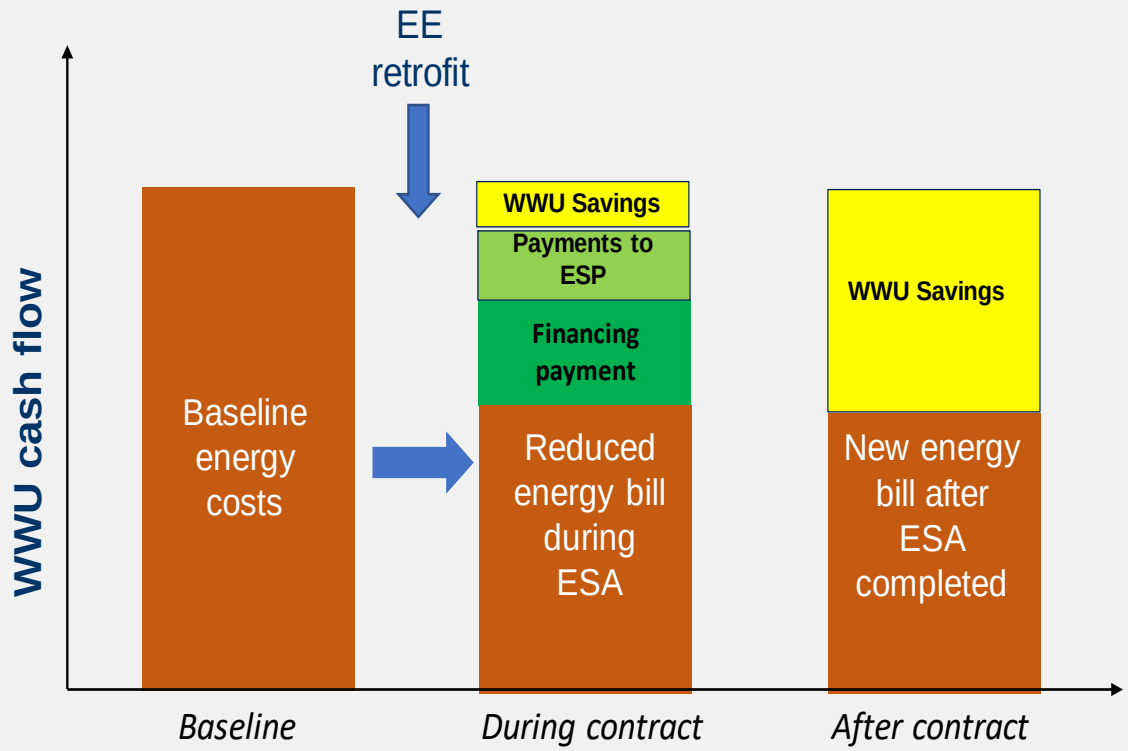
Financing Mechanisms

There is a wide range of energy services business models and the performance contracting model can be attractive to urban utilities.

Energy Services Business Models

1. Engineering Services
2. Financial Services
3. Performance Contracting
4. Outsourced Energy Management

Performance Contracting Model



Mobilizing private sector financing

Uzbekistan: Pilot Case

Private sector: A major pump manufacturer has developed a €5.4 million program for the Samarkand water utility for reducing energy consumption by 45%.

ESCO Contract: The firm is ready to finance the investment with a 5-year ESCO-type contract.

Budget neutral: This arrangement is budget neutral to the water utility, as the energy savings achieved under the contract to repay the firm.

Idea: Mobilizing private sector financing

Large-Scale Investment Program in Energy Efficiency

Requirement: Cash flow neutral to the utility
Requirement: Must solve the problem at scale

One investment lot: 10-40 large water utilities - clustered in one contract with one investor:

- attract world class expertise
- economies of scale
- private sector financing

Investment: USD 10-100 million per contract

Investment model: Design-Build-Finance-Operate-Transfer

Idea: Mobilizing private sector financing

Large-Scale Investment Program in Energy Efficiency

Proposed contract duration: 5-15 years

Payment terms: Energy Performance Contract Shared Savings model (ESCO model)

Technologies: Energy efficiency, Energy Management and NRW reduction

Energy Audits: Explore tendering without energy audits

The role of the World Bank: Potentially payment guarantees

Thank you

The World Bank

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