A close-up, macro photograph of numerous water droplets of various sizes. The droplets are clear and spherical, reflecting light in a way that creates bright highlights and soft shadows. The background is a light, slightly textured surface, possibly a glass or plastic surface, which makes the droplets stand out. The overall color palette is cool, with blues and greys dominating the scene.

Assessing the energy saving and greenhouse gas mitigation potential on the drinking water network of ViKNS

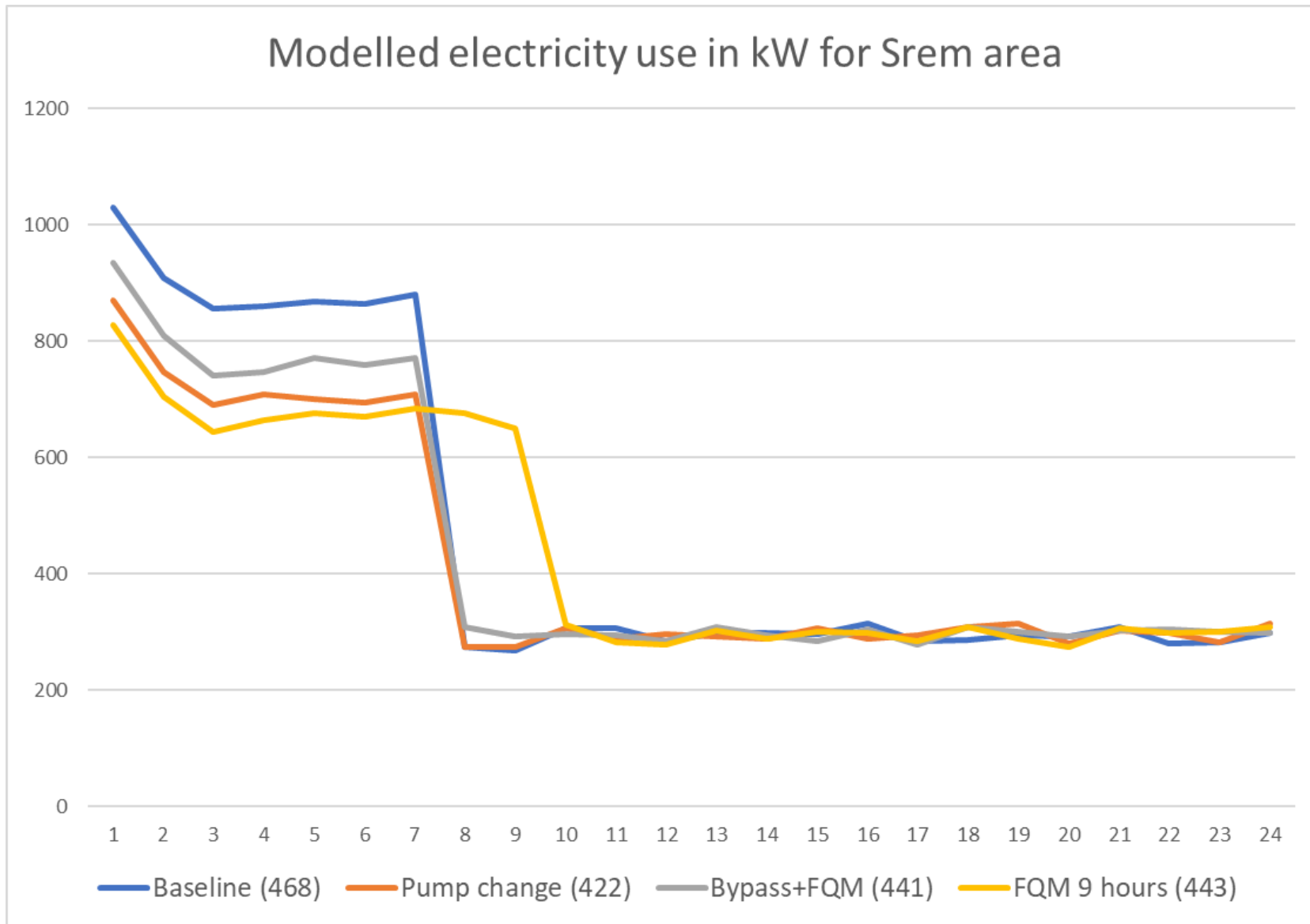
András Kis, REKK

**Dissemination Webinar
30 June, 2021**

Summary of the analysed scenarios

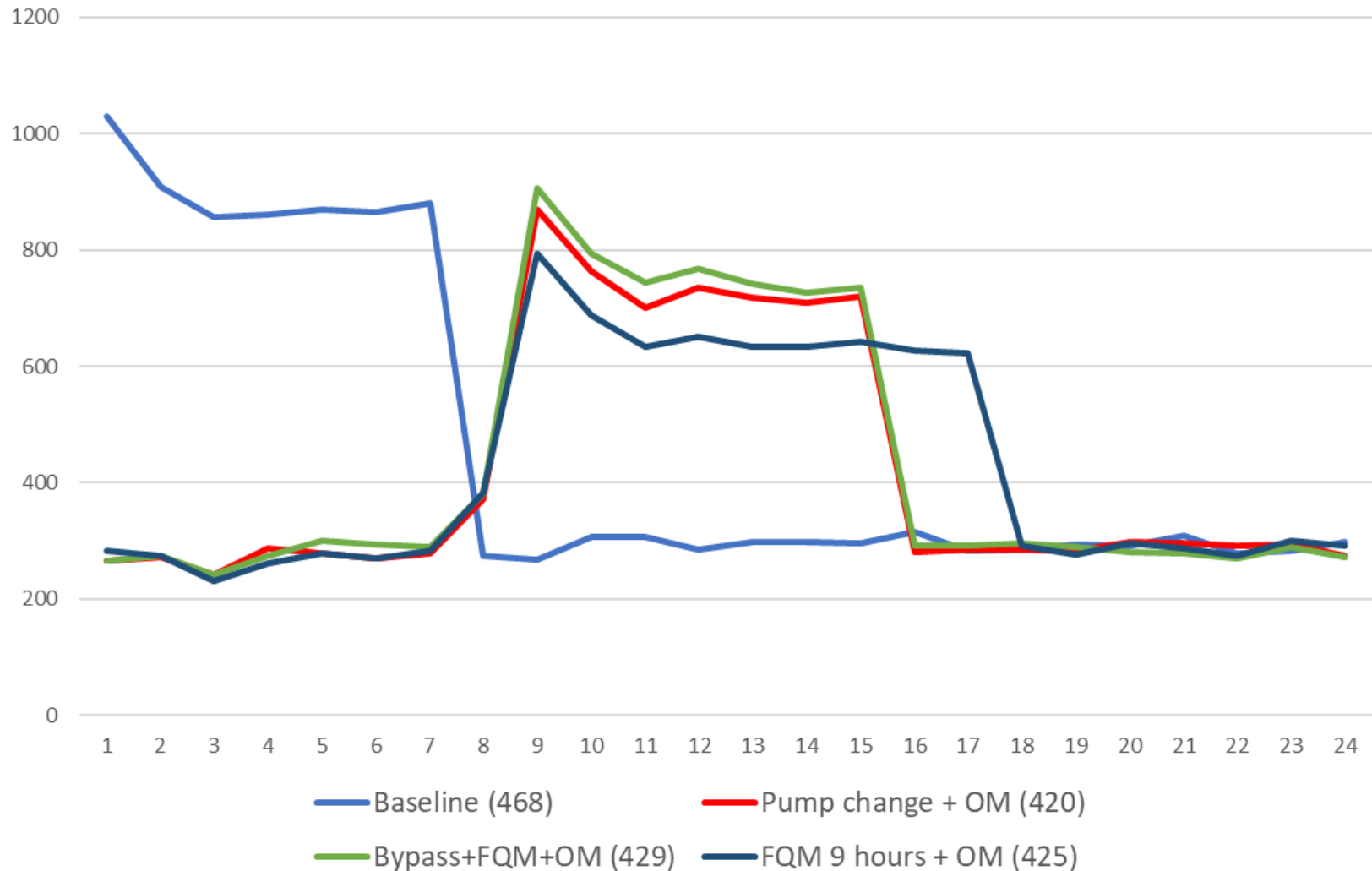
Scenario	Scenario name	Liman technology	Hours of operation
BASELINE	Baseline	Jugoturbina	7 hours (0-7)
S1	Pump change	KSB Omega C	7 hours (0-7)
S2	Bypass + FQM	Jugoturbina + Bypass pump + frequency control	7 hours (0-7)
S3	FQM 9 hours	Jugoturbina + frequency control	9 hours (0-9)
S4	Pump change	KSB Omega C	7 hours (8-15)
S5	Bypass + FQM	Jugoturbina + Bypass pump + frequency control	7 hours (8-15)
S6	FQM 9 hours	Jugoturbina + frequency control	9 hours (8-17)

Electricity consumption of the scenarios



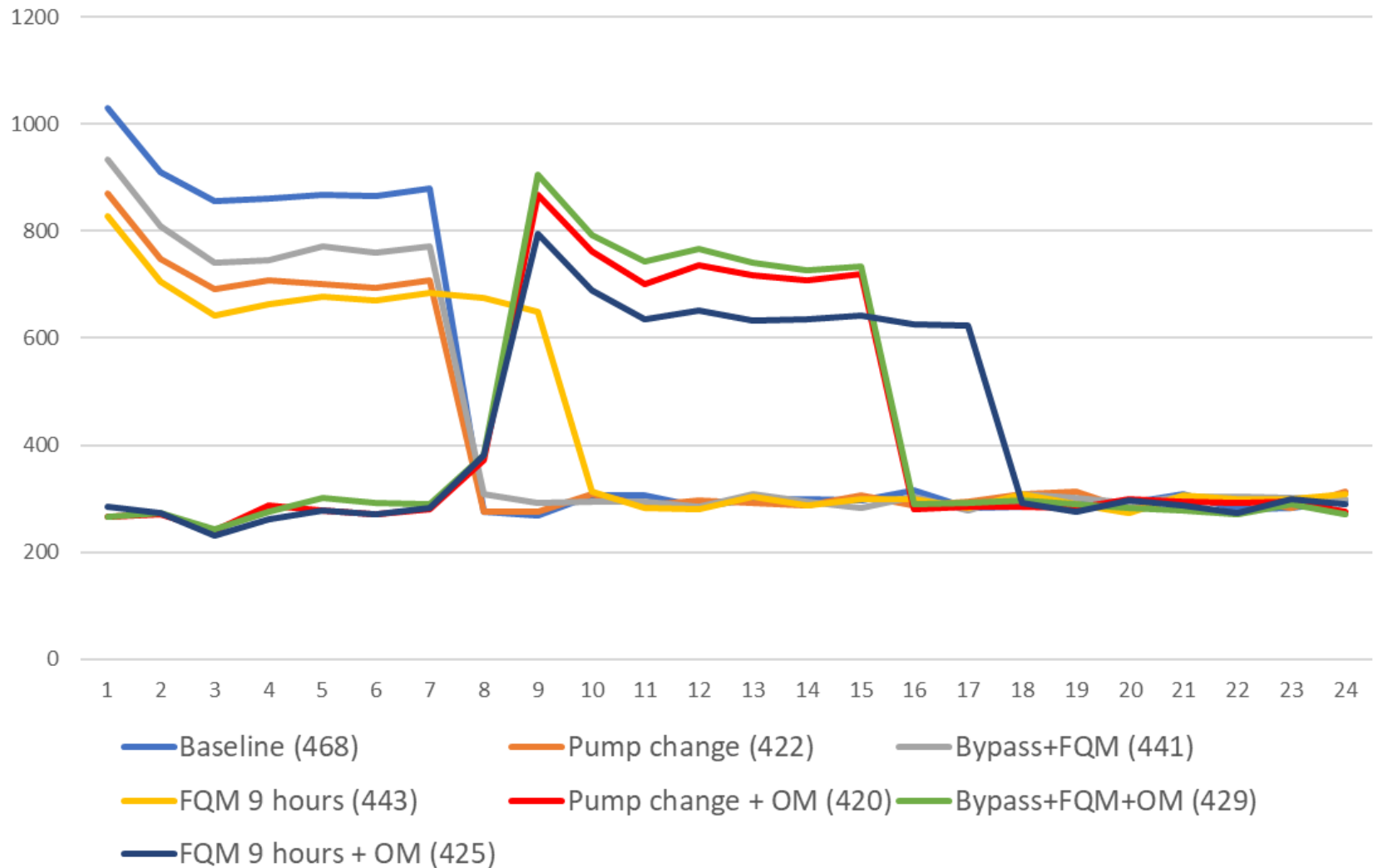
Electricity cost savings of the scenarios

Modelled electricity use in kW for Srem area

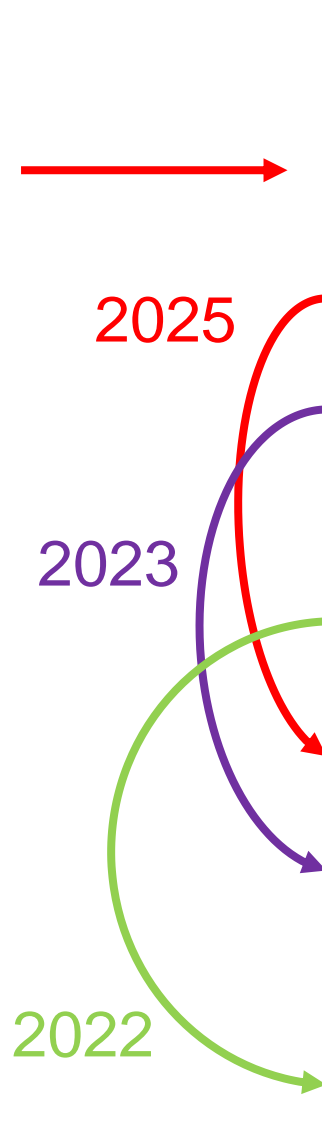


Electricity cost savings of the scenarios

Modelled electricity use in kW for Srem area



Scenario combinations for CBA



Scenario	Scenario name	Liman technology	Hours of operation
BASELINE	Baseline	Jugoturbina	7 hours (0-7) 7 hours (8-15), 2025
S1	Pump change	KSB Omega C	7 hours (0-7)
S2	Bypass + FQM	Jugoturbina + Bypass pump + frequency control	7 hours (0-7)
S3	FQM 9 hours	Jugoturbina + frequency control	9 hours (0-9)
S4	Pump change	KSB Omega C	7 hours (8-15)
S5	Bypass + FQM	Jugoturbina + Bypass pump + frequency control	7 hours (8-15)
S6	FQM 9 hours	Jugoturbina + frequency control	9 hours (8-17)

Cost benefit analysis

Main components:

- Current investment costs (-)
- Future maintenance cost savings (+/-)
- Future electricity cost savings (+)
- *Carbon emission savings (+)*

Common denominator for all future costs and benefits:

- Net present value
- Internal rate of return

Time horizon: 2021-2045

Present value illustration

Discounting: the opposite of interest compounding.

A euro today is worth more than a euro tomorrow.

For example 100 EUR 5 years in the future has the same value as 86.3 EUR today, assuming 3% discount rate:

$$100 / 1.03^5 = 86.3$$

Discount rate	3%	
	Nominal value	Present value
year 0	100	100.0
year 1	100	97.1
year 2	100	94.3
year 3	100	91.5
year 4	100	88.8
year 5	100	86.3
year 6	100	83.7
year 7	100	81.3
year 8	100	78.9
year 9	100	76.6
year 10	100	74.4

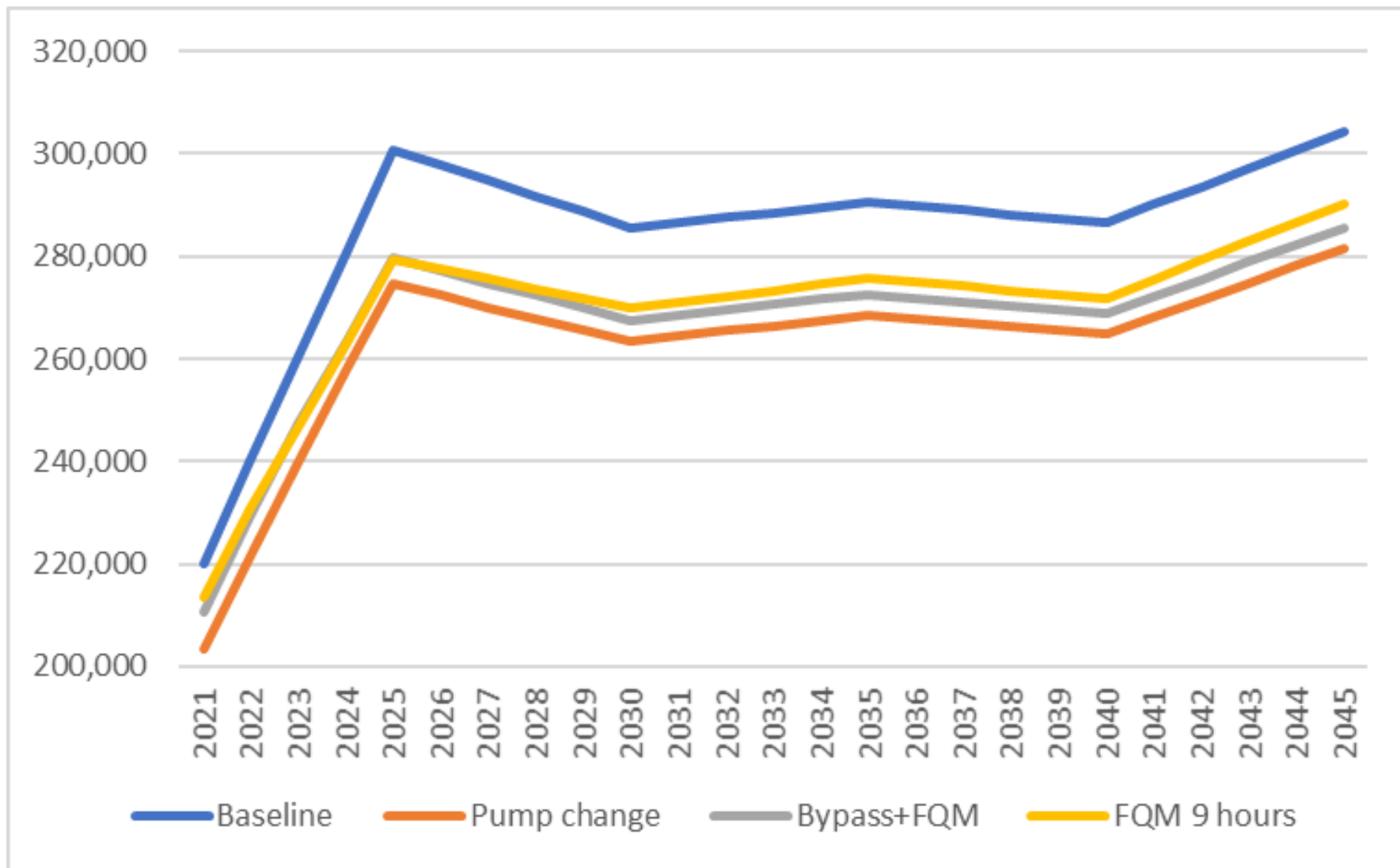
Investment and maintenance cost of scenarios

Scenario	Investment cost including installation	Maintenance cost (estimated average per year)
Baseline	Reconstruction cost in 6-10 years, about EUR 50,000	6,000 EUR/year
Pump change	About EUR 75,000	2,000 EUR/year
Bypass + FQM	About EUR 34,000	4,000 EUR/year
FQM 9 hours	About EUR 20,000	4,000 EUR/year

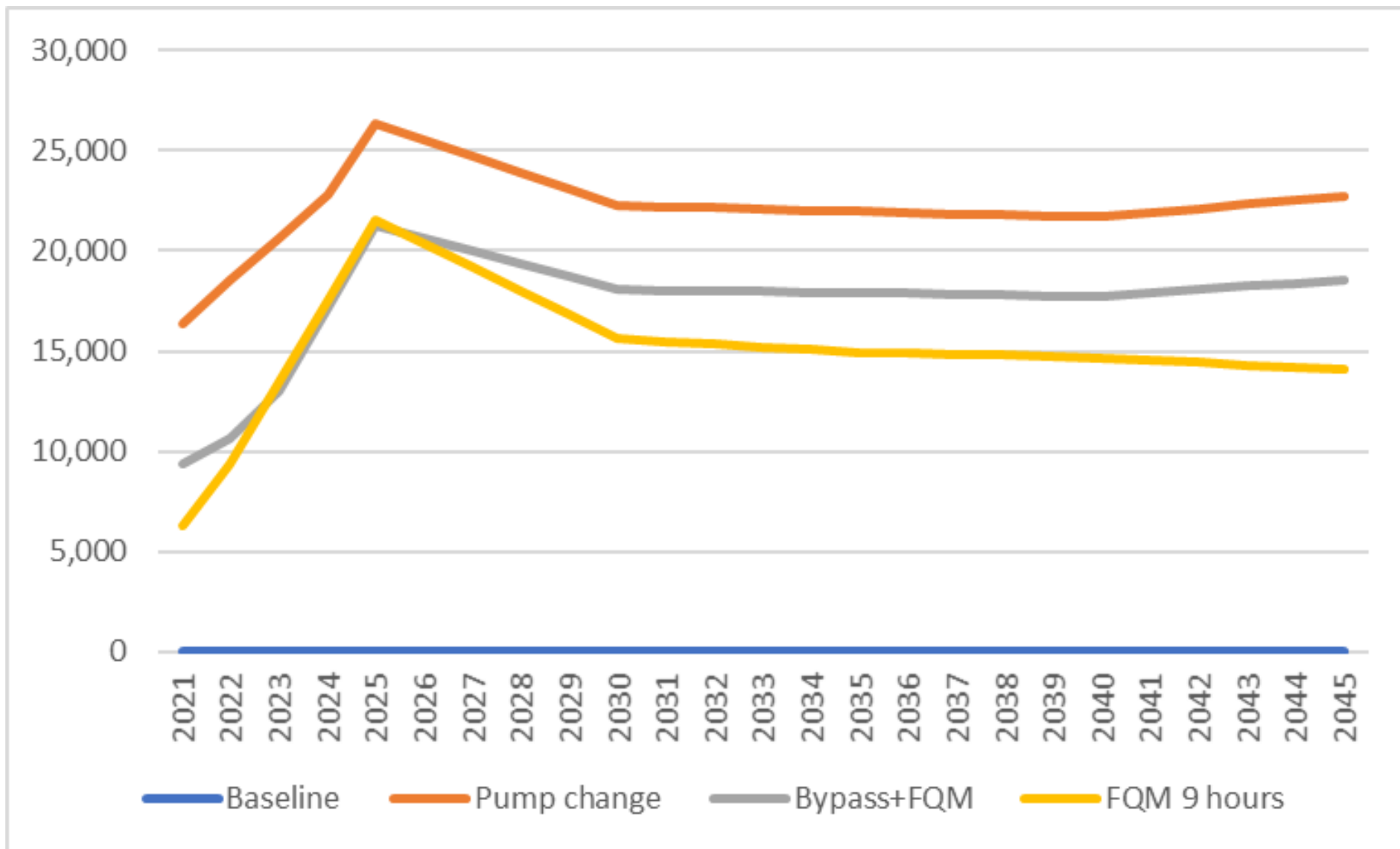
Stress test

Scenario	Investment cost including installation	Maintenance cost (estimated average per year)
Baseline	Reconstruction cost in 6-10 years, about EUR 50,000 (EUR 25,000)	6,000 EUR/year (4,000 EUR/year)
Pump change	About EUR 75,000 (EUR 150,000)	2,000 EUR/year
Bypass + FQM	About EUR 34,000 (EUR 70,000)	4,000 EUR/year
FQM 9 hours	About EUR 20,000 (EUR 40,000)	4,000 EUR/year

Annual energy costs, Srem area (EUR, without VAT)



Annual energy cost savings, Srem area (EUR, without VAT)



Total estimated electricity cost savings in 25 year period, Srem area (EUR)

Present value of savings, EUR

Interest rate	Baseline	Pump change	Bypass+FQM	FQM 9 hours
Nominal (0%)	0	555,000	438,000	380,000
1%	0	494,000	388,000	338,000
3%	0	397,000	310,000	272,000
5%	0	326,000	253,000	224,000

Cost benefit analysis: net present value

- Without consideration of carbon value
- 1% interest rate

Present value calculations	Baseline	Pump change	Bypass+FQM	FQM 9 hours
Investment cost	0	-28,000	13,000	27,000
Maintenance cost savings	0	89,000	44,000	44,000
Electricity cost savings	0	494,000	388,000	338,000
Total	0	554,000	445,000	409,000
Total, under stress test	0	411,000	342,000	321,000

Cost benefit analysis: net present value

- Without consideration of carbon value
- 3% interest rate

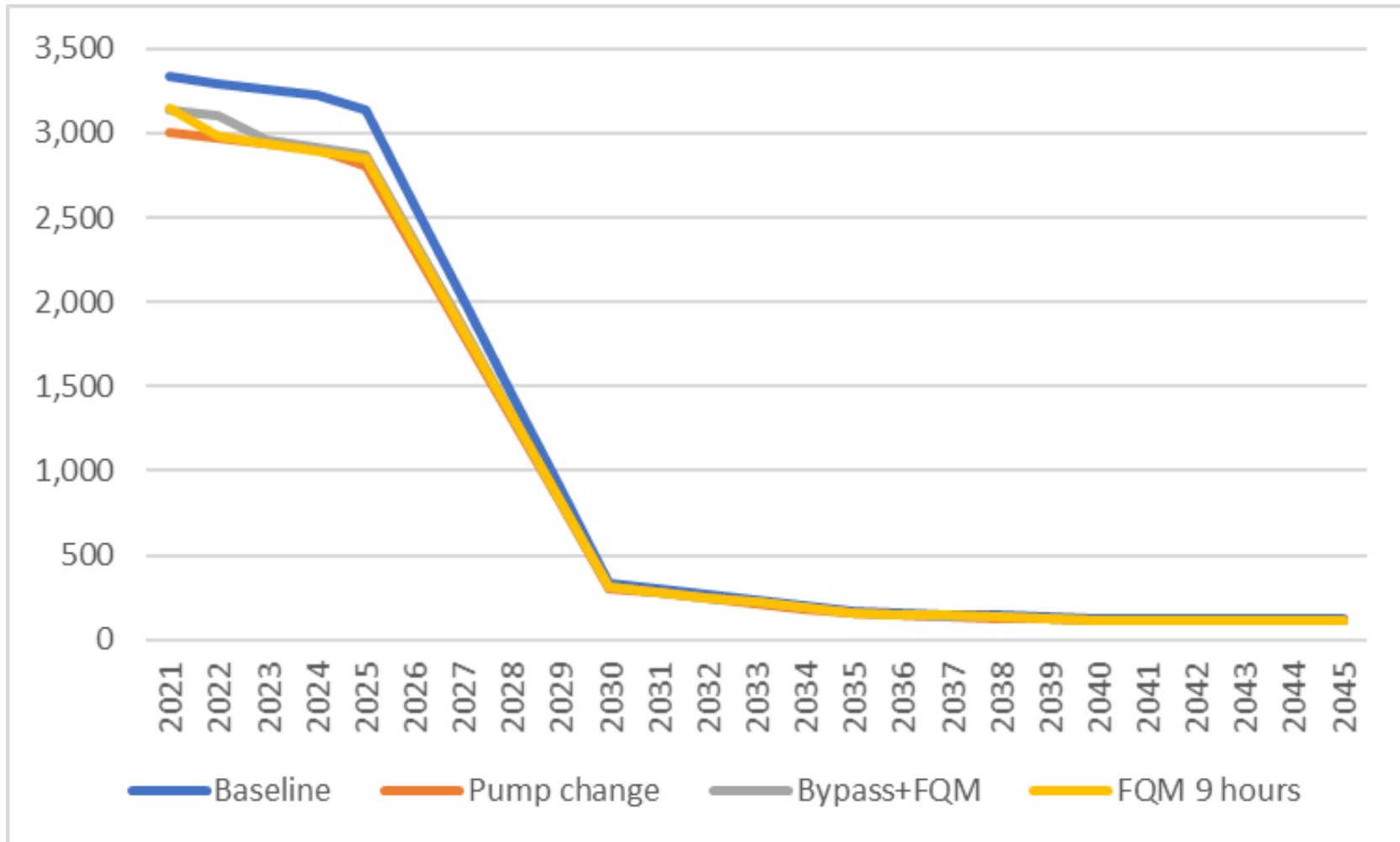
Present value calculations	Baseline	Pump change	Bypass+FQM	FQM 9 hours
Investment cost	0	-34,000	7,000	21,000
Maintenance cost savings	0	72,000	36,000	36,000
Electricity cost savings	0	397,000	310,000	272,000
Total	0	435,000	353,000	329,000
Total, under stress test	0	303,000	260,000	253,000

Cost benefit analysis: internal rate of return, payback time

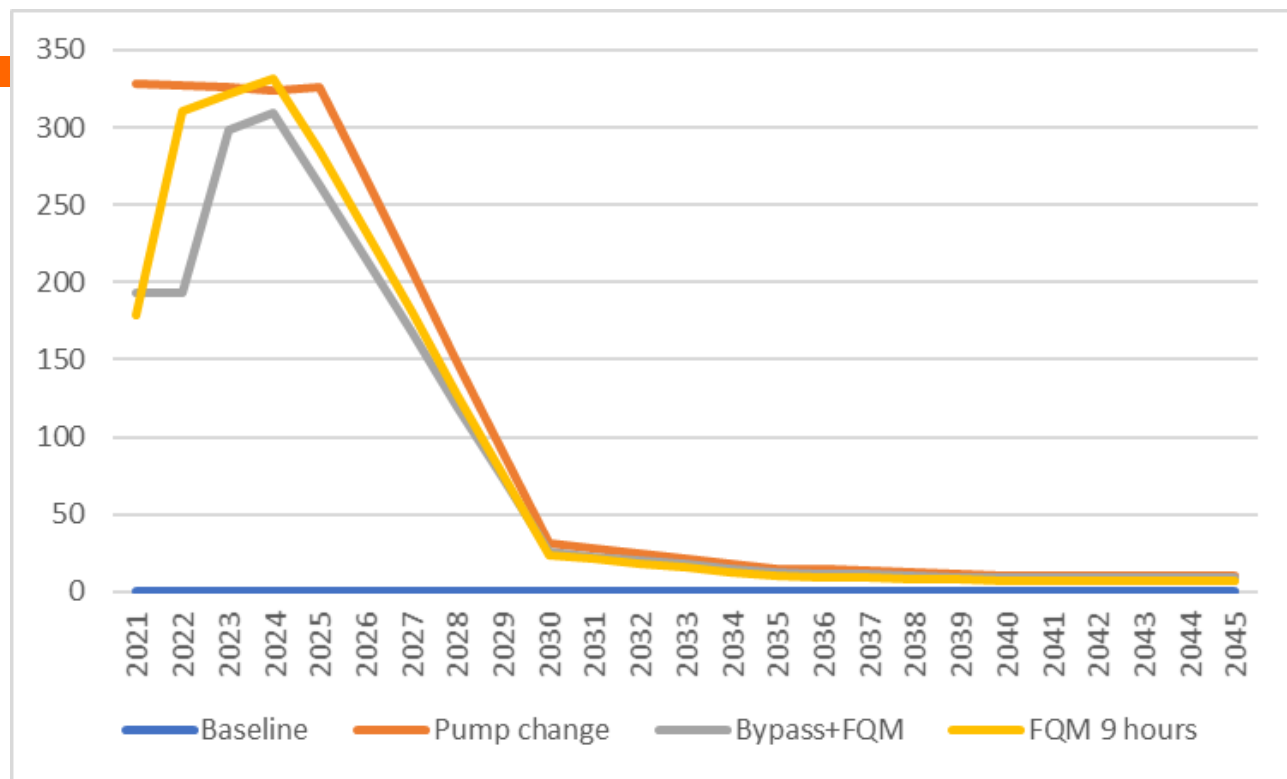
	Pump change	Bypass+FQM	FQM 9 hours
Internal rate of return	49%	74%	124%
Payback time of investment	3.5 years	2.7 years	2.2 years

Total, under stress test	Pump change	Bypass+FQM	FQM 9 hours
Internal rate of return	19%	29%	46%
Payback time of investment	6.3 years	5.0 years	3.7 years

Carbon emissions behind the electricity consumption (ton/year)



Carbon emission savings (ton/year)



	Baseline	Pump change	Bypass+FQM	FQM 9 hours
Total 2021-2045	0	2,603	2,044	2,229
Value in EUR (50 EUR/ton)	0	130,148	102,223	111,430

THANK YOU!

www.rekk.hu

ÁRAMPIAC VÍZGAZDASÁG PUBLIKÁCIÓK ÁRVÍZKOCKÁZAT
SZAKPOLITIKAI TANÁCSADÁS ÁRELŐREJELZÉS ASTEC OKTATÁS EGMM
VÍZGYŰJTŐ-GAZDÁLKODÁS GÁZPIAC MEGÚJULÓ ENERGIÁK
PIACMONITORING OKOS TECHNOLÓGIÁK VÍZIKÖZMŰVEK EEMM
TÁVHŐ SZABÁLYOZÁS ELLÁTÁSBIZTONSÁG
PIACELEMZÉS KLÍMAPOLITIKA ENERGIAHATÉKONYSÁG