Presentation EEE 2021

The Federal Programme for Heating Systems Optimisation in Germany – Evaluation methods and intermediate results

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Programme design and evaluation scope

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- Duration: 2016-2021
- Target: replacement of inefficient heating and hot water circulation pumps and heating system optimisation
- Subsidies: 30% of net investment costs (max. €25,000/site)
- Eligible target groups: private building owners, organisations, municipalities and companies

- Programme theory based formative and summative evaluation with regard to:
  - Programme achievements
  - Programme impact (Suitability, Causality, Unintended effects)
  - Cost effectiveness

Programme Theory (simplified)

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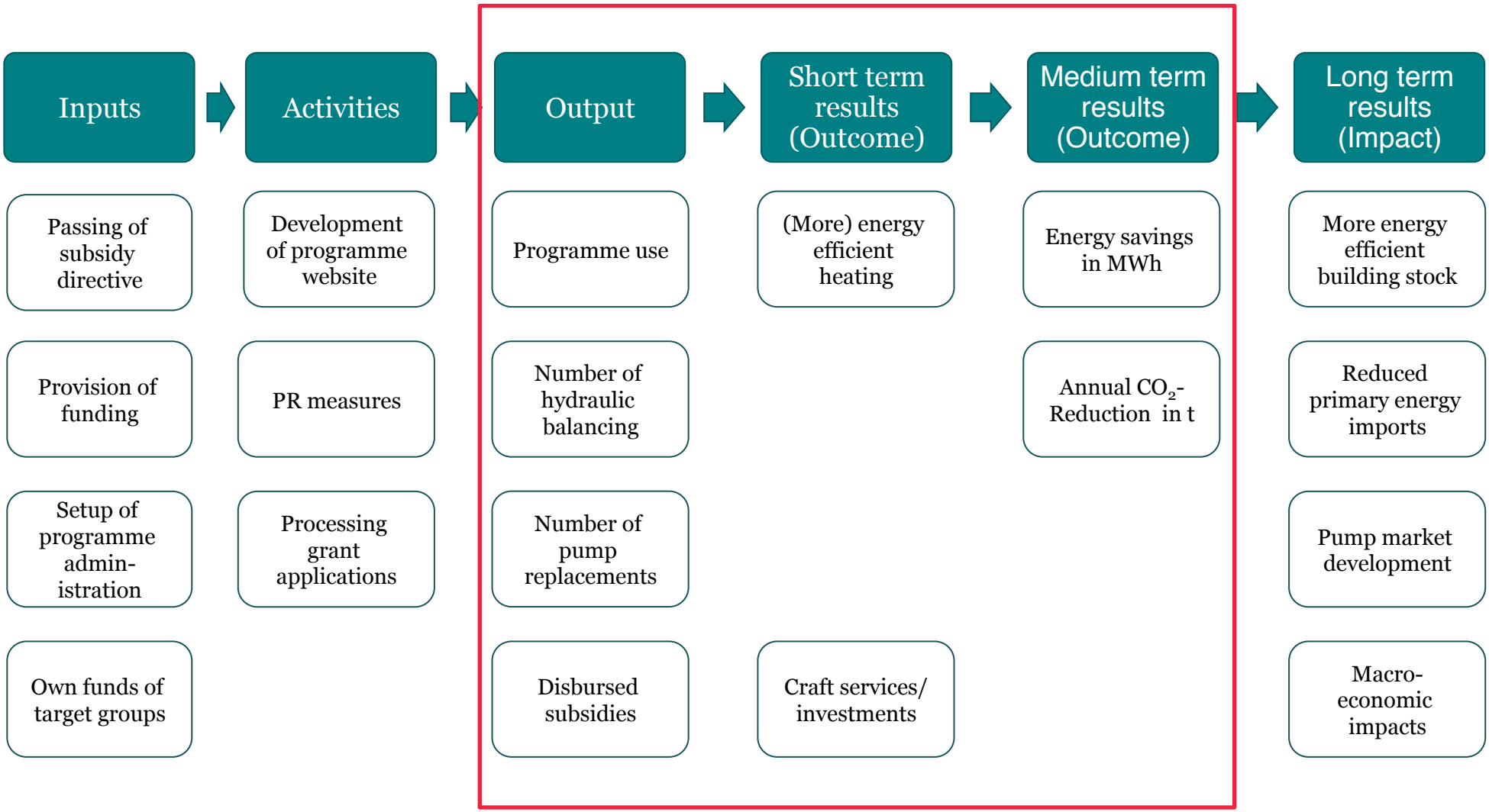

Indicators and data sources

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8 thematic clusters

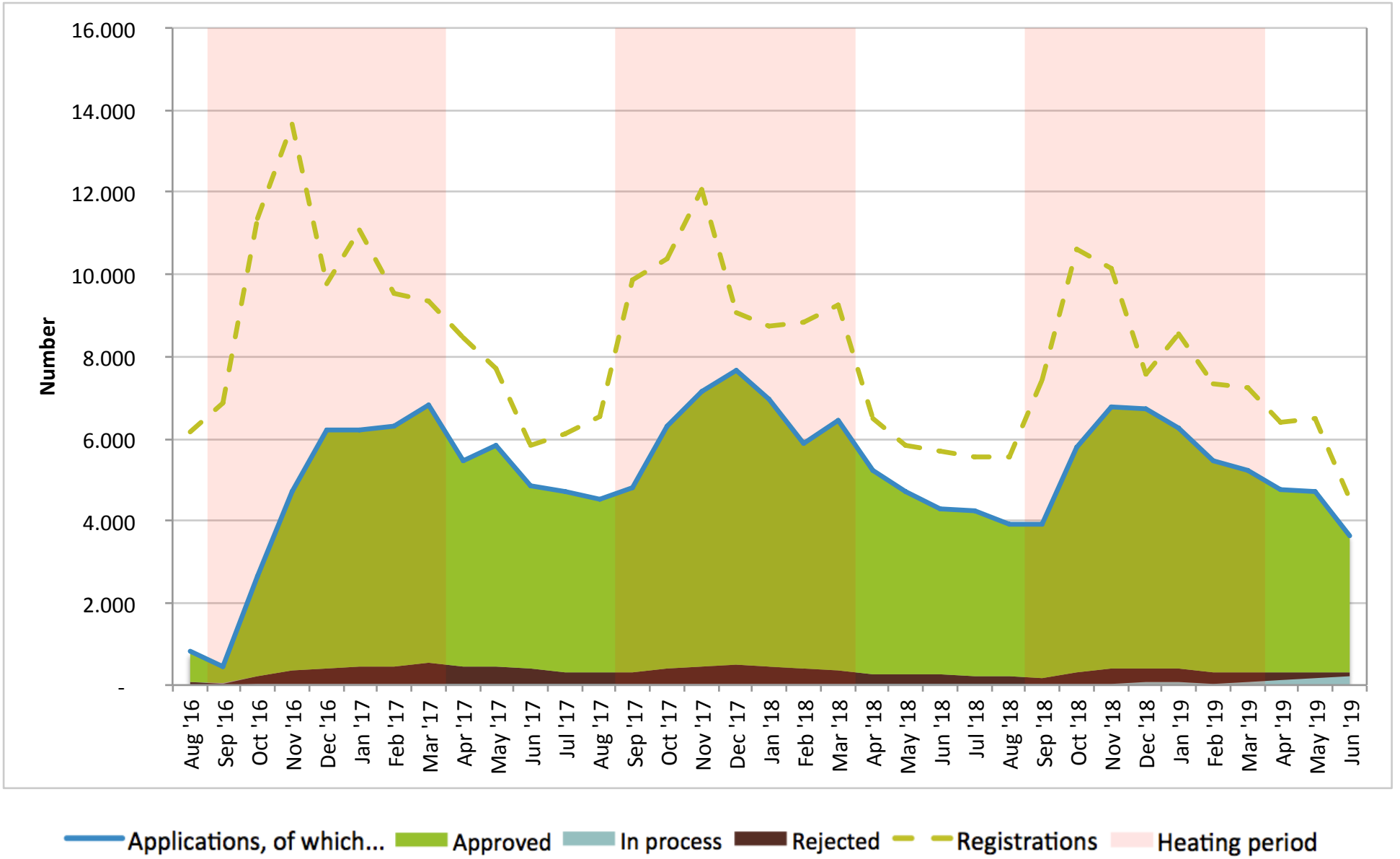
- PR and awareness
- Number of registrations
- Target groups outreach
- Programme Impact
- Multiplier effect
- Economic effects
- Subsidy effectiveness
- Implementation efficiency

Data sources and analyses

- Literature review
- Focus groups
- Surveys with users and registered non-users
- Stakeholder interviews
- Market analysis
- Programme statistics

Programme development

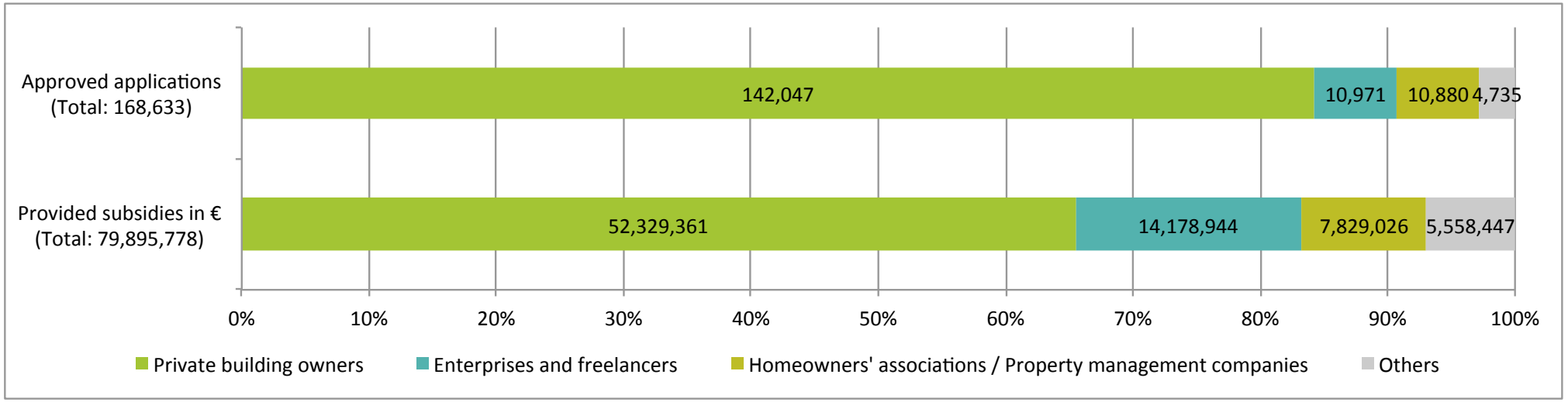
Number of registrations / applications over time (until June 2019)



Target groups outreach

Distribution of approved applications and subsidies

- Main target group (private building owners) well reached
- Non-proportional distribution of approved applications and subsidies



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Bottom-up calculation of CO_2 reduction

per pump replacement

$$CR_p = [[(1-\alpha) * n_p * ES_{pM}] + [\alpha * n_p * ES_p]] * EF_S$$

Whereas

CR_P:	*CO_2 reduction through pump replacement*
n_P:	*Number of annually promoted pumps*
α:	*Share of induced pump replacements in all promoted pumps*
ES_{pM}:	*Average electricity savings per pump replacement compared to MEPS*
ES_p:	*Average electricity savings per pump replacement compared to stock*
EF_S:	*Emission factor electricity (g CO_2 / kWh)*

per hydraulic balancing

$$CR_{HA} = \beta * n_{HA} * ES_{HA} * \varnothing F * EF_W$$

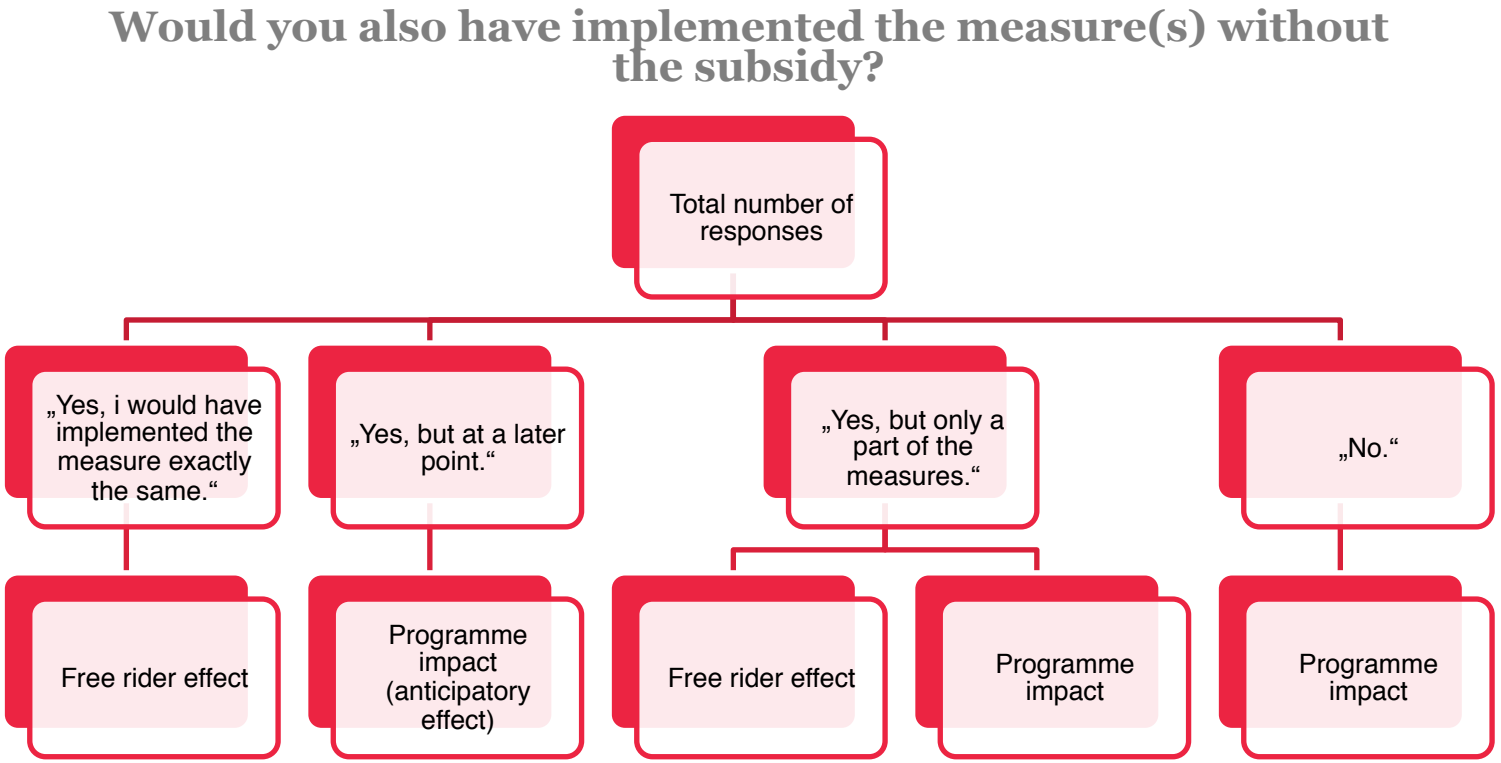
Whereas

CR_{HA}:	*CO_2 reduction through hydraulic balancing*
n_{HA}:	*Number of annually promoted hydraulic balancing*
β :	*Causality of the programme (in % of all promoted hydraulic balancing)*
ES_{pM}:	*Average heat energy savings per hydraulic balancing (in kWh/m²/a)*
$\varnothing F$:	*Average heated floor space (in m²)*
EF_W:	*Emission factor of Ø heating energy mix (g CO_2 / kWh)*

Methodology

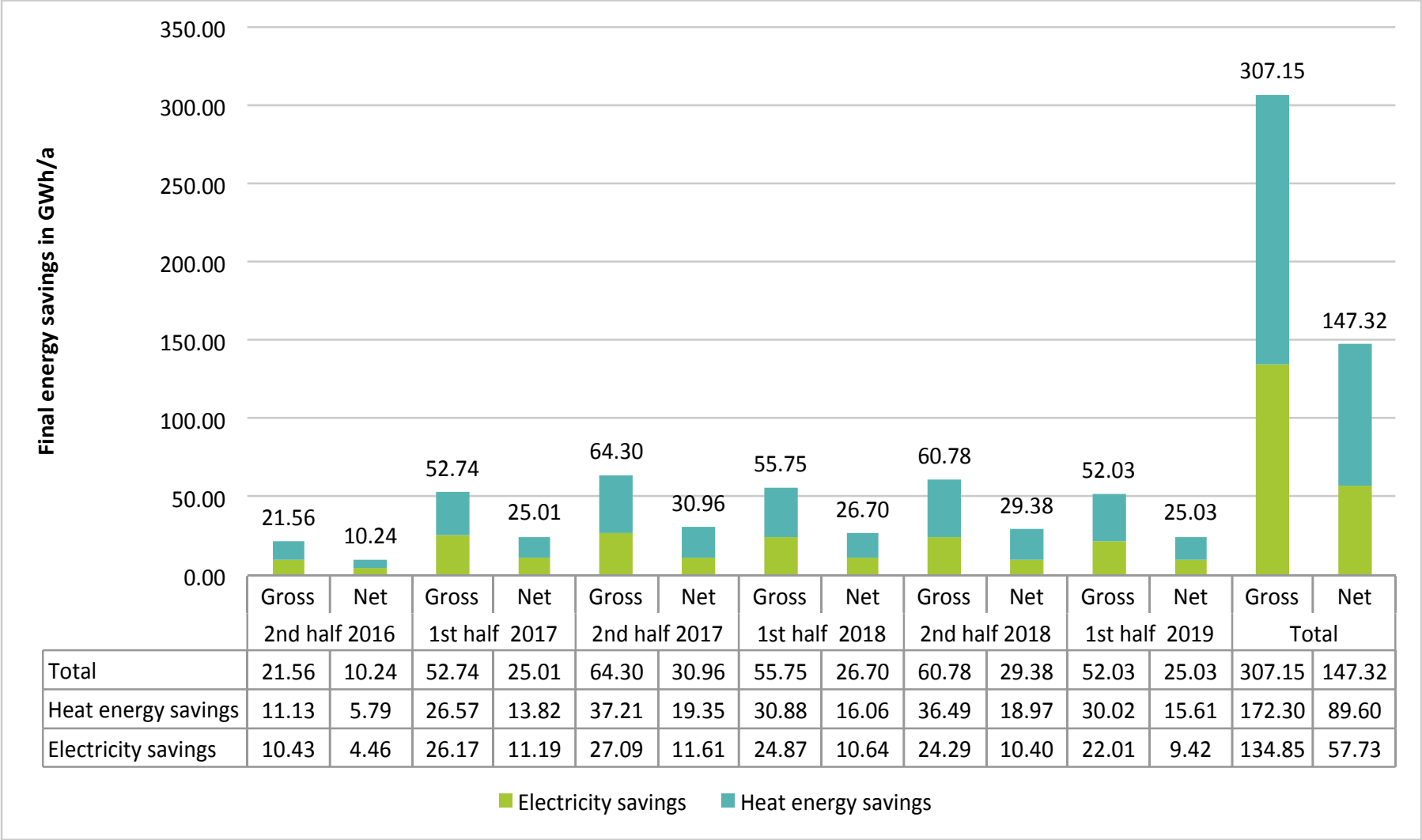
Adjustment for free rider effects (Causality analysis)

- Based on user survey (n = 13,911)
- Differentiated for pump replacement and hydraulic balancing



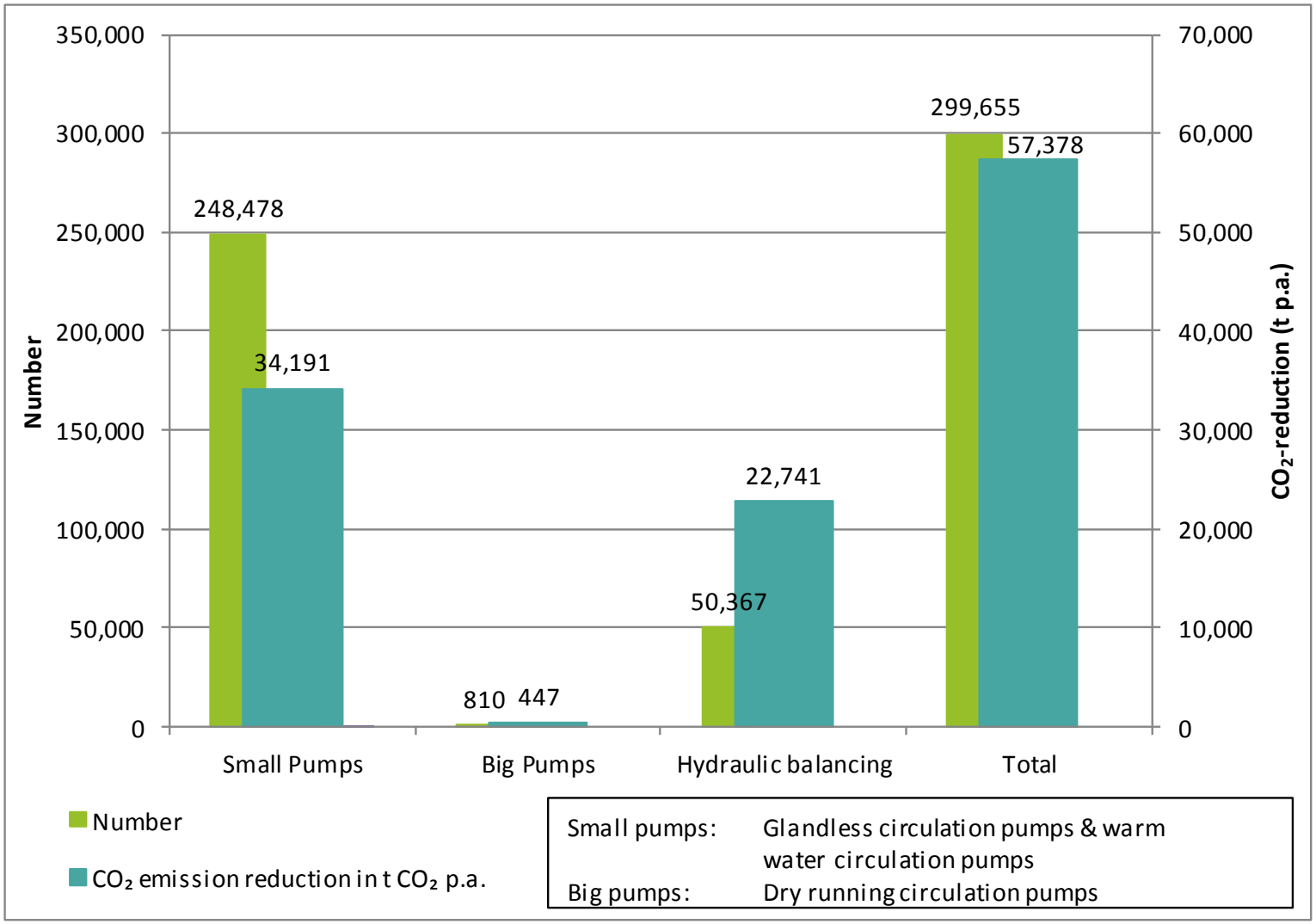
- Significant but expected free rider effect with causality factors of $\alpha = 0.4$ (pumps) and $\beta = 0.52$ (hydraulic balancing)

Programme results
Energy savings



	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net
	2nd half 2016		1st half 2017		2nd half 2017		1st half 2018		2nd half 2018		1st half 2019		Total	
Total	21.56	10.24	52.74	25.01	64.30	30.96	55.75	26.70	60.78	29.38	52.03	25.03	307.15	147.32
Heat energy savings	11.13	5.79	26.57	13.82	37.21	19.35	30.88	16.06	36.49	18.97	30.02	15.61	172.30	89.60
Electricity savings	10.43	4.46	26.17	11.19	27.09	11.61	24.87	10.64	24.29	10.40	22.01	9.42	134.85	57.73

Programme results
Emission savings



Programme results

Cost effectiveness: 5 indicators

#	Indicator	Results
1	Programme administration costs to assess the implementation efficiency	Share of admin costs in total budget 10.58%
2	Programme induced investments / demand effect	Total gross investments: 308,911,787 € • induced investments of 108,184,168 € • free rider 160,942,049 € and • VAT payments of 39,785,570 €
3	Cost effectiveness from the perspective of programme beneficiaries	Pumps: most cost-effective w/o subsidies; Hydraulic balancing: only cost-effective w/ subsidies
4	Cost-effectiveness from a societal perspective	Benefit-cost-ratio: 1.5 to almost 3 (depending on scenario)
5	Subsidy effectiveness in terms of programme costs compared to energy savings and CO2 emissions reductions	37.29 euro / t CO_2 (gross) and 87.69 euro / t CO_2 (net); leverage effect: 3

Conclusions & preliminary recommendations

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- HZO Programme cost-effective and worthwhile for both end-users and the economy as a whole
- Unbalanced distribution of subsidies across target groups and regions
- Utilisation limited by several factors (capacity constraints in the HVAC sector, assumed bureaucracy of application process and lack of overview of energy efficiency promotion programmes)

Preliminary recommendations:

- Explicit target group-specific communication strategy
- Training and further education for the HVAC workforce on technical and subsidy-related questions
- Merging with other promotion programmes (KfW)

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Thank you for your attention

Questions?