Support to the renovation wave - energy efficiency pathways and energy saving obligation in Estonia

REFORM/SC2022/067

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Agenda

Pathways towards achieving the new EED targets in Estonia (60’)

1. Context and methodology
2. EE measures in building sector
3. EE measures in industry sector
4. EE measures in transport sector
5. Study overall results
6. Q&A on the study

General context & methodology

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Context and Methodology

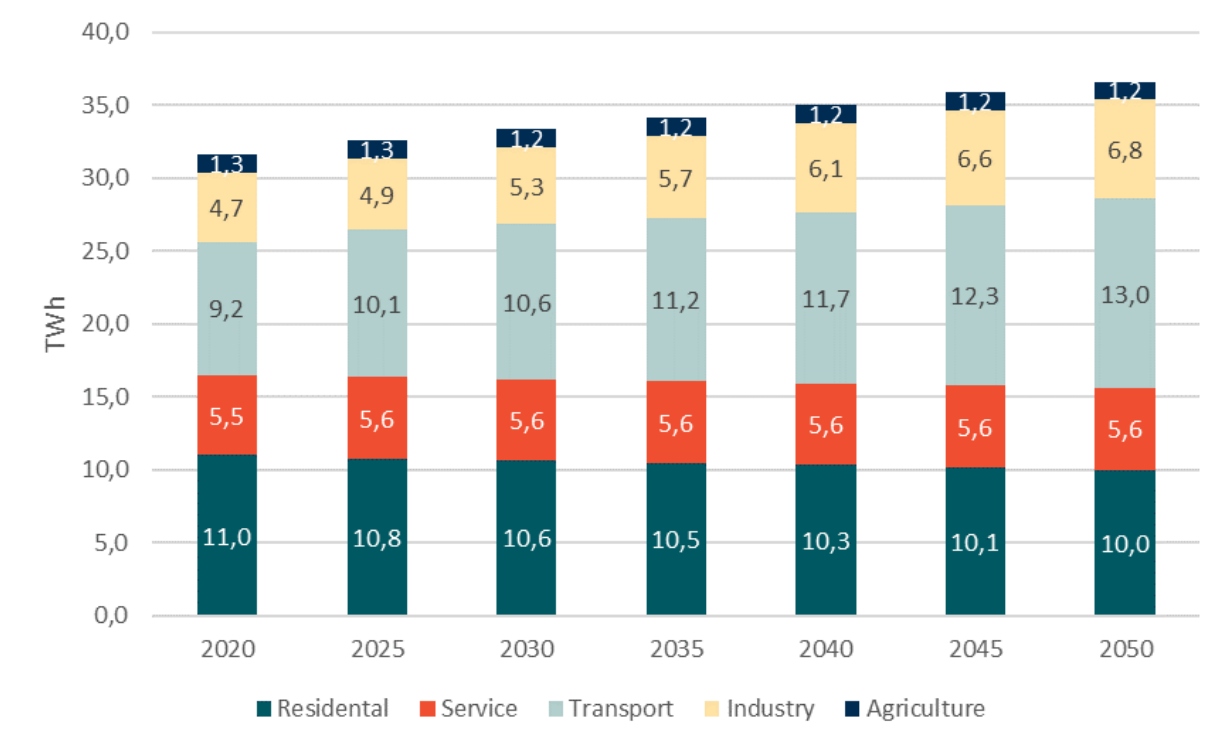
Objective of the study

- Based on the current policy context, define possible pathways allowing to reach the (new) Energy Efficiency targets (EED recast)

Scope

- Focus on final energy use (rather than primary)
- Including all end-use sectors: building, industry, agriculture, forestry, fisheries and transport
- Excluding: energy (electricity production), electrification (e.g. heat pumps, EV)

Context & Methodology



Energy consumption and trends in a Business as Usual

- Building → stock increase & performance increase
- Industry → 1.5%/y growth
- Transport → important increase in demand (from historical trend), with doubling of diesel use

For all sectors, electrification trend

Context & Methodology

Energy Efficiency (EE) targets @2030

- FEC (Final Energy Consumption) in 2030 w/o EE policy: 33.3TWh
  - With existing measures: 33TWh
- Annual savings: require sharp acceleration
  - Average 2024-2030: with existing measures 0.14%
  - In 2030: : with existing measures 0.1%

Table 3-1: 2030 energy efficiency targets and savings

NECP 2030 objective	EED 2018	EED 2023[9]	Reference
Final energy consumption in 2030 (TWh)	33	30	Art 4, binding at EU, Estonia contribution
Primary energy consumption in 2030 (TWh)		45.7	Art 4, indicative at EU, Estonia contribution
Annual final savings rate, 2024-2030 average (%)	0.8%	1.5%	Art 8(1), binding per MS
Annual final energy savings rate in 2030 (%)		1.90%	Art 8(1), binding per MS
Cumulative savings over the 2021-2030 period (TWh)	14.767	21.279	Art 8(1), binding per MS

Context and Methodology

To reach the targets, strengthening the EE policy is needed

- More EE measures
- Balancing financial support, taxation and normative
- Looking beyond 2030 – on long term

The study proposes new measures, and their bundling into different pathways, built on

- Main measures
- « Enabling measures » to support the main measures

Enabling policies
Integrated Planning (incl. climate plans)
Adapt the institutional framework - Governance (more to local authorities)
Capacity building (professionals skills, regional experts & authorities)
Empower end-consumers (access to info, price signal, tech availability, …)
Mobilise finance (incl. sustainable finance, and public support, blending)
Tools and services, e.g. energy audits, building renovation passport, ticketing, etc.

Energy Efficiency options in each sector

Main policy measures

Residential	Service	Industry, agro/forestry	Transport
• Normative: obligation for the owner/occupier (MEPS), or supplier (EEOS) • Incentive: grants • Taxation: property taxation, carbon pricing	• Normative: obligation for the owner/occupier (MEPS), or supplier (EEOS) • Incentive: grants • Taxation: property taxation, carbon pricing	• Incentive: grants, tax exemptions • Incentive: VA • Promote efficient engines, equipment and practices	• Deploy infrastructure (e.g. for EVs) • Invest in and promote alternatives to individual cars (e.g. public, active, …) • Taxation: vehicle taxation, carbon pricing • (alternative fuels – higher efficiency)

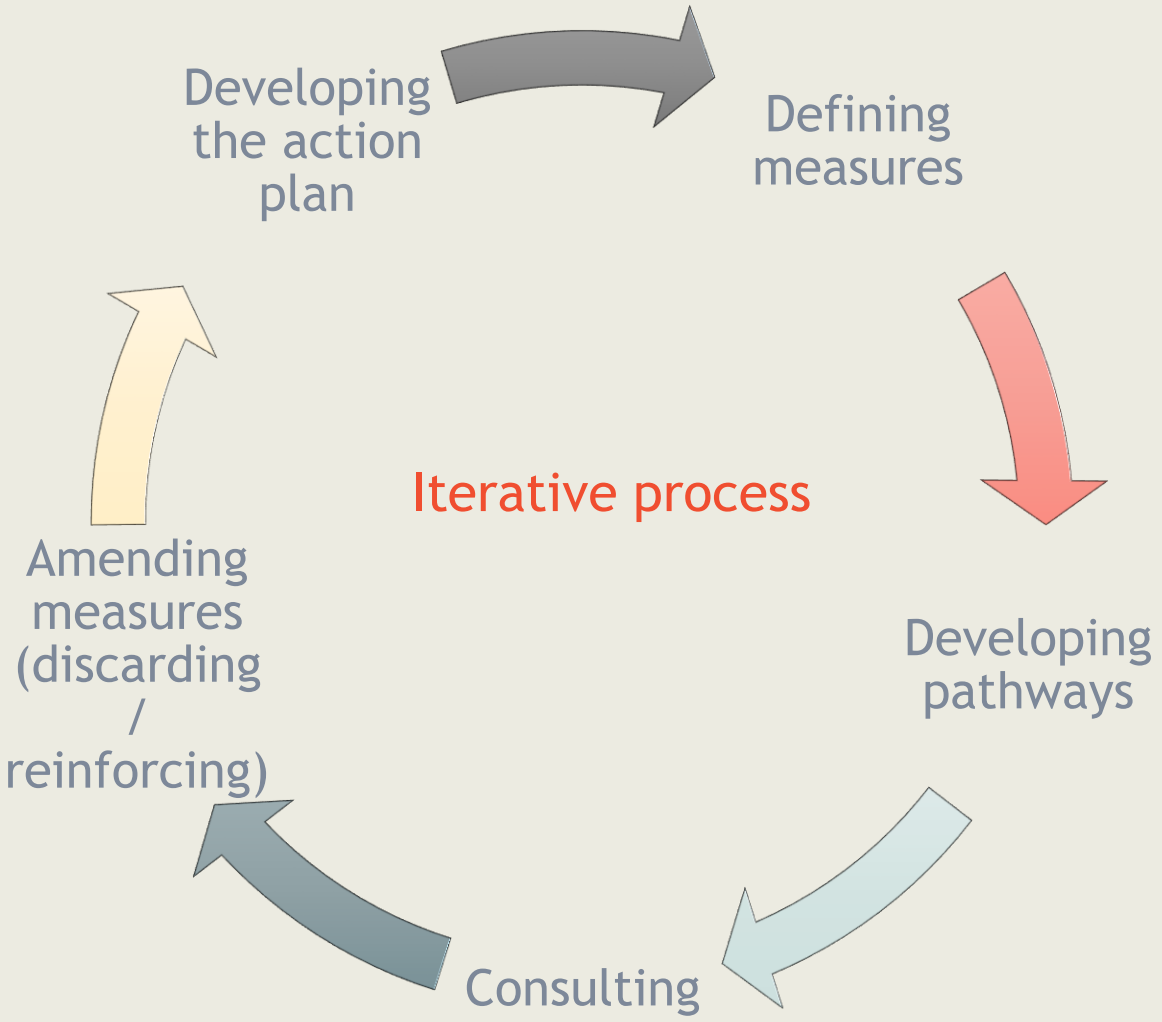
MEPS: Minimum Energy Performance Standards
EEOS: Energy Efficiency Obligation Scheme
VA: Voluntary Agreement

Energy Efficiency pathways

	Pathway	Short description of included measures
1	Baseline	Only existing measures (e.g., support schemes, energy pricing, Renovation Wave, energy efficient transport)
2	Obligation Scheme (EEOS) Focus building & industry	Obligation Scheme in all sectors (high ambition in building), limited grants in buildings, MEPS, grants in industry, and partial transport measures
3	Voluntary Agreement (VA) Focus industry	Highly ambitious Voluntary Agreements in industry & partial grants to support, CO_2 pricing, partial grants in buildings, and partial transport measures
4	Renovation Wave (Renowave) Focus buildings	Focus on buildings (ambitious grants with a slightly higher ambition for public buildings & MEPS), partial CO_2 & property taxation, partial grants in industry, partial in transport
5	Energy efficient transport (EET) Focus transport	Focus on EE in transport vehicle efficiency, public transport and active mobility (high ambition for subsidising the use of public transport, the development of convenient public transport and the railroad infrastructure), CO_2 and property taxation, partial grants in industry & buildings, partial MEPS, grants in industry
6	Comprehensive Energy Efficiency Reform 1 (CEER1) Balanced	MEPS and grants in buildings, property taxation, voluntary agreements in industry with support, and EE in transport vehicle efficiency, public transport and micromobility
7	Comprehensive Energy Efficiency Reform 2 (CEER2) Balanced, with increased ambitions for some measures	A slightly less ambitious MEPS (compared to CEER1) and ambitious grants in buildings, CO_2 pricing, an obligation scheme in non-residential, ambitious voluntary agreements in industry with support, and EE in transport vehicle efficiency, public transport and active mobility (with high ambition for subsidising the use of public transport, the development of convenient public transport and the railroad infrastructure)

REM: measures are varying in intensity

Methodology



Main measures in buildings

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Buildings

Major challenges to increase Energy Efficiency in buildings

- Old building stock with poor energy performance, similar to Central European situation
- Low renovation rates in general
- High energy saving potential in deep renovation of multifamily apartment buildings (70% of people live apartement buildings)
- No motivation for energy improvements in commercial buildings

Buildings

Main parameters in building stock energy model

- Net floor area in conditioned buildings (industrial buildings not included), m^2

	Single family	Multifamily	Office	Commercial	Educational	Other	Total
<2000	18 800 000	22 900 000	4 200 000	4 000 000	3 700 000	4 800 000	58 400 000
>2000	3 600 000	8 100 000	1 600 000	2 600 000	550 000	1 200 000	17 650 000
Kokku	22 400 000	31 000 000	5 800 000	6 600 000	4 250 000	6 000 000	76 050 000

- Buildings built <2000 have poor energy performance and need renovation according to EE LTRS
- Energy use is affected by dropout rate, new construction and energy weighted renovation rate to EPC class C

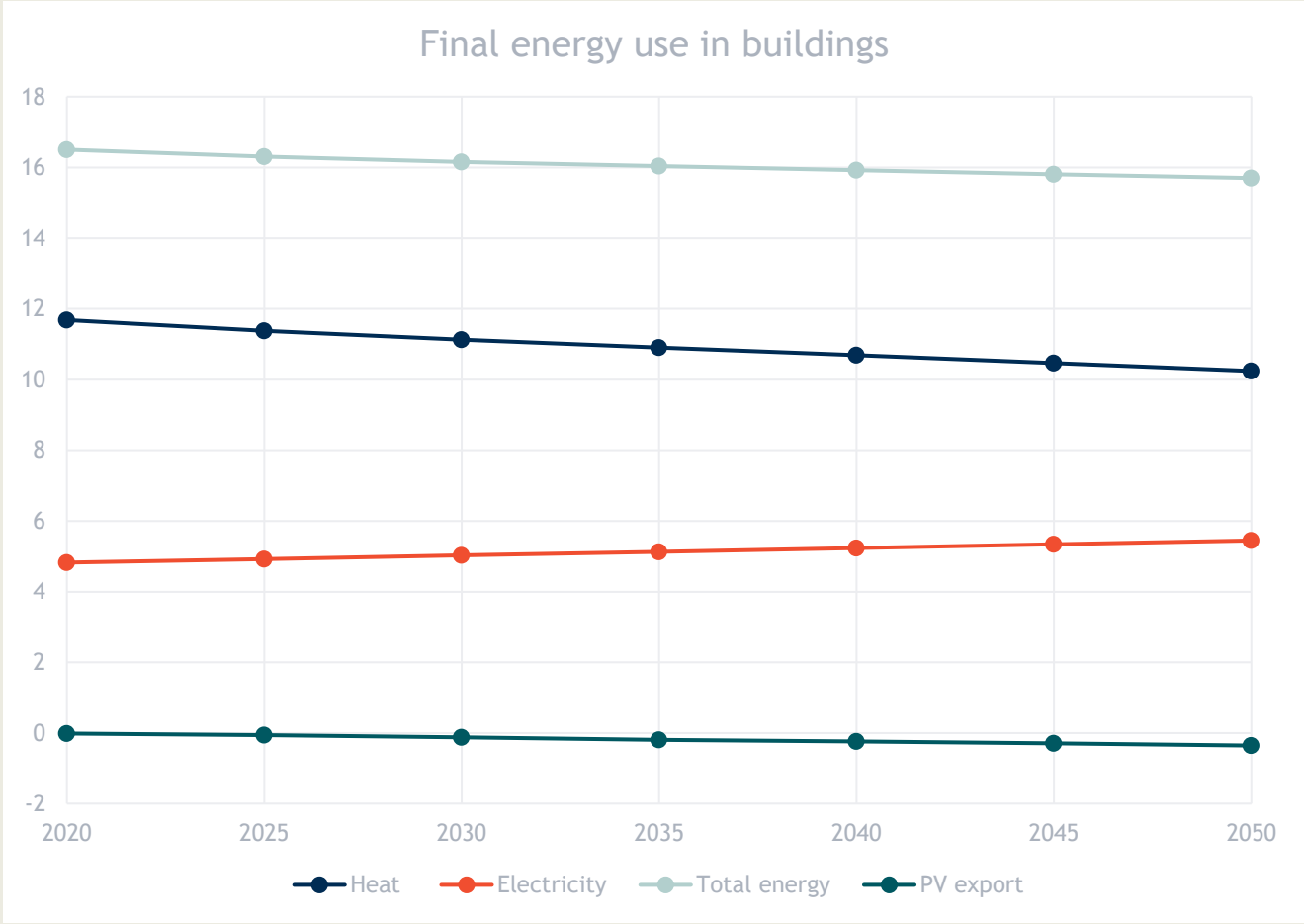
Yearly change	Single family	Multifamily	Office	Commercial	Educational	Other	Total
Dropout rate, m^2/%	95 000	110 000	20 000	20 000	10 000	20 000	275 000
	0.42%	0.35%	0.34%	0.30%	0.24%	0.33%	0.36%
Newbuild, m^2/%	245 000	310 000	75 000	65 000	35 000	50 000	780 000
	1.09%	1.00%	1.29%	0.98%	0.82%	0.83%	1.03%
Renovation rate, m^2/%	85 000	280 000	47 500	62 500	42 250	20 000	692 250
	0.38%	0.90%	0.82%	0.95%	0.99%	0.33%	0.71%

Buildings

Households and service sector - 52-53% of the final energy use in EE

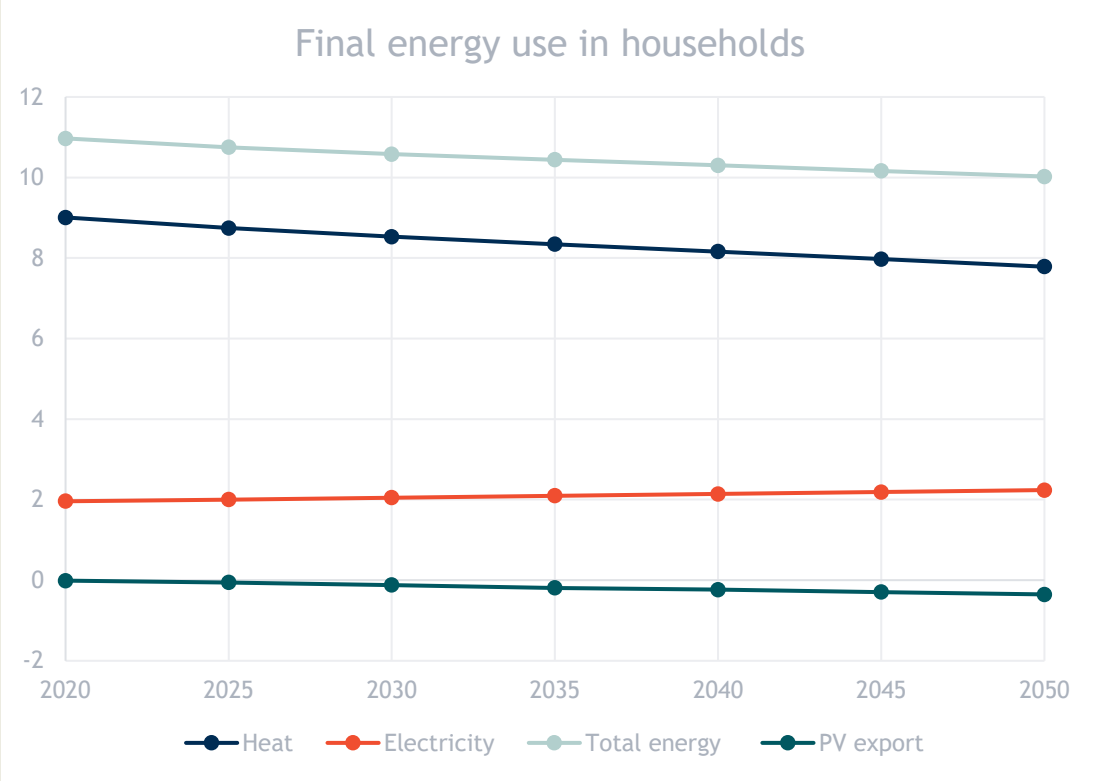
- Baseline without new measures – not fulfilling the targets
- Heat (district heating, fuels) is decreasing – depends strongly on renovation volumes
- Electricity incereases, partly balanced by on-site electricity generation
- PV generation not used in buildings show as negative (PV export)
- Residential and non-residential show different trends

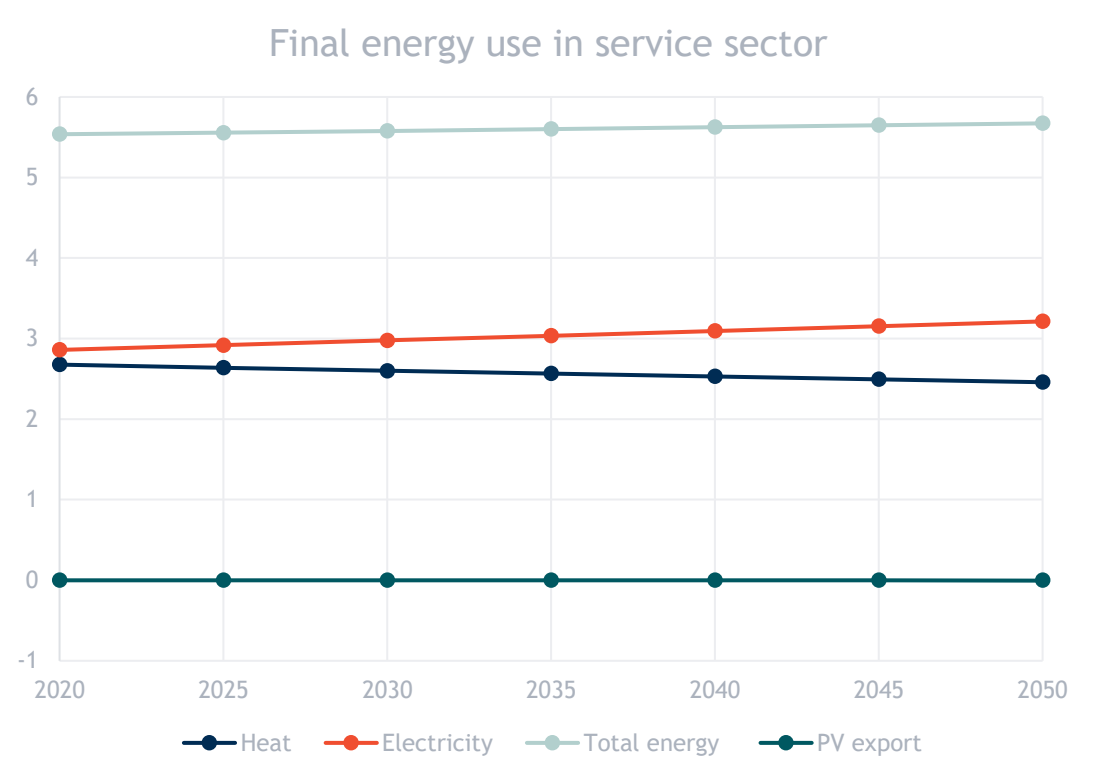
D2 baseline scenario*



Buildings

Households and service baseline





- Current trend in electricity is highly increasing in non-residential buildings
- Renovation rates are low, but energy performance improves because of new nearly zero energy buildings which slowly replace old buildings dropping out

Buildings

EE measures in Households and service sector

			Cost and savings per year			2024-2030 cumulative			
			Cost (M€/a)	Savings (GWh/a)	Unit cost, first year (€/MWh)	Cost (B€)	Savings (TWh)	Unit cost (€/MWh)	Cost allocation
Residential	nR1	Obligation scheme for residential sector	379.7	109.0	3483	2.4	2.3	1046	Energy provider (billed to end user)
	nR2	MEPS targeting rented + sold dwellings	337.5	55.3	6102	2.1	1.2	1833	Building owner
	nR3	MEPS for all dwelling (regulatory requirements for EPC class E, F, and G or above)	1108.1	181.6	6102	7.0	3.8	1833	Homeowners
	nR4	Renovation grants for single family houses (20-30% support)	10.0	8.0	1250	0.1	0.2	325	30% government 70% homeowners (government cost reported)
	nR5	Tax deduction for renovation works by private persons (=parallel track for single family)	3.0	7.2	417	0.0	0.1	123	Tax deduction to homeowners (lost tax for the government)
	nR6	Renovation grants for multifamily buildings/housing associations (30% support)	150.0	117.6	1275	1.1	3.2	325	30% government 70% homeowners (government cost reported)
	nR7	Property tax (according to EPC levels)	50.0	40.0	1250	0.3	0.8	369	Homeowners
	nR8	CO2 tax for end energy use of residential buildings	50.0	40.0	1250	0.3	0.8	369	Homeowners
Service	nS1	Obligation scheme for service sector	152.6	56.0	2726	1.0	1.2	819	Energy provider (billed to end user)
	nS2	Central government buildings renovation support (100% support)	15.0	1.8	8333	0.1	0.1	2213	80% government
	nS3	Public and municipality buildings renovation support (60% support in average)	66.0	13.2	5000	0.4	0.3	1502	60% central government 40% local government (government cost reported)
	nS4	Commercial buildings energy performance investments support	50.0	72.0	694	0.3	1.5	205	30% government 70% building owners (government cost reported)
	nS5	CO2 certificate sales based on energy savings from commercial buildings renovation, income invested as renovation support	10.0	14.4	694	0.1	0.3	205	Businesses buying certificates
	nS6	CO2 tax for end energy use of commercial buildings	50.0	72.0	694	0.3	1.5	205	Building owners
	nS7	Property tax (according to EPC levels)	50.0	72.0	694	0.3	1.5	205	Building owners
	nS8	Minimum energy performance standards for non-residential buildings (regulatory requirements for EPC class E and F)	70.0	30.2	2315	0.4	0.6	695	Building owners

Buildings

Examples of modelling

Renovation grant for apartment buildings								
Period	2024	2025	2026	2027	2028	2029	2030	**Cumulative**
Volume of the measure, M€	150	150	150	150	150	150	150	**1050**
Financial support %	30	30	30	30	30	30	30	
Investment with VAT, €/m2	450	459	468	478	487	497	507	
Energy saving heat, kWh/m2 a	102	102	102	102	102	102	102	
Energy saving electricity, kWh/m2 a	6	6	6	6	6	6	6	
New energy saving heat, GWh	113.3	111.1	108.9	106.8	104.7	102.6	100.6	
New energy saving electricity, GWh	6.7	6.5	6.4	6.3	6.2	6.0	5.9	
Annual energy saving heat, GWh	113.3	224.4	333.4	440.2	544.9	647.5	748.2	**3052**
Annual energy saving electricity, GWh	6.7	13.2	19.6	25.9	32.1	38.1	44.0	**180**
Tax return, M€	160	160	160	160	160	160	160	**1120**
Total volume of investments mobilised, M€	500	500	500	500	500	500	500	**3500**
New jobs created, man-year	8500	8500	8500	8500	8500	8500	8500	**59500**
Unit cost €/MWh	1250	631	425	322	260	219	189	**325**
Co-benefits rating								
Improved indoor climate and real estate value, reduced DALY and health care cost								

Buildings

Main measures

Households – governmental support to budget neutral renovation grants:

- Renovation grants for deep renovation of multifamily buildings/housing associations (30% support)
- Property tax (according to EPC levels)
- Tax deduction for renovation works by private persons (=parallel track for single family)
- Renovation grants for single family houses (20-30% support, specific target groups)

Service sector – governmental support is not necessary:

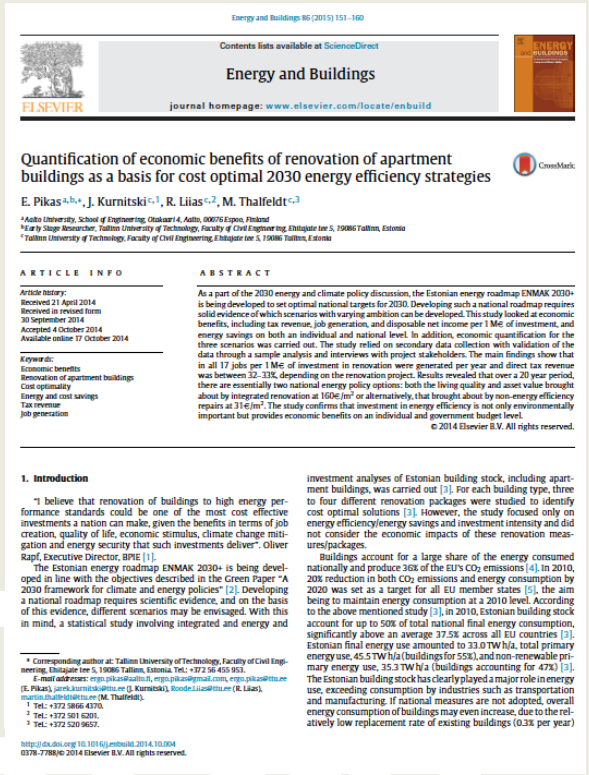
- Minimum energy performance standards (MEPS) for non-residential buildings (regulatory requirements for EPC class E and F)
- Property tax (according to EPC levels)
- Deep renovation of public buildings (3%)

Buildings

Flagship measure: Budget neutral renovation grants in multifamily

Massive savings with deep renovation

- Large volumes of similar buildings
- Standard solutions



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Quantification of economic benefits of renovation of apartment buildings as a basis for cost optimal 2030 energy efficiency strategies

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ABSTRACT

As a part of the 2030 energy and climate policy discussion, the Estonian energy roadmap ENMAK 2030+ is being developed to set optimal national targets for 2030. Developing such a national roadmap requires solid evidence of which scenarios with varying ambition can be developed. This study looked at economic benefits, including tax revenue, job generation, and disposable net income per 1 M€ of investment, and energy savings on both an individual and national level. In addition, economic quantification for the three scenarios was carried out. The study relied on secondary data collection with validation of the data through a sample analysis and interviews with project stakeholders. The main findings show that in all 17 jobs per 1 M€ of investment in renovation were generated per year and direct tax revenue was between 32–33%, depending on the renovation project. Results revealed that over a 20 year period, there are essentially two national energy policy options: both the living quality and asset value brought about by integrated renovation at 160€/m² or alternatively, that brought about by non-energy efficiency repairs at 31€/m². The study confirms that investment in energy efficiency is not only environmentally important but provides economic benefits on an individual and government budget level.

1. Introduction

"I believe that renovation of buildings to high energy performance standards could be one of the most cost effective investments a nation can make, given the benefits in terms of job creation, quality of life, economic stimulus, climate change mitigation and energy security that such investments deliver". Oliver Rapf, Executive Director, BPIE [1].

The Estonian energy roadmap ENMAK 2030+ is being developed in line with the objectives described in the Green Paper "A 2030 framework for climate and energy policies" [2]. Developing a national roadmap requires scientific evidence, and on the basis of this evidence, different scenarios may be envisaged. With this in mind, a statistical study involving integrated and energy and investment analyses of Estonian building stock, including apartment buildings, was carried out [3]. For each building type, three to four different renovation packages were studied to identify cost optimal solutions [3]. However, the study focused only on energy efficiency/energy savings and investment intensity and did not consider the economic impacts of these renovation measures/packages.

Buildings account for a large share of the energy consumed nationally and produce 36% of the EU's CO_2 emissions [4]. In 2010, 20% reduction in both CO_2 emissions and energy consumption by 2020 was set as a target for all EU member states [5], the aim being to maintain energy consumption at a 2010 level. According to the above mentioned study [3], in 2010, Estonian building stock account for up to 50% of total national final energy consumption, significantly above an average 37.5% across all EU countries [3]. Estonian final energy use amounted to 33.0 TW h/a, total primary energy use, 45.5 TW h/a (buildings for 55%), and non-renewable primary energy use, 35.3 TW h/a (buildings accounting for 47%) [3]. The Estonian building stock has clearly played a major role in energy use, exceeding consumption by industries such as transportation and manufacturing. If national measures are not adopted, overall energy consumption of buildings may even increase, due to the relatively low replacement rate of existing buildings (0.3% per year)

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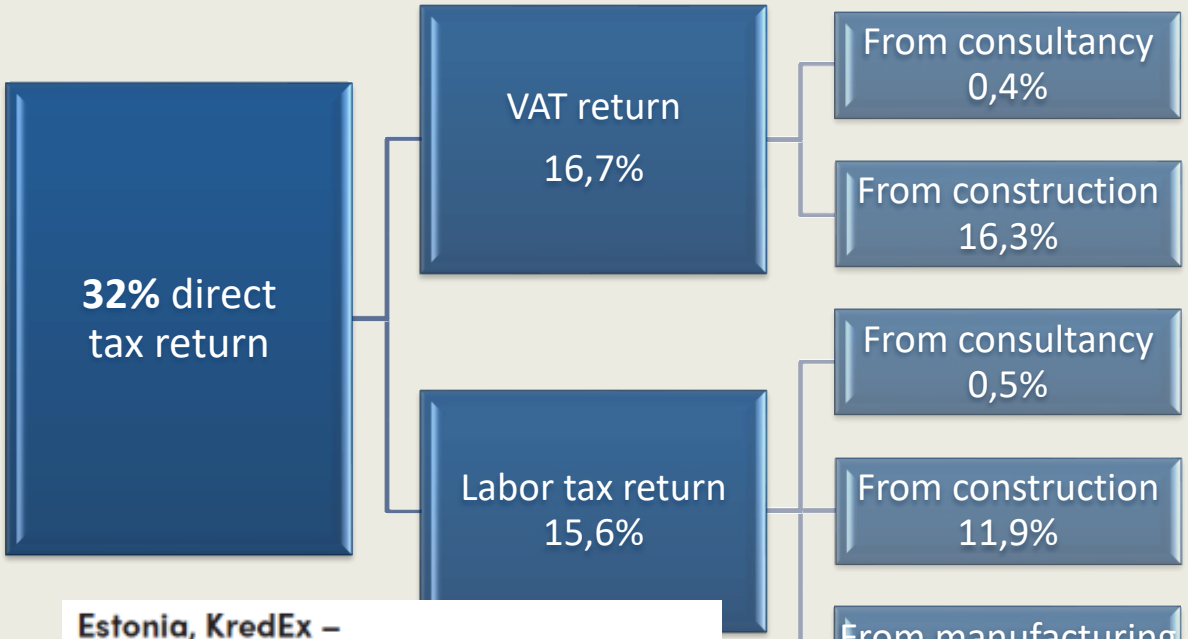


Estonia, KredEx – A Deep Renovation model for Europe

Estonia has achieved great results in deep renovation, thanks to the KredEx renovation grant system. Backed by the EU since its 2010 kick-off, KredEX features strict technical requirements, focusing on high-level energy efficiency and indoor climate conditions.

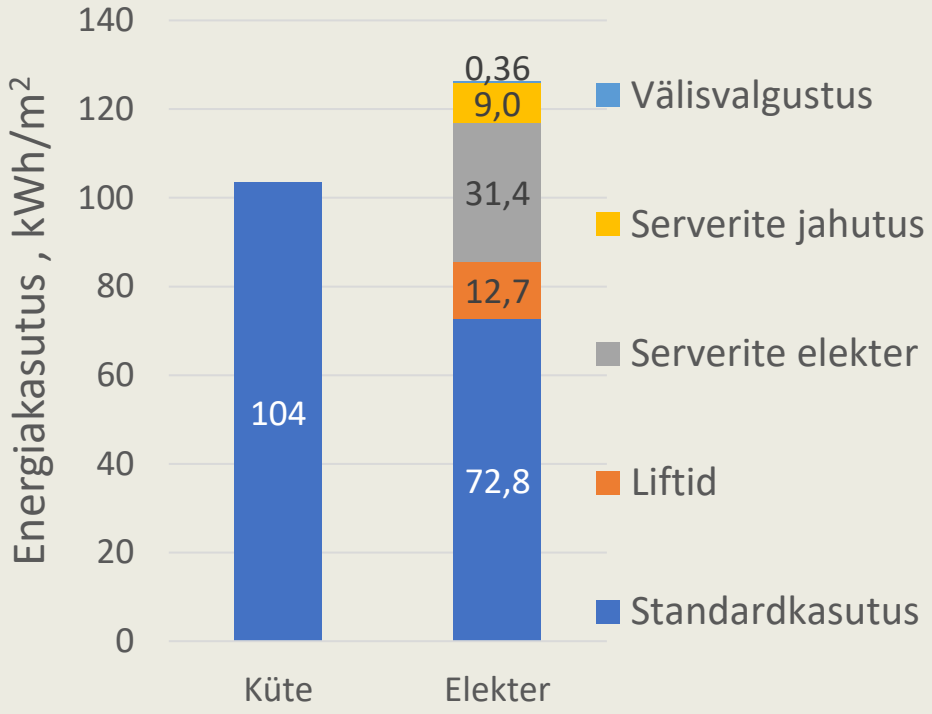
Perpetuum mobile?

- Heating energy savings 60-70%
- Small increase or decrease in electricity depending on PV installation

Buildings Flagship measure: Non-residential MEPS

Commercial building 16 990 m2, 2008:

- Metered energy use, gas heating



- EPC class G according to main meters EP=357
- Submetering provides EP=250, class E
- 37 €/m2 investment to BMS, HVAC and PV results in EPC D
- High saving potential with MEPS

ETA või KEK, kWh/(m²a)	Klass
ETA või KEK ≤ 100	A
101 ≤ETA või KEK ≤ 130	B
131 ≤ETA või KEK ≤ 160	C
161 ≤ETA või KEK ≤ 210	D
211 ≤ETA või KEK ≤ 260	E
261 ≤ETA või KEK ≤ 320	F
321 ≤ETA või KEK ≤ 400	G
ETA või KEK ≥ 401	H

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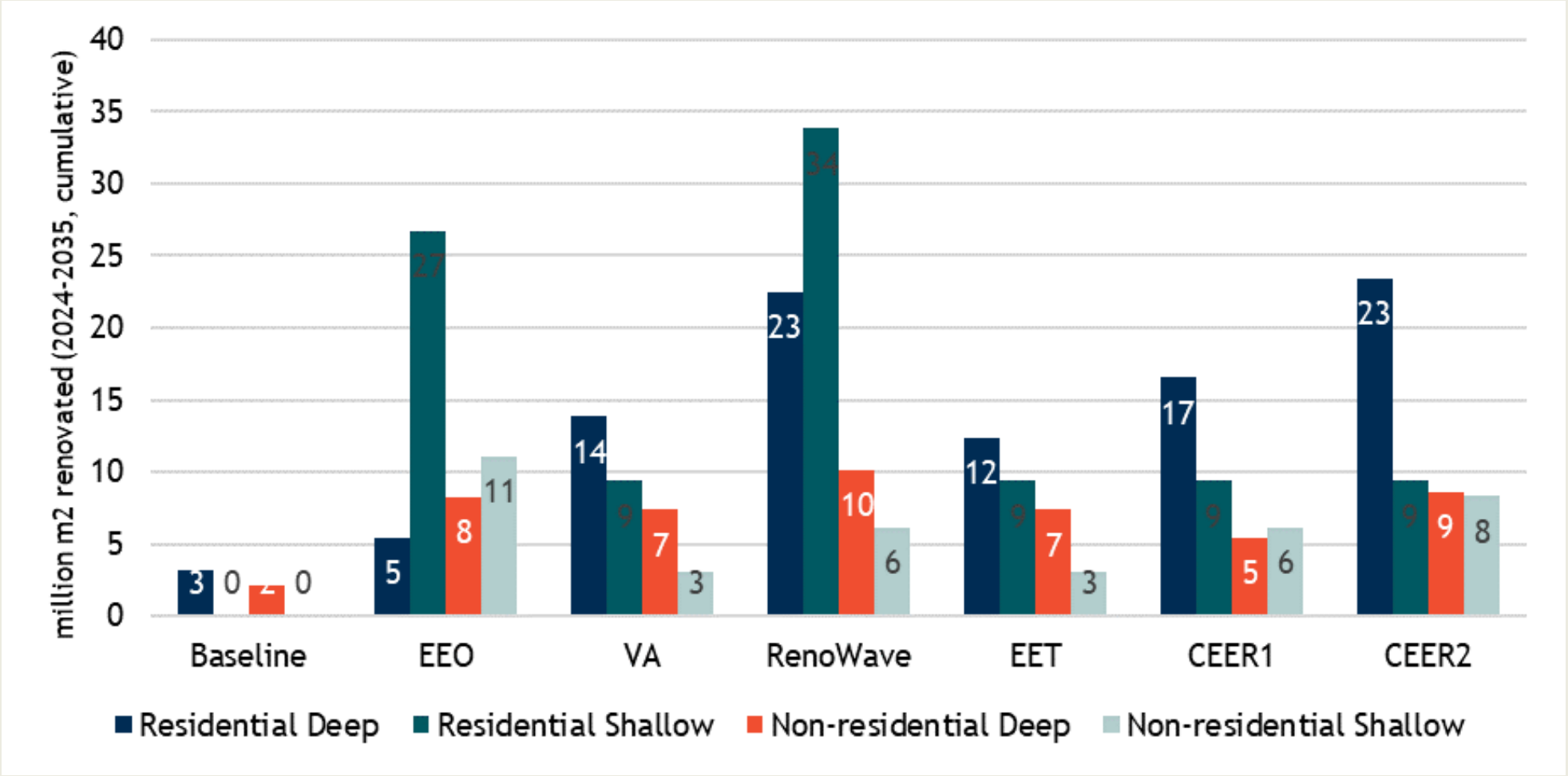
Buildings Comparrison of 7 pathways



Main measures in industry

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Industry

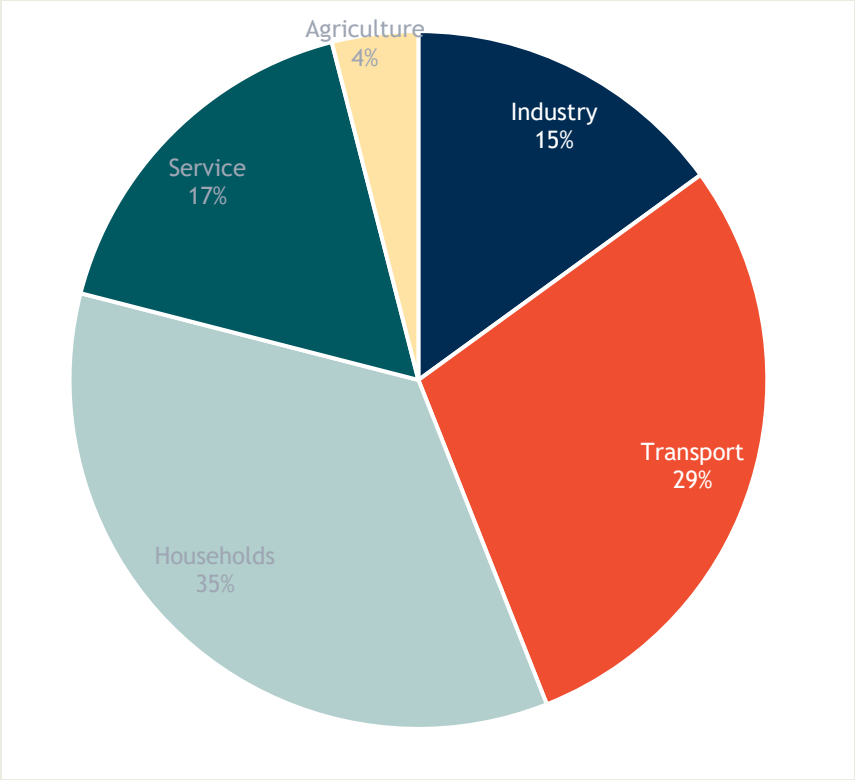
Major challenges to increase Energy Efficiency in industry

- Competitiveness and financial capability
- High upfront costs and payback times
- Weak associations/federations
- Uncertainty

Industry – trends and forecast

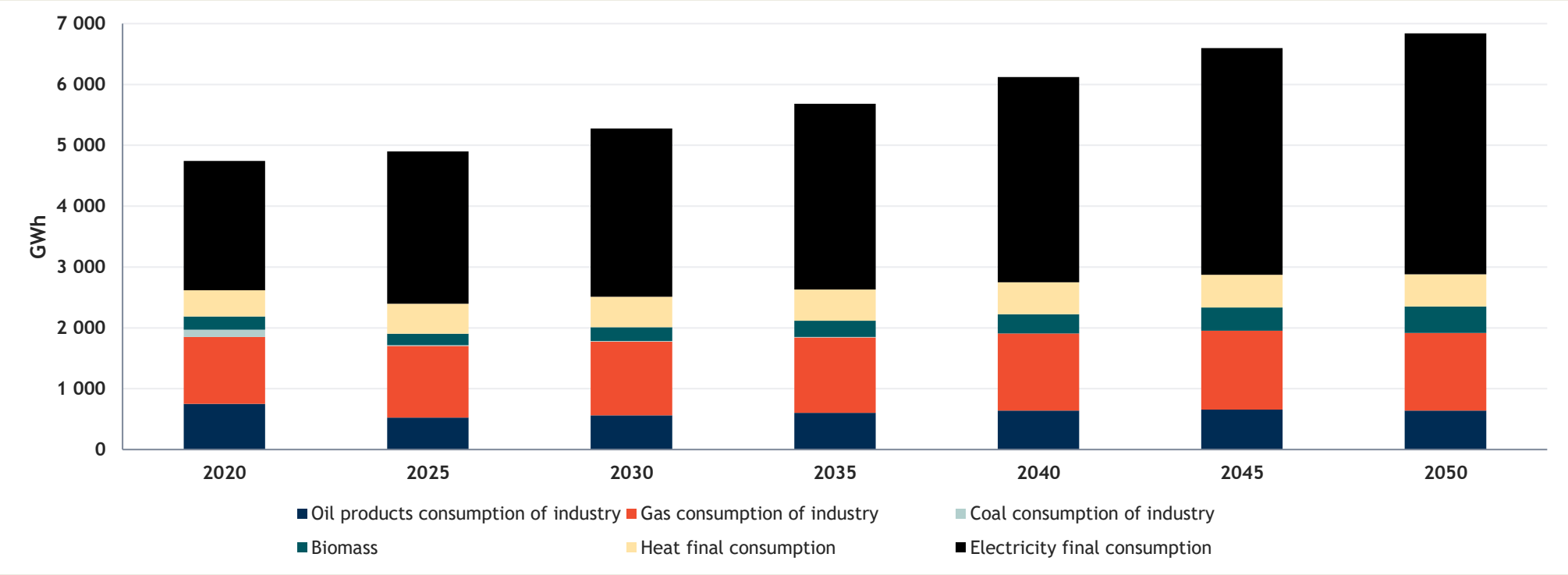
- The share of industrial consumption has decreased both in total and percentage-wise, in 2020 industry amounted for 4.7 TWh of energy use and 15% share, compared with ca 30% share a few decades ago

- As the total energy consumption of industrial sector is low, even a few additional industrial consumers or factories ceasing operation could change the share of industrial consumption in the mix



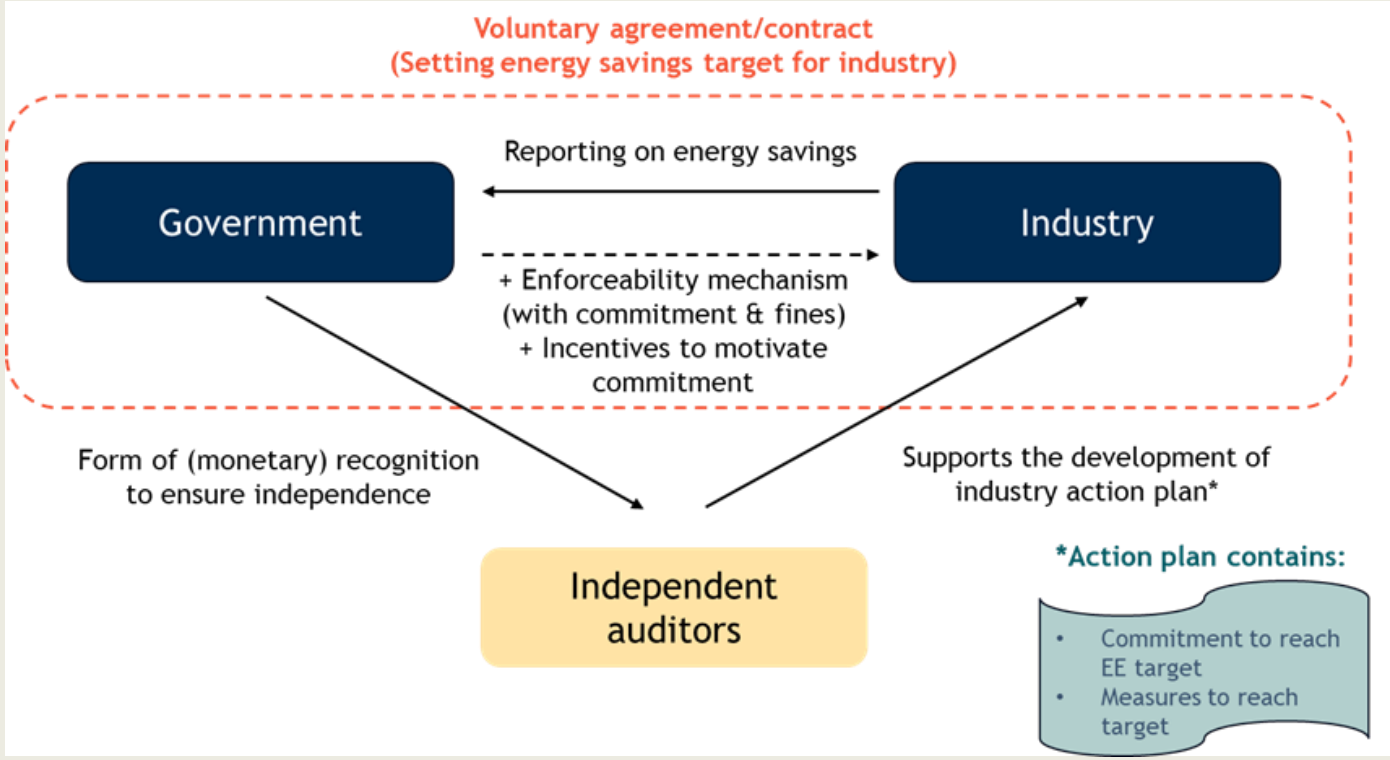
Industry – trends and prognosis

- Energy use forecast without EE measures (baseline)
- It is assumed in the baseline scenario that a new bio products factory will be completed in Estonia by 2030
- Although the trend for industrial energy use has previously been negative, it is estimated that industrial energy use will increase 1,5%/y if no measures are implemented



Industry –measures

- Voluntary agreement (VA) was chosen as flagship measure for industry
- Financial advantage for enterprises in VA is rebate on renewable energy tax
- Enterprises that will not join VA will still have the right to apply for existing measures that are planned to be continued –various EE grants and consultations for SME-s



Voluntary Agreements

- Voluntary agreement scheme will be implemented in two steps
- 1st phase
  - Government initiates the scheme directly, include 20-30 biggest industrial enterprises by energy consumption
  - **Energy efficiency is monitored based on KPIs taking into account energy use per unit to enable development and growth**
  - Start with 50% renewable energy rebate, evaluate the rate
  - Monitor results, empower and include associations/federations
  - Gather feedback, revise the scheme for the expansion to SMEs and other sectors
- 2nd phase
  - Expanding the scheme to SMEs and all industry
  - VA is intermediated by associations/federations not by government directly
  - Revise the scheme again and expand VA further into other sectors like agriculture

Other EE measures

- Measures that are available for enterprises not included in VA
  - Existing and continued
    - Promotion of resource-efficient green technologies of industrial enterprises
    - Investment support for the food industry to ensure security of energy supply
    - Supporting energy efficiency investments in companies
  - New
    - Energy consulting and networking events for small and medium companies (SMEs)
    - Supporting energy efficiency investments in electro-intensive companies

Main takeaways for industry

- Enterprises can choose either to participate in VA and gain benefits from renewable energy rebate (lower electricity cost) or choose not to sign the agreement and remain eligible for EE grants. We estimate that bigger consumers will choose VA over EE grants due to significant reduction in energy costs
- **Key aspect for industry - EE measures should be non-obligatory**
- There are no penalties for Industries that will not participate in VA and will also not increase EE in any other way

Main measures in transport

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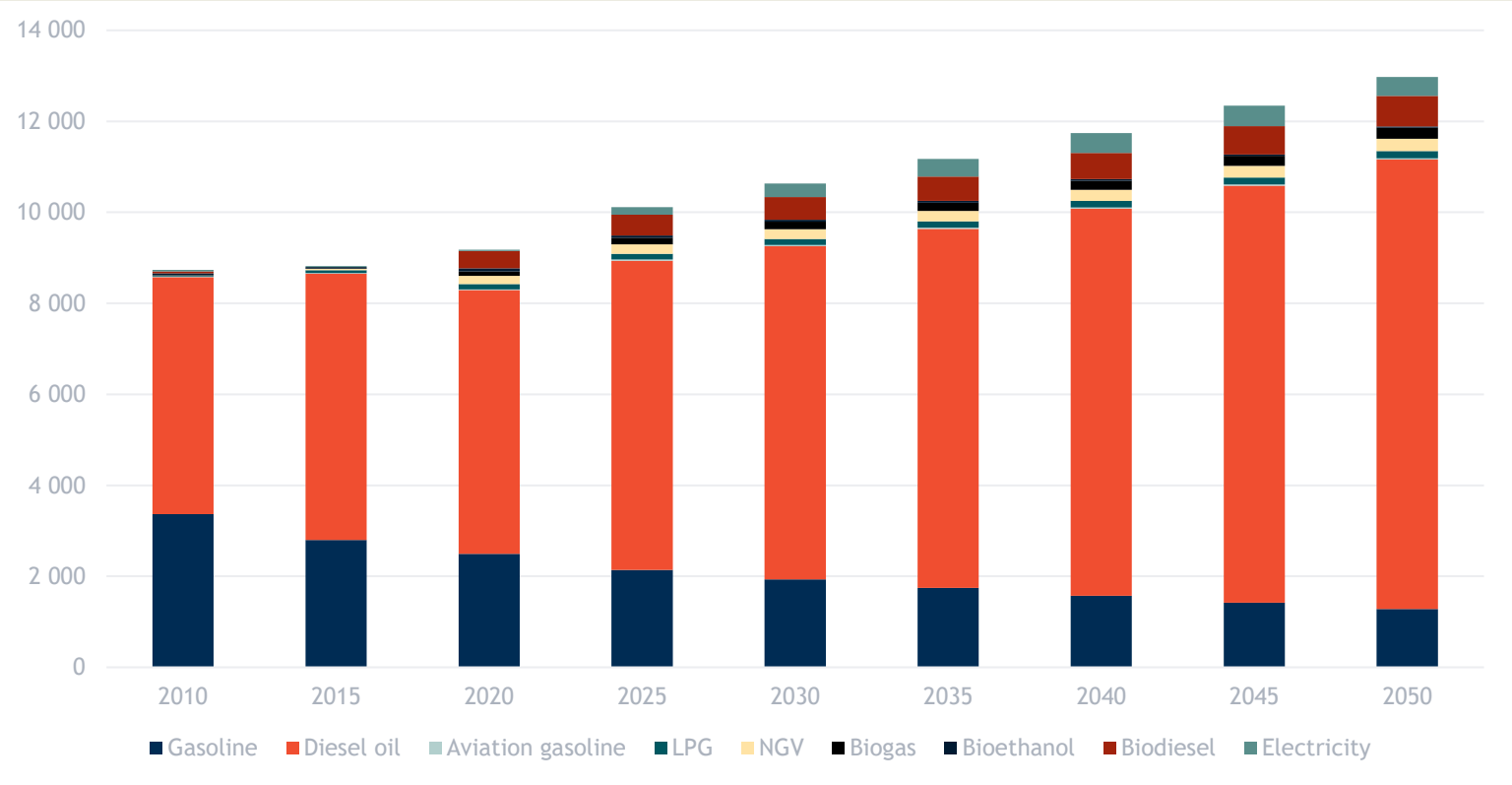
Transport

Major challenges to increase Energy Efficiency in transport

- In transport, sustainability and energy efficiency do not always correlate: several carbon neutral solutions are energy-intensive
- Sparse population does not create enough demand for public transport networks outside of major cities
- Demand is distributed sparsely in both spatial and temporal dimensions
- Energy consumption is not geographically limited

Transport – trends and forecast

- The forecast for fuel consumption in the transport sector shows a significant increase for diesel engines.
- By 2050, the total energy consumption of the transport sector increases to 12 972 GWh (from 9 178 GWh in 2020)



EE measures in transport sector

nT1	Promotion of clean and energy efficient road transport vehicles in public procurement
nT2	Subsidy for public transport usage instead of personal vehicle
nT3	Priority lanes for micromobility
nT4	Electric charging infrastructure for existing inhabitance areas
nT7	Vehicle tax for registration
nT8	Annual vehicle tax
nT9	Development of convenient and modern public transport
nT11	Developing the railroad infrastructure (includes the building of Rail Baltic)
nT12	The railroad electrification
nT15	Acquisition of additional passenger trains
nT16	New tram lines in Tallinn
nT17	Subsidy for micromobility usage instead of personal vehicle
nT18	All Tallinn and Tartu taxis run on electricity
nT19	Tallinn and Tartu congestion charge
nT20	Mileage-based road use fee for heavy vehicles.

Discarded measures

These measures are very important, but due to energy-intensivess the fall out of scope for this study

nT5	Biomethane infrastructure
nT6	Hydrogen infrastructure
nT13	Promoting the use of biomethane in buses
nT14	Promoting the use of electricity in buses
nT21	Subsidizing biofuel that meets the criteria of sustainability or imposing the obligation to sell it to filling stations

Estimated effect of transport measures

		Cost and savings per year			2024-2030 cumulative			
		Cost (M€/a)	Savings (GWh/a)	Unit cost, first year (€/MWh)	Cost (B€)	Savings (TWh)	Unit cost (€/MWh)	Cost allocation
nT1	Promotion of clean and energy efficient road transport vehicles in public procurement	87.5	13.8	6321	0.6	0.3	1899	100% government
nT2	Subsidy for public transport usage instead of personal vehicle	0.4	23.3	17	0.0	0.1	16	100% government
nT3	Priority lanes for micromobility	16.0	23.3	686	0.1	0.5	196	100% government
nT4	Electric charging infrastructure for existing inhabitance areas	3.4	-1.0	-3507	0.0	0.0	-1002	50% government
nT5	Biomethane infrastructure	5.4	-1.0	-5355	0.0	0.0	-1530	50% government
nT6	Hydrogen infrastructure	2.7	0.0	-72292	0.0	0.0	-20655	50% government
nT7	Vehicle tax for registration	0.2	-4.2	-36	0.0	-0.1	-2	Vehicle owners
nT8	Annual vehicle tax	0.2	-11.2	-13	0.0	-0.1	-2	Vehicle owners
nT9	Development of convenient and modern public transport	3.3	43.6	75	0.0	0.9	48	100% government
nT11	Developing the railroad infrastructure (includes the building of Rail Baltic)	420.0	339.4	1237	1.4	1.4	995	100% government
nT12	The railroad electrification	200.0	46.7	4283	0.4	0.7	570	100% government
nT13	Promoting the use of biomethane in buses	0.0	-0.8	0	0.0	0.0	0	100% government
nT14	Promoting the use of electricity in buses	2.5	0.5	5401	0.0	0.0	6751	100% government
nT15	Acquisition of additional passenger trains	20.0	21.6	926	0.1	0.3	206	100% government
nT16	New tram lines in Tallinn	55.0	59.9	919	0.1	0.4	153	100% government
nT17	Subsidy for micromobility usage instead of personal vehicle	0.4	23.3	17	0.0	0.3	7	100% government
nT18	All Tallinn and Tartu taxis run on electricity	0.0	0.8	0	0.0	0.0	0	50% government 50% taxi companies
nT19	Tallinn and Tartu congestion charge	0.1	0.0	-	0.0	0.0	-	Road users
nT20	Mileage-based road use fee for heavy vehicles.	0.0	-1.1	0	0.0	0.0	0	100% government
nT21	Subsidizing biofuel that meets the criteria of sustainability or imposing the obligation to sell it to filling stations	43.3	66.6	650	0.3	1.4	186	100% government
nT22	Replacing existing street lamps with LED lamps	3.8	5.9	641	0.0	0.1	183	100% government

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Study overall results and takeaways

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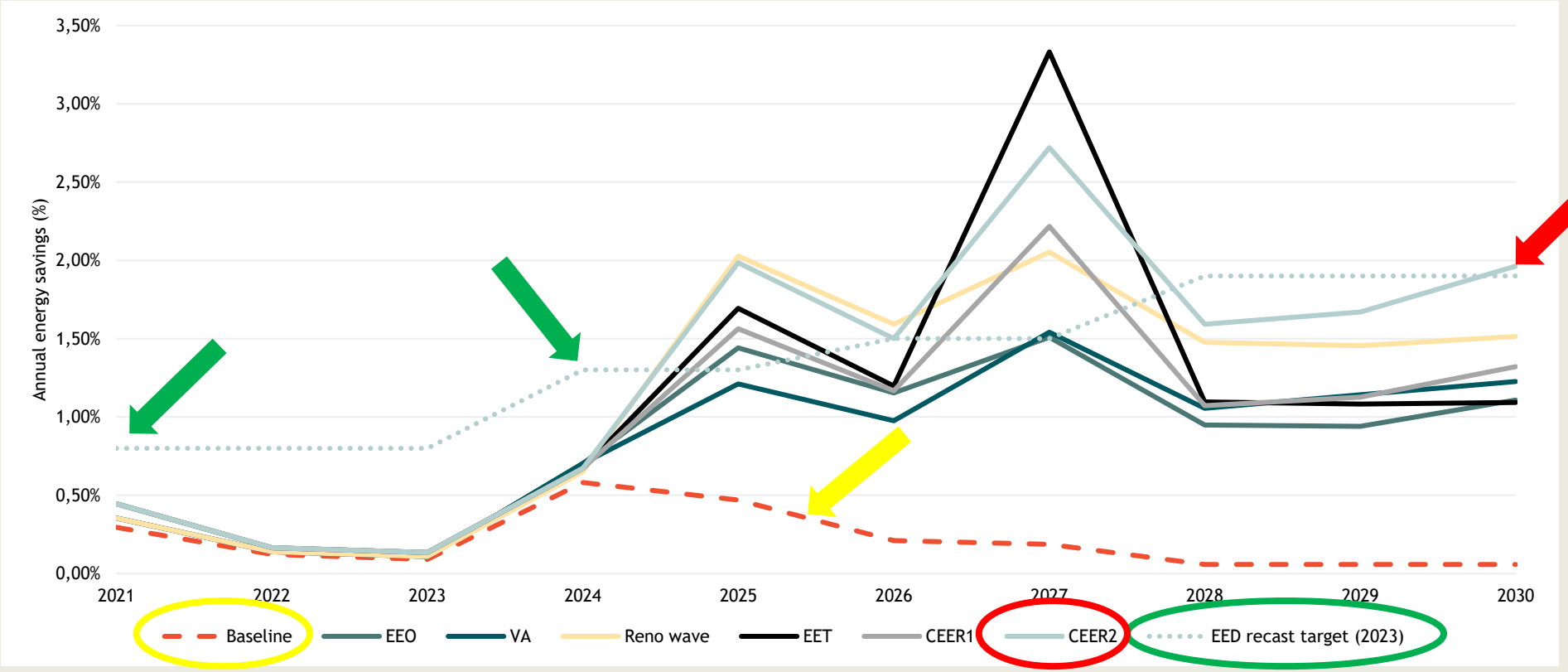
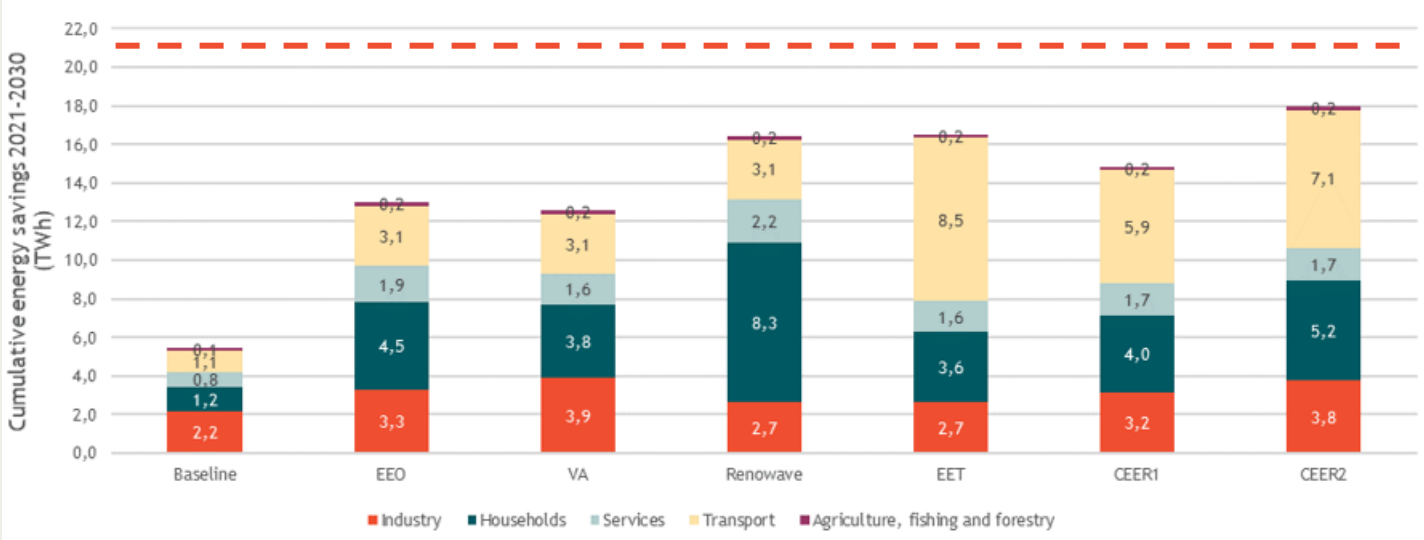
Comparison of 7 pathways



Only CEER2 is at 1.9% annual savings in 2030

Both Renowave & CEER2 achieve the 1.5% average over 2024-2030

Comparison of 7 pathways



21.279 TWh

CEER2 achieves the required cumulative savings (~21.3 TWh) at the end of 2031, Renowave and EET by early 2032.

Comparison of 7 pathways

Objective	Year	Unit	EED target	NECP 2030 [10]	Baseline	EEO	VA	Reno Wave	EET	CEER1	CEER2
Final energy consumption	2030	TWh	30	33,3	32,8	30,7	30,7	29,8	29,9	30,3	29,3
Cumulative energy savings	2021-2030	TWh		21,3	5,5	13,0	12,6	16,4	16,5	14,8	18,0
Final energy savings rate	2030	%	1,90%	1,90%	0,1%	1,1%	1,2%	1,5%	1,1%	1,3%	1,96%
Final energy savings rate, average	2024-2030	%	1,50%	1,50%	0,1%	1,0%	1,0%	1,4%	1,3%	1,2%	1,6%
Primary energy consumption	2030	TWh	45,7	63,9	51,5	48,2	48,1	46,7	47,6	47,7	46,2
Final energy savings of public sector/buildings	2021-2030	%	1,90%		0,0%	1,0%	0,8%	1,0%	0,8%	0,9%	1,0%
Renovation rate of public owned buildings	2021-2030	%	3,00%		0,9%	3,5%	2,9%	3,8%	2,9%	3,4%	3,8%
Total renovated area of central government buildings	2021-2030	mln. m2		0,3	0,12	0,43	0,4	0,5	0,4	0,47	0,54
Industry annual energy savings	2030	GWh		232	313	564,0	862,9	417,5	417,5	645,0	833,4
Transport fuel consumption	2030	TWh		8,3	10,1	9,6	9,6	9,6	8,3	9,0	8,6

CEER2 achieves the highest number of targets

Comparison of 7 pathways

Total investment needed ~13.3 B€

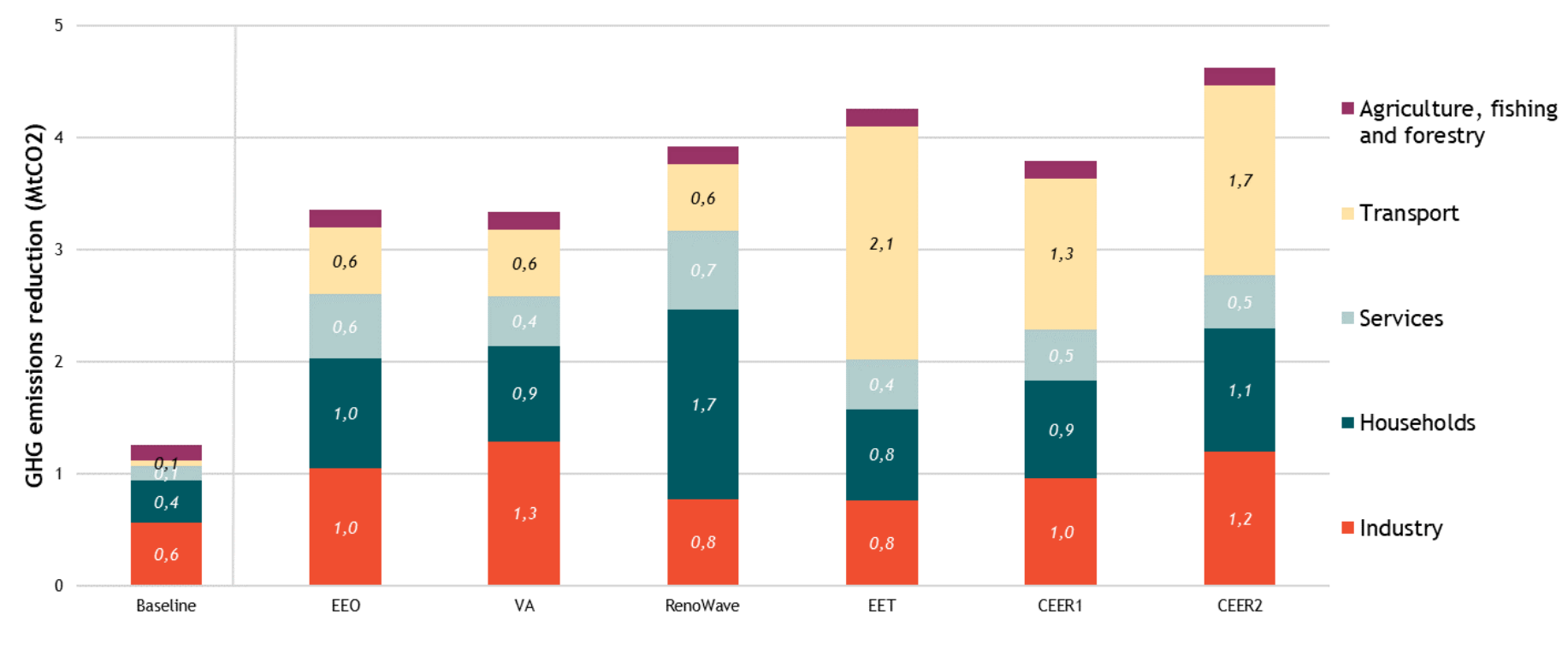
With ~5 B€ public money

Impact on jobs, GDP, revenues are more favourable in Renowave (construction is job intensive)

Positive impact on energy cost as % of disposable income

Indicator	Time period	Unit	Baseline	EEO	VA	RenoWave	EET	CEER1	CEER2
GHG emission reduction, cumulative	2021-2030	MtCO2	1,26	3,36	3,34	3,92	4,26	3,79	4,63
Investment costs (total), cumulative	2021-2030	MEUR	1.588	8.660	9.048	16.231	11.262	9.619	13.306
of which public support, cumulative	*2021-2030*	*MEUR*	*331*	*2.836*	*2.929*	*3.926*	*5.720*	*3.874*	*5.026*
Cost savings, cumulative	2021-2030	MEUR	489	1.261	1.206	1.621	1.667	1.476	1.796
Impact on GDP	2021-2030	%	0,6%	2,9%	3,0%	5,2%	3,7%	3,2%	4,4%
Impact on disposable income	2021-2030	%	0,8%	1,4%	2,1%	0,8%	3,8%	2,5%	3,6%
Impact on employment (Average annual job creation)	2021-2030	Thousand employees	0,83	11,96	11,64	24,23	14,80	12,88	17,41
Impact on tax revenue	2021-2030	%	0,6%	1,5%	1,7%	2,8%	1,5%	1,5%	2,1%
Average energy cost as a share of household disposable income	2021-2030	%	7,98%	7,67%	7,67%	7,41%	7,56%	7,63%	7,46%
Average yearly GDP	2021-2030	MEUR	42.823	43.787	43.828	44.761	44.156	43.931	44.423
Average yearly Investment costs (total)	2021-2030	MEUR	159	866	905	1.623	1.126	962	1.331
Average yearly tax revenue	2021-2030	MEUR	16.042	16.186	16.205	16.389	16.183	16.183	16.274
Average yearly public support	2021-2030	MEUR	33	284	293	393	572	387	503

Comparison of 7 pathways



CEER2 vs baseline

Transport ~1/3 energy use & 37% GHG savings

Residential ~1/3 energy use & 24% GHG savings ➔ too shallow renovation

Services ~1/6 energy use & ~10% GHG savings ➔ too shallow renovation

Industry ~1/6 energy use & ~26% GHG savings ➔ intense efforts

Overall action plan for CEER2

Set of measures	Timeline	Responsibility	EE total investment 2024-2030 needed to fill 2030 targets	
BUILDINGS			**9 147 Meur**	
Existing measures	2021 - 2024	RAM	346 Meur (~30% public)	RRP
Property taxation	2030 ->	RAM	403 Meur (100% private)	
Other taxes (deduction, CO2)	2027 ->	RAM	2 338 Meur (100% private)	
Continue renovation grants for all buildings	2027 - 2035	KLIM	3 875 Meur (~30% public)	ETS & ETS2 revenues
Minimum Energy Performance Standards	2027 ->	KLIM	2 100 Meur (100% private)	
Obligation scheme for non residential	2030 ->	KLIM	84 Meur (100% private)	

RAM = Finance Ministry; KLIM = Climate Ministry; MKM = Economic Affairs and Communication Ministry

Overall action plan for CEER2

Set of measures	Timeline	Responsibility	EE total investment 2024-2030 needed to fill 2030 targets	
INDUSTRY & AGRICULTURE			**430 Meur**	
Existing measures	2021 - 2024	MKM	170 Meur (~30% public)	RRP
Grants and subsidies for all plants (large, SMEs, agricultural)	2024 ->	MKM	122 Meur (~30% public)	ETS revenues
Voluntary Agreement	2024 - 2035	MKM	139 Meur (100% private)	ETS revenues or Exemption of fees to support RES electricity

RAM = Finance Ministry; KLIM = Climate Ministry; MKM = Economic Affairs and Communication Ministry

Overall action plan for CEER2

Set of measures	Timeline	Responsibility	EE total investment 2024-2030 needed to fill 2030 targets	
TRANSPORT			**2 667 Meur**	
Existing measures	2021 - 2027	KLIM, TRAM	10 Meur (100% private)	
Fiscal measures (vehicle tax, congestion charge)	2025 ->	KLIM, TRAM	1 Meur (100% private)	
Deploy EV charging infrastructure	2025 - 2035	KLIM, TRAM	40 Meur (50% private)	ETS revenues
Energy efficient vehicles in public procurement	2025 - 2035	KLIM, TRAM	552 Meur (100% public)	Gov budget
Subsidise public transport use & active mobility	2025 - 2035	KLIM, TRAM	8 Meur (100% public)	ETS & ETS2 revenues
Develop public transport & priority lanes for active mobility	2025 ->	KLIM, TRAM	2 056 Meur (100% public)	ETS & ETS2 revenues

Overall action plan for CEER2

Set of measures	Timeline	Responsibility	EE total investment 2024-2030 needed to fill 2030 targets	
Excises & Fuel VAT (existing)			**1 062 Meur**	
Cross cutting	2021 ->	RAM	1 062 Meur (100% private)	
TOTAL				
		KLIM	**13 306 Meur**	

Takeaways

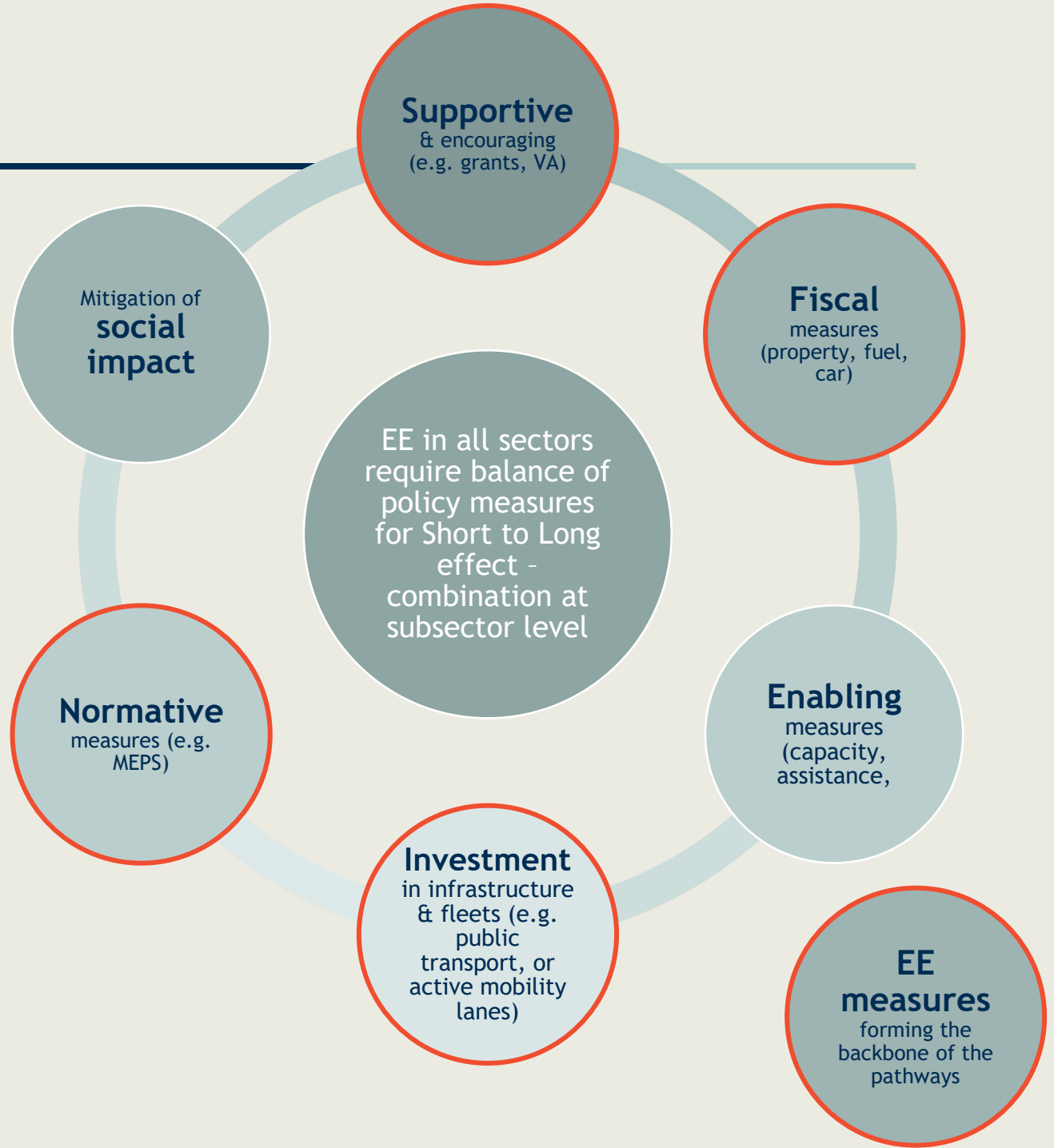
The optimal pathway has to consider the following:

- **CEER2 requires ~EUR 13.3 billion investment (2021-2030)**
- **Address all sectors**, spreading (not diluting) efforts is important: building has large potential but is expensive; industry/agro have lower potential & need competitiveness; transport requires to reduce personal cars
  - Fuel switch is not enough, but requires EE for complete decarbonization
- Applied measures must enable behavioural changes in transport, in buildings but also in industry

Takeaways

Combination of measures ensure right balance:

- Accelerating the transition while ensuring long term affordability
- Avoiding too expensive options
- Possibly influencing behavioural changes thanks to price signal
- Incentivising investments and changes by providing support, and then by progressively de-incentivising
- Setting up realistic and the least complex options
- Engaging the concerned actors, consumers & professionals
- Designing all measures in a coherent package to ensure complementarity
- Allowing easy and fair distribution of costs, to deal with energy poverty concerns



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Q&A

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Thank you for your attention, please contact us for more information.

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