

Study on the optimal combination of alternative energy saving measures

Task 3 and 4 | Technical support on end-use energy saving target and measures under Article 7 of Directive 2012/27/EU

DRAFT REPORT

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Client: Ministry of Energy, Commerce and Industry

Date: Vienna, February 2020



Ministry of Energy, Commerce and
Industry

IMPRINT

Published and produced by: Österreichische Energieagentur – Austrian Energy Agency
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Produced and published in Vienna

Reprint allowed in parts and with detailed reference only. Printed on non-chlorine bleached paper

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1 Introduction

Article 7 of the Energy Efficiency Directive (2012/27/EU), short EED, regulates that Member States have to achieve an annual quantitative energy savings target of 1.5% of energy sales to final customers. By way of derogation from that requirement, Cyprus shall achieve new savings each year from 1 January 2021 to 31 December 2030 equivalent to 0,24 % of annual final energy consumption, averaged over the most recent three-year period prior to 1 January 2019. These savings can be achieved by energy efficiency obligation schemes (EEOs) for retail energy sales companies or energy distributors or by alternative measures. A combination of EEOs and alternative measures is also possible.

Chapter 2 of this report analyses the general Article 7 implementation of Member States, chapter 3 summarises all analysis steps as regards measures and methodologies and chapter 4 includes the proposal for a measure mix for Article 7 implementation in Cyprus.

The report is based on publicly available information and information provided by MECl and other stakeholders in Cyprus. Furthermore EED implementation experiences of other Member States were taken into account.

2 Analysis of existing measures and policy packages in Member States

All policy measures that are potentially enabling final energy savings can be taken into account when implementing Article 7 EED. However the main question when making this policy choice is what features, advantages and disadvantages each measure has. Especially Article 7 foresees requirements that have to be checked thoroughly for each policy measure.

The following overview is based on:

- The English versions of Member States' NEEAPs from the year 2017 available on the website of DG Energy
- The implementation assessment study of the European Parliamentary Research Service from the year 2016
- The study from a consortium led by Ricardo-AEA commissioned by the European Commission on the implementation of Article 7 EED in Member States.

The analysis performed will serve at identifying potential energy saving measures in all end-use sectors that can be used for Article 7 implementation and for which examples from other Member States exist.

EU Member States report a variety of measures in their Article 7 EED implementations. The information provided by Member States in their NEEAPs and annual reports differs quite considerably as regards the details given and quality of descriptions and explanations. In addition it should be noted that this report relies mainly on the non-authorised translations of NEEAPs that are available on the European Commission's website.

The following table gives an overview of the instruments employed in Member States for the implementation of Article 7 EED according to the categories given in Article 7(9). The numbers in the cells represent the number of measures reported in each category.

Table 1: Overview of measures for Article 7 implementation in Member States

Member State	Energy Efficiency Obligation Schemes	Energy or CO ₂ taxes	Finance and fiscal incentives schemes	Energy Efficiency National Funds	Regulations or voluntary agreements	Minimum standards for products (including buildings) and services	Energy labelling schemes	Training, education and advisory programmes	Other	EEOs or Alternative Measures
Austria	1	2	5	0	0	0	0	1	0	Mix
Belgium	0	2	13	0	7	1	0	1	3	Alternative
Bulgaria	2	0	1	0	0	0	0	0	0	Mix
Croatia	0	1	6	0	0	0	0	1	2	Mix
Cyprus	0	1	7	0	0	0	0	2	0	Alternative
Czech Republic	0	0	14	0	1	0	0	4	1	Alternative
Denmark	1	0	0	0	0	0	0	0	0	EEOs
Estonia	0	6	4	0	0	0	0	0	0	Alternative
Finland	0	1	2	0	3	2	0	0	0	Alternative
France	1	0	0	0	0	0	0	0	0	Mix
Germany	0	2	4	0	3	0	0	2	0	Alternative
Greece	0	0	4	1	1	0	0	2	1	Mix
Hungary	0	0	11	0	0	0	0	1	0	Alternative
Ireland	1	1	1	0	0	5	0	2	0	Mix
Italy	1	0	3	0	0	0	0	0	0	Mix
Latvia	1	0	17	0	0	0	0	0	0	Mix
Lithuania	0	1	8	0	0	0	0	1	0	Alternative
Luxembourg	1	0	0	0	0	0	0	0	0	EEOs
Malta	1	0	1	1	1	0	0	0	0	Mix
Netherlands	0	1	0	0	3	0	0	0	2	Alternative
Poland	1	0	0	0	0	0	0	0	0	EEOs
Portugal	0	0	1	1	3	0	0	0	0	Alternative
Romania	0	0	1	0	0	0	0	0	0	Alternative
Slovakia	0	0	32	0	2	1	0	0	0	Alternative
Slovenia	1	0	0	1	0	0	0	0	0	Mix
Spain	0	1	12	6	0	1	0	1	1	Alternative
Sweden	0	4	0	0	0	0	0	0	0	Alternative
United Kingdom	1	1	2	0	1	2	0	0	1	Mix

The overview shows that 12 Member States have reported an EEO for the implementation of Article 7 EED – 3 of them are using only an EEO to achieve the Article 7 savings. Note that the total number of Member States having introduced an EEO might be higher. 16 Member States report alternative measures only; the remaining Member States report a mix of alternative measures and EEOs. The choice of measures for the implementation of Article 7 in the EU shows:

- All possible instruments are reported by EU Member States;
- Financial and fiscal incentive schemes are most frequently reported. Also in terms of energy savings reported this measure plays a major role.

In addition it can be observed that the number of EEOs in the EU has increased since the EED came into force. Thus Article 7 created a certain dynamic with this respect. Looking at the implementation of EEOs a majority of Member States obligates energy retail sales companies (and not distributors) to achieve the required savings. This choice is often justified by the closer relationship of energy retail sales companies with the end customers. In more details all EEOs differ quite considerably.

On the level of single policy measures the overview of the implementation of Article 7 EED in Member States shows the picture presented in the following table.

Table 2: Detailed overview of measures for Article 7 implementation in Member States

Member States / Measure category	Measure
Austria	
Energy Efficiency Obligation Schemes	Energy efficiency obligation scheme for energy suppliers
Energy or CO2 taxes	Energy taxation
Energy or CO2 taxes	Motorway toll for HGVs
Finance and fiscal incentives schemes	Provincial support for housing, construction, energy and the environment
Finance and fiscal incentives schemes	Austrian Federal Government "renovation offensive"
Finance and fiscal incentives schemes	Climate and Energy fund
Finance and fiscal incentives schemes	Domestic Environmental Support
Finance and fiscal incentives schemes	Federal support for sustainable electricity
Training, education and advisory programmes	klimaaktiv mobil
Belgium	
Energy or CO2 taxes	km-charge for lorries
Energy or CO2 taxes	Tax - Freight transport on highways
Finance and fiscal incentives schemes	Energy grants
Finance and fiscal incentives schemes	Financial scheme (loan) - Residential buildings
Finance and fiscal incentives schemes	Financial scheme (loan) - Public buildings
Finance and fiscal incentives schemes	Financial scheme (investment) - Public sector
Finance and fiscal incentives schemes	Financial scheme (grant) - industry
Finance and fiscal incentives schemes	Financial scheme (grant) - energy poverty
Finance and fiscal incentives schemes	Financial scheme (investment) - energy poverty
Finance and fiscal incentives schemes	Financial scheme (investment) - social housing
Finance and fiscal incentives schemes	Financial scheme (grant) - residential buildings
Finance and fiscal incentives schemes	Financial scheme (grant) - industry
Finance and fiscal incentives schemes	Financial scheme (grant) - residential buildings
Finance and fiscal incentives schemes	Financial scheme (subsidy) - public buildings
Finance and fiscal incentives schemes	Financial scheme -public buildings
Regulations or voluntary agreements	Energy audits
Regulations or voluntary agreements	Energy policy agreements with companies
Regulations or voluntary agreements	Public service obligations for rational energy use imposed on network operators
Regulations or voluntary agreements	Voluntary agreement - Public lighting
Regulations or voluntary agreements	Voluntary agreement - SME
Regulations or voluntary agreements	Voluntary agreement - Industry
Regulations or voluntary agreements	Voluntary agreement - public transportation
Minimum standards for products (including building equipment)	Inspection and acceptance of boilers
Training, education and advisory programmes	HomeGrade
Other	Employee Transport Plan
Other	Car sharing
Other	Société de transports intercommunaux bruxellois (STIB) – Brussels public transport
Bulgaria	
Energy Efficiency Obligation Schemes	Individual energy saving targets for energy traders
Energy Efficiency Obligation Schemes	Individual energy saving targets for owners of industrial systems, and government and municipal buildings
Finance and fiscal incentives schemes	National programme for energy efficiency of multi-family residential buildings
Croatia	
Energy or CO2 taxes	Introduction of CO2 emission-based taxation of motor vehicles
Finance and fiscal incentives schemes	Energy renovation programme for family homes (2014 - 2016)
Finance and fiscal incentives schemes	Energy renovation programme for multi-residential buildings
Finance and fiscal incentives schemes	Energy renovation programme for public sector buildings (2014 - 2015)
Finance and fiscal incentives schemes	Energy renovation programme for public sector buildings (2016 - 2020)
Finance and fiscal incentives schemes	Energy renovation programme for commercial non-residential buildings
Finance and fiscal incentives schemes	Financial incentives for energy-efficient vehicles
Training, education and advisory programmes	Incentives for eco-driving
Other	Introduction of individual heat metering
Other	Energy-efficient public lighting programme

Member States / Measure category	Measure
Cyprus	
Energy or CO2 taxes	Motor vehicle taxes based on CO2 emissions.
Finance and fiscal incentives schemes	Energy efficiency investments in public buildings (REPLACEMENT OF SPLIT UNITS IN THE PUBLIC SECTOR)
Finance and fiscal incentives schemes	Energy efficiency investments in public building (REPLACEMENT OF HEAT PUMP CHILERS/ VRV IN THE PUBLIC SECTOR)
Finance and fiscal incentives schemes	Energy efficient street lighting
Finance and fiscal incentives schemes	Grant Scheme «Saving Energy – Upgrading of Households».
Finance and fiscal incentives schemes	Grant Scheme«Saving Energy – Upgrading of Enterprises»
Finance and fiscal incentives schemes	Grant Scheme«Saving Energy – Upgrading of Households» - vulnerable consumers
Finance and fiscal incentives schemes	Integrated Fleet Management System (Central Government vehicles)
Training, education and advisory programmes	Soft measures (information campaigns, trainings, workshops, etc)
Training, education and advisory programmes	Training Eco-driving
Czech Republic	
Finance and fiscal incentives schemes	ENERG Programme (ČMZR)
Finance and fiscal incentives schemes	Green Savings Programme (MoE)
Finance and fiscal incentives schemes	Integrated Regional Operational Programme (MoRD)
Finance and fiscal incentives schemes	JESSICA Programme (MoRD)
Finance and fiscal incentives schemes	Joint Boiler Replacement Scheme (MoE)
Finance and fiscal incentives schemes	New Green Savings Programme 2013 (MoE)
Finance and fiscal incentives schemes	New Green Savings Programme 2014-2020 (MoE)
Finance and fiscal incentives schemes	Operational Programme Enterprise and Innovation 2007–2013 (MIT)
Finance and fiscal incentives schemes	Operational Programme Enterprise and Innovation for Competitiveness 2014–2020 (MIT)
Finance and fiscal incentives schemes	Operational Programme Environment 2007-2013 (MoE)
Finance and fiscal incentives schemes	Operational programme Environment 2014–2020 (MoE) (Priority Axis 2 – SO2.1)
Finance and fiscal incentives schemes	Operational Programme Environment 2014–2020 (MoE) (Priority Axis 5 –SO 5.1)
Finance and fiscal incentives schemes	Regeneration of pre-fabricated concrete buildings – programmes
Finance and fiscal incentives schemes	Sustainable Development Strategic Framework
Regulations or voluntary agreements	Transport Operational Programme (MoT)
Training, education and advisory programmes	State programmes to promote energy savings and the use of renewable energy sources (EFEKT) (MIT)
Training, education and advisory programmes	State programme to promote energy savings (EFEKT 2) (MIT)
Training, education and advisory programmes	Reasonable Energy Savings Programme (MIT)
Training, education and advisory programmes	Alternative measures for increasing energy efficiency in Czech industry and in municipalities and regions
Other	OP Prague Growth Pole –Buildings section (City of Prague)
Denmark	
Energy Efficiency Obligation Schemes	Energy Efficiency Obligation Scheme
Estonia	
Energy or CO2 taxes	Excise and value added tax of natural gas
Energy or CO2 taxes	Excise and value added tax of electricity
Energy or CO2 taxes	Excise and value added tax in heating sector
Energy or CO2 taxes	Excise and value added tax of gasoline
Energy or CO2 taxes	Excise and value added tax of diesel fuel and light fuel oil
Energy or CO2 taxes	Value added tax of firewood
Finance and fiscal incentives schemes	Renovation of street lighting
Finance and fiscal incentives schemes	Energy and resource efficiency in industries
Finance and fiscal incentives schemes	Renovation of apartment buildings
Finance and fiscal incentives schemes	Other investment support schemes
Finland	
Energy or CO2 taxes	Taxation of Transport Fuels/Road Transport
Finance and fiscal incentives schemes	Heat pump heaters of one-family and terraced houses
Finance and fiscal incentives schemes	Investments in a heating plant
Regulations or voluntary agreements	Energy Performance Contracting Activities
Regulations or voluntary agreements	Energy Audit Activities
Regulations or voluntary agreements	Energy Performance Contract Activities/Energy Services Operational Programme and Höyla Energy Efficiency Agreement - Customers
Minimum standards for products (including build	Energy efficiency rules for renovated buildings and start-up grants for deep renovations
Minimum standards for products (including build	Energy efficiency rules for new buildings
France	
Energy Efficiency Obligation Schemes	Energy Efficiency Obligation Scheme

Member States / Measure category	Measure
Germany	
Energy or CO2 taxes	Air Traffic Tax
Energy or CO2 taxes	Energy and Electricity Tax
Finance and fiscal incentives schemes	Business investment support incl. further development
Finance and fiscal incentives schemes	KfW funding programme for energy-efficient construction and renovation (CO2 building renovation programme) incl. further development
Finance and fiscal incentives schemes	Market incentive programme for promoting use of renewable energy in the heating market (BAFA component)
Finance and fiscal incentives schemes	Waste Heat Utilisation' initiative
Regulations or voluntary agreements	Energy Saving Regulation for New Buildings
Regulations or voluntary agreements	Energy Saving Regulation for Existing Buildings
Regulations or voluntary agreements	Renewable Energies Heat Act
Training, education and advisory programmes	Energy efficiency networks initiative
Training, education and advisory programmes	Federal advisory service programmes incl. quality assurance and optimization
Greece	
Finance and fiscal incentives schemes	'Save Energy at Home' programme
Finance and fiscal incentives schemes	'SAVE II' Programme for Local Authorities
Finance and fiscal incentives schemes	'SAVE' Programme for Local Authorities
Finance and fiscal incentives schemes	Replacing old private passenger vehicles
Finance and fiscal incentives schemes	Replacing old public and private light trucks
Energy Efficiency National Funds	OPESD Operations
Regulations or voluntary agreements	Offset of fines on illegal buildings against energy upgrades
Training, education and advisory programmes	Energy managers in buildings of the public sector and the general government
Training, education and advisory programmes	Energy Performance Certificates as behavioural measure
Other	Extension of Athens metro
Hungary	
Finance and fiscal incentives schemes	Additional fees devices integrated electricity bill to encourage the non-residential sector (VET financial instruments) / (Measure not mentioned in NEEAP)
Finance and fiscal incentives schemes	Cooperation Program between Switzerland and Hungary
Finance and fiscal incentives schemes	EEA and Norway Financial Mechanisms
Finance and fiscal incentives schemes	Energy Efficiency Investments Supported from the Central Budget by special decision of the Government
Finance and fiscal incentives schemes	Energy efficiency measures in transport
Finance and fiscal incentives schemes	Energy Efficiency Renovation Tender Program in the Institution controlled by the Ministry of Interior
Finance and fiscal incentives schemes	European Structural and Investment Funds Programs
Finance and fiscal incentives schemes	Green Investment System and Green Economy Financing Scheme support programs
Finance and fiscal incentives schemes	Home building support energy efficiency bonus
Finance and fiscal incentives schemes	On-building renewable energy incentives measures in residential sector for energy efficiency purposes / (Measure not mentioned in NEEAP)
Finance and fiscal incentives schemes	Supported Home savings and Loans (According to the Act CXIII. Of 1996.)
Training, education and advisory programmes	Awareness-raising measures / (Measure not mentioned in NEEAP)
Ireland	
Energy Efficiency Obligation Schemes	Energy Efficiency Obligation Scheme
Energy or CO2 taxes	VRT/Motor tax aligned with emissions
Finance and fiscal incentives schemes	Accelerated Capital Allowances (AC) Public and private
Minimum standards for products (including build	2002 Building Regulations
Minimum standards for products (including build	2008 Building Regulations
Minimum standards for products (including build	2011 Building Regulations
Minimum standards for products (including build	2005 / 2008 Building Regulations - Buildings under than dwellings
Minimum standards for products (including build	Energy efficient boiler regulations
Training, education and advisory programmes	Large Industry Energy Network (LIEN)
Training, education and advisory programmes	SME Programme
Italy	
Energy Efficiency Obligation Schemes	White Certificates
Finance and fiscal incentives schemes	Conto Termico - Thermal energy account
Finance and fiscal incentives schemes	Impresa 4.0 Plan
Finance and fiscal incentives schemes	Tax relief

Member States / Measure category	Measure
Latvia	
Energy Efficiency Obligation Schemes	Energy Efficiency Obligation Scheme
Finance and fiscal incentives schemes	Buildings with low energy consumption
Finance and fiscal incentives schemes	Complex solutions for the reduction of greenhouse gas emission
Finance and fiscal incentives schemes	Complex solutions for the reduction of greenhouse gas emissions in buildings of State and municipal vocational education institutions
Finance and fiscal incentives schemes	Complex solutions for the reduction of greenhouse gas emissions in industrial buildings
Finance and fiscal incentives schemes	Complex solutions for the reduction of greenhouse gas emissions in municipal buildings
Finance and fiscal incentives schemes	Energy efficiency projects under EEA Programme 'National Climate Policy'
Finance and fiscal incentives schemes	European Agricultural Fund for Rural Development (EAFRD) Measure 'Investments in physical assets'
Finance and fiscal incentives schemes	Increasing energy efficiency in municipal buildings
Finance and fiscal incentives schemes	Increasing energy efficiency in tertiary education institution buildings
Finance and fiscal incentives schemes	Installation of smart electrical energy meters - proposals 'Development of technologies reducing greenhouse gas emissions and implementation of pilot projects
Finance and fiscal incentives schemes	Measures implemented by large enterprises - replacement of machinery
Finance and fiscal incentives schemes	Measures implemented by large enterprises -buildings
Finance and fiscal incentives schemes	Measures implemented by large enterprises -lighting
Finance and fiscal incentives schemes	Measures implemented by large enterprises -other measures
Finance and fiscal incentives schemes	Measures to improve the heat insulation of multi-apartment buildings
Finance and fiscal incentives schemes	Reduction of greenhouse gas emissions from lighting infrastructure in local authority public space
Finance and fiscal incentives schemes	Renovation of State-owned buildings under State aid programmes
Lithuania	
Energy or CO2 taxes	Tax and excise on fuel
Finance and fiscal incentives schemes	Apartment block renovation programme
Finance and fiscal incentives schemes	Ignalina Programme
Finance and fiscal incentives schemes	Programme for the renovation (modernisation) of buildings of educational institutions by decreasing energy consumption costs
Finance and fiscal incentives schemes	Programme for the renovation (modernisation) of halls of residence of higher education and vocational training institutions
Finance and fiscal incentives schemes	public buildings state investment programme
Finance and fiscal incentives schemes	Renovated apartment blocks supplied by the Ignalina Visaginas and Zarasai regional authorities
Finance and fiscal incentives schemes	Renovation of public buildings at national level
Finance and fiscal incentives schemes	Renovation of public buildings at regional level
Training, education and advisory programmes	Apartment block renovation programme objective 2: Ensuring that the public is better informed, better educated and more aware of issues relating to building energy performance, renovation/modernisation and energy savings
Luxembourg	
Energy Efficiency Obligation Schemes	Energy Efficiency Obligation Scheme
Malta	
Energy Efficiency Obligation Schemes	Energy Efficiency Obligation Scheme
Finance and fiscal incentives schemes	Financing schemes & instruments
Energy Efficiency National Funds	Public sector leading by example
Regulations or voluntary agreements	Regulations and Voluntary Agreements
Netherlands	
Energy or CO2 taxes	Energy Investment Allowance (EIA)
Regulations or voluntary agreements	Long Term Agreement industry
Regulations or voluntary agreements	Long Term Agreement big industry (MEE), excl. refineries
Regulations or voluntary agreements	Long Term Agreement service sector
Other	Policies targeted at households
Other	Policies targeted at the service sector
Poland	
Energy Efficiency Obligation Schemes	White Certificates Scheme
Portugal	
Finance and fiscal incentives schemes	Solar Thermal - Incentive programs to solar thermal utilization
Energy Efficiency National Funds	National Energy Efficiency Fund
Regulations or voluntary agreements	PPEC - Consumption Efficiency Promotion Plan
Regulations or voluntary agreements	RGCE ST - Management Regulation of Energy Consumption in Transport Sector
Regulations or voluntary agreements	SGCIE - Management System of Intensive Energy Consumption
Romania	
Finance and fiscal incentives schemes	State support scheme

Member States / Measure category	Measure
Slovakia	
Finance and fiscal incentives schemes	Application of legislative measures
Finance and fiscal incentives schemes	Building and upgrading of transport infrastructure (contd.)
Finance and fiscal incentives schemes	Construction of new nearly zero-energy family houses and residential buildings
Finance and fiscal incentives schemes	Efficient lighting
Finance and fiscal incentives schemes	Fleet renewal — Bus transport
Finance and fiscal incentives schemes	Fleet renewal — Bus/trolleybus transport
Finance and fiscal incentives schemes	Implementation of energy efficiency measures from energy audits
Finance and fiscal incentives schemes	Implementation of the principle of energy efficiency in public procurement
Finance and fiscal incentives schemes	Improving the thermal characteristics of buildings - Family houses
Finance and fiscal incentives schemes	Improving the thermal characteristics of buildings - Other buildings
Finance and fiscal incentives schemes	Improving the thermal characteristics of buildings - Residential buildings
Finance and fiscal incentives schemes	Improving the thermal characteristics of public buildings
Finance and fiscal incentives schemes	Improving the thermal characteristics of public buildings — administrative buildings
Finance and fiscal incentives schemes	Improving the thermal characteristics of public buildings — Healthcare and social facilities
Finance and fiscal incentives schemes	Improving the thermal characteristics of public buildings — Schools and other education
Finance and fiscal incentives schemes	Improving thermal performance of public buildings — healthcare facilities
Finance and fiscal incentives schemes	Incentives for industry
Finance and fiscal incentives schemes	Increasing the energy efficiency of industrial production
Finance and fiscal incentives schemes	Innovation and technology transfer in industrial plants
Finance and fiscal incentives schemes	MHD — renewal of trolleybuses
Finance and fiscal incentives schemes	New construction to ultra-low-energy standard - Family houses
Finance and fiscal incentives schemes	Promoting the development and use of public passenger transport
Finance and fiscal incentives schemes	Provision of energy services for the public sector
Finance and fiscal incentives schemes	Provision of energy services in buildings
Finance and fiscal incentives schemes	Reducing energy consumption of public buildings — administrative buildings, schools and educational establishments, healthcare facilities
Finance and fiscal incentives schemes	Renewal and modernisation of the vehicle fleet — Bus transport
Finance and fiscal incentives schemes	Renewal and modernisation of the vehicle fleet — Rail transport
Finance and fiscal incentives schemes	Renewal of office equipment
Finance and fiscal incentives schemes	Replacement of electrical and electronic equipment in private households
Finance and fiscal incentives schemes	Replacement of white goods
Finance and fiscal incentives schemes	Support for energy audits for SMEs in the Bratislava region
Finance and fiscal incentives schemes	Support for the development of non-motorised transport, especially cycling
Regulations or voluntary agreements	Application of legislative measures
Regulations or voluntary agreements	Voluntary agreement on energy savings
Minimum standards for products (including build	Application of legislative measures
Slovenia	
Energy Efficiency Obligation Schemes	Energy Efficiency Obligation Scheme
Energy Efficiency National Funds	The Eco Fund's programme for promoting EE measures
Spain	
Energy or CO2 taxes	Law on fiscal measures for energy sustainability
Finance and fiscal incentives schemes	Aid Programme to Improve the Energy Efficiency of Existing Buildings PAREER
Finance and fiscal incentives schemes	Aid Programme to Improve the Energy Efficiency of Existing Buildings PAREER-CRECE
Finance and fiscal incentives schemes	CLIMA projects in the residential, non-ETS industry and transport sectors
Finance and fiscal incentives schemes	Efficient vehicle incentive programme PIVE 3 to PIVE 8
Finance and fiscal incentives schemes	Environmental stimulus plan PIMA Solar
Finance and fiscal incentives schemes	Environmental stimulus plans PIMA Air
Finance and fiscal incentives schemes	Environmental stimulus plans PIMA Soil
Finance and fiscal incentives schemes	Environmental stimulus plans PIMA Transport
Finance and fiscal incentives schemes	FEDER fund 2014-2020
Finance and fiscal incentives schemes	Industrial competitiveness incentive programme
Finance and fiscal incentives schemes	Plan to Promote Mobility using Alternative-Fuel Vehicles MOVEA
Finance and fiscal incentives schemes	Project MOVELE 2014 and 2015 (incentives for the introduction of electric vehicles)
Energy Efficiency National Funds	National Energy Efficiency Fund: Aid programme to improve the energy efficiency of buildings
Energy Efficiency National Funds	National Energy Efficiency Fund: Aid programme for energy efficiency measures in companies
Energy Efficiency National Funds	National Energy Efficiency Fund: Aid programme for modal shift and more efficient transport
Energy Efficiency National Funds	National Energy Efficiency Fund: Aid programme to improve energy efficiency in desalination
Energy Efficiency National Funds	National Energy Efficiency Fund: Aid programme to improve energy efficiency in railway systems
Energy Efficiency National Funds	Investment fund JESSICA
Minimum standards for products (including build	Ecodriving (driving licence)
Training, education and advisory programmes	communication campaigns
Other	aid programmes implemented by various Spanish regional authorities

Member States / Measure category	Measure
Sweden	
Energy or CO2 taxes	Housing and services (only electricity)
Energy or CO2 taxes	Industry and construction
Energy or CO2 taxes	Land - based industries
Energy or CO2 taxes	Transport (only petrol and diesel)
United Kingdom	
Energy Efficiency Obligation Schemes	Energy Company Obligation (ECO)
Energy or CO2 taxes	Climate Change Levy (CCL)
Finance and fiscal incentives schemes	Low emission vehicles
Finance and fiscal incentives schemes	Rail electrification
Regulations or voluntary agreements	Climate Change Agreements (CCA)
Minimum standards for products (including build	Building Regulations (existing buildings domestic)
Minimum standards for products (including build	Smart metering (non-domestic)
Other	Carbon Emissions Reduction Target

In summary it can be concluded that genuinely new or innovative instruments were not used for Article 7 implementation in Member States. A reason for that might be the fact the Article 7 obligated Member States to achieve a concrete amount of energy savings which should be achieved with a high certainty. That is why Member States rather report established or more traditional instruments, in particular subsidies and other financial incentives.

3 In-depth analysis of energy saving measures

In this chapter all activities within the project concerning the analysis of measures and the respective calculation methodologies are documented. The proposal for a measure mix in Cyprus for Article 7 can be found in chapter 4.

3.1 Horizontal issues

In this chapter topics that are related to more than one energy efficiency measure are discussed.

3.1.1 Double counting

There was email contact between AEA and MECI in March 2019 on double counting. AEA commented on a list of measures sent by MECI and identified possible overlaps between measures. This list was discussed at the interim meeting in the beginning of April 2019 in Nicosia.

Generally double counting can be looked at from two perspectives:

1. The same individual action is counted in two different schemes e.g. because it has received a subsidy from two different schemes – having this information you could split savings between the two policy measures
2. The savings methodology for a policy measure overlaps with the calculation for another policy measure (e.g. tax for motor fuels may overlap with a support programme for efficient vehicles)

For both cases one cannot say for sure whether there is double counting without knowing the individual actions that are implemented within these schemes or without knowing the exact calculation methods, but this approach gives first indications of where double counting might arise.

The easiest approach to rule out double counting is to only use policies for Article 7 implementation that do not overlap at all. However with this approach Member States risk to lose savings that they could report.

A common approach to reduce double counting is setting the rules of different schemes. For example funding from one scheme might rule out funding from another scheme – thus individual actions cannot be counted twice. This is often combined with ex-post controls whether these rules have been followed. So the monitoring, control and verification schemes in place play an important role. In case of such control systems Member States have frequently set up or intend to set up a database to identify possible double counting. The aim of these databases is to collect the necessary information on implemented measures in order to enable them to monitor, control and verify energy savings. Such a database, even when equipped with functionalities to identify double counting, has to be combined with expert knowledge and staff that assess that no single measure that has been through the technical selection process is reported twice.

If detailed information on individual actions is neither available nor cost effective, AEA suggests a straightforward and pragmatic way to avoid double counting in reports to the European Commission. For each year and each category of individual actions only the savings of the measure contributing most savings for this individual action in the respective year is chosen (except if it is known that there are no overlaps between two policies). With this approach savings are lost because the maximum amount of double counting is assumed but the resulting savings number is on the safe side. This approach was operationalised by AEA by creating an Excel tool that allows entering individual actions of policy measures targeting certain end-use categories and analyses possible double counting as well as possible ways to correct the identified cases.

As a part of this support project, AEA created an Excel tool which allows simulating the Austrian double counting approach for Cyprian energy efficiency measures.

Individual energy efficiency actions can be put in into the first worksheet “Input Measures”. The column “Code” is created automatically and is needed for the double counting approach. The column “warning” indicates if there are two or more individual actions which target the same category and year:

- A level 1 warning means that some cross-sectoral measures may overlap with an individual action.
- A level 2 warning indicates individual actions which target exactly the same category and year.

The column “Measure cluster (to adjust for double counting)” allows naming different groups which target the same energy savings and have to be adjusted by the double counting approach. Individual actions with the same name in this column will be summed up and adjusted with the sum of other measure clusters. All individual actions without measure cluster-name will be summed up and added to the adjusted energy savings.

Table 3: Exemplary individual actions and measure cluster

Title	Sector	Category	Year	Savings [kWh/a]	Measure cluster
Public authority e-cars	Transport	Transport	2021	50,000	e-vehicles
Private cars subsidy program	Transport	Transport	2021	85,000	e-vehicles
Charging Stations program	Transport	Transport	2021	110,000	e-charger
Private charging stations	Transport	Transport	2021	90,000	e-charger
Taxes refund on electric vehicles	Transport	Transport	2021	120,000	taxes
New bicycle pathways	Transport	Transport	2021	15,000	
Upgrade of public transport	Transport	Transport	2021	10,000	

The above provided measure clusters would generate the following interim sums:

- e-vehicles: 135,000 kWh/a
- e-charger: 200,000 kWh/a
- taxes: 120,000 kWh/a
- Other: 25,000 kWh/a

Among the different measure clusters the one “e-charger” (200,000 kWh/a) has the highest sum and will be solely chosen to avoid double counting issues. Afterwards it will be summed up with the unnamed measure clusters (25,000 kWh/a) which result in energy savings of 225,000 kWh/a.

In the worksheet “Savings_Policies” the energy savings of all individual actions will be summed up for each policy instrument, each category and each implementation year. The worksheet “Outcome” consists of four relevant tables:

1. Total Savings: Sums up energy savings of each individual action
2. The table “Potential double counting measure reduced” includes the above described double counting logic. Beneath the table the double counting factors can be found.
3. Energy savings by policy instrument: This table has reduced energy savings for each policy measure
4. Energy savings by policy instrument: This table has an additional policy instrument “Double Counting Deductions”, so that the original energy savings are visible.

Disclaimers:

- The calculation of the cumulative energy savings use very simple formulas and do not take into account the lifetime of individual actions. The primary reason of this tool is the simulation of double counting effects.
- Double counting approach applies for cross-sectoral measures in any event. If e.g. taxes do not overlap with specific sectors or categories they have to be implemented for each relevant sector and category (instead of cross-sectoral).

Potential losses of energy savings through the double counting approach can be reduced by increasing the level of disaggregation of categories and individual actions.

3.1.2 Energy poverty

In the amended EED energy poverty has a more prominent role. In the EED energy poverty is mentioned several times, especially Member States have to take it into account in Article 7 implementation. The EED however does not offer a definition of energy poverty, thus Member States need to establish their own definitions. The Energy Poverty Observatory (EPOV) – an initiative by the European Commission – recommends using multiple indicators for determining energy poverty. The primary indicators recommended comprise:

- Arrears on utility bills in the last 12 months
- Low share of energy expenditure in income (M/2): households whose absolute energy expenditure is half below the national median
- High share of energy expenditure in income (2M): households, whose share of energy expenditure in income is more than twice the national median
- Inability to keep home adequately warm

More information can be found on <https://www.energypoverty.eu/>.

To identify policies and measures in current EED implementation AEA looked at all Member States’ NEEAPs and identified the following policies directly targeted at the alleviation of energy poverty.

3.1.2.1 Croatia

Capacity building for combating energy poverty

Capacity building includes providing information on energy efficiency measures contributing to the combating of energy poverty, and the possibilities of co-financing in this area. To that end, mechanisms for counselling vulnerable customers and implementing energy efficiency measures in households at risk of energy poverty will be set up in various cities.

Programme for combating energy poverty

The programme establishes a list of available measures and rate of co-financing for individual measures. A requirement for participating in the co-financing programme is gaining the status of a vulnerable customer in accordance with the regulations applicable at the moment of implementation of a measure. The specific objective of the measure is the establishment of a system that would allow vulnerable energy consumers to improve energy efficiency at household level while improving housing conditions. The following measures are included in the programme:

- Replacement of household appliances
- Replacement of windows
- Improvement or replacement of heating systems
- Increasing the thermal protective envelope
- Simple energy efficiency measures

3.1.2.2 Luxembourg

In Luxembourg it was discussed that energy poor households can receive interest free loans for financing energy efficiency measures.

3.1.2.3 Germany

Germany introduced a programme to exchange fridges in energy poor households. When exchanging a fridge up to 150 Euro is paid as a subsidy. In addition an advice programme for energy poor households has been introduced.

3.1.2.4 Austria

In Austria energy suppliers obligated within the energy efficiency obligation scheme who implement energy efficiency measures in energy poor households can multiply the resulting savings by a factor of 1.5.

3.1.2.5 France

France introduced a funding programme for projects investing in the public transport infrastructure in poor neighbourhoods.

3.1.2.6 Ireland

Better Energy Warmer Homes is a low-income housing retrofit scheme. The measures are delivered free of charge to the customers which meet certain criteria concerning energy poverty. Measures available include draught proofing, attic insulation, lagging jackets for hot water tanks, low energy light bulbs and cavity wall insulation. The funds are about 20 million Euros per year.

The **Housing aid for older people** provides grants of up to €10,500 to assist older people living in poor housing conditions to have necessary repairs or improvements carried out. Grant eligible works include structural repairs or improvements, re-wiring, repairs to or replacement of windows and doors, provision of water supply and sanitary facilities, provision of heating, cleaning and painting.

In the Irish **Energy Efficiency Obligation Scheme** obligated energy suppliers are required to deliver energy efficiency savings in non-residential (75%), residential (20%) and energy poverty (5%) sectors per year.

3.1.2.7 United Kingdom

In all parts of the UK grant schemes for energy poor households are in place. Energy suppliers play an important role in supporting the implementation of these energy efficiency measures.

3.1.2.8 Slovenia

Slovenia has introduced an aid scheme for energy-efficiency improvements for vulnerable groups of people. The measures are aimed at investments, as well as advice and measures to change patterns of behaviour. Via the eco-fund the level of financial support for vulnerable consumers is up to 100% of the investment costs granted. The investment measures can be upgraded with free-of-charge advice on energy efficiency. As part of this advice, the households receive a package of energy efficiency items free of charge (switch divider, protective wrapping, sealants, etc.).

More policies and measures to alleviate energy poverty can be found here: <https://www.energypoverty.eu/policies-measures>.

3.1.3 Declining rate of savings

Annex V 2. (i) of EED 2018 requires Member States to take into account in the calculation of energy the rate at which these savings decline over time. This is a new requirement as compared to the EED 2012 and it is still unclear how this requirement can be met. Early drafts for the Article 7 guidance document by the EC included a section on the declining rate of savings but this was deleted in later versions of the document. IN the current version the requirement is only mentioned with no further explanations or considerations. This leaves even more flexibility to interpret this requirement.

AEA assumes that „declining rate of savings“ actually means that the lower energy consumption of a device/building/process cannot be kept at this level over the whole lifetime of the measure but has a tendency to increase again. This can e.g. be due to the fact that the seal of windows is degrading over time and thus will increase heat losses via the window over time. However to be consistent this phenomenon must be true for all measures and not only for those newly implemented. Thus the decreasing effect can also be observed in the baseline. The only measures for which the declining rate of savings might be relevant are behavioural measures – this view was affirmed at the 5th Plenary Meeting of the Concerted Action EED in a session on the Article 7 EED study commissioned by the European Commission both by Member States and the European Commission.

3.2 Energy and CO₂ taxes

According to the EED the energy efficiency effects of energy and CO₂ taxes can be counted towards the cumulative target for the implementation of Article 7. A methodology for an ex-ante assessment of the effects of energy and CO₂ taxes is described in the following part of this report.

The energy savings effects of an energy or CO₂ tax can be derived by **comparing the observed energy consumption** in a given year **with the hypothetical energy consumption assuming a lower tax level**.

The data needed for such an ex-ante assessment consists of:

- The level of energy consumption targeted by the respective tax
- The level of the tax at least as a share of the total energy price (underlying data: tax level and total energy price)
- The gross prices for the energy carriers
- The elasticity of energy consumption with regard to the energy price (long-term and/or short-term)

The elasticities need to be determined on a national level – so an important pre-requisite to be able to calculate energy savings from taxes is to have up-to date and recent energy price elasticities on a national level. If elasticities are available the next decision is whether to use short-term or long-term elasticities. Short-term elasticities mirror the short-term reactions of consumers to changing energy prices (behaviour); long-term elasticities the long-term reactions (investments). If long-term elasticities are used to calculate effects from energy taxes and a variety of other measures is used for Article 7 implementation double counting might be a serious issue difficult to overcome. Note that the energy consumption targeted by an energy tax might be different from the total energy consumption as some consumer groups or uses might be exempted from taxes.

This data is needed on a meaningful dis-aggregation level and depends mainly on national circumstances as regards different tax levels for different sectors and consumer groups. It should not be lower than the structure of Eurostat energy balances with regards to sectors and energy carriers. The following table lists possible dis-aggregation levels. For all of these sector–energy carrier combinations (cells in the following matrix) the energy consumption, the energy prices, tax levels and price elasticities need to be available. A further disaggregation could be made in the industry sector if more dis-aggregated elasticities are available.

	Private households	Services	Industry	Transport	Agriculture
Electricity (heating purposes)					
Electricity (other uses)					
Natural gas					
Gasoline					
Diesel					
Heating oil					

Ideally the energy consumption according to the national energy balance has to be corrected by those amounts that are not subject to the respective tax (e.g. tax reliefs for companies).

For an ex-ante assessment it can be assumed that the energy consumption targeted by energy taxes over the whole obligation period is the energy consumption targeted by energy taxes of the year for which the most recent data is available.

For calculating the tax shares, the taxes are put in relation to the gross energy price. For the gross energy price e.g. the average price of the last three years could be used. At this point it is important to mention that the EED only allows counting effects of taxes that are beyond EU levels. Thus the shares of EU minimum levels in average gross energy prices also have to be calculated. The difference of the national tax shares and the (hypothetical) EU tax level shares are used for the calculation of energy savings from taxes.

The relative energy savings value in relation to the energy consumption without energy taxes is calculated by multiplying the elasticity with the tax share. The assessment of the energy consumption without taxes is needed to calculate savings from energy taxes and is calculated as follows.

$$EC_B = EC_{Tax} \times \frac{1}{1 + \Delta p \times \varepsilon}$$

EC_B Hypothetical energy consumption without taxes (base)

EC_{Tax} energy consumption targeted by energy taxes

Δp Share of the energy tax in the gross energy price (EU minimum levels are already subtracted)

ε Price elasticity of energy consumption

Energy savings then are a result of the difference between the energy consumption without energy taxes and the observed energy consumption targeted by energy taxes.

These energy savings are annual savings. The lifetime of these savings depends what kind of elasticities are used. If only short-term elasticities are used, the application of a lifetime of one year would be most appropriate as short-term elasticities mirror mostly behavioural changes due to higher energy prices. If long-term elasticities are used the lifetime depends on what the analysis on elasticities was based on.

For the verification of the effects of energy taxes (i.e. reporting of achieved Article 7 savings to the European Commission) it is strongly recommended to work together with an economic research institute. In Austria e.g. the calculation of the effects of energy taxes was conducted by the Austrian Institute of Economic Research which is one of the large economic national research institutions.

3.3 Motor vehicle taxes based on CO₂ emissions

Description of the measure: This measure relates to the tax imposed on vehicles with a view to reducing CO₂ emissions, which has been in force since 2014. The latest amendment to the Motor Vehicles and Road Traffic Law (Law 100(I)/2013) of 9 September 2013 entered into force on 1 January 2014, which modified the annual vehicle tax to be paid for each M1 category motor vehicle, as it would be calculated from then on based on the carbon dioxide (CO₂) emissions (combined cycle) in grams per kilometre (g/km), and this measure reduced the registration of vehicles with a high fuel consumption.

For this measure the same method can be applied as for energy and CO₂ taxes. With CO₂ taxes the only additional step is to convert CO₂ into energy.

3.4 Diesel fuel additives

In 2014 a methodology was developed in Austria to calculate and report the energy savings from the use of additives for diesel fuels.

In addition to additives already added before the beginning of the obligation period, detergents containing cleansing ingredients are added to diesel fuels. Those cleansing ingredients reduce deposits in the fuel injection system (especially in the injection nozzle) and therefore enhance the combustion of fuel.

$$FES_{tot} = l * LHV * f_{sav} * (1 - f_{NC})$$

FES_{tot}	Total final energy savings [kWh/a]
l	Quantity of diesel fuel with additional detergents sold [litres/a]
LHV	Lower heating value of diesel [kWh/l]
f_{sav}	Final energy savings factor [%]
f_{NC}	Share of new cars in total vehicle stock [-]

The share of new cars is subtracted from total savings because for new cars, the use of additives has no additional savings effect.

In Austria, the following default calculation values have been defined:

LHV	Lower heating value of diesel	9.91	kWh/l
f_{sav}	Final energy savings factor	2.6	%
F_{NC}	Share of new cars in total vehicle stock	6.6	%

f_{sav} is based on existing literature (see below). To simplify, a standard savings value was determined for the Austrian EEO. This standard savings value can be understood as a minimum requirement. For each additive product it needs to be proofed that at least the standard savings value of 2.6% is achieved.

All parties obligated to report energy savings measures have to submit the following documentation when using this method:

- Evidence of the purchase of fuels with detergents added (for example an invoice of the purchase) and evidence of the delivery of the fuels to final customers.
- On the evidence of purchase, the type of the fuel with added detergent has to be stated. Producers of the fuel have to prepare data sheets containing information on the used detergent and to which amount it is added to the fuel for each fuel reported.
- The effectiveness of the addition of a certain detergent has to be proofed by an independent inspection body accredited according to EU-Regulation 765/2008. Standardized test procedures have to be used taking into consideration representativeness for Austria in regard to reference fuel, typical engine types and driving behaviour.

Studies used for the definition of the energy savings factor:

- [1] CEC F98-08; Issue 3, Direct Injection, Common Rail Diesel Engine Nozzle Coking Test, 3. November 2008.
- [2] CEC F23-01; Issue 18.1, Procedure for Diesel Engine Injector Nozzle Coking Test (PSA XUD-9A/L). 24. August 2007.
- [3] Diesel Detergent Additive Responses in Modern High Speed Direct Injection Light Duty Engines, R. Barbour, D. Arters, J. Dietz, M. Macduff, A. Panesar, R. Quigley, SAE 2007-01-2001 (JSAE 20077144).
- [4] Use of Fuel Additives to Maintain Modern Diesel Engine Performance with Severe Test Conditions, M.Hawthorne, J.W. Roos, M.J. Openshaw, SAE 2008-01-1806.
- [5] Diesel Fuel Degradation and Contamination in Vehicle Systems, R.Williams and F. Balthasar, Fuels 2009 6th International Colloquium, TAE Esslingen, 2009.
- [6] Trace Metal Contamination of Diesel Fuels, R.Quigley, R.Barbour, G.Marshall, Fuels 2007, 6th International Colloquium, TAE Esslingen, 2007.
- [7] Diesel Detergent Additive Responses in Modern High Speed Direct Injection Light Duty Engines, M.Mcduff, R.Barbour, A.Panesar, D.Arters, J.Dietz, R.Quigley, Fuels 2007, 6th International Colloquium, TAE Esslingen, 2007.

[8] Injector Fouling Effects in Modern Direct Injection Diesels, R.Barbour, D.Arter, J.Dietz, M.Macduff, A. Panesar, R. Quigley, 13th Annual Fuels & Lubes Asia Conference, 2007, Bangkok, Thailand.

[9] Lubrizol 9040 Zero Series Multi-Functional Diesel Additives. The Revolution Continues, R. Quigley, R.Barbour, 16th Annual Fuels & Lubes Asia Conference, 2010, Singapore.

[10] Controlling Deposits in Modern Diesel Engines, R.Barbour, The International Symposium on Fuels and Lubricants, ISFL, March 2010, Delhi, India.

[11] Development of Peugeot DW10 Direct Injection Diesel Nozzle Fouling Test, A.Panesar, JSAE Injector Workshop, Kyoto, Japan, July 2007.

[12] Tickford: An investigation into effects on fuel consumption with a high-speed direct injection diesel engine using a deposit forming fuel and subsequent clean up with powerguard 6520; R. Walker, Innospec Ltd., 2012.

3.5 Action plan to strengthen public transport

Description of the measure: Cyprus does not have a developed public transport system, and there is serious traffic congestion in the major cities. The purpose of the plan is to promote and develop measures/projects/proposals to contribute towards alleviating traffic congestion in large cities. New buses were purchased in large cities in June 2010, as a first step towards implementing the plan. Furthermore, scheduled bus services were established in 2009 between large urban centres and the Larnaca Airport. The measures taken are still at an early stage, and more important developments are expected in the sector, as transport is responsible for almost 50 % of final energy consumption in Cyprus. Based on data from the Ministry of Transport and Works, a target has been set for increasing the percentage of public transport from 2 % in 2009 to 10 % in 2015.

Measures in chapter 3.3 and 3.4 can be summarised under the category “modal shift measures”. There is a challenge with these kinds of measures in a sense that a very comprehensive and technically detailed analyses of the energy savings effect leads to a very complex modelling exercise that often turns out to be a “black box”. AEA prepared a more generic assessment methodology that allows calculating effects of changes in modal shift.

3.6 Increasing the share of cycle, pedestrian and PT trips

Description of the measure: One of the main efforts is to decrease the modal share of vehicles by 30%, increase the modal share for the public transport trips by 20% and of pedestrians and cyclists by 20%, expecting to lead to more than 10% reduction of the consumption of energy from road transport sector by 2030. This measure is expected to reduce CO₂ emissions by reducing the number of car trips and replacing them with sustainable modes of transport including public transport, cycling and walking. This measure is expected to be implemented by the following actions, among others:

- High quality public transport services
- Zero or near zero emission zones
- Improvement of cycling and pedestrian facilities
- Effective parking policy
- Measures to promote the use of sustainable modes of transport and discouragement of the use of the passenger car
- Introduction of tram system in Nicosia

See chapter 3.5

3.7 Use of buses that have low or no GHG emissions

Description of the measure: The quantified objective of this measure is to increase the number of buses with low or no GHG emission. This measure will be implemented by including specific requirements within the new bus operators' contract such as:

- Additional Cost for the Tenderer to Convert their bus fleet to Compressed Natural Gas (CNG), when such fuel source is available in Cyprus and the prerequisites for doing so exist. The proposal should be identifying, but not costing, the number of CNG Fuel Stations;
- Additional Cost for the Tenderer to provide Electric Buses (maximum capacity 22 persons) in Historic City Centres of Nicosia, Limassol, Larnaca, Paphos and Famagusta (Paralimni & Agia Napa) - up to 4 buses per urban core.
- May submit a variant to their standard offer (of 10year contract period), showing amortisation over a longer period – not exceeding 15years – for supplying a fleet with vehicles (buses) operating with electric energy, which are more expensive than the usual diesel buses, and will require further significant investments on charging stations in depots and key locations, but contribute towards a cleaner environment. To consider such a variant all vehicles shall be electric and the tenderer will carry out a detailed feasibility study taking into account all costs (including vehicle and infrastructure cost).
- Provide more incentives for tourist buses to convert to renewable energy sources engines.re will be implemented by the following actions, among others

Energy savings from this measure can be calculated with a method “efficient vehicles”. The method compares the specific energy consumption of the old vehicle with the specific energy consumption of the new vehicle. The information/data needed for this method is:

- Specific energy consumption of old and new vehicle (e.g. kWh/km)
- Annual kilometre performance of the vehicles

The formula is:

$$ES = (ec_{old} - ec_{new}) \times km$$

<i>ES</i>	Annual energy savings
<i>ec_{old}</i>	Specific energy consumption of the old vehicle (kWh/km)
<i>ec_{new}</i>	Specific energy consumption of the new vehicle (kWh/km)
<i>km</i>	Kilometre performance

3.8 Introduction of environmental fees for the use of the road network

Description of the measure: The car trips are expected to be replaced by other sustainable modes of transport by:

- Applying congestion charges in the city centres
- Applying tolls on Highways, Initial toll charges applied to HGV on Motorways to be extended later to other roads and vehicle types
- Increasing the taxes for fossil fuels.
- Increasing the parking charges and penalties.

The savings effects of these measures can follow the same logic as the methodology on taxes as these measures all aim at increasing the price of car transport.

3.9 Measures in the agricultural sector

Most policy instruments mentioned in the NEEAPs may include energy efficiency measures in the agricultural sector. However, the NEEAPs do not contain detailed information on such measures.

Potential measures in the agricultural sector include:

- Water pumps: Artificial irrigation, heating systems
 - Higher efficiency of devices
 - Speed control
 - Optimization of operation time
- Drying of products
 - Heat recovery
 - Recovery of condensed water
- Efficient machines and vehicles
- Agricultural buildings' equipment (heating, ventilation, lighting)

In principle, energy savings all energy efficiency measures, including the agricultural sector, can be calculated with the following simplified formula:

$$ESAV = EC_{Baseline} - EC_{Measure} - EC_{Rebound}$$

with

ESAV	...	Energy savings [kWh/a]
EC	...	Energy Consumption [kWh/a]

The baseline consumption is the situation before the measure is implemented. In case of new installations, the energy consumption of the average installation in the market is relevant for the baseline. Some measures are accompanied by rebound effects. For example, an additional preparatory treatment of goods can result in a

rebound energy consumption is. Hence, the calculation formula considers the energy consumption due to these effects.

All three energy consumptions (Baseline, Measure and Rebound) can be calculated by the following formula:

$$EC = p \cdot ue \cdot \eta \cdot t$$

with

p	...	energy use specific energy performance of the system, appliance or vehicle
ue	...	useful energy demand main driver
η	...	conversion efficiency of performance to useful energy demand
t	...	Operating hours of the system, appliance or vehicle

To apply this equation a main driver for energy consumption has to be defined, e.g. the agricultural area of a field or livestock in a barn. The definition of a main driver allows a comparison between the energy consumption of the baseline and the measure. The energy performance has to be related to the main driver. For the correct calculation of the energy savings, the following combinations of performances and operating hours are needed:

- Average performance with total amount of operating hours
- Nominal capacity with full load hours

This approach allows the creation of simple energy saving calculation formulas for most individual energy efficiency measures. The data collection for the calculation of energy savings should take into account these drivers and at least take into account the energy consumption of the affected energy consumer (either metered or scaled) and the main driver.

Examples of energy efficiency measures in the agricultural sector reported within the Austrian EEO include:

- Geothermal heat supply
 - Use thermal water to heat Greenhouses
 - Use carbon dioxide to fertilize Greenhouse air
- „Energy Shields“ | Reduction of heat losses in Greenhouses through roller blinds
 - Reduced volumes to heat
 - Reduced radiation heat losses during the night
- Agricultural buildings: Modernization of heating systems | Photovoltaics
- Electric tractors and eco-driving training

Information on some innovative measures in the agricultural sector is available on the website of the European Agricultural Fund for Rural Development (EAFRD) https://enrd.ec.europa.eu/projects-practice_en.

3.10 Electric mobility – charging stations

3.10.1 Description

Charging stations are installed at private, semi-public or public spaces. The measure describes the effects on the final energy savings generated by the substitution of conventional by electric or plug-in hybrid vehicles due to the higher availability of charging stations. The substitutional effects have only been researched for passenger cars; Commercial vehicles and other special vehicles are not covered within this method.

In order to use this calculation method and the defined default values, the charging stations have to fulfil the following quality requirements:

- Quick charging stations have to be situated along long-distance traffic routes or at transport hubs and therefore be easy to reach. They have to be public or semi-public and have to be open for charging at any given time (“24/7”) for all users defined in Article 2 (7) of Directive 2014/94/EU. The accessibility has to be non-discriminatory in accordance with Directive 2014/94/EU. The charging capacity has to be at least 22 kW.
- Semi-public and public charging stations have to be accessible for all users defined in Article 2 (7) of Directive 2014/94/EU.
- Private charging stations are stations only available to (paying) users, especially stations situated in residential buildings, at companies and public institutions for their employees and at companies and public institutions for their vehicle fleet.

3.10.2 Formula

$$FES_{tot} = n_{QCS} * ES_{QCS} + n_{SPCS} * ES_{SPCS} + n_{PCS} * ES_{PCS}$$

FES_{tot}	Total final energy savings [kWh/a]
n_{QCS}	Number of installed quick charging stations [-]
ES_{QCS}	Final energy savings generated by the installed quick charging stations [kWh/a]
n_{SPCS}	Number of installed (semi) public charging stations [-]
ES_{SPCS}	Final energy savings generated by the installed (semi) public charging stations [kWh/a]
n_{PCS}	Number of installed private charging stations [-]
ES_{PCS}	Final energy savings generated by the installed private charging stations [kWh/a]

3.10.3 Calculation Values

In Austria, the following calculation values have been defined:

ES_{QCS}	Final energy savings generated by the installed quick charging stations	16,143	kWh/a
ES_{SPCS}	Final energy savings generated by the installed (semi) public charging stations	15,986	kWh/a
ES_{PCS}	Final energy savings generated by the installed private charging stations	5,055	kWh/a

3.10.4 Methodology

Values for the calculation of savings in Austria:

Parameter	Value	Unit
Average energy consumption of an E-vehicle or Plug-In-Hybrid-car		
E-vehicle (topprodukte.at, 2015-10-30)	15.0	kWh/100 Vehicle-km
Combined, weighted, real energy consumption of a Plug-In-Hybrid (electric + conventional drive, <u>well-developed charging infrastructure</u>) (Moser und Muggenhumer, 2015)	45.0	kWh/100 Vehicle-km
Average energy consumption of a reference passenger car		
Reference-Passenger car (newly purchased) (market average of newly purchased vehicles)	53.6	kWh/100 Vehicle-km
Reference-Passenger car (replacement of another car) (market average of in-stock vehicles)	59.4	kWh/100 Vehicle-km
Percentage of new vehicles in the total stock (statistical data)	6.6	%
Reference-Passenger car (combined)	59.0	kWh/100 Vehicle-km
Combined, weighted, real energy consumption of a Plug-In-Hybrid (electric + conventional drive, <u>Baseline scenario</u>) (Moser und Muggenhumer, 2015)	52.3	kWh/100 Vehicle-km
Average yearly mileage		
Yearly mileage E-vehicle and Plug-In-Hybrid (statistical data)	14,000	km/a

Conversion factors for fuels:

	CO ₂ -content [kg CO ₂ /litre]	Density [kg/litre]	Energy content [kWh/kg]
diesel	2.429	0.837	11.67
petrol	2.218	0.744	11.38

To define the Austrian calculation values, a study was performed by Johannes Kepler University. At first, the total savings were divided into four sub-categories:

- Savings by driving an electric car
- Savings by the higher electrical range of plug-in hybrids
- Substitution of conventional vehicles by electric cars due to easier access to charging stations
- Substitution of conventional vehicles by electric cars on long-distance travels due to easier access to charging stations

Calculation of savings by driving an electric car

The average energy consumption of electric vehicles (market stock, 0.15 kWh/km) and conventional vehicles (combination of new cars and car stock, 0.59 kWh/km) in Austria was compared. A study performed by Umweltbundesamt (the Environment Agency Austria) prepared a forecast that between 2015 and 2020, 16,000 e-vehicles will be registered in Austria based on the infrastructure already in place. The number of registered cars multiplied with the average annual yearly mileage (14,000 km) and the difference in energy consumption results in **98.6 GWh of first-year savings**.

Calculation of savings by the higher electrical range of plug-in hybrids

Due to the higher number of charging stations, it is expected that the electrical range of plug-in hybrids (so the distance travelled by using the electric drive) will rise and therefore reduce the final energy consumption of those vehicles.

A study of the Environment Agency Austria predicts that there will be 49,500 plug-in hybrid cars in Austria by 2020. This study also forecasts that this number could be increased to 130,500 in case of an improved infrastructure of charging stations. For the calculation of savings, an average of 90,000 vehicles was defined.

For the definition of final energy consumption, the consumption values of the most common plug-in hybrid models in Austria were averaged. Since research showed that in the case of plug-in hybrids, the standard consumption does not match real consumption, the values were taken from a study performed in the Netherlands¹. The study also showed that the final energy consumption of conventional cars is about 150 % of their standard consumption. A study performed by Fraunhofer ISI² in Germany confirms those values.

The final energy consumption of plug-in hybrids was defined at 52.3 kWh/100 km for the baseline situation. Since the final energy consumption is reduced by higher distances covered by the electric drive, it was assessed in which cases drivers would be willing to wait for the battery to be charged between two trips using methods for calculating opportunity costs. The distances covered by conventional drives are reduced by 22 %, leading to a final energy consumption of plug-in hybrids of 45 kWh/100 km in case of better charging station infrastructure. The predicted number of plug-in hybrids multiplied by the reduction of final energy consumption and average yearly mileage results in **93 GWh of first-year savings** that can be accounted to the charging infrastructure.

¹ Ligterink, Eijk (2014): Update analysis of real-world fuel consumption of business passenger cars based on Travelcard Nederland fuelpass data. TNO Report TNO 2014 R11063, 21. Juli 2014.

² Plötz, Funke, Jochem (2015): Real-world fuel economy and CO2 emissions of plug-in hybrid electric vehicles. Fraunhofer ISI Working Paper Sustainability and Innovation No. S 1/2015.

Calculation of savings by substitution of conventional vehicles by electric cars

The savings calculated in this sub-category result exclusively from e-vehicle purchases triggered by an improved charging station infrastructure. The main barriers for the switch to an electric drive are the vehicle price, maximum travel distance due to battery capacity and availability of charging stations.

A longer maximum travel distance can be achieved by an investment into batteries with higher capacities or by re-charging the battery on charging stations. To compare monetary investments to investing time, opportunity costs for the charging process were calculated. This analysis shows that at a battery price of 125 €/kWh, 72.5 % of drivers would choose better charging infrastructure over higher battery capacity. Therefore, 72.5 % of the savings by newly purchased e-vehicles can be accounted to the installation of charging stations.

Forecasts for the registration of new electric vehicles in Austria in the years 2015 to 2020 predict 28,635 e-vehicles purchased due to higher battery capacities or availability of charging stations. Multiplying this number with the lower energy consumption (see "Calculation of savings by driving an electric car"), the average yearly mileage and the 72.5 % accountable for charging infrastructure, **128 GWh of first-year savings** can be achieved.

Calculation of savings by substitution of conventional vehicles by electric cars on long-distance travels

For the calculation of savings for long-distance travels by electric vehicles, the study made the hypothesis that most of the e-vehicles in Austria are secondary vehicles of households also owning a conventional vehicle. Due to the possibility to charge the vehicle in a quick-charging station, drivers might decide to also use their e-vehicle on long-distance travels. To avoid double counting, the savings calculation is therefore only based on the 16,000 e-vehicles that will be registered in Austria until 2020 according to the Federal Environment Agency and only uses the mileage of long-distance travels that would have been travelled in a conventional car without the charging infrastructure.

Since there are no studies on the switch from conventional to e-vehicle on such travels, opportunity costs were calculated. Travelling 225 km in an e-vehicle generates costs of 6.08 € (0.15 kWh/km and 0.18 €/kWh), the costs of the same distance travelled in a conventional car are set at 16.10 € (0.59 kWh/km and 0.12 €/kWh). The study defines the charging time at quick charging stations at 34 minutes for 22 kW stations and 16 minutes at 50 kW stations. Calculations come to the result that 60 % of all e-vehicle drivers will use their vehicle also for long-distance travels in case the quick charging infrastructure is extended.

The study performed by the Federal Environment Agency gives more information on those long-distance travels: the average mileage of 225 km is on average travelled 18 times per year. This leads to 4,050 km of long distance travels resulting in savings of 1,782 kWh/a per e-vehicle.

Those savings multiplied with the number of vehicles are reduced by the factors 0,66 (percentage of households owning more than one vehicle) and 0,6 (percentage of people willing to use an e-vehicle for long-distance travel) to calculate the resulting **11.3 GWh of first-year savings** triggered by strengthening the quick-charging infrastructure.

Allocation of savings

The total savings generated by all four categories sum up to 330.9 GWh. They are allocated to the three different types of charging stations:

Quick charging stations

As explained above, the savings from these stations are generated by more long-distance travels accomplished in e-vehicles. Therefore, the full amount of savings (11.3 GWh) is accountable. It is suggested that 700 Quick-charging stations will be built. The number is an average formed by different studies suggesting either a total number of charging stations or to define the number in accordance with the number of fuel stations available per 1,000 inhabitants. This results in **savings of 16,143 kWh/a per station**.

Semi-public and public charging stations

Public and semi-public charging stations are an important psychological lever for the purchase of e-vehicles instead of conventional ones. From the savings calculated in "Calculation of savings by substitution of conventional vehicles by electric cars" (128 GWh), only 50 % are accounted in order to prevent double counting. It is suggested that 4,000 public or semi-public stations will be built. The number is calculated by at least one station for every municipality in Austria (2,354) and at least 0,5 stations per 1,000 inhabitants for urban areas. This results in savings of **15,986 kWh/a per station**.

Private charging stations

The savings generated by private charging stations comprise two categories. The savings generated by the higher electric range of plug-in hybrids (93 GWh) are fully accountable. Only 50 % of the savings generated by driving an electric car (98.6 GWh) are accounted in order to prevent double counting. The number of charging stations is calculated as follows: all 16,000 e-vehicles are in need of a charging station at home. About 27 % of all of Austria's employees are commuters. If this percentage is also used on the 90,000 plug-in hybrid vehicles, there are 24,300 vehicles in need of a charging station at work. One station can charge two vehicles per day. In total, 28,150 charging stations were defined. This results in savings of **5,055 kWh/a per station**.

3.10.5 Prevention of double counting

In case that both the installation of charging stations and the purchase of an electric vehicle are measures accountable for the calculation of energy savings, double counting of savings can occur.

The installation of charging station per se does not trigger energy savings. However, a well-developed infrastructure for charging electric vehicles will reduce barriers associated with their purchase like maximum range of a vehicle's battery and will therefore increase the chance of the substitution of a conventional vehicle by an electric one. If the installation of charging stations is the only accountable measure (meaning the purchase of electric vehicles is not accountable), the savings generated by all vehicles charged at this station can be summarized. Depending on the definitions set for an energy obligation scheme, it might be easier to

calculate the savings in a top-down approach using numbers on the registration of electric- or plug-in hybrid vehicles.

If only the purchase of an electric vehicle is accountable, this means that incentives like subsidies play an important role. Other than the issue of battery range, the significantly higher vehicle prices are one of the main barriers for the purchase of electric vehicles.

A combination of both strategies will reduce the barriers of both battery range and high prices and therefore create a stronger incentive for the switch from conventional to electric vehicles. Like mentioned above, in this case, measures to avoid double counting have to be provided. The easiest solution to this is to only partially account the savings of both calculation methods, so for example account 50 % of the savings on charging stations and 50 % to the purchase of vehicles.

3.11 Telematics

3.11.1 Description

The energy consumption of a vehicle depends on the type of vehicle, the route, the kilometres travelled and, to some extent, on the driver's behaviour. As an energy efficiency measure, the use of telematics systems (e.g. fleet telematics systems (FTS)) aims to optimize driving characteristics.

A telematics system includes a control unit, which real-time evaluates the handling of the vehicle. The system provides the driver with a direct and immediate feedback on

- current and average speed,
- current and average fuel consumption,
- behaviour on rolling and braking,
- behaviour on changing gears, and
- behaviour on acceleration.

Furthermore, the system compares the actual performance of the driver with the optimal style of driving for a certain route section and displays potential fuel savings. Given this information drivers learn to optimize their driving behaviour and, thus, reduce fuel consumption. Often, telematics systems record the data and, therefore, allow further evaluation by the driver or the (bus) fleet operator. Drivers must receive periodical trainings on the handling of the system.

3.11.2 Formula

$$ES_{total} = n * EC_{avg} * f_{sav} - EC_{Rebound}$$

ES_{total}	Total final energy savings [kWh/a]
n	Quantity of vehicles equipped with telematics system [-]
EC_{avg}	energy consumption of all journeys of an average vehicle per year [kWh/a]

f_{sav}	Energy savings factor [%]
$EC_{Rebound}$	Energy consumption caused by rebound effect [kWh/a]

3.11.3 Calculation Values and Methodology

Quantity of vehicles equipped with telematics systems

The value for this variable equals the number of vehicles of a fleet that are equipped with telematics systems.

Average energy consumption of all journeys of a vehicle per year without telematics system

The energy consumption of an average vehicle of a fleet per year can be determined by two different approaches:

- With the average fuel consumption per vehicle per year [litres/a] and a conversion factor [kWh/litre],
or
- with the average kilometres travelled by vehicle [km/a] and the average energy consumption of a vehicle per kilometre [kWh/km].

For bus fleets it is recommended to distinguish between city traffic and regional or long distance traffic. The fuel consumption of city busses is usually higher because of shorter distances between bus stops and, hence, shorter periods of constant velocities. The required data is best provided by (bus) fleet operators.

Energy savings factor

The energy savings factor f_{sav} is a standard value based on representative studies or evaluations. This standard savings value can be understood as a minimum requirement.

Studies that are used for the definition of the energy savings factor should include long term evaluations on (bus) fleets with and without telematics systems. Studies should clearly identify savings gained from the changing behaviour of drivers caused by the use of telematics systems. Savings from overlapping measures (e.g. technical measures), if there are any, have to be eliminated. If several representative studies are taken into account, their potential savings factors can be averaged.

4 Proposal for energy savings measures to achieve the Article 7 target in Cyprus

4.1 Overview

At the interim project meeting in Nicosia the following policy measures were chosen as a starting point for an Article 7 measures mix in Cyprus:

- Financing tool for energy efficiency investment
- Energy efficiency obligation scheme
- Support Scheme for promoting roof thermal insulation
- Additional floor space “allowance” for new buildings and buildings that are renovated: incentive for new buildings with higher energy efficiency than the national minimum energy performance requirements
- individual energy efficiency interventions and energy efficiency retrofits in selected governmental buildings
- Applying a lower VAT rate for the renovation and repair of dwellings
- ‘Save & Upgrade’ grant scheme for promoting renovation in dwellings
- ‘Save & Upgrade’ grant for promoting renovation of building in small and medium enterprises
- Increase in the RES fee applied on electricity
- Motor vehicle taxes based on CO₂ emissions
- Energy efficient street lighting
- Incentives for new buildings with higher energy efficiency than national minimum energy performance requirements
- Energy efficiency in defence and in water sector

In addition, other taxation as well as transport policy measures should be taken into account. In the remainder of this chapter the following policy measures are added, resulting in 15 policies:

- Excise tax on transport fuels
- Action plan for the transport sector

Looking at the energy balance of Cyprus the average share of sectors in final energy consumption in the year 2015-2017 was:

- 44% | Transport
- 22% | Residential
- 15% | Industry
- 15% | Service
- 3% | Agriculture

- 1% | Non-specified

Thus the transport sector dominates final energy consumption. This results in two challenges:

- Measures in the transport sector are usually more difficult to implement due to high investment costs as well as politically sensitivities;
- The calculation of energy savings is more difficult due to less well established methodologies and protocols. That is why in chapter 3 a number of calculation methods for the transport sector are analysed and proposed.

In a first step it is analysed whether the policies cover all main sectors/consumption category or whether there is still potential for more measures in some sectors.

Table 4: PAMs and sectoral coverage

Title	Sector	Category
Financing tool for energy efficiency investment	all	all
Energy efficiency obligation scheme	all	all
Additional floor space “allowance” for new buildings: incentive for new buildings with higher energy efficiency than EPBD requirements	all	buildings
Increase in the RES fee applied on electricity	all	Appliances buildings processes
Motor vehicle taxes based on CO ₂ emissions	all	transport
Excise tax on transport fuels	all	transport
Action plan for the transport sector	all	transport
Support Scheme for promoting roof thermal insulation	households	buildings
Applying a lower VAT rate for the renovation and repair of private dwellings.	households	buildings
‘Save & Upgrade’ grant scheme for promoting renovation in dwellings	households	buildings
Incentives for new buildings with higher energy efficiency than EPBD requirements	service	buildings
Individual energy efficiency interventions and energy efficiency retrofits in selected governmental buildings	service (public)	buildings
Energy efficient street lighting	service (public)	lighting
Energy efficiency in defence and in water sector	service	all
‘Save & Upgrade’ grant for promoting renovation of building in enterprises	service industry	buildings

The table above shows 7 cross sectoral measures that target all sectors. The households and service sectors are targeted by several specific instruments in addition to the cross-sectoral measures. In both sectors these specific measures concentrate on buildings. The industry sector seems a little bit underrepresented but can profit from the cross-sectoral measures.

It can be seen from Table 4 that there are 3 policy measures targeted at transport uses – the motor vehicle tax based on CO₂ emissions, the excise tax on transport fuels and the action plan for the transport sector. The Technical University of Nicosia performed an assessment of eligible energy savings resulting from fuel excise taxes on fuels. The calculation methodology used was discussed together with AEA at the interim project meeting in Nicosia in the beginning of April 2019. The method applied meets the criteria of the EED and can be used to report savings for Article 7. The final amount of savings depends on the tax level in the new obligation period 2021-2030 but AEA recommends adding fuel excise taxes to the bundle of Article 7 measures in Cyprus.

The following table summarises the sectoral coverage of the Article 7 measures and indicates on the basis of a colour code whether coverage is sufficient or not (green=sufficient; yellow=can be improved; red=insufficient).

Table 5: Sectoral coverage of Article 7 measures

Sector	Coverage	Comments
Transport	Green	Few measures but high potential
Residential	Green	High number of measures
Industry	Yellow	Few measures explicitly targeting industry
Service	Yellow	Good coverage for public sector Low coverage of private sector
Agriculture	Red	No high importance in terms of energy consumption

Table 6 shows an analysis whether the policy measures proposed are suitable for the implementation of Article 7. The criteria applied include:

- Expected contribution to the 2021-2030 Article 7 target of Cyprus | this criterion assesses the importance of the policy in terms of savings eligible for Article 7 EED.
- Cost effectiveness taking into account programme costs and expected benefits in terms of energy savings | this criterion assesses the cost effectiveness keeping in mind the individual actions implemented and is looked at both from an individual and an public sector perspective
- Administrative burden for obligated/entrusted parties, public authorities and final customers
- Complexity of the scheme | how easy it is to understand the rules of the scheme
- Potential effect of the policy measure to reduce energy poverty | are energy poor households targeted by the scheme
- General compliance of the policy measure with Article 7 EED requirements and requirements from the Regulation on the Governance of the Energy Union

An additional criterion is the existing institutional set-up in Cyprus which is good for all policies with the exception of the Energy Efficiency Obligation Scheme that has not started yet.

The ratings were developed within the project team and are based to a large extent on (Wiese, Larsen and Padea 2017). Further sources used are (ENSPOL 2015), (Broc, et al. 2017), (Europe Economics 2016) and (Gillingham, Keyes und Palmer 2017).

Table 6: Rating of potential policy measures

Title	Contribution to Article 7 target ³	Cost effectiveness		Administrative burden	Complexity of the scheme	Reduce energy poverty	Compliance with Article 7
		End user	Public				
Financing tool for energy efficiency investment	high	medium	high	medium	medium	low	high
Energy efficiency obligation scheme	high	high	medium	medium	high	medium	high
Additional floor space “allowance” for new and existing buildings: incentive for buildings with higher energy efficiency than EPBD requirements	low	medium	Medium	medium	medium	low	low
Increase in the RES fee applied on electricity	high	high	high	low	low	low	high
Motor vehicle taxes based on CO ₂ emissions	high	high	high	low	low	low	high
Excise tax on transport fuels	high	high	high	low	low	low	high
Action plan for the transport sector	high	medium	medium	high	medium	low	high
Support Scheme for promoting roof thermal insulation	medium	high	high	medium	low	medium	high
Applying a lower VAT rate for the renovation and repair of private dwellings	medium	high	high	medium	low	medium	high
‘Save & Upgrade’ grant scheme for promoting renovation in dwellings	high	medium	high	medium	medium	medium	high
Incentives for new buildings with higher energy efficiency than EPBD requirements	low	medium	medium	low	low	low	high
Individual energy efficiency interventions and energy efficiency retrofits in selected governmental buildings	low	high	high	low	low	low	high
Energy efficient street lighting	medium	high	high	low	low	low	high
Energy efficiency in defence and in water sector	medium	medium	medium	low	low	low	high
‘Save & Upgrade’ grant for renovation of building in enterprises	high	medium	high	medium	medium	low	high

³ The cumulative target for Cyprus for the period 2021 – 2030 is 243,044 Tonnes of Oil Equivalent

CONTRIBUTION TO THE ARTICLE 7 TARGET

This is high for measures in the transport sector, as this sector has a high share in Cyprus' final energy consumption and for taxation measures. The contribution to the target is also high for some subsidy schemes and for the EEO.

ENERGY POVERTY

It can be seen from Table 6 that most policies have only low influence on energy poverty either because they do not target the residential sector or because the measures implemented are not relevant for energy poor households. The EEO can be designed in a way that it targets energy poor households (e.g. the quota of savings in energy poor households demanded within the Irish EEO).

Looking at the overall result, the measures for the transport sector and the taxation measures show the best results, followed by the EEO and subsidy schemes. Low scores are achieved by policies that target only a small sector (e.g. public buildings) or a small energy consumption category (e.g. new buildings). Note that this step of the analysis does not consider yet possible overlaps between the policy measures.

For the remainder of the analysis the policy measures are aggregated to policy groups. The following chapters analyse each of the policy groups with respect to expected energy savings. Based on that chapter 4.8 develops policy mix scenarios. Chapter 4.9 proposes an optimal policy mix for the Article 7 implementation in Cyprus.

Table 7: Grouping of policy measures

Title	Policy group
Financing tool for energy efficiency investment	Subsidy schemes and other fiscal instruments
Support Scheme for promoting roof thermal insulation	
Applying a lower VAT rate for the renovation and repair of private dwellings	
'Save & Upgrade' grant scheme for promoting renovation in dwellings	
Incentives for new buildings with higher energy efficiency than EPBD requirements	
'Save & Upgrade' grant for promoting renovation of building in enterprises	
Energy efficiency obligation scheme	Energy efficiency obligation scheme
Additional floor space "allowance" for new and existing buildings: incentive for new and existing buildings with higher energy efficiency than EPBD requirements	Other incentives
Increase in the RES fee applied on electricity	Taxation measures
Motor vehicle taxes based on CO ₂ emissions	
Excise tax on transport fuels	
Individual energy efficiency interventions and energy efficiency retrofits in selected governmental buildings	Policy measures in the public sector
Energy efficient street lighting	
Energy efficiency in defence and in water sector	
Action plan for the transport sector	Transport measures

4.2 Subsidy schemes and other fiscal instruments

A number of policy measures proposed for Article 7 implementation in Cyprus are subsidy schemes including instruments like soft loans. All these schemes trigger the implementation of individual energy savings actions by making the implementation costs cheaper directly. The calculation of energy savings can be done by collecting information on implemented measures and mostly using bottom-up formulas. A separate excel file with a couple of bottom-up calculation methodologies was developed in this project.

First in a generic approach for the analysis of potential energy savings from subsidy schemes and other fiscal measures the following assumptions on the specific reduction costs of energy efficiency measures are made:

Table 8: Specific costs of energy savings

Sector	Cost of saving one kWh
Residential	68 cent (assuming a lifetime of savings of 20 years) 13.6 Euro related to first year savings
Service sector	48 cent (lies between residential and industry and has high share of buildings measures) 9.6 Euro related to first year savings
Industry	2 cent (conservative assumption deducted from report) 20 cent related to first year savings

The numbers for the residential sector/buildings are based on the current support scheme for promoting roof thermal insulation in Cyprus.⁴ The numbers for industry are derived from the study “Review of costs and benefits of energy savings” by the Institute for European Environmental Policy and were cross-checked with a study that was done by the Austrian Energy Agency in 2014 on specific energy savings costs in 2014.

From the information available in the draft NECP of Cyprus (Republic of Cyprus 2019) the annual budget of these schemes is around 10 million Euros. All sectors will be targeted. For the quantification it is assumed that:

- The annual budget of the scheme is 10 million Euros
- Funded projects will receive 30% of investment costs, triggering 33.3 million Euros of investments each year
- Funds will be allocated to the sectors residential, service and industry according to their shares in final energy consumption (42% residential, 29% service and industry each)

Taking these assumptions and the average energy saving costs defined above, this results in total average savings costs of 8.6 Euro per kWh expressed as first year savings. From this it can be followed that 3.88 million kWh or **0.33 ktoe** of savings can be achieved with these instruments. To go more into detail the measures are analysed according to sector.

4.2.1 Household sector

The following measures target (at least partly) households:

- Financing tool for energy efficiency investment
- Support Scheme for promoting roof thermal insulation
- Applying a lower VAT rate for the renovation and repair of private dwellings
- ‘Save & Upgrade’ grant scheme for promoting renovation in dwellings
- Incentives for new buildings with higher energy efficiency than EPBD requirements

⁴ The max grant amount per action is 1,500 Euro; the estimated annual savings are 7,304 kWh. Taking into account the subsidy contribution of 30% the cost of savings of one kWh is 0.68 cent.

For this analysis the savings reported in the past years for Article 7 of the EED and the economically viable savings potential from (Vougiouklakis, et al. 2017) are compared. In this report the economically viable savings potential was derived from the technical potential taking into account available financial resources and average energy savings per energy efficiency intervention.

Table 9: Energy savings in the household sector

	ktoe (annual new)
Average savings reported for Article 7 (2014-2017)	1.00
Economically viable savings potential (Vougiouklakis, et al. 2017)	1.65

As can be seen the reported savings are considerably lower than the potential. However it has to be noted that energy savings reported in 2015 were much below the values for 2016 and 2017. Nevertheless it can be assumed that the energy savings from measures in the household sector could be increased in order to bring them closer to the potential.

4.2.2 Commercial sector

The following measures target (at least partly) companies:

- Financing tool for energy efficiency investment
- ‘Save & Upgrade’ grant for promoting renovation of building in enterprises
- Incentives for new buildings with higher energy efficiency than EPBD requirements

For this analysis the savings reported in the past years for Article 7 of the EED and the economically viable savings potential from (Vougiouklakis, et al. 2017) are compared. In this report the economically viable savings potential was derived from the technical potential taking into account available financial resources and average energy savings per energy efficiency intervention.

Table 10: Energy savings in the service sector

	ktoe (annual new)
Average savings reported for Article 7 (2014-2017)	0.54
Economically viable savings potential (Vougiouklakis, et al. 2017)	1.23

It can be seen that reported savings are clearly below what can be seen as a realistic potential.

Two more measures that include financial incentives are mentioned in the following paragraphs.

The **Business4Climate-program** is based on voluntary agreements for small and medium enterprises (SME) which are not part of the emission trade system (ETS) and has a target to reduce CO₂ emissions by 8% until 2030. The program is financed by the European Institute of Innovation and Technology (EIT). The participating companies have to draft energy action plans and keep their emission inventory in an online tool. This inventory can be used as a baseline for emission savings. The toolkit also provides participating companies with measures calculation methodologies. It is planned to subsidize realised CO₂ emission reductions with the market price for CO₂. This funding scheme has however not been implemented yet.

In the **Fund of funds programme** it is planned to give loans to companies that implement energy efficiency measures. This programme that is supported by the EU structural funds grants favourable bank loans to SMEs for projects on energy efficiency and renewable energy sources. 15% of the budget comes from national sources and 85% from EU sources.

Both programmes can increase the above mentioned savings value of 0.54 ktoe considerably.

4.3 Energy efficiency obligation scheme

A research of Energy Efficiency Obligation Schemes in Europe shows that these schemes' share in total savings reported for Article 7 differs between 100% and 4%.

A share of 100% or close to 100% can be observed in Bulgaria, Denmark, France, Ireland, Luxembourg and Poland. Italy, Slovenia and Austria have a share of between 40 and 60%. The UK, Greece and Malta have lower shares.

The contribution of the EEO in Cyprus will depend on the suppliers obligated and the eligible measures that are not known in detail yet. It was expected initially that the EEO will deliver 15 ktoe of annual savings between 2021 and 2030. The lifetime of the measures is expected to be one year with implemented measures diesel fuel additives and soft measures mainly.

The expected energy savings of 15 ktoe are considered to be quite high by the Austrian Energy Agency. As could be observed in other schemes in Europe, EEOs do not deliver all expected savings from the first year after introduction because both public authorities (detailed rules of the scheme) and energy suppliers (how to comply with the obligation) need to adapt to the introduction of the scheme. Also it is not known at the beginning whether obligated parties will deliver the savings required. That's why it is recommended to treat expected savings from the EEO with more wariness. Therefore it was agreed at the final project meeting in Nicosia in July to reduce expected final energy savings from the **EEO to 10 ktoe of annual savings**, keeping the lifetime of one year.

4.4 Other incentives

The only non-financial incentive in the proposed measure mix is the **Additional floor space “allowance” for new and existing buildings: incentive for new and existing buildings with higher energy efficiency than EPBD requirements.**

Energy savings eligible for Article 7 for this policy measure are expected to be limited and not contribute considerably to the Article 7 target for two main reasons:

- Energy savings for Article 7 would need to be calculated using the difference between EPBD minimum requirements (which are cost-optimal) and the realised situation. This is true for new as well as existing buildings. Thus the effects are relatively small in comparison to other instruments.
- A rebound effect would need to be taken into account because building more m² than initially planned is a classic example of the direct rebound effect.

The measure is under revision by the Department of Special Planning and Housing in collaboration with the Energy Service. The aim is to tighten the eligibility requirements by 2020 in order to go beyond NZEB requirements.

4.5 Taxation measures

Under taxation measures all policy measures are summarised that are taxes or influence the energy price. Considerations on energy taxes can be found in chapter 3.2 of this report. In most countries that report energy savings from energy and CO₂ taxes the share in reported energy savings is considerable.

Taking the experience from Austria and other Member States the excise tax on transport fuels as well as the increase in the RES fee applied on electricity have a high potential for contribution to the Article 7 target because they both target a large share of final energy consumption.

The potential for the motor vehicle taxes based on CO₂ emissions is lower because this instrument in one of many factors in the investment decision for a new vehicle.

For the savings effects of fuel taxes a savings calculation by the Technical University of Cyprus was provided. The expected savings from fuel taxes from scenario 3 of the calculations including the whole road transport are shown in the table below

Table 11: Expected energy savings from fuel taxes for Cyprus

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Energy savings from fuel taxes	ktoe	51	39	30	23	19	19	19	19	18	18

The effects incorporate both short and long-term elasticities. The lifetime of savings for the excise fuel tax is assumed to be one year.

Furthermore Cyprus reported savings for motor vehicle taxes based on CO₂ emissions and taxes on electricity in the annual EED reports for the year 2016 and 2017 (motor vehicle tax) and 2017 (RES fee on electricity). The average annual savings are **0.63 ktoe for the motor vehicle tax** and **2.70 ktoe for the electricity tax**.

For the further analysis the above shown savings from fuel taxes for the respective years and the average reported savings for the other two taxes are used for the period 2021-2030.

Currently the introduction of a green tax reform (carbon tax) is discussed. The carbon tax is planned to affect non-ETS companies excluding electricity. Further details as to the exact design of the reform are not known yet (e.g. us of the incomes). Expected energy savings due to the introduction of a carbon tax are considerable and exceed the savings by the other taxes discussed above. However the carbon tax is not included in the further analysis because its implementation in Cyprus is too unclear at the moment.

4.6 Policy measures in the public sector

This category comprises 3 policy measures:

- Individual energy efficiency interventions and energy efficiency retrofits in selected governmental buildings
- Energy efficient street lighting
- Energy efficiency in water sector

These measures have a high relative energy savings potential but can be expected to have only a limited contribution to the overall Article 7 target. It is however recommended to include these measures in the Article 7 policy mix of Cyprus because they show the exemplary role of the public sector.

For measures in the buildings sector the assumption of a savings rate of 15% per project is realistic. By exchanging existing street lighting with highly efficient technologies 30% can be saved.

In the annual report of 2018 Cyprus reported annual savings of **0.0513 ktoe for street lighting**. For **measures in public buildings 0.0944 ktoe** of annual savings were reported on average.

In the water sector the following measures are planned in the period 2021-2030:

- Energy efficient design of water networks
- Energy efficiency based procurement:
- Predictive maintenance of pumping equipment
- Leak detection
- Energy efficient water management
- Introduction of energy management

All the measures above are targeted at improving the efficiency of the water supply system. The most cost efficient measures are leak detection and the energy efficient design of the water networks.

Based on the quantitative information provided by MECI on the pumping infrastructure in Cyprus an energy savings potential analysis was performed.⁵ The data provided on pumping station level include electricity consumption, cubic meters and height of the station in the year 2012. The energy consumption data for 2012 was normalised to an optimal efficiency of the pumping stations. The difference between the actual consumption 2012 and the theoretical consumption in optimal conditions is interpreted as the energy savings potential. This potential is a rather conservative number as it mainly reflects optimisation of the existing infrastructure. The resulting annual final energy savings potential amounts to **0.04 ktoe**.

Summarising the annual final energy savings potential of all measures in the public sector is **0.19 ktoe**.

4.7 Measures in the transport sector

In this chapter the action plan for the transport and its main goals sector is described. Due to the fact that transport causes half of the energy consumption and 91% of modal split is by cars the Ministry of Transport in Cyprus developed a strategy plan for the transport sector. Modal shift is the most important measure to develop a sustainable mobility. The strategy foresees a reduction of car journeys in the modal split from 91% to 68% in 2030. These 68% include the introduction of a tram line in Nicosia. Without the tram line the modal share of cars would be 78%. The share of public transport is expected to rise from 3% to 10%. The following actions are planned to achieve this target:

- Improve public transport service, e.g. installing of a tram system
- Improve infrastructure
- Purchasing of buses with low fuel consumption and electric buses; 7% of the bus fleet in 2030 is planned to be electric
- 6% of the private transport should be electric in 2030
- Planting of trees next to roads (cooperation with forest department)
- Environmental tax and fees on fossil fuels

In sum there are about 23 individual actions to achieve the target. The Ministry of Transport assumes an annual growth rate of 1.5% for private transport in the following years. The costs of this bundle of measures is considerable but the benefits not only in terms of energy and CO₂ emission savings but also in terms of additional benefits (e.g. reduction of congestion, positive effects on health) have to be taken into account.

With the simplified calculation methodology for modal shift developed by AEA in this project, an assessment was done on the expected amount of energy savings from the measures in the transport sector described above. All measures are expected to influence the modal shift to the target levels mentioned above. The method takes into account reduced energy consumption by cars and increased energy consumption by the public transport (due to the shift from cars to public transport). In the year when the reduction from 91% to 68% car transport is achieved, the resulting final energy savings amount to 21.08 ktoe. In this study it is assumed that this level is achieved in 2030 with a linear trajectory between 2021 and 2030. Taking into account a lifetime of 1 year of modal shifts, the resulting cumulative energy savings amount to 115.96 ktoe.

⁵ Data was provided for the following pumping stations: Tersephanou, Mazera, Kattouthkia (Latsia), Kornos, Dhipotamos, Phrenaros, Souni-Zanatzia. Dhipotamos was not considered in the analysis as the framework conditions for this pumping station are specific and the year 2012 is not representative.

4.8 Policy mix scenarios

In this chapter different mixes of policies for the Article 7 implementation are developed and analysed in terms of expected energy savings/target achievement, double counting and other relevant Article 7 issues. The basis for the expected energy savings for existing instruments is the average annual savings reported by Cyprus between 2014 and 2017:

Table 12: Expected energy savings of energy efficiency policies in Cyprus in 2021-2030

Nr.	Policy name	ktoe (annual new)	ktoe (cumulative 2021- 2030)	Lifetime of savings (years)
1	Subsidy schemes and other fiscal measures	1.54	84.31	15
1a	Households	1.00	54.85	15
1b	Commercial buildings	0.54	29.46	15
2	Energy efficiency obligation scheme	10.00	100.00	1
3	Excise tax on transport fuels	between 18.00 and 51.00	253.85	1
4	RES fee on electricity	2.70	27.04	1
5	CO ₂ motor tax	0.63	31.09	7
7	Measures in the public sector	0.19	10.40	15
8	Measures in the transport sector	21.08	116.00	1

If all savings are summed up, this results in cumulative savings in the year 2030 of **622.40 ktoe**, which clearly exceeds the Article 7 target for Cyprus of 243.00 ktoe. But it has to be noted that this aggregated number does not take into account double counting between the policy instruments as well as uncertainties in implementation (e.g. EEO). The following figure shows the target achievement over time where the area under the red lines is the cumulative savings target according to Article 7 EED for Cyprus and the green columns represent the achieved savings in each year.

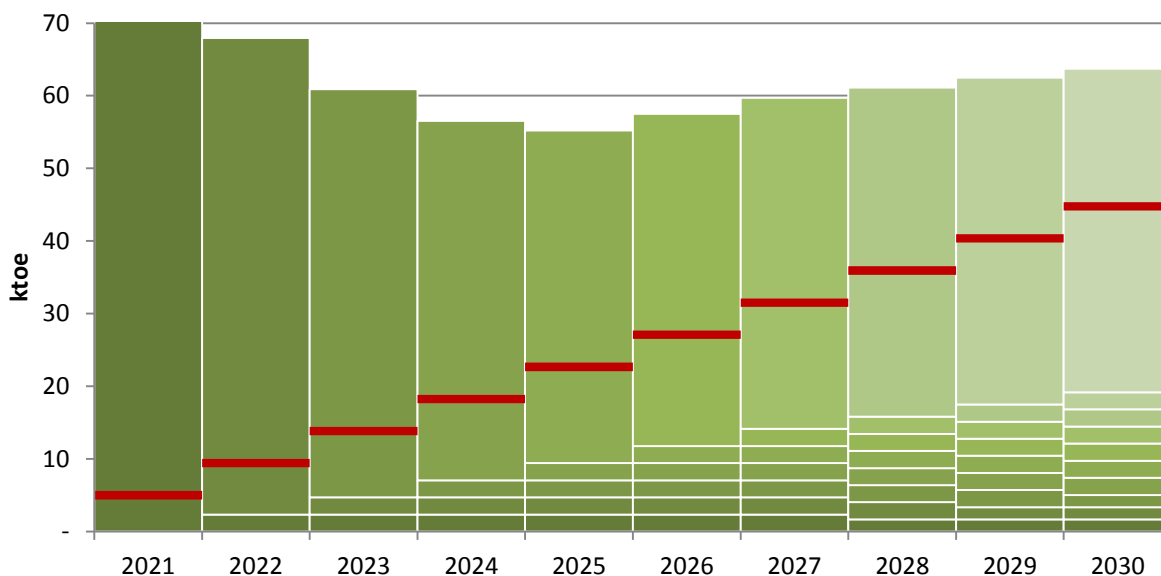


Figure 1: Theoretical Article 7 target achievement using all policy instruments

Starting from this comprehensive but unrealistic scenario, further scenarios are developed and analysed with respect to target achievement, double counting and other implementation issues.

The combination of taxation measures and the EEO will not be analysed because double counting issues are too strong with this scenario. For the same reason the combination of transport measures and taxation measures will not be analysed.

4.8.1 Scenario | only subsidy schemes and policy measures in the public sector

This scenario encompasses the policy measures 1a, 1b and 7 from the policies shown in Table 12 (Chapter 4.8). With **94.4 ktoe of expected final energy savings** the cumulative Article 7 target of 243 ktoe is achieved only by 39%. This means the efforts in subsidy schemes and measures in the public sector in Cyprus would need to almost triple if the Article 7 target is intended to be only achieved by such measures. In this scenario there is no obvious danger of double counting between the policies.

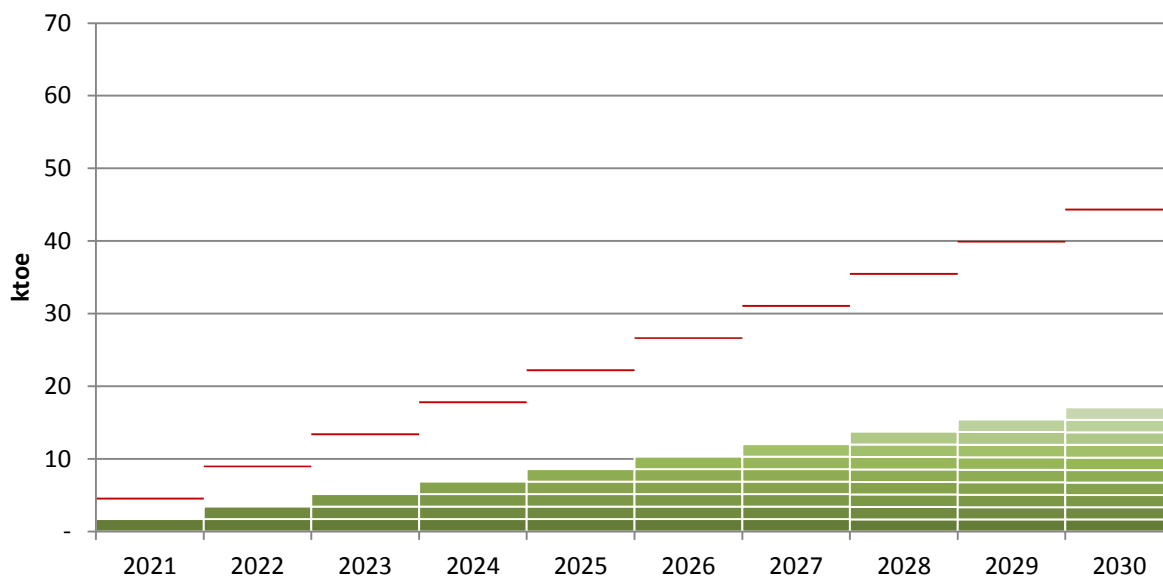


Figure 2: Article 7 target achievement for scenario *only subsidy schemes and policy measures in the public sector*

It can be concluded that using only subsidy schemes and policy measures in the public sector for Article 7 implementation will not secure the target achievement for Cyprus. However subsidy schemes play an important role in Member States' Article 7 implementation (see also chapter 2). Thus it is recommended to keep efforts in subsidy schemes at least at current levels with a perspective of exploring additional funding opportunities. See chapter 4.2 for a comparison of currently realised energy savings and the economically viable potential.

4.8.2 Scenario | only taxation measures

This scenario encompasses the policy measures 3, 4 and 5 from the policies shown in Table 12 (Chapter 4.8). With **312 ktoe of expected final energy savings** the cumulative Article 7 target of 243 ktoe is over achieved by 28%. This means that theoretically all required energy savings for Article 7 could be achieved by only reporting energy savings from taxation measures. In this scenario there is no obvious danger of double counting between the policies. The fuel and electricity taxes target different energy consumptions. The motor vehicle tax and the fuel tax do not overlap because the motor tax targets the purchase of vehicles whereas the fuel tax targets the use of vehicles. As can be seen from the following figure, the first 5 years cause the over-achievement of the cumulative Article 7 target.

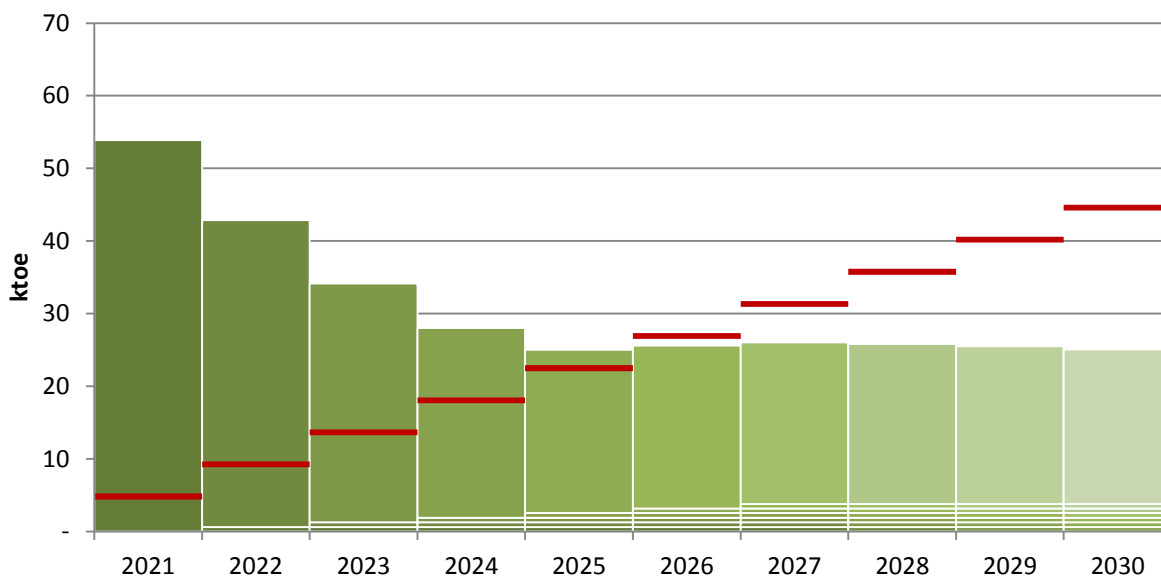


Figure 3: Article 7 target achievement for scenario *taxation measures*

This study however does not propose to use only taxation measures for Article 7 implementation. Taxation measures should rather be seen as a complementary contribution to Article 7. This recommendation builds on the following reasoning that is mainly inspired by (Europe Economics 2016): Although taxes are seen as an effective measure to influence energy consumption there are usually instruments in the policy mix that target energy consumption more directly (e.g. subsidy schemes for energy efficiency). This means although taxes are an important tool to work against certain unintended developments, they need other complementary instruments to help to achieve the desired outcomes. Thus although it is acknowledged that taxes play an important role in increasing energy efficiency, the effects of other more direct instruments should mainly be shown and accounted for.

4.8.3 Scenario | only EEO

This scenario encompasses the policy measure 2 from Table 12 (Chapter 4.8). With **100.0 ktOE of expected final energy savings** the cumulative Article 7 target of 243 ktOE is achieved only by 41%. This means the efforts in the EEO in Cyprus would need to more than double if the Article 7 target is intended to be only achieved by this measure. This is not considered to be a realistic option (see also chapter 4.3) and is thus not recommended in this study. As only one policy is used for this scenario there is no of double counting.

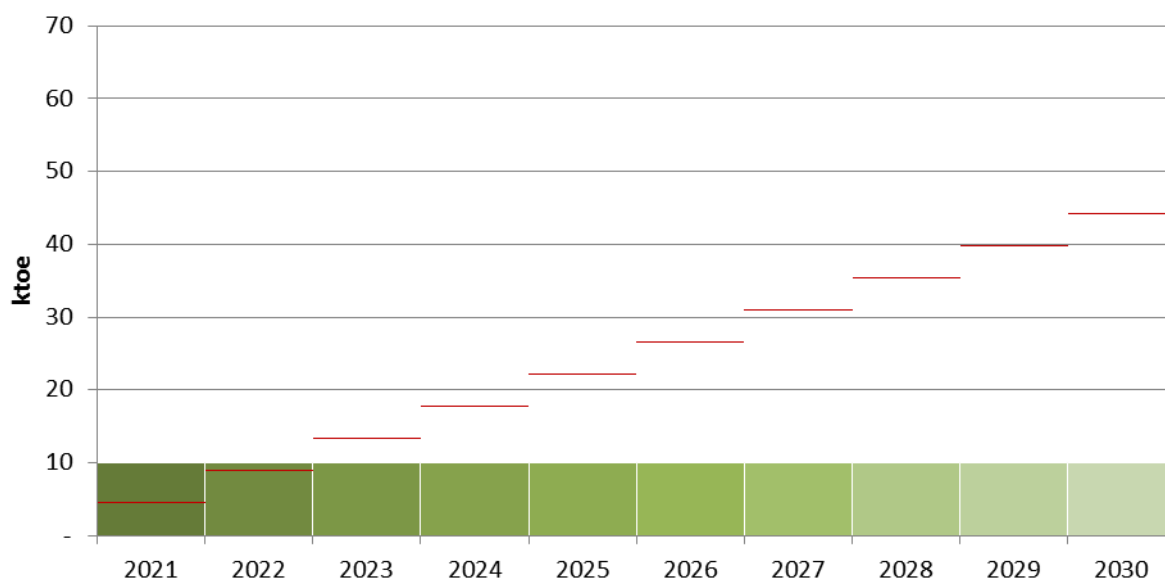


Figure 4: Article 7 target achievement for scenario *only EEO*

4.8.4 Scenario | subsidy schemes and policy measures in the public sector & taxation measures

This scenario encompasses the policy measure 1a, 1b, 3, 4, 5 and 7 from the policies shown in Table 12 (Chapter 4.8). With **406.4 ktoe of expected final energy savings** the cumulative Article 7 target of 243 ktoe is over-achieved by 67%. This means that all required energy savings for Article 7 could be achieved by only reporting energy savings from these measures. In this scenario there is some danger of double counting because the subsidy schemes and the electricity tax could target the same measures (e.g. electric appliances or heat pumps).

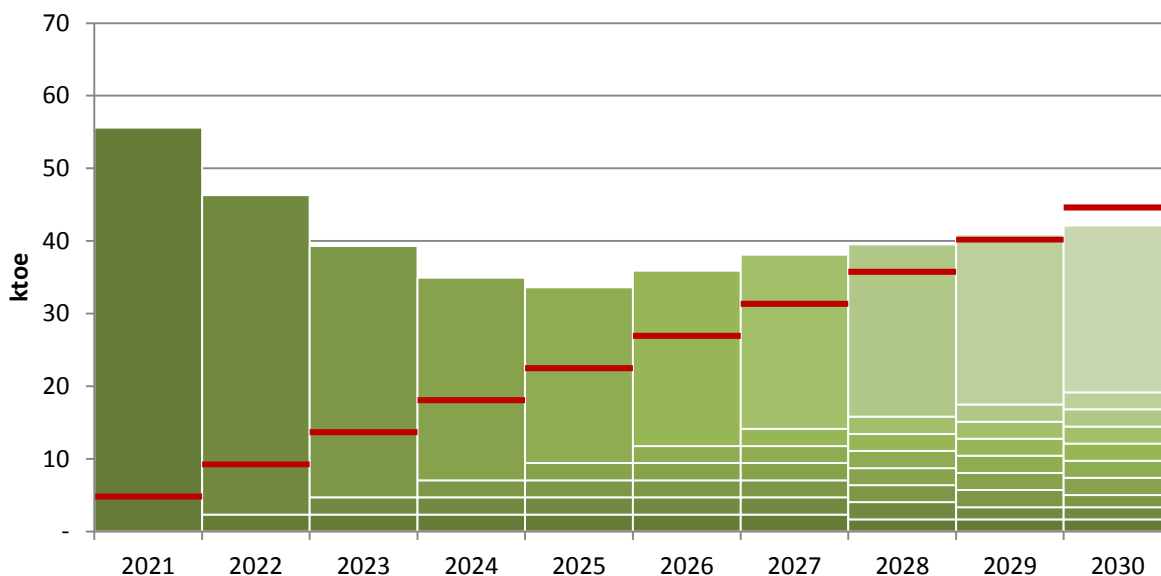


Figure 5: Article 7 target achievement for scenario *subsidy schemes and policy measures in the public sector & taxation measures*

4.8.5 Scenario | subsidy schemes and policy measures in the public sector & EEO

This scenario encompasses the policy measure 1a, 1b, 2 and 7 from the policies shown in Table 12 (Chapter 4.8). With **194.4 ktoe of expected final energy savings** the cumulative Article 7 target of 243 ktoe is achieved only by 80%. This means the efforts in subsidy schemes and measures in the public sector and in the EEO in Cyprus would need to be increased considerably if the Article 7 target is intended to be achieved by a combination of these measures. In addition in this scenario there is danger of double counting between the subsidy schemes and the EEO as long as obligated parties in the EEO are completely free to choose the measures they implement to comply with their obligation. Thus a correction for double counting would further reduce the expected 194.4 ktoe of annual energy savings.

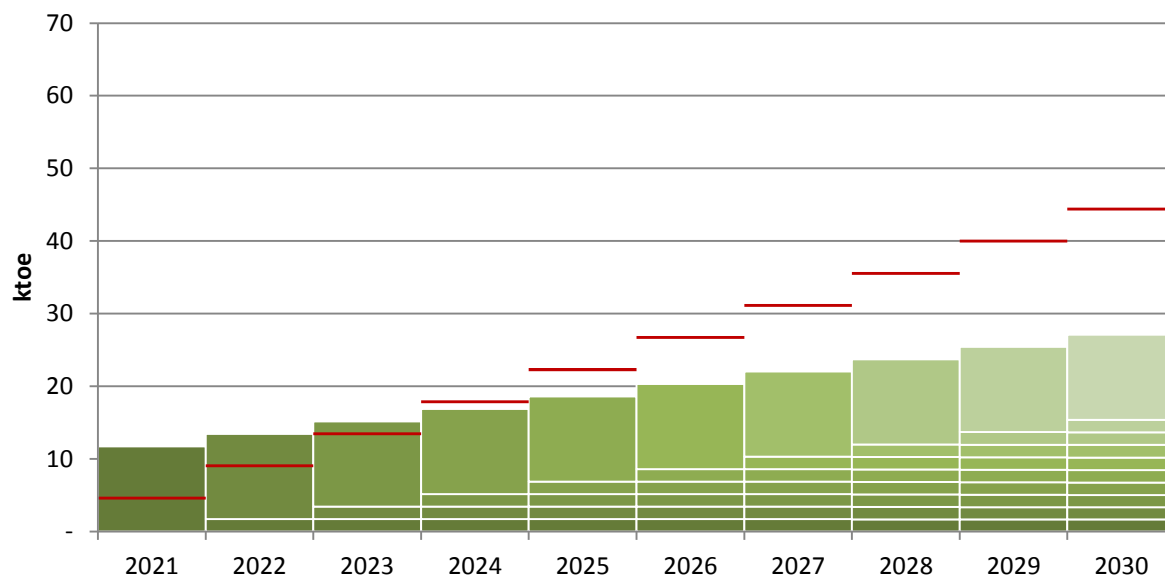


Figure 6: Article 7 target achievement for scenario *subsidy schemes and policy measures in the public sector & EEO*

4.9 Proposed policy mix for Article 7

Based on the scenarios shown in chapter 4.8 this chapter proposes a policy mix for the Article 7 implementation of Cyprus in the period 2021-2030. To start with it has to be clarified that all policy measures analysed in chapter 4.1 can be used for Article 7 implementation and especially contribute to achieve Cyprus' energy efficiency targets. These policies are:

- Financing tool for energy efficiency investment
- Energy efficiency obligation scheme
- Additional floor space "allowance" for new and existing buildings: incentive for new and existing buildings with higher energy efficiency than EPBD requirements
- Increase in the RES fee applied on electricity
- Motor vehicle taxes based on CO2 emissions
- Excise tax on transport fuels
- Action plan for the transport sector
- Support Scheme for promoting roof thermal insulation
- Applying a lower VAT rate for the renovation and repair of private dwellings
- 'Save & Upgrade' grant scheme for promoting renovation in dwellings
- Incentives for new buildings with higher energy efficiency than EPBD requirements
- Individual energy efficiency interventions and energy efficiency retrofits in selected governmental buildings
- Energy efficient street lighting
- Energy efficiency in defence and in water sector

- ‘Save & Upgrade’ grant for promoting renovation of building in enterprises

So it is **recommended to report all the policies shown in chapter 4.1 for Article 7 implementation**. However when it comes to the reporting of energy savings a pragmatic way for avoiding double counting is recommended – especially for the ex-ante assessment of expected energy savings. For more considerations on double counting see chapter 3.1.1. Taking into account the double counting considerations developed in the previous chapters the following policy mix to assess expected energy savings for Cyprus is recommended:

Transport

- Excise tax on transport fuels
- CO₂ motor tax

Buildings

- Subsidy schemes and measures in the public sector

Services, industry, agriculture

- Subsidy schemes

The EEO plays an important role in Article 7 implementation in Cyprus but as this instrument is being prepared at the moment and it is unclear how much the target contribution will be, the expected savings from this policy measure are not used to assess the expected energy savings for Article 7 implementation. Depending on the information available on individual actions energy savings from the EEO can be reported for the implementation of Article 7 as long as double counting can be ruled out. Subsidy schemes and the RES fee on electricity tax could target the same measures (e.g. electric appliances or heat pumps) – so the RES fee on electricity is left out of the reporting of energy savings to avoid double counting.

In addition the measures in the transport sector and the transport energy taxes target the same energy consumption. Thus the transport measures are not used to assess the expected energy savings for Article 7 implementation. Depending on the information available on individual actions energy savings from these measures can be reported for the implementation of Article 7 as long as double counting can be ruled out.

The proposed policy mix starts from the one developed in chapter 4.8.4 and deducts the RES fee on electricity due to double counting issues with the subsidy schemes (see chapter 4.8.4). Thus this scenario encompasses the policy measure 1a, 1b, 3, 5 and 7 from the policies shown in Table 12 (Chapter 4.8). With **379.4 ktoe of expected final energy savings** the cumulative Article 7 target of 243 ktoe is over-achieved by 56%. This means that all required energy savings for Article 7 could be achieved by reporting energy savings from these measures. The achievement of these savings depends on the assumptions that for the whole period 2021-2030:

- for subsidy schemes and measures in the public sector at the least the efforts of past years are kept, i.e. sufficient funds are provided;
- the tax levels in Cyprus are realised as assumed in the calculation of energy savings in the respective studies.

The figure below shows the achievement of the cumulative energy savings target for Article 7 in Cyprus over the years of the period 2021-2030.

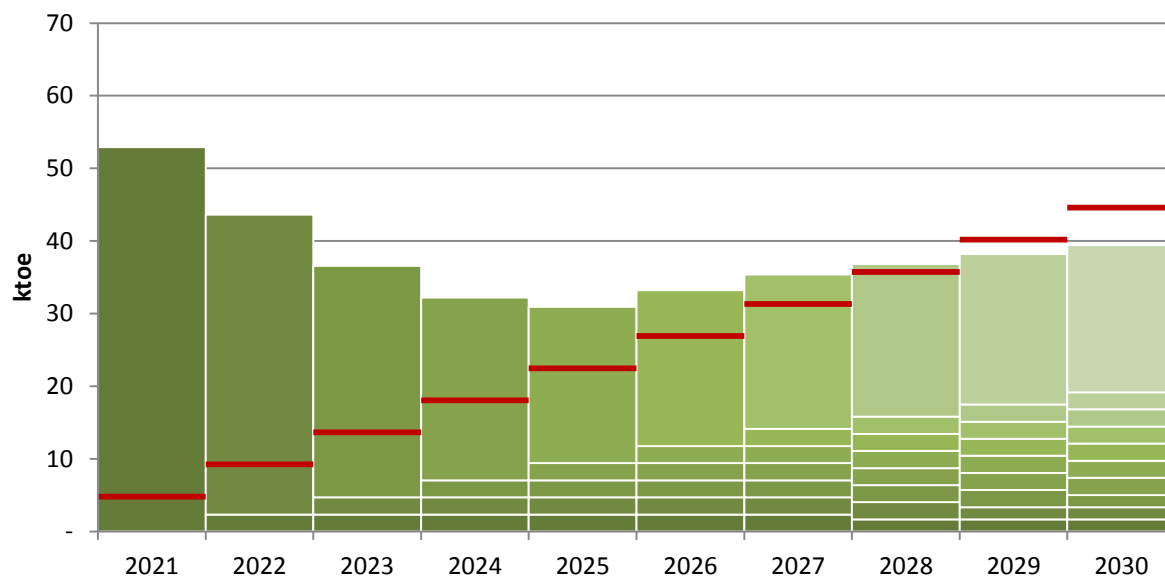


Figure 7: Article 7 target achievement for recommended policy mix

4.10 Descriptions for Article 7 measures

In this chapter the proposed policy measures are described as foreseen in the contract and the inception report. First a summary table with the most relevant information is shown. After that all information necessary for reporting the measures is presented.

4.10.1 Subsidy schemes and other fiscal instruments

Table 13: Short description of subsidy schemes

Subsidy schemes and other fiscal instruments	
Description	
Category	Financing schemes and instruments or fiscal incentives
Existing/new	Mostly existing
Target groups	Households, companies (services, industry)
Energy poverty	There are no specific mechanisms in these schemes to alleviate energy poverty
Description	<p>The subsidy schemes and other fiscal instruments comprise the following policy measures:</p> <ul style="list-style-type: none"> - Financing tool for energy efficiency investment - Support Scheme for promoting roof thermal insulation - Applying a lower VAT rate for the renovation and repair of private dwellings - 'Save & Upgrade' grant scheme for promoting renovation in dwellings - Incentives for new buildings with higher energy efficiency than EPBD

	requirements - 'Save & Upgrade' grant for promoting renovation of building in enterprises		
Further information	Draft NECP of Cyprus An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050		
Calculation method			
Method	Deemed savings and scaled savings		
Materiality	The subsidy or other financial incentive (i.e. financial incentive) ensures materiality		
Additionality	Not applicable. The investments would not be materialised without the existence of the Grant Scheme.		
Double counting	Within the subsidy schemes and other financial incentives the rules of the schemes rule out double counting. Concerning other policy measures there is potential double counting with taxation measures and the EEO.		
Lifetime	The average lifetime of the individual actions in these schemes is 15 years. Most individual actions are implemented in buildings or commercial /industrial installations.		
Expected end-use energy savings (Mtoe)			
2021-2030	Annual 1.54	Cumulative 84.31	
Implementation			
Entrusted/obligated party	Entrusted party: Ministry of Energy, Industry and Commerce		
Budget and financial resources	The budget has to be kept at least on the level of the period 2014-2020.		

- Type of policy measure.

Financing schemes and instruments or fiscal incentives

- Brief description of the policy measure including the design features per each policy measure.

The following policy measures are included in subsidy schemes and other fiscal instruments:

- Financing tool for energy efficiency investment
- Support Scheme for promoting roof thermal insulation
- Applying a lower VAT rate for the renovation and repair of private dwellings
- 'Save & Upgrade' grant scheme for promoting renovation in dwellings
- Incentives for new buildings with higher energy efficiency than EPBD requirements
- 'Save & Upgrade' grant for promoting renovation of building in enterprises

These schemes are targeted at removing the financing barriers of energy efficiency actions.

- Expected total cumulative and annual amount of savings per each measure and/or amount of energy savings in relation to any intermediate periods.

The expected annual savings amount to 1.54 Mtoe, which results in cumulative savings of 84.31 Mtoe

- Eligible actions foreseen under the measure.

The focus is on actions in buildings (building envelope and heating/cooling systems). In the commercial sector also other installations and processes can receive incentives.

- Implementing public authorities, participating or entrusted parties and their responsibilities for implementing the policy measure(s).

Entrusted party: Ministry of Energy, Industry and Commerce

- Specific policy measures or individual actions targeting energy poverty.

None

- Measurement methods used referred to Annex V(1) of Directive 2012/27/EU.

Deemed and scaled savings

- Method to express the energy savings (primary and final energy savings).

Final energy savings

- Lifetimes measure and how they are calculated or on what they are based.

The individual actions are implemented mainly in the buildings sector. A conservative lifetime of 15 years is assumed.

- Brief description of the calculation methodology including how additionality and materiality of savings are ensured and which methodologies and benchmarks are used for deemed and scaled savings.

For actions in buildings, bottom-up calculation methods are available. These methods follow the deemed savings approach. For other measures the savings are calculated on an individual basis using scaled energy savings.

- Information on how the possible overlaps between the measures and individual actions are addressed to avoid double counting of energy savings.

Within the subsidy schemes and other financial incentives the rules of the schemes rule out double counting. Concerning other policy measures there is potential double counting with taxation measures and the EEO.

- Climatic variations and approach used (if relevant).

For measures in the buildings sector energy savings (i.e. energy consumption before and after the intervention) are normalised to a reference year

- Monitoring and verification system, together with the process of the verification.

All applications for subsidies are collected by the authority. There are desktop plausibility checks for each project. In addition more detailed random checks are performed for a representative sample of projects.

- Main responsibilities of the public authority in charge of monitoring and verification system in relation to the alternative measures.

Administration of applications, check for compliance with requirements of the subsidy scheme

- Independence procedures of monitoring and verification from the participating and entrusted parties.

The decision on funding as well as the verification are done completely independently from the parties receiving the subsidies.

- Statistically significant proportion of energy efficiency improvement measures and proportion and criteria used to define and select a representative sample.

When the population of individual actions implemented is known it will be ensured that a representative sample of individual actions is checked in more detail.

- Estimated budget/implementation cost for each suggested measure.

The budgets have to be kept at least on the level of the period 2014-2020.

- Possible sources of funding (national funding, European funding, etc.).

EU (structural funds) and national.

- Reporting obligations for obligated parties (savings achieved by each obligated party, or each sub-category of obligated party, and in total under the scheme).

Not applicable

- Publication of energy savings achieved (each year) under the energy efficiency obligation scheme and alternative measures;

The energy savings achieved in each year will be made public by MECl.

- Information on Member States legislation on penalties to be applied in case of non-compliance

Not applicable. The financial incentives are only granted if certain requirements are met.

- Approach on how to demonstrate materiality and additionally for each suggested measure

The subsidy or other financial incentive (i.e. financial incentive) ensures materiality. The investments would not be materialised without the existence of the Grant Scheme; this ensures additionality.

- Any other provisions referred under Article 7 and Annex V of the EED (amendment), as well as Annex II of the proposal for a Regulation on the Governance of the Energy Union, including any amendments made before or during the execution of the Contract

Not applicable.

4.10.2 Energy efficiency obligation scheme

Table 14: Short description of energy efficiency obligation scheme

Energy efficiency obligation scheme			
Description			
Category	Energy efficiency obligation scheme		
Existing/new	New		
Target groups	Households, companies (services, industry), transport		
Energy poverty	There are no specific mechanisms in the scheme to alleviate energy poverty		
Description	In the EEO energy suppliers (electricity, gas and transport fuels) are obligated to trigger energy savings actions on final customer level.		
Further information	Draft NECP of Cyprus An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050		
Calculation method			
Method	Deemed savings and scaled savings		
Materiality	Within the obligation scheme rules for materiality will be defined.		
Additionality	Within the obligation scheme rules for additionality will be defined.		
Double counting	Within the obligation scheme specific rules will be developed to rule out double counting. There is potential double counting with subsidy schemes and taxation measures.		
Lifetime	The average lifetime of the individual actions in the EEO is 1 year as it is assumed that actions will mainly comprise fuel additives and soft measures.		
Expected end-use energy savings (Mtoe)			
2021-2030	Annual 10.00	Cumulative 100.00	
Implementation			
Entrusted/obligated party	Obligated party: Energy suppliers (electricity, gas, transport fuels)		
Budget and financial resources	The budget is provided by obligated energy suppliers.		

- Type of policy measure.

Energy efficiency obligation scheme

- Brief description of the policy measure including the design features per each policy measure.

In the EEO energy suppliers (electricity, gas and transport fuels) are obligated to trigger energy savings actions on final customer level.

- Expected total cumulative and annual amount of savings per each measure and/or amount of energy savings in relation to any intermediate periods.

The expected annual savings amount to 10.00 Mtoe, which results in cumulative savings of 100.00 Mtoe

- Eligible actions foreseen under the measure.

The focus is on diesel fuel additives and soft measures.

- Implementing public authorities, participating or entrusted parties and their responsibilities for implementing the policy measure(s).

Implementing public authority: Ministry of Energy, Industry and Commerce

Obligated party: Energy suppliers (electricity, gas, transport fuels)

- Specific policy measures or individual actions targeting energy poverty.

None

- Measurement methods used referred to Annex V(1) of Directive 2012/27/EU.

Deemed and scaled savings

- Method to express the energy savings (primary and final energy savings).

Final energy savings

- Lifetimes measure and how they are calculated or on what they are based.

The individual actions are implemented mainly diesel fuel additives and soft measures. A lifetime of 1 year is assumed.

- Brief description of the calculation methodology including how additionality and materiality of savings are ensured and which methodologies and benchmarks are used for deemed and scaled savings.

For all actions bottom-up calculation methods will be available. These methods follow the deemed savings approach.

- Information on how the possible overlaps between the measures and individual actions are addressed to avoid double counting of energy savings.

Within the obligation scheme specific rules will be developed to rule out double counting. There is potential double counting with subsidy schemes and taxation measures.

- Climatic variations and approach used (if relevant).

For measures in the buildings sector energy savings (i.e. energy consumption before and after the intervention) are normalised to a reference year

- Monitoring and verification system, together with the process of the verification.

All reported energy efficiency measures collected by the authority. There are desktop plausibility checks for each reported measure. In addition more detailed random checks are performed for a representative sample of reported measures.

- Main responsibilities of the public authority in charge of monitoring and verification system in relation to the alternative measures.

Administration of reported measures, information for obligated parties, check for compliance with requirements of the obligation scheme.

- Independence procedures of monitoring and verification from the participating and entrusted parties.

The authority in charge of monitoring of the scheme is completely independent from obligated parties.

- Statistically significant proportion of energy efficiency improvement measures and proportion and criteria used to define and select a representative sample.

When the population of individual actions implemented is known it will be ensured that a representative sample of individual actions is checked in more detail.

- Estimated budget/implementation cost for each suggested measure.

The budget is mainly provided by obligated energy suppliers.

- Possible sources of funding (national funding, European funding, etc.).

National (administration, monitoring) and energy suppliers

- Reporting obligations for obligated parties (savings achieved by each obligated party, or each sub-category of obligated party, and in total under the scheme).

Each obligated party is required to report implemented energy efficiency actions and the resulting energy savings once per year to the authority in charge of monitoring and verification.

- Publication of energy savings achieved (each year) under the energy efficiency obligation scheme and alternative measures;

The energy savings achieved in each year will be made public by MECL.

- Information on Member States legislation on penalties to be applied in case of non-compliance

The legislation on the EEO foresees penalties in case of non-compliance of obligated parties.

- Approach on how to demonstrate materiality and additionally for each suggested measure

Within the obligation scheme rules for materiality will be defined. Within the obligation scheme rules for additionality will be defined.

- Any other provisions referred under Article 7 and Annex V of the EED (amendment), as well as Annex II of the proposal for a Regulation on the Governance of the Energy Union, including any amendments made before or during the execution of the Contract

Not applicable.

4.10.3 Taxation measures

Table 15: Short description of taxation measures

Taxation measures			
Description			
Category	Energy or CO ₂ taxes		
Existing/new	Existing		
Target groups	Households, companies (services, industry), transport		
Energy poverty	There are no specific mechanisms in these schemes to alleviate energy poverty		
Description	The three taxation measures used for the implementation of Article 7 in Cyprus are: <ul style="list-style-type: none">- Excise tax on transport fuels- CO₂ motor tax- RES fee on electricity		
Further information	Draft NECP of Cyprus An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050		
Calculation method			
Method	Modelled savings		
Materiality	The legal basis of the taxation measures ensures materiality.		
Additionality	Only the levels that go beyond EU minimum requirements are taken into account for the taxation measures.		
Double counting	There is potential double counting with all other measures for Article 7. The pragmatic solution is to claim savings from taxation measures for Article 7 only for those sectors for which no other measures are reported.		
Lifetime	For the fuel and electricity tax the lifetime is 1 year; for the CO ₂ motor tax the lifetime is 7 years (lifetime of vehicles)		
Expected end-use energy savings (Mtoe)			
2021-2030	Annual Excise tax on transport fuels 25,39 on average CO ₂ motor tax 0.63 RES fee on electricity 2.70	Cumulative Excise tax on transport fuels 253,85 CO ₂ motor tax 31.09 RES fee on electricity 27.04	
Implementation			
Entrusted/obligated party	Entrusted party: Ministry of Finance		
Budget and financial resources	Tax revenues not known		

- Brief description of taxation measure.

The three taxation measures used for the implementation of Article 7 in Cyprus are:

- Excise tax on transport fuels
- CO₂ motor tax
- RES fee on electricity

The excise tax on transport fuels and the RES fee on electricity influence energy consumption behaviour i.e. the use of existing vehicles and appliances. The CO₂ motor tax influences investment decisions for new vehicles.

- Duration of taxation measure.

All three taxation measures will run for the whole period 2021-2030.

- Implementing public authority.

Ministry of Finance

- Expected cumulative and annual amount of savings per measure.

For the excise tax on transport fuels the annual savings change over time:

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Energy savings from fuel taxes	ktoe	51	39	30	23	19	19	19	19	18	18

With a lifetime of savings of 1 year the cumulative energy savings amount to 253.85 Mtoe in the period 2012-2030.

The annual energy savings of the CO₂ motor tax is 0.63 Mtoe. With a lifetime of savings of 7 years (lifetime of a vehicle) the cumulative energy savings amount to 31.09 Mtoe in the period 2012-2030.

The annual energy savings for the RES fee on electricity is 2.70 Mtoe. With a lifetime of savings of 1 year the cumulative energy savings amount to 27.04 Mtoe in the period 2012-2030.

- Target sectors and segment of tax payers.

The taxation measures target all sectors and types of final customers.

- Calculation methodology (taking into account data availability), including which price elasticities are used and how they have been established.

The calculation of energy savings is based on modelling analyses by the technical university Cyprus.

- Additionality and materiality.

The legal basis of the taxation measures ensures materiality. Only the levels that go beyond EU minimum requirements are taken into account for the taxation measures. This ensures additionality

4.10.4 Policy measures in the public sector

Table 16: Short description of policy measures in the public sector

Policy measures in the public sector			
Description			
Category	Financing schemes and instruments or fiscal incentives		
Existing/new	Existing		
Target groups	Public services		
Energy poverty	There are no specific mechanisms in the scheme to alleviate energy poverty		
Description	The policy measures in the public sector include energy efficiency interventions in selected governmental buildings and, street lighting and measures in the water sector.		
Further information	Draft NECP of Cyprus An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050		
Calculation method			
Method	Deemed savings and scaled savings		
Materiality	The Republic of Cyprus has the obligation to deliver energy savings in the framework of Article 7. The measure is financed via the public budget.		
Additionality	The minimum levels according to EU legislation are used to define the baseline.		
Double counting	There is potential double counting with taxation measures.		
Lifetime	The average lifetime of the individual actions is 15 years.		
Expected end-use energy savings (Mtoe)			
2021-2030	Annual Buildings: 0.09 Street lighting: 0.05 Water sector: 0.04	Cumulative 10.4	
Implementation			
Entrusted/obligated party	Public authorities		
Budget and financial resources	The budget is provided via the state budget		

- Type of policy measure.

Financing schemes and instruments or fiscal incentives

- Brief description of the policy measure including the design features per each policy measure.

The policy measures in the public sector include energy efficiency interventions in selected governmental buildings and, street lighting and measures in the water sector.

- Expected total cumulative and annual amount of savings per each measure and/or amount of energy savings in relation to any intermediate periods.

The expected annual savings amount to 0.15 Mtoe, which results in cumulative savings of 8.00 Mtoe

- Eligible actions foreseen under the measure.

Energy efficiency actions in buildings (envelope, heating/cooling systems), street lighting and measures in the public water supply system.

- Implementing public authorities, participating or entrusted parties and their responsibilities for implementing the policy measure(s).

Public authorities

- Specific policy measures or individual actions targeting energy poverty.

None

- Measurement methods used referred to Annex V(1) of Directive 2012/27/EU.

Deemed and scaled savings

- Method to express the energy savings (primary and final energy savings).

Final energy savings

- Lifetimes measure and how they are calculated or on what they are based.

The individual actions implemented are measures in buildings and in the public lighting and water infrastructure. An average lifetime of 15 years is assumed.

- Brief description of the calculation methodology including how additionality and materiality of savings are ensured and which methodologies and benchmarks are used for deemed and scaled savings.

For actions in buildings, bottom-up calculation methods are available. These methods follow the deemed savings approach. For other measures the savings are calculated on an individual basis using scaled energy savings.

- Information on how the possible overlaps between the measures and individual actions are addressed to avoid double counting of energy savings.

There is potential double counting with taxation measures.

- Climatic variations and approach used (if relevant).

For measures in the buildings sector energy savings (i.e. energy consumption before and after the intervention) are normalised to a reference year

- Monitoring and verification system, together with the process of the verification.

All implemented energy efficiency measures will be collected by MECI and checked for compliance with Article 7 EED

- Main responsibilities of the public authority in charge of monitoring and verification system in relation to the alternative measures.

All public authorities: Implementation of energy efficiency measures. MECI: Collection of information on implemented measures.

- Independence procedures of monitoring and verification from the participating and entrusted parties.

The measures are implemented in the public sector. MECI will have the role of ensuring that only Article 7 compliant energy savings are reported.

- Statistically significant proportion of energy efficiency improvement measures and proportion and criteria used to define and select a representative sample.

When the population of individual actions implemented is known it will be ensured that a representative sample of individual actions is checked in more detail.

- Estimated budget/implementation cost for each suggested measure.

The budget is provided by the public state budget.

- Possible sources of funding (national funding, European funding, etc.).

National and EU (structural funds).

- Reporting obligations for obligated parties (savings achieved by each obligated party, or each sub-category of obligated party, and in total under the scheme).

Not applicable

- Publication of energy savings achieved (each year) under the energy efficiency obligation scheme and alternative measures;

The energy savings achieved in each year will be made public by MECI.

- Information on Member States legislation on penalties to be applied in case of non-compliance

Not applicable.

- Approach on how to demonstrate materiality and additionally for each suggested measure

Materiality: The Republic of Cyprus has the obligation to deliver energy savings in the framework of Article 7. The measure is financed via the public budget. Additionality: The minimum levels according to EU legislation are used to define the baseline.

- Any other provisions referred under Article 7 and Annex V of the EED (amendment), as well as Annex II of the proposal for a Regulation on the Governance of the Energy Union, including any amendments made before or during the execution of the Contract

Not applicable.

5 Literature

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ABOUT THE AUSTRIAN ENERGY AGENCY (AEA)

The Austrian Energy Agency offers answers for the future of energy. We provide scientifically founded advice for decision-makers in politics, business and administration – both nationally and internationally. As a competence centre for energy we concentrate on three strategic areas: **missionzero**, **transformation** and **smart energy**.

Focusing on **missionzero** the Austrian Energy Agency pursues the long-term objective of building a fossil-fuel free future through strategy development und the implementation of concrete measures. Relating to the **transformation** of the energy system we consider the associated changes and profitable business opportunities in the energy-relevant sectors. With regard to **smart energy** we engage in the intelligent and flexible energy system of the digital future. Our focus lies on promoting energy efficiency and renewable energy sources between the poles of competitiveness, climate and environmental protection, and supply security. The Austrian Energy Agency develops strategies for sustainable and secure energy supply, provides advice and training, and is the networking platform for the energy industry. klimaaktiv, the climate protection initiative launched by the Austrian Federal Ministry of Sustainable Development and Tourism (BMNT) is managed by the Austrian Energy Agency and coordinates the various measures in the areas of mobility, energy saving, construction & renovation and renewable energy. In addition, the Austrian Energy Agency operates the Energy efficiency monitoring body on behalf of the BMNT. <http://www.energyagency.at>

