

IMPACT ASSESSMENT OF THE CYPRUS INTEGRATED NATIONAL ENERGY AND CLIMATE PLAN

**Project funded by the European Commission's
Structural Reform Support Service**

Service Contract No. SRSS/C2018/070

Deliverable 4:

Methodology to Perform the Impact Assessment

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Abbreviations

CH ₄	Methane
CUT	Cyprus University of Technology
CyI	The Cyprus Institute
ETS	EU Emissions Trading System
GHG	Greenhouse gases
MARDE	Ministry of Agriculture, Rural Development and Environment of Cyprus
MECI	Ministry of Energy, Commerce and Industry of Cyprus
MOF	Ministry of Finance of Cyprus
MTCW	Ministry of Transport, Communications and Works of Cyprus
NECP	National Energy and Climate Plan
N ₂ O	Nitrous oxide
NO _x	Nitrogen oxides
PM	Particulate matter
PM ₁₀	Particulate matter with diameter up to 10 µm
PM _{2.5}	Particulate matter with diameter up to 2.5 µm
PPM	Scenario of ‘Planned Policies and Measures’
PWD	Public Works Department of the Ministry of Transport, Communications and Works
SO ₂	Sulphur dioxide
SRSS	European Commission’s Structural Reform Support Service
UCy	University of Cyprus
WEM	Scenario ‘With Existing Measures’

1. Introduction

According to the Tender Specifications of the Service Contract on the “Impact assessment of the Cyprus Integrated National Energy and Climate Plan”, after completion of the Inception Report (included in Deliverable 1), Task 2 should focus on the Policies and Measures to be assessed in the study. In this Task, the project team should (a) identify planned and proposed policies and measures (Sub-Task 2.1) and (b) suggest the methodological approach for the impact assessment (Sub-Task 2.2).

This report (Deliverable 4) summarizes the work performed under Sub-Task 2.2 (Methodology for the impact assessment). Along with Deliverable 3, they were presented to national authorities – in draft versions – at a specialised workshop that was held at MECI premises on 9 July 2019 in order to be finalized. The minutes of this workshop are provided in the Appendix. As a result of this workshop, the methodology was agreed; this report describes the final agreed methodology.

2. Requirements of the Energy Governance Regulation

According to the requirements of Annex I of Regulation 2018/1999 of 11 December 2018 on the Governance of the Energy Union and Climate Action, Section B of each National Energy and Climate Plan should contain a chapter explicitly devoted to the impact assessment of this Plan. This chapter (Chapter 5 of Part I / Section B of the NECP) should contain the following information:

5. Impact Assessment of Planned Policies and Measures

5.1. *Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals, including comparison to projections with existing policies and measures (as described in section 4).*

- i. *Projections of the development of the energy system and GHG emissions and removals as well as, where relevant of emissions of air pollutants in accordance with Directive (EU) 2016/2284 under the planned policies and measures at least until ten years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures.*
- ii. *Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply*

- iii. *Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures*
- 5.2. *Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures*
- 5.3. *Overview of investment needs*
 - i. *Existing investment flows and forward investment assumptions with regard to the planned policies and measures*
 - ii. *Sector or market risk factors or barriers in the national or regional context*
 - iii. *Analysis of additional public finance support or resources to fill identified gaps identified under point ii*
- 5.4. *Impacts of planned policies and measures described in section 3 on other Member States and regional cooperation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures*
 - i. *Impacts on the energy system in neighbouring and other Member States in the region to the extent possible*
 - ii. *Impacts on energy prices, utilities and energy market integration*
 - iii. *Where relevant, impacts on regional cooperation*

The following Sections describe the agreed methodology to assess impacts according to chapters 5.1 – 5.4 of the Regulation. To prepare this draft methodology proposal, the project team has also consulted the existing NECPs of all EU Member states, which are available on the European Commissions website¹.

3. Methodology to Address Chapter 5.1 of the Regulation

Chapter 5.1 requires to assess impacts of planned policies and measures, in comparison to existing policies and measures. This means that essentially the impact assessment involves an evaluation of

¹ <https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans>

the *additional* impacts foreseen in the “planned policies and measures” (PPM) scenario, having as a reference point the “existing measures” (WEM) scenario. For individual items of this Chapter, the following methodological approach is followed in order to fulfil all requirements of Annex I, Part 2 of the Regulation:

- i. *Projections of the development of the energy system and GHG emissions and removals as well as, where relevant, of emissions of air pollutants in accordance with Directive (EU) 2016/2284 under the planned policies and measures at least until ten years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures.*

Our approach: We report (in the form of tables and graphs) for each year up to 2050 the projected evolution according to the WEM and PPM scenarios of the following items:

- energy demand by main economic sector and fuel
- power generation by technology
- greenhouse gas emissions (CO₂, CH₄ and N₂O)
- air pollutant emissions (NO_x, SO₂ and PM)

These projections are based on the output of the energy models used by the project team and by the national authorities in order to prepare the corresponding scenarios in the NECP of Cyprus. Emissions of greenhouse gases and air pollutants are reported on the basis of the results of modelling work to be conducted in the frame of Contract SRSS/C2018/038, which is also being carried out by the same project team. The methodology for performing these projections is well known to national authorities from previous Technical Assistance projects and is included in the corresponding reports of project SRSS/C2018/038.

- ii. *Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply*

Our approach: In agreement with national authorities, we assess the difference in energy demand between the WEM and PPM scenarios by main economic sector, and explore how the projected additional energy savings of the PPM scenario will reduce the requirements for energy supply in comparison to those of the WEM scenario.

- iii. *Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures*

Our approach: On the basis of the analysis carried out with the energy and emissions forecast models mentioned above, and in agreement with national authorities, we assess whether, to what extent and how the results of the PPM scenario of Cyprus contribute to achievement of the EU-wide targets for energy savings, renewable energy penetration and emissions reduction. This analysis is based on a comparison of:

- Energy savings foreseen in Cyprus between WEM and PPM scenarios and the corresponding EU-wide energy savings requirement;
- The percentage of renewable energy a) in power generation and b) in total energy consumption in Cyprus in 2030, and whether the rate of increase in renewables penetration is compatible with the rate required to achieve the EU-wide renewables target;
- The possibility for Cyprus to meet the binding commitment of the Effort Sharing Regulation, for reducing non-ETS emissions in 2030 by 24% compared to 2005.

Especially as regards energy savings, our study also addresses the implications of applying the ‘Energy Efficiency First’ principle (whose importance is highlighted by the European Commission) in close cooperation with the government of Cyprus.

4. Methodology to Address Chapter 5.2 of the Regulation

This part of the assessment shall include:

Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 [of the NCEP] at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures.

Our approach for addressing these aspects is described in the following sections.

4.1. Environmental and health impacts

As explained in Section 3, emissions of greenhouse gases (CO₂, CH₄ and N₂O) and air pollutants (NO_x, SO₂ and PM) for both WEM and PPM scenarios are reported on the basis of the results of modelling work carried out in the frame of Contract SRSS/C2018/038. Detailed emission factors have been included in the OSEMOSYS model for this purpose, based on official sources: the IPCC

Guidelines² for greenhouse gas emissions, and the EMEP/EEA Emissions Inventory Guidebook³ for air pollutant emissions. What is particularly relevant for policy making is the difference in emissions of these substances between WEM and PPM scenarios.

In order to explore the associated health impacts, the changes in emissions are converted to changes in external costs; these are the damage costs caused on human health, agricultural production, floods, ecosystems etc. over the short, medium and long term – but the damages to human health dominate in all these assessments. External costs of greenhouse gases are calculated on the basis of assessments conducted by the U.S. Environmental Protection Agency⁴. External costs of air pollutants are based on the corresponding assessments that have been performed in the frame of European projects and adopted by the European Commission^{5,6}. Apart from cost estimates, the impact assessment includes a description of the actual health impacts due to these emissions; this is based on the corresponding studies used for calculating external costs.

4.2. Effects on production sectors of the Cypriot economy

To study the economic effect of the PPM scenario in comparison to the WEM scenario, two different modelling approaches are applied: an input-output model of the Cypriot economy, and an econometric model of the main production sectors. The following sub-sections provide a brief general description of each modelling approach; more information is provided in the literature references that are cited in the text below.

4.2.1. An input-output model for the Cypriot economy

Input-output (IO) analysis is a quantitative technique for studying the interdependence of production sectors in an economy over a stated time period, which has been extensively applied for policy impact

² IPCC (UN Intergovernmental Panel on Climate Change) (2006), 2006 IPCC Guidelines for National Greenhouse Gas Inventories – Volume 2: Energy, Japan, 2006.

³ EMEP/EEA Emission Inventory Guidebook 2013; Technical report No 12/2013; European Environment Agency: Copenhagen, Denmark, 2013.

⁴ IWG (Interagency Working Group on Social Cost of Carbon), 2013. Technical Support Document: [Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866](#). United States Government, revised November 2013.

⁵ CASES (Cost Assessment for Sustainable Energy systems) – [Final Conference Proceedings and External Costs Database](#). 2008.

⁶ Ricardo-AEA. [Update of the Handbook on External Costs of Transport](#). Report for the European Commission's Directorate General for Mobility and Transport. 2014.

evaluation, technical change analysis and forecasting⁷. In the frame of this project, we transform the national Cyprus IO table available by Eurostat to a system of linear equations accounting for the way in which the output of each economic sector is distributed through sales to other sectors (intermediate demand) and final demand (consumers). The IO framework has been incrementally extended to employ physical units to trace energy use and related environmental activities⁸. Energy IO analysis estimates the total amount of energy required to deliver a product to final demand, both directly as the energy consumed by an industry's production process and indirectly as the energy embodied in industry's input.

An energy input-output model is applied in this study to estimate the direct and indirect energy embodied in sectoral production for Cyprus. In this case, the PPM scenario will involve additional investments. These changes in investment needs are input in the IO model in order to simulate their effects on the economic output and employment of each main sector of the Cypriot economy. Sectors to be covered are electricity production, manufacturing and its main sub-sectors (food, non-metallic minerals and machinery), services, construction, transport, hotels and restaurants and other services.

4.2.2. *Effects on competitiveness and employment*

Compared to the WEM scenario, the PPM scenario involves different fuel and electricity prices on the way to the transition to a low-carbon energy system. Price changes in the PPM scenario may be due to stronger investments in renewable energy that may give rise to higher electricity prices, investments in electricity interconnection that may allow lower electricity prices, higher penetration of biofuels in transport that may increase automotive fuel prices, the implementation of a carbon tax that will lead to higher excise taxes on fuels etc. We then study how these price changes will affect the sectors of the economy in terms of investment behaviour, employment, productivity and energy use. For this purpose we employ a dynamic factor demand model which is based on state of the art economic knowledge, embodies rational expectations and dynamic optimisation in the presence of efficiency gains and adjustment costs, and has been econometrically estimated with national data. More information about this model is provided in a relevant Working Paper of the University of Cyprus⁹. The sectors investigated are manufacturing and its sub-sectors, services, construction, transport storage and communication, hotels and restaurants, other services etc. Data required for the empirical analysis of factor demands are available from the Statistical Service of Cyprus. Simulations

⁷ Miller, R.E., Blair, P.D. (2009). *Input-output analysis: Foundations and extensions* (2nd edn). Cambridge University Press, New York.

⁸ Giannakis, E., Kushta, J., Giannadaki, D., Georgiou, G.K., Bruggeman, A., Lelieveld, J. (2019). Exploring the economy-wide effects of agriculture on air quality and health: Evidence from Europe. *Science of the Total Environment*, 663, 889-900.

⁹ Ketteni E., Mamuneas T. and Zachariadis T., The Effect of EU Energy and Climate Policies on the Production Sectors of the Economy of Cyprus – Final Results. Economic Policy Paper 01-13, Economics Research Centre, University of Cyprus, February 2013.

of energy price changes of the PPM scenario are intended to show how firms in a particular sector of the economy will react by adjusting inputs to production (capital, labour, energy and raw materials) and what the overall effect will be on the unit cost of production of each sector; the latter is associated with the competitiveness of each sector. This model will be used by the project team if the input-output model mentioned in Section 4.2.1 above cannot address these issues within its modelling framework.

4.3. Distributional impacts with a view to a ‘just transition’

As mentioned in Section 4.2.2, the PPM scenario may involve different fuel and electricity prices because of e.g. stronger investments in renewable energy that might affect electricity prices, higher penetration of biofuels, the implementation of a carbon tax etc. Consumers may thus benefit from a cleaner environment, but may also face a change in the cost of living due to higher or lower retail prices of market goods. How far they will be affected depends on whether they can substitute goods increasing in price for other goods. To study this, we use estimated consumer demand systems satisfying fundamental principles of economic theory.

The simulation of the effects of higher energy prices on the cost of living of households is performed using national Family Expenditure Survey data, which have been obtained from the Statistical Service of Cyprus. Using a consumer demand system that has been estimated with Cypriot data in the recent past¹⁰, we compute how each household will respond to the changing prices of goods by differentiating its consumption pattern. We can then use the results to compute the aggregate effect for the whole population and the effects on socioeconomic groups of policy interest. In particular, we compute the reduction in the living standard of households a) for urban and rural households and b) for different deciles of the income distribution to assess the effect of policies on income inequality.

5. Methodology to Address Chapter 5.3 of the Regulation

According to the Regulation, this chapter should provide i) an overview of the investment needs, especially those related to the PPM scenario; ii) risk factors or barriers for implementing the required investments; and iii) public interventions (e.g. through financial support schemes) to overcome the barriers identified in point ii).

Our approach: Investment needs for the PPM scenario (expressed as needs that are *additional* to those of the WEM scenario) have been identified by national authorities in the draft NECP. Moreover, our modelling work leads to two estimates of investment requirements:

¹⁰ Pashardes P., Pashourtidou N. and Zachariadis T., Estimating welfare aspects of changes in energy prices from preference heterogeneity. *Energy Economics* 42 (2014), 58–66.

- The output of the OSEMOSYS model that we employ for preparing the WEM and PPM scenarios of the Cyprus NECP also contains estimates of additional investments. The main focus of OSEMOSYS calculations are investments in different technologies of power generation (thermal power plants, solar photovoltaics, solar thermal plants, wind power, biomass plants) as well as investments in the transport sector (new public transport modes such as buses and tram, low-emission trucks and buses, electric vehicles). Investments in heating and cooling technologies for buildings and agriculture are also assessed in an aggregate manner. Net total investment needs are calculated for the PPM scenario as compared to the WEM scenario.
- In a separate methodology that we have developed¹¹, we assess cost-effective policies and measures for greenhouse gas abatement in non-ETS sectors. These assessments are accompanied by calculations of the required investments by 2030 and 2050 in order to implement the foreseen emissions abatement. This bottom-up methodology includes detailed cost data for different energy saving and renewable energy technologies used in buildings, and supplement that main investment calculations coming out of the OSEMOSYS model.

We use the results of these two models in order to compare the estimated investment needs with those of the draft NECP, and provide a final assessment of the foreseen investment needs up to 2030 and 2040, in the power generation as well as in the non-ETS sectors (transport, buildings, industry and waste management). These calculations comply with the requirements of the reporting template as included in Annex I Part 2 of the Regulation.

As a next step, on the basis of earlier experience in Cyprus and around Europe, we identify market risks and barriers for realizing these investments, and propose public interventions to overcome these barriers. For this purpose, the project team has obtained information from several studies that have been conducted for the Cypriot government from organizations such as JRC and GIZ. If necessary, the project team may additionally consult national stakeholders such as consumer and business associations and private investors, in order to arrive at realistic qualitative recommendations.

6. Methodology to Address Chapter 5.4 of the Regulation

According to the Regulation, this chapter should provide an assessment of the impacts of planned policies and measures on other Member States and regional cooperation at least until the last year of the period covered by the plan, including a comparison with projections with existing policies and measures. Such impacts could comprise the effect on the energy systems of neighbouring and other Member States in the region; the effect on energy prices, utilities and energy market integration; and, where relevant, impacts on regional cooperation.

¹¹ Zachariadis T., Michopoulos A., Vougiouklakis Y., Piripitsi K., Ellinopoulos C. and Struss B., Determination of Cost-Effective Energy Efficiency Measures in Buildings with the Aid of Multiple Indices. *Energies* 11 (2018), 191; doi:10.3390/en11010191

Our approach: With regard to regional cooperation as well as the effect on the energy systems of neighbouring and other Member States in the region, the PPM scenario may lead to interesting results, which may differ substantially from those of the WEM scenario – especially if the PPM scenario includes assumptions on electricity interconnection and natural gas exports. We therefore assess and present up to 2040:

- The regional aspects of these results to the extent possible, i.e. potential exports of natural gas or electricity from Cyprus to neighbouring countries and other EU Member States; and potential changes in main energy system indicators of Cyprus (import dependency, energy intensity, carbon intensity, renewable energy penetration etc.) in the PPM scenario compared with the WEM scenario. Regional cooperation aspects will also be considered to the extent possible.
- The impact of the PPM scenario (compared to WEM) on energy prices in Cyprus, especially prices of natural gas and electricity that may be significantly affected by the above mentioned assumptions on the availability of natural gas and the electrical interconnection of Cyprus with neighbouring countries.
- The effect of the PPM scenario (compared to WEM) on the operation of utilities in Cyprus and on the integration of the Cypriot energy market. The implications for integrating renewables in the electricity mix and for ensuring an integrated energy market are explored through the OSEMOSYS model that is used by our project team, by assessing the penetration of renewable electricity and electric vehicles in each scenario. These two aspects determine to a large extent the level of electricity storage needed in each scenario – which in turn affects the requirements for grid stability. By the time of this writing (September 2019), regulatory issues related to the design of the electricity market of Cyprus, are studied by the competent authorities (CERA, TSO and MECI); the impact assessment study will take into account the outcome of these policy decisions – but this may need to happen towards the end of this study when some regulatory issues may have been clarified by the government of Cyprus.

7. Work plan (Gantt chart)

In line with the provisions of the Contract of this project, this Deliverable contains the work plan of the project in the form of a Gantt chart. This is provided in the following page. The work plan has taken into account the actual time of delivery of specific reports as it was known at the time of writing (September 2019).

Project start: 6 December 2018														
Total project duration: 14 months														
Task No.	DURATION (Months after project start)													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 – Kick-off of the project														
2 – Planned and proposed policies and measures to be assessed														
2.1 – Planned and proposed policies and measures to be taken into consideration														
2.2 – Methodology for the impact assessment														
3 – Comprehensive study of the impact assessment of the planned and proposed policies and measures														
4 – Overall comparison of the proposed policies and measures options														
Deliverable No. Submitted to SRSS			2.1	2.2	1; 2.3	2.4	2.5	2.6	2.7; 3; 4	2.8; 5	2.9	2.10; 6	2.11; 7	2.12

Note: Deliverables 5, 6 and 7 will be prepared in their draft version in months 10, 11 and 13 respectively, as foreseen in the chart above. The final versions will be delivered as soon as public consultations and consultations with the competent national authorities have been finalised.

APPENDIX

Minutes of the workshop held on 9 July 2019

APPENDIX

Minutes of the workshop held on 9 July 2019

NECP Impact Assessment Workshop in the Frame of Project SRSS/C2018/070

Tuesday 9 July 2019, 9:00 – 12:30

Ministry of Energy, Commerce and Industry, Nicosia

MINUTES OF THE MEETING

1. The meeting of the project team with national authorities was convened in order to discuss and, to the extent possible, finalise a) the assumptions to be used in each one of the scenarios of the Cyprus NECP impact assessment study, and b) the methodology to be used in the impact assessment.

2. List of organisations and their representatives who were project at the meeting:

CUT – Cyprus University of Technology
(Theodoros Zachariadis, Chryso Sotiriou)

Cyl – The Cyprus Institute
(Nestor Fylaktos, Elias Giannakis, Constantinos Taliotis)

DGEPCD – Directorate General for European Programmes, Cooperation and Development
(Maria Philippou)

MECI – Ministry of Energy, Commerce and Industry
(Charalambos Rousos, Christina Karapitta, George Partasides, Katerina Piripitsi, Christodoulos Ellinopoulos, Georgina Lahdo, Irene Mitsinga)

MFin – Ministry of Finance
(Andreas Karaolis)

MTCW – Ministry of Transport, Communications and Works
(Michalis Lamprinos, Demetris Psyllides)

Representatives from MARDE – Ministry of Agriculture, Rural Development and Environment – could not participate at the meeting due to urgent other obligations.

3. The meeting had the following agenda:

3.1. Welcome and adoption of the agenda

3.2. Update from the Technical Working Group meeting held in Brussels on 2-3 July

3.3. List of existing and planned policies and measures as provided by national authorities; and discussion with the objective to finalize the measures of each scenario

3.4. Proposed methodology for the impact assessment in line with provisions of the Energy Governance Regulation; and discussion with the objective to agree on the methodology

3.5. Discussion about linkages with Sustainable Development Goals

4. Discussion and decisions

With regard to point 3.1, the agenda (Appendix 1) was adopted by the participants. T. Zachariadis mentioned that T. Mesimeris from MARDE notified on that morning that he could not be present at the meeting, and underlined the need (also pointed out by T. Mesimeris) that the meeting should lead to finalising assumptions of each scenario.

With regard to point 3.2, G. Partasides presented (Appendix 2) recommendations by the European Commission about several aspects of the NECP and its impact assessment, on the basis of presentations and discussions held at the Technical Working Group meeting that he attended in Brussels on 2-3 July 2019. He presented specific recommendations focusing on a) energy efficiency, b) renewable energy penetration, c) land-use change and forestry and d) other issues. He also outlined possible next steps regarding the impact assessment, with the aim to explore different options before finalising the Planned Policies and Measures scenario.

With regard to point 3.3, T. Zachariadis distributed a detailed list of policies and measures (adopted, implemented, planned and provisional) as provided by national authorities for the preparation of the draft NECP that was submitted in January 2019. He asked all participants to confirm that these measures will be included in the two scenarios of the final NECP, so that they can also be included in the impact assessment study. It was agreed that by 19 July all authorities will have gone through this list and will provide the project team with this information. It was also agreed that each policy and measure will include, to the extent possible, an assessment of its cost and its effectiveness in reducing GHG emissions, so that they can be prioritised on the basis of their cost-effectiveness.

With regard to point 3.4, representatives of CUT and Cyl presented the proposed methodology of the impact assessment (Appendix 3), going through the requirements of the corresponding paragraphs of the Energy Union Governance Regulation. Representatives of national authorities agreed on the methodology. It was also agreed that special emphasis will be given to considering the 'Energy Efficiency First' principle as required by the European Commission; more discussions about this aspect will clarify the preferred approach to follow.

With regard to point 3.5, M. Philippou explained that DGEPCD is responsible for coordinating national efforts to collect information about progress in Cyprus towards meeting the seventeen UN Sustainable Development Goals (SDG). It was agreed that the results of the Impact Assessment study will be used and, to the extent possible, linked with this national SDG assessment work.

Mrs Eirini Mitsinga (arrived later due to other commitments) said that she will also submit the existing policies and measures for the Industry Sector, including other sectors such as Digitalization and Research and Development.

Mr. Partasides concluded that the final Scenario(s) that will be submitted for the final NECP should be conditional since there are major infrastructure projects (i.e. Interconnector) that will affect the whole energy system. He has also informed that any questions or doubts about the methodology can be finalized during the next Technical Working Group that will take

place in Brussels in September (16-17 / 9 / 2019) or through bilateral discussions that can take place in Cyprus. He also mentioned that all the final Scenarios and Assumptions used up to now should be submitted by the Cyl and CUT. A closer cooperation is necessary (especially with the Department of Environment) in order to finalize the exogenous parameters that are not included in the Scenarios submitted from JRC and Cyl (i.e. Forestry, non-road transport, waste and water treatment etc)

Limassol, 16 July 2019

Theodoros Zachariadis, coordinator of Project SRSS/C2018/070

APPENDIX 1

NECP Impact Assessment Workshop in the Frame of Project SRSS/C2018/070

Tuesday 9 July 2019, 9:00 – 12:00

Ministry of Energy, Commerce and Industry, Nicosia

AGENDA

- | | |
|---------------|--|
| 9:00 – 9:05 | Welcome and adoption of the Agenda |
| 9:05 – 9:30 | Update from the Technical Working Group meeting held in Brussels on 2-3 July (G. Partasides, MECI) |
| 9:30 – 10:30 | <ul style="list-style-type: none">- List of existing and planned policies and measures as provided by national authorities (T. Zachariadis, CUT)- Discussion with the objective to finalize the measures of each scenario |
| 10:30 – 11:30 | <ul style="list-style-type: none">- Proposed methodology for the impact assessment in line with provisions of the Energy Governance Regulation (T. Zachariadis, CUT)- Discussion with the objective to agree on the methodology |
| 11:30 – 12:00 | Discussion about linkages with Sustainable Development Goals |

Participants:

CUT – Cyprus University of Technology

Cyl – The Cyprus Institute

DGEPCD – Directorate General for European Programmes, Cooperation and Development

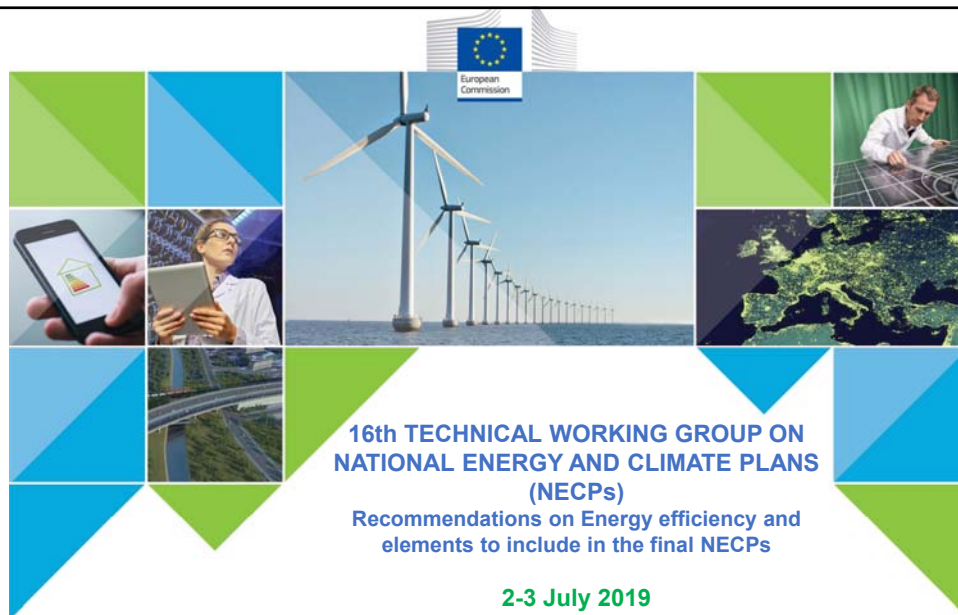
MARDE – Ministry of Agriculture, Rural Development and Environment

MECI – Ministry of Energy, Commerce and Industry

MFin – Ministry of Finance

MTCW – Ministry of Transport, Communications and Works

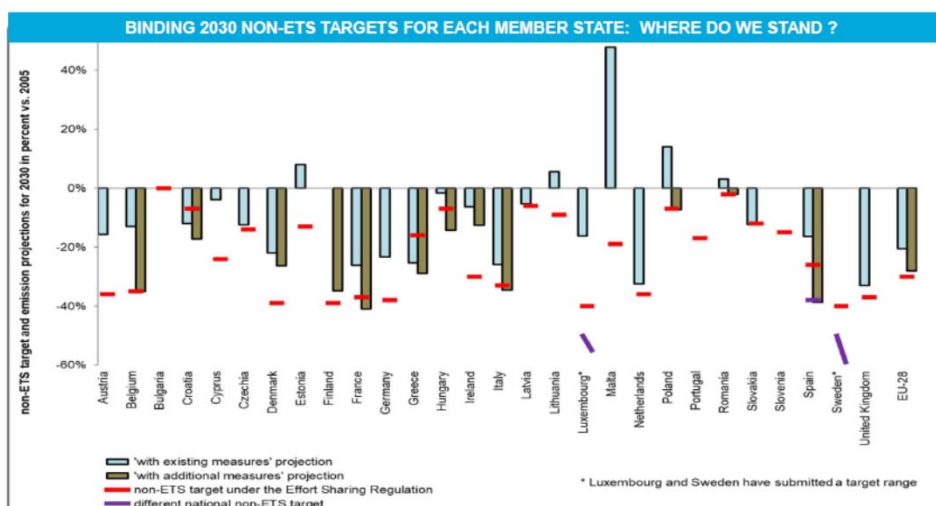
APPENDIX 2



Περίληψη των κύριων Παρουσιάσεων



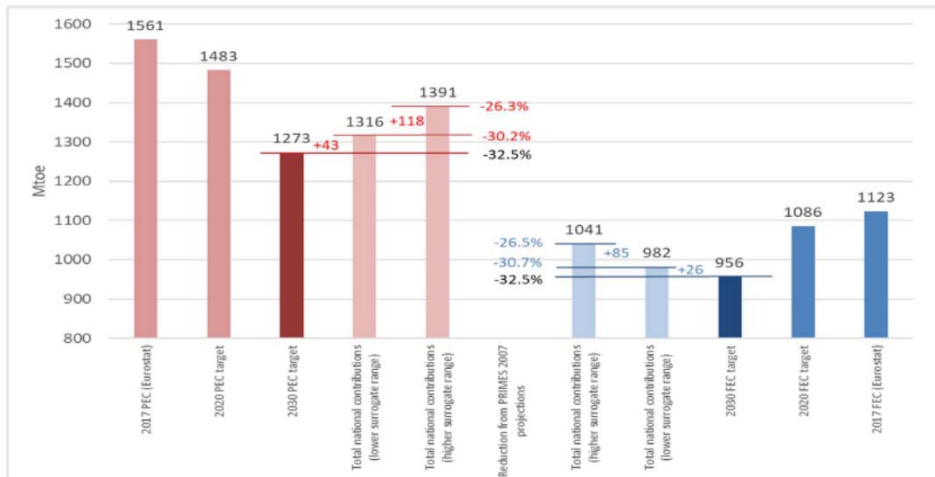
ASSESSMENT



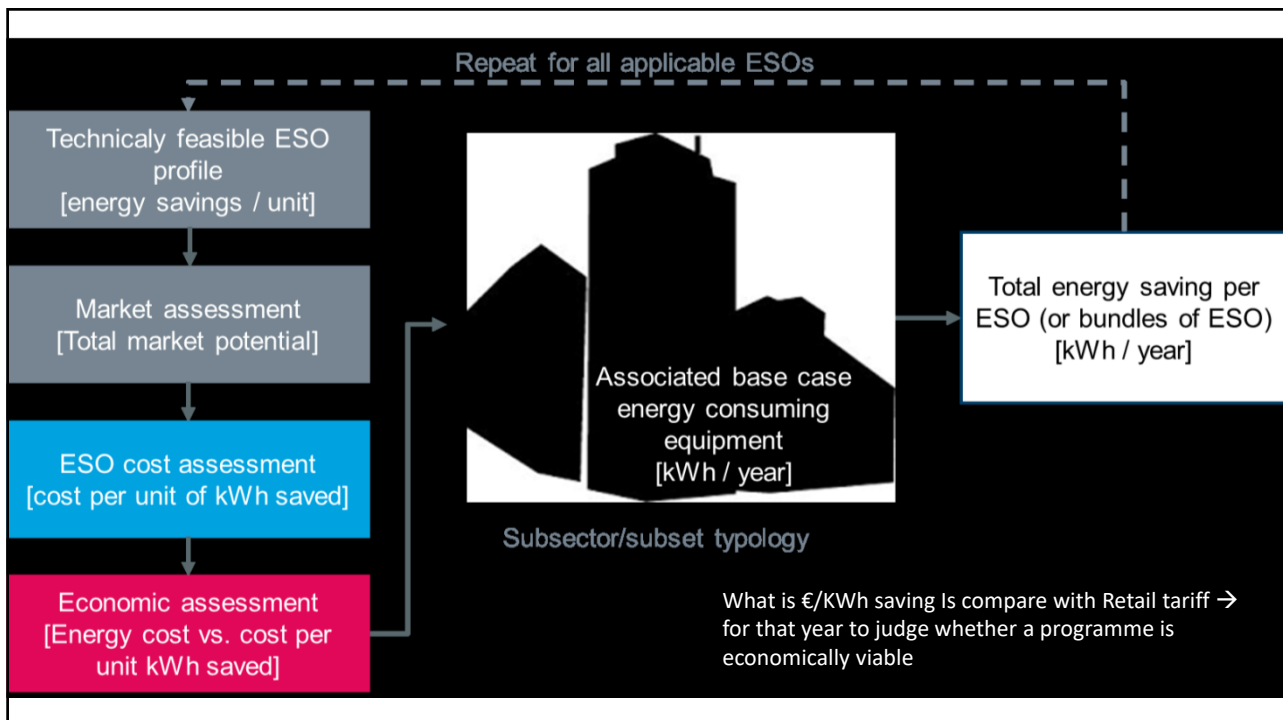
National non-ETS targets correspond to -30% compared to 2005 in EU
Current projections based on the draft NECPs is 28% reduction

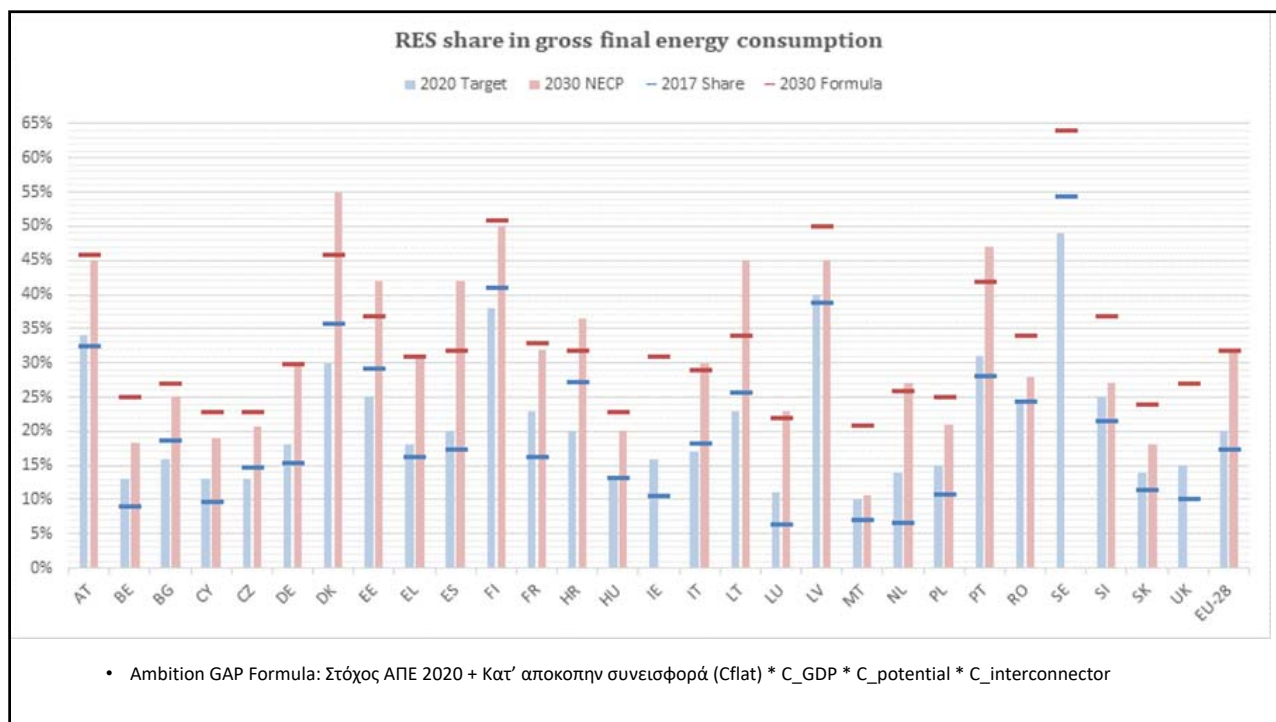
ASSESSMENT

AT LEAST 32,5% ENERGY EFFICIENCY BY 2030: WHERE DO WE STAND ?



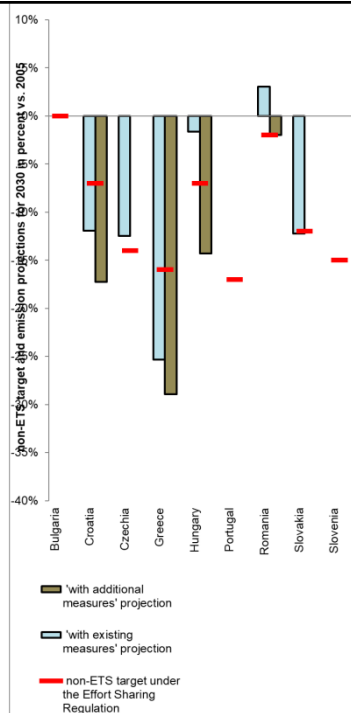
The gap for Energy efficiency could be as big as 6.2 percentage points (PEC) or 6 percentage points (FEC)



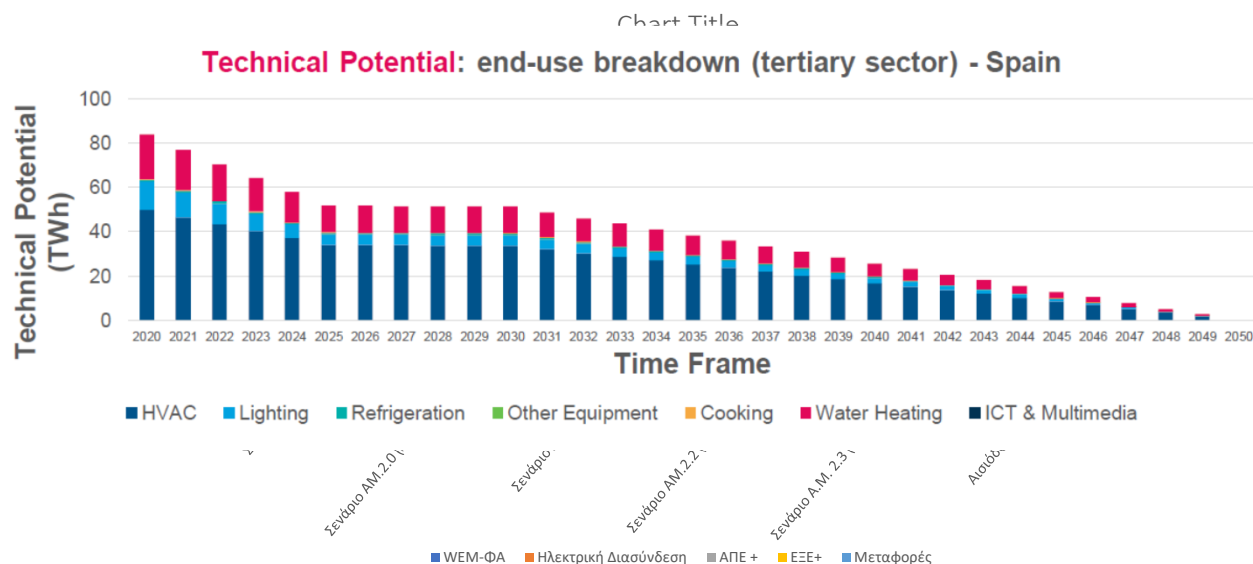


Guidance on GHG recommendations

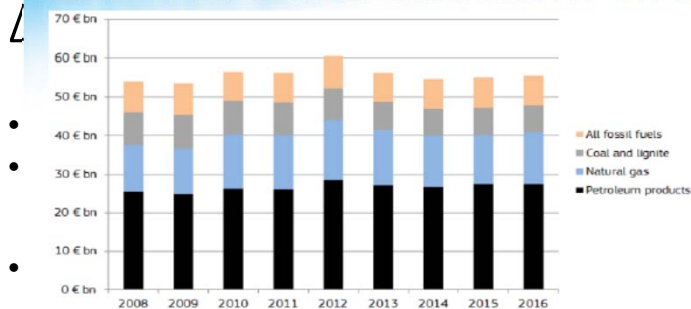
- Οι πολιτικές και μέτρα θα πρέπει να είναι οικονομικά συμφέρουσες
- (Ιδιαίτερη έμφαση στα Δάση) -> Forest Reference Level (FRL)
- Adopted FRLs will enable flexibility between ESR and LULUCF sectors: either need of annual allocations of ESR to fulfil LULUCF no-debit requirement or use of additional net removals from LULUCF to comply with ESR.
- Member States should analyse this option, exploit potential for growth and jobs
- Address policy interactions e.g. with renewables, other Energy Union dimensions, air pollution, circular economy



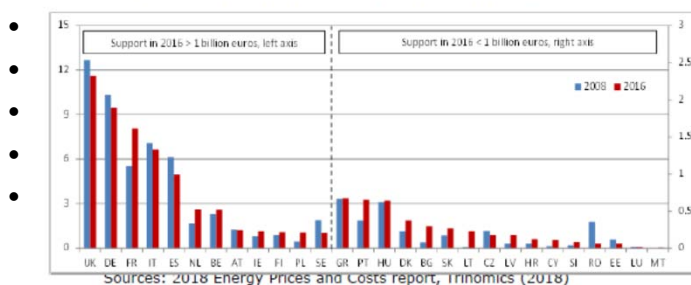
Παρουσίαση Βασικού Σεναρίου (ΕΡαΜ) και επιπλέον επιλογές από τα διάφορα ΑΡαΜs



What does the EC data shows on fossil fuel subsidies?



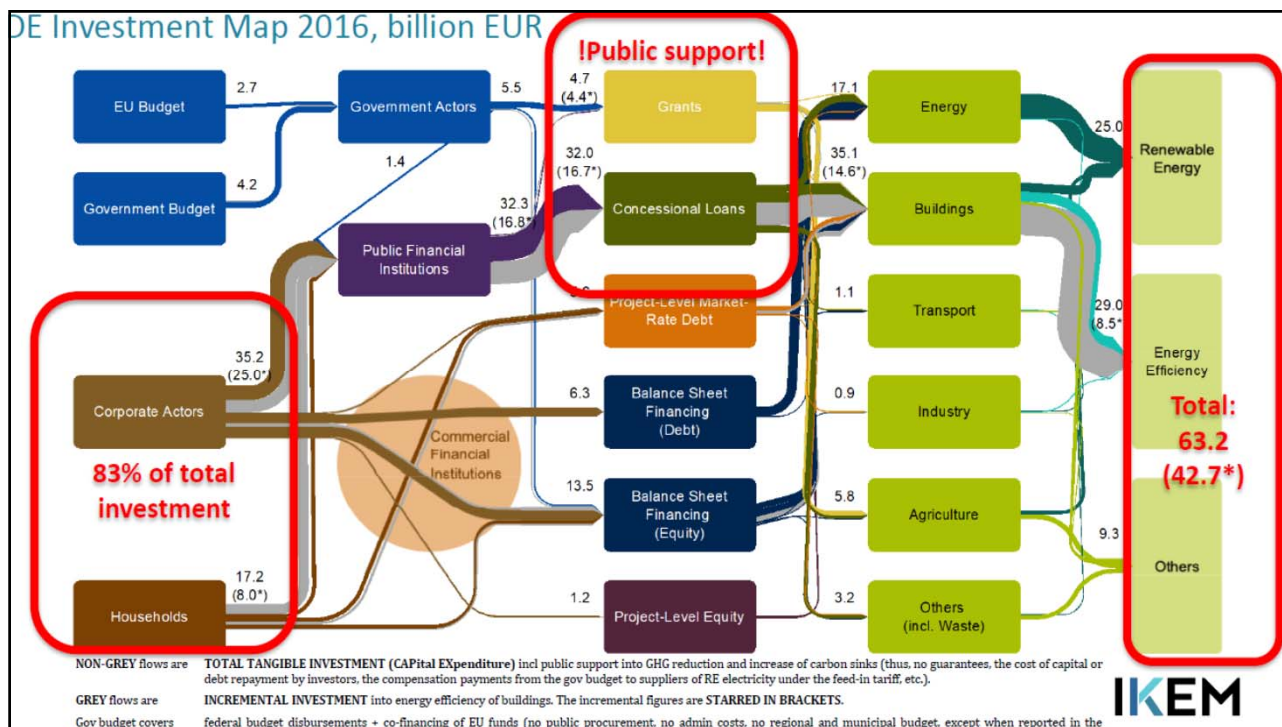
- Fossil fuels subsidies are not declining; €55 billion in 2016



- Wide differences in support to fossil fuels exist in the EU.

Ανάγκη για Επενδύσεις και Μεθοδολογία

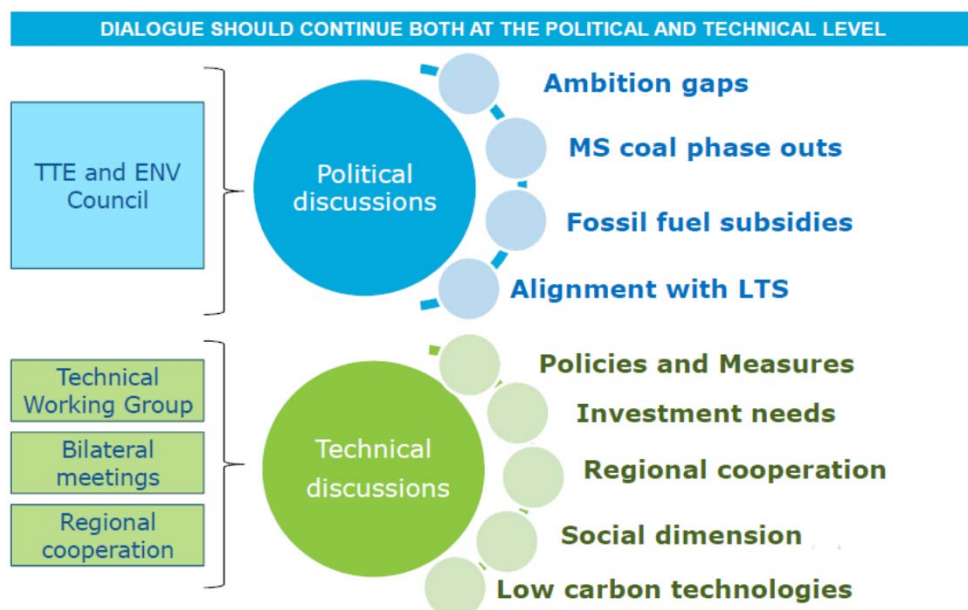
- Τα ΚΜ πρέπει να δείξουν το γενικό πλαίσιο και κατανομή επενδύσεων
- Το πιο πάνω θα πρέπει να είναι αποτέλεσμα μοντελοποίησης
- Impact on GDP, expressed as % deviation from the With Existing Measures (WEM) projections.
- Main fiscal implications of the planned policies and measures on government's budget
 - e.g. quantifying the investments and/or subsidies requiring the use of public resources and quantifying or at least describing how they are going to be financed (e.g. additional taxes, partly self-financing, reducing other public expenditures). The amounts can be expressed in % of GDP deviation from the WEM or in euros.



Μελέτη Αντικτύπου

- Περιγραφή της μεθοδολογίας και των δεδομένων
- Χρήση των διάφορων δειγμάτων που έχουν σταλεί
- Ανάλυση των WEM and with WAM.
- Πρωτογενής Κατανάλωση Ενέργειας, παραδοχές
- *Πρέπει να φαίνεται η Διασύνδεση μεταξύ policies and measures (Section 3) and WAM scenarios και το Impact Assessments (Section 5)*
- Διαφάνεια στα αποτελέσματα και στην χρήση των διάφορων παραδοχών.
- **Impacts of PPAM on energy system and greenhouse gas emissions and removals including comparison to projections with existing policies and measures.** (Να εξεταστούν οι συνέργειες μεταξύ των Κλάδων/ Τομέων)

NEXT STEPS



APPENDIX 3

Impact Assessment of the Cyprus National Energy and Climate Plan

Discussion about the Impact Assessment Methodology

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CYPRUS UNIVERSITY OF TECHNOLOGY



Proposal to address Chapter 5.1 of the Regulation – par. (i)

- We will report for each year up to 2050 the projected evolution according to the WEM and PPM scenarios of the following items:
 - energy demand by main economic sector and fuel
 - power generation by technology
 - greenhouse gas emissions (CO₂, CH₄ and N₂O)
 - air pollutant emissions (NO_x, SO₂ and PM)
- These projections will be based on the output of the energy models used to prepare the corresponding scenarios in the NECP.



Proposal to address Chapter 5.1 of the Regulation – par. (ii)

- In agreement with national authorities, we will assess difference in energy demand between WEM and PPM scenarios by sector
- Explore how the projected additional energy savings of PPM scenario will reduce the requirements for energy supply in comparison to those of WEM scenario.
- Implications for integrating renewables in the electricity mix and for ensuring an integrated energy market will also be explored.



Proposal to address Chapter 5.1 of the Regulation – par. (iii)

- We will assess how PPM scenario results of Cyprus contribute to achievement of EU targets :
 - Energy savings foreseen in Cyprus between WEM and PPM scenarios and the corresponding EU-wide energy savings requirement;
 - Percentage of renewable energy in power generation and in total energy consumption in Cyprus in 2030, and whether the rate of increase in renewables penetration is compatible with the rate required to achieve the EU-wide renewables target;
 - Possibility for Cyprus to meet the binding commitment of the Effort Sharing Regulation, for reducing non-ETS emissions in 2030 by 24% compared to 2005.



**Proposal to address
Chapter 5.2 of the Regulation
1 – Environmental and health impacts**

- Emissions of GHG (CO₂, CH₄, N₂O) and air pollutants (NO_x, SO₂ and PM) for both WEM and PPM scenarios will be reported
- We will convert the changes in emissions to changes in external costs on the basis of assessments conducted by the U.S. EPE and the European Commission. We will also include a description of the actual health impacts due to these emissions; this will be based on the corresponding studies used for calculating external costs.

3EP



**Proposal to address
Chapter 5.2 of the Regulation
2 – Macroeconomic impacts**

- An energy input-output model will be applied in this study to estimate the direct and indirect energy embodied in sectoral production for Cyprus.
- The PPM scenario will involve additional investments compared to WEM. These changes in investment needs will be input in the IO model in order to simulate their effects on the economic output and employment of each main sector of the Cypriot economy.

3EP



**Proposal to address
Chapter 5.2 of the Regulation**
3 – Distributional impacts for ‘just transition’

- PPM scenario may involve higher fuel and electricity prices. To study its effect we will use estimated consumer demand systems satisfying fundamental principles of economic theory.
- The simulation of the effects of higher energy prices on the cost of living of households will be performed using national Family Expenditure Survey data from Cystat. We can compute the changes in cost of living a) for urban and rural households and b) for different income groups.

3EP



**Proposal to address
Chapter 5.3 of the Regulation**

- Investment needs for the PPM scenario (*additional* to those of WEM scenario) through calculations of OSEMOSYS with additional assessments if necessary for non-ETS sectors.
- On the basis of earlier experience in Cyprus and around Europe, we will identify market risks and barriers for realizing these investments, and will propose public interventions to overcome these barriers

3EP



Proposal to address Chapter 5.4 of the Regulation

- Assess regional aspects of results, i.e. potential exports of natural gas or electricity from Cyprus to neighbouring countries and other EU MS; and potential changes in main energy system indicators of Cyprus in PPM compared to WEM scenario.
- Assess impact of PPM scenario (compared to WEM) on energy prices in Cyprus.
- The effect of the PPM scenario (compared to WEM) on the operation of utilities in Cyprus and on the integration of the Cypriot energy market.

3EP



General notes on other countries' progress in NECP preparation

- Only four complete chapters, but **only one** (Poland) thoroughly written
- Most countries dedicated lots of pages on the presentation of emissions forecasts etc., **without qualitative insight**
- Macroeconomic and health benefits were modelled in 5 cases (Finland, Greece, Italy, Poland and Spain) using **a mixture of I/O and CGE techniques**
- Less developed chapter of all, almost in every case (bar Poland)

3EP



Summary of impact assessment chapters in draft NECPs of EU Member states

	Chapter complete	Emissions, interactions	Macroeconomic, health etc.	Investment needs	Impacts on neighbouring countries	Notes
Austria	No	No	No	No	No	
Belgium	Partial	Yes	No	No	No	Lots of emphasis on Renewables
Bulgaria	No	No	No	No	No	
Croatia	Partial	Yes	No	No	No	
Czechia	No	No	No	No	No	
Denmark	Partial	Yes	No	Yes, including policy measure costs	No	
Estonia	Partial	Yes, per sector	No	No	No	
Finland	Yes	Yes	Yes, but relying on external reports (using TIMES)	Yes, including policy measure costs	Yes	Impact chapter complete, but not very detailed
France	Partial	Yes, per sector	Yes, but no description on tool used for macro	Yes	No	
Germany	Partial	Partial	No	No	No	
Greece	Partial	Yes, per sector	Yes, I/O	Yes	No	
Hungary	Partial	Yes, per sector	No	Yes, but low on details	No	
Ireland	Partial	Yes, per sector	No	Yes, but low on details	Yes	Uses four scenarios - WEM and WAM with variants on low and high oil prices
Italy	Partial	Yes, per sector	Yes, I/O and CGE	Yes	No	Most complete Macroeconomic assessment, but no health assessment
Latvia	Partial	Partial	No	No	No	
Lithuania	No	No	No	No	No	
Luxembourg	No	No	No	No	No	
Malta	No	No	No	No	No	
Netherlands	Partial	Partial	No	No	No	
Poland	Yes	Yes, per sector	Yes, CGE	Yes	Yes	Report in Polish, chapter 120 pages long, looks complete and thorough
Portugal	No	No	No	No	No	
Romania	Yes	Yes	Yes (no indication of model)	Yes	Yes	Report complete, extremely scant on details
Slovakia	No	No	No	No	No	
Slovenia	No	No	No	No	No	
Spain	Partial	Yes	Yes, I/O and CGE	Yes	No	
Sweden	No	No	No	No	No	
UK	Partial	Yes	Partial (no modelling)	Yes	Yes	Scant details