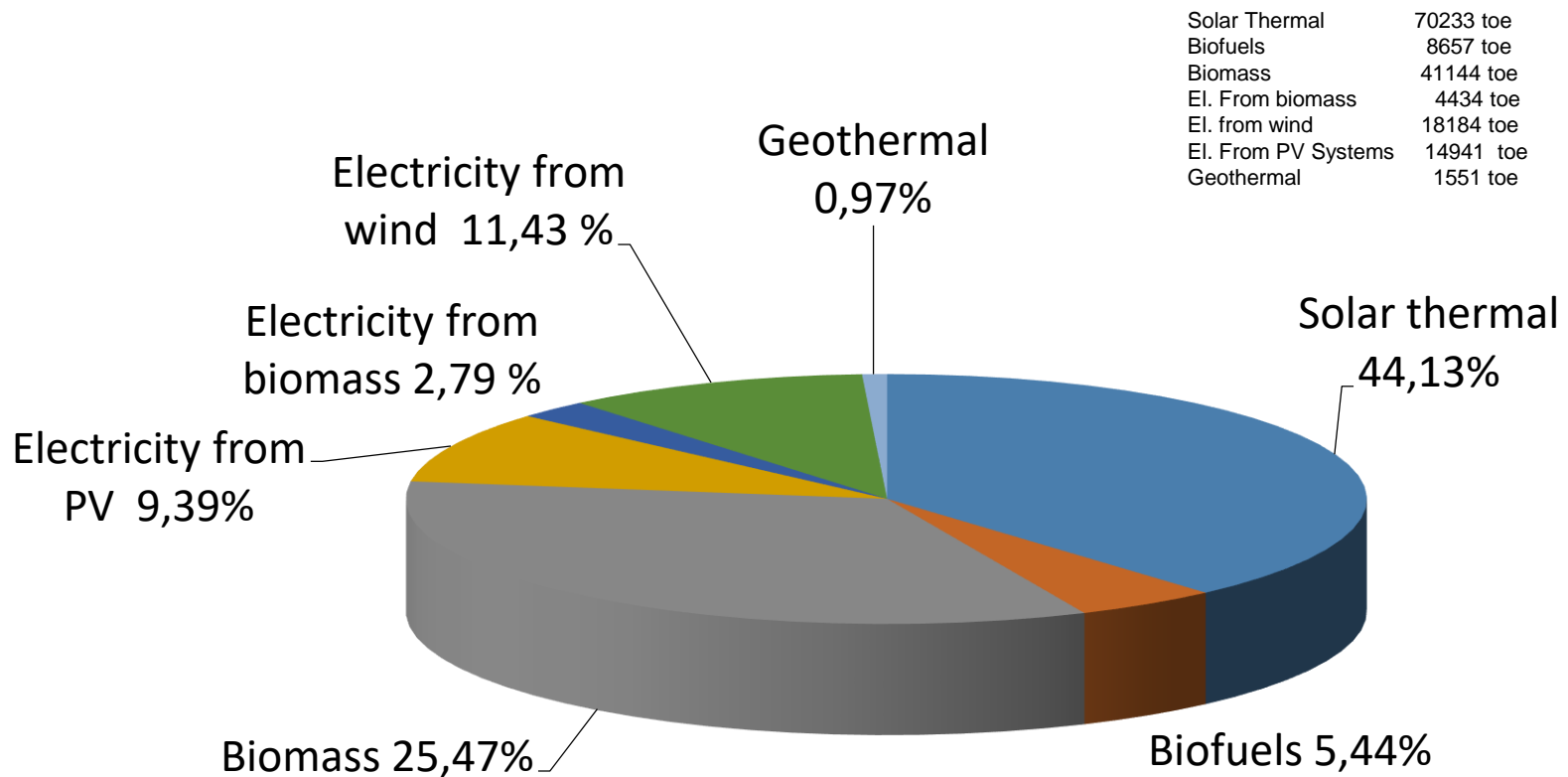




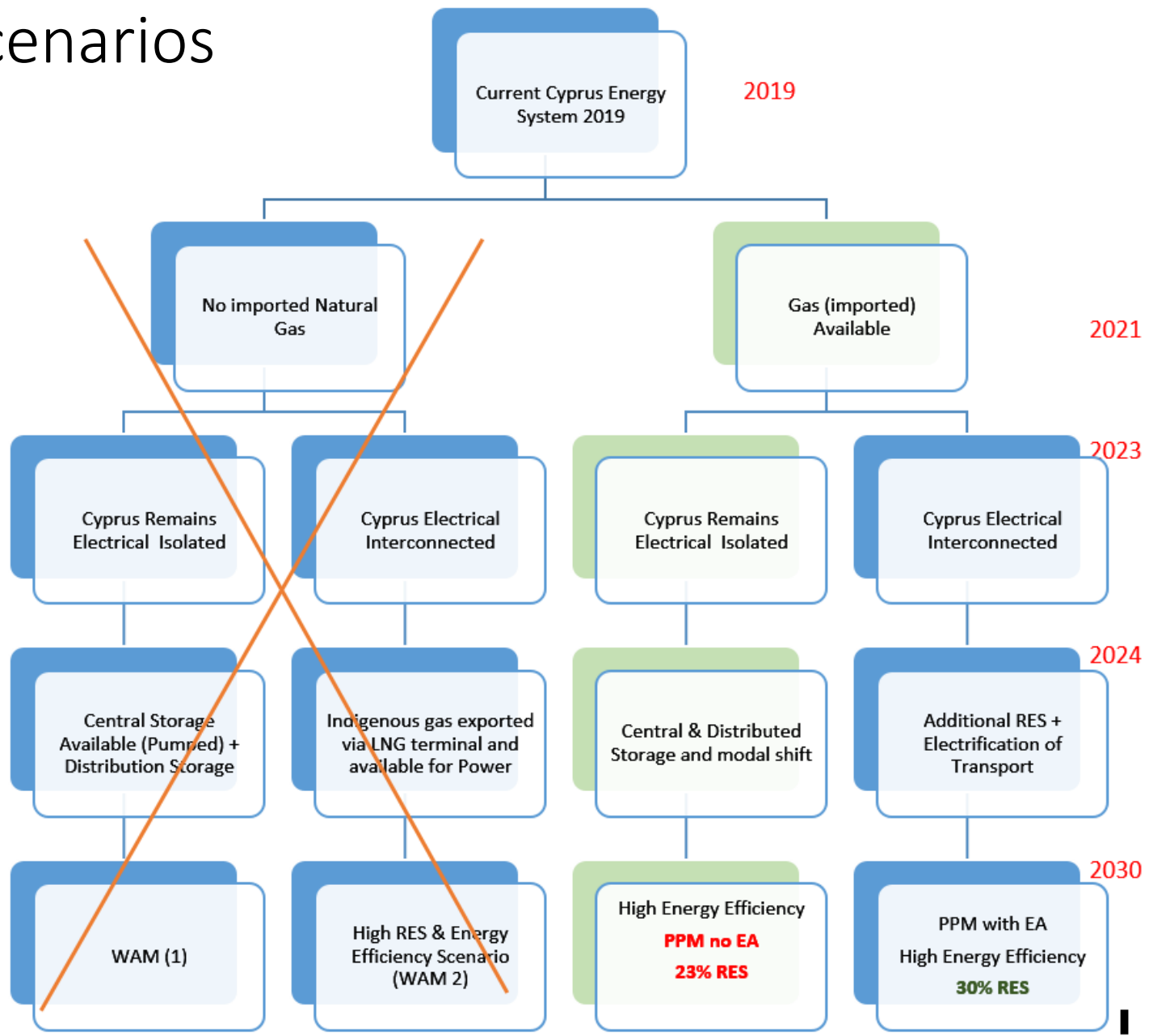
National Energy and Climate Plan 2021-2030 – Renewable Energy Sector



Latest Energy Balance (2018 - unofficial)



Basic Scenarios



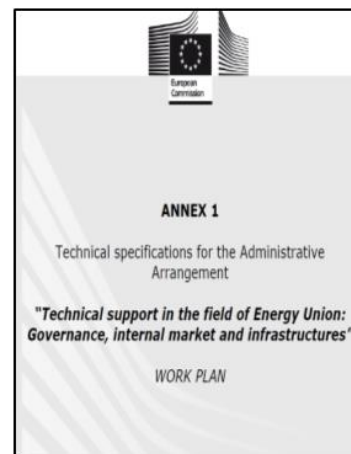
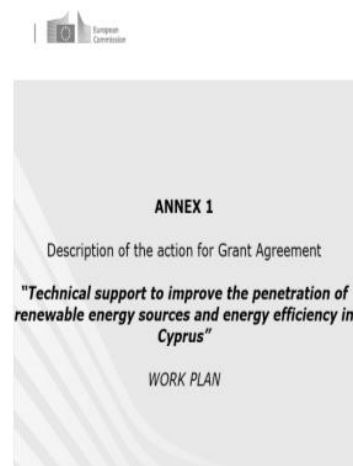
Various studies and Reports from SRSS



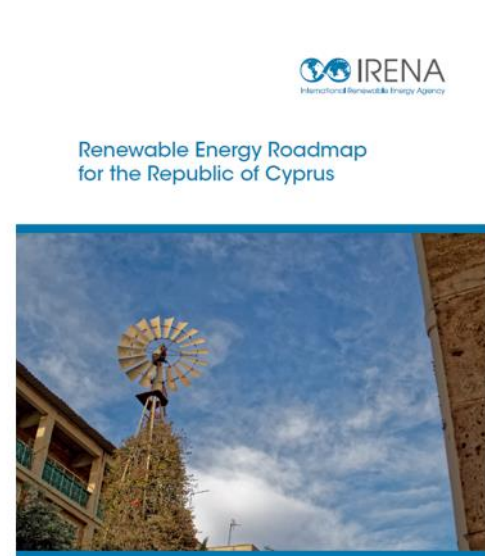
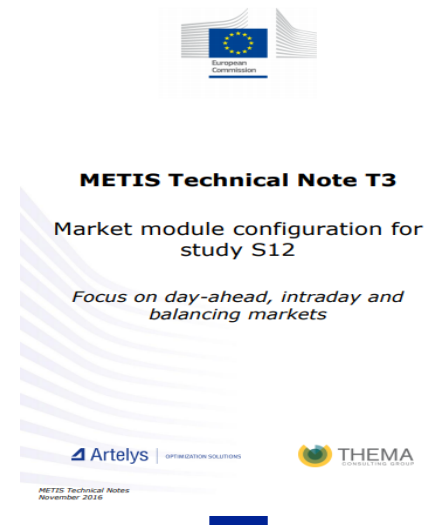
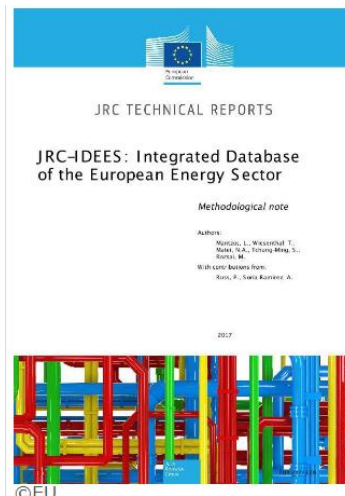
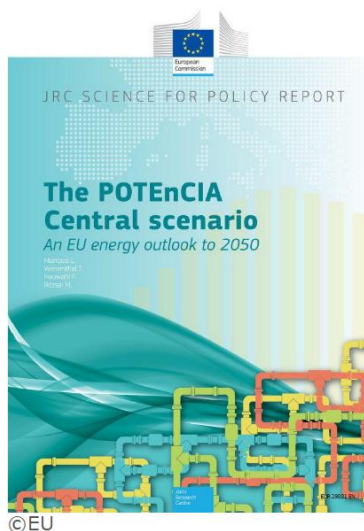
CYPRUS TRANSMISSION SYSTEM OPERATOR



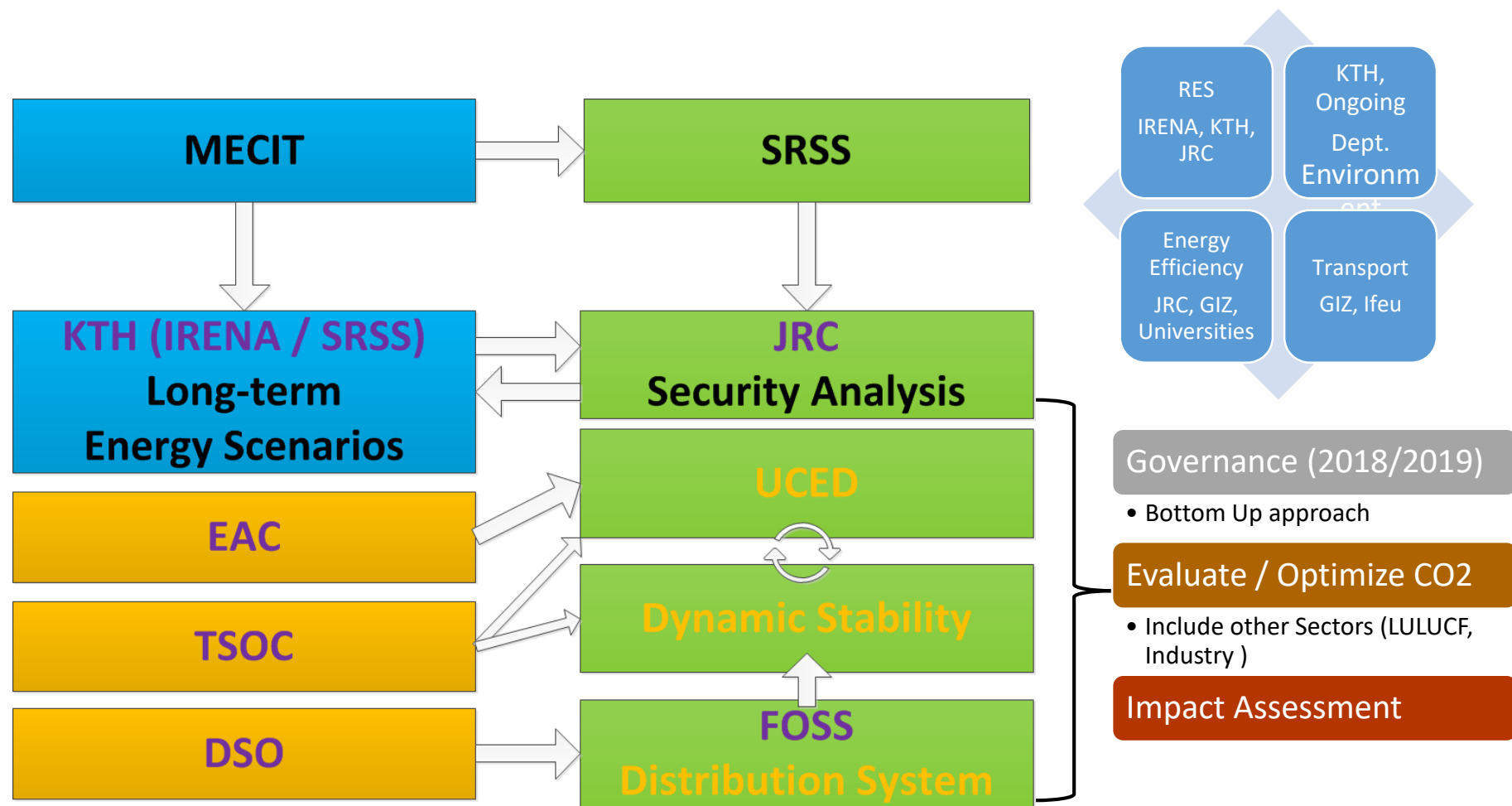
Trading and Settlement Rules



Various studies and Reports from SRSS and IRENA and EU



Achieving the 2020 and 2030 Targets



Ministry of Energy, Commerce and Industry, Workshop



Modelling approach

- Modelling choices from the side of consumers
 - Technology-specific discount rates
 - Taxation included in the analysis
- Two scenarios were developed:
 - Existing Policies and Measures (PaMs): considers legislation and actions that are already in place (FSRU for gas imports 2021)
 - No storage nor electrified transport
 - *No pumped hydro storage*
 - *Cap on PV – 750 MW in 2030 based on TSO-Cy study*
 - Planned PaMs: considers implementation of additional legislation and actions (i.e. EuroAsia Interconnector)
 - Reduced Net Transfer Capacity of Interconnector



Fossil Fuel Prices and ETS Price Projections

- A lower fossil fuel price projection was adopted according to MECI recommendations (from CHC)
 - 2030 values in EC recommendations were
 - Oil at 15.02 EUR2016/GJ
 - Gas at 9.09 EUR2016/GJ
- ETS price projections follow EC recommendations

		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Oil	EUR2016/GJ	5.12	5.40	5.69	5.99	6.30	6.64	6.71	6.79	6.86	6.93	7.00	8.51	9.61
Gas	EUR2016/GJ	5.16	5.43	5.73	6.03	6.34	6.68	6.76	6.84	6.91	6.98	7.06	8.57	9.68
Carbon price ETS sectors	EUR2016/ton CO2	15.5	17.6	18.6	20.7	21.7	23.3	25.9	27.9	30.0	32.1	34.7	43.5	51.7



Electricity - Renewable Energy Technology assumptions

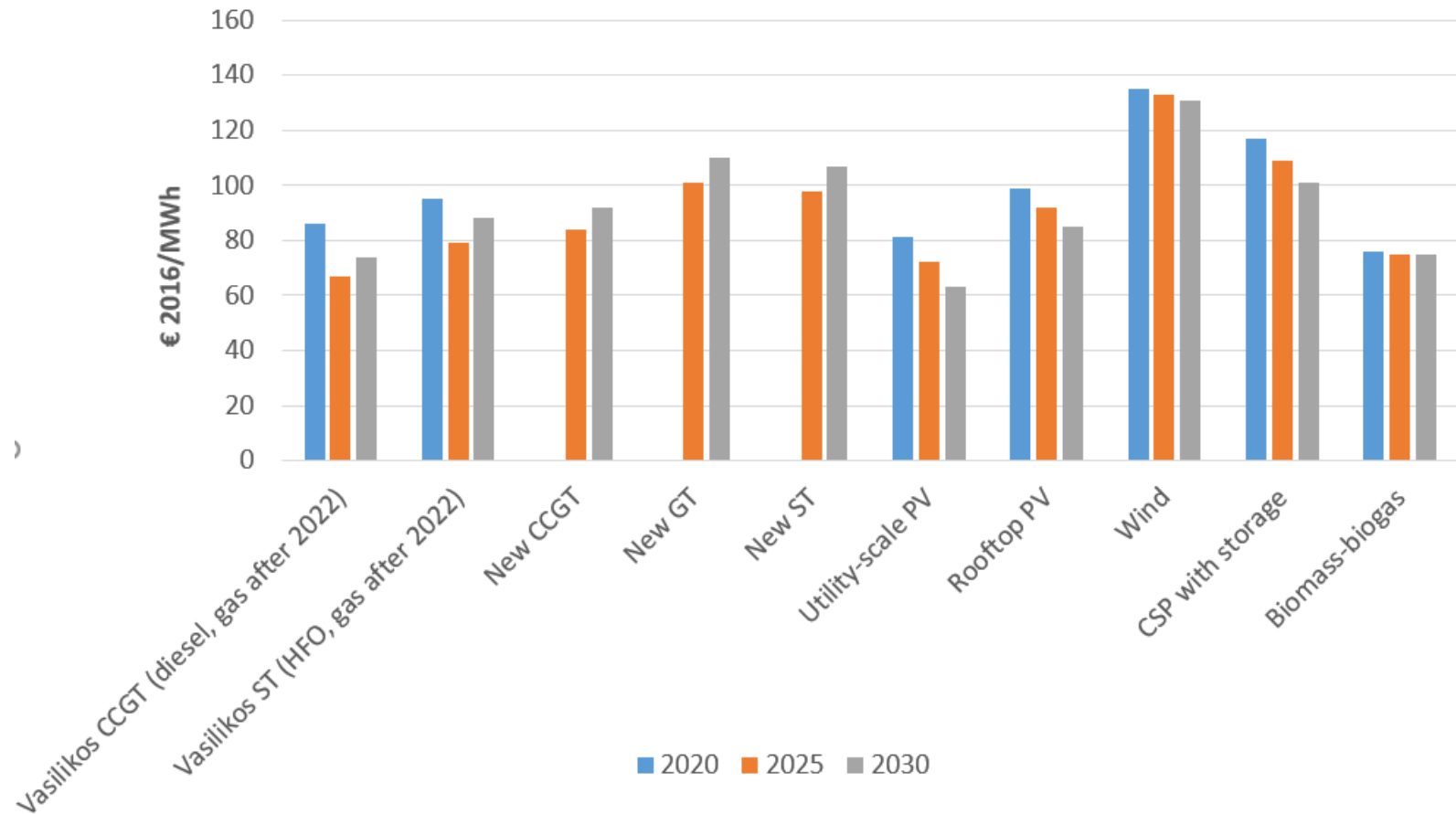
- As compared to EC recommendations, more moderate RET learning rates assumed to reflect local conditions
 - Exception for CSP for which more optimistic assumptions were adopted

	Investment Cost (EUR2016/kW)			Variable O&M cost (EUR2016/MWh)	Fixed Cost O&M cost (EUR2016/kW)	Capacity Factor	Lifetime (years)
	2020	2030	2040				
Utility-scale PV	1,161	886	611		9	18.5%	20
Wind	1,394	1,330	1,266		53	16%	25
Biomass-biogas	2,461	2,438	2,415		62	48.5%	30
Rooftop PV	1,467	1,241	1,016		12	18.5%	20
EOS 50 MW CSP with 8 hours storage	3,535				106	39.3%	30
CSP with 6 hours storage	4,410	3,724	3,430	3.1	58.2	50.8%	25



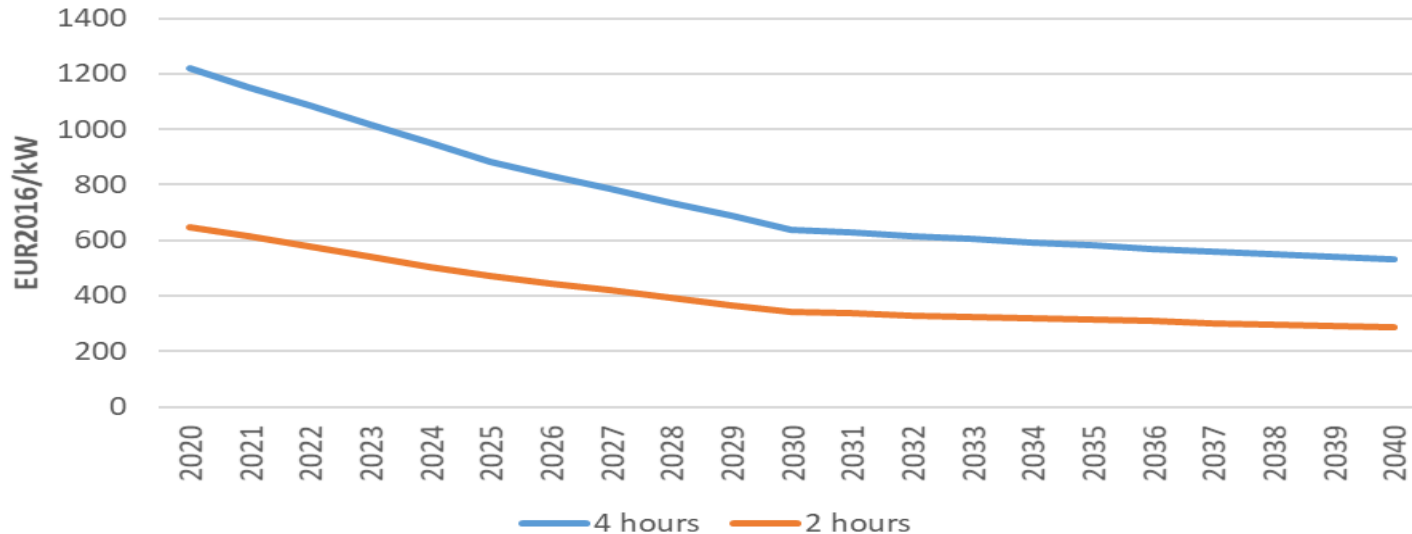
Electricity – LCOE in generation technologies

Increasing fossil-fired generation cost vs decreasing RES cost



Storage assumptions – Battery storage

- Lithium ion Batteries - techno-economic assumptions from IRENA's 2017 report on *Electricity Storage and Renewables: Costs and Markets to 2030*
 - Lifetime extended to 15 years
 - Efficiency improved to 95%



EuroAsia Interconnector – Planned PaMs measures

- Net Transfer Capacity of 1,000 MW for 1st phase
 - Cyprus-Crete by end of 2023
 - Cyprus-Israel by end of 2023-2024
- Interconnector will become part of each local grid leading to an increase on each country's network tariffs.
 - For Cyprus assumption used is 2.9 EUR/MWh
- Interconnector does not contribute to operational reserves
- Interconnector contributes to the capacity reserve at 50%
- Electricity prices (EUR/MWh) taken from ENTSOE's TYNDP 2018

	2020	2025	2030	2035	2040
Greece	72.8	73.5	74.2	74.9	75.6
Israel	50.1	63.0	75.9	88.8	101.7



Transport Sector – Fuel Efficiency

Fuel efficiency based on figures from transport study by ifeu

		2020	2025	2030
Busses	Diesel	11.92	11.56	11.27
	BEV	4.33	4.06	3.91
	Natural gas	10.44	10.12	9.86
Light commercial vehicles	Diesel plug-in hybrid	2.76	2.69	2.60
	BEV	1.22	1.20	1.16
	Diesel	3.19	2.94	2.75
Motorcycles	Gasoline	1.20	1.20	1.21
Passenger cars	Diesel plug-in hybrid	2.76	2.69	2.60
	BEV	0.94	0.89	0.89
	Gasoline plug-in hybrid	2.20	2.15	2.17
	Diesel	3.06	2.87	2.71
	Gasoline hybrid	2.15	2.15	2.11
	Gasoline	2.99	2.87	2.74
	LPG	2.52	2.48	2.44
	Natural gas	2.54	2.49	2.50
Trucks	BEV	3.40	3.27	3.14
	Diesel	9.37	9.30	9.05
	Natural gas	8.20	8.14	7.92



Transport Sector – Biofuels

- Cost for 1st generation biofuels retrieved from UNCTAD, 2015 report on *Second Generation Biofuel Markets: State of Play, Trade and Developing Country Perspectives*
 - Biodiesel cost inclusive of taxes at **approximately 1.8 EUR/litre ?**
 - **Local Biodiesel did not used at this study it is expected to be lower.**
- Cost for 2nd generation biofuels retrieved from IRENA, 2016 report on *Innovation Outlook: Advanced Liquid Biofuels*
 - Biodiesel cost inclusive of taxes exceeds 2 EUR/litre
- Target for 2030 (14% with first generation of biofuels or 7% with second generation of biofuels) – target **unachievable** unless:
 - Fleet becomes reliant entirely on diesel
 - Bioethanol mixing is introduced
 - B100 vehicles are introduced



Transport Sector – Planned PaMs measures

- Modal shift away from passenger cars to public transport
- Clean Vehicles Directive:
 - *45% of new busses for period 2022-2025 should be BEV or CNG*
 - *65% of new busses for period 2026 onwards should be BEV or CNG*
- Nicosia Tram – in operation by 2028 and serving 17.9 million passengers in 2030

	Unit	Value
Line length	km	14.2
Tram Services	services/day	108
Daily Service	km/day	2,706
Capital Cost	million EUR2016	225
Operation and Maintenance Cost	million EUR2016/yr	11.8
Energy Consumption	MJ/km	35.92



Heating and Cooling Sector – Demand in Existing PaMs

Values taken from previous JRC work and forecast by Dr. Zachariadis

- *Useful Energy Demand (PJ)*

Service	Sector	2020	2025	2030	2035	2040
Cooling	Residential	7.58	8.46	9.37	10.28	11.14
	Others	6.10	6.41	6.75	7.08	7.39
Heating	Residential	7.63	7.80	7.95	8.06	8.12
	Others	8.22	8.37	8.77	9.15	9.65

- *Final Energy Demand (PJ)*

	2020	2025	2030	2035	2040
Oil Products	9.01	8.90	8.53	7.63	6.71
LPG	3.38	3.38	3.49	3.36	3.20
Pet coke	4.33	4.12	3.82	3.57	3.33
Biofuels/biomass	1.42	1.56	1.80	1.89	1.93
Solar Thermal & Geothermal	4.21	4.37	5.23	6.56	7.93
Electricity	7.56	8.69	9.78	10.31	10.67



Heating and Cooling Sector – Demand in Planned PaMs

Additional efficiency measures lead to lower demand projections

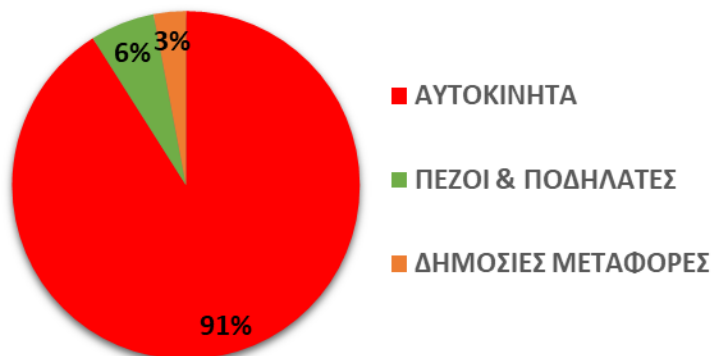
- *Final Energy Demand (PJ)*

	2020	2025	2030	2035	2040
Oil Products	8.9	8.6	8.19	7.21	6.21
<i>Change from Existing PaMs scenario</i>	-1%	-3%	-4%	-6%	-7%
LPG	3.32	3.21	3.27	3.05	2.77
<i>Change from Existing PaMs scenario</i>	-2%	-5%	-6%	-9%	-13%
Pet coke	4.32	4.07	3.81	3.54	3.3
<i>Change from Existing PaMs scenario</i>	0%	-1%	0%	-1%	-1%
Biofuels/biomass	1.39	1.48	1.7	1.72	1.69
<i>Change from Existing PaMs scenario</i>	-2%	-5%	-6%	-9%	-12%
Solar Thermal & Geothermal	4.1	4.1	4.83	5.66	6.23
<i>Change from Existing PaMs scenario</i>	-3%	-6%	-8%	-14%	-21%
Electricity	7.56	8.29	8.89	9.17	9.29
<i>Change from Existing PaMs scenario</i>	0%	-5%	-9%	-11%	-13%

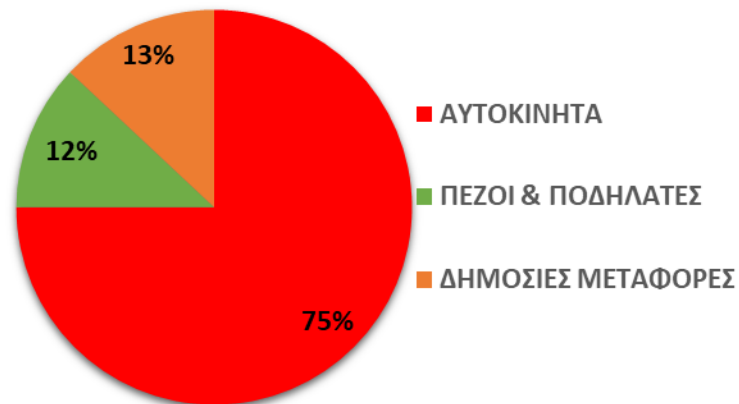


Transport Sector: Modal share for road transport

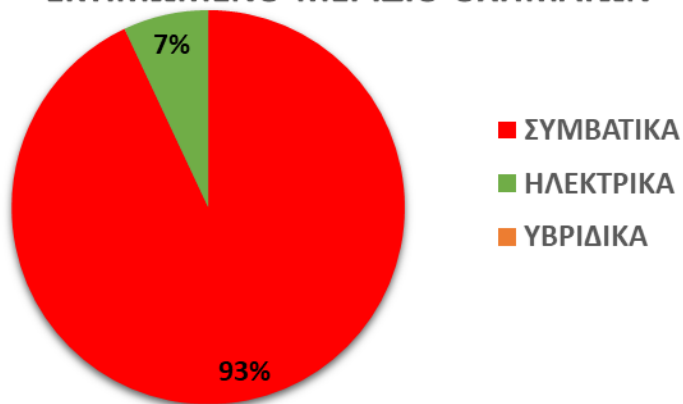
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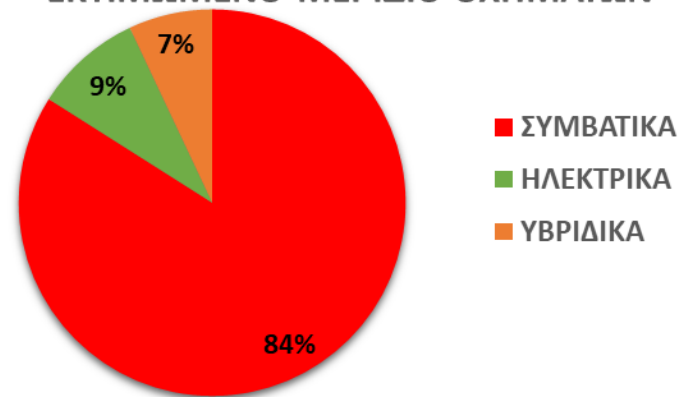
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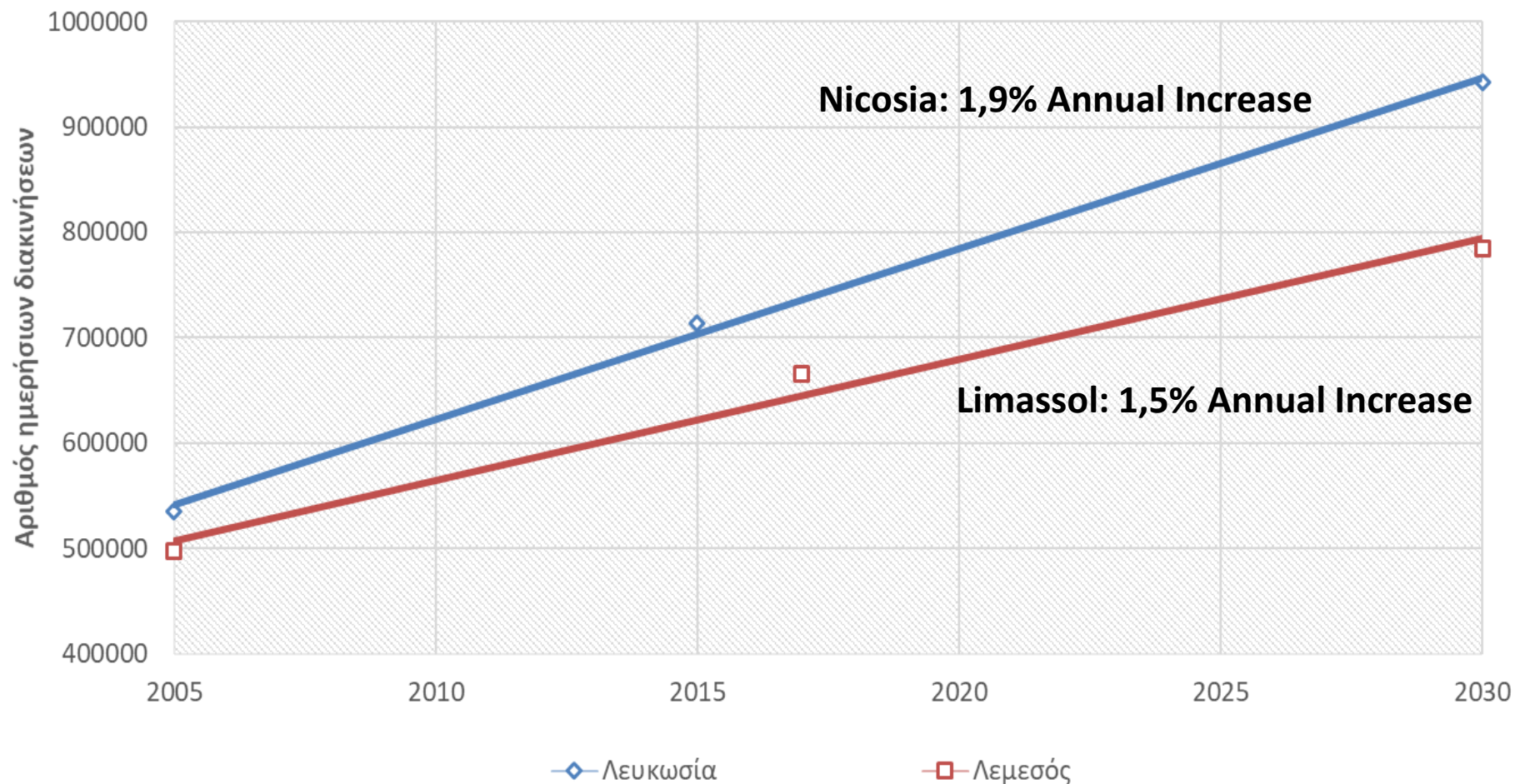
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ΕΚΤΙΜΩΜΕΝΟ ΜΕΡΙΔΙΟ ΟΧΗΜΑΤΩΝ



Transport sector: Annual increase in person trips



With existing policies and measures (1)

- The Amendment of the Motor Vehicles and Road Traffic Law for revision of the vehicle taxes and annual circulation taxes
- Incentives for the purchase and use of low/zero emission vehicles including the old vehicle scraping scheme and financial incentives for the purchase of electric vehicles that was announced in late 2019.
- The Integrated Fleet Management System (Central Government vehicles) installed in 2017
- Installation of 10 additional double fast-charging stations in highways and public roads.

With existing policies and measures (2)

- The new bus concessions that are planned to be put in force in 2020 and will further improve the public transportation system
- The installation of a telematic system that manages the bus services and records data for further optimisation of the public transport system
- Use of biofuels in the transport sector
- Use of LPG in the transport sector

With proposed policies and measures / The shift of modal share from car trips to sustainable modes of transport

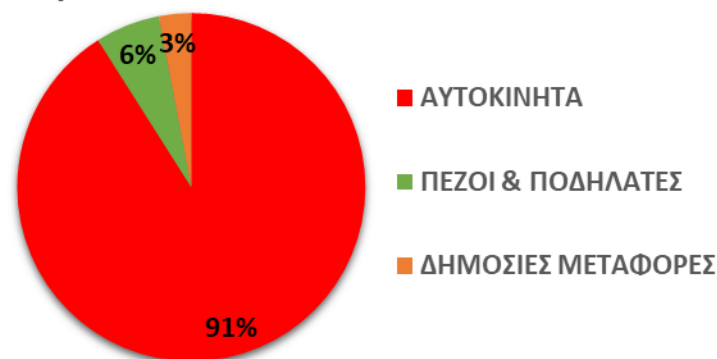
Based on the plans and studies that have already been completed, a modal share of 75% car, 13% public transport, 12% walking/ cycling can be achieved and is set as a national target.

Actions:

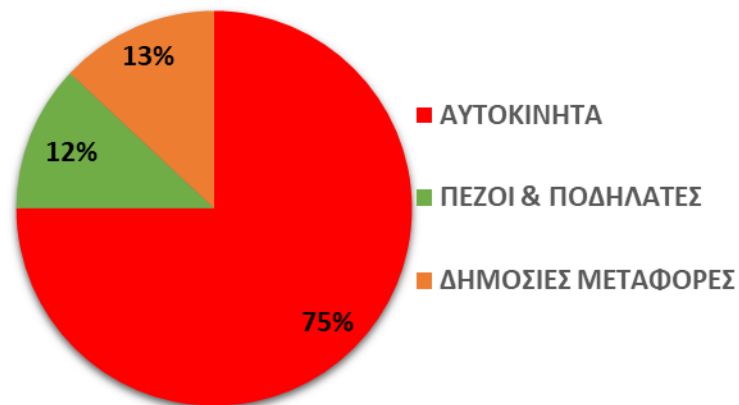
- 1) Significantly improved bus services (routes, frequency, hours of operation),
- 2) Upgrading of infrastructure for pedestrians/ cyclists / public transport, development
- 3) Implementation of a holistic parking policy
- 4) Implementation of high-quality public transport corridors
- 5) Essentially a group of targeted measures that promote the use of sustainable modes of transport and discourage the use of car trips.

Impact: Source: Limassol SUMP

ΥΦΙΣΤΑΜΕΝΟ ΜΕΡΙΔΙΟ ΔΙΑΚΙΝΗΣΕΩΝ



ΕΚΤΙΜΩΜΕΝΟ ΜΕΡΙΔΙΟ ΔΙΑΚΙΝΗΣΕΩΝ



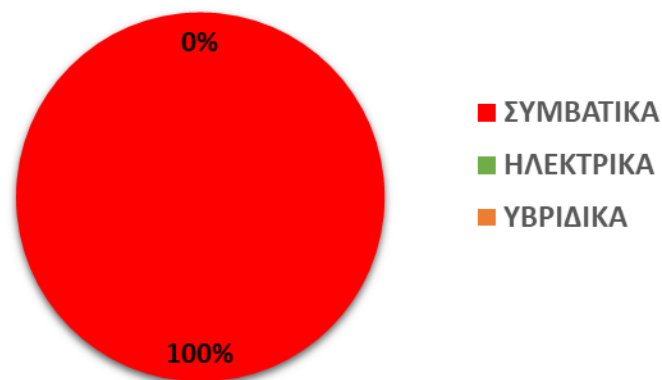
With proposed policies and measures / The promotion of the purchase and use of low or zero emission buses

Additional actions:

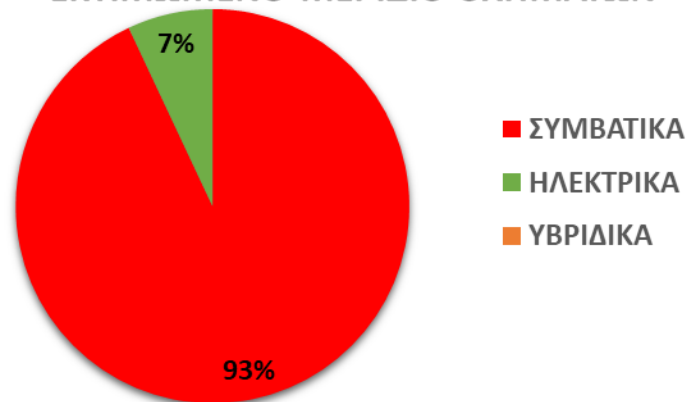
- 1) Incorporation of the new public transport contracts terms
- 2) Incentives for the use of low/zero emission tourist buses
- 3) Harmonisation and implementation of European Directives (eg. Clean Vehicles Directive) for the purchase of new vehicles both for the private and public sector.

Impact (Source: Impact Assessment 2019)

ΥΦΙΣΤΑΜΕΝΟ ΜΕΡΙΔΙΟ ΟΧΗΜΑΤΩΝ



ΕΚΤΙΜΩΜΕΝΟ ΜΕΡΙΔΙΟ ΟΧΗΜΑΤΩΝ



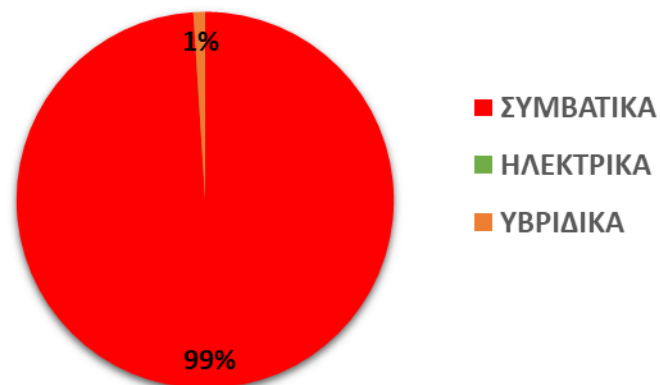
With proposed policies and measures / The promotion of the purchase and use of low or zero emission vehicles

Additional Actions

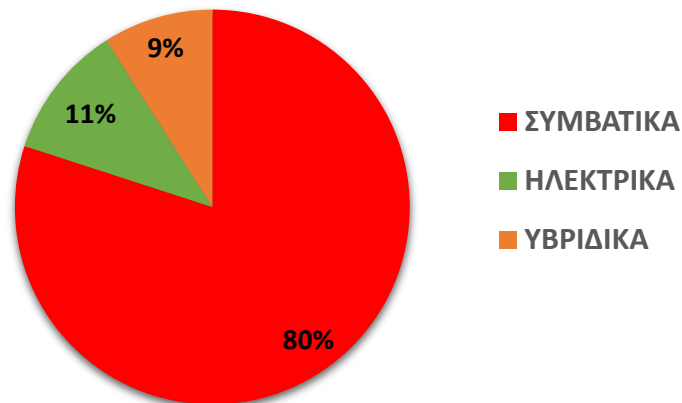
- 1) Harmonisation and implementation of European Directives (eg. Clean Vehicles Directive) for the purchase of new vehicles both for the private and public sector.
- 2) Further incentives for the purchase and use of low/zero emission vehicles in the period 2020-2030 (eg. Further financial incentives for the purchase of electric vehicles)

Impact (Source: Impact Assessment 2019)

ΥΦΙΣΤΑΜΕΝΟ ΜΕΡΙΔΙΟ ΟΧΗΜΑΤΩΝ



ΕΚΤΙΜΩΜΕΝΟ ΜΕΡΙΔΙΟ ΟΧΗΜΑΤΩΝ



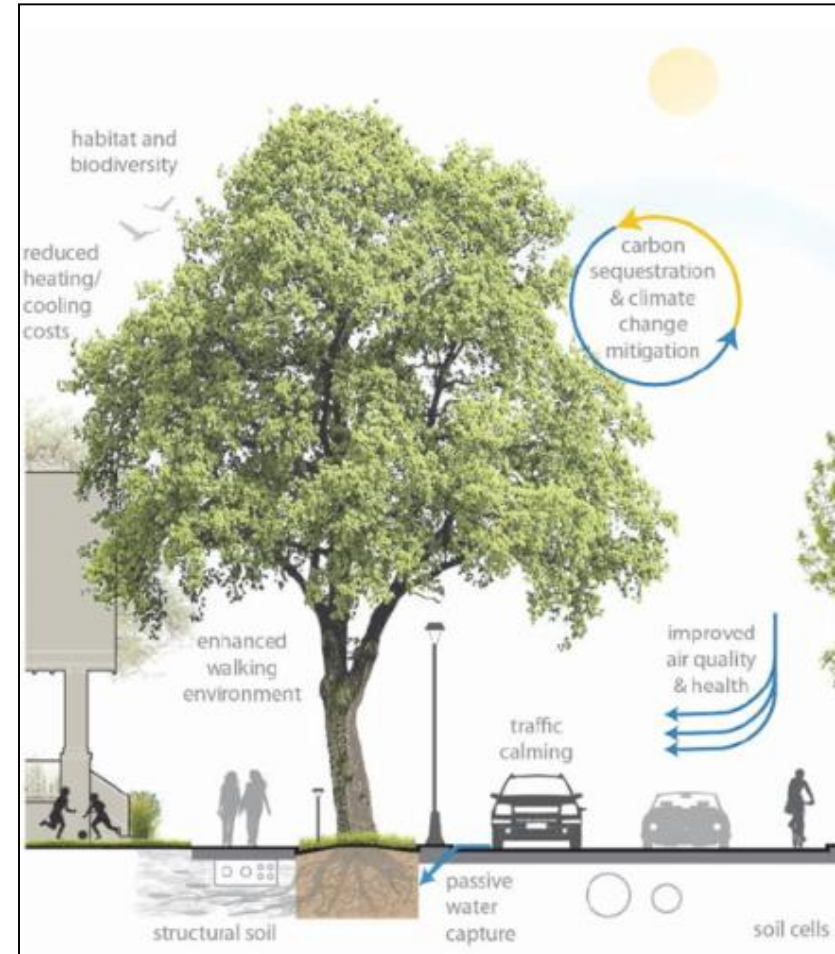
With proposed policies and measures / Extensive tree planting along the urban and interurban road network

Extensive tree planting along the urban road network and along the interurban road network.

The effects of this measure are long term, due to the amount of years required for a tree to reach a significant size and for the benefits mentioned above to be effective.

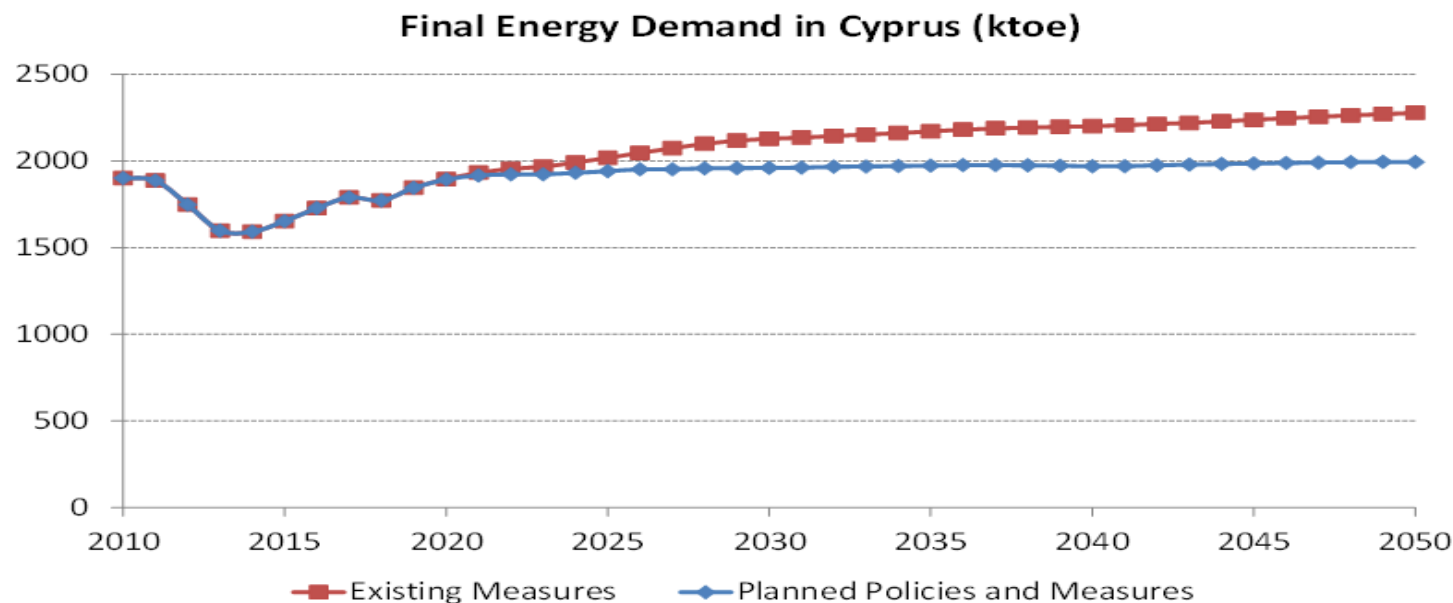
Benefits (Long- term):

- CO₂ absorption
- Aesthetic upgrading
- Shading
- Lowering temperatures
- Better conditions for cycling and walking that could have a significant impact in the use of sustainable modes of transport



ΕΞΕΛΙΞΗ ΕΞΟΙΚΟΝΟΜΗΣΗΣ ΕΝΕΡΓΕΙΑΣ

- ΓΡΑΦΙΚΗ ΧΡΟΝΙΚΗΣ ΕΞΕΛΙΞΗΣ



Στόχος	WEM	PPM	Draft NECP	PPM without interconnector	Ambitious
Επίτευξη υποχρεωτικού στόχου για σωρευτική εξ. ενέργειας (243,044 toe τη δεκαετία 2021-2030)	NAI	NAI*	NAI	NAI	NAI
Ενδεικτικός στόχος Πρωτογενής κατανάλωση (Mtoe)	2.6	2.5	2.6	2.4	2.3
Τελική κατανάλωση (Mtoe)	2.1	2	2.2	2	1.7

Οι μέτρα και πολιτικές στο σενάριο με επιπρόσθετα μέτρα (PPM) αυξάνουν τη συνεισφορά για επίτευξη του στόχου κατά περίπου 115%



Ευχαριστούμε

- Χριστίνα Καράπιττα
- Γιώργος Παρτασίδης
- Νίκος Χατζηνικολάου
- Κατερίνα Πιριπίτση

- www.energy.gov.cy

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