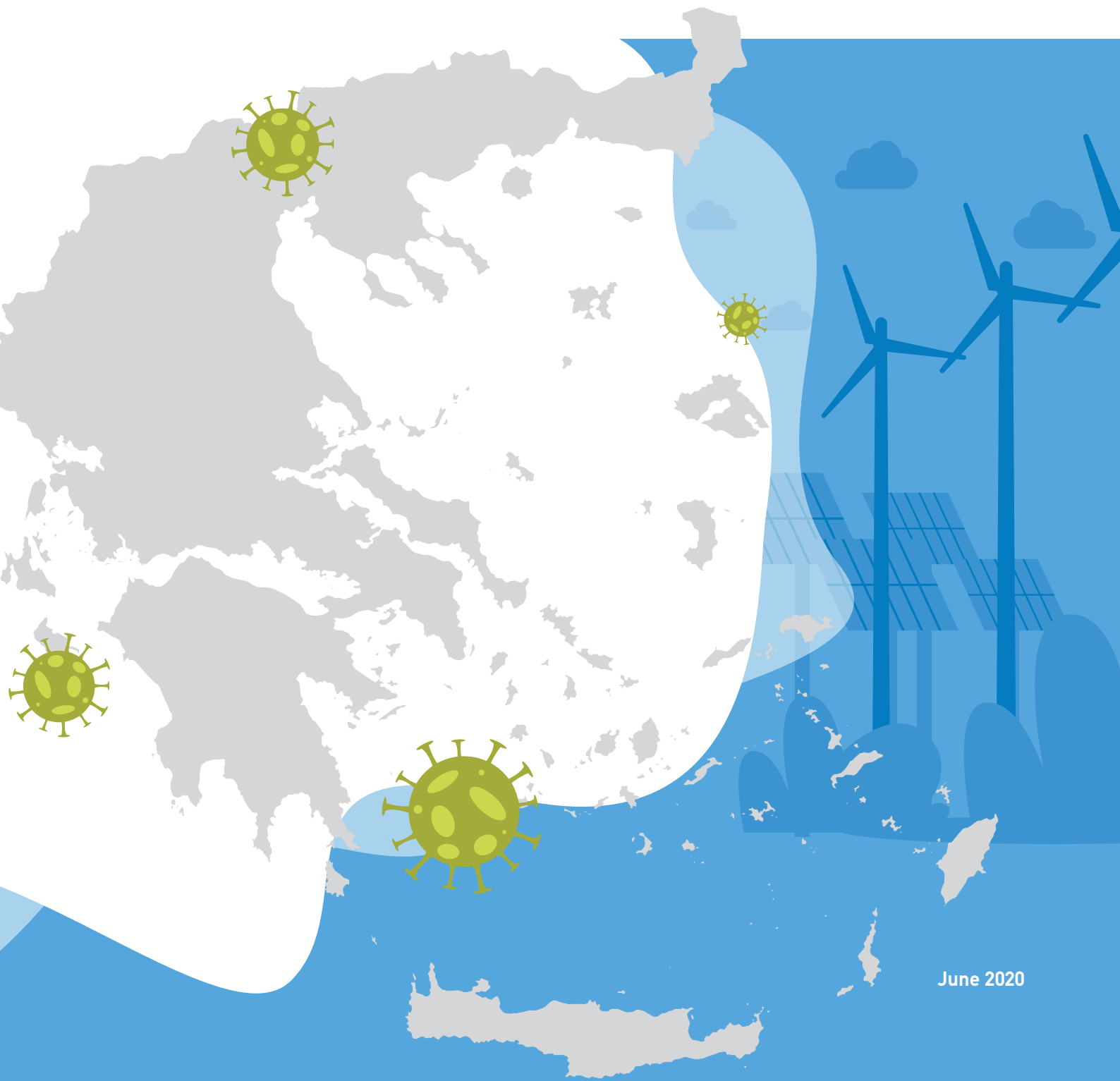


Greece - Post-COVID State of Play: How **Green** will the **relaunching** be?



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Summary

As Greece recovers from the lockdown for dealing with the health effects of the COVID-19 pandemic, successfully by all accounts, it has to deal next with the relaunching the economy. As the health danger retreats, a debate has started as to the appropriateness and possible effects of the measures already taken and most importantly the planning for the Greek share of the €750bil "Recovery" Package proposed by the EC. To inform this debate, we examine the effect of the lockdown and the extraordinary measures already taken on the energy section, on the policies and measures (PAMs) of the Greek National Energy and Climate Plan (NECP) and on the GHG emissions. Although the reduction of electricity consumption is estimated finally not to exceed 5% in 2020, the expected drop in transport and the tertiary sector will lead to a reduction of emissions in 2020 which most likely will continue, albeit to a smaller extent, in 2021 as changes in both consumption habits and work modes become permanent. In looking at the measures announced so far, no delays or

reallocations of funds away from the NECP PAMs was found but no new ones were proposed to be funded by the "Recovery" Package. At the same time, the measures taken in the "emergency" and "ensuring solvency" phases of the COVID-19 crisis were to a very large extent horizontal and without any green filters attached. A review of the positions of the major opposition parties showed that there is broad agreement on ensuring, in line with the European Green Deal proposals, that green profile should be a prerequisite for measures to be funded by the "Recovery" Package, and on focusing investment in RES, clean energy infrastructure, building upgrades and smart, climate-friendly agriculture, but not on R&D and truly green transport. Although no clear vision for using this crisis to move to a different, greener economy has been articulated, it is encouraging that there is broad political agreement this far, at least in words, that the way out of this crisis should be green.

1. Introduction

Greece, as all other countries, has been affected deeply by the COVID-19. Its response to the health threat was immediate, science based, well planned and executed in a measured and firm manner resulting in one of the lowest number of infections and deaths in Europe. The means of containing the pandemic was a lockdown that eventually included major activities such as most retail shops, schools, eating facilities as well as the majority of citizens except those providing essential services.

The lockdown, as expected, resulted in a severe downturn of economic activity with estimated reduction of GDP that might reach 6% for EU and ca 10% for Greece for 2020. Although a recovery is expected in 2021, it is widely recognized that permanent changes in business practices and social behavior will materialize.

In parallel with efforts to find an effective means to protect the public from COVID-19 through vaccination or medical treatment, both at EU and at national level, attention is turning on relaunching the economy. The means to do so and the priorities to be set are now debated both at EU level as regards the size and the structure of the so called 'Recovery' Package which may lead to possible delays in agreeing the European Green Deal (EGD) and reverting resources originally earmarked for it.

In this, there is concern that the resources for truly needed support of both business and private citizens for them to survive, be they emergency handouts, tax reductions, subsidies or loans, will be given horizontally, with not enough attention paid to the environmental impacts of the activity of enterprises receiving aid.

The changes in business patterns and consumer behavior during the lockdown phase itself and in the post-COVID-19 stage will also affect substantially the energy sector - which is in the heart of the EGD - and the realization of the policies and measures (PAMs) included in the National Energy and Climate Plans (NECPs).

The Greek Government has repeated stated that it has adopted a step -by-step approach in dealing with both the health and economic crisis. It has thus announced and put into effect two tranches of measures to deal with the emergency state and the "solvency" (Anderson et al., 2020) stages respectively with more support from National funds to be put in place as needed in the future.

As we are moving in the "rebooting" stage of the econo-

my for which the recently proposed "Recovery" Package is to distribute ca. €750bil to EU member States of which ca €32bil for Greece, it is important to gage the impacts of the lockdown on the economy (section 2), the energy sector (section 3) and on their effect on the resulting GHG emissions (section 4) and on greening the economy. Furthermore it is of interest to analyze, on the basis of available information which clearly is changing from day to day, the stimulus measures proposed as to their impact on greening the economy (section 5) and on the implementation of the Greek NECP (section 6), and on that basis to identify (section 7) policy implications and offer recommendations to assure that the pandemic does not derail the ambitious plans of Greece for a swift and just transition to a carbon free economy.

As the economy is starting to recover and as new information is continuously coming out on new measures or further elaboration of those already announced is provided, a cutoff date for this work was necessary. The World Environment Day (5 June 2020,) was chosen as cutoff so that its content be in time to hopefully contribute to the medium and longer term planning debate that has already started.

2. The Greek economy: past, present and future

2.1 Structure of the economy: Trends up to 2019 and future expectations (pre COVID)

The history of the Greek economy in the 21st is well known. It was running with growth rates which reached 4% in the 2000-2009 period, before plunging into depression in the 2010-2012 which brought the country to near bankruptcy with a ca 25% reduction of its GDP and a dept to GDP ratio of

the order of 180%. It took eight years to turn this around with positive growth rates of 1.9% seen in both 2018 and 2019. The pre-COVID expansion estimates for 2020 was 2.8% (2020 National Budget).

An overview of the structure of the Greek economy based on the latest available GVA breakdown from ELSTAT¹ is provided in Table 2-1 below.

Current Prices	2008	2009	2010	2011*	2012*	2013*	2014*	2015*	2016*	2017*	2018*	2019*
Agriculture, forestry and fishing	6793	6663	6519	6109	6191	5794	6070	6730	6313	6673	6870	6851
Mining and quarrying; manufacturing, electricity, gas, steam and air conditioning supply; water supply; sewerage, waste management and remediation activities	27.176	25.825	22.368	22.016	21.571	21.791	21493	21.835	22.376	23.402	24.196	24.170
of which Manufacturing	20.578	18.146	16.356	16.175	15.377	15.251	15019	15.347	16.222	17.022		
Construction	10719	10550	8888	6310	5821	4701	3783	3314	3844	3699	4008	4479
Wholesale and retail trade; repair of motor vehicles and motorcycles; transportation and storage; accommodation and food service activities	56917	51420	49399	44313	37677	36344	37678	37317	36082	38246	40280	41654
Information and communication	8061	8568	7683	6355	5518	5749	5518	5323	5366	5447	5567	5743
Financial and insurance activities	9396	9775	9623	8652	8396	8293	7513	7095	6908	6466	5832	5379
Real estate activities	28303	29544	33515	31367	32324	30331	28867	27966	27032	26987	26166	26219
Professional, scientific and technical activities; administrative and support service activities	13649	13463	10593	9570	8683	7649	7600	8014	7871	8203	8625	9008
Public administration and defence; compulsory social security; education; human health and social work activities	43968	46716	43238	40403	35920	32859	32933	32408	31783	31941	32642	32797
Arts, entertainment and recreation, repair of household goods and other services	8835	9868	7820	6815	6879	6726	6459	6612	6469	6462	6602	6801
Total A10	213819	212391	199644	181909	168979	160237	157913	156613	154044	157526	160789	163101
Taxes less Subsidies on Products	28172	25143	26388	25120	22225	20418	20743	20645	22444	22691	23925	24355
Gross Domestic Product	241990	237534	226031	207029	191204	180654	178656	177258	176488	180218	184714	187456

NB: Light Brown fill indicates minimum yearly values over the 2008-2018 period

1. <https://www.statistics.gr/el/statistics/-/publication/SEL45/->

Of the €163.1Bil total GVA in 2019, €41.7Bil (25.5%) are accounted for by the Trade, Accommodation and Food sector of which a large part comes from tourism. The contribution of this sector is almost certainly higher as it is the sector with the highest black market activity. The Public sector is the second highest contributor with 20.1%, followed by the Real Estate (16.1%) and the Manufacturing, Mining and Energy (14.8%) sectors. The remaining six NACE sectors account for the rest 24%, with none contributing more than 5.5%. It is important to underline the fact that despite the 2009-2012 crush and the difficult years of austerity to recovery, the structure as expressed by the relative contribution of the 10 activity sectors remained almost constant over this 10 year period which shows that the necessary fundamental restructuring to a new more internationally competitive paradigm has not taken place. As a result, the economy remains vulnerable to variations of its main sectors of Trade, Accommodation and Food (mainly tourism), Real Estate (also related to tourism) and Public Expenditures.

2.2 Estimates of the lockdown impact

The full lockdown to address the COVID-19 pandemic in Greece was initiated in the period of 11-23 March by which time a notification was required for every citizen, except essential personnel of health services and law enforcement, for venturing outside. A long list of subsectors of the economy were required by decree to close down which resulted in a large number of layoff and furloughs. The economic impact of the lockdown was felt immediately especially in the small retail shops and small and very small enterprises which comprise 95% of the economy, including restaurants and coffee houses. This affected a large number of part time and freelance workers. The lockdown was extended over the Easter holiday travel and religious activities period (17-21 April). As Easter is of the same or even higher importance as Christmas in Greece and marks the opening of enterprises that operate in the March to October period with its seasonal hiring, the lockdown exacerbated further the impact to the economy.

The consumer's price index exhibited a significant drop in the month of April to ca -1.4% compared to last year's April and a relative drop of 0.5% compared to the previous month (March 2020). The evolution of this index illustrates to a large extent the specific impact of the COVID-19 crisis to a 4.7% In particular, it included a 4.7% reduction in the accommodation/housing category and an impressive 6.1% in the transport category despite the lower fuel cost compared to last year's month (more than 25% reduction for end-use natural gas and

heating oil price and 15% for transport fuels and lubricants). The index drop from its March 2020 value is also significant for these two categories of products and it is calculated at 1.9% and 2.6% respectively.

To provide support to citizens affected, some of whom live paycheck -to paycheck, as well as the enterprises that were compelled to close, the Government announced a basket of emergency measures, totaling €9.5Bil of which €1.56Bil in delays of payments, that can be summarized as follows:

1. Special subsidy of €800 (corresponding to €534 per month) to furloughed employees of enterprises and self-employed in the subsectors that were ordered to cease operation
2. Social Security and Health contributions of furloughed or laid off employees and self-employed of said subsectors to be paid by the State
3. Special support of €400 to long term unemployed and extension of the duration of unemployment benefits
4. Special support of €600 to specific self-employed professional groups (e.g. lawyers, engineers, accountants, doctors) for their reduced activity during the lockdown period
5. VAT and tax payments of said subsectors postponed by 3-6 months
6. Hiring of 3000 health professionals and increased payments to the National Health System workers
7. Support of enterprises to meet their loan obligations (with restrictions based on revenue lost) to be repaid in 5 years with one-year grace period
8. Support of the banking system from EIB liquidity to provide new commercial loans
9. Establishment of a Support Mechanism to provide load guarantees for development projects and coverage of the interest payments for three months for loans of SMEs which have not laid off personnel

The effectiveness of these support measures remains to be seen, with the Government reiterating that, in line with its step-by-step strategy, it will monitor the economy and may provide additional support in the near future as required. In the Greek National Reforms Program (2020) submitted to EC in late April 2020 under the European Semester, the Government estimates that, taking into consideration the support measures already announced, the reduction of the 2020 GDP will reach 4.7% (see Table 2-2). These estimates are based on a scenario in which the economic activity will recover to pre-pandemic levels by the beginning of the Q3-2020.

Table 2-2: Basic Macroeconomic Scenario*

	2018	2019	2020	2021
GDP (% change)	1,9	1,9	-4,7	5,1
Private consumption (% change)	1,1	0,8	-4,1	4,2
Public consumption (% change)	2,5	2,1	1	-0,9
Gross fixed assets formation (% change)	-12,2	4,7	-4,6	15,3
Exports of goods & services (% change)	8,7	4,8	-19,2	19,2
Imports of goods & services (% change)	4,2	2,5	-14,2	15,6
GDP inflation rate (% change)	0,8	-0,4	0	0,7
Unemployment (%)	19,3	17,3	19,9	16,4

* From the Greek National Reforms Program 2020

On 20 May the Greek Government announced its 2nd tranche of measures to bolster employment by assisting enterprises to retain employees and to provide liquidity to enterprises that have been ordered to close during lockdown. The new measures are in essence an enhanced version of the measures previously communicated to the EC in the National Reforms Program. In particular the measures to support enterprises include a facility to provide guarantees for loans to the business sector totaling €3Bil.

Greece is in a favorable position, for the first time in the last decade, to provide stimulus as it will not be constrained to achieve the 3.5% primary budget surplus agreed in the MoU with the Institutions in 2015. In addition, of the ca €34bil reserves which are left from the last 2015 assistance package, over €17bil are unencumbered and available for support. To this amount, one should add its share of the EU recovery package that will be agreed, including SURE and ECB and EIB facilities.

It is not clear yet how the Greek Government will make use of the forthcoming Recovery funds that have just been proposed at EU level. At the same time, other organizations which because of their role are in a position to take into account impacts in the economies of other countries of Europe or worldwide, have also provided projections of the GDP reduction. Fitch (2020) estimated the reduction at 8.7% in 2021 with a recovery of 5.1% in 2021/ The European Commission (2020) in its 6 May 2020 statement ups the reduction to 9.7%, the highest in the EU, while the IMF (2020) in its April report projects an even higher drop of 10.1% (with -7.4% and +4.7% for the Eurozone in 2020 and 2021 respectively). Both make explicit reference to the large reliance of the Greek economy on tourism (and to a lesser degree on shipping) which is

going to be hit the hardest. Both of these pillars of the Greek economy are cyclical and will most likely follow the evolution of the EU and world economy which according to IMF (Kristalina Georgieva in interview to Politico², 15 May 2020) might not return to its previous levels until 2023.

The direct contribution of tourism to the Greek economy is estimated at about €18bil (with shipping adding another €16-17bil) contributing more than 73% of foreign income from services with an equivalent amount in secondary value added in 60% of the other sectors reaching 20% of the Greek GDP. As no reliable estimates on the impact of the lockdown in tourism are currently available, but taking into consideration the fact that rules for air transport are not clear and that the spring months are already lost, it would be a reasonable guess that more than half of the tourist income will be lost, which translates into the 10% reduction of the GDP predicted for 2020 by both IMF and EC for Greece.

This severe reduction of the tourist sector activity and the restrictive terms and rules of the operation of retail stores and hospitality establishments including restaurants/coffee shops will result in increased unemployment which could even reach 25-27% levels last seen in the height of the Greek crisis of 2011-2012. This is exacerbated by the seasonal employment patterns in the tourist and hospitality sector as those employed in this sector might remain unemployed till the opening of the next season in 2021.

As the restrictions are lifted and the economy recovers, the shape of this recovery, whether it is U, V, W or even Texas

2. https://www.politico.com/video/2020/05/15/global-translations-interview-with-kristalina-georgieva-of-the-international-monetary-fund-may-15-2020-075530?utm_medium=email&utm_source=go-delivery

shaped (with a panhandle), will depend on developments in the international scale but also in the restoration of appetite for consumption, and investment both from domestic and foreign sources. In the medium to long term, the challenge for Greece is to make use of this chance for change to reform its economy and increase its competitiveness by developing other sectors of its economy, including primary

production and high technology and health services thus reducing its overdependence on tourism. It is thus imperative that a debate be initiated on a strategic medium-long term plan for this transformation of the Greek economy hopefully leading to an wide agreement, at least on the principal pillars, between the political system, business and civil society.

3. The energy sector

3.1 Supply and Demand structure

The gross inland consumption of energy in Greece follows in general the same trajectory as its GDP, falling from a high of ca 31Mtoe in 2008-9 before the crisis to a low of ca 24Mtoe by 2013 as the crisis reached its bottom, and remaining at that level since (Table 3-1). Greece imports 38,956ktoe (latest National Balance³ figures 2018) of which 33696ktoe oil and petroleum products and exports 20,572ktoe, 99% of which are oil and petroleum products from the four refineries. As shown in Table 3-1, after the very large drop following the 2010 near bankruptcy of Greece, the oil consumed in for non-electricity generation, i.e. mostly in the transport and residential sectors, has remained constant are about 10.1-10.5 Mtoe in the last years.

years as well as the fact that recovery is slow and remains coupled strongly to GDP. Sectorial consumption reached minimum in the 2012-2013 period, as did the subsectors with some exemptions such as the Non-ferrous production, namely aluminum, and Mining and quarrying which are influenced mostly by the international markets.

This impact is reflected in electricity consumption, which in 2009 fell by 3.4% in just one year and then continued falling until 2013, reaching a 14% reduction, before starting recovering in 2014; in 2017 it was only 5% lower than in 2008. It is also reflected in electricity production; however, after 2014, when more than half of the electricity produced came from lignite, the share of lignite in the power generation mix started shrinking.

Table 3-1: Gross Inland Consumption (ktoe)

Year	Oil	Oil for electricity	NG	NG for electricity	Total
2009	15788	1852	2971	1816	30341
2010	13853	1484	3234	2060	28345
2014	10760	1366	2484	1281	23256
2015	11225	1506	2677	1317	24088
2016	11396	1294	3490	2235	23655
2017	11922	1428	4204	2852	24104
2018	11433	1293	4147	2693	23500

Final energy consumption (FEC) is similar dropping from a high of ca 20Mtoe in 2008-9 to a low of ca 15Mtoe in 2013-14, and remains at that level since (see Table 3-2 - the series does not include 2019 as the national energy balance for that year will not be available until late 2020). The distribution between sectors remains in general unchanged over the 11-year 2008-2018 period, namely 18-21% for industry, 34-42% for transport, 10-14% for tertiary, 25-31% for households and about 2-3% for agriculture. If 2008 sectoral consumption is used as a basis, the 2018 sectoral FEC for industry is down to 65%, for transport to 74% (where road transport comprises consistently 85% followed by internal navigation with 10%), for households to 74% and for the tertiary sectors to 94%.

These figures illustrate clearly the effect on FEC of the economic crisis with ca 10% yearly reduction of GDP for 2-3

Even though the FEC trends presented in Table 3-2 and commended above cover the period from before the 2009 world crisis until 2018, they can reasonably be extended to 2019 as this was a year with the same growth rate and without radical changes in the structure of the economy as seen from the sectoral GVA data presented in Table 2-1.

As the electricity sector is responsible for about 1/3 of all GHG emissions in Greece (see Table 4-3 below), it is of interest to see its structure and generation trends. The total installed capacity on 31 March 2020 was 21,356MW (see Table 3-3) of which 10,861MW conventional and the rest RES. The total electricity available for consumption is seen in Table 3-3 to remain virtually unchanged over the last five years with the inland generation variation matched by counterbalancing changes in net imports.

3. <https://ec.europa.eu/eurostat/web/energy/data/energy-balances>

Table 3-2: Final Energy Consumption

(Ktoe)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Final energy consumption	20.352,2	19.656,2	18.249,2	18.081,9	16.278,4	14.668,3	14.804,1	15.741,0	15.879,2	15.720,8	15.168,8
Industry sector	4.231,5	3.462,4	3.472,8	3.322,8	2.982,2	2.835,5	3.088,3	3.128,4	3.073,1	2.762,8	2.743,3
Iron & steel	225,2	188,4	177,1	182,7	156,2	140,8	134,7	90,7	130,7	128,5	129,6
Chemical & petrochemical	262,4	224,5	194,3	173,8	100,6	111,3	161,7	222,2	153,9	121,1	130,2
Non-ferrous metals	744,4	607,4	764,5	801,5	789,9	882,3	828,2	829,2	776,1	682,4	708,4
Non-metallic minerals	1.132,8	856,3	968,9	726,9	684,6	727,1	760,3	736,4	776,3	680,5	649,6
Transport equipment	34,9	34,1	25,6	37,5	17,0	12,1	20,2	21,2	15,5	18,3	22,2
Machinery	67,3	12,2	18,9	45,8	24,4	26,5	36,4	36,6	29,6	49,9	64,8
Mining & quarrying	91,2	76,9	59,4	33,9	64,2	74,2	75,4	87,3	80,5	90,9	115,3
Food, beverages & tobacco	658,2	618,3	580,5	595,4	539,9	470,3	522,8	523,0	445,2	423,6	459,7
Paper, pulp & printing	139,8	123,0	121,5	91,9	95,8	97,9	98,6	83,3	47,9	48,4	54,2
Wood & wood products	51,5	43,9	48,2	54,6	37,5	29,1	24,6	30,7	23,2	27,1	41,5
Construction	152,0	150,5	128,3	87,7	52,9	86,1	151,0	127,7	128,7	165,2	152,7
Textile & leather	169,4	93,5	88,9	76,3	46,2	43,5	32,9	31,3	41,2	38,0	98,7
Not elsewhere specified (industry)	502,4	433,3	296,7	414,9	373,2	134,4	241,5	308,9	424,3	288,8	116,3
Transport Sector	7.521,5	8.278,1	7.352,3	6.602,1	5.512,1	5.608,8	5.635,5	5.753,4	5.897,0	5.815,3	5.903,9
Rail	44,4	38,3	24,3	20,2	30,3	27,2	57,9	59,0	56,5	55,5	54,6
Road	6.505,1	7.055,9	6.361,5	5.833,6	4.727,6	4.956,2	4.925,4	4.976,1	5.092,7	4.992,1	5.009,0
Domestic aviation	352,9	290,7	237,2	221,8	187,0	176,7	179,8	167,4	189,0	195,2	222,2
Domestic navigation	599,1	880,7	717,1	515,6	525,2	430,5	449,1	534,3	556,8	570,6	615,7
Commercial & public services	2.230,1	2.153,7	1.957,4	1.870,1	1.935,3	1.820,6	1.714,0	1.874,9	2.037,5	2.191,7	2.095,3
Households	5.270,4	4.887,5	4.666,5	5.526,0	5.096,0	3.821,3	3.844,9	4.460,6	4.348,7	4.413,3	3.916,7
Agriculture, Fishing & forestry 1	1.098,7	874,6	800,2	669,1	316,0	323,9	280,6	271,3	283,4	303,6	279,2
Not elsewhere specified (other)	0,0	0,0	0,0	91,7	436,7	258,2	240,9	252,3	239,4	234,0	230,5

NB: Light Brown fill indicates minimum yearly values over the 2008-2018 period

3.2 Recent developments

The revised version of Greece's NECP (initially drafted in late 2018) was published by the Greek Government in late December 2019, after public consultation until mid-December

2019, featuring more ambitious targets for climate change mitigation, with implications for most economic sectors. Among others, this revised NECP aims to reduce energy consumption by promoting energy efficiency measures

Table 3-3: Electricity Generation (GWh) and Power (MW)

Year	Lignite	NG	Hydro	Oil	RES	Distributed Generation	Net Imports	Consumption
2015	19418	7267	5391	4571	6031	4714	9609	57001
2016	14898	12512	4843	4627	6519	4734	8796	56929
2017	16387	15397	3457	4927	6834	4730	6237	57969
2018	14907	14136	5051	4579	7328	4732	6279	57012
2019	10418	16228	3361	4589	8150	4995	9944	57685
Power (2020)	3904	5200	3170	1757	7192			

in households; achieve rapid penetration of electric cars in the transportation sector; and proceed in the longer run to interconnecting most Greek islands to the mainland electricity grid. Most importantly, the plan appears to focus on a complete lignite phase-out by 2028, with potentially positive effects on the Greek economy.

For the Greek energy sector, this year is therefore meant to be quite critical in order to allow the smooth and efficient evolution and transition of the energy system, as described under the NECP, with a number of important milestones to be met. In particular, in the electricity and gas sectors

- The launch of the new electricity market model is planned, expected to increase the competition at the wholesale and retail electricity market
- The electricity market coupling with Italy is to be activated
- A new licensing framework for Renewables is expected to be in place in order to accelerate the currently lengthy and heavily bureaucratic procedure
- Legislation for the operational and remuneration framework for RES hybrid plants and for the relevant framework for storage plants in the electricity market is to be submitted to Parliament
- The lignite decommissioning plan is to be initiated by also presenting a comprehensive development master plan for the regions in transition. Since the shutdown of the lignite plants is expected to severely impact employment and local economies, as part of a just transition, funding is to be made available for these communities to transform their economy and development model and maintain social cohesion (Nikas et al., 2020).
- The first phase of the interconnection of the island of Crete is to be concluded
- The amended long-term development plans of the

electricity transmission and distribution Operators, considering the new policy priorities for energy infrastructures under the NECP, have to be approved paving the ground for an increased number of investments at energy infrastructure level

- The privatization plans for the Electricity Operators and the Public Natural Gas Company is to be concluded
- the conduction of various market tests for gas terminals and hydrocarbons sites exploitation that could lead to significant investment decisions are to be carried out

In this context the RES share in Greece, continues to increase at steady pace, leading to an overachievement of the national binding EU target of 18% by possibly 2% to 20% by the end of the year. Especially in the electricity mix, the RES share is expected to exceed 30% by the end of 2020. In terms of RES investments, last year was a record year for the domestic wind sector (>700MW, i.e. four times more new yearly installed capacity than average), while almost 1.1GW of RES projects have been awarded license to operate during the 2019 RES auctions.

Currently a high number of RES applications of cumulative capacity of over 10GW, has been submitted to RAE for approval during the last two years, with large PV plants to have the predominant share on capacity basis. Similarly, almost 2GW of PV applications of small to medium size have been filed to the DSO for acquiring connection offers. This vast number of new RES (mostly PV) applications is expected to lead to an increased congestion at local grid level and to a strong competition in future RES auctions. However, currently the licensing maturity of PV projects above 10MW remains at very low levels and therefore PVs awarded capacity in 2019 and most likely also in 2020 for this category of projects, will remain below the foreseen annual targets of 300MW (600MW cumulative target for years 2019-2020).

The lignite decommissioning plan is also driving ahead private investments for new CCGT natural gas power production plants (814MW under construction with an additional 2400MW with production licenses) and this year's system adequacy study from the TSO that also integrates the NECP projections and policies, refers to the need of more than 1GW new gas capacity until 2025.

3.3 COVID-19 effect

3.3.1 Energy supply

The COVID jolt started affecting the Greek energy sector in March so relevant quantitative information to gauge its magnitude is just starting to come in. Overall, as a result of consolidated quarantine measures and reduced economic activity, the electricity demand during the period March to May decreased. Even though the lockdown was put in place over the 11 -23 March period, the first clear indication of impact is seen in the electricity sector (see Figure 3-1) already in March and with increasing rates in April and a maximum drop of 26% in week #16 and a gradual recovery in the following weeks to 13% in week #19 when the first relaxation of measures was announced⁴. It is noteworthy that in that week, lignite electricity production was zero, a first since 1953. Similar demand patterns are also seen in other countries.

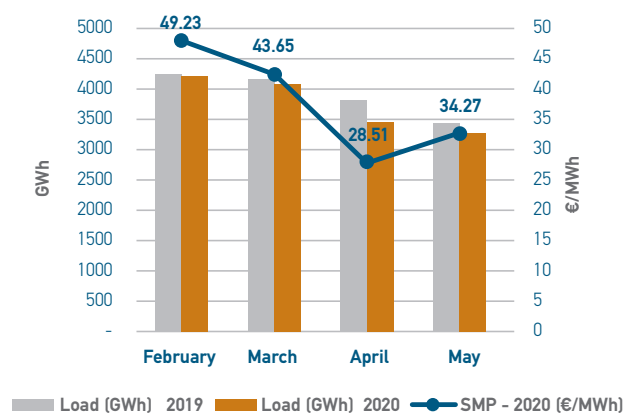


Figure 3-1: Electricity consumption in the mainland grid and System Marginal Price in 2020

Specifically, compared to the corresponding month of 2019, the reduction in the total electricity demand in the mainland was 2,1% on March, 9,8% on April and 6,9% on May. The impacts of the quarantine measures were higher at the high voltage level, with a reduction of almost 11% on March, almost 23% on April and 16% on May compared to the corre-

sponding months of 2019. On the contrary, the impact was lower for the Low and Medium voltage level, since the consumption remained almost stable for March (0,3% increase) while the reduction on April was 6,9% and 4,5% on May. The cumulative reduction of electricity demand nationwide in the period March to May, compared to last year's period is estimated at around 0.8-0.9TWh, while for the January to May period there is an overall reduction in electricity demand in the mainland of 4,3% compared to last year's period.

The very low electricity demand drove electricity prices downwards. The average System Marginal Price (SMP) of March decreased by 5,58 €/MWh compared to February, and by 16,22 €/MWh compared to March 2019. The decrease of the average SMP continued during April, with a further reduction of 15,14 €/MWh compared to March and 33,89 €/MWh lower than April 2019. It must be stressed that the average SMP of April 2020 is the lowest average SMP of the last four years, while also a number hours of zero SMP occurred due to long periods of high wind generation. During the 1st week of May, while still in lockdown, the average weekly SMP remained low at 27.47 €/MWh, but as the coronavirus mitigation measures relaxed, it recovered resulting to a monthly average SMP of 34.27 €/MWh. This resulted in an increase of 5,76 €/MWh compared to April, but still a very high decrease of 31,64 €/MWh compared to last year's May.

The electricity price decline, besides the decreased demand, can be attributed to the high generation of RES units, and the decreased variable cost of the CCGT units because of the low prices of LNG in the terminal of Revithoussa. As a side effect, in week 19 (4-10 May 2020) and 21 (25-31 May) there was no lignite production notified in the day-ahead market of electricity, and on 8 June 2020 there was zero a first since 1953 when the first lignite power plant went on line in Greece.

Provided that a second wave of COVID-19 in the Fall does not force a second lockdown, one can envision a scenario in which a drop of 10% in April and 5% in May is followed by a mainland grid demand recovery but also by 10% reduction in the islands for the summer months, leading to a marginal residual reduction till the end of the year, then an estimate for a weighted reduction factor of less than 5% in electricity demand nationwide would lead to 51-52TWh electricity consumption in 2020.

Similarly to the electricity consumption, a significant drop in the consumption of oil products in the transport sector was observed, whereas specifically for the road transport an overall 35% reduction was observed during the period

4. Data of electricity demand in the interconnected system (i.e. excluding the non-interconnected islands)

from February to April⁵ and if compared to the corresponding month of the previous year this reduction reached 41% in April. On the other hand, because of the collapse of the oil prices the retail price of the heating oil was reduced by almost 30% leading to off-season record sales, meant to be used in the next winter season (see Figure 3-2 below).

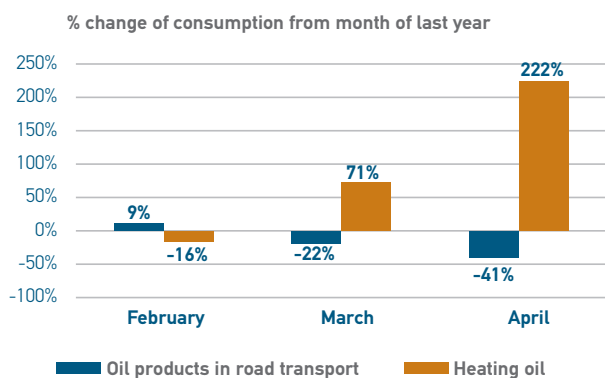


Figure 3-2: Comparison of 2019 and 2020 consumption of oil products (2020 preliminary data)

3.3.2 Energy demand

The COVID-19 jolt is also expected to affect the sectors of final energy consumption in the short and medium term. This section provides a rather qualitative assessment of these effects, focusing on the total level of final energy demand per sector of the energy system as well as on structural changes related to the role of sub-sectors, modes, energy uses and the fuels used in each sector.

Residential sector



The lockdown of the economy has resulted in a significant portion of the workforce staying at home and working through telework. Also, for almost 2.5 months the schools were closed, and the students continued their education through distance learning. As a result, energy consumption in residential buildings during this period is expected to increase due to the equipment used for telecommunications and the extended usage of other equipment (e.g., for heating, cooling, ventilation, lighting, cooking) to support a longer stay of the members of households at home. These effects are expected to be mitigated in the short term as employees return to work and students to their schools.

Low oil prices acted as an incentive for a significant num-

ber of households to purchase and store heating oil for the next winter season (October 2020-April 2021). It is worth noting that the subsidized period of heating oil, which starts in October and expires at the end of April each year, has been extended twice to 31 May 2020 in order to cover the increased demand. Therefore, the reduction in household income expected due to rising unemployment and wage cuts attributed to the COVID-related economic recession, will mainly affect households' energy demand for heating in the medium-run, after the depletion of the available heating oil reserves, most likely by 2021. It should be noted that in the residential sector in Greece about 64% of total energy consumption is related to space heating, of which 54% is used in central heating systems.

A third dimension of COVID's impact on household energy consumption has to do with the use of air conditioners. According to the health guidelines, the operation of central air conditioning systems that recirculate air (usually installed in buildings of the tertiary sector) should be avoided. This has created confusion in households, the majority of which plan to limit the use of air conditioners to only very hot days, resulting in a reduction in electricity consumption in the short run. However, this reduction could be mitigated by inappropriate use of air conditioners (e.g., by keeping the windows open). As many of these households also use air conditioners for space heating, it is possible that they will restrict their usage during the winter period in favor of other technologies and fuels.

Concluding, energy consumption in residential buildings is expected to increase in the short term, while energy consumption trends in the sector are more uncertain in the medium term.

Tertiary sector



The COVID effect is undoubtedly expected to contribute to reducing the sector's energy consumption, both in the short and medium term.

During the lockdown period, a significant part of the companies in the sector either did not operate at all or operated through teleworking, which resulted in a significant reduction in energy consumption. As the economy re-opens, energy consumption in the sector will begin to rise, but is expected to remain at considerably lower level than in previous years, as tourism activity in summer and associated business are expected to decline. Assuming that the energy intensity in the sector remains unchanged, a 10% reduction in GVA during 2020 will result in reduced energy

5. On the basis of preliminary data

consumption by more than 200 ktoe, mainly as electricity.

Given that space heating/cooling is a key energy use of the sector, which is done mainly through central air conditioning systems and heat pumps, it is uncertain how and to what extent the health guidelines regarding these systems that recirculate air will affect their level of usage and related electricity consumption.

Transport



COVID effects on transport will be multifaceted.

During the lockdown, the restriction of travel resulted in a reduction in energy consumption in all means of transport.

In the coming months, the significant reduction in tourism activity in the country and particularly in the number of foreign visitors is expected to reduce energy consumption for both aviation and inland navigation. Road transport is also expected to be affected to some extent by declining tourism activity, however low fuel prices and the avoidance of public transport due to health risks are likely to lead to increases in transport activity realized by private cars and in the related energy consumption.

In the longer term, the reduction in household income and the increased role of teleworking may lead to a reduction of the total amount of transport work.

Industry



The conditions during the lockdown created business opportunities for some sectors (leading to increased production) and losses for most industrial sub-sectors as production declined accompanied by a commensurate energy consumption.

An increase in energy consumption though is expected in the coming months as the economy recovers. To the extent that the prices of fuels and CO₂ emission allowances will be maintained at relatively low levels, they may signal a further increase in energy demand and a delay in the implementation of energy saving programs.

In the medium term, industrial production may be affected by the reductions in household purchasing power (as happened during the economic crisis) resulting in lower energy demand.

Assuming that the energy intensity in the sector remains unchanged, a 10% reduction in GVA during 2020 will result in reduced energy consumption by approximately 300 ktoe.

4. The GHG emission profile

4.1 National Inventory

Emissions in Greece in the period since the 1990 FCCC base year have been rising till 2005, a base year for a number of EU targets, and declining since. An overview of the total emissions evolution is provided in Table 4-1 following taken from the latest submission⁶ (April 2020) of Greece to UNFCCC.

Total emissions are seen to increase gradually from 103.3 MtCO₂eq in 1990 to a maximum of 136.5 MtCO₂eq in 2005

74% in the last five years. Of the other three sectors in the inventory, waste emissions have remained virtually unchanged at about 4.7 MtCO₂eq, as have those of the agriculture sector at about 7-7 to 7.9 MtCO₂eq. Finally the Industrial Processes and Product Use (IPPU) sector exhibits a trend similar to the overall emissions increasing from about 11MtCO₂eq in 1990 to a maximum of 16.4 MtCO₂eq by 1999 and declining back to 11-12MtCO₂eq in the last ten years till 2018. It is thus worth

Table 4-1: Total GHG Emissions by Sector (ktCO₂eq)

Year	Energy	IPPU	Agriculture	Waste	Total	LULUCF
1990	77026	11277	10140	4864	103309	-2107
1995	81091	13603	9488	5151	109332	-2872
2000	96797	15193	9147	5356	126492	-1941
2005	107297	15432	8959	4758	136446	-3301
2006	106000	12748	8862	4929	132540	-1463
2007	108239	13185	8994	4767	135171	-1463
2008	105340	13002	8737	4767	131846	-2955
2009	100363	11271	8518	4488	124640	-3043
2010	93155	11760	8839	4769	118522	-3043
2011	92036	10424	8596	4537	115593	-3131
2012	88304	11245	8405	4409	112323	-3086
2013	77926	11966	8405	4409	102705	-1582
2014	74491	12328	7990	4468	99277	-126
2015	71190	11995	7846	4451	95482	-3719
2016	66966	12503	7856	4515	91840	-3473
2017	70259	12794	7888	4646	95586	-3209
2018	67307	12387	7781	4746	92222	-2978

and to decrease to a minimum of 91.9 MtCO₂eq in 2016 at which level they remain till 2018. The energy sector, which in UNFCCC inventories include energy related emissions of the transport, as well as of the industry and residential/tertiary sectors, accounts for close to ¾ of the emissions with its share ranging from ca 75% in the 1990-2000 decade up to ca 80% in the 2004-2013 period with a gradual return to ca 73-

focusing in the energy sector emissions in view of their major contribution and their volatility.

In Table 4-2 below, the breakdown of the IPCC energy sector is provided. The energy industries subsector which comprises mostly the electricity generation activity is seen to account for more than 50% of the energy sector in the 2000-2010 period and about 47% in 2011 down to 42% in 2018 of total emissions.

This is also made clear by examining the latest (April 2020) EU

6. <https://unfccc.int/ghg-inventories-annex-i-parties/2020>

Table 4-2: Energy Sector (IPCC) Emissions

CO ₂ eq (Mton)	2011	2012	2013	2014	2015	2016	2017	2018
Energy Industries	55,01	55,76	50,28	46,79	41,70	37,57	40,58	38,89
Industry	4,98	5,52	5,28	5,46	5,24	5,35	5,78	5,11
Transport	20,06	16,69	16,52	16,50	17,05	17,38	17,18	17,40
Other sectors	11,21	19,58	5,17	5,08	6,49	6,06	6,10	5,36
Others	1,24	1,31	1,18	1,13	1,02	0,77	0,84	0,76
Total	92,50	98,86	78,44	74,96	71,49	67,13	70,48	67,51

ETS verified emissions, which are presented in Table 4-3 next. Of the 38.9MtCO₂eq emissions of the energy industries sector in 2018, fully 33.5 MtCO₂eq are the result of electricity generation, to which one should add an additional ca 0.9 MtCO₂eq coming from fugitive emissions (mostly CH₄) at the lignite min

The continuous decrease of the energy sector emissions is reflected in the total emissions. The large drop in 2016 is due to the almost doubling of the electricity produced by NG

accompanied with a similar decrease of lignite production that was due to the very large drop in NG prices. This was reversed in 2017 as NG prices went up, while in 2018 emissions dropped again as the very large increase in the EU ETS allowance price resulted in a decrease of lignite production. The drop continued at an accelerated pace in 2019.

Whereas the electricity sector emissions dropped by over ca 35% in the last 10 years, the second larger contributor, the

Table 4-3: ETS Verified Emissions

(tCO ₂ eq)	No of units	2010	2015	2016	2017	2018	2019
Lignite	9	35.615.245	29.404.777	23.127.444	25.592.109	24.141.421	17.458.805
NG	11	2.949.333	3.684.139	5.585.659	6.553.222	6.012.912	6.720.643
Oil	20	3.661.240	3.484.773	3.502.571	3.660.999	3.373.380	3.430.795
Electricity	40	42.225.818	36.573.689	32.215.674	35.806.330	33.527.713	27.610.243
Cement	8	6.834.499	5.522.819	6.046.896	5.659.893	5.467.143	5.347.551
Iron	5	247.489	99.455	100.698	110.218	114.208	107.614
Refineries	4	4.017.632	5.517.482	5.879.297	5.468.660	5.786.481	5.364.430
Comb & Elect rest	25	187.099	537.811	244.434	252.010	224.209	199.497
Alum	1	-1	95.007	89.322	97.309	105.905	106.792
Ceramics	38	237.747	72.077	64.638	79.607	93.167	98.489
Paper	14	143.769	108.762	75.598	71.114	68.535	70.499
Glass	1	47.679	47.258	47.843	48.556	48.441	47.028
Ferrous metals	2	658.912	836.501	821.343	833.586	758.785	672.897
Ammonia	1	-1	-1	167.912	287.703	267.540	244.958
Non-ferrous	1	-1	24.713	20.736	20.171	22.174	21.551
Mineral wool	1	-1	5.346	10.446	15.852	16.446	13.569
Lime	20	323.628	445.745	524.957	511.132	604.709	570.864
Total - ETS	161	54.924.268	49.886.664	46.309.794	49.262.141	47.105.456	40.475.982
Total - National		118.436.490	95.330.370	91.697.730	95.420.780	92.221.660	N/A

transport sector emissions, has decreased much less (ca 15%) because of the very slow renewal of the fleet and the very small utilization of rail and other public transport.

4.2 COVID-19 effect

The reduction in economic activity will result in a reduction of emissions. Looking at the main IPCC categories, no reduction should be expected in the Agriculture and Waste ones. In the Energy category reduction is expected in the electricity sector due to demand decrease as discussed above but also due to reduced load factors of the lignite plants in view of the very short duration of the ETS allowance price dip (see Figure 4-1) and the very large drop in system marginal price (SMP). Taking an average emission factor of $0.75\text{tCO}_2/\text{MWh}$ (down from $0.84\text{tCO}_2/\text{MWh}$ to account for the continuing contribution of lignite to the generation mix) the reduction of demand by 2-2.5TWh in 2020 will lead to a reduction of about 1.5-1.9MtCO₂ GHG emissions from the electricity sector. If the short-term effect of the lockdown estimated at about 1.5MtCO₂ is subtracted, the rest 1MtCO₂ that reflects a lower consumption pattern in specific economic activity sectors as well as pressure in private consumption as unemployment increases and disposable income decreases, may persist for the next 1-2 years.



Figure 4-1: EU ETS weekly allowance prices up to Week 22 [1-5 June]⁷

The lockdown also affected the transportation emissions, both of GHG and other pollutants. In fact, the surface transportation sector's emissions can be very responsive to policy changes and economic shifts. Globally, surface transport accounts for nearly half the decrease in emissions during

confinement, and active travel (walking and cycling, including e-bikes) has attributes of social distancing that are likely to be desirable for some time (Kissler et al., 2020) and could help to cut back CO₂ emissions and air pollution as confinement is eased.

In the IPPU category, more than half of GHG emissions come from the contribution of F-gases which are not expected to be affected noticeably by the lockdown. The rest, mostly process emissions in the cement and lime industries which supply the construction sector, are expected to be affected by the downturn of the overall economic activity but in particular of tourism whose infrastructure upgrading and enlarging comprised pre-COVID a large percentage of construction. If the long-term effect of COVID-19 on tourism persists, one should reasonably expect a 5-10% reduction in emissions from this category.

Taking all currently available information including the analysis in both supply and demand aspects of the energy sector presented in Section 3 above into account, an overall estimate of changes in emissions in the medium term till 2022 can be compiled and is presented in Table 4-4.

In summary, a noticeable reduction in emissions should be expected in 2020. In the medium (ca 2021-2023) to long-term horizon, a reduction of GHG emissions in Greece from the COVID-19 lingering effects, can be expected, mostly from a more permanent reduction in transportation activity - as on-line work increases and tourism travel decreases - which will be proportionate with the changes, direct and indirect, in the tourism industry and in work patterns.

7. <https://www.investing.com/commodities/carbon-emissions-streaming-chart>

Table 4-4: 2018 GHG Emissions and 2020-2021 Trends

(ktCO ₂ eq)	2018	2020	2021
Energy	67307		
Energy industries	38267	↓ ↓	↓
Manufacturing	5125	↓	↓
Transport / road	14782	↓ / ↑	↑
Transport / aviation	425	↓ ↓	↓
Transport / navigation	2111	↓ ↓	↓
Residential	4220	↑ ↑	↑
Services	684	↓ ↓ ↓	↓
Agriculture	512	~	~
IPPU / Industrial	6440	↓	↓
IPPU / Product uses as substitutes for ODS	5944	↓ / ↑	↑
Agriculture	7782	~	~
Waste	4746	~	~

NB: In assessing the short- and medium-term evolution of GHG emissions in Greece compared to 2018 levels a qualitative scale with 3 grades per direction – increase or decrease – has been used

5. Effects on the NECP trajectory and PAMs implementation

In general, the effects of managing the COVID-19 pandemic on the planning and implementation of the Greek NECP do not seem to be significant.

Looking at the major project of de-lignitization of the electricity sector, its ambitious schedule seems to be unaffected as the Anytaio plant is expected to close down in September 2020 and the remaining Kardias-3 and Kardias-4 in 2021. These last two Kardias units are actually already out of operation till the Fall when they will operate primarily to provide district heating to the Municipality of Ptolemais. Furthermore, work at the Ptolemais V plant under construction continued with only limited delays and the unit is still expected to go on-line in early 2022. At the same time, PPC announced on 17 May 2020 a voluntary early retirement plan for 1000 personnel employed in the lignite mines and plants who are within five years of retirement, which includes a €20k bonus in addition to the €15k severance payment. Of the ca 650 personnel in total of the Amyntaio mine and plant, those not eligible for early retirement are offered the opportunity to relocate to other PPC facilities.

The shutdown of various lignite plants will give rise to job losses and overburden local economies, which are heavily dependent on the operation of these plants. A just, low-carbon transition should support local communities and entail investments in clean sectors and technologies, respect labor rights, and be based on social dialogue among all affected. To manage such a just transition, a new Special Office for Just Transition was established on 2 March 2020 within the Ministry of Environment and Energy which on 15 May 2020 presented⁸ a strategy that is based on:

- Promoting the employment of the unemployed and the self-employed and the adaptability of workers and businesses
- Dealing with social implications and strengthening social cohesion
- Preparing for economic and production diversification, (including in primary sector)
- Enhancing entrepreneurship and attracting investment
- Restructuring of the energy sector and rationalization of the utilization and use of environmental resources.

- Promoting urban renewal and sustainable urban mobility.
- Providing scientific and technical support for preparing and maturing projects

At the same time, an increase of the National Just Transition Fund resources was promised to match the Greek share of the European Just Transition Mechanism which is part of the European Green Deal. Furthermore, the tax rate of new enterprises that open in the lignite regions will be reduced by 5% for the first five years of operation and social security contributions on new hires will be reduced substantially⁹.

The effects on the RES capacity auctions also seem to be small. The 2 April 2020 auction went on without any hitches with almost all the amount covered (502MW of 508MW on auction, a record of RES auctioned capacity per round) fetching once again lower bids of €49.1/MWh to €54.8/MWh. Of the 502MW, only 138MW were wind and the rest PV. Furthermore, RAE announced that the next auction is scheduled for 27 July 2020 for 482MW wind and an additional 482MW PV.

The partial shut-down of activity including of public authorities and of travel had an effect on the progress of RES project development and construction. The Government extended deadlines for permitting submissions and grid connection as well as the applied remuneration reference values, by three to six months and the duration of the construction workers lockdown was kept to a minimum of a little over a month, so delays overall have been limited and are not expected to exceed three to six months and overall not to jeopardize the commissioning of new RES plants.

Until now there have been no significant effects in the clearance and the settlement of the energy markets because of the pandemic situation. Moreover, the operating aid payment of the RES producers from DAPEEP (i.e. the Managing Body for RES and GOs) have been streamlined and no payment delays are currently observed.

However, a major postponement in the energy sector operation did occur during this period. Specifically, the full operation of the target model was put on hold, since the pilot operating period that was to start in April in order to jointly operate the spot and balancing markets and to familiarize participants with the software and procedures was not met,

8. Chair of Special Office Mousouroulis' press conference, 15 May 2020

9. Prime Minister's press conference, 5 June 2020

and subsequently the go-live day planned for end of June has been postponed. Probable date for the pilot period is now July–August with the new planned go-live day to be shifted for mid-September.

Other electricity market mechanisms like the interruptibility scheme and the transitory flexibility remuneration mechanism are still pending since their approval from the relevant EC services has not been yet concluded and for this reason criticism from market stakeholders arose. The operation of the financial forwards products in the electricity market was also initiated by the Hellenic Energy Exchange, during March, but with almost zero interest from the market participants, mainly due to the impact of the pandemic situation to the electricity demand and the collapse of the spot prices and the market uncertainties for the next period.

Greek banks do not seem, due to waivers of the European Central Bank, to be facing liquidity problems. Yet, the very large percentage (<40% of €170bil in total) of non-performing loans which was declining from 2016 on might start increasing again as the tourism downturn affects the private sector. This might result in a decrease of their net worth at the end of the year which if it goes negative will require under present law infusion of new capital by the State. Presently, no discernable delays in approving new loans for RES ventures or increased interest rates have been noticed but bank appetite might change as the balance between risk and State provided guarantees is being gaged. Notably, during the lockdown measures, all the main Greek commercial banks through public statements declared their willingness and commitment to continue financing RES projects.

During the lockdown process, no standstill in the formulation of new energy-related legislation was observed, a very positive development. On the contrary, significant legislative acts, highlighted in the NECP as policy priorities, namely for the streamline of the RES licensing process, the simplification and acceleration of the environmental permitting process, the definition of the priority criteria for granting connection offers to RES plants, as well as the process for the revision of the Energy Building Regulation were formulated and legislated.

Similarly, energy infrastructure works continued almost as planned in both electricity and gas networks and no significant delays are expected for the conclusion of ongoing grid projects.

In addition, RAE on 15 May 2020 announced the results of a study regarding configurations and costs for increased storage capacity in view of large RES stochastic contributions in the future. The results of the indicate that in the NECP RES

penetration scenario (65% by 2030) with PV and wind installed capacity of 15700MW the recommended storage that achieve the highest cost benefit if contribution to adequacy is considered, is of the order of 1500MW with about 500MW batteries (of 10-100MW for 4h) and the rest pumped hydro. However, RES curtailments even with smaller storage capacities remain quite low and if such storage capacities are deployed the overall curtailment of PV and wind generation is estimated below 1%. The presented findings are similar to the projections foreseen under the NECP for both storage capacity and stored energy until 2030. At the same time, the Secretary General for Energy announced¹⁰ the convening of a Working Group to look at all legal aspects for the facilitation of investing in storage facilities. The Ministry also intends to proceed to an individual notification to DG Comp for the pump-hydro storage plant of Amphilochoia (of 670MW capacity), a PCI nominated project, foreseen under the NECP to be in operation by 2025.

One of the side effects of the April–May drop in electricity demand and high winds during the same period was the increased RES share in the daily load and therefore the opportunity for the TSO to manage high penetrations of RES for consecutive hours and gain valuable experience for future use. In this context, the 1 May 2020 event should be note when for four consecutive hours (1500 to 1800h) the SMP was zero resulting in non-payment of operating aid for the energy produced by RES plants with CfD contracts.

In this context, it has been announced that in Q2 of 2020, RAE will present a new incentive-base regulation for the Operators (starting with the DSO) for the formulation of their regulated return, including in this methodology possibly targets for RES grid integration, grid losses and upgrade measures for the management and control of the grid system.

The national electromobility plan was presented on 5 June 2020 and is planned to be legislated during summer. This legislation aims to streamline licensing of charging stations, ensure standardization and provide incentives (i.e. subsidies, tax rebates and others) for purchases or leasing of electric cars and other types of vehicles as well as for production facilities for the electromobility sector (see section 6 for more details). Some incentives, including a 30% subsidy for the installation of a charging station, are already (since December 2019) in place.

Energy conservation programs from Community funds also seem to not be affected drastically. The very popular and oversubscribed “Exoikonomo kat Oikon” (Saving at home)

10. Secretary’s General for Energy press conference 12 May 2020

program for energy upgrading of residences (2nd phase) with an overall budget of ca €295mil of which €241mil public expenditure continues without noticeable delays with expectations to service all applications already approved by the Fall of 2020. Planning for a 3rd phase is also on the way with its launch scheduled for this Fall with a budget target of €350m according to Ministry announcements. Similarly, the intended flagship program for energy renovation of public buildings through the provision of energy services by the market, called ELECTRA, while still under design, is

estimated, according to Ministry sources to be put out for procurement during the summer or early Fall. At the same time, measures for upgrading commercial buildings including hospitality establishments will most likely be postponed as a number of hotels and restaurants might not open at all this year. In any case whatever delay may occur is expected to be handled as the relaxation of rules of the use of Community funds can be made use of. Also, a number of projects already approved may be carried over to the next period 2021-2027.

6. Measures to relaunch the economy and Green component

6.1 Measures announced by the Government

The Greek Government approached the twin health-economic crisis in a step-by-step manner. This meant that following the advice of epidemiology experts, economic activity was shut down early followed by a complete lockdown with fully enforced rules for movement. This included the Easter holiday period. Support for businesses affected and their employees initially took the form of a cash payment to workers of €800 to cover loss of paycheck income and postponement of some taxes, VAT payments and selected loan obligations for enterprises. According to Government pronouncements the emphasis was on containing a surge of layoffs, permanent or temporary or conversion of full to part time employment and the associated loss of income especially in the lower income groups who do not have adequate savings to fall back on. The actual amount of this first basket of measures announced in late March is not known with any accuracy but it is estimated to be of the order of €3.5bil of direct assistance. A second basket of stimulus was announced on 21 May¹¹ which is much more comprehensive and of a much larger amount which might reach €27bil if leveraged, and it is targeted on providing "solvency" support.

The main measures include:

- Continued support to cover income losses to employees who will be furloughed or have their working hours reduced
- Reduction of VAT rates for sectors directly affected such as hospitality and transport
- Postponement of payment of VAT and selected taxes for up to 6 months
- Loans to SMEs with zero interest for two years
- Guarantees of loans to small and large enterprises
- Reduction of prepayment of taxes of enterprises by 50%

At the same time the Hellenic Private Asset Development Fund, which is called to support a number of the measures announced recently developed with assistance from EBRD a ESG Rating tool to help enterprises evaluate their sustainability and exposure to environmental risk and so as to gage their eligibility for loans.

11. Prime Minister's Address to the Nation, 21 March 2020

Of particular interest are the measures announced by the Ministry for Development¹² for the support, mostly by providing loan guarantees and loans with very attractive terms to SMEs, of enterprises active in the energy sector including critical infrastructures or in circular economy, expected to reach €3.7bil with leverage.

The measures are designed to serve the following six overarching targets, namely to:

- improve the business environment.
- transition as quickly as possible to an economy of low environmental footprint.
- digitize manufacturing companies.
- stimulate competitiveness.
- develop modern skills in human resources.
- assure safety and health of workers.

Specific measures also announced include:

- The proceeds from the sale of the 49% share in the electricity DSO and the sale of the NG TSO to go for the upgrading and expansion of the electricity and NG grids respectively
- Support for RES investments from the Greek Investment Bank to the tune of ca €400mil to attract €600mi of private equity so as to possibly reach €3bil by leveraging.

The measures to boost R&D also announced¹³ on 21 May 2020 include mainly tax reductions through increasing deductibles of R&D expenses of enterprises from 130% to 200% as of 1 September 2020, but with no new state funds for R&D to research institutes and universities, which have not increased in the last years (hovering around 1040mil as opposed to the private sector expenditures which went from €643mil in 2015 to €1049mil in 2018) . These measures are not in line with the modest target of reaching 1.81% of GDP by 2030 (from 1.3% in 2020) included in the National Reforms Program.

The Ministry of Environment and Energy also announced that it intends to notify to the EC services the extension of the

12. Minister's for Development Georgiadis press conference, 21 May 2020

13. Deputy Minister's for Development Dimas press conference, 21 May 2020

RES auction scheme. However, this announcement came without releasing any further details about the structure and frequency of the future RES auctions. The extension of this scheme is very crucial for the domestic RES market as an absence of a clear framework for post 2020 creates reduced investment visibility and increased risks. Similarly, regarding two other significant topics for the development of new RES investments in Greece, it has been announced that although the conclusion of the RES licensing framework reform in order to streamline and accelerate the licensing is aimed for 2020, but with a foreseen delay for the adoption of the new special RES spatial framework for mid-2021.

Under a framework agreement signed between the Ministry of Environment and Energy and the Technical Chamber of Greece in April 2020, the National Building Regulation is to be revised by the end of this year, and go into effect by mid-2021 so as to initiate the transition to nZEBs. Under the same framework agreement, new guidelines and schemes for the certification of the energy auditors are also to be developed.

Finally on 5 June 2020, a set of measure totaling €100mil to increase electromobility was announced¹⁴. They include subsidies for the purchase of electric private cars (15%), taxis (25%), scooters and bicycles, free parking and reduction of taxable income of 50-70% for commercial vehicles. In addition legislation to streamline licensing of charging stations will be brought to Parliament soon.

At the same time, an additional basket aiming at full recovery of the economy may be provided later if needed, in line with the step-by-step approach and funded by the Greek share of the €750Bil "Recovery" Package proposed by the EC on 29 May 2020, which may amount to ca. €32bil. Guidance for priorities and structure for the utilization of this Package is to be provided by a Committee of economists headed by Nobel Laureate Prof. Pissaridis who are to report by the end of summer.

6.2 Proposals from other Parties

On 25 May 2020, **Syriza**, the main opposition party announced its proposal¹⁵ for the recovery phase stimulus package. It also announced that they are working on a proposal for the medium term which aims at redirecting the economy to a new "sustainable economy of needs". Its "solvency" period proposals aim at:

- maximum support for employees and businesses,
- maximum mitigation of the effects of the recession,
- minimum possible increase in the debt-to-GDP ratio

The Syriza proposal includes measures for the health sector (€1bil), tourism (€600mil), employees' salary support (€3.7bil), emergency income support (€1bil), agriculture (€230mil) and support for enterprises (ca €22bil) for a total of €47bil to be financed by SURE (€1.5bil), ECB (€12bil), EIB (€3bil), Government borrowing (€4.5bil) and use of reserves of ca€20bil. The enterprise support includes forgiveness or postponement of VAT and social security payments, subsidies, state guarantees of loans, microfinancing of SMEs, and guarantees of up to 25% of private investments.

Of direct interest to green development is the part of the proposal for a "bold public investment program in the direction of sustainable and non-sustainable growth, green transition and digital modernization of the economy" and in particular for:

- Strengthening social infrastructures (Health, Education, Welfare, etc.).
- Enhancing the resilience of infrastructure to the risks of the climate crisis (and other risks)
- Strengthening environmental infrastructure, water supply, sewerage and waste management
- Energy saving in private and public building stock
- Investments in RES and the country's electricity interconnection
- Completion of spatial planning (Land Registry, Forest Maps, Local Spatial Plans)
- Expansion of rail transport (Railway, Metro) and the gradual electrification of road transport
- Digital modernization of public infrastructure, the interconnection of different systems, the strengthening of high-speed digital networks
- Maintenance and modernization of the existing infrastructure

The third largest party **KINAL** has not put forth a comprehensive proposal¹⁶ to upgrade an older of 4 April 2020 which included seven emergency measures to provide immediate support to those threatened with layoffs, shore up the per-

14. Prime Minister's press conference, 5 June 2020

15. <https://www.syriza.gr/article/id/92274/MenoymeOrthioi:-To-epikairo-poihmeno-programma-toy-SYRIZA.html>

16. <https://kinimaallagis.gr/orthia-koinonia-zontani-oikonomia-epi/>

sonnel of the health system, the farmers, and additional liquidity to SMEs to that proposed by the Government in its first tranche of measures. The main measures proposed are:

- A liquidity booster program and especially for SMEs.
- Major increase of the inadequate amount (€130mil) proposed by the Government.
- Support for enterprises and workers In the tourism sector
- No reduction of the salaries and pensions.
- Coverage of unemployment payments to those laid off and the long-term unemployed who do not receive payments for the entire duration of the crisis.
- Extension of the ban on home auctions for non-payment of loans.
- Inclusion of health workers in the "heavy" and "hazardous" category of enhanced social security benefits.

Never-the-less, some proposals have been put forward by the KINAL energy group to be funded from the EC Package. They include:

- Increase of the energy renovation rate of dwellings per year by a strong tax stimulus such as an income tax exemption of ca 50% of the total expense for the energy renovation.
- Immediate start of absorption of the revenue deriving from auctioning 25 million EUAs (€525-700 mil) of the EC's reserve for funding the electrical interconnections of the islands of the North Aegean Sea and the Dodecanese.
- Use of the "Recovery and Resilience Facility" for a radical redesign of the five-year development plan of the electricity distribution network.
- DSO to bear the costs of connection to its grid of small (<500MW) RES
- Greece – in cooperation with other South East Europe

countries - to promote the construction of an electrical "highway" of direct current, as a Project of Common Interest (PCI).

- Rapid completion of a dense high-speed rail system in Greece, funded by the "Recovery and Resilience Facility".

On 5 June 2020, World Environment Day, **KINAL** announced that they are in full agreement with EC's view that the Member States should not consider the reconstruction plan for the post-COVID-19 period as a simple mechanism to rescue an outdated normality but rather they must compile and propose green, socially responsible and fair, National Sustainable Development Plans to valorize the funds of the "Recovery" Package. KINAL also proposed specific measures, namely:

- Strengthening the interconnection of RES, in order to cover 60% of the demand for electricity by 2030 and 80% by 2050.
- Enhancement of the energy communities mechanism by allowing not only production but also storage and sale of electricity produced
- Support of the lignite communities with €300mil per year for 15 years from the proceeds of the auctioning of ETS EUA allowances
- Support of enterprises to be conditional of their accepting new rules for implementing specific environmental and social responsibility objectives, such as reducing their carbon footprint, saving energy, and recycling their products.
- Greening of tourism

Both Syriza and KINAL as well as the Communist Party oppose any further privatization of the national grids.

The other parties, the **Greek Communist Party**, the **Greek Solution** and **MeRA25**, have not announced any concrete proposals yet for the contents of the stimulus package.

7. Policy implications

Recovery from the economic crisis that COVID-19 caused in international and national level clearly has three phases emergency, solvency support and rebooting the economy (Anderson et al., 2020). We are past the emergency stage and well into the second stage in which enterprises, that is those which have survived, and their personnel are looking for support to open and address their obligations for the next months. This applies to Greece where a number of businesses that have shut down either because of Government imposed restriction or because of their seasonal activity and the timing of the lockdown, will decide to remain closed till next year.

In a very recent (May 2020) and most timely study (Hepburn et al., 2020), a large number (over 700) of stimulus policies grouped in 25 stylized archetypes were considered by 231 academic economists, finance sector executives and government finance and treasury officials from 53 low, medium and high income countries as to their short, medium and long term effectiveness (economic multiplier) and impact on reducing GHG emissions. The results of the survey, conducted in late April 2020 identified clearly the following consensus opinions of the expert group: (i) those policies with fast implementation consisting of liquidity support for large corporations, SMEs and households, cash transfers to temporary workers and VAT and tax reductions were judged to have high multiplier effect but also high negative impact on greening efforts with bailouts of airlines the most detrimental, (ii) investment in R&D, clean energy infrastructure, education, climate friendly agriculture and building upgrades have both high multiplier and positive impact on greening efforts and (iii) these results hold true in general, with reasonable variations, in both high and low-medium income countries.

It is instructive to examine the stimulus measures announced by the Greek Government thus far presented in Section 6 in the light of the above survey findings. The measures announced by the Greek Government in the two tranches of March and May are all in the first categories of negative impact policies on greening as they are typically of mostly the fast kind that provide emergency liquidity without any selective green filtering as a criterion.

At the same time, on 26 May 2020 a group of leading Greek economists including ex-ministers of the economy and advisors to various branches of the Government presented the results of a study (OEE 2020) carried out under the auspices

of the Economic Chamber of Greece on the impacts of COVID-19 on the Greek economy and their policy proposals for the next day. The core of their recommendations is to view this crisis as an opportunity to re-align the Greek economy focusing on changes in the industrial sector so that its contribution to GDP to increase from 10-11% currently to 15-16% by 2030, a doubling of Greek agricultural exports which will also attract people from the urban centers to the countryside and create possibly 100,000 new jobs, and a turn to RES to reduce energy dependence, building stock upgrading, increased use of energy efficient machinery and appliances, and environmentally friendly transport means including electric vehicles and enhanced use of mass transit. They also acknowledge that the three basic pillars that have been put forth by the EC namely digital transformation, transition to a green economy and improvement of European economy competitiveness should indeed be the basis for the new paradigm at EU level.

Similar proposals have been put forward by other civil society organizations such as the Observatory of Sustainable Development of the Institute for Alternative Politics (ENA, 2020). All express their fear that the stimulus funds will not discriminate enough on green criteria but rather support consumption, and might not be lead toward a deep transition to a more sustainable future.

The first two tranches of measures announced by the Government were not accompanied by filters to assure sustainability and at least neutrality as regards climate impacts. As these were immediate application measures, this is to be expected as also pointed out by the international group of experts surveyed by Hepburn et al. (2020). Furthermore not enough details as to their application were provided, except for some general pronouncement by the Minister for Development in his 21 May 2020 press conference, so that meaningful checks can be carried out at this time as to their green credentials or even as to the actual amount of funds to be dispersed. Yet, there is still time to include some filters in the requirements for approval of applications of enterprises for support especially for guarantees of loans.

The lack of such a priori inclusion of green content might be excused in the "emergency" time span, but it cannot be allowed in the design of the much larger stimulus package of €32bil from the "Recovery" Package.

In this context, Greece should adopt and apply fully the re-

cently announced agreement (20 April 2020) of the EU Council for the regulation on “taxonomy”, which will set for businesses and investors a new common framework to identify the economic activities that are considered environmentally sustainable. Through this taxonomy regulation, investments could be driven and focused on the basis of their sustainability impact and prioritized accordingly. The specific taxonomy regulations for climate change mitigation and climate change adaptation are expected by the end of this year. The adoption of this taxonomy regulation, also creates a new potential for the design and promotion of sustainable investments and allows the strategic planning of more extroverted national programmes and measures with the participation of the various Financial Market Participants who are required to report under this taxonomy regulation. Especially for the Greek context, this could lead to a wider participation of the financial institutions towards sustainable investments and to the creation of relevant new financial products, also in sectors with previously negligible interest for them (i.e. energy building renovation and energy services market).

The next day of the pandemic integrates a range of challenges for the energy sector which, like other sectors, is initially called upon to regain its activity and turnover, ensure continued investment and jobs, create new ones, while at the same time it should optimally plan policies and measures that will lead us to the energy transition - as presented in the NECP. Its formal adoption makes for a basic advantage for the energy sector, as there is an approved roadmap for investments and policies, able to co-shape a sustainable model of development and to assist in the economic rebooting.

Already in the field of RES, the market is sending clear positive messages that the development of new RES plants will not be substantially disrupted, and that the majority of planned investments will proceed without significant delays.

However, challenges have also arisen in this area. The reduction in electricity consumption has brought to the forefront, conditions and challenges for the operation of energy markets for participants where the high penetration of RES will be dominant. In this context, the operation of the new electricity market model, the coupling of energy markets, the development of the operating framework of the storage stations, the completion of grid expansion projects and digitization of energy infrastructure as well as the completion of the reform of the licensing framework for RES must be launched without delay in order to keep the positive momentum, which seems to have not been affected by the pandemic, in the domestic RES market.

Yet, the critical issue and challenge is of a different nature.

Specifically, the task relates to whether we are ready to take advantage of the impetus to grow and strengthen economic activity in actions with a clear sustainable developmental orientation and focus, and also with high domestic added value.

A typical example could be the building sector, which can and should be used as a springboard to strengthen the National economy. However, this presupposes the targeting of liquidity enhancement measures in actions and programs of the building sector that will be able to give this development perspective, as well as the active participation of the private financial sector that in the past was absent from similar actions. The actions already designed that improve energy efficiency in existing and new buildings (Forouli et al., 2019), promote the use of RES in them and the coupling of sectors, must first be implemented without delay, and at the same time, new, with more extroverted and participatory character, especially those focusing on behavioural change, to be launched.

Moreover, as public funds directed to the energy renovations of buildings are scheduled to triple in the coming years if the NECP targets are to be met, it will be necessary to re-define how to renovate them in order to achieve the goal of very low or even zero energy consumption. It would require energy renovations to move from the current step-by-step component-based energy renovation realized by buildings' owners to an overall and one step energy renovation of each building realized by specialized construction companies. In other words, the industrialization of deep energy renovations is necessary. In the Netherlands, this industrialization process has led to a reduction of the on-site intervention to one week and halved energy renovation costs (Saheb 2018). The target is to deliver zero energy renovated homes at €400/m² (OpenExp 2016). This would make the renovation work acceptable for the end-user and net zero energy renovation economically affordable for low-income families. At the same time this is a great opportunity for the construction industry and small and medium enterprises active in the sector. New actors, such as aggregators of small projects, will enter the market. Public support is needed and measures to secure it should be instituted to reshape skills and upgrade facilities.

As already mentioned, the reduction in electricity demand during the pandemic in March and April 2020 led to a significant increase in the share of RES in meeting the required electricity loads, without problems in the security of energy supply. This could be a picture of the future when RES will be required to meet the same or even higher share of a much higher electricity demand. The NECP calls for more than doubling the installed capacity of wind and photovoltaics in the next decade.

At the same time, social reactions to RES especially wind are increasing, complicating the process of locating new plants or even completing ongoing ones. In this context, it is crucial, to move ahead fast with the new special RES spatial framework and to define clear environmental assessment criteria but also to allow enforcement of legislation. Moreover, proper use should be made of the "energy communities" tool, without allowing distorting approaches to discredit this scheme. Community projects can transform public opposition into support for new RES installations and infrastructure and contribute to reaching the 2030 RES target. Success factors to an uptake of the local ownership models depend upon (Gancheva et al., 2018):

- A clear political commitment to energy transition and stable policies for the development of RES at all governance levels;
- A clear legal framework that governs the establishment, functioning and access to the energy market for local energy communities;
- Access to financing instruments or partnership schemes for de-risking the investments;
- Synergies and partnerships with local and regional authorities.

Similarly, the upgrade of the energy infrastructures should be accelerated, with flagship projects the interconnection of the islands and the roll-out of smart meters. The streamlining of these grid-related investments will release a huge investment potential for new RES projects, the empowerment of the consumers and their active role as well as the full exploitation of measures and mechanisms for demand response and sector coupling. The development of an integrated energy system and its digitalization, must be brought up the list of priorities for the next period and with the related investments to increase the cost-efficiency and the added value of all the energy sector.

In the medium and long term, it is important that additional funds from the "Recovery" Stimulus Package be channelled toward supporting innovation. Greece has high quality technical personnel as evidenced by the quality and quantity of publications but an embryonic high technology support service and incubation network resulting in a very limited number of knowledge-based enterprises and technical start-ups and a very small contribution of high technology products and services to the GDP. This holds true also in the energy sector where green investments especially in RES and energy conservation should have a large portion of local content if a new more competitive paradigm for the Greek economy is to be sustainable. The rather uninspiring target of 1.81% of

GDP going to R&D by 2030 inscribed in the latest (April 2020) Greek Reforms Program should be increased considerably making use of the "Recovery" Package funds focusing in areas of energy storage, synthetic fuels and green transport but also in other non-energy sectors such as smart agriculture, building materials and waste treatment and recycling.

The Transport sector is responsible for 1/3 of FEC and contributes 20% of the National emissions, second only to the Energy Industries 55%. Almost all (>96%) of its energy use is oil (5% of which biodiesel) with rail covering only about 1-1.5% of transport demand and BEVs in circulation numbering only in the hundreds. The Government had announced in 2019 that it considers the electrification of road transport a priority. The NECP includes measures to increase the use of electricity in road and rail transport from less than 0.4% in 2020 to 4.0% in 2030. This increase will be mainly achieved by meeting the NECP target of 30% EVs share in the new purchases of passenger cars in 2030, a share which just was announced to be increased slightly through a more policy related message so that "by 2030 one in three vehicles to be electric"¹⁷. Support from the "Recovery" Package and National funds starting with the installation of charging stations will be instrumental if this moderate target is to be uped.

At the same time a number of other "soft" initiatives should also been supported. Such action should include better public transport services, promoting transport sufficiency, shifting to other transport modes (railways and public transport). and rededicating street space for pedestrians and cyclists to enable safe individual mobility as recently proposed for the center of Athens, resulting in notable permanent contributions to GHG emissions mitigation (Le Quéré et al., 2020).

On 31 May 2020, the Minister for Environment and Energy announced that of the amount of the "Recovery" package proposed by the EC on 27 May 2020 to be allotted to Greece which might reach €32Bill, the energy sector will take a very large share. These funds will be used, according to current planning, to (i) increase threefold the amount of dwellings to be upgraded, (ii) support RES penetration directly and by improving grid infrastructure, (iii) install a large number of charging stations for electric vehicles and (iv) increase the Greek Just Transition Fund level from ca €280Mil to ca €1700Mil.

The overall picture that comes out of the measures already announced to provide a lifejacket to the economy and stimulate its rebooting in the energy supply sector is that of maintaining on-going activity and enhancing already planned PAMs the large majority of which would meet "green" cri-

17. Prime Minister's press conference, 5 June 2020

teria, but with no new initiatives put forward yet. On the demand side, the picture is mixed as measures are horizontal in nature with neutral or negative environmental impacts. It is thus imperative that the measures planned for the new larger stimulus of ca €32bil for Greece, especially in the demand side, have a positive environmental and in particular climate impact.

The next day of the energy sector may indeed look optimistic and be the starting point for more sustainable and development-friendly investments, on a larger and faster scale than previously thought, in line with central coordination and the allocation of appropriate funds. The aim should be to develop even more dynamic and ambitious new policies, with the participation of wide range of stakeholders, companies and financial institutions, capable of combining the demand for a development perspective with the reduction and possibly elimination of uncertainties and unintended consequences (van Vliet et al., 2020), and the achievement of the intended sustainable energy transition. To close on a positive note, it is heartening that most political parties seem to agree on this, which gives hope that it might become reality, especially if the public is given to understand the necessity and benefits of the green transition and brought along.

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