CONFERENCE PROCEEDINGS

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ABOUT THE EVENT

Cretan Energy Conferences (CEC) was honored to organize the International Energy Exhibition of Greece and 6th Cretan Energy Conference & Exhibition.

The event took place on 01-03 of July 2022 in the city of Chania, Crete under the auspices of Hellenic Ministry of Energy and Environment and Hellenic Ministry of Maritime Affairs & Insular Policy, and the support of Region of Crete.

The event presented a unique platform and brought together national authorities, industry executives and experts from Greece, Mediterranean and other countries to share information and insights related to energy, shipping and sustainable growth.

With FREE entrance attendees from local authorities, regulators, institutes, society, academia and industries had the opportunity to gain invaluable insights of the energy and shipping sector via Presentations and Workshops and connect with various stakeholders and decision - makers.

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ADVENT

Athanasios Stubos |
Demokritos

Emmanuel Stamatakis |
FORTH

Tasoulas Fokion |
Group Innovation & Technology Director, Titan Cement

John Kokarakis |
Technical Director, SEEBA Zone Bureau Veritas

Michael Thomadakis |
Strategy & Development Division Director, DESFA

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Giannis Plakiotakis |
Minister of Maritime Affairs & Insular Policy

John Kokarakis |
Technical Director, SEEBA Zone Bureau Veritas

Maria Boile |
Professor, University of Piraeus & Coordinator Waterborne TP

Adamis Mitsotakis |
CERTH

Georgios Tsifoutidis |
Head of Geothermal Energy Dept (acting), Ministry of Environment and Energy, Greece

Michael Thomadakis |
Strategy & Development Division Director, DESFA

Yiannis Katsigiannis |
Assistant Professor, Department of Electrical and Computer Engineering, Hellenic Mediterranean University

Maria Apostolaki |
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Michail Chatzipanos |
IPTO

"AURORA" Workshop

Day 1: Friday 1st of July 2022

Subject Matter: Energy Strategy for EU - East Mediterranean and Global Future

Alexandra Sdoukou |
Secretary General of Energy and Mineral Resources, Ministry of Environment and Energy, as representative of the Prime Minister of Greece, Mr. Kyriakos Mitsotakis

Crete has always been a historical crossroad of high strategic importance in east Mediterranean Europe and southern Europe as a whole. And today Crete opens a large window of opportunity and cooperation with our neighboring countries and is the pillar that Greece's ambition to become a cutting-edge energy hub.

Europe faces one of the worst traits in the last decade. This energy crisis has pushed to the limits many countries that were considered immune to even these strong economic shocks. Everyone foresees that we will have a difficult winter. All these happened because the last few years we have a series of reasons such as the sad and sharp recovery after the pandemic, the increase in demand and prices of energy in the Asian market, the restriction of supply in Europe, the reduction of the european gas production, we had low stocks in underground storage, and the shortage of supply from Russia. All these were enough to trigger this uncontrolled jump in gas prices that tracked down electricity prices and brought the European Union to its responsibilities. I think it was a pivotal moment for Europe and its energy and climate policy, and this is because this crisis that spread deepened after the Russian salvation of Ukraine threatened to momentarily derail the basic principles and structures of energy transition policy.

It took the European decision-making system to wake up, and strong pressure from several member countries on the commission to mobilize an entire risk prevention mechanism and to have a series of measures and actions and to define the instruments that will finance the path firstly to curb the effects of the crisis and secondly to continue the path. In targeted support for businesses that have been supported with state guarantees for loan subsidies and of course the promotion of a forward-looking policy to win European Union as quickly as possible from imports of Russian fossil fuels. Of course, here we have to say that Europe has not unfortunately responded to the serious issue of dealing with the run-away gas prices that are driving up electricity prices, energy prices with a drastic solution with the European solution only the countries are struggling to deal with the crisis with their own physical space. They cannot do this alone. The only loud voice in Brussels every

time is that of the Prime Minister, who from the very first moment proposed a way to intervene at the root of the problem. We are still waiting this effective European solution.

Now, Greece is dealing with this energy crisis more effectively than any other country in Europe. We have launched the strongest package of measures to tackle energy poverty in Europe. In Greece electricity, gas, and liquid fuels, we have actively support Greek citizens even retroactively, and I stress this, especially those who needed it most, the most vulnerable. This is a difficult battle. The battle of the kilowatt. The first electricity package we have launched cooperation with the European commission as a government.

Europe's last collective response to these serious problems that European strategy making system itself has largely caused to itself the repower European Union project. We all know it the urgent need to diversity Europe's energy sources with immediate decoupling from Russian fossil fuels indicatively. We aim to reduce inputs of natural gas currently 150 bcm by 2/3 within a year. Very ambitious aim to reduce by 2/3 and completed by 2027. The second thing that the reporter uses is that we need to accelerate the penetration of renewables increasing Europe's energy self-sufficiency the target of the share of renewables from 40% a few months ago with it for 55 is now increased to 45 and greater emphasis on energy store to address any disruption to supply adequacy and similarly savings storage have gone from 9% to 13%, a very demanding target. With free power European Union, we all aspire as a united euro to address the difficulties and the disruption of the global energy market.

Allow me to this point to explain to you briefly why this urgent transform Europe's energy system. There are two main reasons. I would say first, in our dependence on Russian energy unfortunately Moscow instrumentalization the fossil fuels as they export in Europe in order to be able to control the governments of the member states. As we understand this has painful consequences for the economies and pocket the taxpayers. I imagine you know how much money we spent on important gas oil and coal from Russia. Almost 100 billion euro a year. So, if we act collectively and with the one voice, we can achieve this goal and quickly and above all with security of supply from different suppliers.

The second reason is because we need to continue our own how was the energy transition. This is the importance of Greek government and in particular the Minister of Environments and Energy insists on promoting policies and actions that contribute to the further penetration of green energy. Our forecasts show a further deceleration of energy costs in the coming years precisely because of this significantly higher participation of renewables and electricity system. To be clearer the target in 2019 as a country we had a target we said for 2013. We are in position as a country to reach this goal earlier around 2026. So, we have the possibility also in the rise the fit for 55 to adjust our 2013 renewable energy targets upwards. Based on what I have already mentioned we predict that by 2026 we will have installed 20 gigabytes of renewable capacity in the country and by 2030 we will have exceeded 24. So, to sum up the European Union's energy strategy is about green transformation boosting economic growth, security and climate action and our key tools on this path. Perhaps for the first time in modern history the choices concerning our neighboring countries and by the end of this decade investment in

the energy sector, especially in renewable energy is expected to exceed 50 billion euros.

So, back to Crete, I think that this policy it was a political conflict, but it is very positive that is no longer present because this huge work of interconnecting decreed, the island with the continental. Greece is an electrification system. This is a new period, a new era and as you all know it is one of the most ambitious projects and this is the top five critical articles in the top five of the most innovative interconnection projects and from 2024 when both interconnectors will be operationally operational, we estimate that Greek consumers will see reductions of 550 million euros in their electricity bills reaching one billion euros in 2030. Let's not forget that Crete is the focal for major electrical interconnection projects being considered for the region such as the Euro-Asia connector and as we have now represented this from Egypt. Another important project is the interconnection with Cyprus and Israel and Egypt. This is a very important corporation which will transfer 100 green energy from Egypt and Greece will become a way to transfer green energy from Egypt to Europe. Crete has a huge potential. You have now 314 megawatts 67% is wind. So, it is evident how the potential Crete has to develop. This is, also, within the policies that the Greek government carry on this effort as a ministry to develop the renewable energy resources. Now we have 12.5 gigahertz of installed power, and we aim to 25 gigabytes until 2030. We aim to deploy three gigabytes of storage and we give the potential to Crete for small projects up to 400 kilowatts. And with net metering and self-generation, I think this is very important for the residents of region to decrease the cost of energy and in the businesses. And of course, when the interconnection is completed, everything will be there will be more margins.

I know of course it is not self-evident that everything I have told you is easy. We need to exploit the corporations. We are lucky to have resources. And in total in the next years for energy more than 10 billion euros will be made available. These are funds that will be allocated to green projects accelerating in the energy transition energy storage and sustainable mobility and this were in Ukraine.

Despite the unnecessary adjustments that it obliges to make it does not alter the core of our plants. The lignite plant for example in the country will necessarily have to operate more in the coming period to meet demand. But it doesn't mean that we will not carry on by the book until 2028 remaining only in reserve and let me say about gas because I know that many people are worried about the possibility that in the winter, we may find ourselves with energy shortages. It is a well-founded risk for Europe if Russia carries out its threats and cuts off the gas flow, we already see countries like Germany preparing the worst-case scenario. In our country although our dependence is lower than others we are not resting. And we are implementing several projects that will allow us to secure our gas supply but also to support other countries as we already joined with Bulgaria. So, we have a new floating tank near, and we increase the capacity of the station by 70% and we carry on working for the energy security of the country.

There is a commitment for prime minister and for everything else mentioned so far. I think that in a few years even though we have now faced difficult situations and uncertain situations, I think that in a few years Greece will be a completely different country concerning energy and I think that the country will have a brighter future.

Dora Bakoyannis |
M.P. Former Minister of Foreign Affairs of Greece

It is no secret that the war in Ukraine that has been raging for five months now has impacted dramatically the energy landscape, the energy security and sustainability of the world and of course of Europe. Prior to the war, EU's energy strategy was ambitious. We needed more green energy, we needed curb emissions and transition to cleaner forms of energy by a net zero output by 2050.

Today the ambition is even greater. As we face three major challenges. How to rapidly reduce energy dependence on Russia with the view to imposing an embargo on Russian oil and possibly gas that European Union members can support. How to build new partnerships with third countries around green tech and critical raw materials to protect European energy security in the long term. And how to implement the measures in the fit of 55 package that can bring the European green deal to life. And of course, they said challenges spread out intersectorally and require investment in their own right in infrastructure in welfare support to help struggling households and businesses and in political and diplomatically commitment.

What is important to point out is that the European Union is rising to the challenge of the looming energy security and even with small steady steps it creates the fundamentals for a common European geology energy strategy. The commission's repower energy plan sets our significant milestones for a climate transition away from fossil fuels and it was only a few days ago that the decision of G7 that the holistic approach seems to sink in. not just in isolating Russia and the dependence from its oil and gas but also to solidify cooperation on energy security and sustainability. I'm sure you heard on Tuesday the speech by the executive president of the European Commission Mr. Timmerman at the Brussels forum where these goals come together to enhance and create an energy independent European Union that will invest in renewables, green hydrogen and alternative sources of energy and build with the necessary infrastructure to allow member states to reach the potential on energy security. Greece and the government of Kyriakos Mitsotakis have been since day one focused and oriented on that goal. Both on energy transition and climate change. Our country has been at the core countries of the European Union to promote legislation strategic policy plans that today come at a great use. The investment in Alexandroupolis port, turning the area in energy hub. The investment on ING, the facilities, the policy legislation of photovoltaics, the cooperation with Egypt, Bulgaria and Cyprus and Israel as well as policies that support the everyday consumer and businessmen are few examples that demonstrate the readiness of our country. Of course, the path is not easy. The vision set out in a repower European Union is only the first step in transforming the use energy strategy. Its implementation will require a whole scale renovation of European leaders' approach to climate and energy diplomacy. The European Union needs a foreign policy strategy to manage all these efforts to build and sustainably financing and to manage the geopolitical dimension.

If European Union strengthen the partnership with the African union this will heighten the risk of African economies falling prey to an extracted model that hampers the green transition even as the rest of the world profits. Greece with the strategic geopolitical location and strong relations with the middle east and Africa can and should be on the forefront of this energy foreign policy. At the same time, however, to support such an ambition we must ensure a strong coordination between European Union institutions in Brussels and member state capitals as well as the third countries between EU delegations and national embassies to ensure that energy and climate diplomacy are central to the promotion of European interests abroad.

To sum up, today more than ever the stakes are high. The challenges that lie ahead are not easy but are not insurmountable. It is eighth unity that we can overcome them to achieve

energy security and serenity. As well as the ambitious green goals of the climate change agenda we need security, stability, and security plan. Greece as a key member of the European Union on the policy for greener sustainable future and the bridge between European Union and the southeast neighborhoods can contribute, can innovate and above all Greece can lead.

Ahmed Mohammed Mohina |
Egypt's Ministry of Energy and Renewables - First Undersecretary of Research, Planning & Authorities Follow up

Egypt: Electrical Energy transformation[1]

- *Situation in Summer 2014*
- *Actions Taken to Overcome Generation Shortage*
- *Upgrading Transmission Grid*
- *More Sustainable Phase*
- *Egypt is an Energy Hub for international Interconnections and Corridors*

Jose Emmanuel Lamarque |
French journalist, specialist in pan-European & Oceanographic Geopolitics Issues

What an energy strategy for the European Union one of four decades many of us have been campaigning for a real European energy policy based on two main axes. The first energy is a weapon. The second is an energy diplomacy that must exist. For two long years this has been ignored while water has become the blue gold. Natural gas and electricity are instruments of negotiation. An energy strategy for the European Union is possible on the condition of not of harmonization but of coordination of the prison forced considered the geopolitical character of each state without even and ever forgetting diplomacy energy. Diplomacy that the European Union does not possess. It would be stupid to think of a global energy for the European Union, but energy identified for each state. An example, France has a neutral energy which is a good and clean energy therefore not polluting. Why today doing back to coal fire power stations which are the worst pollution concerning energy? About other electricity provided that the dams in Europe are in good or bad condition.

Without speaking about sand wind green hydrogen and waves energy what will we when we will understand the energy we can get from waves. All subjects are valid on the condition that we have to the means for a European energy policy that we do not have today why because the economic and financial crisis of the 2010 showed that Europe was not united and that on the country certain member states had not hesitated to place the weight of the crisis in Greece. This which has been the greatest European injustice since the creation of the European Union. Having an energy policy means giving yourself the means for an energy policy on the condition of having a common strategy today. The war shows us that once again Europe is divided, and this is because it was not prepared for such a situation behind the speeches must be action for the moment that only action. We see after the speeches are actions that go against the interest of European consumers. Regarding

[1]See Appendix

the Eastern Mediterranean it must be clear does the European Union give itself the means of a policy and diplomacy in the face of a strong state that cannot be ignored which is Turkey. With so many political so many states which somewhere plays their own game. We absolutely must support and help Greece both in an energy policy and the real policy of European corporation in all areas. Once again, of all this only a question of political will and the question of war today shows us that weakness of the European Union accumulated over many decades when we had the means to set up an energy plan of the future and I repeat this account by energy diplomacy.
It's never too late although we lost a lot of time of friends is to be able to adapt greatly. Today we can no longer allow ourselves to be observers, but we must be actors able to place energy diplomacy beyond national interest but beyond the interests of the European continent because it is of the urban continent which means that we cannot ignore an important part of this continent. It is this condition that we will have the means to extend our energy diplomacy to the member states around the Mediterranean which are privileged partners of Europe. Energy today as a guarantee of peace and shock and should not divided people. Let us have this cleverness.

George Kremlis |
Principal Advisor to the Greek Prime Minister on Energy, Climate, Environment, & Circular Economy Issues

It is time to reflect on a new treaty amending the Lisbon treaty with a full full-fledged energy union. I think the time now has come to develop the weak energy framework currently existing with one article in the treaty of the European union and develop a full-fledged energy union together with the defense union, etc. There are other improvements that we can bring to the existing treaty and in that respect I would like to refer to the previous treaty of the European community of steel and coal were the steel and coal resources of the European Union were managed collectively so this can give us ideas for an energy union full of energy union to develop in the future with the full energy grid with a sharing of resources with solidarity and with other mechanisms which are able to be developed drawing lessons from the current crisis. That's the first point.
The second point I wanted to share with you is that we need to make sure that the energy crisis the energy and the energy property as well as the fact that there is no energy security currently within the European Union do not undermine the energy transition and the goal of the green deal and the European climate law on becoming climate neutral and of course reducing emissions by 2030 by 55%. It is a difficult exercise because of the war. The energy crisis exacerbated and the process to green energy transition has been delayed in some countries. This is something we need to keep in mind.
The third point I wanted to make is the power European Union. This is a strong response from the European Union and moreover, in the last council it has been decided that a social climate fund will be developed. So, the European Union is now developing new frameworks, new ideas under repower European Union to ensure boosting renewables phasing out from Russian gas and hydrocarbons, promoting hydrogen, and of course improving energy efficiency which is also extremely important. The next point I wanted to make is that we need as the European Union

has no energy resources referring to gas and hydrocarbons. We need to promote new energy resources through exploration where this is possible within the European Union. And of course, we needed to exploit the resources of eastern and Mediterranean.

I would like to refer to the PCIS project. We ne keep this mad alive, we need to keep it on the radar. It is an extremely important project. And now in this period of energy crisis under scarcity of resources it can be considered as an emblematic project is supported fully by the European Union as well as by the international community to promote the diversification of the energy sources and to bring gas to the European Union. It is something that we can make bankable If we want there is political will, and the conditions are now met.

Last consideration Egypt. There have been references to Egypt. I was in Egypt a few days ago. Egypt is not only hosting COP27 In November but is becoming a green hub for green electricity and in the future for hydrogen. They have water, they have renewables. With the help of the European Union and foreign investments boost further the development of renewables and production hydrogen in Egypt. And of course, there are important projects to connect Egypt through a cable. But the important thing is to develop stable connections. Electricity cables and the pipelines as the stable connections through long-term contracts are those who can ensure security, energy security and reasonable prices compared to the ad hoc movements of gas from different countries who are selling the current gas and which have benefited a lot from the current crisis as the prices of the gas where they are produced other than in Russia have increased a lot and one has to say that illegal competition phenomena have also arisen because of this situation of the war and the suspension of the provision of gas from gas to several countries of the European Union These are the considerations I wanted to share with you.

There is the room to improve the situation the European Union is developing new tools I think also to exploit the political decision to have purchases undertaken by the European Union as such as we did with the vaccines to ensure that sufficient quantities of gas will be purchased and the important point is the new regulation on gas restorage for those countries who do not have gas storage capacity and according to this proposal we need the countries that do not have storage capacity in any degrees we to store 15% of our needs in another country which has such a capacity in our case it will be either Bulgaria or Italy or a possible share between the two countries. These are initiatives which show that we can do more in the context of an energy union to be further developed.

Karydas John |
Chief Executive Officer – Renewables and Energy Storage – Copelouzos Group

The project is strategic not only for Egypt and Greece, but also for the whole Europe. In Copelouzos Group we strongly believe that without electricity and connections with third countries which have the potential to export sufficient quantities of clean energy the transition to green energy will take additional time and hence the dependency on natural gas of Europe will continue. Having recognized such need for electrical interconnection projects Copelouzos Group through our subsidiary ELICA has been developing in collaboration with the Egyptian Ministry of Electricity and Renewables and the Egyptian Transmission Operator a key

project that of the electrical interconnection between Egypt and Greece.
We started this interconnection back in the year 2008 and we signed the first agreement with Egypt in year 2010. This project plans to interconnect Egypt with Attica, Greece mainland in order to transfer 100% clean energy. We know that Egypt has a very ambitious plan as we said to install around 61 gigabytes of renewable energy projects by year 2035. So, we understand there will be a surplus of green energy to transfer to Europe via Greece. Our project will have a capacity of 3000 megawatts with a bi-directional transmission capability. We believe that for technical environmental and financial reasons directly connecting Egypt with Attica mainland without any intermediate points is the only viable solution for interconnecting Greece with Egypt. The estimated length of the submarine cable is around 950 kilometers because the present route bypasses the exclusive economic zone of Libya. The estimated budget is around 3.5 billion euro and we have received a very strong expression of interest both by Greek banks as well as international institutions both European and American to provide long-term finance for the project. Our group has the preliminary studies both preferability study and technical study and we are in discussions with the Egyptian electricity holding company and the Egyptian transmission operator and the Greek operator of ADMIE to procced with the final feasibility studies and engineering study to reach the final investment decision. It is important to say that according to a study we have done with a Greek university the implementation of this project will enhance the transfer capacity of the existing interconnections between Greece and European union countries, mainly Italy and Bulgaria by at least 700 megabytes. The project has been included in the 10-year network development plan of the European transmission system operators which made it eligible to be included in the next PCI PMI list which will open doors for faster permitting and access to European sources of funds. Also, we aim to include this project t repower European Union plan and the Greek government has already proposed to be included this plan and we believe that we have the ability with our partners to accelerate and expedite its implementation to be concluded within two and a half three years after final investment decision. Why we believe that this project is strategic. It is strategic not only for Greece but for the whole Europe. First, the transfer of 3000 megawatts of clean energy obviously contributes significally both to the tackling of the climate crisis and the greenhouse effect prevention but most importantly provide energy differentiation, provide energy security for Europe and especially green energy. Hence, it will help to reduce the dependency of Greece in Europe on fossil fuels namely natural gas and especially on Russian natural gas. Just to give some numbers to show you the significance of this project. The transfer of three thousand megawatts of clean energy can help to reduce the requirement of around 4.5 bcm billion cubic meters of natural gas on an annual basis. Last year Greece consumed 6.1 bcm out of which 3.3 came from Russia. So, you understand that the implementation of such a project will release Greece from Russian natural gas and will provide neighboring European union countries to benefit also from such clean energy. Besides that, these 3.000 megabytes of clean energy will help to reduce co2 emissions by 10 million tons per year. So, by the sun that in this way Greece becomes an energy hub in the region and specially a green energy hub in the region and the routing of the cable which has been very carefully designed. Strengthens rights of Greece and of its Europe

exclusive economic zones. So, we strongly believe that electrical interconnections. The strategic direction in which Europe must move forward int the context of energy independence of fossil fuels and Russia natural gas. And towards achieving energy differentiation and safety. So, we try in collaboration with the Greek government and the Egyptian government to expedite all our steps towards fast implementation of the project and we believe that this is a project, but it is very important for all three parties involved Egypt, Greece, and Europe. In Copelouzos Group we have activities in renewable energy for more than 25 years very carefully attended the discussion a few minutes ago. Wind parks we have two production licenses there, but I choose to present to you this project because of its extreme significance very important significance in our effort to refuse dependency on Russian natural gas and achieve a very fast energy transition both for Greece and Europe as a whole.

Ahmed Salek Tarehk |
Elsewedy (Egypt)

A brief history of the company, which was started in Egypt, then expanded in Africa and now they have several others all around the world. The company Elsewedy started in 1938 as an electronic trader equipment. Mooning forward all the way to 2006 when the founder has been listed under the name of Elsewedy electric since it was the company cables beforehand and this is how they started with different cables manufacturers around the world.
First started in Egypt, then expanded in Africa and now they have several all around the world. 2019 was the first presence in the renewable sector by having developed two projects. Last year the revenues for Sweden electric were north of three billion dollars. Having a revenue from both the Greek and solar projects in Egypt almost of at 20 million dollars every year just this sector alone.
This was just more info about the team structure the asset management info about the different projects that we have here in Greece we have three wind farms and one small hydro plant they are powering almost 35.000 households by new renewable energy sustainable energy having a total 64 megawatt installed capacity saving around 100k of a tone of co2 every year.
These are some of our partners that we partnered with on this project we have the national bank of Greece, our lenders white and case ensign young ng. Moving forward to the projects that we have two projects in Egypt developed in collaboration with EDF of a total of 130 megawatts saving around 160.000 tons of carbon dioxide each year.
This week we had a huge loan from EBRD of 150 million US dollars for the further expansion of the different manufacturing plants over Sweden and investing more in the renewable energy. Very recently we have been on the talk on the conversation of green hydrogen. We believe that hydrogen is the key for completing the cycle of powering the globe with renewable energy as you all know that renewables so far, they are getting cheaper, they are sustainable, they are clean however they still have the intermitted problems which they are not available all the time. So, we need to find a way to store this energy. We need to find a clean way to store this energy and we believe that hydrogen is one of the key solutions to this. Therefore, our interest in green hydrogen. A whole department focused on this and as we heard so many times today and very recently in the news in the interconnection

between Europe and Africa since we are all seeing right now how the geopolitical situation is affecting us this leads to more innovative solutions. This leads to collaboration between continents not just countries anymore since Africa has a lot of untapped resources. This is one of transferring having this energy corridor between both continents.

Elsewedy is very interested in being a key player into this mega project. Not just on the EPC side of the different substations and the providing cables but also on the generation side and the development of the generation renewable energy projects on Egypt and the north Africa side of the equation. To conclude, in Elsewedy we believe in providing an affordable and clean sustainable future. The future generations all while doing it at the top and highest quality.

Susanna Terstal |
Ambassador of Netherlands to Greece

Greece and the Netherlands: Moving towards a greener future together

More than ever, it is time for action to realize the green transition and decrease our energy import from Russia as soon as possible. This transition favors the bold: the sooner one greenifies, the lower the costs will be at a later stage. The Netherlands and Greece are setting important steps, using innovative technology. For instance, when it comes to offshore wind, green hydrogen, and circularity. We are looking forward to cooperating on a future-proof energy landscape.

Charles Ellinas |
Senior Fellow - Atlantic Council

Europe's energy dilemmas[2]

- *The war in Ukraine and Europe's energy dilemmas*
- *The reality is that since 1970 about 80% of global energy comes from fossil fuels*
- *EU priorities affecting the East Med*
- *East Med energy contribution*
- *East Med major gas fields / LNG plants*
- *Possible routes of East Med export gas pipelines*
- *The future*

Maria Tsialdi |
General Manager Global Sustain
Sofia Yialama |
ESG & Sustainability Consultant based in Cairo, Egypt

[2] See Appendix

Global Sustain

ESG Rating is gaining momentum at national and international levels. Regulators, banks, investors, and suppliers are increasingly evaluating companies' ESG performance, especially those operating in carbon-intensive sectors such as the energy sector.

Global Sustain has over 15 years of experience in ESG measurement and evaluation methods and in response to the evolving market needs and challenges is currently launching "Global Sustain Rating", an ESG Data Gathering, Management and Rating Application.

Global Sustain Rating will support companies to raise ESG awareness, measure their ESG performance and get an ESG score and rating. In this way, energy companies, for example, will be able to comply with national laws (e.g., the upcoming climate law), as well as EU regulations and directives (CSRD, CSDD, Taxonomy, SFDR, RTS), while they manage ESG risks, access finance (e.g. green loans) to transform into low-carbon business models, and capitalize on new business opportunities.

Day 2: Saturday 2nd of July 2022

Subject Matter: Energy and Development

Christos Dimas |
Deputy Minister of Development and Investments (Research & Innovation)

- *Ο κομβικός ρόλος της έρευνας και της τεχνολογίας στην ενεργειακή πολιτική σε εθνικό, ευρωπαϊκό και διεθνές επίπεδο.*
- *Τα χρηματοδοτικά εργαλεία της ΕΕ όσον αφορά την έρευνα και την καινοτομία.*
- *Οι πρωτοβουλίες του Υπουργείου Ανάπτυξης και Επενδύσεων και των ερευνητικών κέντρων της χώρας στο κομμάτι του περιβάλλοντος και της ενέργειας.*

Joseph Casa Miralles |
Authority of Housing and Social Inclusion of the Catalan Government

Housing Policies -Decarbonization[3]

- *Power Point*
- *Housing Policies*
- *Next Generation Funds*

[3] See Appendix

- *Territorial Housing Plan (THP)*
- *Urban Improvement*
- *Urban Sustainability Actuations, Energy Saving and Efficiency*

Efthimios Tartaras |
Geoscience Manager & Management Consultant, HHRM

A road map to energy independency & transition[4]

- *Climate Change: A global and national challenge*
- *Lessons from the energy crisis*
- *Connecting the pieces*
- *Local demand and infrastructure*
- *The Ionian and Crete Basin*
- *First offshore seismic surveys since 2016 completed successfully with the highest environmental and safety standards*
- *Accelerating Greece's Upstream Gas Sector is a National Priority*
- *Roadmap the monetization of potential domestic natural gas deposits*
- *Windows of opportunity*

Nikos Pasadakis |
Geoenergy, FORTH/IG

I will use my time for two topics. The first one the is the part of our institute of geo-energy because this path shows the energy matters and the impasses our country has. The second part will be a short discussion about the energy transition concerning the new real sustainability of the planet.
We as institute of geology were created three years ago 2019 as an institution of oil research of the institute of research and energy and it was our wish, a wish of the state to create such a research center about hydrocarbons in the country which was not present up to now. And your conclusions are here. It was that time that Greece was a delay but also a lot of hope was trying to catch up with a research development about hydrocarbons in eastern Europe. Unfortunately, our institution did not find the real support from the state which would sound logical. Would not be so logical for such an important topic. The next stage after the creation of our institution some things changed. The energy sector Europe and Greece with the green deal were oriented monolith even though even the banking finance of the companies active in the natural gas was impossible and natural gas was recognized as the fuel of energy traditional country. These delays in the development of the hydrocarbons and the ambiguity of the politicians and some actions of abrupt implementations what made the landscape of the business in these fields and at the same time they assisted from banks, the bank-assisted companies and wind parks had a real development but due to the problems they had about the storage and the absence of strategic infrastructure and net they couldn't keep a sustainable energy system.
At the same time in Europe and especially in our country, the procedure of financial

[4] See Appendix

support was completed, and this decreased even extinguished. The differences in the energy prices and the old-fashioned contracts of fixed prices were replaced by the fever of the everyday changes and these are proved to be beneficial for companies but not for the society the landscape of high prices to the final consumer. The energy poverty which started 2020 had today some dystopic characteristics. Today even especially the geopolitical crisis in Ukraine. In this context our institute tried to watch and affect the developments in two directions that are correct for us, and we changed to institute of geology, and we created three directions fossil fuels and carbon management, green energy and third direction environment and regular economy. In this context a very important investment is in Chania for the creation of a center of sustainable energy transition and a project about 10 million euros funded by the recovery fund, the European bank and we hope that it will operate in a few years in Chania, in two years from today. Our institute and the business landscape of energy in the last year has been determined by the administrative decisions which we think that they do not correspond correctly. And normally today we have presented data and then and solutions as an institute. However, I assure you that we do this work and applied research but today in this conference I would like to share with you some thoughts. For the general topic of today's energy system, decision that form the landscape and no other solutions that are not feasible. First, I would like to mention it is a way of production of energy and the sustainability of the planet and the second the reasons how the energy transition is being made and the position of renewable resources. Let's start with the first one. Energy and sustainability. Today there is an opinion that sustainability of the planet which is recognized as a problematic one could be assured with only changing the way of production of energy following a path of energy transition. We describe the different models of energy of the green deal and electrification of energy is the nucleus is a central part and the use of wind parks, wind energy and solar energy and with the technologies of storage and transformation. These models especially in the eyes of the people are logical and most of the scientific community also agrees and especially because of the targeted funding. It's true that the problem sustainability of the planet has developed not today by the science but a few decades before because it has not been connected from the science to the energy sector. Obviously, we cannot exhaust the topic.

I would like to mention some things only which are undoubtedly today earth's population is eight times bigger than the prehistoric period and now we have a huge problem with energy production also the surface of the planet has changed. Especially due to agriculture to support the real survival needs of the humans and the needs. Especially today especially in the rich regions of the country which are determined by factors which have not to do with the survival and the production of the sustainability of the humankind. Also, chemicals which cannot be assimilated by the systems and accelerate the problem. Also, humans today are the 36% of all the mammals in the planet and the rest 60% is the animals. We breed for food and 4% is for nature, wild nature, and at the beginning the humankind the percentages were 1% and 99%, obviously 99% was the wild nature. Since 1940 90% of the fossils fuels has been consumed generally and this produced carbon dioxide pollutions much more than the photosynthesis took place. Because photosynthesis is decreased due to the destruction of the forests and the continuous decertification.

We see that humankind has overcome the sustainability limit of the planet and we need to combat this.
Today's image looks like very problematic that human systems collapse and by using the same or even improved technological instruments and tools but also the strong and to keep the profit and the status quo. Today there is no living space for the today's models of societies. It's not only useless but also dangerous. And I think it' sad that all these are scientifically documented. And this is obvious that we see models that copy old approaches with a phenomenal. Such a model is the energy transition model, the main model.
There is a climate change relates to the use of fossil fuels. Also, we see some simple things. If fossil fuels if the consumption of fossil fuels is reduced, then the carbon dioxide emissions will be reduced. Temperature will be reduced, and climate change will be avoided in climate crisis as well. So, I wonder if also all these things will decrease the extreme weather conditions. Are these connected with the climate change? If we wait that this is over with the floods and if we expect that all these fires will be disappeared, then I think we will be disappointed.
In closing, the model energy transition as is today suggests they over to overcome the crisis with the same tools that they created the energy which means more technology, more resources, rare metals, and very important cultivating land which is disappeared even better development and the preservation of all the pathogens of the system, the over consumption, and inequality of distribution, inequal distribution of resources. But who and why chooses to impose this model? Very soon the development of the renewable resources and the social cost which can be explained that this is a very important chance for investment, supported by spawn. Source of many regional agents and a business risk is minimized but this business risk is a supposed strong asset of the financial capital. This image in my opinion has many common core elements with the development of the banking loans in the USA before 2008 and maybe we will see something similar.
And the current implementation of all these policies we see that the environmental worries in recently are now secondary have become secondary because geopolitical issues are now more important. How easy can we replace the Russian natural gas with liquefied gas. Due to the way of its production and the transportation also the reintroduction of carbon in the electricity production does not go together with the model of the decrease of fossil fuels. Also, it is questionable how we see that the EU is not ready to develop own resources of fossil fuels. This is not only for the whole Europe but for Greece unfortunately it's true.
What I have told you it makes us uncomfortable, and we worry but we do not see our role we seek the scientific true as research institute behind the phenomena for the best solution for the society. Obviously, we do accept resourceful renewable energies, but it should be in accordance with the natural limits of the planet also promote the development of humans and the society.

George Psyrris |
Director, Grid Telecom

Η γεωστρατηγική θέση της Κρήτης ως ενεργειακός και τηλεπικοινωνιακός κόμβος[5]

- *Εταιρική ταυτότητα*
- *Γεωπολιτική και Γεωστρατηγική*
- *Η Διασύνδεση της Κρήτης με την Ηπειρωτική Ελλάδα*
- *MINOAS East-West και APOLLO East-West*
- *Ο Καλωδιακός Σταθμός Προσαιγιάλωσης της grid Telecom*
- *Συνδεσιμότητα Υψηλής Διαθεσιμότητας και Αξιοπιστίας*
- *Καλωδιακοί Σταθμοί και Data Centers*
- *TEAS-Trans Europe Asia System*
- *Διασύνδεση Ελλάδας – Αιγύπτου*
- *EuroAsia Interconnector*

Workshop "Energy & Tourism"

The impact of tourism, renewable energy, and economic growth on the sustainable development of ecosystems

Sustainability is well linked with the protection and sustainable development of ecosystems and the preservation of their biodiversity. However, human activities have been the cause of irreversible harm to those ecosystems on multiple occasions, prompting a need to alleviate human pressure. RES projects enforce sustainability as they consist one of the most crucial tools for climate change mitigation, while tourism contributes to the local sustainable economy as a more anthropocentric activity which empowers circularity.

Coordinator: *Prof. Theocharis Tsoutsos / Rapporteur: Georgia Skiniti (ReSEL_TUC)*
Panel discussion (alphabetically):
- George Alexakis, Vice Governor for European and International Affairs, Region of Crete
- Dr. Leonidas Antoniou, Cyprus University of Technology
- Dr. Heleni Hatziyianni, DG MARE, European Commission
- Kyriakos Kotsoglou, Vice Governor for Tourism & e-Government, Region of Crete
- Prof. Stella Kyvelou, Prof., Panteion University of Social and Political Sciences, EAST
MED focal point (MSP Assistance Mechanism)
- Dimitris Mountakis, Chania Chamber of Commerce, and Industry
- George Mylonakis, Mayor of Kissamos Municipality

Topics:

- *The use of coastal and marine areas can be combined in harmony with economic and tourism growth?*
- *How can local strategies integrate into their plan the principles of sustainable tourism and energy?*
- *Can the local communities empower integrated strategies?*
- *Are insular and rural communities capable to meet the challenges of climate*

[5] See Appendix

change?

- *How the local systems can become more resilient in economic, health and energy crises?*

Subject Matter: Towards Hydrogen market uptake

Constantinos Papalucas |
Coordinator of the National Hydrogen Committee

George Kasapidis |
Governor of Western Macedonia

Jorgo Chatzimarkakis |
Hydrogen Europe, Secretary General

Valentina Dedi |
KBR

Panagiotis Grammelis |
CERTH

Vasilis Tiriakidis |
B & T

Nora Gourdoupi |
ADVENT

Athanasios Stubos |
Demokritos

Emmanuel Stamatakis |
FORTH

Tasoulas Fokion |
Group Innovation & Technology Director, Titan Cement

John Kokarakis |
Technical Director, SEEBA Zone Bureau Veritas

Constantinos Papalucas: *Good afternoon, everyone. My name is Constantinos Papalucas. I am an energy expert and east med specialist. over the last few years, I have been advising the Ministers of Environment and Energy on several topics. Since the beginning of 2021. I'm serving as the coordinator of the Greek National Hydrogen Committee. It's a great pleasure to be here and I'd like to say a big thank you to the host, the international Energy Exhibition of Greece for bringing this amazing blend of people to this beautiful venue. I may need to note here that this is probably the first time in my life where I'm not wearing a tie in an event like that. First, I would like to invite the speakers to go to their sits. So, in a more casual setting I'm very honored to be sharing this panel. I must admit that this is another*

year with a great line up of distinguished speakers. Let me start with
-Mr. Fokion Tasoulas, Group Director and Executive Committee member at the Cement Company Group
-Mrs. Nora Gourdoupi Senior Vice president of Business Development from Advent Technologies
-Mr. Vasilis Tiriakidis, founder and visioner behind BNT composites
-Dr. John Kokarakis, Technology and Business Development Director OF Bureau Veritas
-Mr. Thomadakis, Strategy and Development Division Director from DESFA
-Dr. Stamatakis from FORTH-ITE representative of Hydrogen Europe in Crete and the center of GeoEnergy in Chania
-Dr. Panagiotis Grammelis, CERT, the guy behind the Hydrogen hub
-And we also have virtually with us, his Excellency Mr. Giorgos Kasapidis, Governor of Western Macedonia
-We will be joined later by Mr. Yorgos Chatzimarkakis, the Secretary General of Hydrogen Europe
-Dr. Athanasios Stubos, the national representative of Greece in the joint undertaking of Hydrogen for the European Commission, Director of Demokritos and among the visioners of Cyrus Spin off
-Also, we had the great pleasure to be joined by Dr. Valentina Dedi, lead Economist at KBR in the United Arab Emirates and Deputy Director of Access for Women in Energy.
So, today I intend to start with presenting you the latest updates on what we have achieved so far on a national level and then I will ask from our distinguished speakers to help us take a deep dive in the global regional and national hydrogen developments from a corporate policy and research angle. The topic is the hydrogen market, the hydrogen economy. Please calculate the time needed for your comments so we cover as much as possible and get some good questions from the audience.
Last year the topic of this panel was an introduction to Hydrogen in Greece. We had some representatives from European Investment Bank to help us think how to finance hydrogen projects. We had a few ambassadors and representatives from the companies that they were planning hydrogen projects. The great news of last year was that we had a commitment from the regional governor of Crete that northern highway, also known as Vorios Odikos Aksonas Kritis (VOAK) will be a hydrogen-ready highway. This year the title that I will give to this panel is the survivors. And what I mean this year is that we do have projects that are moving forward and yes, I insist that Hydrogen is no longer coming from the future it's not another thought. Let me put it this way. When we speak now about hydrogen, we don't need to have you know to listen to the futuristic music of Vangelis Papathanassiou anymore It's happening now. So, let me start with first big success that basically put Greece officially on the European Hydrogen map. I'm talking about the two projects that have been notified in the first wave from the Greek state. The Green Hippo of ADVENT Technologies which is an innovative production facility of electrolyzes and fuel cells in Western Macedonia and h2 tank from BNT Composite which is related to an RDNI a first industrial deployment project related to innovative tanks made of carbon fiber that can be used in transportation of hydrogen or for storage purposes.

Most of them are deemed quietly positively from the DB and the next wave dedicated on decarbonization through Hydrogen will be notified around September together with the climate energy and environmental aid guidelines also known as SAC. And then the evaluation of the rattle wave kicks in so those are the first to results of a cross-sectoral approach we applied as the pci process has been embraced by our government vertically involving not only the secretaries of energy and industry as the originators but also the ones of maritime affairs transportation and research and innovation. Another Greek project by the way we expect to see soon is hydrogen trains but let me stop here on the IPCIS last but not least in December 2021 we concluded the Greek national strategy, an extended document including a road map and more than 30 policy major proposals, and the next step is to move to public consultation which is expected to begin maybe in a few weeks. So, this is what is happening on the Greek front I will leave it here and I will go take my seat and start asking questions.

Constantinos Papalucas: *How do you feel that the first two projects that have been published, are both projects of Western Macedonia? How do you see as a step Is this a step to see Western Macedonia to be a pioneer in the field of Hydrogen?*

George Kasapidis: *Thank you for this invitation to participate in this excellent conference and I congratulate the organizers for this conference and for the outcomes that have been concluded so far for the benefit of Western Macedonia. As you already said two of the programs that our country has published in European Union have been approved and they have to do with Western Macedonia. It is our pleasure that we accept them, and we have put a lot of effort in previous years to create this good environment for the Region of WM and to have these suggestions and proposals. It is a historic, an important event for the Western Macedonia and Greece because we are talking about a new technology which seems that will prevail much earlier than scientists thought. And after 2040, till they thought, it would prevail but now it's a fact and it started in Western Macedonia.*

Constantinos Papalucas: *What's the story with happening now? We lost track. You are almost everywhere.*

Nora Gourdoupi: *First, thank you very much for the invitation. It is our honor to be here in Crete in this excellent conference about energy. We heard a lot of things since yesterday very interesting things and the session is also very interesting. This component started in 2006. In 2021 in February, we managed to enter the stock market of New York. The company bought some other companies and we managed to pass from components to final systems and the company always since it started continues to do components of fossil fuels and electrolyzers. So, with green hippos for now/ And at this part I would like to thank Mr. Kasapidis and everyone that helped ADVENT to enter this field because there was a work has been done a few years ago. It was years or some months it was a preparation that took place during some months only, yes, it was business which helped some technologies to proceed earlier. So, ADVENT today will be in the field of development of systems of fossil fuels final systems for production of energy and fuels and electricity and our aim as*

we will also mention later in the presentation through green hippo. The production line of both systems and to be in Western Macedonia.

Constantinos Papalucas: *Share your story with us. Describe us why is your project so innovative. It's your another success story.*

Vasilis Tiriakidis: *Thank you very much for the invitation. It's an honor for me to be here. BNC Composites is a company based in Florina. It develops products and exports them in Europe mainly. The projects of tones and savings of hydrogen is a continuation of work that has been made in the last years with our procurement and our participation we had the chance to present our work and be introduced after 18 months of persistent work. We are going to develop some innovative hydrogen storage systems and transportation systems. What is the innovative is that tanks will have systems of detection of potential licks with optical fibers systems? The next step is to create tanks which will not have an internal liner that take fire tanks in cooperation with the university of Ioannina. And these are the systems that makes our tanks innovative. Many companies are interested to cooperate with big European companies. We are very happy that as a company in the West Macedonia we contribute together with Mr. Kasapidis, we are also part of his vision that Western Macedonia to be the first region that will use hydrogen and build hydrogen maybe western Macedonia will be the center of hydrogen in Greece and maybe Mr. Kasapidis the first hydrogen island will be in Prespes, Agios Axilios, maybe will be in our region.*

Constantinos Papalucas: *It is true that I first time I hear this. I'm surprised since we are in Western Macedonia let's carry on to Mr. Grammelis. Tell us in a few words about your venture and how these fits in this hydrogen valley.*

Panagiotis Grammelis: *Thank you very much for this invitation. We plan to construct this. We are in the beginning. We already have the composites. It is an initiative by Mr. Kasapidis which he trusted our region in Western Macedonia. He is head its headquarters in Thessaloniki, but he also has six brunches in Greece, and we have a big infrastructure from resources of the original western Macedonia. And we follow the same trend and this idea of combo hydrogen and the idea was to have a project which will be the beginning of for having companies who want to invest in the region and in order to have a big part in the production of hydrogen and the facilities which will support investors in terms of hydrogen production now we are creating a study which is supported by the green fund will have the first results soon. Now, we are talked about the land planning. There are many different components. We have the unit of production of green hydrogen with all the technical difficulties that are present for example we need to be able to construct hydrogen much bigger than Demokritos. Also, the topics of electricity production. Another dimension is electricity. How this will be regulated from the photovoltaics. Another topic that will help you. Of course, we do not forget the factory facilities. About the timeline until 2025 we expect it to work. So, you can be part of the category of survivors a lot of years in Western Macedonia but now we are adapting the environment.*

Constantinos Papalucas: *First, what does hydrogen has to do with cement. I would also like to hear more information about your vision as a company because I know that you have a huge fleet of heavy-duty vehicles.*

Tasoulas Fokion: *Thank you for the invitation. We are a company with 120 years of history, but we try always to adapt and innovate and be head of our times and to have a very ambitious strategy to have competitive advantage through digitalization and sustainability and innovation. So, these are the three pillars that the last five years has given us a lot of boosts to do new things. One of this, and I will say this because it's connected what we are doing is this digitalization today we run most of our assets with AI with real time optimizers and we have two spin-offs as in other companies the get out to offer services to some additives. From the side of sustainability, you know whether we are co2 emitters and part of this emissions are coming from limestone that will convert this to calcium oxide so 60% of our emissions is from that so we cannot fight with this up for the moment and we need to take other measures. But 40% of these are coming from fuel. So, our level of ambition is to eliminate these emissions that are coming from fuel and from heat that we require. So, part of our strategy is to replace our fuels with alternative fuels and with our innovation from the program the last years we thought about hydrogen and because we have developed a new culture of experimenting testing new ideas and then scaling them up and accelerating we did that with hydrogen for two years now at a very small scale and we have been proven that hydrogen for us is enhancing and catalyzing in our burning process and giving us great opportunities. So, after that we thought that's a great opportunity for us to scale it up. And we can talk later about more details on that and try to spill over some of the effects of hydrogen to other probably implementations. As you mentioned we have increased more than 2.000 heavy vehicles that cannot be managed with batteries now or other fuels than the traditional fuel so that we are thinking to with our new project that we must scale it up and have such a spillover and try to implement hydrogen also as a fuel of mobility. So, we have great plans, and we are very happy being here and sharing ideas together with you that you are an ecosystem of innovation in hydrogen.*

Constantinos Papalucas: *Let me clarify here that TITAN is very active not just in Greece but in the United States and many other countries.*

Tasoulas Fokion: *We are having a history of 120 years, 80% of our Ebida and revenues coming from abroad most of it from US, but also have presence in southeast Europe, in Turkey, in north Africa, in Brazil. We believe that we are a very young company even that we are 120 years old.*

Constantinos Papalucas: *Since you talked about an ecosystem that it is now a reality; I think it's a good time to go to Mr. Stubos. Maybe one day we will call you Thanos, something like a founding father of hydrogen or something like that in Greece. Thanos is the national representative of Greece in the joint undertaking of hydrogen director of Democritus and among the visionaries of the curys spin-off.*

Constantinos Papalucas: *I would go directly to the chase Thanos because you had a great presentation of hydrogen refueling station about a month ago with Manos of course and the rest of the team in Democritus. We are talking about the very innovative project a hydrogen refueling station with non-mechanical composed mechanisms which makes it quite innovative and very attractive. Would you like to tell us how your envision? Of course, Thanos and Manos as well as re part of the national hydrogen committee and we spent hours and hours and we still spend more hours and hours to get thing moving. Thanos the floor is yours.*

Athanasios Stubos: *Many thanks to the organizers for the invitation. It's really a pleasure to be with you today even at a distance. Thanks for calling me father of hydrogen in Greece. It has been a pleasure that we are a team of course. Manos is there and several other collaborators. We have been behind the initiation of the various activities related to hydrogen technologies in the country over the last years. That's a good think to hear and a good feeling for us. In Democritus we have developed several research and development activities regarding hydrogen technologies especially concerning storage of hydrogen compression of hydrogen using, avoiding the use of the classical mechanical compressors with the moving parts and all the disadvantages that come along with these devices and recently we have started the official operation because the actual operation has started long ago. The official operation of the first pilot hydrogen refueling station in the country in the premises od Democritus. This is something that we hope will provide the opportunity or will be the first step toward the development of a series of activities that have to do a lot of things not only research but also in relation to market deployment of hydrogen technologies, wide market deployment of hydrogen technologies in the country in transportation, industry and in any other energy related applications. One important thing regarding the actual development of the station is that it incorporates, it integrates compression technology that has been developed in Democritus and it is now property of a spin-off company of Democritus named curys, a compression technology that avoids the use of mechanical parts. In that respect it has a series of advantages it uses it reduces a lot the use of electricity for the compression of hydrogen. It is noiseless that's also a very important advantage. It comes along with very much reduced operational costs and so on. So, I guess that we will have the opportunity to discuss about thing later as well. Like I said the important thing for the country I think is to develop a hydrogen market now in several ways and in several applications including as I said transportation industry and so on. That is a step that must be taken and there are several things that must be done in that respect, and we can we are here perhaps to discuss those necessary things.*

Constantinos Papalucas: *How many hydrogens refueling stations do you see in the next five years, 10 years, 20 years. If somebody decides to buy a hydrogen car?*

Athanasios Stubos: *From my position as a national representative of the country of this in Brussels at the European commission of hydrogen technologies I can say that the official number used to be -I say used to be because this was a number*

about two years ago and things have changed drastically over the last one-two years as we all know from many new boarding's- the official number was about 850 hydrogen refueling stations to be operated, deployed and operating actually operating in different countries, in different member states of the European union by the year 2025. I am pretty sure that this number will be pushed upward very soon and this about a minimum of hydrogen refueling stations to be operating in Europe by 2025. I believe that there would be several thousands of those by 2013 and it will be possible the dream we all have for many years now to get a continuous network of highways that will make it possible for someone to drive a hydrogen powered car/vehicle, a passenger car or a truck or a heavy duty vehicle or whatever dried it from Greece, from Crete even from the south and most point of Europe to European union up to the north of Norway or something like this. So, I think this is something that we must really look forward and we must try to make it a reality. All of us not only Greece.

Constantinos Papalucas: *Proportionally how many do you think we need?*

Emmanuel Stamatakis: *The number of Islam said two years ago for Greece was around 18 feeling sessions, but thing has changed so due to the new regulations of the European commission because now they demand to have at least one HRS they have generalization every 150 kilometers, so these numbers has changed. For Crete I think at least four or five. One for each main city.*

Constantinos Papalucas: *From what we read your hydrogen project has been earmarked as power European Union project and especially now after the war in Ukraine. What's your view for a high emergence of the European hydrogen economy? I know, also, that DESFA is a founding member of the hydrogen backbone association.*

Michael Thomadakis: *First of all, let me remind everybody that we are building the first hydrogen pipeline in Greece. It goes to West Macedonia. We are very happy to hear that hydrogen will be produced there. In any case our pipeline is going to will position to accommodate in the long run. It's the first pipeline in Greece that fully meets the hydrogen transportation standards. High pressure. So good luck Mr. Kasapidis and everybody else in efforts to produce hydrogen in West Macedonia. In parallel, allow me to say that we are also concluding our study on how much hydrogen can be transported in today's network so blend it with natural gas because the more hydrogen we can transport throughout Greece the better will be for the development of the market of hydrogen. I think this is important. To come to what you mentioned, the repower European Union we had since last year, let's say one and a half year now, the idea of developing a pure hydrogen pipeline so let's say the Greek hydrogen backbone. Designed to transport only hydrogen. It will need very large amounts of hydrogen to transport. In parallel, we have made a study on how much is the production of hydrogen in Greece and with us in a gradual way. So, we think, and that's why we proposed it that we have somehow duplicate our current system with a pure high hydrogen ready pipeline meaning a pipeline is in absolute position you transport a hundred per cent hydrogen through it. We did not stay*

there. We collaborated with Bulgarian' gas tap and snub. Also, plus North Macedonia nearby. So, the new pipeline to North Macedonia which is about to start a construction in the next following months will also be hydrogen ready. So, all these things will formulate let's say the Greek and the southeast European hydrogen backbone on that. We have already submitted this project almost a year ago and it has already been incorporated in what is called 10-year development plan of hydrogen for Europe. So, the inauguration last month and the signature of by Mrs. Gali of the founding declaration of all 31 TSOs in Europe for transportation hydrogen was just another step in our effort to develop a hydrogen backbone in Greece. We have, due to the latest facts that which relate heavily with the executive supply of gas and we have proposed that this project becomes part of the repower EU projects you know we have of course incorporated this idea also in the IPCEI projects for the time being not having let's say rejected but we don't have a positive response there yet but if this project is a part of the repower EU since the same pipeline is already needed to cover the needs of our neighbors with natural gas. We must not forget that the hydrogen ready pipeline is also a natural gas ready pipeline. Hydrogen is more difficult gas than natural gas so whatever is hydrogen rate is by default natural gas ready. So, we try to combine he needs of today with the needs of tomorrow and with this power EU proposal which we heavily support right now we spend a lot of time and efforts on that. We hope that we will be in position part by part gradually to develop a hydrogen ready backbone in Greece, and we very much urge everybody to produce enough hydrogen transport because at the end of the day we will need hydrogen to transport but we are here to help any effort in this direction, and we are doing whatever we can not only us but also our shareholders who are very- you know that are among the most advanced and pioneers in hydrogen in Europe. We are doing our best to also promote the development of hydrogen market in Greece as part of southeast Europe. A relevant market and let's not forget that this effort has a name is the fifth hydrogen corridor of the European hydrogen backbone. So, we started and let's see.

Constantinos Papalucas: *It is time for a reality check, I guess. This is probably one of the most important specters of an emerging Greek hydrant value chain and I'm referring to shipping. The floor is yours.*

John Kokarakis: *Thank you very much and good afternoon. Thank you personally for the invitation and at the same time I would lie to congratulate the organizers of this conference for two reasons. one is that is organized in my home city Chania and the second reason is that this is a gathering of authorities on the subject and let me tell you that I'm very encouraged by what I've heard so far as we know. Rome was not built in one day. So, I'm very encouraged by the progress that has been done so far and I believe that this is going to continue in that and faster pace I have to admit that I was familiar with ADVENT who presented their work to my company. What is critical is that we at shipping are mandated by the international maritime organization to decarbonate and we consider very different fuels we consider methane, ammonia, methanol, and of course hydrogen. Hydrogen is a key in the future multi-fuel society why because it is the mother of all fuels. You need the hydrogen as a feedstock to create all the others. So, if you capture carbon dioxide*

combine it with hydrogen and you can make the other fuels. It has high energy; it has its problems as they say in America that there are no freelances but there are various stumbling blocks in the pathway which I'm sure are going to be overcome because technology is moving very fast. Some ideas improvement of the electrolysis process if we go with green hydrogen. I was reading about the simcore procedure which has upscaled production of hydrogen to almost a thousand tons per day and can probably be upgraded as well. There are problems I don't want to go into the logistics we need water, we need electrolytes. For one kilogram water we need about nine kilograms. Of one kilogram hydrogen we need nine kilograms of water. That's a lot of water probably the loch ness. So, we also need electricity. We produce with the conventional methods of production today we have ten kilograms of carbon dioxide emitted to get one kilogram hydrogen. So, in that sense it doesn't make a difference to produce. No impact on the carbonization on the tally of carbon dioxide. Recently, I would like to give you the information that three days ago IMO has started a correspondence working group to determine the life cycle, make the life cycle assessment of various fuels. That means that we are going to consider the carbon dioxide emitted besides that methane and the nitrous oxide which are major greenhouse gases not only from tank to weight but also from well to time. And that will make our life more difficult but that's the way it must be. I don't want to monopolize the time I'm here.

Constantinos Papalucas: *From the very first time that I gave my first speech on hydrogen that was like two or three years ago pointed out what's the great opportunity for the Greek shipping family. Not just hydrogen it's hydrogen and co2 transportation as well, it's not just what's the right fuel to burn for the shipping industry but somebody must connect the dots and that's the moment that I will go to Mrs. Dedi. We started from Western Macedonia, then we went South, and then we went through shipping we went regionally through DESFA and then through shipping we are going globally right now. So, the discussion is somebody has to connect the up streamers of hydrogen right with the emerging centers like the demand centers. Whether that is a Japan, Korea, or Germany. So, there are two questions. The first one is what is the role that you envisioned for the Greek shipping community in terms of transporting transferring hydrogen or co2, blue hydrogen. The other one is which is totally different I know that our shipping family was always referring to IMO and they were a bit away from the decision making in Brussels. Now I feel that they got it right and they want to engage with people that decide because it's better to decide with your presence than nonbeing there. What's your take on that?*

John Kokarakis: *With respect to hydrogen, I believe that is going to be a major share of hydrogen in the future but a few years ago we had the same discussion about ING the so-called chicken and neck situation. Like VGA we like ING there is no infrastructure, and we have the same question for hydrogen. Is there infrastructure, okay we will make infrastructure. Today it seems that when it comes to ING there is no problem with the infrastructure. We hope that the same is going to be the case with hydrogen. Maybe a ham, an island, same way that the miles has converted beyond hormone island in Denmark to the so-called methanol island, where they*

make methanol with wind turbines. So, this problem is going to be solved. Unfortunately, allow me to make a little bit. I have a little bit of a fear that we are going all over. We follow many different avenues and that reminds me of the dogs that change their tales. Probably we must focus somewhat look at the most promising pathway and focus on that because we split our potential. This is one problem.

Constantinos Papalucas: *That was the point during Posidonia that we are not going to see one fuel but a blend of few fuels.*

John Kokarakis: *It is a plan, and we look to all of them. In my profession I get questions from ship owners. The major question today, the hot potato, the one-million-dollar question yes, I will build but what fuel. So, there are different answers. Maybe you have enzymes that will burn all of them, that's possible, you can do this with minor correction. But it is a problem we must pick somewhere.*

Constantinos Papalucas: *The other question was about Brussels.*

John Kokarakis: *Personally, I don't work for IMO although I am a technical advisor for the friends plan in the procedures, but I believe that the initiative by the European community may be wrong because it is a regionalization of regulations. That's going to cause confusion and problems. Unfortunately, we have the covid pandemic. This has made the work of IMO very difficult. Do you know how many hours they worked in the MBC conventions? Three*
Hours per day. What can you do in three hours per day? Nothing. So, European Community claims that IMO does not move so we are going to move. The wheel is there. They are going to revise their strategy and instead of having 50% reduction of co2 in 2050, they are going for zero initiatives. It is better if there is going to be an agreement is going to be regulation by IMO alone because now, we have an opening of the pandora's box. We have a European community, then we have China, then we have India, then we have United States and it's going be a mess.

Constantinos Papalucas: *I have several questions I would like to ask here since you are based in the United Arab Emirates. So, we have the co-op there, we had the Irena summit for renewables, for hydrogen. The topic I remember was the geopolitics of hydrogen. First, in would like to invite you to give us a broad statement of how as from your role how you see the future of hydrogen, regionally first. I know that the region over there, they have huge plans about hydrogen UAE, the Kingdom of Saudi Arabia as well. I would invite you to give us a brief overview first, and then I will ask asking more specific things.*

Valentina Dedi: *thank you so much for the invitation likewise it's a great pleasure to be here with you even virtually although I must admit I'm a bit jealous. It would have been a great pleasure if I was there with you in person and specially this time of the year instead being here in the humite and hot Dubai. It's a great pleasure to be here and discuss contribute to this discussion on hydrogen because we are really living in very exciting times. I remember just a couple of years ago we were working*

on oil and gas projects and within the past two years everything has to do about this law carbon technologies and hydrogen. So, everyone now, all our customers are interesting in hydrogen and how they take a share of this hydrogen pie. You asked me about to give you a review of the regional situation here which indeed both the UI and the Saudi Arabia have big ambitions about the hydrogen deployment, and they are envisioning becoming leaders in exporting hydrogen. But let me give you also a global overview because now we have many clients from Asia, as well as from Latin America who also have the same vision of becoming leaders in the global hydrogen economy. So, there is a strong competition now. We understand that these countries, like I said these middle east countries or Chile and Australia for example from Asia, they do have access to renewable resources, or they do have access to gas so it will make it easier to become dominant players in exporting hydrogen. Of course, we should not expect what we need really to be realistic because we should not expect hydrogen to become like a global traded commodity within the next few years right. We are far away from that, and I will tell you why. Because now what we are seeing and what I see from all these discussions about hydrogen is that we focus a lot on hydrogen production. Of course, the upstream segment, I mean achieving producing hydrogen at a competitive basis is important. It is the starting point but having a fully functioning and developed hydrogen economy need to go beyond hydrogen production and we really need to look at the entire value chain and now we are not doing it. So, we really need to understand that besides increasing the production capacity and having it at a competitive basis we need to look at the development of CC US, storage, conversion, distribution, infrastructure and look at demand as it was mentioned it was discussed earlier. And now there is a big gap. Also, besides those countries that envision to become leaders in exporting hydrogen we have seen even those countries that they do not have this capacity or the access to resources. They still envision to become leaders maybe in technology and there are plenty Asian countries and a good example of that is Japan and South Korea but targeting that and of course Europe is trying to become a leader in policy. Most of the ambitious climate targets now are coming from Europe.

Constantinos Papalucas: *I see that there is great potential from European technology companies, and I think that we have a couple of them here but would that energy vendor 2.0 because Germany is the one that leads this technology effort in hydrogen. Do you think that we will see another china – China dominating again the whole technology sector because of its favorite position in the value chain in critical raw materials and other materials that are used for fuel cells and electrolyzers. What is your take on that?*

Valentina Dedi: *There is that risk now Europe is doing quite well on providing technology for example for electrolyzers as you mentioned and there are efforts that are being made now to maintain that position and in order not to see due to experience against what we saw educated go what happened with renewables so there is the risk. I'm not sure on that to be honest. I'm not sure if I'm the right one to comment on that but as I said with Europe and all these policies and all this effort that is being put now for the region to carbon neutral and for seeing hydrogen has*

really kept a lot of all these plants. I expect that there will be significant effort and then maybe they don't really give in now because there are lots of opportunities that are emerging now with the hydrogen deployment, so I expect Europe not really to give in or not really to do maybe there are then the same mistakes as in the past and lose again the market.

Constantinos Papalucas: *Has recently appointed as the representative of Hydrogen Europe here in Crete. We are working closely for the works of the national hydrogen committee, and he is also among the founders of Cyrus spin-off. Can Crete be hydrogen powerhouse?*

Emmanuel Stamatakis: *First, let me say that we are also connected somehow to the regional of Western Macedonia and the initiative of the Hudson??? Technology that are taken there. We are together with Democritus our institute also an advisory advisor for the region and Mr. Kasapidis on hydrogen technologies. We are also as we said this pin of companies Cyrus that developing these initiative hydrogen compressors. Somehow, we relate to both technology with both companies here. ADVENT recently under a strategic investor in our company and, we are in go contact with Mr. Kasapidis to see if and how we can collaborate and developing our compression with his materials that he's developing. We are trying and we are trying to build on this statement last year of to develop Vorios Odikos Aksonas Kritis (VOAK) as the first hydrogen highway. It needs a lot of effort, and we are trying to organize the regional community on this to see who and how to implement this visionary target. Crete has the potential to be a valley on hydrogen and be a node between Africa and Europe.*

Constantinos Papalucas: *So, that will be the statement for the whole panel. Crete is going to be hydrogen valley island of Greece.*

Emmanuel Stamatakis: *Yes, the connector between two continents because of the cables.*

Constantinos Papalucas: *And the cheap electricity produced in Africa, which means low marginal cost hydrogen that means competitive hydrogen.*

Emmanuel Stamatakis: *Yes. And something we can add because we are doing applied research in our institute so we can be let's say the assistance between the companies and the market of how to easier and safely introduce this technology in our economy who had the discussion before with Mr. Thomadakis and one of a recent project that we were starting now from the European Commission that we are coordinators, is to try to explore the geology of the country and especially around Crete to see if there are potential sites and short caverns to store large quantities of hydrogen and because storage. This is something that we will start looking very much in detail from this October it's a three-year project and we hope we will have a good result after that when we are going to have the first results probably, we can say something next year.*

Γεώργιος Κασαπίδης: *Το προηγούμενο διάστημα ήμασταν συνδεδεμένοι με κάτι όχι τόσο ευχάριστο και μάλιστα κατά την διάρκεια της προετοιμασίας αυτού του συνεδρίου με τους διοργανωτές μιλήσαμε και είπαμε μήπως μπορούμε να κάνουμε το επόμενο συνέδριο εδώ στη Δυτική Μακεδονία και να συνδέσουμε τις δυο περιφέρειες με έναν ισχυρό δεσμό αυτόν τον ενεργειακό, των πράσινων ενεργειακών τεχνολογιών που θέλουμε και οι δυο περιφέρειες να παίξουμε έναν πρωταγωνιστικό ρόλο και να δώσουμε αυτή την προοπτική στις τοπικές οικονομίες βοηθώντας πάρα πολύ την πατρίδα μας. Και η Κρήτη έχει πολλά πλεονεκτήματα και η Δυτική Μακεδονία έχει τα δικά της. Έχουμε και ισχυρούς ιστορικούς δεσμούς γιατί πολλοί κρητικοί έπεσαν εδώ μαχόμενοι για την ελευθερία της Μακεδονίας κατά την διάρκεια του Μακεδονικού πολέμου.*

Οπότε εγώ θα ήθελα να θέσω την πρόσκληση για το επόμενο συνέδριο, αμέσως μετά το καλοκαίρι αναλαμβάνουμε εμείς να φιλοξενήσουμε και να υποστηρίξουμε τη διοργάνωσή του, να δούμε πως τρέχουν οι εξελίξεις που τρέχουν ραγδαία αυτή την περίοδο στον ενεργειακό τομέα, η Ευρώπη βλέπουμε ότι στηρίζει πάρα πολύ ισχυρά ειδικά το πράσινο υδρογόνο, έχουμε ξεκινήσει ήδη εδώ κάποιες εφαρμογές σε συνεργασία με το πανεπιστήμιο και το ΚΕΤΑ στη Δυτική Μακεδονία και θέλουμε αυτό να συμπαρασύρει όλες τις περιφέρειες και την Ελλάδα μπροστά, ψηλά σε ένα ρόλο πρωταγωνιστικό, για να μπορέσουμε να φέρουμε πίσω όλους αυτούς τους επιστήμονες που ακούσαμε και σήμερα να μιλάνε από άλλες χώρες του εξωτερικού, να βρουν δουλειά εδώ στην πατρίδα μας και να μεταφέρουν αυτή την δυναμική και αυτή τη γνώση την επιστημονική προς όφελος της Ελλάδας μας. Άρα, αν ενώσουμε δυνάμεις εδώ, που είμαι πεπεισμένος ότι αυτό είναι η επιθυμία και η ευχή όλων έχουμε πολύ θετικά αποτελέσματα. Να ευχαριστήσω, κλείνοντας αν μου επιτρέπετε, τον κ. Στούμπο και τον κ. Σταματάκη που ήταν οι μέντορές μου μπορώ να πω στο πράσινο υδρογόνο. Από αυτούς ήρθα σε επαφή πιο κοντά με τον πυρήνα των εξελίξεων της ευρωπαϊκής ένωσης πριν από πολλά χρόνια και από τότε είδα αυτό που σήμερα γίνεται πραγματικότητα, χωρίς τότε οι περισσότεροι να πιστεύουν ότι αυτή η τεχνολογία μπορούσε να έρθει το 2022 στην Ελλάδα. Όλοι λέγαμε ότι μετά το 2040, το 2050 θα έχουμε τις εφαρμογές. Όμως οι εξελίξεις μας εκπλήσσουν θετικά όλους και έχουμε θετικά αποτελέσματα σίγουρα στη Δυτική Μακεδονία. Ο κ. Τιριακίδης είναι μια επιχείρηση στα πέντε χιλιόμετρα από τα σύνορα. Το έχουμε ανάγκη να έχουμε τέτοιες επενδύσεις προηγμένης τεχνολογίας.

Κωνσταντίνος Παπαλουκάς*: Ακριτική επιτυχία*

Γεώργιος Κασαπίδης: *Η ADVENT που έρχεται στη Δυτική Μακεδονία με μια επένδυση της τάξεως των 800 εκατομμυρίων ευρώ, ίσως να είναι από τις μεγαλύτερες στην Ελλάδα και κομίζει τεχνολογία αιχμής που αυτή τη στιγμή δεν υπάρχει σε πρακτικό επίπεδο, παραγωγικό στην πατρίδα μας. Καταλαβαίνετε λοιπόν ότι ο κύβος ερρίφθη για πολλές θετικές εξελίξεις και ο «Λευκός Δράκος» με μια αναθεώρησή του στο επόμενο κύμα της αξιολόγησης πιστεύω ότι θα ολοκληρώσουμε όλη αυτή την προσπάθεια με μεγάλη επιτυχία ικανοποιώντας τις προσδοκίες και τις επιθυμίες όλων όσων πιστεύουμε σε αυτήν την προοπτική.*

Jorgo Chatzimarkakis: *Many thanks and congratulations to this panel. Given the fact that you are already in the middle of the discussion I will leave the slides. I will*

really concentrate on giving some highlights in an oral manner and to start why it's exactly constantly as you say Greece is on the map of hydrogen not to be expected two years ago, quite in question mark one year ago. This year we can clearly say that Greece is one of the major elements. That's good to hear. There are some drivers for this, one is yourself (Mr. Papalucas), because you have helped in the Ministry to push things. So, today you are the moderator but for all this process you have played a fundamental role and we must be as the hydrogen sector, also, grateful for that. Another important factor is Georgios Kasapidis, as the Governor of Western Macedonia. Without his insisting and sometimes, also, his annoying passion and patience, it wouldn't have been possible. He was the one who really delivered with his region basically a blueprint of why Greece needs to be in and what can be done.

I admit that I would always love to see more courageous steps by any government so, to set this clear from the very beginning. We know that the first IPCEI projects stumming from Greece will be greenlighted very soon, this is out of question. This big project, "White Dragon", in the timeline has gone a little bit further in to the future but is still heavily on the table and this is important, it needs some functioning, but this will be done, and this is my most important message possibly for today, that despite any rumors that you can hear in Greece, this is a very important project. I will explain why. And I would give a snap chat of the current situation.

Basically, the role of hydrogen which was already core and center of the energy transition with the pandemic and with the hydrogen strategy. Vice president, till some month, says that every day. it's the rock star of the energy transition. It's core center. With the war in Ukraine, with the Russian invasion into Ukraine, this has changed dramatically. Because Hydrogen and its derivatives has brutally stepped into the scene as not the rock star but the one that delivers the volume for their replacement. We need to replace and that's clear. The dependency on Russian gas by something else, and the commission has decided that 25% of the whole volume of Russian gas into European Union will be replaced by hydrogen until 2030. And of course, that 20 million tons of they say renewably produced Hydrogen. But I will pick up what I just heard in the discussion. We have the impression that it might be a mix of renewable and clean hydrogen among others stemming from nuclear. This is out of question that we will see also a nuclear dimension which has the same boosting effect for the electrolyzers because still we need to split water with electricity stemming from nuclear in this case. But I must make one very important distinction. Whereas with the renewables we talk about the principle of additionality. We need to add renewable infrastructure. Renewable energy sources, this is out of question, and will be done. In the case of nuclear we as Hydrogen Europe would not ask for nuclear installations but what we would ask is to use as much as existing nuclear to be recommissioned for the hydrogen production right now. To give you one very simply example Ukraine itself. Ukraine started as of last week to deliver current electricity to its neighbors to Romania, and to Slovakia. They export energy. You can bet or you can guess where it comes from. It comes from the nuclear power plants, and we know that the Hydrogen strategy prepared for Ukraine will contain exactly that. A mix of renewables photovoltaic will be taken over by nuclear to make hydrogen cheap. 24/7 you need electrolyzers to be

running all the time and this is what happens right now. I had a look at the last amendments of the European Parliament on renewable energy directive II and the latest developments on the European level. It seems that the targets that we have, the big targets, the 20 million tones, based on a 50% target for industrial hydrogen so chemical industry, but also, steel industry in the future they need to be replaced and we might be entitled to feel up this by clean hydrogen. Clean means that you cannot produce more than a kilo per kilo of hydrogen on co2 and nuclear obviously will get into this category.

Another good news is that seems, also, the other target we have and the renewable fuels of non-biological origin we have the target of 5% until 2030. So, out of other fuels in 2030 5% need to be based on hydrogen and this had been watered by the members states the other week but the European parliament and its latest compromise from yesterday keeps it up so they are very confident they will land there, so we have clear targets and I add these targets might be ended up by clean instead of having only renewables. The bottleneck here is also the infrastructure to be honest.

We need to scale it up, but this is difficult, because still prices go up, we have interruption of supply chains. We have also some difficulties in photovoltaics so will be a mix that's cleared to be seen now, and here's exactly the role Greece? To focus very much on the renewable part.

Constantinos Papalucas: *What's your vision for Crete?*

Jorgo Chatzimarkakis: *My vision for Crete must do basically with the role of Greece as a hub from hydrogen that comes from Middle East and north Africa. Crete will develop as a one of the main of the hubs here. It's out of question that European Commission is preparing now something which is called the Green Mediterranean Hydrogen Partnership. So, this is important because it will foresee not only existing retrofitting of existing pipelines in the western part of the Mediterranean so Morocco, Spain but also Tunisia, Algeria to Spain and Algeria to Italy, there will be a new pipeline, the galaxy project for the ones who know and retrofitting venetian pipelines via Sicily to Italy and in the eastern part now we have nothing. And the commission looks much more than the Greek government, I have to say, because Greek government has been quit lately into the East med project. Super important because it will be the most critical issue to transport the renewable hydrogen and its derivatives cheaply in the transition time and here comes the role of Crete, we will use ammonia. I will give an example I will give you an example.*

I met last week the CEO of the biggest consumer of hydrogen in the world, which is the chemical company of BASF in Ludwigshafen in Germany. Germans wanted to have cheap access to natural gas because of heating and because they wanted to use it in the energy section but mainly as a chemical feedstock. And most of the product they need now is ammonia. So, to really replace the big dependency that BASF and the Germans have to Russia they need green ammonia very fast.

And here Greece and Crete can play first the role of also a production center. We can produce cheaply renewable hydrogen and hence? A green ammonia and we can cheaply ship it. That's the point where Greece and some Cretans ship owners also, I think have a role to play to retrofit from now on the existing fleets versus ammonia.

We will need much more ships that can bring the ammonia basically to Trieste That's a direct direction from Trieste to Ludwigshafen?? or to go the long way on to Rotterdam and to north ports that I visited yesterday where you can then ship with parches via the Rinne. This is all crucial quite urgently. Much more than Greeks the Germans face immediately the shutdown from Russian gas and BASF must stop 14 days we might have problems with our bread because East is based on these processes that come from Ludwig southern which is the mother of all chemical companies all over Europe. So, therefore we have an eye on that. I have a meeting with the German vice chancellor Thursday to discuss how we can do this and here we need Cretan ship owners and not only. And Crete as a main hub to drive these processes and I'm very confident that we will land there. Of course, in Crete on the island itself it goes without saying that some first uses especially we don't have industry there but in tourism so rental cars, why not to have rental cars based on hydrogen and of course the bus fleet can be replaced easily and can replaced fast because the applications are there and here, we are waiting for the island to play the role model. Ibiza?? It could have played this not there yet. Crete could be there yet. Of course, I will be in summer back in my home Ireland, and I will try to drive this process further.

Constantinos Papalucas: *Thanos the founding father and I want his final remarks.*

Athanasios Stubos: *It was very good to listen to Yorgos. Chatzimarkakis is Cretan as already knows. I thank him for the good news and for the nice overview of what is going on right now. I would just mention one thing. The main issues are, and we all try to that is to step up, to start creating the hydrogen market in Greece and in Europe in general. Many things were said and heard all the different parameters and the legal framework, the funding, the pilot projects, the need of the value stakeholders to for synergies and so on everything was mentioned except one thing which is ton technological – It is very important, as Yorgos know as well, that we look at this so-called public awareness issue. It is important to have the people with us in anything we look regarding this energy transition and of course regarding deployment hydrogen technologies and it is extremely important to inform in a convincing and in a serious way the public on that. An important parameter there and allow me to say that maybe some people will not agree with that. We must think in a different way unfortunately. I say unfortunately because the problems we are facing and these problems make the energy transition a necessity are such problems for first time perhaps in history of humanity that we cannot say that we any technologies that are good enough, are cheap enough or whatever so we can stay with the business as usual, and we continue as we are today. This is not an option anymore. And this is the first-time humanity faces that. Let's not be us, we have fathers and grandfathers today, with us today- let's not be us answering the question of our sons and daughters and our children, grandchildren, saying that if they ask for example, why didn't it happen that time in time this energy transition successfully and we might reply to them we are sorry hydrogen technology was not produced, green hydrogen couldn't reproduced at 1 Europe kilogram, but it was 2,5 and then it was abandoned. This is not an answer we can give to our grandchildren some years later those of us who will be here, and this must be understood by*

everyone that the criteria we usually use techno-economically, and we are used to employ these criteria for this successive introduction of new technology and so on have to be rethought. We must rethink them in view of the current reality which is much different than anything the humanity has faced so far.

Day 3: Sunday 3rd of July 2022

Subject Matter: Shipping & Development

Giannis Plakiotakis |
Minister of Maritime Affairs & Insular Policy

Είναι γεγονός ότι η ενέργεια αποτελεί αυτήν τη χρονική στιγμή το μεγαλύτερο ζήτημα στον πλανήτη. Τα δυο χρόνια πανδημίας αλλά και οι τελευταίοι μήνες με την παράνομη εισβολή της Ρωσίας στην Ουκρανία, σε ένα πόλεμο εντός Ευρώπης που ακόμη μαίνεται, έχει οδηγήσει σε κατακόρυφη αύξηση του κόστους της ενέργειας σε όλες τις μορφές της. Αυτό έχει προκαλέσει αλυσιδωτές αντιδράσεις στην αγορά με την ακρίβεια να βρίσκεται παντού, ενώ παράλληλα έχουμε αναπροσαρμόσει τις προτεραιότητές μας και σε επίπεδο Ευρωπαϊκής Ένωσης με την ανάγκη αναζήτησης εναλλακτικών πηγών ενέργειας και απεξάρτησης από τις πηγές φυσικού αερίου της Ρωσίας να είναι επιτακτική. Τα νέα δεδομένα στα οποία καλούμαστε να προσαρμοστούμε δεν μπορούν να αφήσουν ανεπηρέαστη και την ναυτιλία σε όλα τα επίπεδα, αφού αποτελεί το μέσο το οποίο διακινεί περισσότερο από το 90% του παγκοσμίου εμπορίου. Αυτό που έχουμε μπροστά μας είναι η μετάβαση σε μια ναυτιλιακή βιομηχανία που δε βασίζεται σε ορυκτά καύσιμα, μια αλλαγή η οποία αποτελεί τον πιο ριζικό μετασχηματισμό που συνέβη ποτέ στη ναυτιλία εδώ και έναν αιώνα. Αν κάτι μας δίδαξε η πανδημία αλλά και η τρέχουσα ενεργειακή κρίση, είναι ότι ο κόσμος δεν μπορεί να αντέξει λιγότερο αποδοτικές από ή ακριβές μαζικές θαλάσσιες μεταφορές.

Εκπροσωπώντας την ελληνική ναυτιλία, τον παγκόσμιο ηγέτη του κλάδου. Μπορώ να διαβεβαιώσω ότι η χώρα μας θα συμβάλει αποφασιστικά στην υιοθέτηση βιώσιμων πολιτικών απαλλαγής από τον άνθρακα προς όφελος του περιβάλλοντος για ένα βιώσιμο μέλλον αυτού του πολύ σημαντικού τομέα ο οποίος διαδραματίζει στρατηγικό ρόλο για το έθνος μας, την ευρωπαϊκή ένωση αλλά και ολόκληρο τον κόσμο. Η ελληνική ναυτιλιακή βιομηχανία προσβλέπει στην εποικοδομητική συνεργασία όλων των φορέων ναυτιλιακών, παραγωγών καυσίμων και μηχανών, ναυπηγείων για την επίτευξη του στόχου της απανθρακοποίησης, ο οποίος παράλληλα αποτελεί και μια πρώτης τάξεως ευκαιρία για την βελτίωση της δημόσιας εικόνας της ναυτιλίας.

Στην παρούσα ενεργειακή κρίση η βαλκανική χερσόνησος και ιδιαίτερα η χώρα μας μπορεί να κατακτήσει τη δική της θέση στην στρατηγική της ενεργειακής μετάβασης της Ευρώπης. Πριν από περίπου ένα μήνα μαζί με τον πρωθυπουργό Κυριάκο Μητσοτάκη, εγκαινιάσαμε τις εργασίες κατασκευής της πλωτής μονάδας αποθήκευσης και αεριοποίησης της Αλεξανδρούπολης. Πολύ σύντομα οι ελληνικοί

σταθμοί NLG θα είναι σε θέση να καλύψουν πλήρως όχι μόνο την ελληνική αγορά αλλά και να αποκαταστήσουν ένα σημαντικό τμήμα του ρωσικού αερίου στα Βαλκάνια. Είναι η στιγμή να καταλάβουν όλοι, ιδιαίτερα στην Ευρωπαϊκή Ένωση ότι η ελληνική ναυτιλία και οι Έλληνες πλοιοκτήτες που ελέγχουν σήμερα το 22,3% της παγκόσμιας χωρητικότητας των NLG carriers μπορούν να εξασφαλίσουν τις ανάγκες της Ευρώπης σε εναλλακτικές πηγές ενέργειας.

John Kokarakis |
Technical Director, SEEBA Zone Bureau Veritas

Environmental Challenges of Shipping

Following business as usual combined with a steady growth of world commerce will increase the contribution of shipping to the anthropogenic burden of many pollutants and GHG. Global warming is just the tip of the iceberg. Black carbon spreading on the snow causes the radiation from the sun to be absorbed and not reflected melting the snow. We can improve fuel quality burnt in ships, after-treat engine emissions, and adopt other efficiency enhancement measures to reduce fuel consumption. A low hanging fruit is the reduction of speed. Energy saving devices ameliorate the flow of water under the ship's hull reducing drag and increasing fuel efficiency. International Maritime Organization picked the gauntlet thrown at it by COP 26. Decarbonization Strategy has been revised targeting a zero-carbon economy by 2050. This is a huge undertaking because the technology and fuel infrastructure do not currently exist. Biofuels, batteries, hydrogen, ammonia, and methanol are emerging as possible options for shipping, aiming to decarbonize the sector. IMO has launched two new regulations: The Existing Ship Energy Efficiency Index, EEXI and the Carbon Intensity Indicator. Ships that are not of at least average rank and above will be unlikely to be selected by charterers, pushing them out of the market. At the present the most technological mature technology is the use of LNG, LPG, and biofuels. The benefit of using LNG is the drastically reduced SOX, NOX and to a lesser extent CO2 emission. Wind is the most promising form of renewable energy. Stakeholders are not willing to risk investments in technologies which may lead to stranded assets. Ship-owners face the Shakespearian dilemma to build or not to build. They are expected to invest in the new fuels, but they rarely get a larger piece of the pie following eco-improvements. In recent years, the European Union began to make serious efforts to address the environmental issues of shipping. We do hope that this regionalization of regulations will be replaced by the global regulator of World Shipping, the IMO.

Maria Boile |
Professor, University of Piraeus & Coordinator Waterborne TP

The role of research and innovation in the transition to greener shipping

Research and innovation need to address specific needs of the shopping industry and the shipping industry needs to support research.

Adamis Mitsotakis |
CERTH

Alternative fuels and environmental challenges in shipping sector[6]

- *CERTH/CPERI profile*
- *Marine sector in Greece*
- *International framework for pollution control Areas-ECA*
- *Vessel traffic in the Mediterranean Area*
- *Air pollution and alternative fuels*
- *Gas pollutant measurements in ports*
- *Air pollutant measurements | Heraklion Port*
- *Comparative Measurement of SO2 | Piraeus Heraklion Limassol Ports*
- *Port of Heraklion- Air pollution measurements*
- *Results of activities and actions (Total) POSEIDON MED II*
- *Natural Gas (NG) & Liquefied Natural Gas (LNG) The trading situation*
- *Global trade of LNG by ships and NG with pipelines*
- *Price of NG and LNG in Asia. Surge of LNG*
- *Future challenges for shipping/coasting*
- *Suggested solutions*

Subject Matter: Sustainability & Heading for the Green Deal

Georgios Tsifoutidis |
Head of Geothermal Energy Dept (acting), Ministry of Environment and Energy, Greece

Geothermal energy in Greece, prospects, and challenges

The present energy crisis points out again to the need for energy security, in tandem with the 2030 National Plan for Energy and Climate goals on reducing CO2 emissions, energy efficiency, saving of resources and sustainable development. Geothermal energy is a renewable energy source (RES) that has smallest CO2 footprint among other RES and provides base load.

Greece possesses those geological features that promote low-cost electrical & thermal energy generation, however its exploitation in Greece is currently limited to thermal energy in agricultural applications in northern Greece and some NE Aegean islands. Law 4602/2019 provides the geothermal regulatory framework upon which details are drawn in the form of Ministerial Decisions. The recently published Regulation of Geothermal Works in 2021 and the Terms and Conditions for leasing rights on exploration, exploitation, and management of the geothermal potential in geothermal fields of national interest and in non-characterized areas in 2022, show the way forward with more to come.

Geothermal electrical power generation however requires, by comparison to other RESs, greater upfront capital expenditure (CAPEX) and extra time for all those ground investigations that help establish the available power capacity. Hence the State should counterbalance the thus implicitly generated uncertainty by granting priority to examining applications for connectivity and operation licensing of geothermal power stations, or by direct or indirect state aid, refundable or not, as a

[6] See Appendix

motive for developing such projects, especially in border and island regions where it could support energy grid stability, assist local sustainable growth and diversification of local products.

Michael Thomadakis |
Strategy & Development Division Director, DESFA

The role of infrastructure in the development of the H2 value chain[7]

- *The network at a glance*
- *Upgrading & expanding our network, making Greece an energy gateway to SE Europe*
- *Area of utmost importance for the next decade development of ssLNG implementations; DESFA has deep dived in the identification of the 3 most attractive clusters for business expansion*
- *The Crete cluster focuses on serving bunkering and remote networks via a second satellite station*
- *DESFA's H2 project proposal*
- *Our project as part of the EHB initiative*

Yiannis Katsigiannis |
Assistant Professor, Department of Electrical and Computer Engineering, Hellenic Mediterranean University

Energy transition of Crete[8]

- *Cretan Energy System*
- *Current Efficiencies*
- *CREPSA: Cretan power system operation with interconnection*
- *Current Requirements of RES Systems*
- *Case Study (PVs only)*
- *CREPSA: Cretan power system operation with double interconnection*
- *Energy Balance of Crete 2021*
- *Cretan power system operation (1/11/2021-Today)*
- *Cretan power system operation with interconnection (Feb.2022)*
- *Cretan power system operation with interconnection (1-3 Jan 2022)*
- *Geographical Electricity Consumption in Crete*
- *Needed steps to the climatic neutrality*
- *Installation of Energy Storage Systems*
- *Energy Storage Systems*

Maria Apostolaki |
Region of Crete

Transforming Crete into a green and resilient region

Crete is a region where the effects of climate change and energy crisis are expected to be particularly strong. The Region of Crete responds to these challenges and

[7] See Appendix
[8] See Appendix

accelerates its actions for the transition into a green and resilient region, aligned with the European and national energy targets. Focusing on the sectors of energy security and clean energy, climate resilience, sustainability, circular economy and innovation, the Region of Crete cooperates, coordinates, promotes and implements actions to reduce greenhouse gas emissions, increase the percentage of renewable energy and improve energy efficiency. In combination with the strengthening of the competitiveness of local businesses and the protection of consumers, the appropriate conditions are being set in Crete for the sustainable development of the local society and economy in a cost-effective, equitable and socially balanced way.

Michail Chatzipanos |
ΙΡΤΟ

Interconnecting Greece[9]

- *Ο ΑΔΜΗΕ πρωταγωνιστής τις Διασυνδέσεις των Ελληνικών Νησιών*
- *Οι διασυνδέσεις ως Έργα Ενεργειακής Μετάβασης*
- *Διαθέσιμα Περιθώρια ισχύος για σύνδεση νέων σταθμών ΑΠΕ (MW)*
- *Οι Διασυνδέσεις του ΑΔΜΗΕ ως Παγκόσμια Σημεία Αναφοράς*
- *Διασύνδεση Κρήτης-Πελοποννήσου- Η διασύνδεση των Ρεκόρ*
- *Διασύνδεση Κρήτης-Πελοποννήσου-Σύντομη Ιστορία*
- *Διασύνδεση Κρήτης - Αττικής*
- *Έργα ενίσχυσης Συστήματος Μεταφοράς Κρήτης*
- *Διασύνδεση Νοτίων και Δυτικών Κυκλάδων*
- *Επισκόπηση του έργου*
- *Διασύνδεση Σκιάθου-Σποράδων*
- *Διασυνδέσεις Ιονίων νήσων*
- *Διασύνδεση Δωδεκανήσων και βορειοανατολικού Αιγαίου*
- *Νέες Διασυνδέσεις του Ελληνικού Συστήματος με Γειτονικά Συστήματα*
- *Διασύνδεση Κρήτης-Κύπρου-Ισραήλ*
- *Διασύνδεση Ελλάδας-Κύπρου*
- *Χρηματοδότηση*

"AURORA" Workshop

Challenges, opportunities and implications for investment and financing for Southeastern Europe's transition to carbon neutrality. The key topics are covering by the impact of the war on European but also more regionals markets, the new and ambitious plans of the EU and their impact on our decarbonization trajectory but also the cultural shift from subsidized and fixed revenue business models to more merchant renewables.[10]

- *Energy market developments and outlook*
- *SEE's transition to carbon neutrality: challenges, opportunities and implications for investment and financing*
- *SEE's transition to carbon neutrality*

[9] See Appendix
[10] See Appendix

- ***Coordinator:*** *Panos Kefalas, Commercial associate Southeastern Europe, Aurora*
- *John Feddersen, Founder and CEO of Aurora Energy Research*
- *Julian Popov Fellow of the European Climate Foundation, Chairman of the Building Performance Institute Europe, and Former Minister of Environment of Bulgaria*
- *Chris Basinski, European Bank for Reconstruction and Development*
- *Philipp Kunze, Managing Director of BayWa r.e. Projects Greece*

APPENDIX

EGYPT : Electrical Energy Transformation

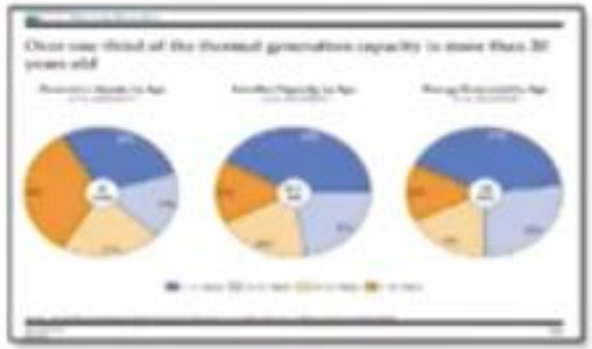
Contents :

1- Situation in Summer 2014

Challenges lead to the Importance of setting a new strategy of electricity Sector

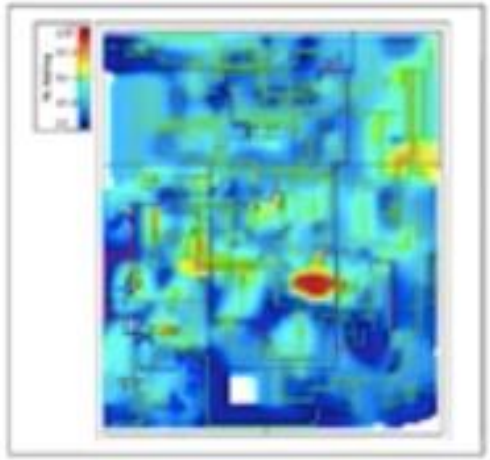
During Year 2014

Massive Electrical Power Outage



Low Availability factor of power plant

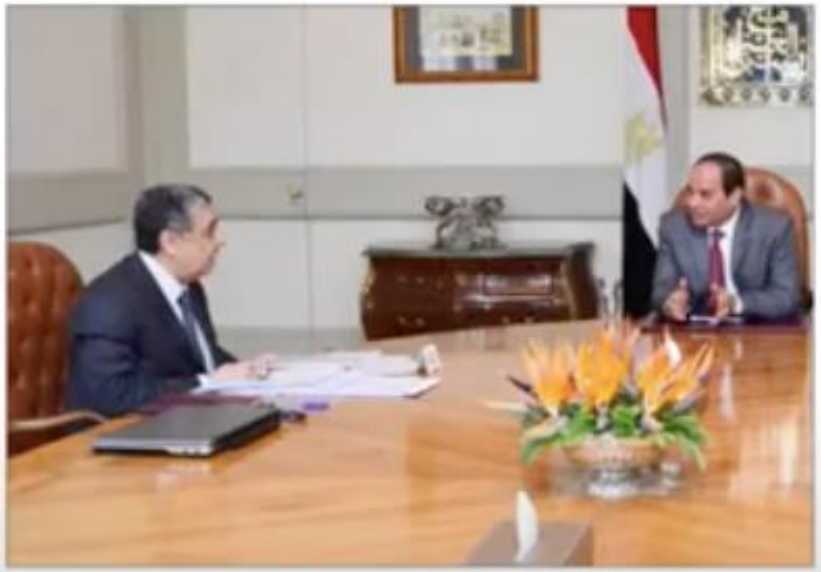
Fuel Shortages & Load Shedding



Transmission Constrains and losses

Political Leadership Support

Energy is considered a matter of national security.



we started from the clear instruction

Fast Track Plan

EPC + Finance	
Added Capacity	3636 MW
Total Cost	2.7 Billion $
Commercial Operation	In 8.5 Months

West Damietta PP

West Assuit PP

Mobile Units

Distributed in Upper Egypt

Attaqa PP

Port Said PP

Sharm Elshiekh PP

Hurghada PP

Mahmoudia PP

Completing of Under construction
Power Plants before 2014

Added Capacity 4250 MW

Total Cost 3.98 Billion $

Start Date	End Date
Sep. 2009	March 2017

6th October P.P (600 MW)

600 MW Completed totally

Banha P.P (750 MW)

250 MW Completed

Wind Farm (200 MW)

200 MW Completed totally

SUEZ P.P (650 MW)

250 MW Completed

North Giza P.P (2250 MW)

1250 MW Completed

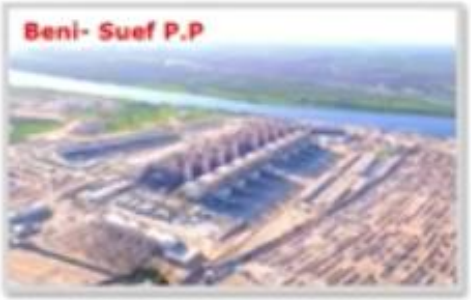
Ain Sokhna (1300 MW)

1300 MW Completed totally

Totally Added Capacities in One Year (From January -December 2015)

Fast Track Plan + Completed Power Plants = 6886 MW

Mega Project Power Plants in cooperation with SIEMENS & Local Partners



Three Mega Power Plants

with Total capacity 14400 MW installed in 2.5 years

Work Started in the three Power Plants : (end 2015).

EPC + Finance Cost of 6 Billion Euro.

Energy Efficiency

Converting simple cycle power plant into combined cycle power plant

Shabab P.P adding 500 MW
(Total capacity : 1500 MW)

Assuit P.P adding 500 MW
(Total capacity : 1500 MW)

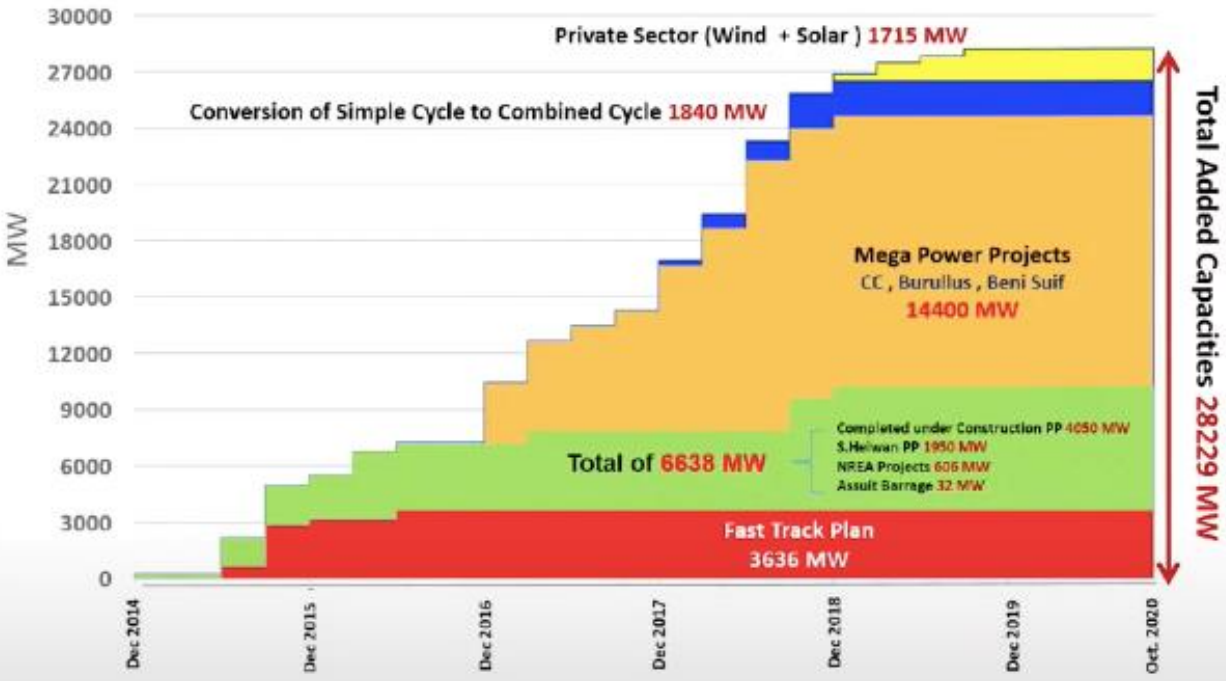
6th October adding 340 MW
(Total capacity : 940 MW)

West Damietta P.P adding 250 MW
(Total capacity : 750 MW)

- Converting simple cycle power plant into combined cycle power plant by adding 1840 MW without using an Extra Fuel.

Extension W. Damietta adding 250 MW
(Total capacity : 750 MW)

Installed Capacities Added from the End of 2014 till the Oct of 2020



Total Capacities Added

(28229 MW)

Equivalent to 13 Times the installed capacities from the High Dam

Energy Efficiency

The Reduction in Fuel Consumption

The Reduction in Fuel Consumption 2020/2021 comparing with 2014/2015 about 16 %

Increase of Natural Gas sharing percentage from 73.6% in 2014/2015 to 98.19% in 2020/2021 which led to improvement in fuel consumption rates.

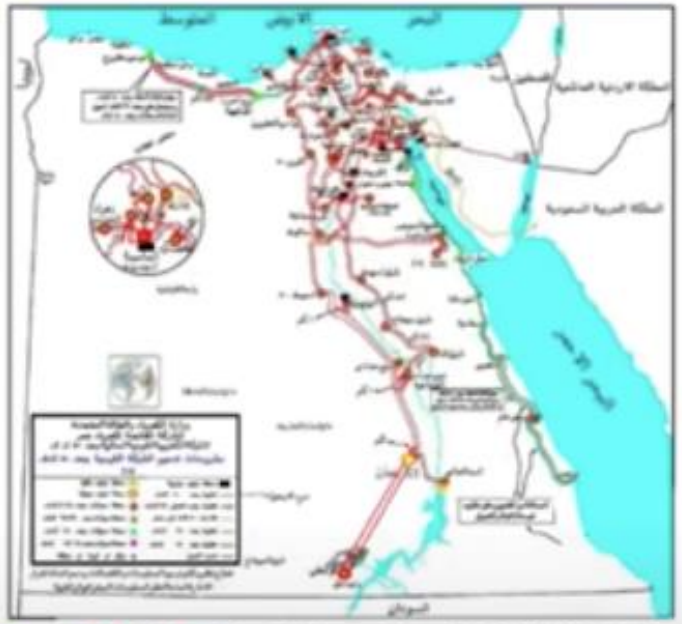
The Total Annual Reduction in Fuel Consumption cost in 2020/2021 comparing to last year = 4.8 Billion EGP

Situation for 500KV Transmission Network By End of 2021

ELECTRICITY GRID 2014

2364 km total length of 500 KV Grid

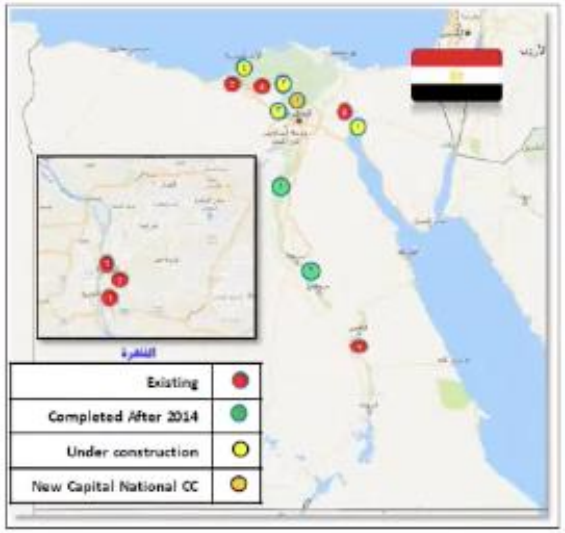
ELECTRICITY GRID BY END 2021



6006 km Total Length of 500 KV Grid

Adding more than 3640 KM More than 1.5 times the existing length in 2014

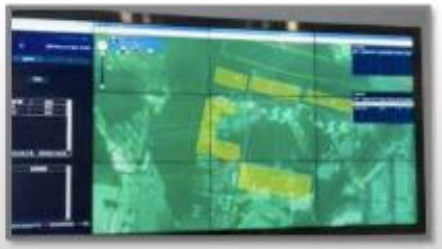
New and upgrading
Control Centers in Transmission networks



no	Completed After 2014
1	Middle Egypt Regional Control Center
2	Upper Egypt Regional Control Center (upgrade)

no	Under Construction
1	Canal Regional Control Center (upgrade)
2	Cairo Regional Control Center (upgrade)
3	Alex Regional Control Center (upgrade)
4	Delta Regional Control Center

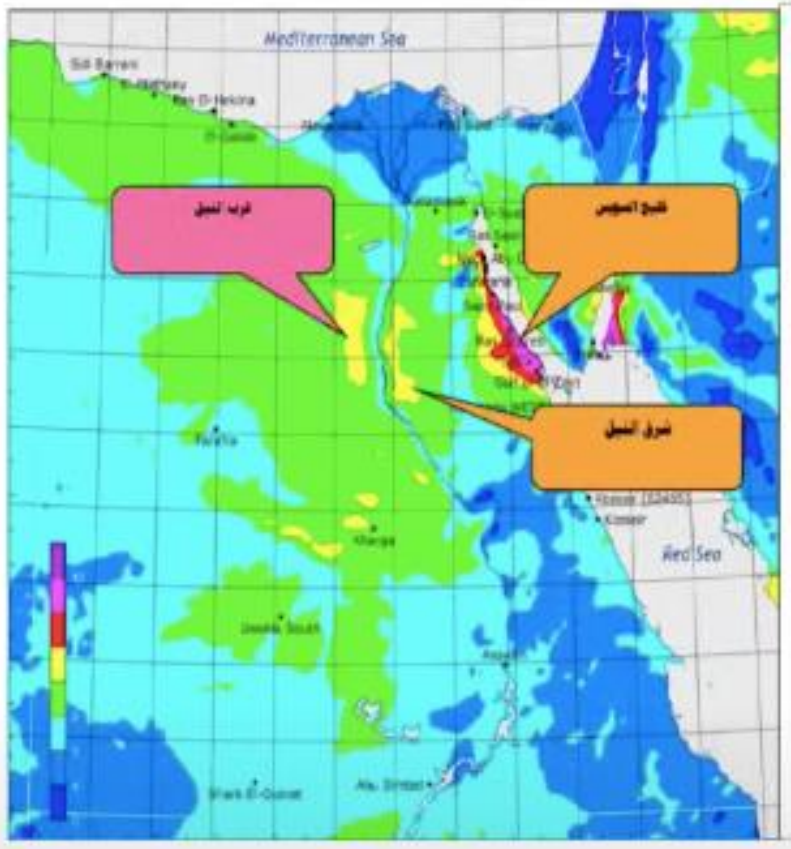
no	Existing Before 2014
1	National Control Center
2	Cairo Regional Control Center
3	Backup Control Center
4	Alex Regional Control Center
5	West Delta Regional Control Center
6	Canal Regional Control Center
7	Egypt Regional Control Center



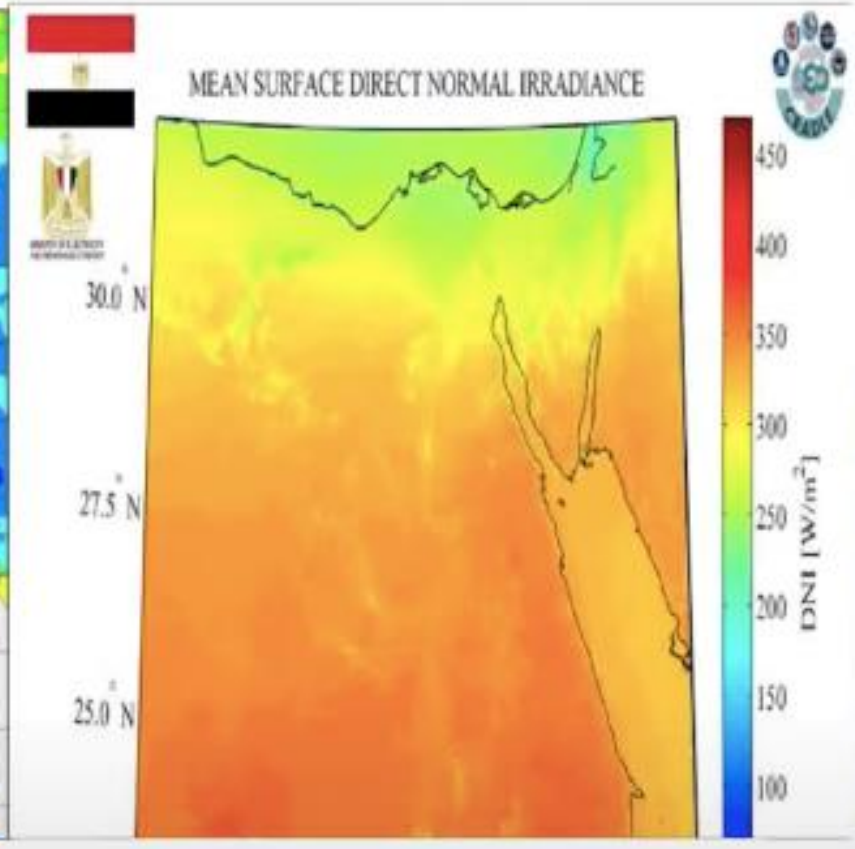
4- More Sustainable Phase

Potentials from Wind & Solar Based on (Wind & Solar Atlas)

There is About 5200 KM^2 have been allocated for Implementing RE projects with expected potential of 77 GW



(Wind Atlas)



(Solar Atlas)

Integrated Sustainable Energy Strategy to 2035

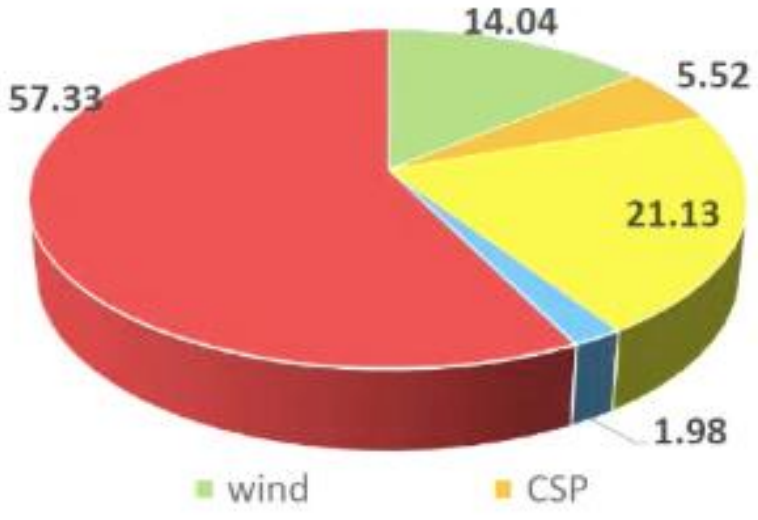
- Targeting : 20 % Renewable Energy from Peak load by year 2022.

- <u>Targeting by year 2035 :</u>
  - 42 % Renewable Energy from total installed capacity.
  - 18% Improvement in Energy Efficiency.

Egypt's Energy Mix by 2035

Source	Percentage
PV	21.3
Wind	14.04
CSP	5.52
Hydro	1.98
Conventional	57.33
100 %	

Renewable Energy 42.7 %



- 2035 Strategy has Been Revised and Excluding COAL option from the Energy Mix and replaced it by Renewable Energy using (BOO) Scheme "will be shown later"

Incentives For Investments In Renewable Energy

Considering the Renewable Energy in our Energy Strategy until year 2035 to encourage private investments:

Incentives For Investments In Renewable Energy
Land has been allocated for renewable energy project: Solar and Wind has been allocated **5200 Km2**
Availability of information concerning Solar Atlas and Wind (Available for all investors).
Environmental Impact Assessment Studies.
Long Term bankable PPAs.
Custom duties for all imported materials and equipment do not exceed 2%.
Sovereign Guarantees issued by Ministry of Finance.

Renewable Energy FIT Private Sector Projects

Recent Projects Contracts (Under Implementation)

Company	Capacity (MW)	Technology	Price (cent $ / K.w.h)
Masdar	200	Wind	3
Acwa Power	200	PV	2.47 (Competitive Tenders)
* Nowais	500	PV	2
	500	Wind	3
ENGIE - Orascom-Toyota	500	Wind	3
Siemens – Gamesa	500	Wind	3
ACWA Power	1100	Wind	2.85
Total	3500		

* Nowais Renewable Energy FIT projects of total 1000 MW has been replaced instead of Coal Project

Wind Energy

Wind Total Installed Capacities : 1625 MW

- **Public Sector** With Total Capacities: **1125 MW**
- **Private Sector** With Total Capacities : **500 MW**

Wind Energy Public Sector

- **Public Sector** With Total Capacities: **1125 MW**

Wind Energy Private Sector

Ras Ghareb Project (250 MW)

Consortium (Toyota , Orascom, ENGIE)

Commercial operation 2020

Wind Energy Private Sector

Lekela Power Project (250 MW)

Commercial Operation October 2021

Benban Solar Park

Success Story of Private Sector Investment in Renewable Energy

Currently this project the largest in Middle East and Africa

Benban Solar Park
The largest in Middle East and Africa

No. of Projects	Capacity (MW)	Total (MW)
27	50	1350
3	20	60
1	25	25
1	30	30
Overall Installed Capacity		1465

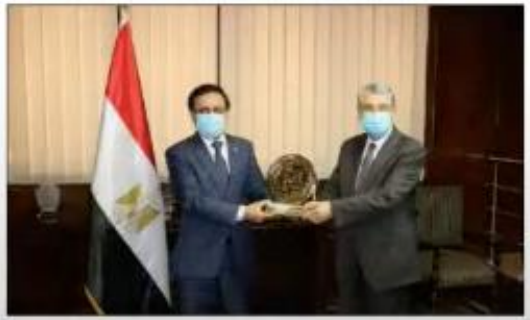
Signed PPA	32
Total Area for Solar Park	37.1 Km Square
Total Investment	2 Billion $
Workers and Job Creation	More than 10000
Co_2 emission	2 million tons

Benban Solar Park
The largest in Middle East and Africa

First time for Egypt to win such an award.

The Interim President of the WBG, Kristalina Georgieva announced that Benban Solar Project (1465 MW) in Aswan wins best project prize worldwide.

An award that reflects the bank's support for the economic reform program in Egypt and government plans to enhance the role played by the private sector in achieving comprehensive development



November 2020 Benban Solar Park wins the Arab Government Excellence Award as the best project to develop infrastructure

Net metering +Roof-Top PV

Total Capacities of (Net Metering + Roof Top PV = 120 MW)

Hydropower

Hydropower Installed Capacities

High Dam

2100 MW

Aswan Reservoir 1

280 MW

Aswan Reservoir 2

270 MW

Esna Barrage

86 MW

Naga Hamadi Barrage

64 MW

Assyiut Barrage

32 MW

Total Hydropower Installed Capacities

2832 MW

Summary

Current Renewable Energy Installed Capacities (Hydro – Wind – Solar)	**6128 MW**
Wind Projects (Under Implementation)	**250 MW** (will be finished by end of 2023)
Wind Projects (Under Implementation)	**1200 MW** (will be finished by end of 2023)
	1600 MW (will be finished by end of 2023)
Solar Project – PV	**820 MW** (will be finished by end of 2023)
Total	**9998 MW**

By End 2021 (6378 MW) Represents about 20% from the expected peak load which exceeds the strategy Target of Renewable Energy share in 2022

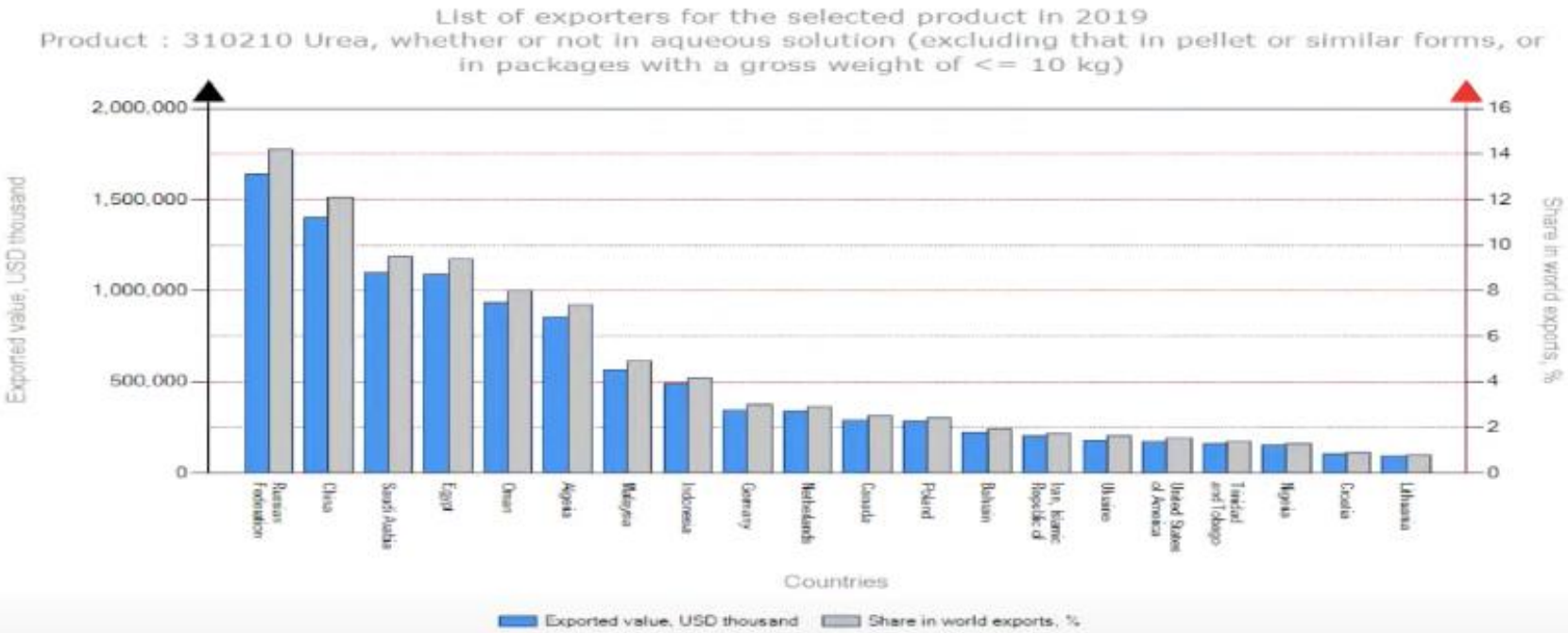
Green Hydrogen

- Cooperation with International Companies
- Preparing The National Hydrogen Strategy

Hydrogen Current Situation in Egypt

The Egyptian leadership urged the preparation of an integrated national strategy for the production of clean hydrogen as it is promising source of energy for the near future.

Hydrogen Current Situation in Egypt



Hydrogen products are essential in many industries such as fertilizer industry. Egypt is ranked the fourth country in the field of hydrogen fertilizers with a share about 9.4% of all world exports in 2019.

Hydrogen Current Situation in Egypt

- Egypt one of first countries had a project with green hydrogen on KIMA fertilizer manufacturer is based in Aswan and was started up on 1960. The factory was used the electricity from Aswan dam to produce green Hydrogen. In 2018, the factory transformed to use natural gas in producing hydrogen.
- Hydrogen is produced in Egypt in several local sectors. The produces hydrogen is utilized in many industrial applications such as refineries, petrochemicals, fertilizers, glass, steel and others.

Hydrogen Current Situation in Egypt

A prime minister decree has been issued for forming a high – level working group from various ministries to set a road map for future steps for using hydrogen. The working group finished the final report and recommendations.

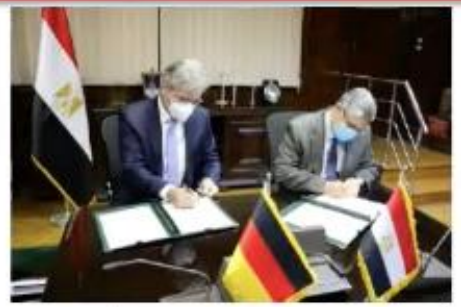
On 5th of March 2022, A MoU signed with EBRD to provide finance for consultancy work regarding the National Hydrogen Strategy. This strategy will set a clear vision for a clean, innovative, safe and competitive hydrogen industry.

Pilot Projects:

- In parallel with the preparation of the strategy, we are working with private companies in the field of hydrogen projects. In this regard, a pilot projects with capacity of 100-200 megawatts are being studied until the completion of the national strategy as follows:

Green Hydrogen

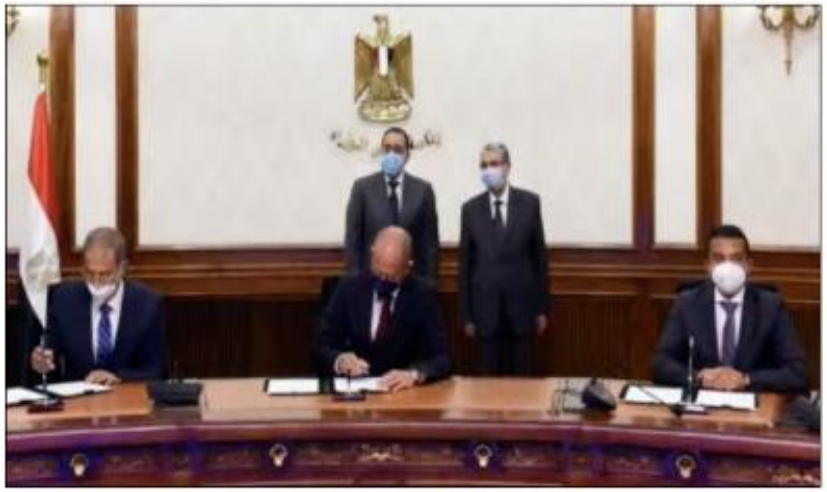
A pilot project will be implemented in EGYPT in Cooperation with Siemens



we already signed an agreement of intent with one of the most important developers in this field (Siemens) to start discussions and negotiations for the possibility to develop 100 MW Electrolyzer for more green hydrogen as an (EPC) project

Green Hydrogen

Siemens Signed (MoU) with the Egyptian Electricity Holding Company (EEHC)



August 2021 Germany's Siemens Energy has signed a memorandum of understanding (MoU) with the Egyptian Electricity Holding Company (EEHC) to jointly develop hydrogen-based industry in Egypt with the capability for export based on the letter of intent The agreement builds on a letter of intent signed in January 2021 between Siemens Energy and EEHC

Green Hydrogen

Cooperation with Belgian Companies


COOPERATION AGREEMENT

March 2021 a cooperation agreement was signed between

- Egyptian electricity holding company .
- Aboukir ports construction and Management company
- Egyptian National gas Holding company.
- Belgian Consortium

To prepare a feasibility study in different locations in Egypt to establish a green hydrogen production project (HYPORT-EGYPT).

Cooperation with Italian company (Eni) in Hydrogen production projects

July 2021, A memorandum of understanding was signed in the field of the cooperation a study on joint projects for the production of green hydrogen as well as blue hydrogen.

Cooperation with Norwegian company (Scatec) in Green Hydrogen production projects

14 October, 2021: The Sovereign Fund of Egypt had signed agreement with Scatec and Fertiglobe to jointly develop a 50-100 MW green hydrogen plant as feedstock for green ammonia production.

Partnership in the field Of Green Hydrogen Production

- On 28 March, 2022: an MoU signed between Maersk, The General Authority for Suez Canal Economic Zone (SCZone), the Sovereign Fund of Egypt, the Egyptian Electricity Transmission Company (EETC) and the New & Renewable Energy Authority (NREA) to produce green hydrogen that will be used to fuel ships.
- On 20 April, 2022: an MoU signed between the Green Fuel Alliance (France's EDF Renewables, and Egypt's Zero Waste), The General Authority for Suez Canal Economic Zone (SCZone), the Sovereign Fund of Egypt, the Egyptian Electricity Transmission Company (EETC) and the New & Renewable Energy Authority (NREA), to develop a project for producing green ammonia to supply ships with green fuel.

Partnership in the field Of Green Hydrogen Production

- On 20 April, 2022: an MoU signed between AMEA Power (AlNowais), The General Authority for Suez Canal Economic Zone (SCZone), the Sovereign Fund of Egypt, the Egyptian Electricity Transmission Company (EETC) and the New & Renewable Energy Authority (NREA) to develop 300 MW green hydrogen facility as feedstock for green ammonia production.

Waste to Energy

in Cooperation with Ministry of Environment

Waste to Energy

- Energy-from-Waste is the process of generating energy in the form of electricity and/or heat.
- According to the Ministry of Environment: 20% of the total collected of Municipal Solid Waste (MSW) will be forwarded to the technologies of W2E (about 4.2 milliom tons of MSW to W2E)
- Private sector is invited to participate in electricity generation form waste.

Waste to Energy

- A compensation tariff for purchasing electricity produced from solid waste to be 1.4 EGP per K.w.h

- Expected Electricity that could be Generated from Waste according to the cabinet Decree (300 MW for the coming 5 years)

Government Support to Invest in Electrical infrastructure of Electric Vehicles

Government Support to Invest in Electrical infrastructure of Electric Vehicles

- An incentive tariff has been approved (by the Egyptian Cabinet) for EV charging.

- **The Approved tariff :**

Voltage Level	Tariff proposed
Up to 22 k.w (AC)	169 piaster / kwh (without the use of the place occupancy fees)
	189 piaster / kwh (with the use of the place occupancy fees)
Up to 50 K.w (DC)	375 Piasters / kwh
Household	The Same as household Tariff

- In addition The government has also provide a package of Incentives to encourage the investment in this field including : Charging Tariff , Customs Exemption ……
- The Production Capacity of EV for the Local Manufacturer (Nasr Company) = 25000 Electric Vehicle / Annually

The Strategic Plan for water Desalination from Renewable energy in Cooperation with Ministry of Housing & Ministry of Water Resources and irrigation

- The Land required to be approved for allocation have been Identified.
- 5-years plan starting from year 2020 aiming to produce approx. 2.9 million m^3 /day
- Utilize Renewable Energy to Supply Desalination plants .

The Strategic Plan for water Desalination from Renewable energy in Cooperation with Ministry of Housing & Ministry of Water Resources and irrigation

Strategic Plan for Extension in Water Desalination Stations to Save Potable Water Needs

Total	2050	2045	2040	2035	2030	2020-2025	Plan parts	Governorate
Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day		
491	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Part 1	Matrouh
245	0	0	0	0	0	245	Part 2	
365	90	90	105	30	30	20	Part 4	
1101	165	140	175	120	95	406	Matrouh Total	
371	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Part 1	Red Sea
20	0	0	0	0	0	20	Part 2	
560	0	100	198	132	130	0	Part 4	
951	45	134	290	212	220	50	Red Sea Total	
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Part 1	North Sinai
12	0	0	0	0	7	5	Part 2	
32	0	0	0	0	17	15	North Sinai Total	
311	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Part 1	South Sinai
70	0	0	0	0	0	70	Part 2	
4	0	0	0	0	4	0	Part 4	
385	0	105	50	50	54	126	south Sinai Total	
1000	0	0	0	0	0	1000	Part 3	Ismailia
1000	0	0	0	0	0	1000	Ismailia Total	
120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Part 1	Port Said
466	0	0	0	0	0	466	Part 3	
586	0	0	0	0	120	466	Port Said Total	
339	0	0	0	0	0	339	Part 3	Suez
20	0	0	0	0	0	20	Part 4	
359	0	0	0	0	0	359	Suez Total	
40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Part 1	Daqahlia
395	0	0	190	170	0	35	Part 3	
435	0	0	190	170	40	35	Daqahlia Total	
195	0	0	95	70	0	30	Part 3	Kafr Elshaikh
195	0	0	95	70	0	30	Kafr Elshaikh Total	
450	0	0	0	0	0	450	Part 3	Behiera
5	0	0	0	0	0	5	Part 4	
455	0	0	0	0	0	455	Behiera Total	
910	0	0	0	455	455	0	Part 3	Alexandria
910	0	0	0	455	455	0	Alexandria Total	
1353	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Part 1	Total
335	0	0	0	0	0	335	Part 2	
3755	0	0	285	695	455	2320	Part 3	
966	90	190	303	162	171	50	Part 4	
6409	210	379	800	1077	1001	2942	Grand Total	

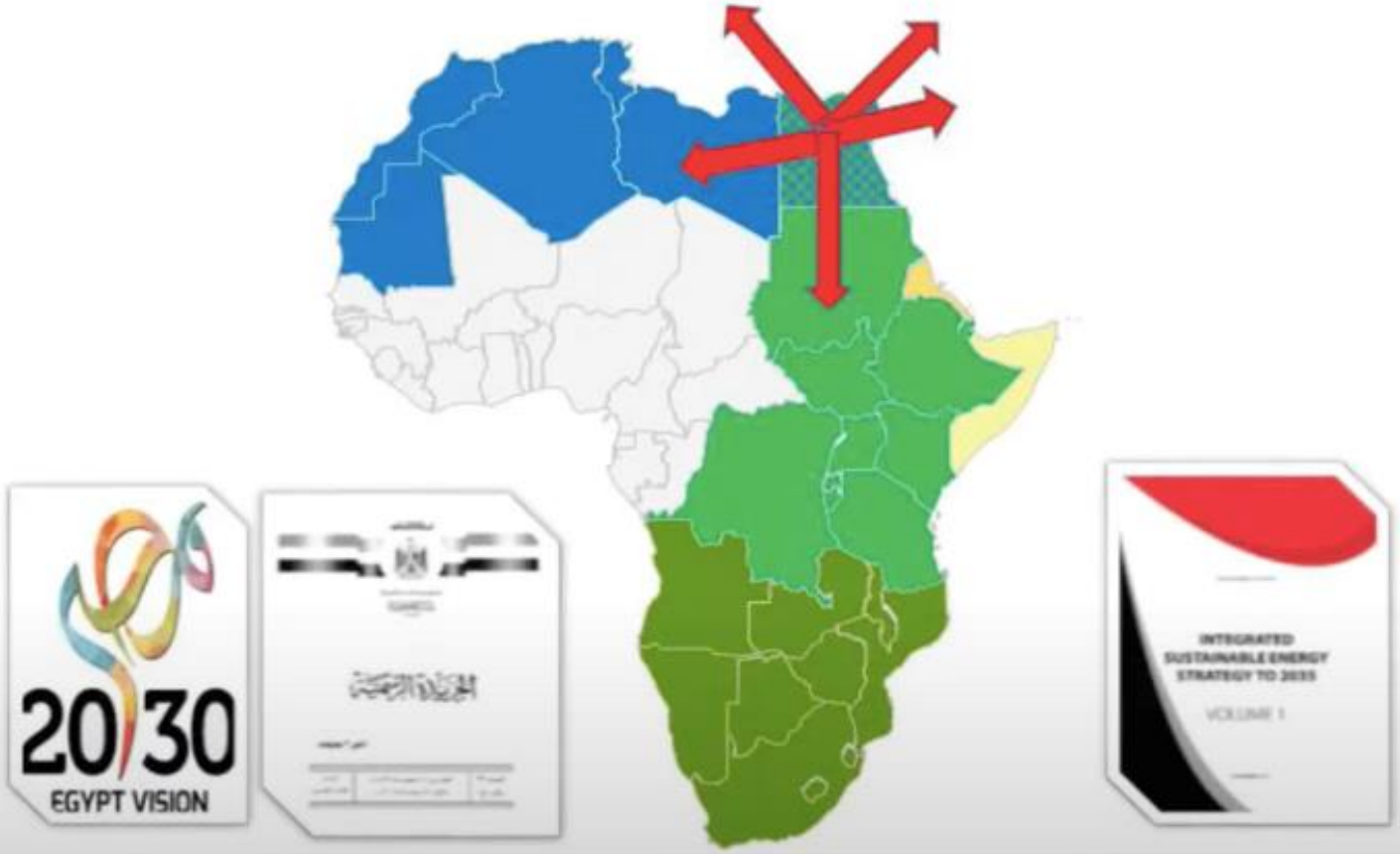
TOTAL PRODUCTION CAPACITY FOR STRATEGIC 5-YEAR PLANS STARTING FROM YEAR 2020 :

2942 THOUSAND m³ / DAY

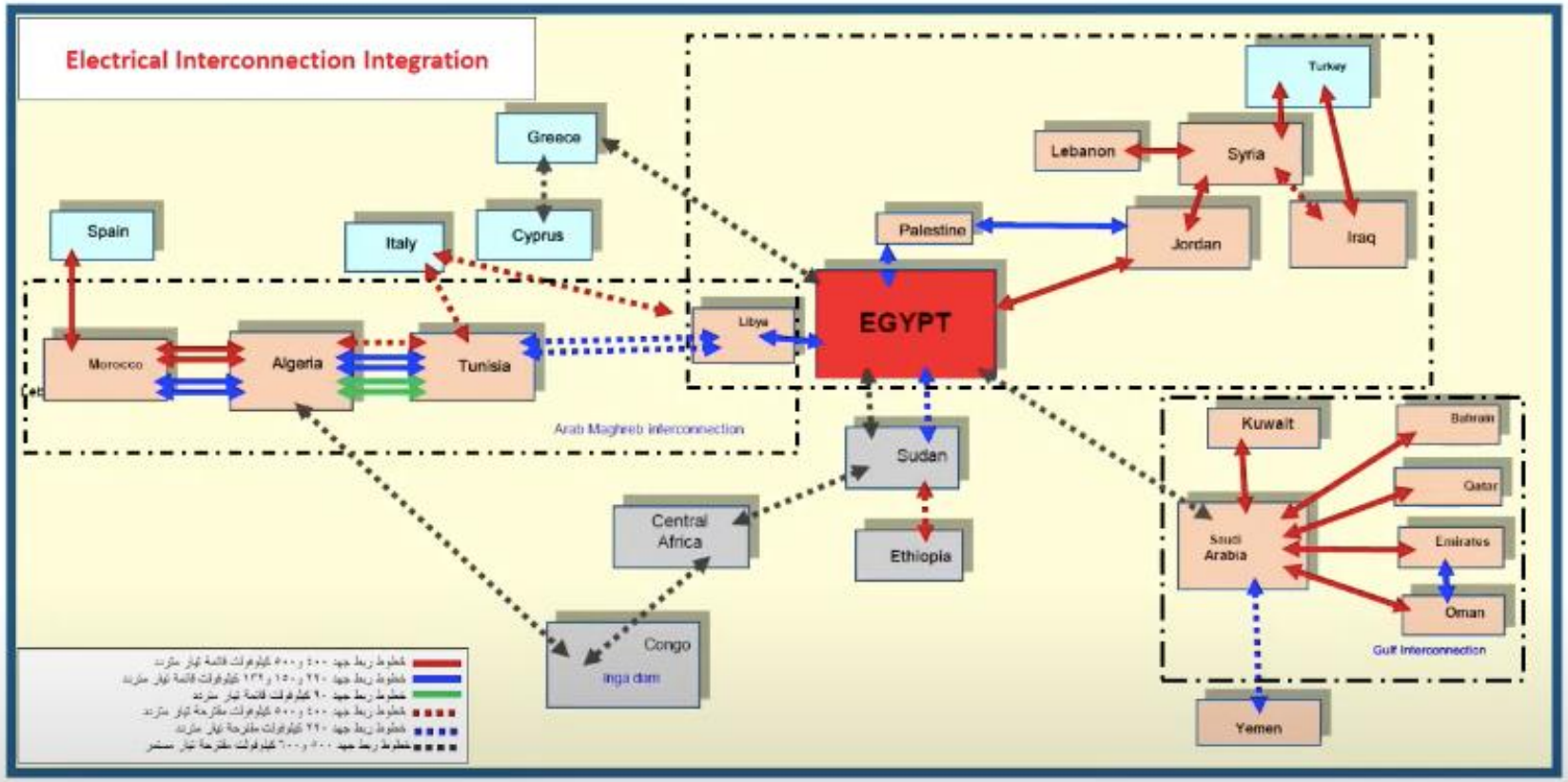
	2020-2025	2030	2035	2040	2045	2050	Total
	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day	Capacity 1000 M³/day
Grand Total	2942	1001	1077	800	379	210	6409

5- Egypt is an Energy Hub for International Interconnections and Corridors

Egypt is a Hub/ Gateway for Electrical International Interconnections and Corridors



Egypt is an Energy Hub for International Interconnections and Corridors



Egypt Electrical International Interconnections

Egypt /Jordan Interconnection (450MW)

Existing + Strengthen connection

- **March 2021**, A framework agreement was signed between Egypt /Jordan to increase interconnection capacity **to 1000 M.W**.

Egypt Electrical International Interconnections

Egypt / Sudan Interconnection (300 MW).

(Existing + Strengthen Connection)

EGYPT

Sudan

- (Phase 1): In April 2020 Energized with exchanging up to 80 MW and will reach 300 MW in the next year.
- (Phase 2): Intended to be raised to 1000 MW .

Egypt Electrical International Interconnections

Egyptian /Libyan Interconnection (150MW).

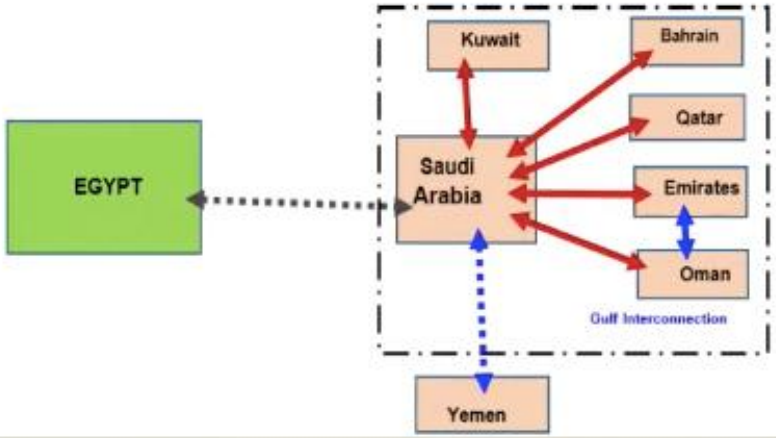
(Existing + under Study Strengthen Connection)

A study of strengthening the Egyptian - Libyan electrical connection was prepared to increase the exchange capacity to **2000 MW** through two alternatives as follows:

- Supporting the connection to the voltage of 400 KV.
- Strengthening the connection on the voltage of 500 KV

Egypt Electrical International Interconnections

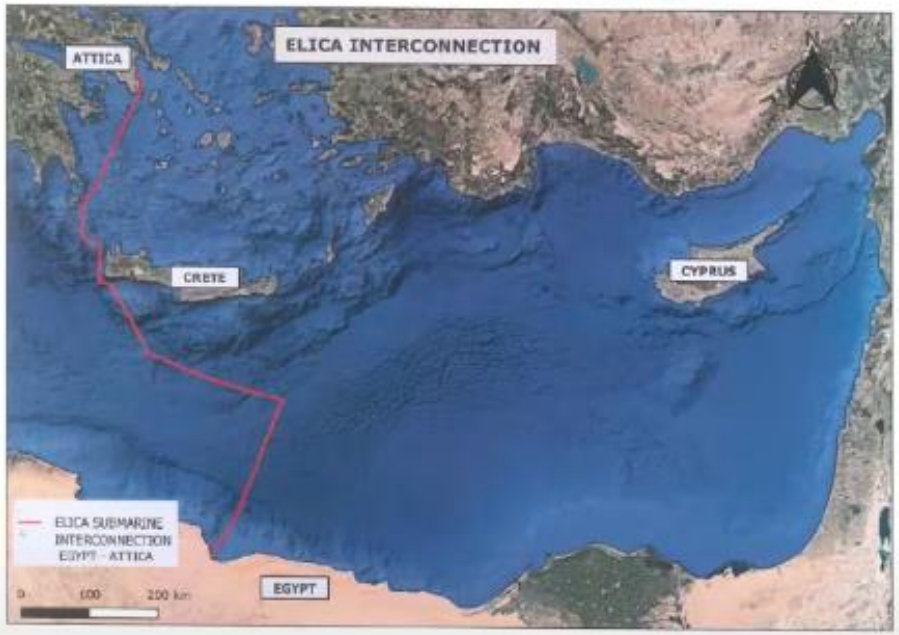
Egypt / Saudi Arabia
to Allow Exchanging of 3000 MW

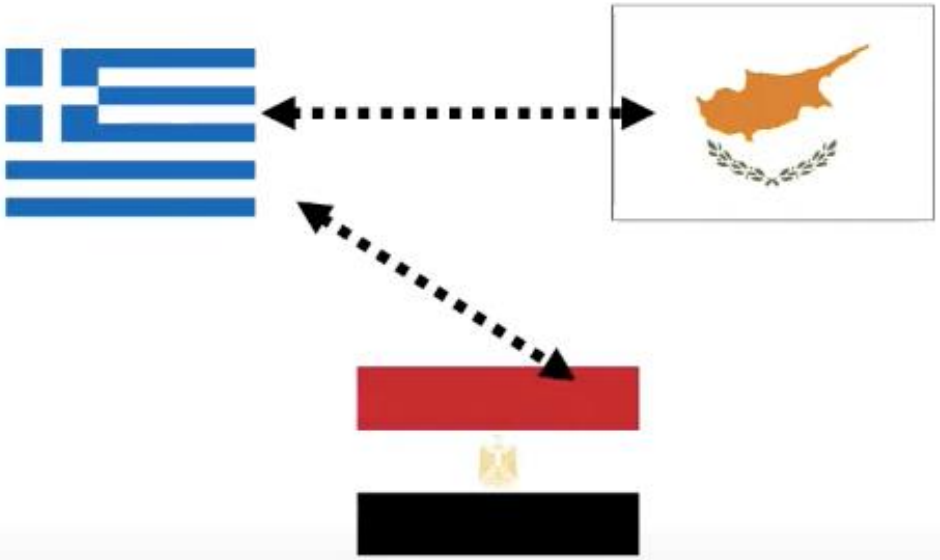


- 5th of October 2021 packages of contracts signed for the electrical interconnection project between Arab Republic of Egypt & Kingdom of Saudi Arabia
- Total Investment cost from both sides : 1.8 Bil $

Egypt Electrical International Interconnections

Egypt, Cyprus and Greece





Allow supply 3000 MW of Green Energy to Europe.

Egypt- Greece Interconnection

- **Copelouzos – Elica Proposal**

Technical description of the Project and overall budget

Main equipment - Budget

1. **Converter Stations**
   - Voltage Source Converter Stations of 3,000 MW are envisaged to be installed at both ends of the link near WADI EL NATROON EHV Center in Egypt and near AHARNES EHV Center (Attica -Greece). Now alternative locations for Attica, such as Mesogia EHV center and /or Agios Stefanos EHV center are evaluated, instead of ACHARNES, in order to avoid local congestion. The Converter type is Voltage Source Converter (VSC).

2. **Submarine cables**
   - The submarine cable is of extruded type (XLPE insulation), synthetic armoring, voltage ±500 kV and Al conductor.

3. **Interconnection Lenghts**
   - Overhead line 500km length between WADI EL NATROON Converter Station and EL SALLUM and up to the sea shore underground cable length: 10 km
   - The new alternative routing between EL SALLUM and Keratea has a length of 921 km and EL SALLUM to N.Makri of 954 km.
   - Underground cables lengths in Attica are 18,7 km and 29,8km

Approximate Cable Lengths (km)	Maximum sea depth (m)
68	1,298
357	2,712
48	2,527
78	1,520
370-403	752

4. **Overall Budget**
   - **Estimated Budget:** € 3.569bn

Proposed Route

Egypt Electrical International Interconnections

Egypt, Cyprus and Greece

Cyprus, Greece and Egypt signed a trilateral Memorandum of Understanding (MoU) to connect their respective electricity grids in Athens on Tuesday 19 Oct. 2021.

Egypt Electrical International Interconnections

Egypt, Cyprus and Greece

Bilateral MoUs had been signed between (Egypt- Greece) and (Egypt- Cyprus) in the field of Electrical Interconnection on 14,16 Oct. 2021

Egypt- Greece Interconnection

- It was agreed to appoint a consultant to prepare a pre-feasibility study for the project.
- Several international companies have expressed their desire to discuss opportunities for cooperation in financing the project between Egypt, Cyprus and Greece:

Gridworks	Copelouzos - Elica
Tractebel	Bechtel
EDF	Nexans

- World Bank has expressed interest in the project and propose a grant to cover the cost project consultancy services.

Egypt Electrical International Interconnections

Egypt, Cyprus and Greece

April 2022 the **first meeting between the management of IPTO and the EETC** , laying the foundations for the cooperation that the two sides have begun in the last year to prepare the major energy project.

An informative meetings held between the Heads of Administrators of the two countries

Egypt Electrical International Interconnections

Egypt, Cyprus and Greece

- On April 13, 2022, the World Bank technical team met with EETC and IPTO leadership teams to discuss possible ways to support both entities to develop the Project.
- The World Bank can offer potential support to the Project in a sequential way.

Quick economic evaluation (in-house and entirely paid by WB)

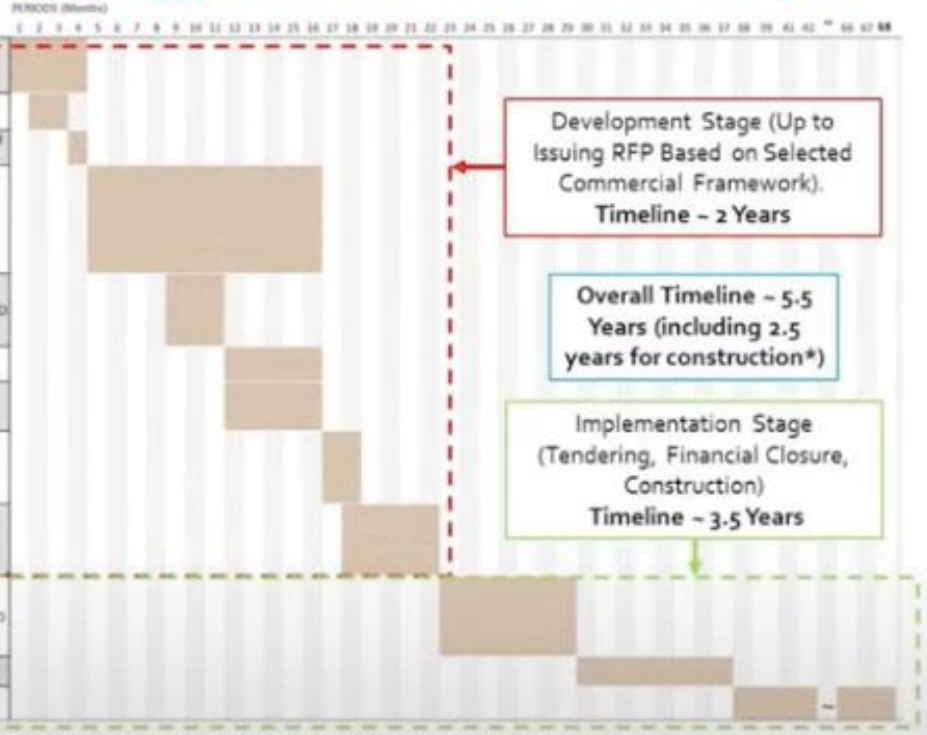
Financing of a detailed Feasibility Study, Env & Social (E&S) assessments, and marine surveys (IBRD Project Preparation Advance and grants)

Project financing* (support with financing package through a mix of concessional IBRD loans and guarantee instruments to raise commercial financing)

Egypt- Greece Interconnection

Tentative Ambitious Schedule for Egypt-Greece Interconnection Project

ACTIVITY	START	DURATION	By
Quick economic assessment (separate study)	1	4	WB (in-house using grants)
Start of procurement to hire international consultant for Bankable Feasibility Study	2	2	EETC/IPTO
The contract for Feasibility Study is signed	4	1	EETC/IPTO (Loan and Grant)
The Consultant completes the detailed feasibility study including technical definition of the Project, financing strategy and plan, recommendations on commercial framework for the Project, and Project procurement strategy	5	12	Consultant
Consultant prepares the scope of work and IPTO/EETC issues RFP for E&S studies and geotechnical/geological seabed surveys for route selection	9	3	Consultant/EETC/IPTO
Env and Social Studies	12	5	E&S Consultant
Geotechnical/geological seabed survey for route selection (Sample Route Survey)	12	5	Seabed Survey Contractor
IPTO/EETC agree on commercial framework and financing structure for the Project (traditional EPC with off-the-balance sheet financing from TSOs, SPV, or other)	17	2	MEE/IPTO - MoERE/EETC
Consultant drafts the bidding documents based on the selected commercial framework of the project, and develops detailed implementation schedule	18	5	Consultant
Tendering/Selection of the EPC Contractor/Private Sector Partner, completion of bid evaluation, contract negotiations and signing	23	7	Consultant/EETC/IPTO
Financial Close (For PPP Model)	30	8	Selected Developer
Construction (HVDC Cable and Converter Stations)	38	30	EPC Contractors

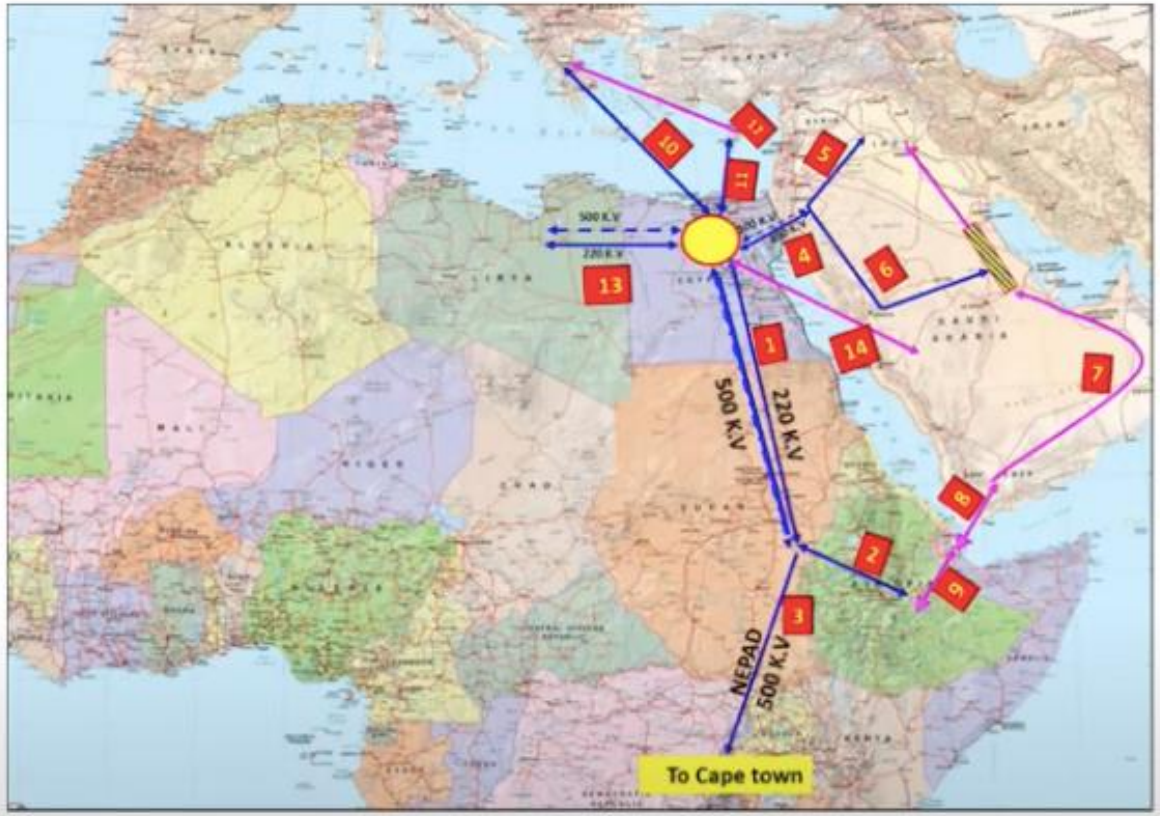


* It is recommended to balance the scheduling crashing needs with the project budget to avoid unnecessarily expensive bids

A Conception Figure After Completing the Interconnection between Egypt and Neighbor Countries

Line	Path / Interconnection
1	Egypt / Sudan (220 – 500 kv)
2	Sudan / Ethiopia 500 kv
3	Egypt / Cape town 500 kv
4	Egypt / Jordan (400 kv – 500 Kv)
5	Egypt / Jordan / Iraq
6	Jordan / GCC Gulf Cooperation Council
7	GCC Gulf Cooperation Council / Yemen
8	Yemen / Djibouti
9	Djibouti / Ethiopia
10	Egypt / Crete/ Greece
11	Egypt / Cyprus
12	Egypt / Cyprus / Greece
13	Egypt / Libya (220 kv – 500 kv)
14	Egypt / KSA

GCC Gulf Cooperation Council



Total Investments of Current & Future Projects Since 2014

Total Investments of Current & Future Projects since 2014

66 Billion $

29 Billion $

- **22 Billion $** — Generation Projects (Including 2 Billion $ private sector & FDI)
- **4.6 Billion $** — Transmission Projects
- **2.4 Billion $** — Distribution Projects
- **4.4 Billion $** — Renewable Energy Projects (private sector & FDI) (Under Implementation)
- **2.3 Billion $** — Control Centers (Transmission & Distribution)
- **24 Billion $** — Nuclear Power Plant + Pump Storage Project
- **6.5 Billion $** — Electrical International Interconnections (Est.) (KSA + Greece + Sudan + Jordan)

Ministry of Electricity & Renewable Energy

Europe’s energy dilemmas

6th Cretan Energy Conference

1 July, 2022

Dr Charles Ellinas – Senior Fellow Atlantic Council - CEO eCNHC

Introduction

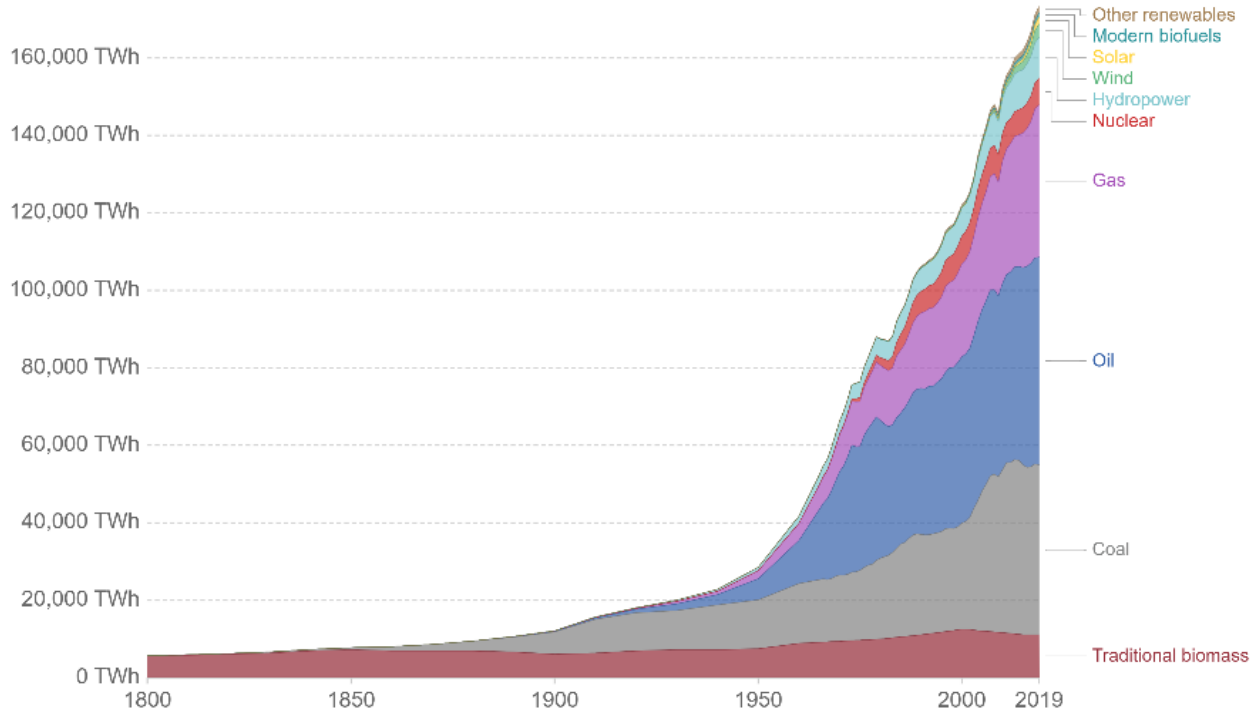
- Russia's invasion of Ukraine has radically and permanently upended the global energy sector
- A bipolar world is emerging with the US and the EU on one side and China and Russia on the other, with the rest of the world in between. This also applies to energy
- The EU's goal is to get rid of Russian gas - now at 40% - by 2027, or at the latest by 2030
- This re-opens gas export opportunities from the East Med that previously were considered to be commercially challenging
- But is this realistic? What are the opportunities and limitations?

The war in Ukraine and Europe's energy dilemmas

- Decoupling of European energy from Russian oil, gas and coal is one-way and permanent, at least over the foreseeable future
- What the Ukraine war brought home is that fossil fuels are still existential to global energy systems and that global energy security and geopolitics matter
- The reality is that since 1970 about 80% of global energy comes from fossil fuels
- Increasing reliance on renewables is still challenged by long-term intermittency, for which there are no answers yet
- As the world pushes for more renewables, the need for gas as back-up increases. Gas is a necessary part of the solution
- The world and governments will need to think about how people pay for energy longer-term. It is a basic living requirement

The reality is that since 1970 about 80% of global energy comes from fossil fuels

Fossil fuels still 80% of world energy



Source: Smil, V. (2017), "Energy Transitions: Global and National Perspectives" and "BP Statistical Review of World Energy".

So what should be done?

- The world will still need secure and affordable supplies of oil and gas for a long time to come
- But the reality is that, so far, the big winner from this crisis is coal – the world needs to get out of coal and replace it with renewables supported by natural gas during transition
- What is also needed is a global climate deal and China and Russia will need to be part of it
- Plans to address Europe's energy dilemmas must reflect reality: the pain of high prices and inflation on Europeans today, before they take to the streets in bigger numbers
- The war in Ukraine appears to be becoming protracted. Europe must have answers to its energy dilemmas soon. A long-period in crisis mode and high prices will be destructive

EU priorities affecting the East Med

- EU requires alternative supplies of gas so that it can end its dependence on Russian gas by 2027, or at the latest 2030
- In addition, the EU is accelerating transition away from fossil fuels – to renewables and hydrogen - planning to cut overall natural gas consumption by 30% by 2030, on the way to largely eliminate fossil-fuels by 2050
- The EU is unlikely to change its long-standing dismissive stance on financing of long-term fossil fuel projects
- EU priority is fast transition to green energy, intending to avoid lock-in of long-term fossil fuel projects
- In other words it does not need East Med gas beyond 2030
- But the G7 opened the way for investment in LNG as a "necessary response to the current crisis" – but given resistance by climate campaigners will it stick?

East Med energy contribution

- Diversification of energy suppliers has opened up opportunities for East Med gas supplies to Europe, but limited to 2030
- On this basis, the East Med should give priority to maximizing and accelerating LNG exports from already existing facilities. These include Israel's developed gas-fields and Egypt's liquefaction facilities at Idku and Damietta
- This is what the EU-Egypt-Israel MoU has formalised
- EU's targets do not support any new gas projects that cannot come on-stream over the next 2-3 years – especially pipelines
- Securing long-term investments requires the EU to confirm that reliance on gas will be longer-term, beyond 2040, something it does not, at present, appear to be prepared to do

East Med major gas fields / LNG plants

Possible routes of East Med export gas pipelines

The future

- With the EU accelerating transition to green energy and hydrogen, the future of energy in the East Med lies in a new strategy based on a rapid growth of RES, combined with energy storage, electricity interconnectors and use of natural gas regionally, in support of RES during transition
- The greatest, evolving, future opportunities are in hydrogen
- However, Europe's energy dilemmas will not be solved by rushing into putting all its eggs into the basket of low energy density, intermittent renewables. It will need gas for a while yet
- That, and the G7 decision, could still open the way for the East Med to make a greater contribution of natural gas to Europe, making full use of its 600bcm unutilised gas reserves

Generalitat de Catalunya
Departament de Drets Socials
Secretaria d'Habitatge i Inclusió Social

Deputy Directorate General of Housing

Secretariat of Housing and Social Inclusion

Josep Casas Miralles
Deputy Director General
Chania, Crete
July 2022

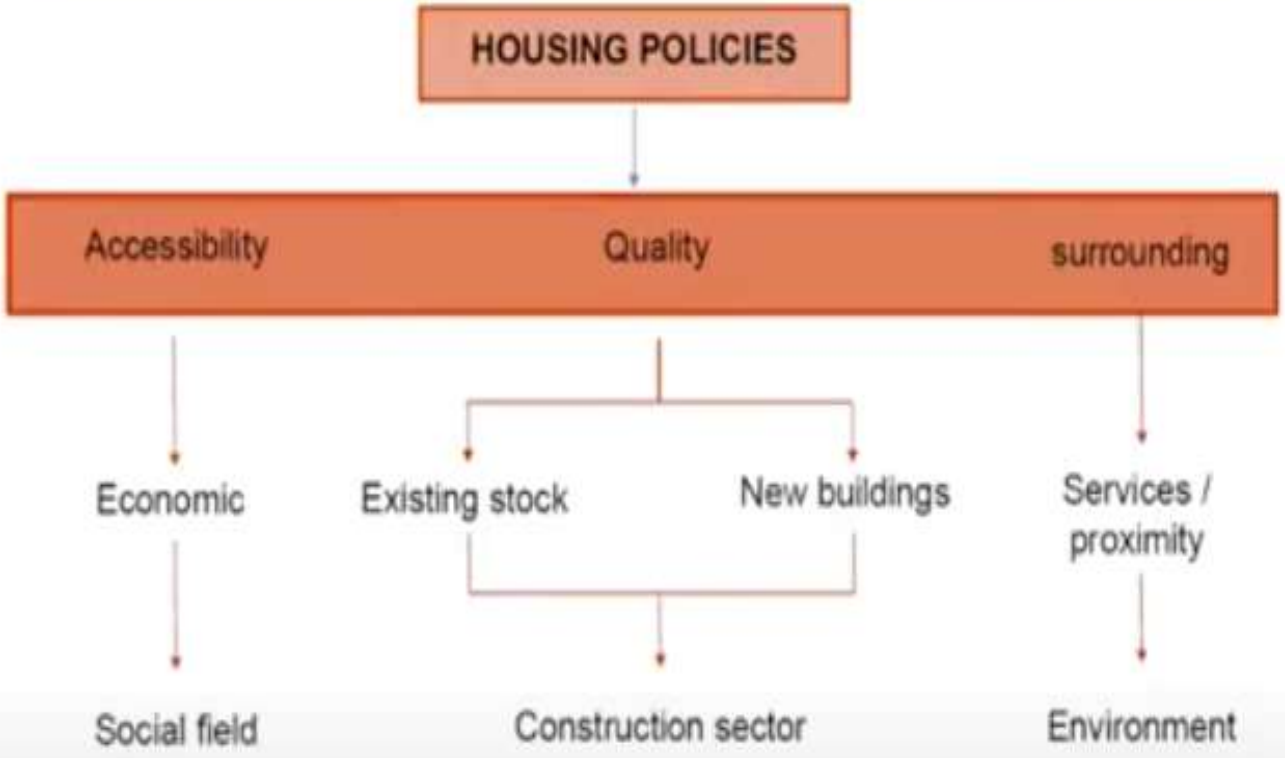
Context

HOUSING POLICIES

↕

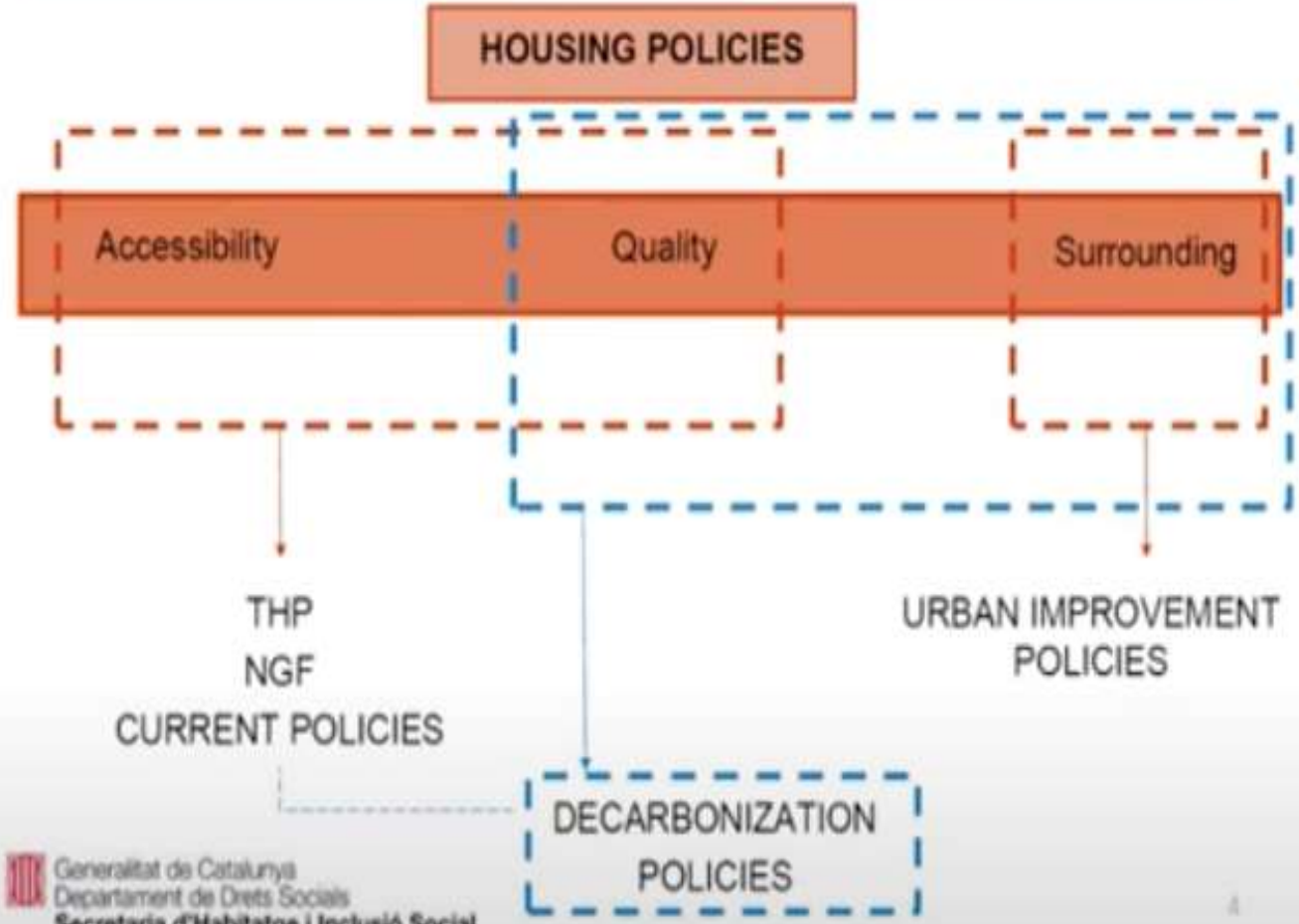
DECARBONIZATION

Context



Generalitat de Catalunya
Departament de Drets Socials
Secretaria d'Habitatge i Inclusió Social

Context



Generalitat de Catalunya
Departament de Drets Socials
Secretaria d'Habitatge i Inclusió Social

Context

- **Buildings** account for 40% of the EU's final **energy consumption**. In the specific case of Spain, they represent approximately 26% (17% of homes and 9% of buildings in the tertiary sector).

- **Buildings** are responsible for **36% of greenhouse gas emissions**, generated mainly during their construction, use, renovation and demolition.

- Despite its potential, the current **rates of building renovation** in the European Union are **very low** (0.4-1.2% per year depending on the country).

NEXT GENERATION FUNDS

NEXT GENERATION FUNDS

Double objective related to the reduction of the Demand and Consumption of non-renewable primary energy

1. **Reduction of energy demand** depending on the climatic area :
   - 0% B climatic zone
   - 25% C climatic zone
   - 35% D and E climatic zone

2. Eligible investment per home based on the **reduction of consumption**
   - From 30% to 45%
   - From 45% to 60%
   - More than 60%

NEXT GENERATION FUNDS

2022-2026
For all refurbishment programmes

480 MEUR CAT

- Refurbishment of 65.000 dwelings with energy efficiency criteria.
- Projects.
  Maximum 9% of the funds
- Technical offices and management
  About 4% of the funds

neighborhood

NEXT GENERATION FUNDS

65.000 DWELLINGS 2022-2026

Permeability between programmes

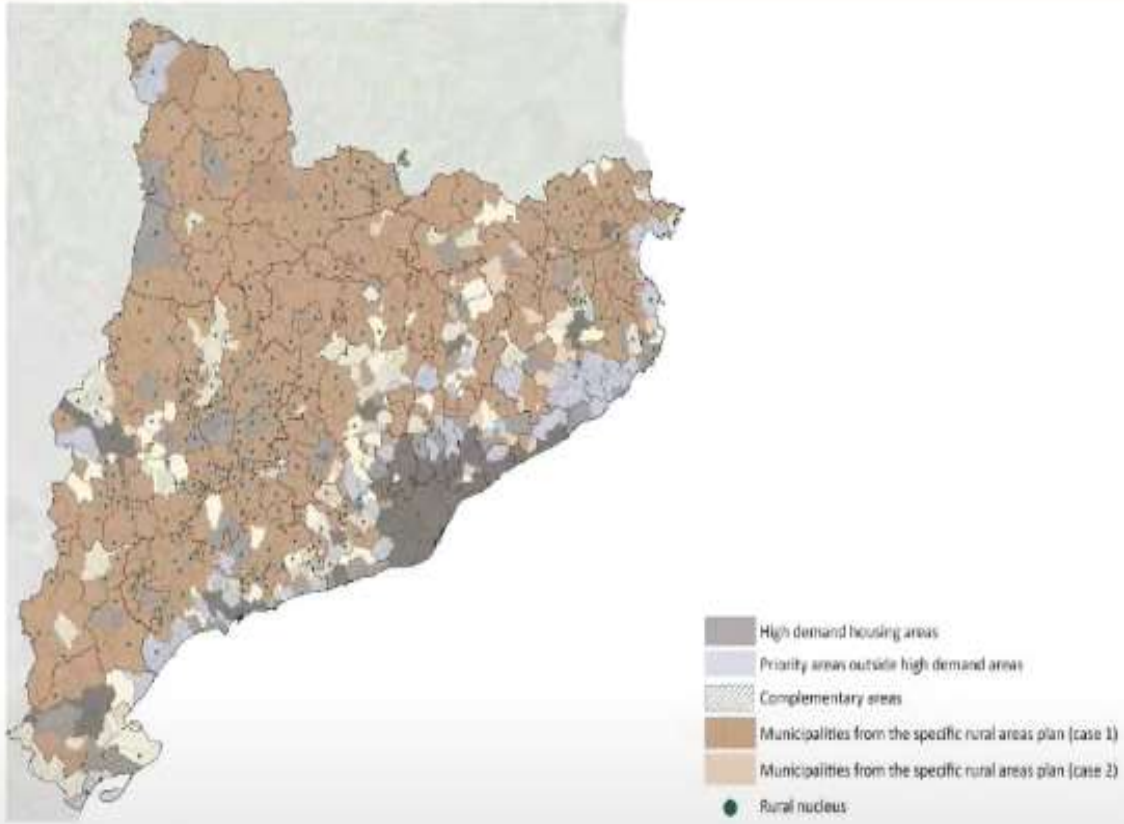
Neighborhood programme
25% of the units

Building programme
35% of the units

Dwelling programme
40% of the units

Generalitat de Catalunya
Departament de Drets Socials
Secretaria d'Habitatge i Inclusió Social

TERRITORIAL HOUSING PLAN (THP)



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TERRITORIAL HOUSING PLAN (THP)

Urban solidarity mandate

Actual situation

	Objective	Existing	Deficit
Percentage	15%	7,3%	7,7%
Number	395,626 dwellings	193,961 dwellings	201,665 dwellings

Year 2042

	Objective	Existing	Deficit
Percentage	15%	5,7%	9,3%
Number	455,200 dwellings	154,900 dwellings	**300,300 dwellings**

TERRITORIAL HOUSING PLAN (THP)

Increase social rental housing:

	Objective social rental stock	Existing	Deficit
		Actual situation	
Percentage	7%	1,7%	5,3%
Number	217,279 dwellings	54,066 dwellings	163,213 dwellings
		Any 2042	
	Objective social rental stock	Existing	Deficit
Percentage	7%	1,5%	5,5%
Number	255,981 dwellings	54,066 dwellings	201,915 dwellings

Urban improvement

The law of districts

- Public intervention in special attention urban areas where there is a concentration of:
  - Urban regression processes
    - Building degradation
    - Public equipment deficiencies
    - Urbanization and services deficiencies
    - Public spaces deficiencies
  - Demographic problems
    - Ageing
    - Loss of population
    - Excessive population growth
  - Social and economic deficiencies

Urban improvement

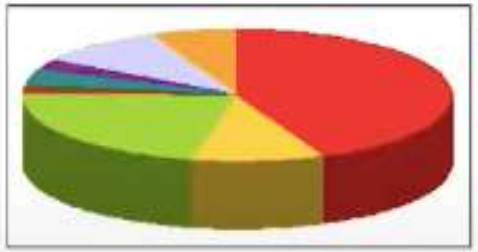
The law of districts

- Need an overview
  - 7 Calls
  - 148 Selected projects
  - 117 municipalities (5.652.926 hab.)
  - 143 neighbourhoods (989.138 hab.)
  - 582 M € subsidies
  - 1.123 M € investment cost
  - 17 years (2004 – 2021)

Urban improvement

The law of districts

- Transversal actions



Improvement of public space and supplying green spaces	507 M€ (45%)
Building rehabilitation and services	80 M€ (7%)
Public equipment	263 M€ (23%)
Information technology	8 M€ (1%)
Sustainable urban development	45 M€ (4%)
Gender equity	18 M€ (2%)
Improvement of social, urban and economic program	135 M€ (12%)
Accessibility	67 M€ (8%)
	1.330 M€

Generalitat de Catalunya
Departament de Drets Socials
Secretaria d'Habitatge i Inclusió Social

Urban Sustainability actuations, energy saving and efficiency

316 interventions

- Selective waste collection actions of replacement and burying containers and creating green spots.
- Measures to reduce water consumption
- Actions to promote sustainability
- Recovery actions sustainable landscaping and environmental improvement.
- Programs to promote the sustainability and efficiency measures energy.

Urban Sustainability actuations, energy saving and efficiency

- Replacement or burying of containers
- Selective collection awareness campaigns
- Energy saving campaigns: electricity and water
- Creation of bike lanes and parking areas
- Energy efficiency in public buildings
- Installation of solar panels
- Urban Gardens
- Composting workshops
- Basement of overhead lines
- Asbestos Waste Disposal
- Installation of fire hydrants
- Water supply replacement

Urban Sustainability actuations, energy saving and efficiency

- Domestic water saving programs
- Construction of a rainwater collection tank
- Tree planting / Acoustic trees
- Disposal of uncontrolled spills
- Creation of community gardens
- Installation of walkways_ bridges
- School road signs
- Biomass boiler installations
- Creation of car parks
- Recovery and / or cleaning of streams

Urban Sustainability actuations, energy saving and efficiency

Biomass boiler installations

Urban Sustainability actuations, energy saving and efficiency

Solar Panels

Urban Sustainability actuations, energy saving and efficiency

Walkways

Generalitat de Catalunya
Departament de Drets Socials
Secretaria d'Habitatge i Inclusió Social

Thank you!!

gencat.cat

Josep Casas Miralles
jcasasm@gencat.cat

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HELLENIC HYDROCARBON RESOURCES MANAGEMENT

Building a Bridge to a Carbon Free FUTURE

A road map to energy independency & transition

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Climate Change: a global and national challenge

Currently experiencing an unprecedented energy crisis

Energy Security

Energy Trilemma

Environmental Sustainability

Energy Equity

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Lessons drawn from the energy crisis

Energy Crisis is not short term

We shall prepare for a prolonged energy crisis

Little tolerance to supply-demand gaps

Supply and demand gaps will be difficult to manage and carry a burden on economy

Security threat

Short term actions towards diversification of energy supply sources

Energy Independence

Independence can only be achieved through development of domestic resources

All resources needed

No luxury for either or dilemmas, all resources needed for the transition

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HELLENIC HYDROCARBON RESOURCES MANAGEMENT

Connecting the pieces

Turning the crisis into opportunity

Geographical advantage

Advantageous geographical location between Europe, Middle East ad North Africa, ready to connect resource rich regions with the European Markets

Market drivers

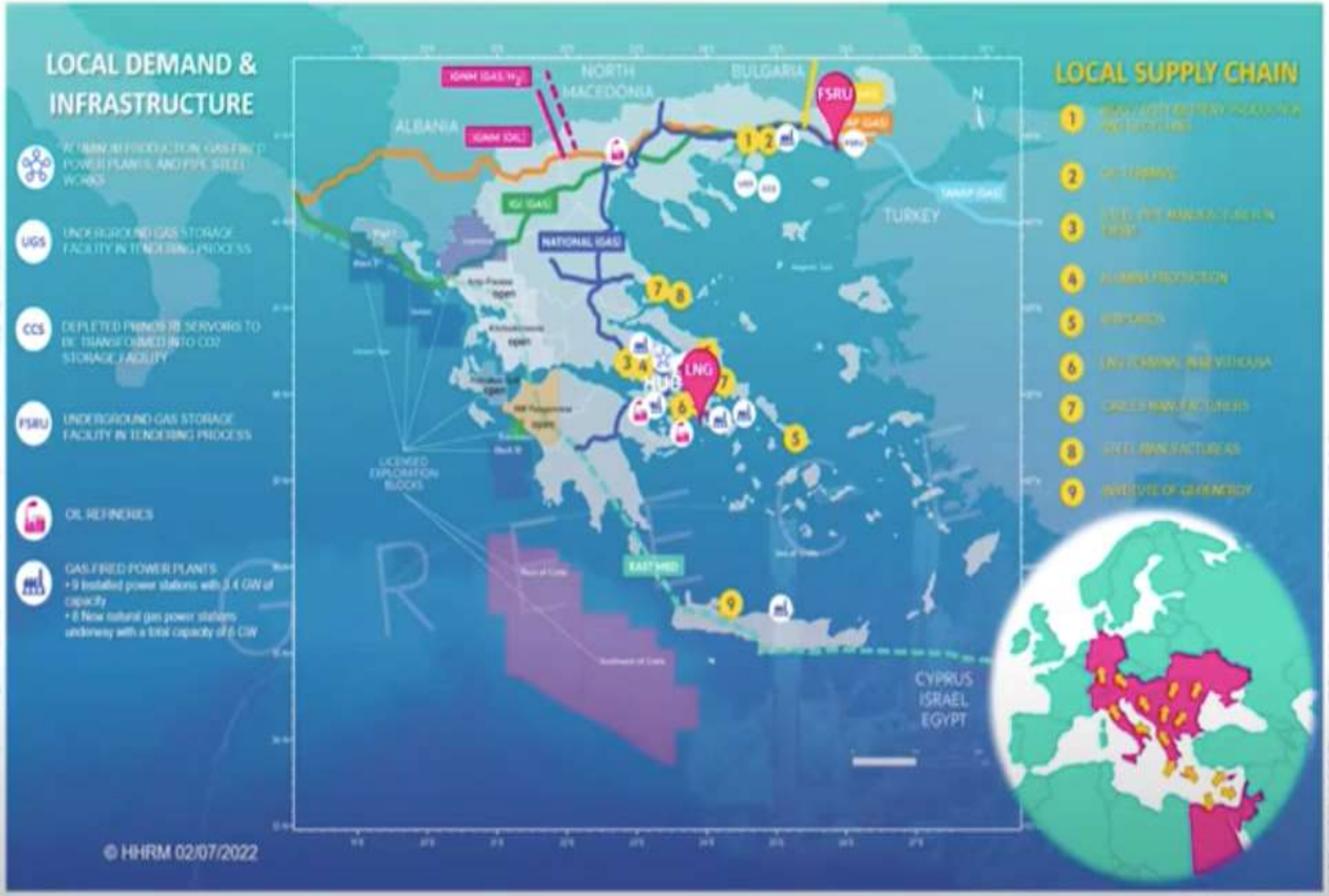
Huge market in demand, offering a price differential, enjoying political support and offering a diversity of energy investments

Energy Resources

Indisputable RES potential and high likelihood of significant natural gas resources

Infrastructure in place

Critical infrastructure in place and expanding, ready to expedite the rollout of new energy projects – reducing time and cost


LOCAL DEMAND & INFRASTRUCTURE
UGS
CCS
FSRU
OIL REFINERIES
GAS FIRED POWER PLANTS
• 9 Installed power stations with 3.4 GW of capacity
• 8 New natural gas power stations underway with a total capacity of 6 GW
© HHRM 02/07/2022
ALBANIA
NORTH MACEDONIA
BULGARIA
TURKEY
CYPRUS
ISRAEL
EGYPT
NATIONAL IGAS
EAST MED
LNG
FSRU
LICENSED EXPLORATION BLOCKS
LOCAL SUPPLY CHAIN

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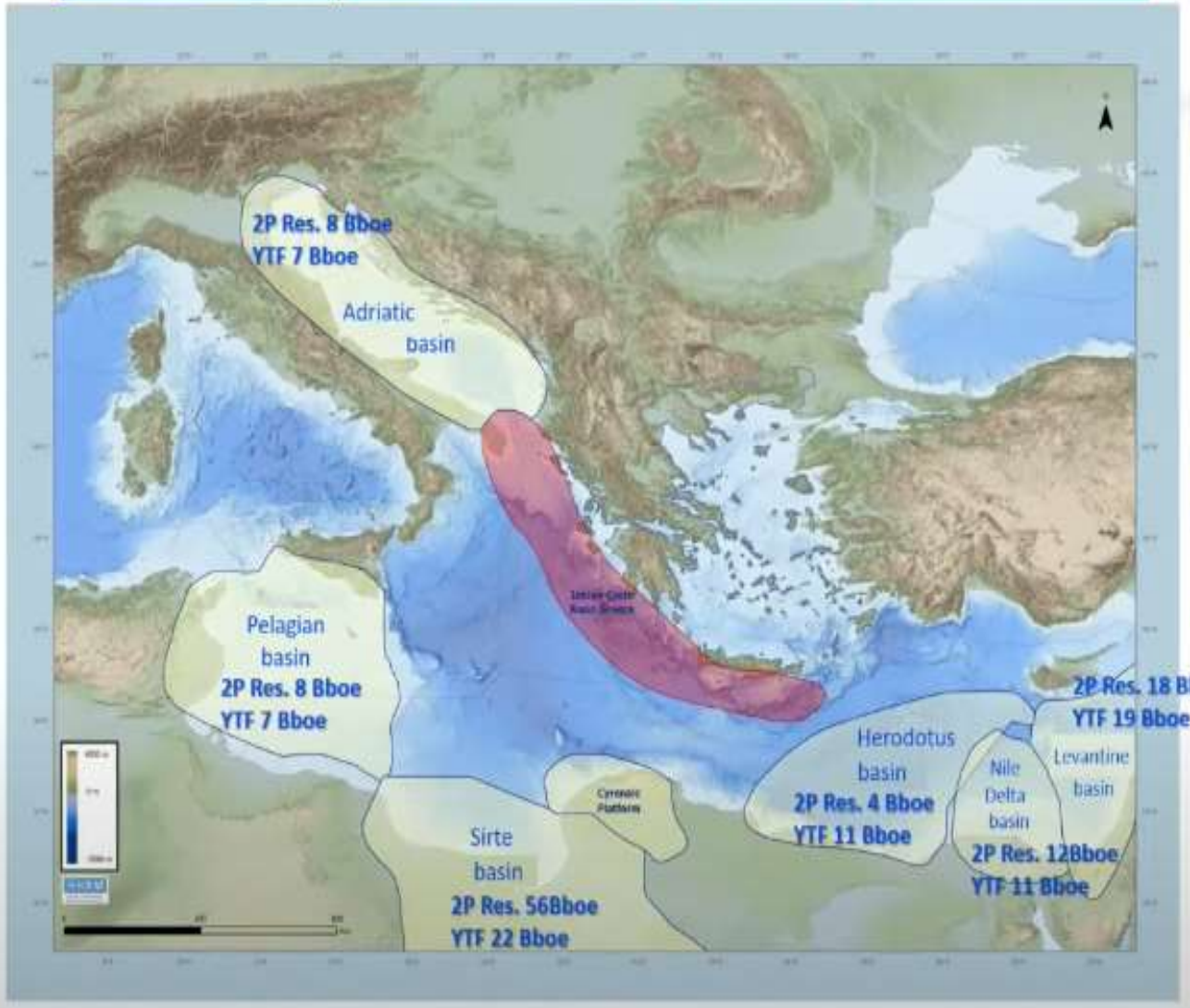
The Ionian and Crete Basin

Significant potential but largely under-explored



- Thick sedimentary infill (up to 10km or more)
- Shallow/deep/ultra-deep water
- Underexplored areas (near shore) & practically unexplored areas (further offshore)
- Sparse 2D seismic coverage
- 3 wildcats with oil & gas shows (+ 5 more further near-shore)
- One gas (and oil) discovery nearby (Katakolo field)

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First offshore seismic surveys since 2016 completed successfully in 2022 with the highest environmental and safety standards

2D seismic surveys completed by HELPE in early 2022 in Blocks 10 & Ionian

New environmental standards set for SEE region

- **"Soft start" protocol** to ensure that marine mammals can be temporarily removed from the geophysical survey area prior to commencement.
- **Doubling of marine mammal observers** aboard seismic surveillance to ensure protection of cetaceans and other marine life within the safety zone.
- **Doubling the radius of the safety zone up to 1.5 km** around the ship that carried out the seismic surveys in case of detection of large marine animals.
- **Waiting period 30 minutes** before the start and stop of each research activity.
- **Passive acoustic monitoring** of underwater sounds for the measurement of sea noise levels and the detection of marine mammals.
- **Application of a 1 km exclusion zone** around the "Natura" areas as well as fish farms.
- **Land and air monitoring of cetaceans** during and after surveys.
- **Environmental monitoring of wildlife sanctuaries**, including telemetry monitoring of loggerhead turtles with GPS tracking devices.
- **Full compliance with all applicable regulations and guidelines** (MARPOL VI and ACCOBAMS conventions and JNCC guidelines).

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Accelerating Greece's Upstream Gas Sector is a National Priority

Greece aiming to become a natural gas producer within the decade

Clear and Full Political Support by the Prime Minister Kyriakos Mitsotakis

Greece Currently Has 8 Active Concessions

- 2 blocks in exploitation phase: Prinos and Katakolon
- 6 blocks in exploration stage:
  - 3 offshore blocks located in the Ionian sea: Block 2, Block 10, and the Ionian Block.
  - 2 blocks offshore Crete: West of Crete and Southwest of Crete
  - 1 onshore block: Ioannina, which is the most mature

Friendly investment environment for Hydrocarbon Exploration Projects Deemed Projects of National Interest. Special Task Force set up by YPEN to ensure swift progress.

- Fast track permitting process
- Favourable tax regime
- Easier access to financing

Estimations point towards natural gas deposits worth upwards of €250 bn

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Roadmap for the monetization of potential domestic natural gas deposits

Milestones for the development of potential natural gas deposits in Greece

Completion of seismic surveys **1-2 years**

Completion of exploratory drilling **3-4 years**

Domestic Production & revenue generation **6-7 years**

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Window of Opportunity

Connecting the pieces

Shortage of supply & high prices

EU security of supply

Geopolitical pressure

Vertical energy corridor & growing Balkan market

EU market price differential

Long term mitigation of energy cost

National untapped gas resources

Multi billion investments strengthening national security

Significant local demand & infrastructure

Promotion of East-Med collaboration

The recently announced MOU between Egypt, Israel and the EU demonstrates the importance of having access to energy resources through friendly partners and further highlights the value of the potential domestic natural gas deposits.

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THANK YOU

Η Γεωστρατηγική Θέση της Κρήτης ως Ενεργειακός και Τηλεπικοινωνιακός Κόμβος

GRID TELECOM

Ιούλιος 2022

Εταιρική Ταυτότητα

- Η GRID-TELECOM ιδρύθηκε τον Ιανουάριο του 2019
- 100% θυγατρική εταιρεία του ΑΔΜΗΕ
- Όχημα του ΑΔΜΗΕ για την παροχή τηλεπικοινωνιακών υπηρεσιών σε εθνικού και διεθνείς τηλεπ. Παρόχους και μεγάλες επιχειρήσεις

GRID TELECOM

Γεωπολιτική και Γεωστρατηγική

- Η Μεσόγειος είναι μία μεγάλης έκτασης κλειστή θάλασσα, μεταξύ τριών ηπείρων ενώ παράλληλα αποτελεί **θάλασσα διέλευσης**, δεδομένου ότι συνδέει την Ανατολή με τη Δύση, ενώνοντας διαφορετικούς λαούς, πολιτισμούς και κόσμους.
- Η Ανατολική Μεσόγειος αποτελεί διαχρονικά πεδίο υψίστης στρατηγικής σημασίας και η Κρήτη στην καρδιά αυτής της περιοχής, αποτελεί ένα σημείο εξαιρετικής **γεωπολιτικής** και **γεωστρατηγικής** σημαντικότητας.
- Η νευραλγική γεωγραφική θέση της Κρήτης προσφέρεται για να καθιερωθεί ως σημαντικός **ενεργειακός** και **τηλεπικοινωνιακός** κόμβος στην ευρύτερη περιοχή της Μεσογείου.

Η Διασύνδεση της Κρήτης με την Ηπειρωτική Ελλάδα

- Η Grid Telecom έχει εντάξει δυναμικά την Κρήτη στους διεθνείς τηλεπικοινωνιακούς διαδρόμους μέσω των καλωδιακών συστημάτων οπτικών ινών **MINOAS East-West** και **APOLLO East-West** που διασυνδέουν το νησί με την Πελοπόννησο και την Αττική.
- Η σύνδεση της Κρήτης με τα δίκτυα της ηπειρωτικής Ελλάδας και της Ευρώπης γενικότερα, προσθέτει χωρητικότητα εκατοντάδων Tbps για τη μεταφορά δεδομένων μέσα από 4 εναλλακτικές γεωγραφικές οδεύσεις, εδραιώνοντας τη θέση της Grid Telecom ως περιφερειακό κόμβο **ανοικτής πρόσβασης**, δημιουργώντας τις βάσεις για να αναπτυχθούν ψηφιακές υποδομές στρατηγικής σημασίας στην Κρήτη.

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MINOAS East-West και APOLLO East-West

Minoas East and West

Copy link

RFS
2021

Cable Length
270 km

Owners
Grid Telecom

URL
https://www.grid-telecom.com/

Notes
Minoas East and West are fiber optic cables attached to power cables. Minoas East was RFS in December, 2021. Minoas West was RFS in May, 2021. Each leg is 135 km in length, for a total of 270 km of fiber optic cable.

Landing Points
Neapoli, Greece
Nopigeia, Greece

Apollo East and West

Copy link

RFS
2024 Q2

Cable Length
670 km

Owners
Grid Telecom

URL
https://www.grid-telecom.com/

Notes
Apollo East and West are fiber optic cables in parallel (but not attached) to power cables. Each leg is 335 km in length, for a total of 670 km of fiber optic cable.

Landing Points
Korakia, Greece
Pachi, Greece

TeleGeography Submarine Cable Map

GRID TELECOM

Ο Καλωδιακός Σταθμός Προσαιγιάλωσης της Grid Telecom

- Η Grid Telecom, προσηλωμένη στην αναβάθμιση των τηλεπικοινωνιακών υπηρεσιών, σχεδιάζει την κατασκευή **Καλωδιακού Σταθμού Προσαιγιάλωσης** στη νότια πλευρά της Κρήτης.
- Ο καλωδιακός σταθμός θα λειτουργεί ως σημείο υποδοχής διεθνών υποθαλάσσιων καλωδιακών συστημάτων οπτικών ινών που αναπτύσσονται στην Μεσόγειο, συνδέοντας την Ελλάδα με την υπόλοιπη Ευρώπη, την Αφρική και την Ασία.

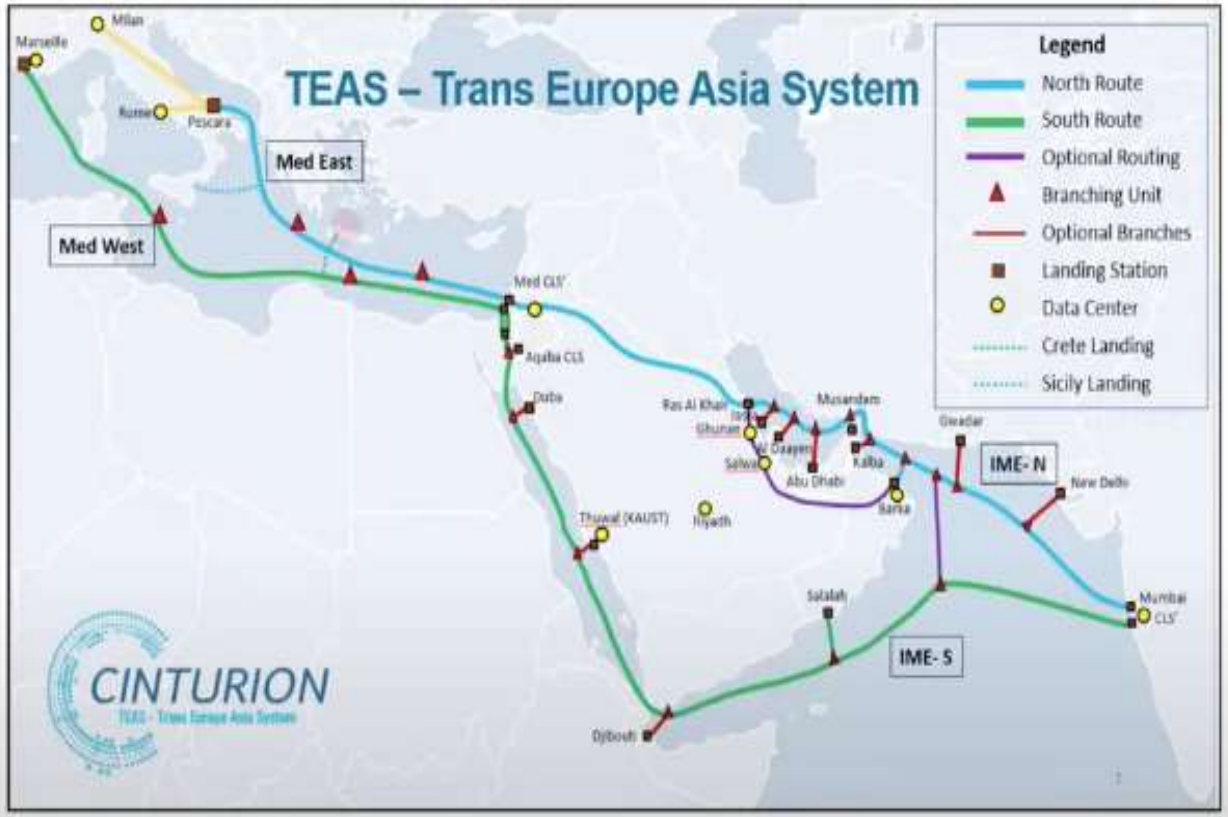
Συνδεσιμότητα Υψηλής Διαθεσιμότητας και Αξιοπιστίας

- Με τη νέα υποδομή, η Grid Telecom θα παρέχει συνδεσιμότητα υψηλής διαθεσιμότητας, με υφιστάμενα και νέα Data Centers στην Κρήτη, την ηπειρωτική Ελλάδα και τις γειτονικές χώρες, αξιοποιώντας τόσο τα υποθαλάσσιο όσο και το χερσαίο οπτικό δίκτυο που διαθέτει.
- Η Grid Telecom θα προσφέρει όλες τις απαραίτητες υποδομές για την ασφαλή προσαιγιάλωση, λειτουργία και διασύνδεση των καλωδιακών συστημάτων οπτικών ινών με **επίγεια** και **υποθαλάσσια** δίκτυα ενώ, επιπλέον, θα παρέχει υπηρεσίες τεχνικής υποστήριξης.

Καλωδιακοί Σταθμοί και Data Centers

- Η Κρήτη ήδη διαθέτει καλωδιακούς σταθμούς της Telecom Italia, και της OTEGlobe, καθώς και το Data Center «Κνωσσός-1» του GRNET ενώ τα επόμενα έτηθα δημιουργηθούν τρία επιπλέον Data Centers.
- Τα διεθνή καλωδιακά συστήματα BLUE-RAMAN, TEAS, MEDUSA και India Europe Xpress έχουν ήδη προεπιλέξει την Κρήτη ως σημείο προσαιγιάλωσης ενώ, άλλα συστήματα όπως το 2AFRICA, AFRICA-1, SMW6, EMIC-1 και LITE εξετάζουν σοβαρά το ενδεχόμενο.
- **Οι επενδύσεις σε Data Centers και καλωδιακούς σταθμούς, θα αναβαθμίσουν τις ψηφιακές υποδομές και θα καθιερώσουν την Κρήτη ως ένα σημαντικό περιφερειακό κόμβο μεταφοράς δεδομένων.**

TEAS – Trans Europe Asia System



- H Grid Telecom υπέγραψε Μνημόνιο Κατανόησης (MoU) με τη **Cinturion** για την προσαιγιάλωση του προηγμένου καλωδιακού συστήματος **TEAS** (Trans Europe Asia System) στην Κρήτη που θα προεκτείνεται μέσω δύο ξεχωριστών συνδέσεων κατά μήκος της Μεσογείου, διασυνδέοντας τη **Μέση Ανατολή** μέσω πολλαπλών διαδρομών κατά μήκος της Αραβικής Χερσονήσου και μίας ακόμη όδευσης στον Κόλπο της Άκαμπα και της Ερυθράς Θάλασσας.

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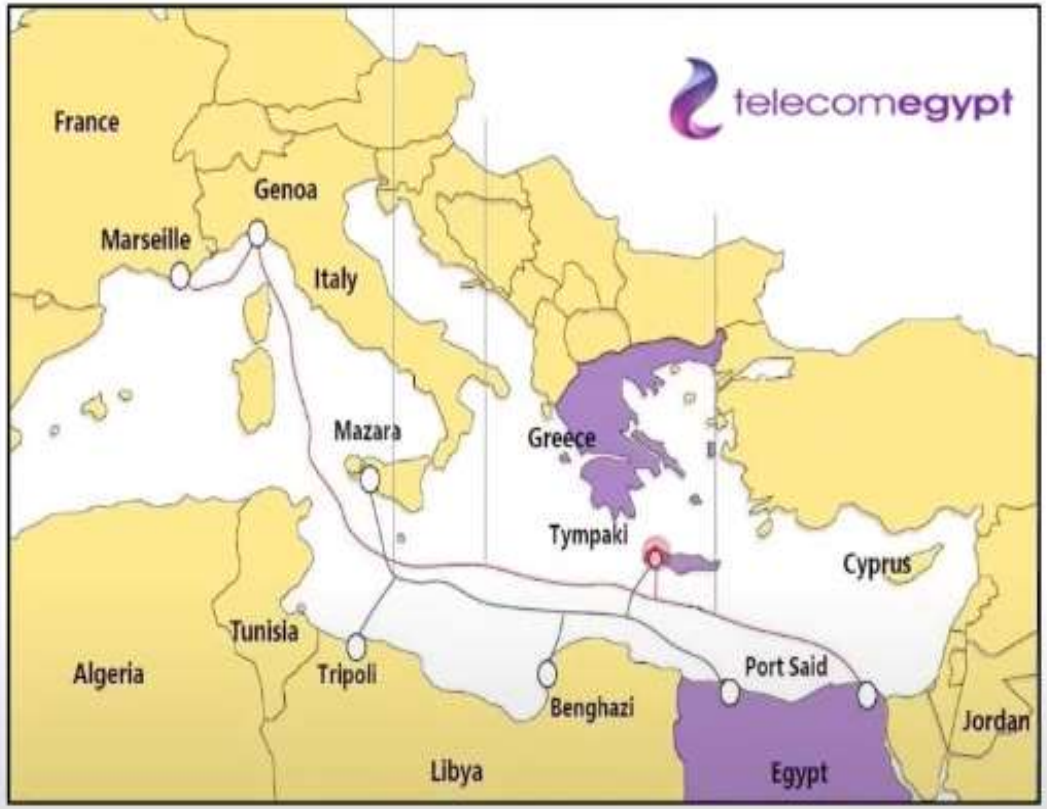
Διασύνδεση Ελλάδας - Αιγύπτου



- Ο ΑΔΜΗΕ και η Grid Telecom υπέγραψαν συμφωνία με την Telecom Egypt για την **τηλεπικοινωνιακή** διασύνδεση Ελλάδας – Αιγύπτου μέσω διακλάδωσης διεθνούς καλωδίου προς την Κρήτη, προσφέροντας τη συντομότερη δυνατή όδευση προς **Βαλκάνια** και άλλους προορισμούς στη νοτιοδυτική Ευρώπη όπως τη **Γένοβα** και τη **Μασσαλία**, μέσω χερσαίων και υποθαλάσσιων δικτύων.
- Παράλληλα εξετάζεται η **ηλεκτρική** διασύνδεση Ελλάδας – Αιγύπτου στο συνολικό σχεδιασμό των διεθνών διασυνδέσεων, μέσω των οποίων η Ελλάδα μετασχηματίζεται σε έναν **κρίσιμο ενεργειακό κόμβο** στη Νοτιοανατολική Μεσόγειο.

GRID TELECOM

EuroAsia Interconnector

- Ο ευρασιατικός interconnector EuroAsia θα διασυνδέσει το **Ισραήλ** και την **Κύπρο** με την ηπειρωτική Ελλάδα μέσω Κρήτης, αυξάνοντας την ενεργειακή ασφάλεια της χώρας και τη διείσδυση των ΑΠΕ.
- Ο ΑΔΜΗΕ βρίσκεται σε προχωρημένες συζητήσεις με τον **EuroAsia Interconnector** φορέα των ηλεκτρικών διασυνδέσεων Ελλάδας – Κύπρου – Ισραήλ, για συμμετοχή στο μετοχικό του κεφάλαιο ενώ, σε δεύτερο στάδιο θα εξεταστεί η συμμετοχή στο καλώδιο οπτικών ινών **Quantum** που θα διασυνδέει τις ίδιες χώρες με τη Δυτική Ευρώπη.

Συμπεράσματα

- Η συνεργασία της Grid Telecom με τους διαχειριστές υποθαλάσσιων καλωδιακών συστημάτων προσφέρει δυνατότητες **ουδέτερης** διασύνδεσης στους χονδρεμπορικούς πελάτες, εξασφαλίζοντας αδιάλειπτη μετάδοση δεδομένων, με τεχνολογία αιχμής.
- Η ΝΑ Μεσόγειος παρέχει ευκαιρίες για συνέργειες που θα συμβάλουν στην ανάδειξη της ευρύτερης περιοχής ως σημαντικού **ενεργειακού** και **τηλεπικοινωνιακού** κόμβου, κατοχυρώνοντας τη στρατηγική θέση της Κρήτης στο γεωπολιτικό χάρτη της ΝΑ Ευρώπης.
- Οι διεθνείς συνεργασίες του ΑΔΜΗΕ και της Grid Telecom με συνεργάτες, ενισχύουν το στρατηγικό ρόλο της Κρήτης ως σημαντικό περιφερειακό κόμβο ηλεκτρικής διασύνδεσης και ανοικτής πρόσβασης δεδομένων στο σταυροδρόμι τριών ηπείρων.

GRID TELECOM

Chemical Process and Energy Resources Institute (CPERI)

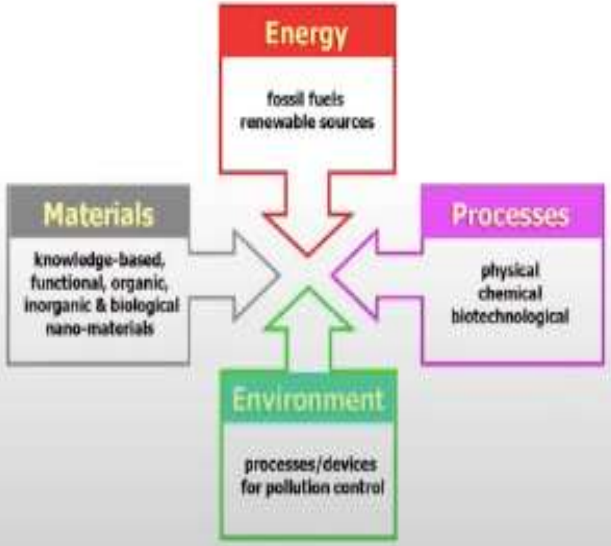
International Energy Exhibition of Greece
Shipping and Development

Alternative Fuels and Environmental Challenges in Shipping sector

Crete, July 3nd 2022

Dr. Adamis Mitsotakis

CERTH/CPERI PROFILE



CPERI was established in 2012 by the union of 2 pre-existing institutes:

- Solid Fuels Technology and Applications (since 1987)
- Chemical Process Engineering Research Institute (since 1985)

- **Research staff ~ 250 employees, Operating cycle ~ 10 mil. €/year**
- **Research and technology areas (among others):**
  - LNG applications in shipping and other end uses
  - LNG Supply Chain Sustainability Studies
  - LNG logistics
  - Air Pollutants Measurements- Eastern Mediterranean ports
  - Utilization and innovative biofuel production technologies (BiosferA)
  - Coal and biomass/waste co-combustion
  - Small Scale biomass boilers
  - Gasification processes
  - CCS technologies
  - By-products utilization
  - Alternative fuels
  - Hydrogen and Ammonia production and utilization – Fuel Cells

marine sector in Greece

Aiming to prepare a plan of infrastructure development in Eastern Mediterranean, so that LNG can be widely adopted as marine fuel for shipping operations.

POSEIDON MED LNG BUNKERING PROJECT

Archipelago LNG

Aiming to identify the key technical, economic and legislative framework of the small scale LNG as marine fuel value chain in the South Aegean Region

POSEIDON MED II (CEF Transport)

26 Partners

Facilitate all necessary actions to achieve maturity, build strong cooperation among stakeholders, explore and enhance synergies

Co-financed by the European Union
Connecting Europe Facility

International framework for Pollution Control Areas– ECA

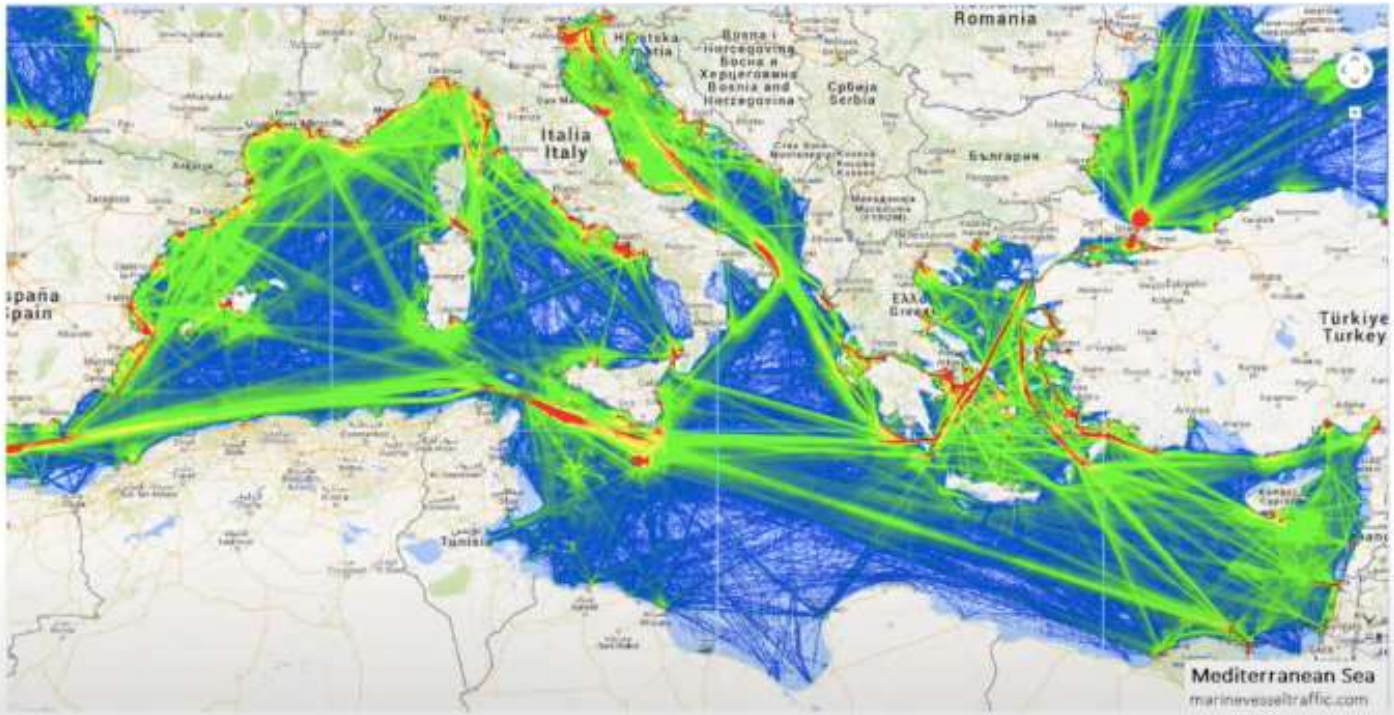
Source: DNV GL

IMO Marpol Annex VI – 2008 amendments

- **ECA** (Emission Control Areas) (North Sea, Balkan Sea, English Channel) : 0.1% sulphur content since 1/1/2015
- **In all European waters :** 0.5% sulphur content by 2020

Mediterranean Sea is considered as a future ECA

Vessel traffic in the Mediterranean Area



Air Pollution and alternative fuels

Challenges before the Russia-Ukraine War (Feb 2022)

- Requirement to Reduce Gas Pollutants in the next few years mainly in Shipping (SOx, Nox PMs)
- Integration of different, competing LNG transportation and supply methods
- Harmonization of European legislation and safety regulations in the Greek legislative, social and political framework
- Social acceptance

Actions

- Measurements od atmospheric pollutants in the ports: Piraeus, Patras, Igoumenitsa, Heraklion and Limassol
- Mobilization of DEPA and Private sector for the creation of LNG transport companies
- Full legislative framework for LNG information and training of staff
- Participation and presentations on the topics of alternative fuels with moderate acceptance results

Gas pollutant measurements in ports (Photos)

Air pollutant Measurements (hourly average) Heraklion Port

NO_2

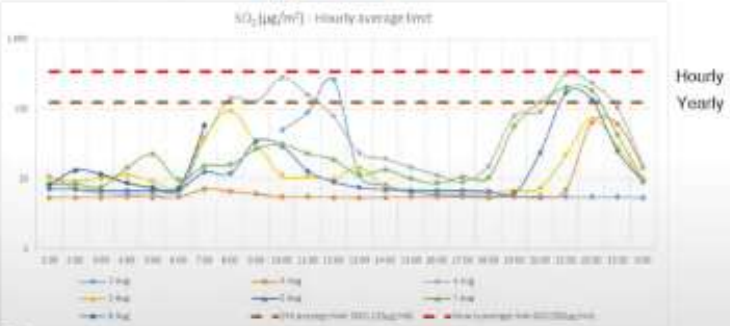
Low Season

High Season

SO_2

Low Season

High Season



NO_2

- ✓ Low Season-High Season: High average emissions level– Risk of exceeding limit in yearly basis

SO_2

- ✓ Low Season – High Season: Emissions increase (06.00-12.00, 18.00-23.00)

Air Pollutant Measurements (h.a.)
Heraklion Port(2018-19)

PM2.5

Low Season

High Season

PM10

Low Season

High Season

- ✓ Low Season: Increased emissions PM10 (7:00-10:00)
- ✓ High Season: 1 day long over limit (20:00-22:00)

Comparative Measurement of SO2 Piraeus Heraklion Limassol ports

Piraeus Port

Heraklion Port

Limassol Port

- Emission measurement results filtered by using shipping routes and wind direction data
- All ships use HFO/Diesel
- High emissions level on start up of the engines
- Ship traffic negative impact on air quality in the port
- Peak emissions during ship movement (arrival – departure)

Air Pollutant Measurements (h.a.)
Heraklion Port(2018-19)

PM2.5

Low Season

High Season

PM10

Low Season

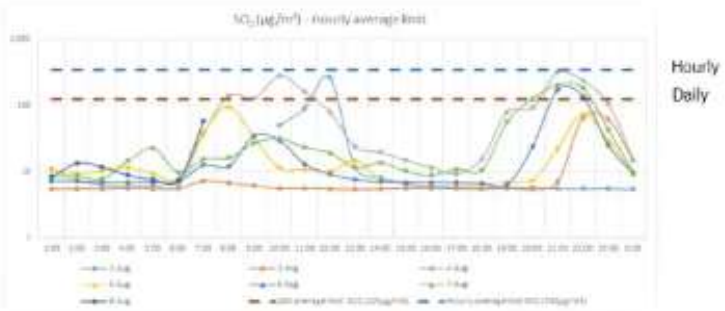
High Season

- ✓ Low Season: Increased emissions PM10 (7:00-10:00)
- ✓ High Season: 1 day long over limit (20:00-22:00)

Comparative Measurement of SO2 Piraeus Heraklion Limassol ports

Piraeus Port

Heraklion Port



Limassol Port

- Emission measurement results filtered by using shipping routes and wind direction data
- All ships use HFO/Diesel
- High emissions level on start up of the engines
- Ship traffic negative impact on air quality in the port
- Peak emissions during ship movement (arrival – departure)

Port of Heraklion – Air Pollution Measurements

Results

- Point measurement
- Effect of measurements from the movement of the ships
- Dependence of measurement from the wind
- Limitation of a available measurement points due to lack of suitable infrastructure
- Evidence of impact on the urban fabric due to proximity
- Need for permanent pollutant measurements with " compact stations" and drones

Results of Activities and Actions (Total)
POSEIDON MED II

Completed studies and Developed Constructions:

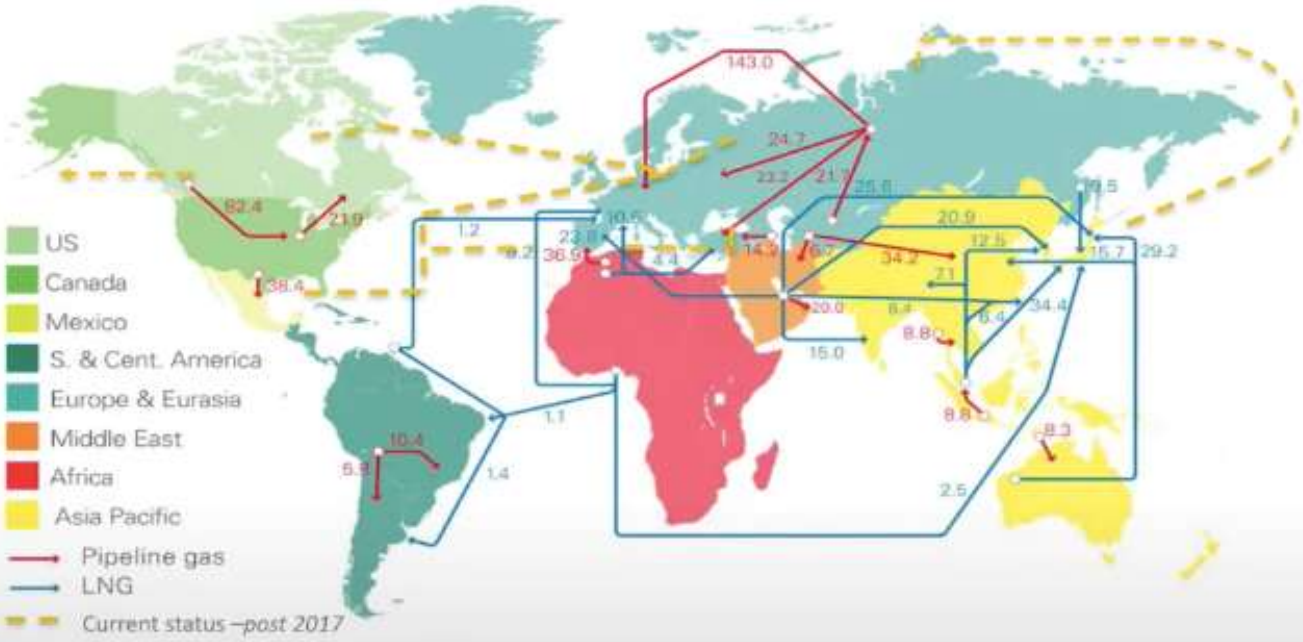
- 5 LNG Supply vessels (4 under construction)
- Completed Studies for LNG port storage facilities and for the conversion of 14 ships from conventional fuel to LNG
- Completed LNG-Revythoussa DESFA truck loading system
- Developing (Patra), Planning (Igoumenitsa, Heraklion) Small Scale LNG (SSLNG)
- Evidence of air pollution from ships in ports
- Ports complete pollution measurement Procurement & Installation programs

Natural Gas (NG) & Liquefied Natural Gas (LNG)
The Trading Situation

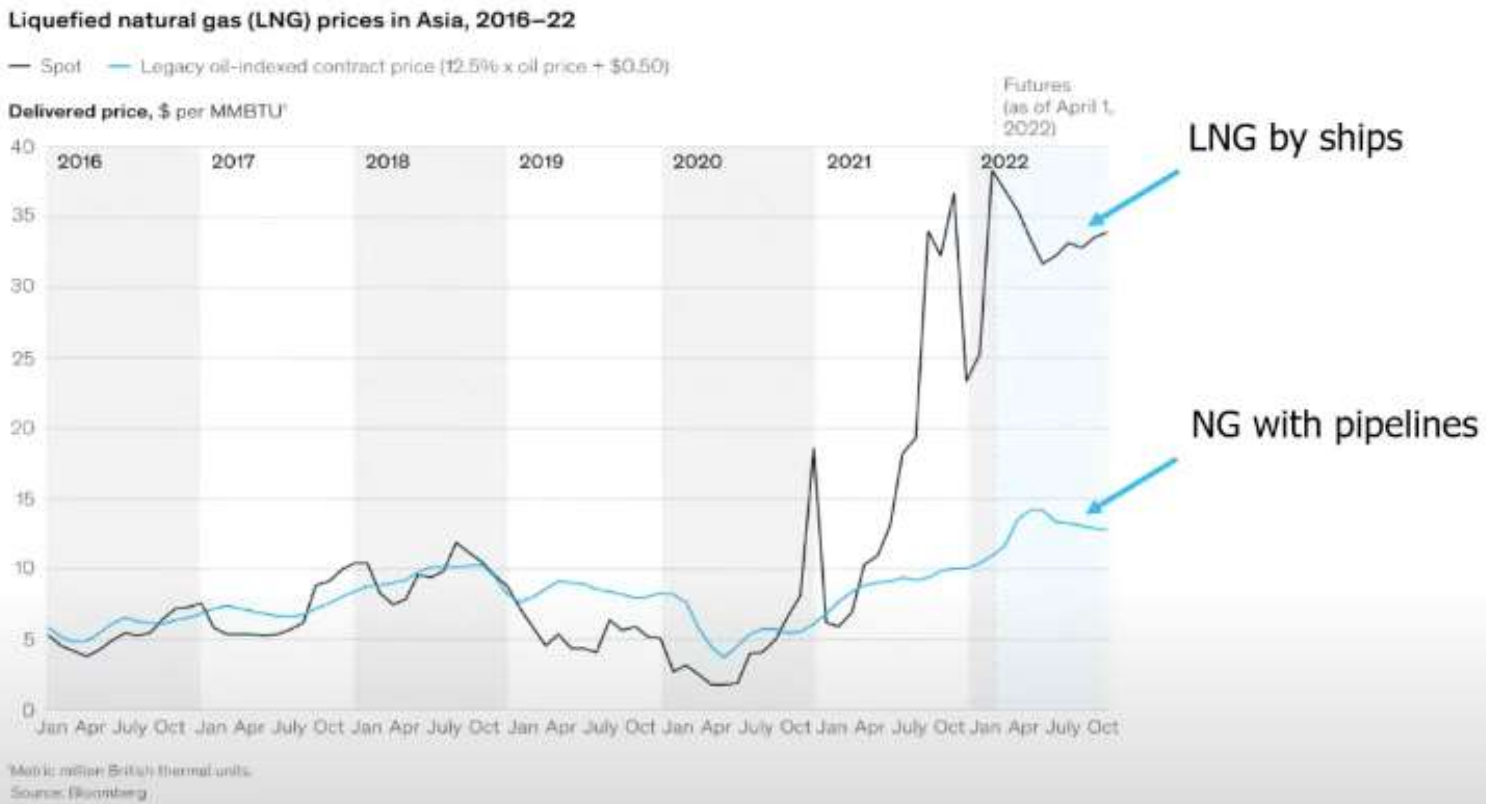
- 1. Global distribution of LNG by ships and NG with pipelines
- Prices of NG and LNG (Asian market)

Global trade of LNG by ships and NG with pipelines

Large quantities in Germany/Northern Europe



Price of NG και LNG in Asia. Surge of LNG



[1] Metric million British thermal units.
Source: Bloomberg

McKinsey & Company

Future challenges for shipping/coasting

Alterative Fuels, Air Pollutants and Climate Change

- Short-Term (until the end of the war)
- Continuation of the shipping pollution reduction requirements (SOx, Nox, PMs) και CO2, possible reduction in policing
- Prohibition of LNG-powered shipbuilding, except Carrier LNG (LNG transport)
- Medium-Term (after expiration)
- Increased policing for Air Pollutants. Possible establishment of MED-ECA with invitation to North African countries
- Increasing trend of building ships powered by LNG, development of Hydrogen Propulsion (Ammonia) and Electric ships
- Long-Term
- Establishment of MED-ECA with North African countries
- Increasing trend of alternative fuels, but maintaining the role of Diesel fuel

Suggested Solutions

Contemporary Actions

- Subsidy required (European & National) for the infrastructure of ships (Coastal shipping) and ports
- Energy saving in the movement of ships
- Electrification of Ports to supply electrical energy to docking ships (Cruise ships as well)

Parallel Actions

- Participation in European and National Projects for the promotion of innovative RES solutions (Electrical, Hydrogen, E-fuels based)
- Partnerships with the Private Sector to develop similar harmonized technical solutions
- Creation of Clusters with specific targeting and participation in projects

Thank you for your attention

Questions?

δesfa

"The role of infrastructure in the development of the H2 value chain"

Maria Rita Galli, CEO
Michael Thomadakis, Head of S&D

IEEG, Chania 02/07/2022

The network at a glance

1,466 km
High Pressure Pipelines

6
Operation & Maintenance Centers

1 + 1
LNG Storage & Regasification Terminal Stations in Revithoussa & Kuwait

22
Exit Points to Distribution Systems

4
Interconnection Points

2
Dispatch Centers

53
Metering & Regulating Stations

1
Compression Station

Upgrading & expanding our network, making Greece an energy gateway to SE Europe

DESFA's 10YDP 2022-2031 - €830 Mn. within the next 10-year period

1. **HP Pipeline to Western Macedonia** — Shareholders: DESFA
2. **HP Pipeline to Western Greece** — Shareholders: DESFA
3. **Small-Scale LNG & TL Station** — Shareholders: DESFA
4. **Interconnector Greece-North Macedonia** — Shareholders: DESFA
5. **Supply of NG to Ioannina** — Shareholders: DESFA

Participations

6. **FSRU Alexandroupolis** — Shareholders: Gastrade

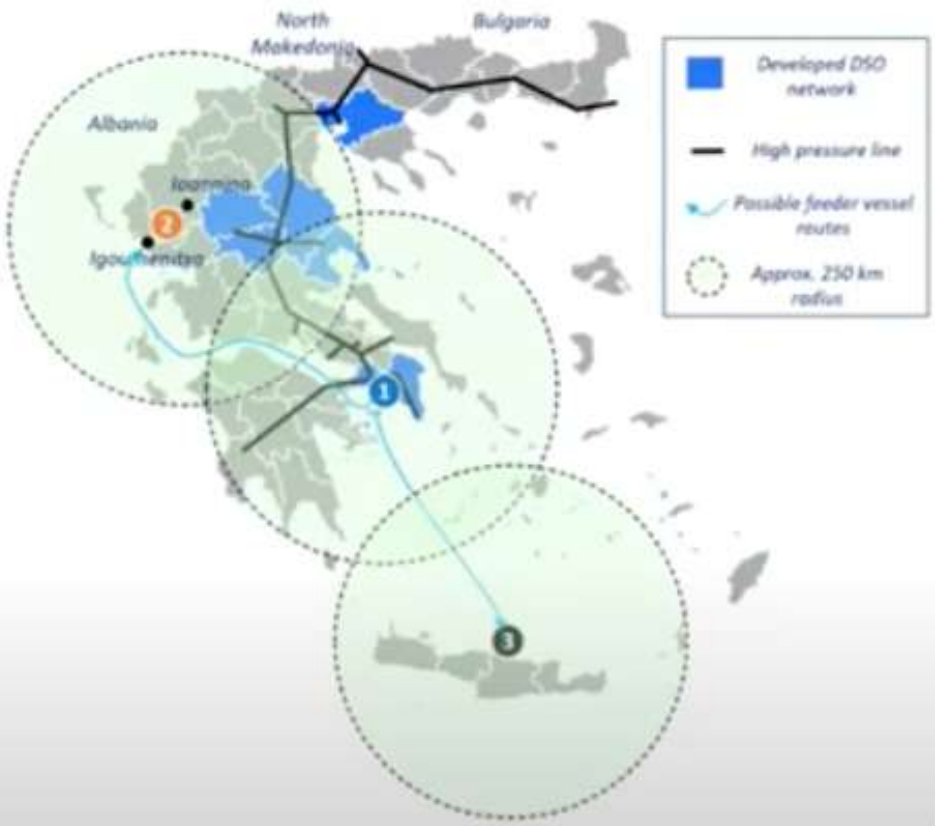
Other Developers

7. **Dioriga Gas FSRU** — Shareholders: Motor Oil 100%
8. **Argo FSRU** — Shareholders: Power Globe 100%
9. **Interconnector Greece-Bulgaria** — Shareholders: DEPA, Edison, BEH
10. **TAP** — Shareholders: BP, Socar, Snam, Fluxys, Enagás, Axpo

Tenders

11. **UGS South Kavala** — DESFA has expressed interest to participate in the tender

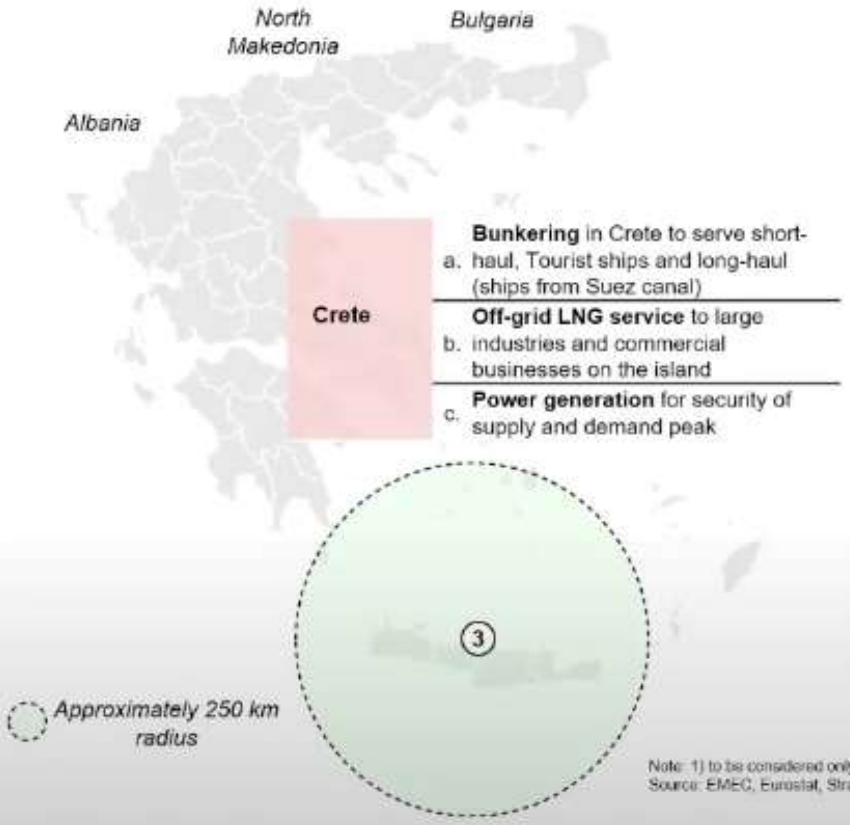
Area of utmost importance for the next decade is the development of ssLNG implementations; DESFA has deep dived in the identification of the 3 most attractive clusters for business expansion



Cluster	ID	Prioritized opportunity
Revithoussa (Piraeus)	1.a	**Bunkering** to the port of Piraeus
	1.b	**Off-grid services** at a distance of 250 km max from Revithoussa (e.g. Achaia)
	1.c	**Road transport** in Athens and Attika
Igoumenitsa & Ioannina	2.a	**Bunkering** in the port of **Igoumenitsa** serving the Adriatic Sea traffic
	2.b	**Off-grid services** including remote network to **Ioannina, Arta and Preveza** and towards Albania
	2.c	**Road transport** including HD trucks in transit between EU and Turkey
Crete	3.a	**Bunkering in Crete** to serve short-haul, Tourist ships and long-haul (ships from Suez canal)
	3.b	**Off-grid LNG** service to large industries and commercial businesses on the island

The Crete cluster focuses on serving bunkering and remote networks via a second satellite station

DESFA opportunities deep dive



a. **Bunkering** in Crete to serve short-haul, Tourist ships and long-haul (ships from Suez canal)

b. **Off-grid LNG service** to large industries and commercial businesses on the island

c. **Power generation** for security of supply and demand peak

Target | Not target

Initiative	3 Crete
Scope description	 • Creation of a satellite LNG base in Heraklion or other Cretan ports to broaden bunkering activities (including transit from Suez Canal) • Serve large industries and commercial businesses switching to a cheaper fuel such as LNG • Potential upside of LNG for power generation
Target business segments	Off-grid; Road transport; Bunkering; Power Generation

Potential Demand (MNm^3)	Off-grid	Bunkering	Power gen[1]	Tot (excl. p. gen)
2025	64.0	8.0	5-17	72.0
2030	88.8	20.4	5-17	109.2

Open points for assessment

- Required **infrastructure** and **investment** costs (from Poseidon Med II)
- **Business model** to deliver LNG (satellite depot, …)
- Assessment of **implementation roadmap**

Note: 1) to be considered only as potential upside
Source: EMEC, Eurostat, Strategy& analysis, Suez canal annual report

DESFA's H2 project proposal

- **Phase 1: Preparation of existing infrastructure to receive and transport the first produced quantities of hydrogen - as a blend with natural gas -** following the system's H2 readiness assessment study *(to be finalized within Q3 2022)*

- **Phase 2: Construction of a regional, open-access, high-pressure 100% hydrogen-ready network along Greece**, in parallel with the existing system, connecting supply with demand throughout the country, which, through its interconnections, will start the **SE part of the European Hydrogen Backbone.**

- The early development of a **hydrogen pipeline system can foster the realization of the national long-term vision for a prosperous, modern, competitive and climate neutral economy**

- We have already established **partnerships with various H2 projects, both on hydrogen production** in the country **and hydrogen infrastructure development** by other EU TSOs, TAP, Bulgatransgaz, Snam and North Macedonia NER amongst the more relevant.

Our project as part of the EHB initiative

- ✓ To deliver the 2030 hydrogen demand targets set by the **REPowerEU plan, 5 large scale pipeline corridors are envisaged by the European Hydrogen Backbone** (EHB) initiative.
- ✓ **EHB members signed a pledge** to the European Commission to establish hydrogen supply corridors by 2030 at the **European Hydrogen Backbone Day event which took place in June 2022 in Brussels**.
- ✓ **East and South-East Europe corridor with Greece** as an essential part of it, leveraging **vast land availability and high-capacity factors for solar & wind**, would connect **high hydrogen supply potential regions with off takers in Central Europe and southern Germany**, where the demand is expected to be significant by 2030. The corridor would be set up by **2030, covering 10,000 km of large scale hydrogen pipelines** across all countries of the corridor , of which approximately 60% will be repurposed pipelines
- ✓ The buildout of this corridor by 2030 requires **national governments to take clear and concrete actions across**. This includes actions associated with infrastructure development and planning, the development of **cross-national initiatives** and securing access to **early funding and long term, low-cost financing**.

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Thank you

www.desfa.gr

Institute for Energy Environment and Climate Change
Hellenic Mediterranean University

Energy Transition of Crete

Prof. Emmanuel Karapidakis
Presenter: Yiannis Katsigiannis

Cretan Energy System

Electricity → kWh

Heat → kcal/lit

Transportation → kcal/lit

Energy as end use (kcal, kWh, TOE, etc.)

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Cretan Energy System

Energy Sources

Transmission Energy Conversion

End Use

- Conventional fuels
- RES

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Cretan Energy System

Energy Sources

Transmission Energy Conversion

End Use

- Supply chain
- Transmission Lines
- Energy Storage Systems

- Steam Turbines – Boilers
- Internal Combustion Engines
- Electric Generators
- Photovoltaics

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Cretan Energy System

Energy Sources

Transmission Energy Conversion

End Use

- Space Heating/Cooling
- Electricity
- Transportation

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Current Efficiencies

Electricity	Heat	Transportation
3.200GWh	610GWh	3.540GWh
3.000GWh	550GWh	1.450GWh

→ **7.350GWh**

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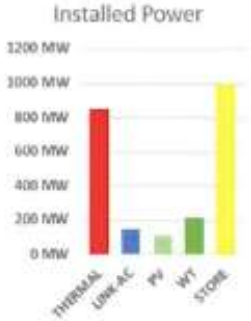
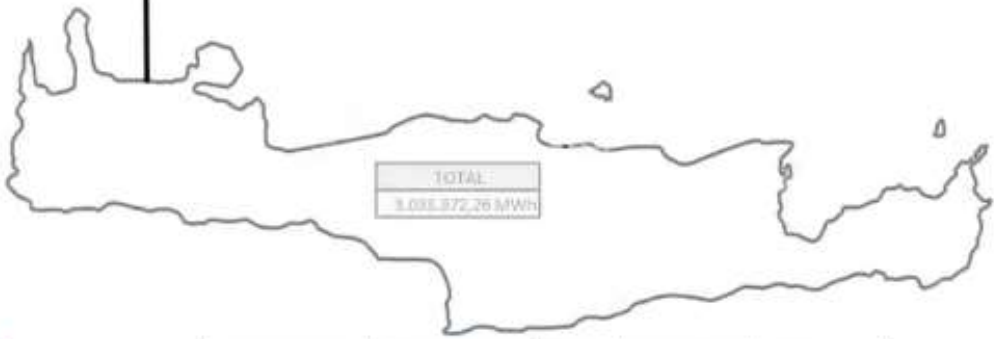
CREPSA: Cretan power system operation with interconnection

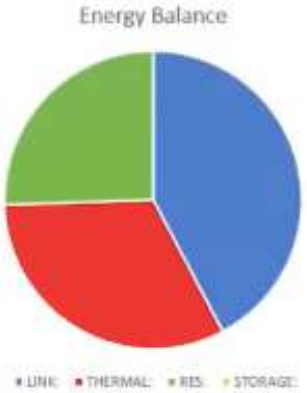
RUN

-1.284.233 MWh

AC Connection	150 MW
	-130 MWh
	1.284.363 MWh
	1.284.233 MWh







	RES	330 MW
☑	PV	110 MW
☑	WT	220 MW

	Source Type	Generation	Share	Min	Max
☑	LINK	1.284.233 MWh	42,3%	-46 MW	150 MW
	THERMAL	978.617 MWh	32,2%	0 MW	471 MW
	PV	193.532 MWh		0 MW	89 MW
	WT	582.490 MWh		0 MW	179 MW
	RES (Gross)	776.023 MWh		0 MW	255 MW
	RES (Net)	776.023 MWh	25,5%	0 MW	255 MW
	REJECT	0 MWh	0,0%	0 MW	0 MW
☐	STORAGE	0 MWh	0,0%		0 MW
		0 MWh	0,0%		0 MW
	Losses	0 MWh	0,0%		
	TOTAL Balance	3.038.872 MWh	100,0%		

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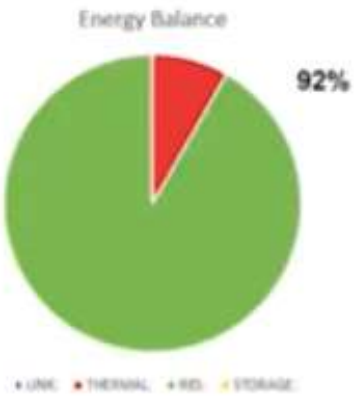
Current Requirements of RES Systems

Wind turbines (WTs)
1000MW
2.650GWh

Photovoltaics (PVs)
400MW
705GWh

3.000GWh



Energy balance & power balance

IEECC

CREPSA: Cretan power system operation with interconnection

32.444 MWh

AC Connection	150 MW
	-511.724 MWh
	479.280 MWh
	-32.444 MWh

	RES	1400 MW
☑	PV	400 MW
☑	WT	1000 MW

Source Type	Generation	Share	Min	Max
☑ LINK	-32.444 MWh	-1,0%	-150 MW	150 MW
THERMAL	267.365 MWh	8,2%	0 MW	483 MW
PV	703.754 MWh		0 MW	325 MW
WT	2.647.684 MWh		0 MW	814 MW
RES (Gross)	3.351.438 MWh		0 MW	1085 MW
RES (Net)	3.006.542 MWh	92,8%	0 MW	862 MW
REJECT	-344.895 MWh	-10,3%	0 MW	549 MW
☐ STORAGE	0 MWh	0,0%		0 MW
	0 MWh	0,0%		0 MW
Losses	0 MWh	0,0%		
TOTAL Balance	3.241.464 MWh	100,0%		

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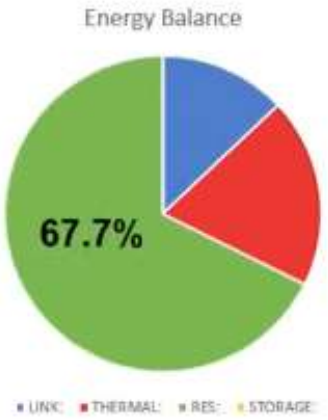
Case Study (PVs only)

WTs
220MW
582 GWh

PVs
1180MW
2.076GWh

3.000GWh



Energy balance & power balance

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CREPSA: Cretan power system operation with interconnection

RUN

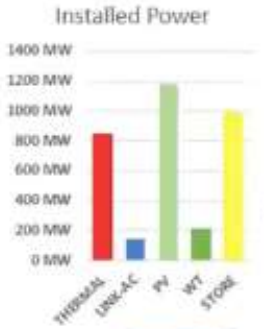
Load Factor
1,50

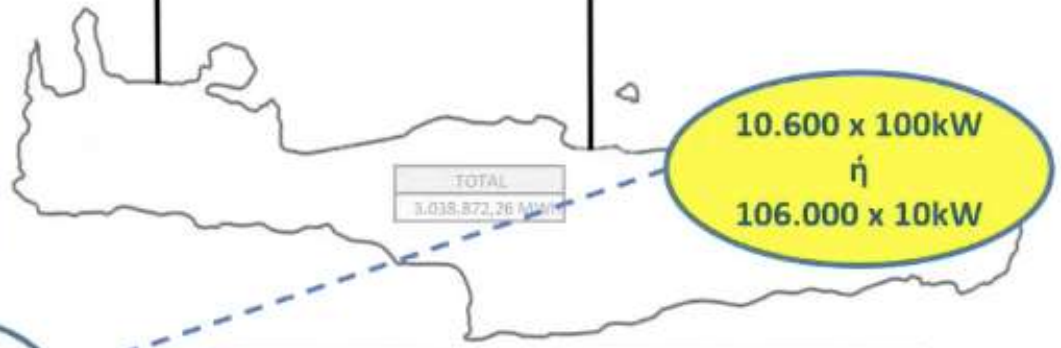
-394.410 MWh

AC Connection	150 MW
	-412.426 MWh
	806.836 MWh
	394.410 MWh

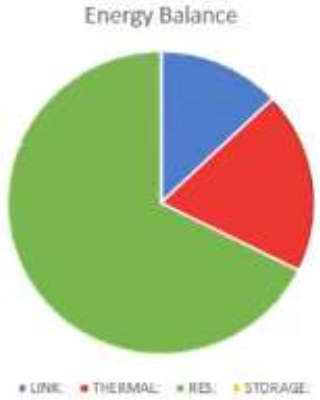
0 MWh

DC Connection	0 MW
	0 MWh
	0 MWh
	0 MWh



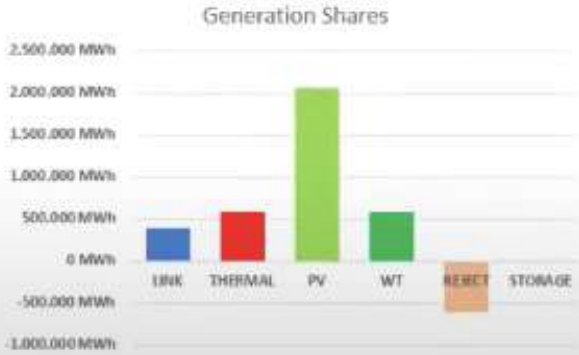


10.600 x 100kW
ή
106.000 x 10kW



	RES	1400 MW
☑	PV	1180 MW
☑	WT	220 MW

	Source Type	Generation	Share	Min	Max
☑	LINK	394.410 MWh	13,0%	-150 MW	150 MW
	THERMAL	587.865 MWh	19,3%	0 MW	470 MW
	PV	2.076.074 MWh		0 MW	958 MW
	WT	582.490 MWh		0 MW	179 MW
	RES (Gross)	2.658.564 MWh		0 MW	1089 MW
	RES (Net)	2.056.597 MWh	67,7%	0 MW	792 MW
	REJECT	-601.967 MWh	-22,6%	0 MW	720 MW
☐	STORAGE	0 MWh	0,0%		0 MW
		0 MWh	0,0%		0 MW
	Losses	0 MWh	0,0%		
	TOTAL Balance	3.038.872 MWh	100,0%		



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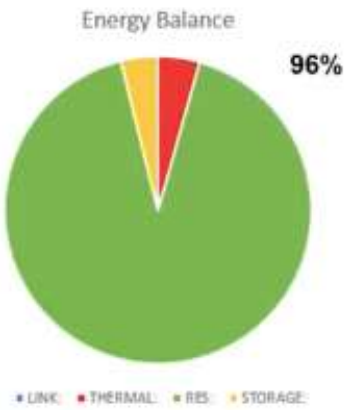
Current Requirements of RES and Storage Systems

WTs
1000MW
2.650GWh

PVs
400MW
705GWh

Storage 500MW / 4GWh

3.000GWh



Energy balance & power balance

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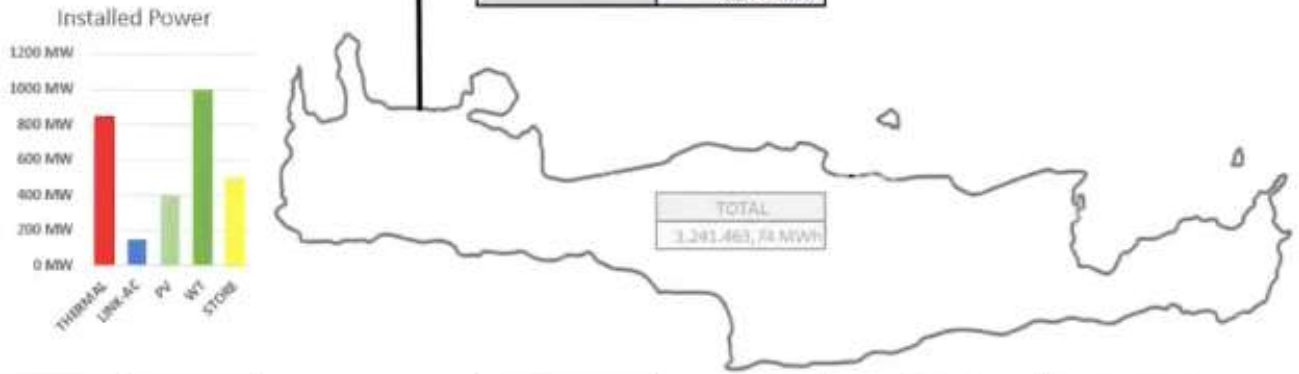
CREPSA: Cretan power system operation with interconnection

RUN

32.444 MWh

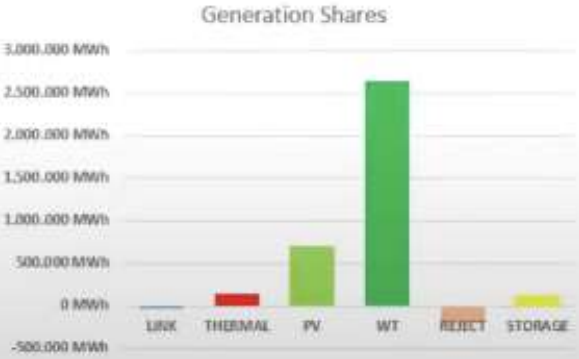
AC Connection	150 MW
	-511.724 MWh
	479.280 MWh
	-32.444 MWh



	RES	1400 MW
☑	PV	400 MW
☑	WT	1000 MW

STORAGE		
Performance	90%	
Energy Min	200 MWh	5%
Power	Hours	Energy
500 MW	8 h	4.000 MWh

	Source Type	Generation	Share	Min	Max
☑	LINK	-32.444 MWh	-1,0%	-150 MW	150 MW
	THERMAL	141.760 MWh	4,4%	0 MW	483 MW
	PV	703.754 MWh		0 MW	325 MW
	WT	2.647.684 MWh		0 MW	814 MW
	RES (Gross)	3.351.438 MWh		0 MW	1085 MW
	RES (Net)	3.006.542 MWh	92,8%	0 MW	862 MW
	REJECT	-201.235 MWh	-6,0%	0 MW	545 MW
☑	STORAGE	-129.294 MWh	-4,0%		-450 MW
		125.606 MWh	3,9%		423 MW
	Losses	14.366 MWh	10,0%		
	TOTAL Balance	3.241.464 MWh	100,0%		



Current Requirements

Annual Electricity Consumption
5.900GWh

90%	90%	75%
3.000GWh	550GWh	1.450GWh

→ **5.000GWh**

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Needed Installed Capacity

WTs
1800MW
4.765GWh

PVs
800MW
1.410GWh

Electricity
5.900GWh

Energy balance & power balance

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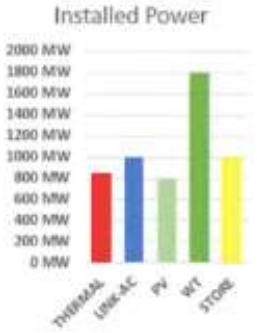
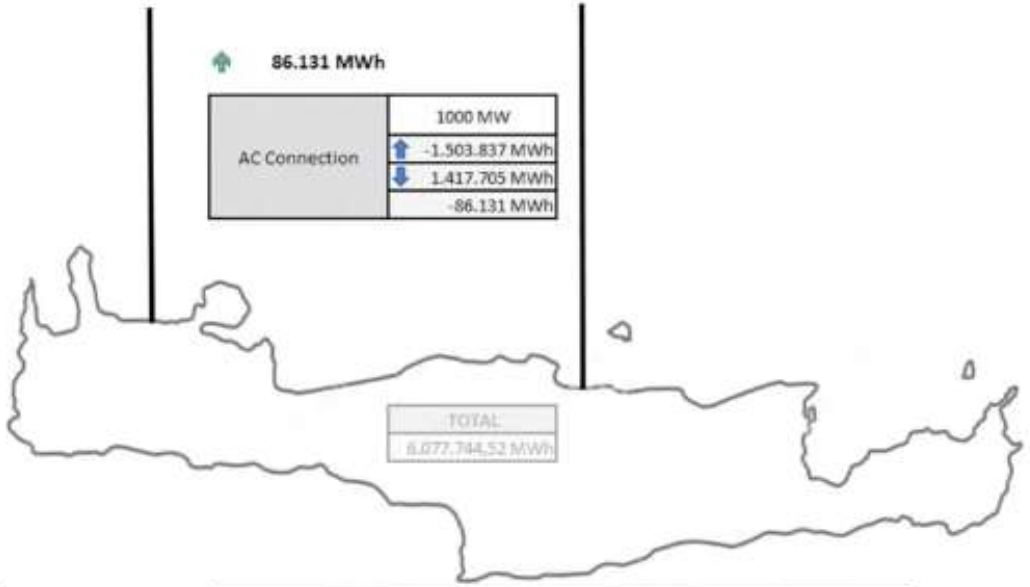
CREPSA: Cretan power system operation with **double** interconnection

RUN

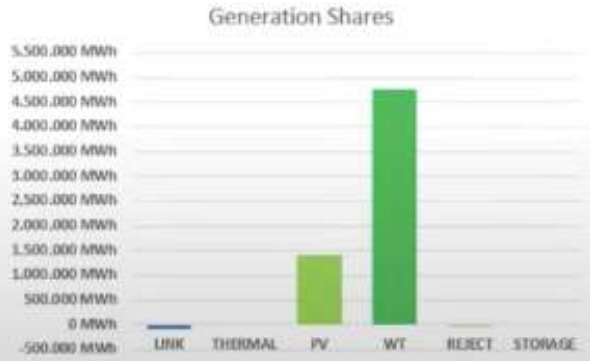
Load Factor
3,00



	RES	2600 MW
☑	PV	800 MW
☑	WT	1800 MW



	Source Type	Generation	Share	Min	Max
☑	LINK	-86.131 MWh	-1,4%	-1000 MW	1000 MW
	THERMAL	944 MWh	0,0%	0 MW	190 MW
	PV	1.407.508 MWh		0 MW	650 MW
	WT	4.765.831 MWh		0 MW	1466 MW
	RES (Gross)	6.173.338 MWh		0 MW	2014 MW
	RES (Net)	6.162.932 MWh	101,4%	0 MW	2014 MW
	REJECT	-10.407 MWh	-0,2%	0 MW	286 MW
☐	STORAGE	0 MWh	0,0%		0 MW
		0 MWh	0,0%		0 MW
	Losses	0 MWh	0,0%		
	TOTAL Balance	6.077.745 MWh	100,0%		



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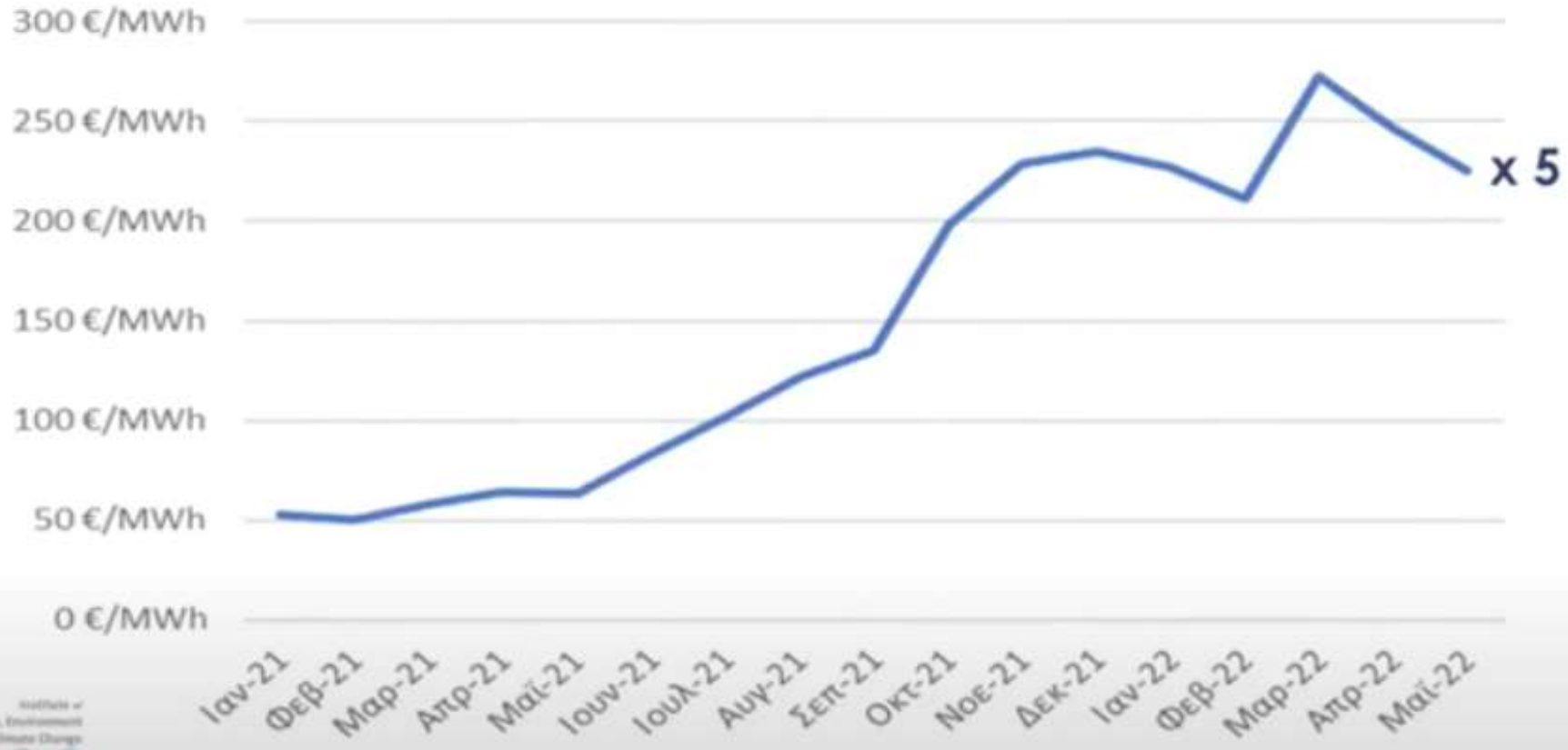
Variation of Market Clearing Price (MCP) in Greece from Jan. 2021 – May 2022



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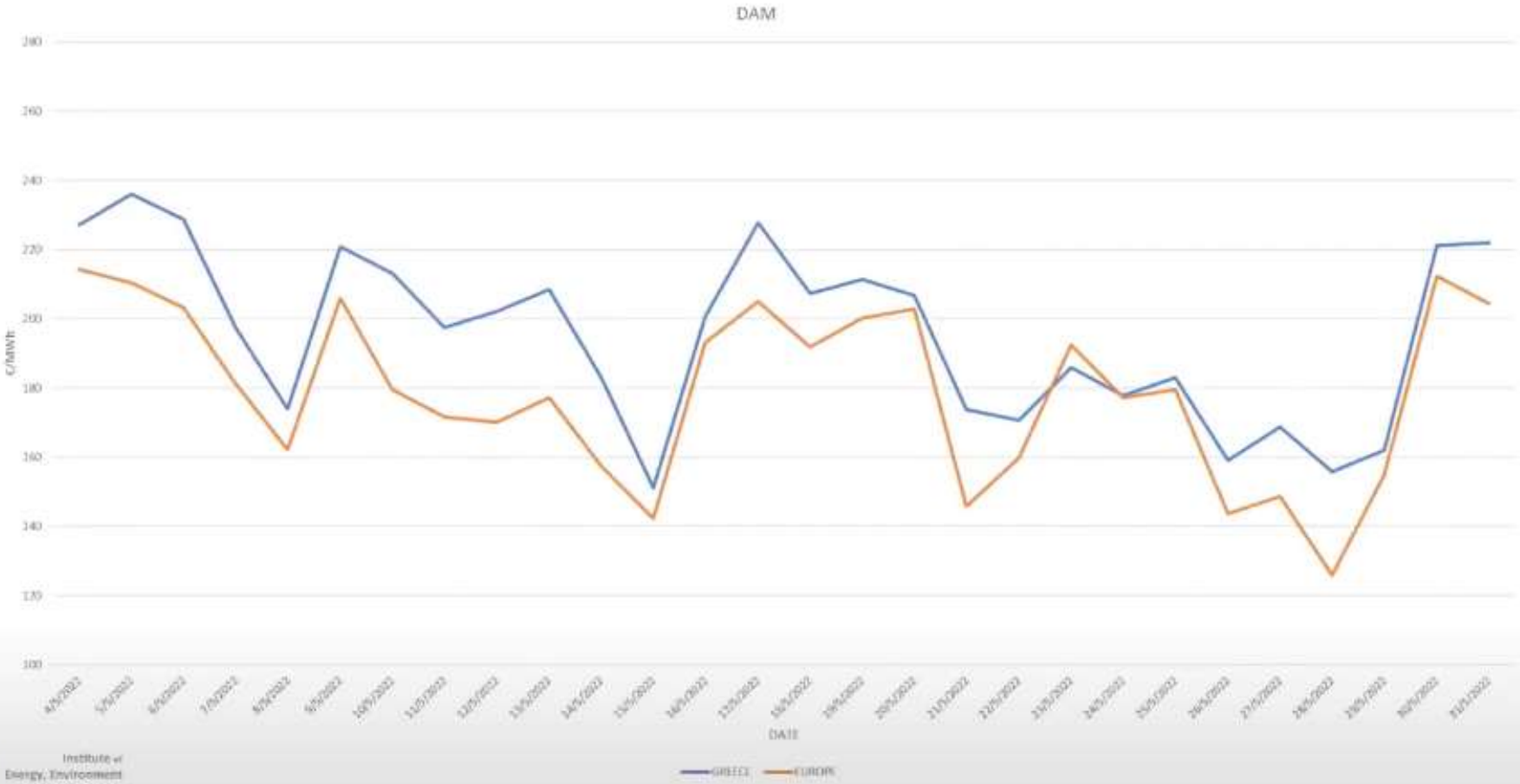
Variation of Market Clearing Price (MCP) – May 2022



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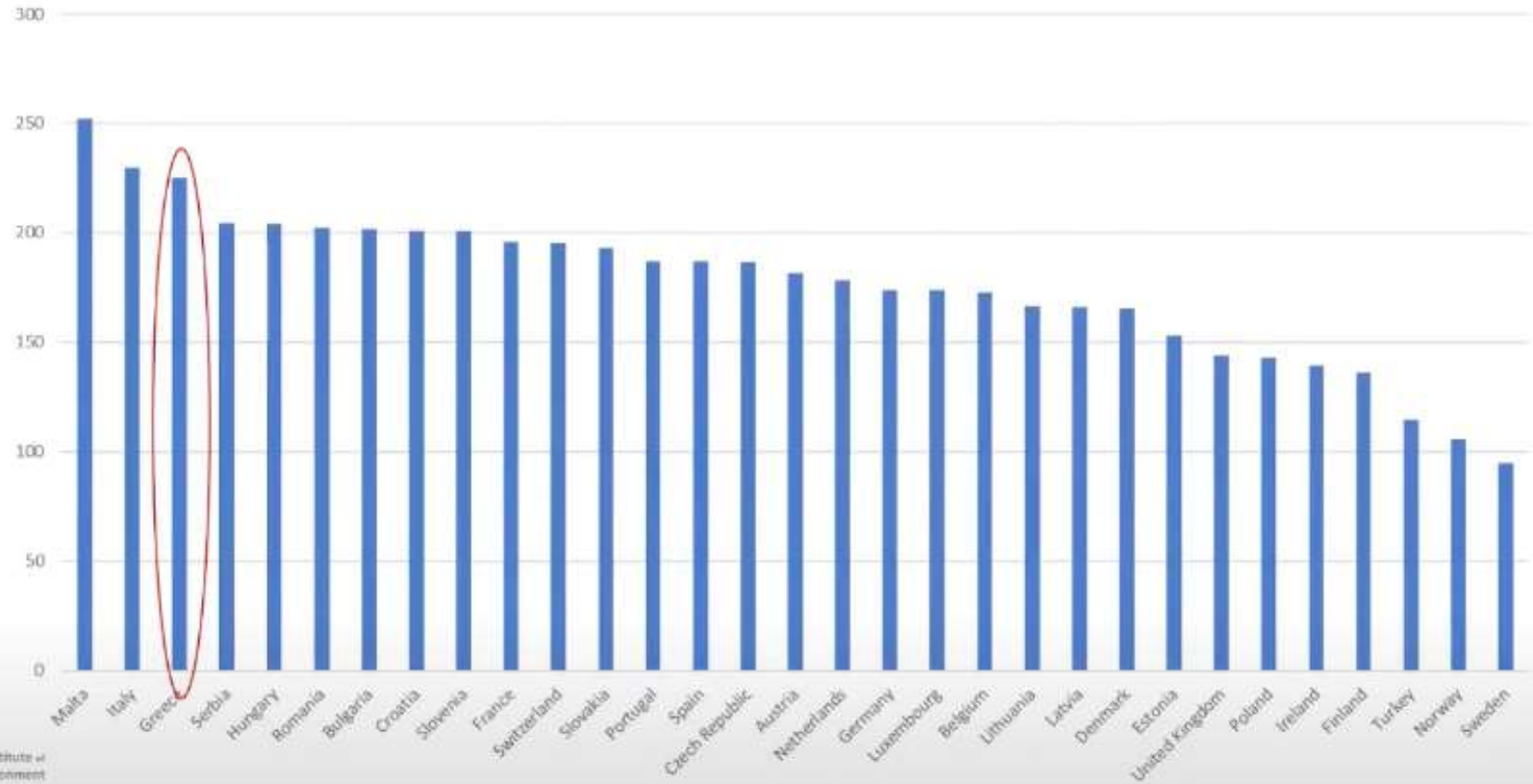
Average Monthly Market Clearing Price (MCP) – May 2022



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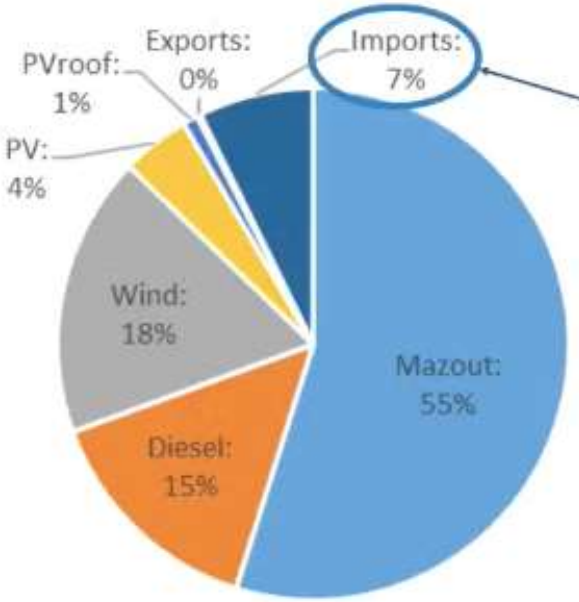
Energy balance of Crete 2021



Cretan interconnection on 1/11/2021

- Annual electricity consumption 3TWh
- Annual fuel cost ≈ 350 M€

Mazout: Diesel: Wind: PV: PVroof: Exports: Imports:

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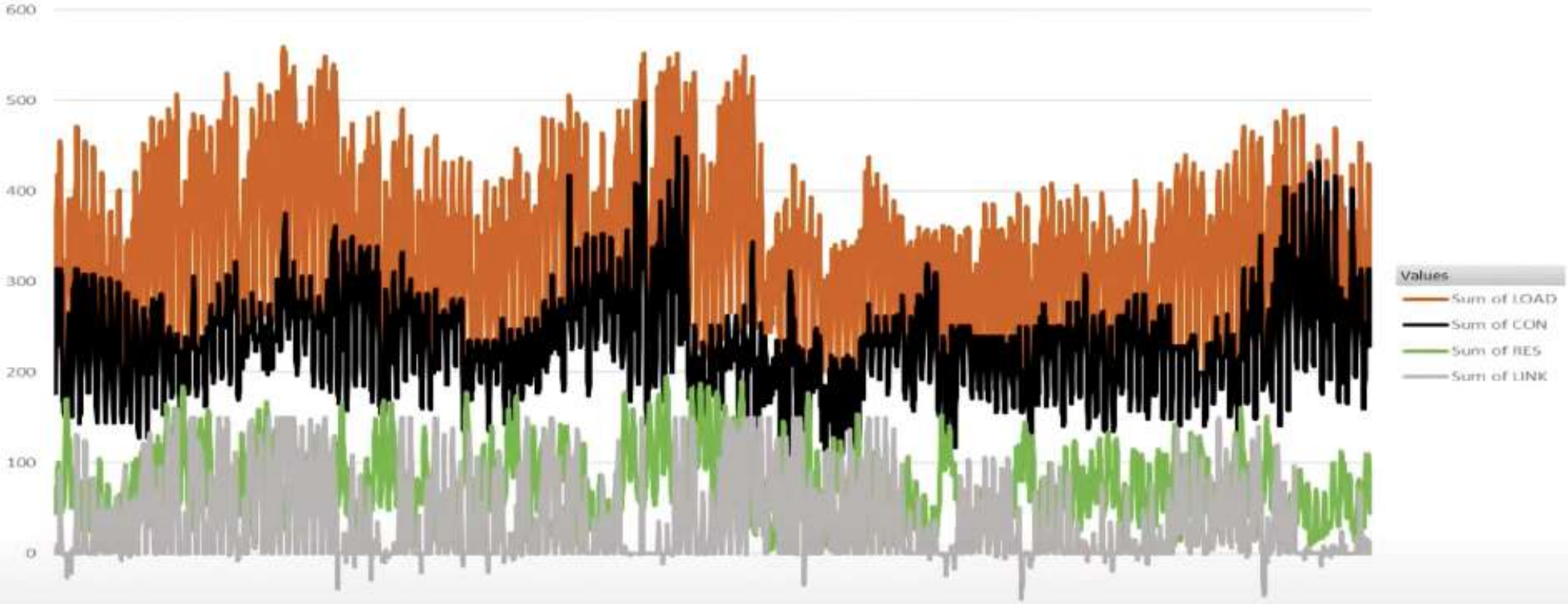
Cretan power system operation (1/11/2021-Today)



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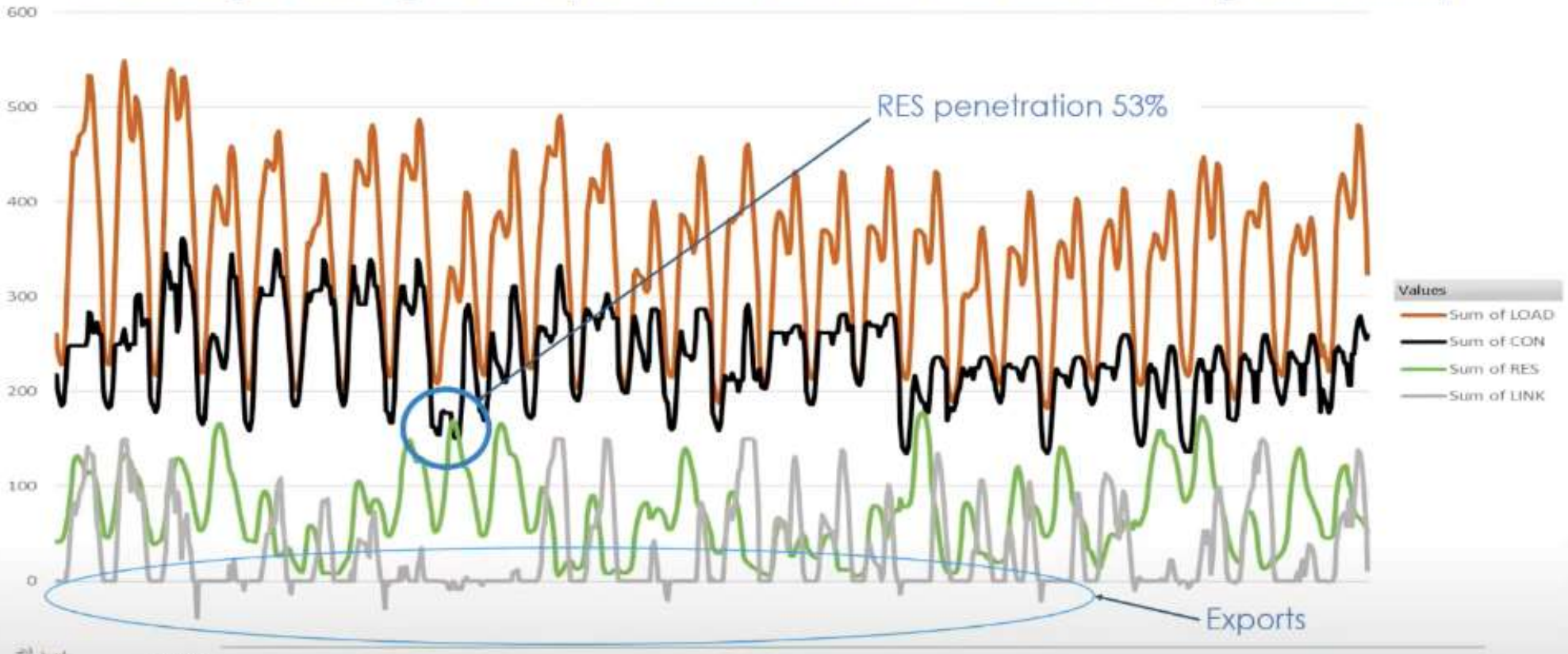
Cretan power system operation with interconnection (Feb. 2022)



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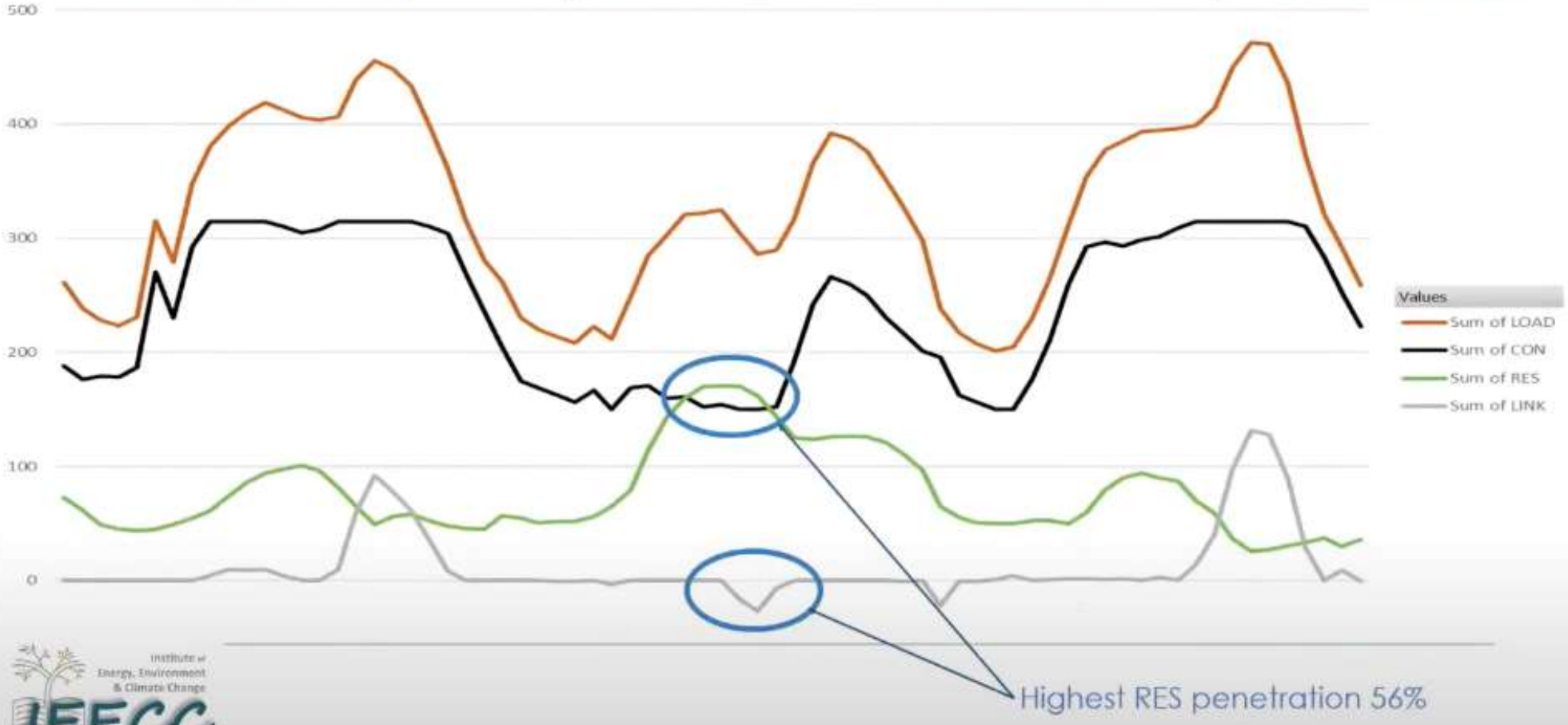
Cretan power system operation with interconnection(1-3 Jan 2022)



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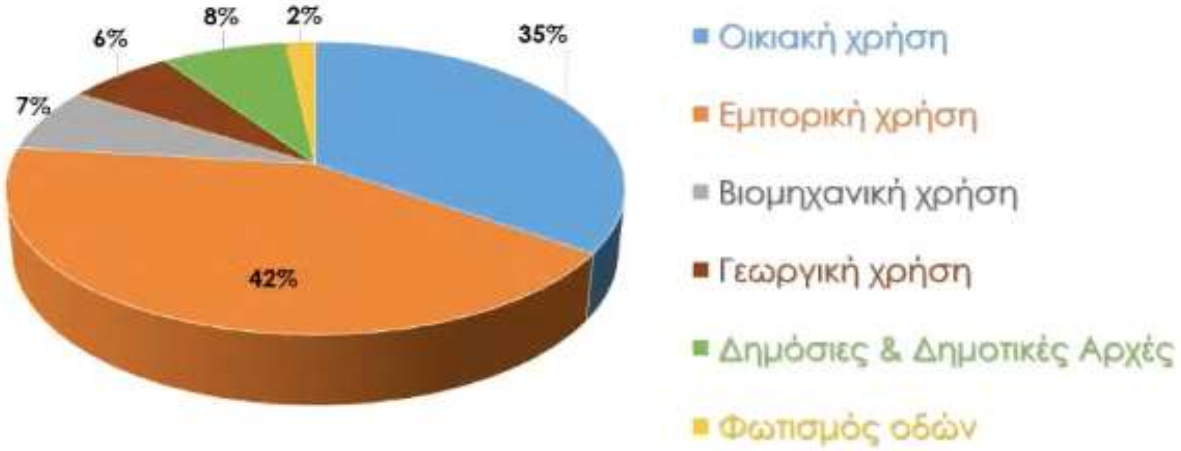
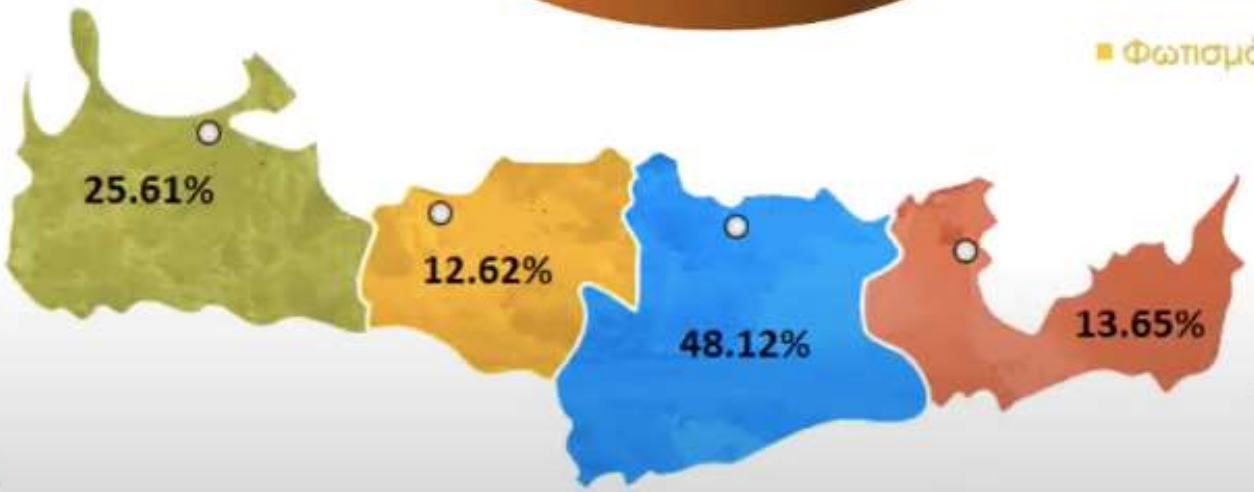
Geographical Electricity Consumption in Crete





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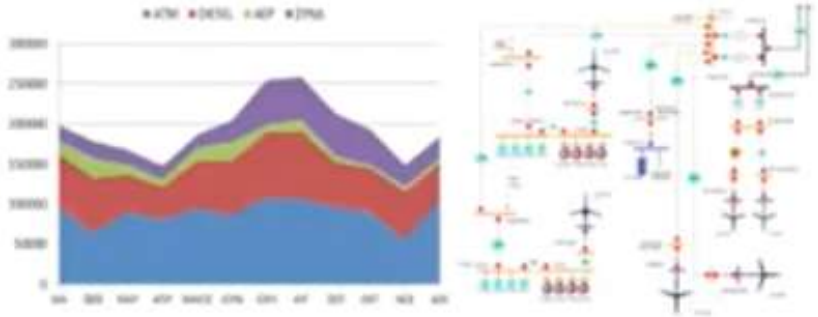
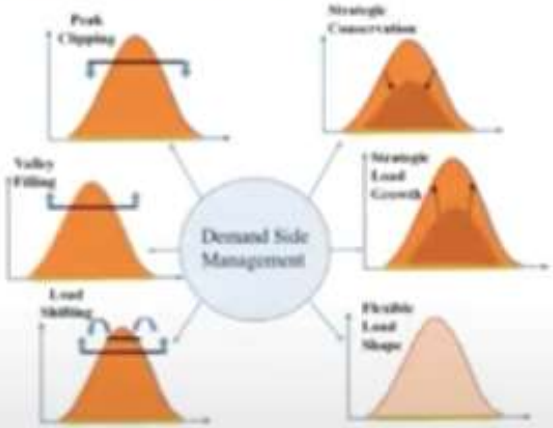
Needed steps to the climatic neutrality

- ✓ Large number of RES installations
- ✓ Large-scale energy storage
- ✓ Demand side management and energy efficiency
- ✓ Small-scale RES





- ✓ Autoproducers and Energy Communities

- ✓ Reliable Infrastructure

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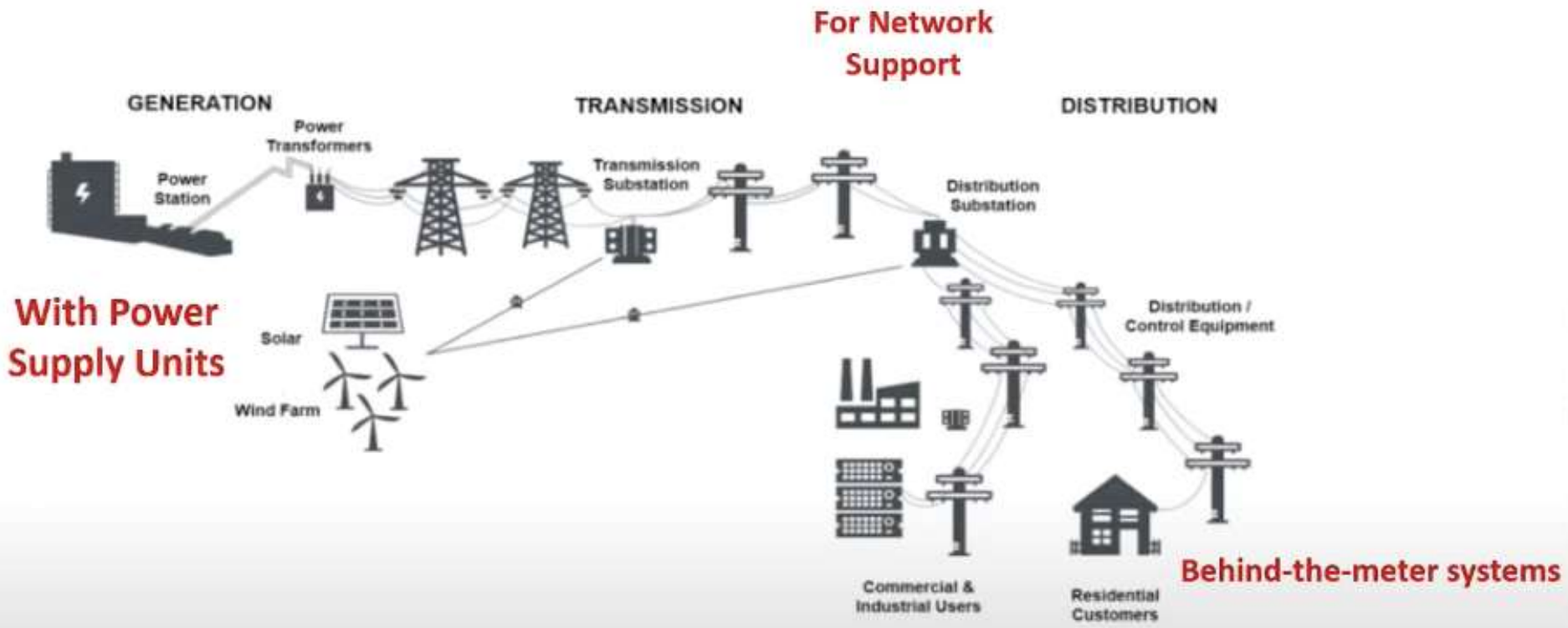
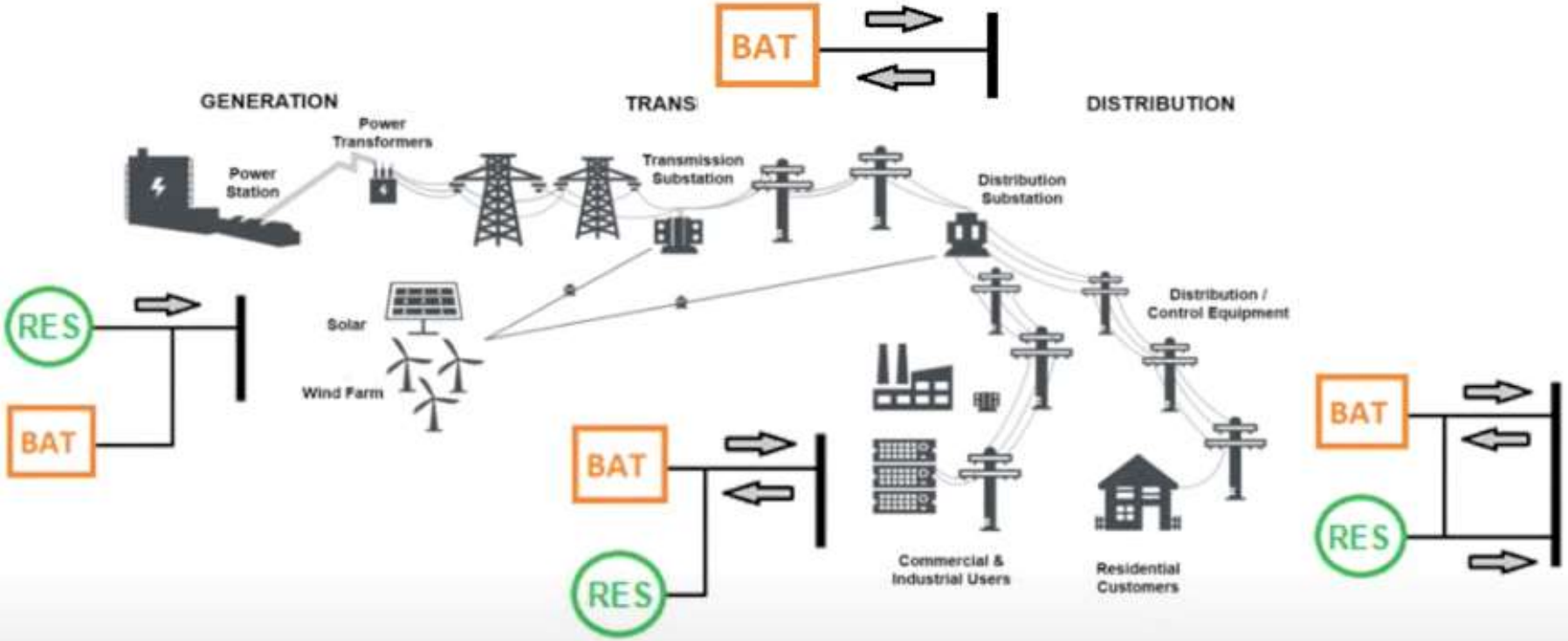
Installation of Energy Storage Systems



Installation of Energy Storage Systems



Energy Storage Systems

- ✓ Pumped Hydro Energy Storage (Large scale, Complex project, Long lifetime)
- ✓ Batteries (Flexible, Direct installation, Relatively short lifetime)
- ✓ Hydrogen (Flexible, Direct installation, Long lifetime)

6th Cretan Energy Conference International Conference and Exhibition

3 Ιουλίου 2022, Χανιά, Κρήτη

Διασυνδέοντας την Ελλάδα.

Ο ΑΔΜΗΕ πρωταγωνιστεί στην μετατροπή της Κρήτης σε διεθνή ενεργειακό Κόμβο.

Μιχαήλ Α. Χατζηπάνος,
Διευθυντής Νέων Έργων Μεταφοράς ΑΔΜΗΕ

αδμηε

ΑΝΕΞΑΡΤΗΤΟΣ ΔΙΑΧΕΙΡΙΣΤΗΣ ΜΕΤΑΦΟΡΑΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ

02

Διασυνδέοντας την Ελλάδα

Ο ΑΔΜΗΕ πρωταγωνιστής στις Διασυνδέσεις των Ελληνικών Νησιών

- Το Δεκαετές Σχέδιο Ανάπτυξης Δικτύου του Ανεξάρτητου Διαχειριστή Μεταφοράς Ηλεκτρικής Ενέργειας (ΑΔΜΗΕ) προβλέπει την ηλεκτρική διασύνδεση όλων σχεδόν των ελληνικών νησιών, στο πλαίσιο ενός προγράμματος πράσινων επενδύσεων ύψους 5 δισ. ευρώ την επόμενη δεκαετία.
- Μέχρι το 2024, οι παραπάνω επενδύσεις περιλαμβάνουν τις διασυνδέσεις 10 νησιών των Κυκλάδων (6 εκ των οποίων είναι ήδη συνδεδεμένα με την ηπειρωτική χώρα), τις διασυνδέσεις της Κρήτης με την Πελοπόννησο (σήμερα σε λειτουργία) και την Αττική (μέχρι το 2024) καθώς και τη διασύνδεση της Σκιάθου με την Εύβοια, ένα έργο που ωφελεί επίσης τη Σκόπελο και την Αλόννησο.
- Το 2027 θα ακολουθήσει η διασύνδεση των Δωδεκανήσων και έως το 2029 η διασύνδεση των νησιών του Βορειοανατολικού Αιγαίου, ολοκληρώνοντας την ένταξη όλων των μεγάλων νησιωτικών συμπλεγμάτων του Αιγαίου στον ηπειρωτικό κορμό.
- Επιπλέον ο ΑΔΜΗΕ αναβαθμίζει τις υφιστάμενες καλωδιακές συνδέσεις των Ιόνιων Νησιών με την ηπειρωτική Ελλάδα, μέσα από επενδύσεις ύψους περίπου 100 εκατ. ευρώ.

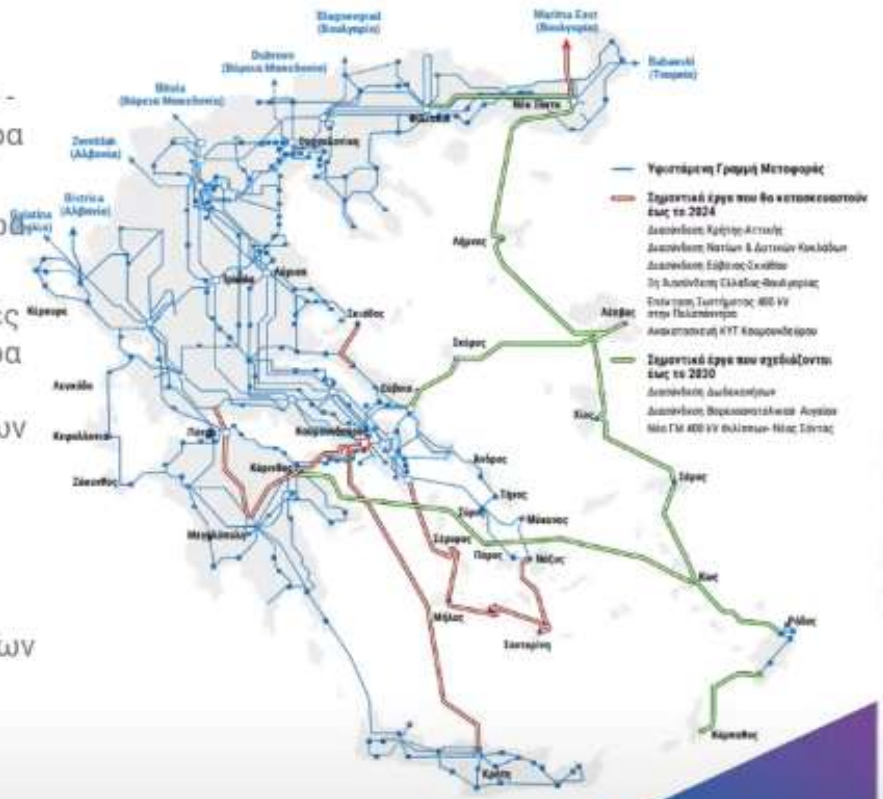
αδμηε

Διασυνδέοντας την Ελλάδα

Οι Διασυνδέσεις ως Έργα Ενεργειακής Μετάβασης

- Απόσυρση των ρυπογόνων, τοπικών σταθμών ηλεκτροπαραγωγής - που χρησιμοποιούν κυρίως πετρέλαιο ή μαζούτ και έχουν ιδιαίτερα υψηλό κόστος λειτουργίας-
- Εξασφάλιση αξιόπιστης ηλεκτροδότησης από την ηπειρωτική χώρα
- Δραστικός περιορισμός των εκπομπών διοξειδίου του άνθρακα στην ατμόσφαιρα και κατακόρυφη μείωση των ρύπων. Οι εκπομπές CO2 –από 2,8 εκατ. τόνους κατ' έτος σήμερα, θα μηδενιστούν. Πέρα από τις πετρελαϊκές μονάδες που έχουν ήδη σταματήσει να λειτουργούν θα αποσυρθούν επιπλέον 850 MW ρυπογόνων μονάδων ηλεκτροπαραγωγής.
- Μικρότερη όχληση τόσο για τους κατοίκους όσο και για τους επισκέπτες των διασυνδεόμενων νησιών και αναβάθμιση του τουριστικού προϊόντος.
- Φθηνότερο ρεύμα για όλους με την σταδιακή μείωση των χρεώσεων Υπηρεσιών Κοινής Ωφέλειας. Με τα έργα που έχουν πραγματοποιηθεί την τελευταία τριετία η εξοικονόμηση αυτή αγγίζει τα 500 εκατ. ευρώ ενώ αναμένεται να ανέλθει σε 1,5 δισ. ευρώ σε ετήσια βάση, μέχρι το 2030.
- Διείσδυση περισσότερων μονάδων ΑΠΕ. Μέχρι το τέλος της δεκαετίας ο ηλεκτρικός χώρος που θα έχει δημιουργηθεί θα είναι της τάξης των 17 GW ξεπερνώντας μάλιστα τους εθνικούς στόχους για την Ενέργεια και το Κλίμα κατά 2 GW

Χάρτης Ελληνικού Συστήματος Μεταφοράς Ηλεκτρικής Ενέργειας



αδμηε

Διαθέσιμα Περιθώρια ισχύος για σύνδεση νέων Σταθμών ΑΠΕ (MW)

Οι Διασυνδέσεις του ΑΔΜΗΕ ως Παγκόσμια Σημεία αναφοράς

- **Μεγάλος βαθμός πολυπλοκότητας:** Μεγάλου μήκους θαλάσσια και χερσαία καλωδιακά συστήματα, υποσταθμοί Υψηλής Τάσης τελευταίας τεχνολογίας μονάδες, τελευταίας τεχνολογίας δυναμικής αντιστάθμισης αέργου ισχύος. Καινοτόμα έργα συνεχούς ρεύματος (DC), με το Κρήτη – Αττική ως ένα από τα ελάχιστα αυτού του είδους στον κόσμο που χρησιμοποιεί την καινοτόμο τεχνολογία VSC (Voltage Source Converters) για την μετατροπή του εναλλασσόμενου ρεύματος σε συνεχές..
- **Απαιτητικές Συνθήκες Εγκατάστασης:** Ιδιαίτερο ανάγλυφο (βάθη και κλίσεις) του αιγαιοπελαγίτικου βυθού και η έντονη αλιευτική δραστηριότητα, με τον ΑΔΜΗΕ να αξιοποιεί την υψηλή τεχνογνωσία του και τεχνολογικές καινοτομίες προκειμένου να υλοποιήσει το έργο με τον πλέον αποδοτικό και περιβαλλοντικά φιλικό τρόπο.
- **Καινοτόμα Αρχιτεκτονική:** Οι επενδύσεις του ΑΔΜΗΕ υλοποιούνται με απόλυτο σεβασμό στο περιβάλλον και την αρχιτεκτονική του τόπου, με χαρακτηριστικό παράδειγμα τον πρόσφατο Υποσταθμό που κατασκευάστηκε στη Νάξο. Ο ΑΔΜΗΕ μεριμνά για την προστασία του φυσικού κάλλους των Κυκλάδων ελαχιστοποιώντας την οπτική όχληση με την κατασκευή αποκλειστικά υπόγειων γραμμών μεταφοράς, σε πλήρη συνεργασία με τις τοπικές κοινωνίες των νησιών.

αδμηε

Διασύνδεση Κρήτης – Πελοποννήσου – Η διασύνδεση των Ρεκόρ.

- Έργο της χρονιάς 2020
- Η μεγαλύτερη σε μήκος καλωδιακή διασύνδεση 150kV Εναλλασσόμενου Ρεύματος στον κόσμο (~180 χλμ.),
- Η μεγαλύτερη σε μήκος υποβρύχια καλωδιακή διασύνδεση Υψηλής Τάσης (ΥΤ) με τριπολικό καλώδιο τεχνολογίας μόνωσης XLPE στον κόσμο. (~135 χλμ.)
- Η βαθύτερη υποβρύχια καλωδιακή διασύνδεση Υψηλής Τάσης (ΥΤ) με τριπολικό καλώδιο τεχνολογίας μόνωσης XLPE στον κόσμο. (~1.000 μέτρα βάθος), υπερβαίνοντας σε μεγάλο βαθμό ό,τι έχει επιτευχθεί μέχρι στιγμής.
- Χρήση καινοτόμων υλικών για πρώτη φορά παγκοσμίως

Διασύνδεση Κρήτης – Πελοποννήσου – Σύντομη Ιστορία.

- Το έργο ξεκίνησε να εξετάζεται τη δεκαετία του ‘70.
- Οι πρώτες εργασίες ξεκίνησαν αρχές του 2018 και οι κύριες συμβάσεις υπογράφηκαν στο τέλος του 2018.
- Το έργο ολοκληρώθηκε εντός στόχου παρά τις δυσκολίες που προκάλεσε η πανδημία και η δοκιμαστική ηλέκτριση του πρώτου κυκλώματος πραγματοποιήθηκε τον Δεκέμβριο του 2020. Λίγους μήνες αργότερα, τον Μάιο του 2021 ολοκληρώθηκε και δοκιμάστηκε και το 2ο κύκλωμα.
- Το έργο μπήκε επιτυχώς σε λειτουργία τον Ιούλιο του 2021, μεταφέροντας τα πρώτα φορτία προς την Κρήτη και πλέον το καλώδιο λειτουργεί στην προβλεπόμενη δυναμικότητά του.
- Θωρακίζεται η ενεργειακή ασφάλεια της μεγαλονήσου.

Διασύνδεση Κρήτης - Αττικής

- Η επένδυση της της τάξης του 1 δισ. ευρώ κατασκευάζεται σήμερα από τη θυγατρική Εταιρεία του ΑΔΜΗΕ, Αριάδνη Interconnection και θα ηλεκτριστεί με ορίζοντα το 2024.
- Το Ηράκλειο θα συνδεθεί με τη Δυτική Αττική με ηλεκτρικά καλώδια υπερυψηλής τάσης Συνεχούς Ρεύματος μήκους 340 χλμ., τάσης 500 kV και συνολικής ισχύος 1.000 MW.
- Η Κρήτη θα αποτελέσει έναν ισχυρό κόμβο του ΕΣΜΗΕ παρέχοντας έτσι τη δυνατότητα της ηλεκτρικής διασύνδεσης της χώρας και με άλλα δίκτυα στην περιοχή της Νοτιοανατολικής Μεσογείου.

Διασύνδεση Κρήτης - Αττικής

Αποτελείται συνοπτικά από:

- 2 Σταθμούς Μετατροπής HVDC τεχνολογίας VSC (2x500 MW /ανά σταθμό), 500kV σε Αττική και Κρήτη
- 1 Υποσταθμό 150kV GIS στην Κρήτη
- Υποβρύχιο καλωδιακό σύστημα DC 500kV συνολικού μήκους 670km και μέγιστου βάθους 1200m (335km ανά πόλο)
- Υπόγειο καλωδιακό σύστημα 500kV συνολικού μήκους 86km. Μήκος όδευσης επί της Αττικής 32km και επί της Κρήτης 11km
- Οπτικές ίνες συνολικού μήκους 756km (2x335km υποβρύχια και 2x43km υπόγεια)
- Υποβρύχιο καλωδιακό σύστημα Μέσης Τάσης 23km και χερσαίο 43km
- 2 Σταθμούς Ηλεκτροδίων με τα αντίστοιχα λιμενικά έργα (1 στην νήσο Σταχτορόη στην Αττική και 1 στην Κρήτη)
- Γραμμή Μεταφοράς 150kV για διασύνδεση με το σύστημα της Κρήτης μήκους περίπου 4,5km.

Ελλάδα 2.0

αδμηε

Έργα Ενίσχυσης Συστήματος Μεταφοράς Κρήτης

- Νέα Γ.Μ. Αθερινόλακκος - Σύστημα (2024)
- Νέα Γ.Μ. Σπήλι - Μοίρες και αναβάθμιση της Γ.Μ. Ιεράπετρα – Μοίρες (2024)
- Νέα Γ.Μ. Χανιά Ι – Χανιά ΙΙ (2025)
- Νέα Γ.Μ. Χανιά Ι – Δαμάστα (2026)
- Μελλοντικά: Νέος Υ/Σ Καντάνου και σύνδεση του με ΓΜ Καστέλι – Κάντανος και ΓΜ Χανιά Ι – Κάντανος.

αδμηε
ΑΝΕΞΑΡΤΗΤΟΣ ΔΙΑΧΕΙΡΙΣΤΗΣ ΜΕΤΑΦΟΡΑΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ

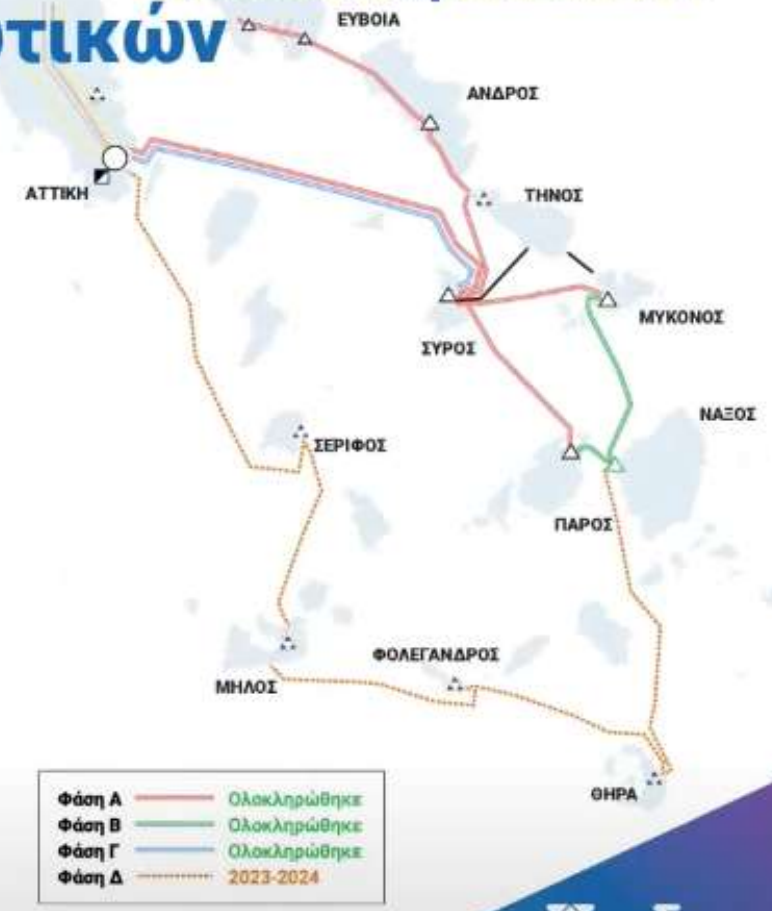
Διασύνδεση Νότιων και Δυτικών Κυκλάδων

- Προϋπολογισμός 408 εκατ. Ευρώ (383 εκατ. ευρώ για έργα μεταφοράς και 25 εκατ. ευρώ για έργα δικτύων)
- Επέκταση της ολοκληρωμένης διασύνδεσης των Βορείων Κυκλάδων (Κυκλάδες Φάσεις Α, Β και Γ).
- το έργο υλοποιείται στο πλαίσιο του Εθνικού Σχεδίου Ανάκαμψης και Ανθεκτικότητας «Ελλάδα 2.0» με τη χρηματοδότηση της Ευρωπαϊκής Ένωσης – NextGenerationEU

Νησιά που θα διασυνδεθούν:

- Σαντορίνη (2023), Φολέγανδρος (2024), Μήλος (2024), Σέριφος (2024).

Διασύνδεση Κυκλάδων



Ελλάδα 2.0

αδμηε

Επισκόπηση του έργου

Βασικός εξοπλισμός:

- 5 υπόγεια και υποθαλάσσια καλωδιακά κυκλώματα (~370 χλμ.)
- 4 υποσταθμοί GIS (επί των νησιών)
- Εγκατάσταση μονάδας δυναμικής αντιστάθμισης αέργου ισχύος (SVC) -100/+50MVA στη Σαντορίνη

Κλειστός βρόχος:

i. με το διασυνδεδεμένο σύστημα των Βορείων Κυκλάδων (μέσω του Υ/Σ Νάξου) και

ii. με το ηπειρωτικό διασυνδεδεμένο Σύστημα (μέσω του Υ/Σ ΥΥΤ Λαυρίου στην Αττική)

Διασύνδεση Σκιάθου (Σποράδων)

- Το καλοκαίρι του 2022, ολοκληρώνεται η διασύνδεση της Σκιάθου με το ηπειρωτικό σύστημα, μέσω της Εύβοιας, στο πλαίσιο επένδυσης 57 εκατ. ευρώ. Με το έργο αυτό θα διασφαλιστεί η ομαλή ηλεκτροδότηση για τις Βόρειες Σποράδες συνολικά.

Βασικός εξοπλισμός:

- 1 υπόγειο και υποθαλάσσιο καλωδιακό σύστημα κυκλώματα (~30 χλμ.)
- Κατασκευή και Αναβάθμιση Υφιστάμενης Εναέριας Γ.Μ. (~ 30 χλμ.)
- 1 υποσταθμός GIS (επί των νησιών)

Διασυνδέσεις Ιονίων Νήσων

- Έργα ενίσχυσης Συστήματος για την τροφοδοσία της Κέρκυρας και αναβάθμιση κυκλωμάτων 150kV στον βρόχο Ιονίων νήσων με στόχο τον πλήρη εκσυγχρονισμό των υποδομών μεταφοράς ηλεκτρικής ενέργειας στα νησιά του Ιονίου.
- Συνολικός Προϋπολογισμός: 100M Ευρώ περίπου

Βασικός εξοπλισμός:

- 4 υπόγεια και υποθαλάσσια καλωδιακό συστήματα κυκλώματα (~76 χλμ.)
- Κατασκευή και Αναβάθμιση Υφιστάμενης Εναέριας Γ.Μ. (~ 86 χλμ.)
- Επεκτάσεις/Βελτιώσεις 5 υποσταθμών

Νησιά των οποίων η διασύνδεση θα αναβαθμιστεί:

- Ζάκυνθος (2023),Κεφαλλονιά (2024),Λευκάδα (2025), Κέρκυρα (2025)

Διασύνδεση Δωδεκανήσων και Βορειοανατολικού Αιγαίου

Οδεύοντας προς το τέλος της δεκαετίας που διανύουμε -μέχρι το 2029- θα έχουμε διασυνδέσει επίσης τα Δωδεκάνησα και τα νησιά του Βορειοανατολικού Αιγαίου, σε τρεις φάσεις έργων με συνολικό προϋπολογισμό 2,35 δισ. ευρώ.

Νησιά που θα διασυνδεθούν:

- Κως, Ρόδος (2027)
- Λήμνος, Λέσβος (2027)
- Κάρπαθος, Σκύρος, Χίος, Σάμος (2028)
- Ολοκλήρωση Βρόχων (2029)

Νέες Διασυνδέσεις του Ελληνικού Συστήματος με Γειτονικά Συστήματα

- Δεύτερη διασύνδεση Ελλάδας – Βουλγαρίας
- Δεύτερη Διασύνδεση Ελλάδας – Τουρκίας
- Δεύτερη διασύνδεση Ελλάδας – Ιταλίας
- Διασύνδεση Ελλάδας - Κύπρου – Ισραήλ
- Διασύνδεση Ελλάδας – Αιγύπτου
- Αναβάθμιση διασύνδεσης Ελλάδας - Βόρειας Μακεδονίας
- Δεύτερη διασύνδεση Ελλάδας - Αλβανίας

αδμηε

Διασύνδεση Κρήτης – Κύπρου - Ισραήλ

- Η διασύνδεση Ελλάδας-Κύπρου-Ισραήλ με promoter τον Euroasia Interconnector είναι ώριμο έργο καθώς η Ευρωπαϊκή Επιτροπή έχει συμφωνήσει επί της αρχής να διαθέσει 657 εκατ ευρώ μέσω του Connecting Europe Facility
- Ο ΑΔΜΗΕ συνδράμει το έργο παρέχοντας τεχνογνωσία στον φορέα υλοποίησης ενώ εξετάζεται η επενδυτική συμμετοχή του ΑΔΜΗΕ στο έργο υπό κατάλληλη αναθεώρηση του ρυθμιστικού πλαισίου ώστε να λαμβάνονται υπόψη οι νέες συνθήκες.

αδμηε

Διασύνδεση Ελλάδας - Αιγύπτου

- Η ηλεκτρική διασύνδεση της Αιγύπτου βρίσκεται στα πρώτα μελετητικά στάδια υπάρχει όμως ισχυρή πολιτική βούληση από όλες τις πλευρές να επιταχυνθούν οι διαδικασίες
- Συνεργαζόμαστε με τον Διαχειριστή του Συστήματος της Αιγύπτου EETC για να διασφαλίσουμε την τεχνική και οικονομική βιωσιμότητα του έργου. Πρόσφατα στο Κάιρο, συμφωνήθηκε και από τα δύο μέρη, η ένταξη των μελετών βιωσιμότητας του έργου στην ευρωπαϊκή πρωτοβουλία RePowerEU.
- Πρόκειται για ένα έργο που καταρχήν έχει συμφωνηθεί ότι θα βασίζεται στην πρόταση GREGY.

αδμηε

Χρηματοδότηση

- Κάθε έργο που έχει υλοποιηθεί ή δρομολογείται καλύπτεται κατά τουλάχιστον κατά 35-40% με επιδοτήσεις, ενώ είναι ενδεικτικό ότι στη διασύνδεση Αττική-Κρήτη η επιχορήγηση θα αγγίξει τα 450 εκατομμύρια ευρώ, από τα 700 εκατ. που είναι συνολικά τα κεφάλαια του ΕΣΠΑ τα οποία διατίθενται σε έργα ενεργειακής εξοικονόμησης.
- Διεκδικούνται επιδοτήσεις κοντά στο 1 δισ. ευρώ από το RepowerEU, για τις διασυνδέσεις των Δωδεκανήσων και των νησιών Βόρειου Αιγαίου.
- Το υπόλοιπο ποσό καλύπτεται μέσω δανεισμού.
- Η πρόσφατη απόφαση της ΡΑΕ για ποσοστό απόδοσης κεφαλαίων (WACC) 6,1 % επί της περιουσιακής βάσης του ΑΔΜΗΕ για το 2022 έναντι 8,16 % που ήταν το τελευταίο αίτημα του Διαχειριστή, θα επηρεάσει τη δυνατότητα του ΑΔΜΗΕ να αναπτύξει το σύστημα στο χρόνο και με τον τρόπο που έχει συμφωνηθεί με την ΡΑΕ και την Πολιτεία, ενώ ο ΑΔΜΗΕ θα μείνει χωρίς τους αναγκαίους πόρους, που θα διευκόλυναν την αξιοποίηση των ευκαιριών συμμετοχής σε στρατηγικές διεθνείς επενδύσεις που δρομολογούνται.

αδμηε
ΑΝΕΞΑΡΤΗΤΟΣ ΔΙΑΧΕΙΡΙΣΤΗΣ ΜΕΤΑΦΟΡΑΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ

Ευχαριστούμε

για την προσοχή σας!

αδμηε

ΑΝΕΞΑΡΤΗΤΟΣ ΔΙΑΧΕΙΡΙΣΤΗΣ ΜΕΤΑΦΟΡΑΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ

AURORA
ENERGY RESEARCH

Energy market developments and outlook

Aurora Energy Research workshop

International Energy Exhibition of Greece

3 July 2022

Aurora provides data-driven intelligence for the global energy transformation

AURORA

Power markets

Renewables

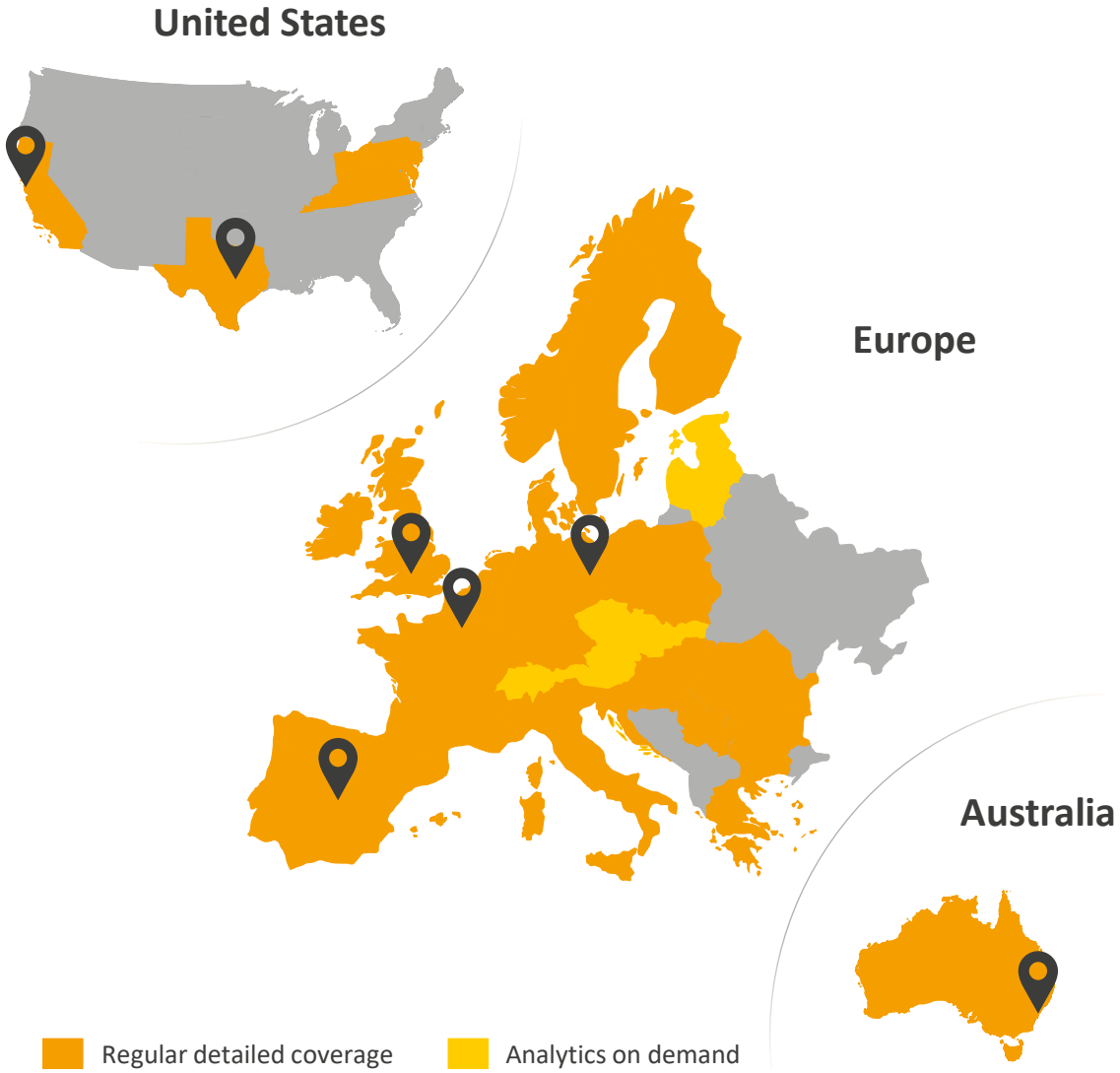
Storage

Electric vehicles

Hydrogen H_2

Carbon CO_2

Natural gas



7 Offices

Oxford | Berlin | Madrid | Paris
Sydney | Austin | SF Bay Area

250+

market experts

550+

subscribing companies

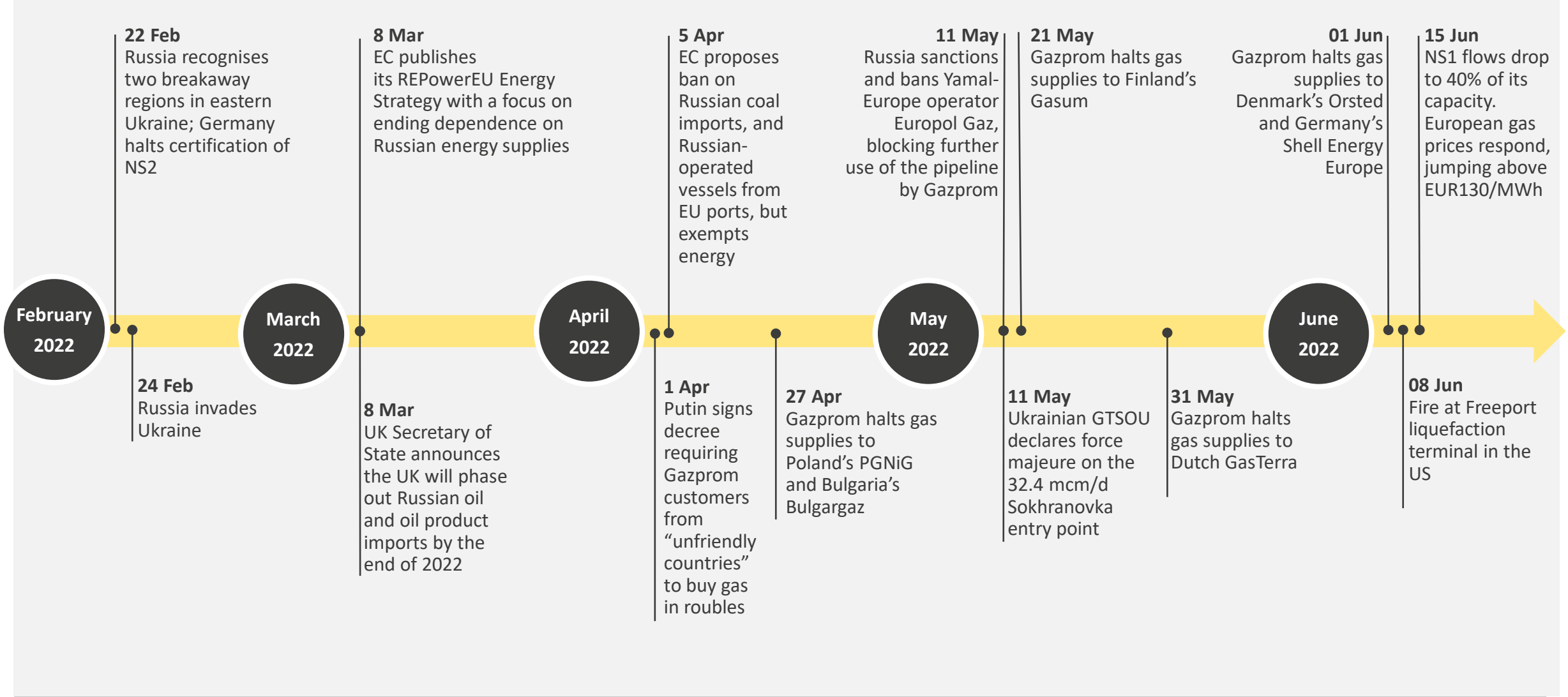
120+

transactions supported in 2021

Source: Aurora Energy Research

Timeline of key developments from the start of the war

AURORA



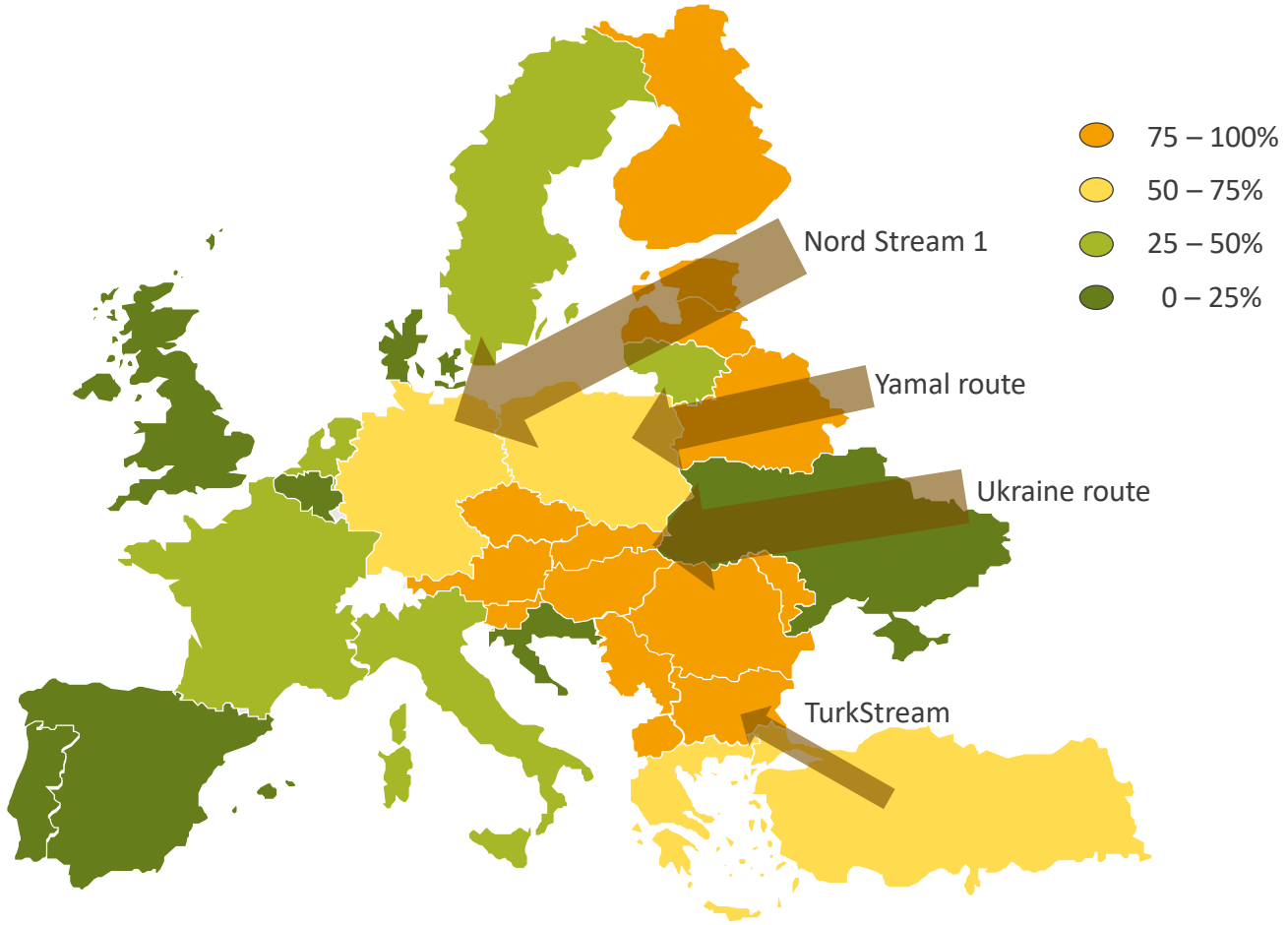
The timeline is not exhaustive

Sources: Aurora Energy Research

Many countries in Europe particularly in the south and east use Russian gas for over half of their needs

Share of Russian gas in extra-EU imports[1] in January-June 2021

%



- Reliance on Russian gas is much higher in central and eastern Europe than in western Europe and is nearly 100% in some countries in southeast Europe
- Ten EU Member States (Bulgaria, Czechia, Estonia, Latvia, Hungary, Austria, Romania, Slovenia, Slovakia and Finland) sourced more than 75% of their non-EU gas imports from Russia in the first half of 2021
- The UK does not face the same energy security risks, as it imports very little from Russia (3-5%). However, it remains exposed to price risks, which could be exacerbated if Russia were to completely halt its gas supply to Europe

1) Pipeline + LNG flows. Share % of trade in value. Extra-EU trade flows (no intra-EU trading)

Sources: Aurora Energy Research, Eurostat database Comext

The European Commission has responded to the Ukraine war with an updated decarbonisation strategy to reduce reliance on Russian gas

AURORA

Part of over-arching EU Green Deal framework

Key objectives	2021 'Fit for 55'	2022 REPowerEU	Aurora's assessment of REPowerEU
	Proposed package reflecting a ratcheting up of climate ambition and energy-related targets by 2030	**A plan to reduce EU's reliance on Russian fossil fuels and fast forward the green transition**	**Achieving all the targets set in REPowerEU will be difficult due to possible supply chain bottlenecks and the magnitude of required investments**
1 Emissions reduction	▪ 55% reduction in GHG emissions by 2030 relative to 1990 levels	▪ Heightened ambition to electrify industry and buildings by doubling heat pump deployment and by requiring rooftop solar installations	▪ Supply chain disruptions/limitations could hinder such heightened ambitions
2 Renewables deployment	▪ 40% share of renewable energy in EU's overall energy mix by 2030	▪ Raise the 2030 target for renewables under Fit-for-55 from 40% to 45%[1], speeding up permitting to achieve 20% faster[2] buildout in 2020s ▪ Target of 10 mt of domestic green hydrogen production by 2030	▪ Permitting often slowed down by NIMBYism and public acceptance ▪ Supply chain disruptions/limitations could hinder such heightened ambitions
3 Increase energy efficiency	▪ 36% and 39% energy efficiency improvements in final and primary energy consumption, respectively	▪ Increase from 9% to 13% of the binding energy efficiency target ▪ Measures to encourage energy savings and promotion of behavioural changes	▪ Promotion of behavioural changes requires consumer and political acceptance; important to assess the effect that suggested measures could have on standard of living
4 Ensure security of supply	▪ Increase share of sustainable fuels in aviation and shipping to decarbonise and reduce reliance on fossil fuel imports	▪ Diversify supply to reduce EU dependence on Russian gas ▪ Investment in LNG infrastructure ▪ Domestic biomethane production of 35 bcm by 2030	▪ The LNG market is set to be tight up to mid-2020s ▪ The European Biogas Association estimates that the capital investments needed to reach this target could be some EUR80 billion

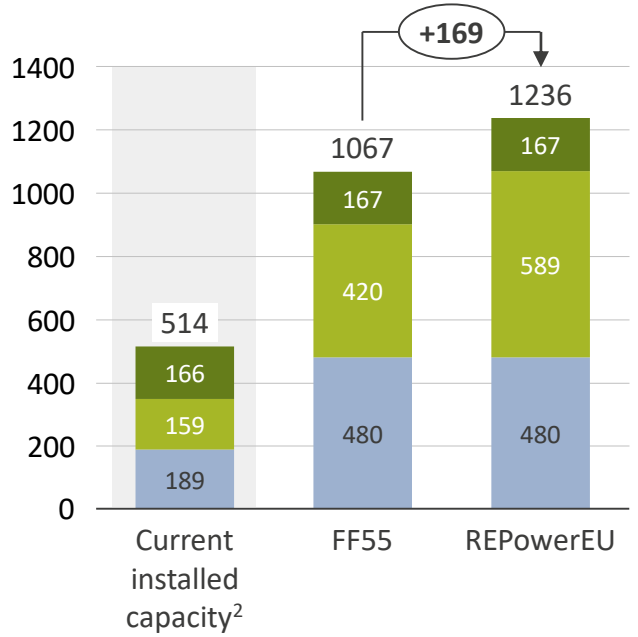
1) Total wind and solar capacity would reach 1069GW, 644GW more than in 2022. 2) Versus "Fit for 55" baseline buildout rate

Source: Aurora Energy Research

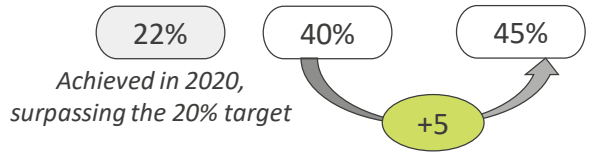
The Commission has proposed to increase the renewables target to 1236 GW of capacity by 2030, requiring 4x faster deployment

AURORA

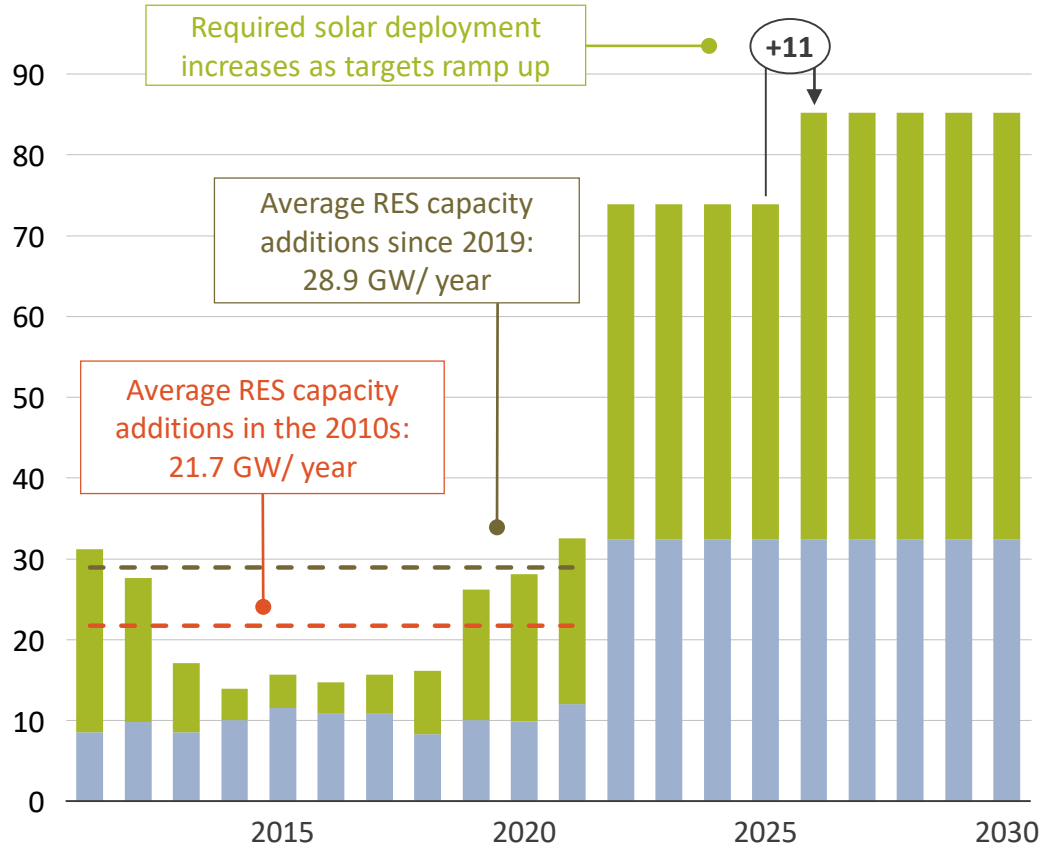
Target installed RES capacities by 2030[1]
GW



Target RES share of gross final energy consumption
%



Wind and solar capacity commissioned per year[1]
GW



Other RES[3] | Solar | Wind | Avg build rate (2011-2021) | Avg build rate (2019-2021)

- The 'Fit for 55' (FF55) package targeted 1067GW RES capacity by 2030 including 480 GW of wind and 420 GW of solar
- The REPowerEU plan adds a further 169 GW, raising the target to 1236 GW by 2030 with a focus on solar PV, aiming for 320 GW by 2025 and almost 600 GW by 2030
- 42 GW of solar would need to be deployed annually until 2025, rising to 53 GW from 2026 onwards while 32 GW of wind would need to be deployed annually to 2030
- These represent a cumulative average of 80 GW required annually, 4x faster than average build rate over the last 10 years
- To support deployment of these capacities, the Commission also presents the *EU solar strategy* and *European Solar Rooftop Initiative* and plans to speed up permitting and innovation

1) Shown for EU-27 only. 2) As at the end of 2021. 3) Other RES includes hydro and biomass.

Sources: Aurora Energy Research, European Commission, Eurostat, WindEurope

Two scenarios are considered and compared with Central: the Immediate Halt and the Managed Phaseout of Russian gas supply

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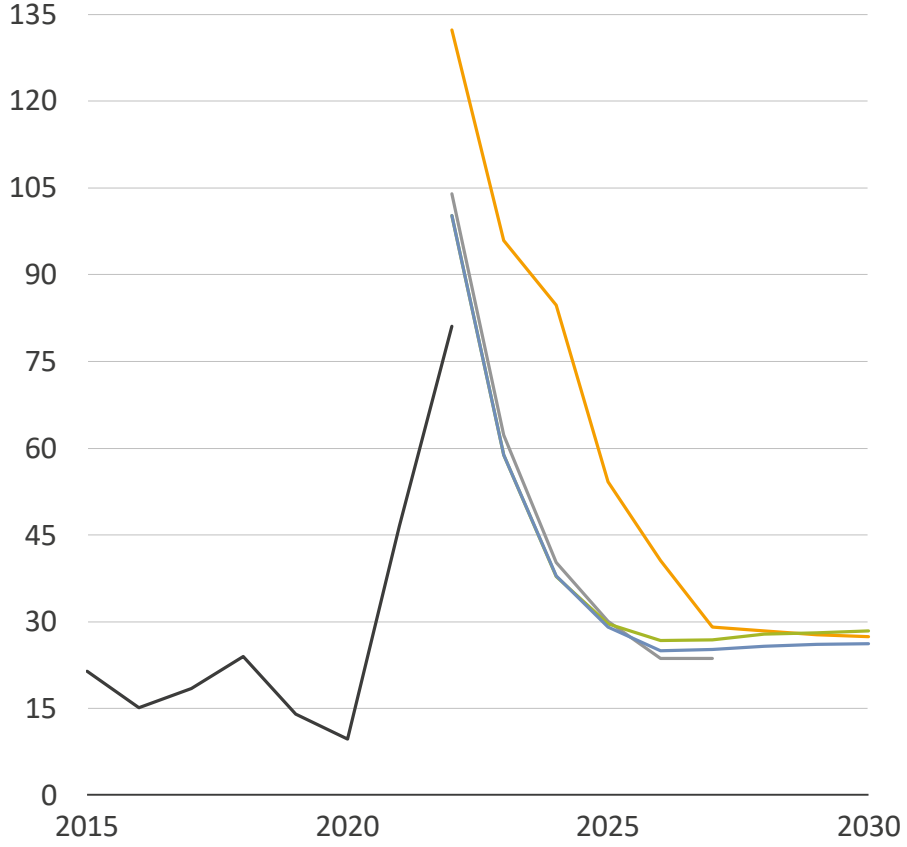
	Immediate Halt scenario Russia completely halts supply to Europe as soon as Jul-22	Managed phaseout scenario Europe strives to fully phase out Russian gas by the end of 2026
1 Loss of Russian gas supply vs Central (bcm)	-96, -153, -153, -152, -151, -151, -150, -147, -146 2022 2023 2024 2025 2026 2027 2028 2029 2030	-78, -92, -107, -122, -136, -151, -150, -147, -146 2022 2023 2024 2025 2026 2027 2028 2029 2030
2 Price and policy driven demand reduction vs Central (bcm)	-86, -105, -62, -49, -48, -50, -55, -60, -68 2022 2023 2024 2025 2026 2027 2028 2029 2030	-62, -70, -42, -40, -46, -48, -52, -58, -65 2022 2023 2024 2025 2026 2027 2028 2029 2030
3 Biomethane production	▪ REPowerEU target of 35bcm by 2030 is achieved. In 2021, biomethane production totalled 3bcm	
4 Accelerated renewables build-out	▪ 950GW of solar and wind capacity in EU-27 are achieved by 2030, 119GW short from the REPowerEU target	
5 LNG import capacity buildout – additional vs Central (bcm)	2, 26, 41, 52, 52, 59, 64, 61, 60 2022 2023 2024 2025 2026 2027 2028 2029 2030	

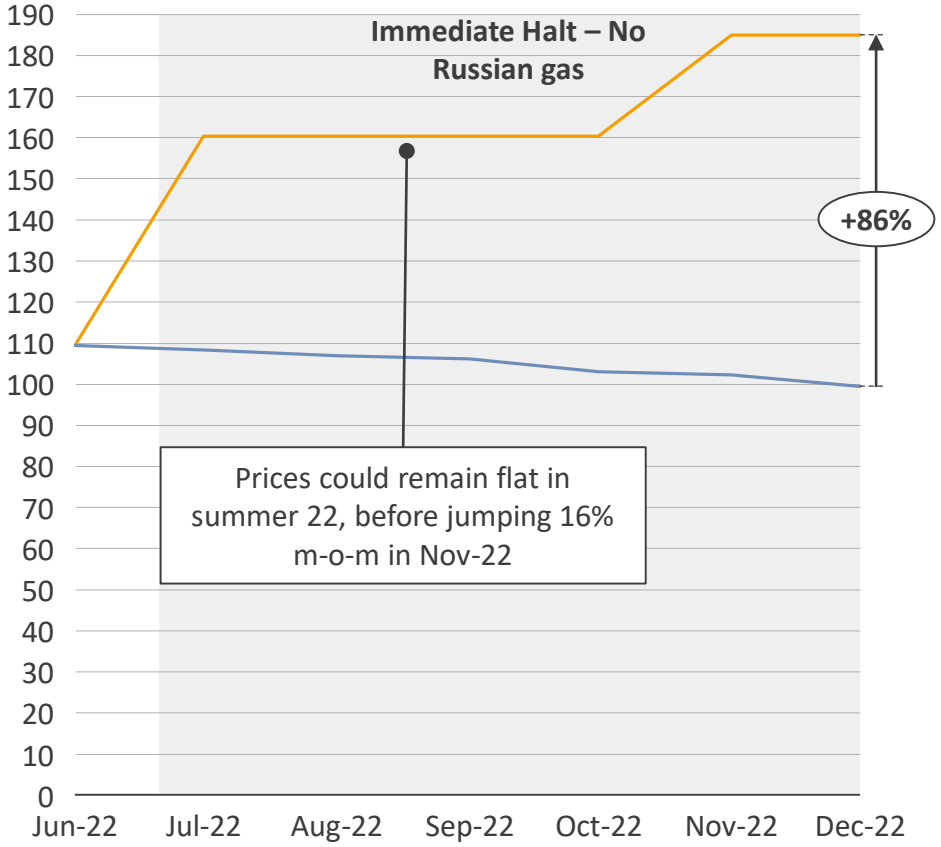
Sources: Aurora Energy Research

In the Immediate Halt scenario, TTF hub prices could increase by 86% vs Continued Flows, trading at EUR185/MWh by the end of 2022

Average annual TTF natural gas prices
EUR/MWh (real 2021)



TTF natural gas prices – focus on 2022 prices in Immediate Halt
EUR/MWh (real 2021)



Historical | Futures[1] | Immediate Halt | Managed Phaseout | Central

1) Futures as of 14/03/2022, aligned with Continued Flows scenario published in April by Aurora

Sources: Aurora Energy Research EOS, EIKON

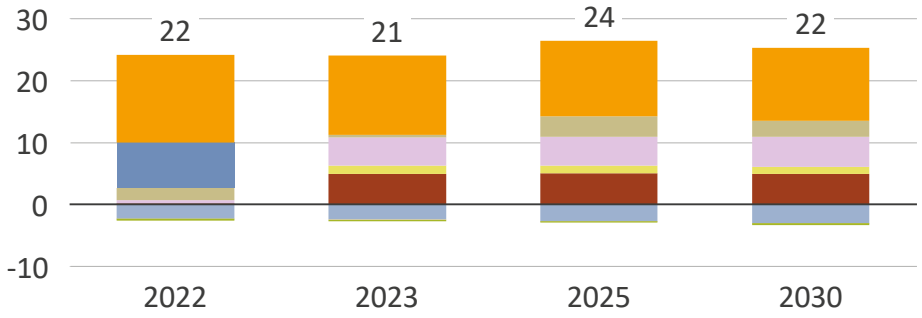
- In Immediate Halt, gas prices reach EUR160/MWh in Jul-22, and EUR185/MWh in Nov-22, 48% and 86% above Continued Flows, respectively
- As a result of the ambitious policy driven demand measures and additional supply from biomethane and LNG, Managed Phaseout prices are well aligned with Continued Flows up to 2024
- After 2026, TTF prices in both scenarios average only EUR2/MWh more than Continued Flows due to:
  - Permanent demand reduction compared to Continued Flows because of policy measures (1)
  - Increasing LNG regasification buildout (more than 95% of the new capacity available by 2026) (2)
  - Expanding global LNG liquefaction capacity, particularly in the US (3)

Bulgaria and Hungary security of supply could be at risk if European imports from Russia were to stop

While Romania does not face any security of supply risk due to their abundant indigenous production. On the other hand, Bulgarian and Hungarian energy security could be endangered, as in Central Russian gas fulfils more than 60% and 98% of Bulgaria and Hungary's gas demand

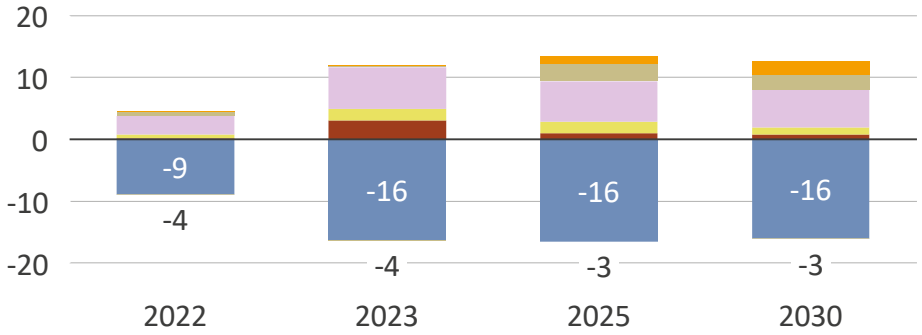
Bulgaria-Hungary-Romania combined gas balance – Immediate Halt

bcm



Delta from Central

bcm



Indigenous Production | Slovakia | Moldova | Greece | Austria
Turkey (Turk Stream) | Serbia | Macedonia | Croatia

	Risks for security of supply	Severity of possible shortage of supply	Mitigation factors
Bulgaria	▪ More than 60% of gas supply in Central is of Russian origin ▪ Little opportunities for LNG import capacity development ▪ Very limited storage infrastructure	◑	▪ Pipeline import capacity from Greece has expanded since 2021 ▪ Possible implementation of measures to reduce demand
Hungary	▪ Almost 100% of gas supply in Central is of Russian origin ▪ Landlocked	◕	▪ Well developed pipeline infrastructure connecting to all neighbouring countries ▪ Possible implementation of measures to reduce demand
Romania	▪ Romanian gas may be also needed to support Hungary and Bulgaria	○	▪ Current indigenous production is larger than expected gas demand in Immediate Halt scenario

Sources: Aurora Energy Research

AURORA

ENERGY RESEARCH

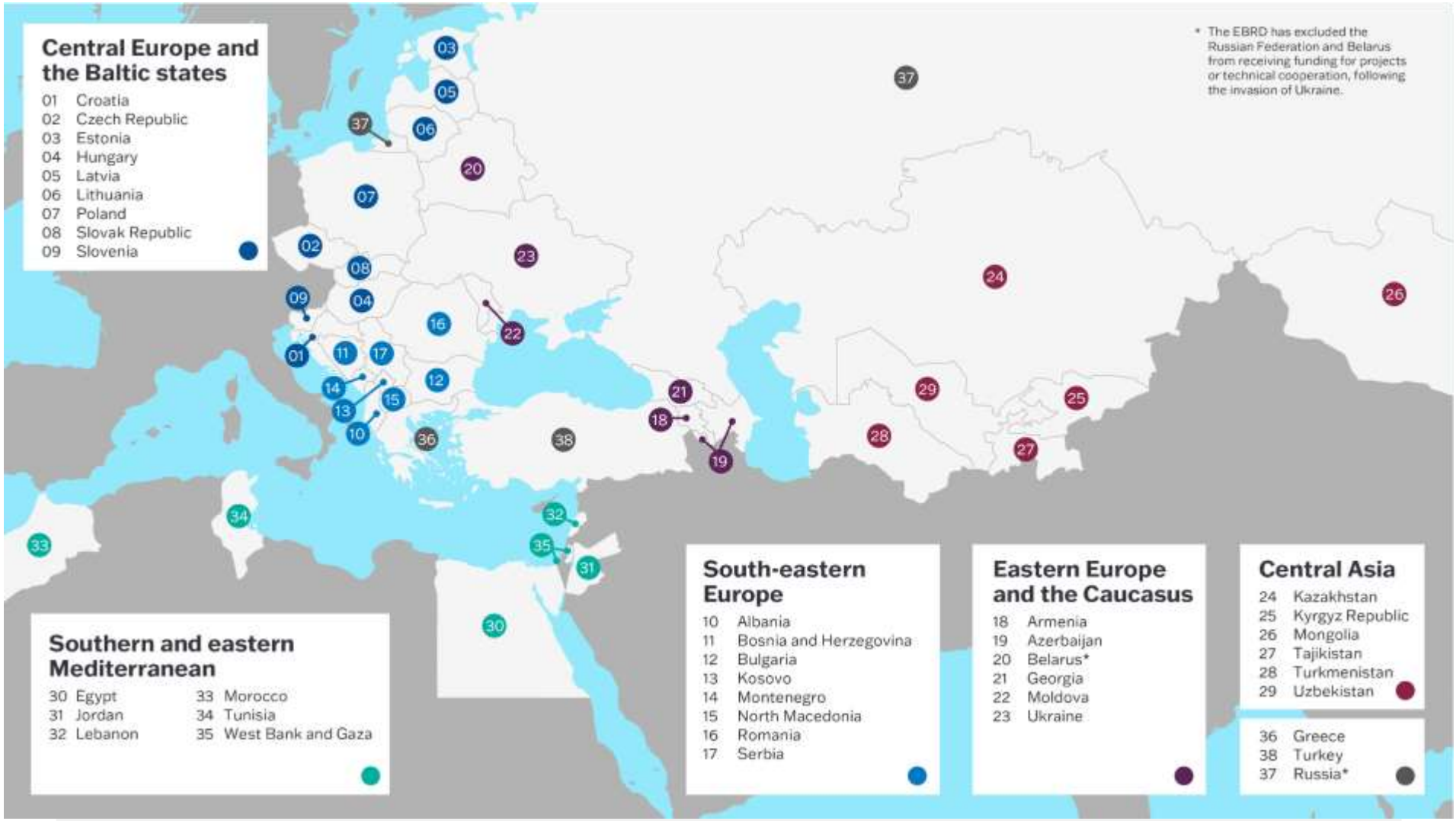
IEEG – SEE's transition to carbon neutrality: challenges, opportunities and implications for investment and financing

3rd July 2022

European Bank
for Reconstruction and Development

Overview of the EBRD

European Bank
for Reconstruction and Development



The EBRD and the war on Ukraine

European Bank
for Reconstruction and Development

Our Resilience and Livelihoods Framework will help in countries directly affected by inflows of Ukrainian refugees.

Within Ukraine, the Resilience and Livelihoods Framework will focus on four main elements:

1. Payment deferrals, debt forbearance and restructuring
2. Trade finance, including for fuel imports
3. Emergency liquidity finance, in coordination with partners
4. Emergency reform support, to support the Ukrainian authorities with immediate legislative and regulatory interventions

In the neighbouring countries taking in refugees, the Framework will concentrate on:

1. Energy security, including through emergency energy purchases to compensate for loss of imports from Russia and Belarus
2. Municipal services and livelihoods for displaced persons, with the United Nations saying two million people have now fled Ukraine
3. Trade finance
4. Provision of liquidity for small and medium sized enterprises

The Framework could also be extended more widely to cover other countries with particular concerns over energy security.

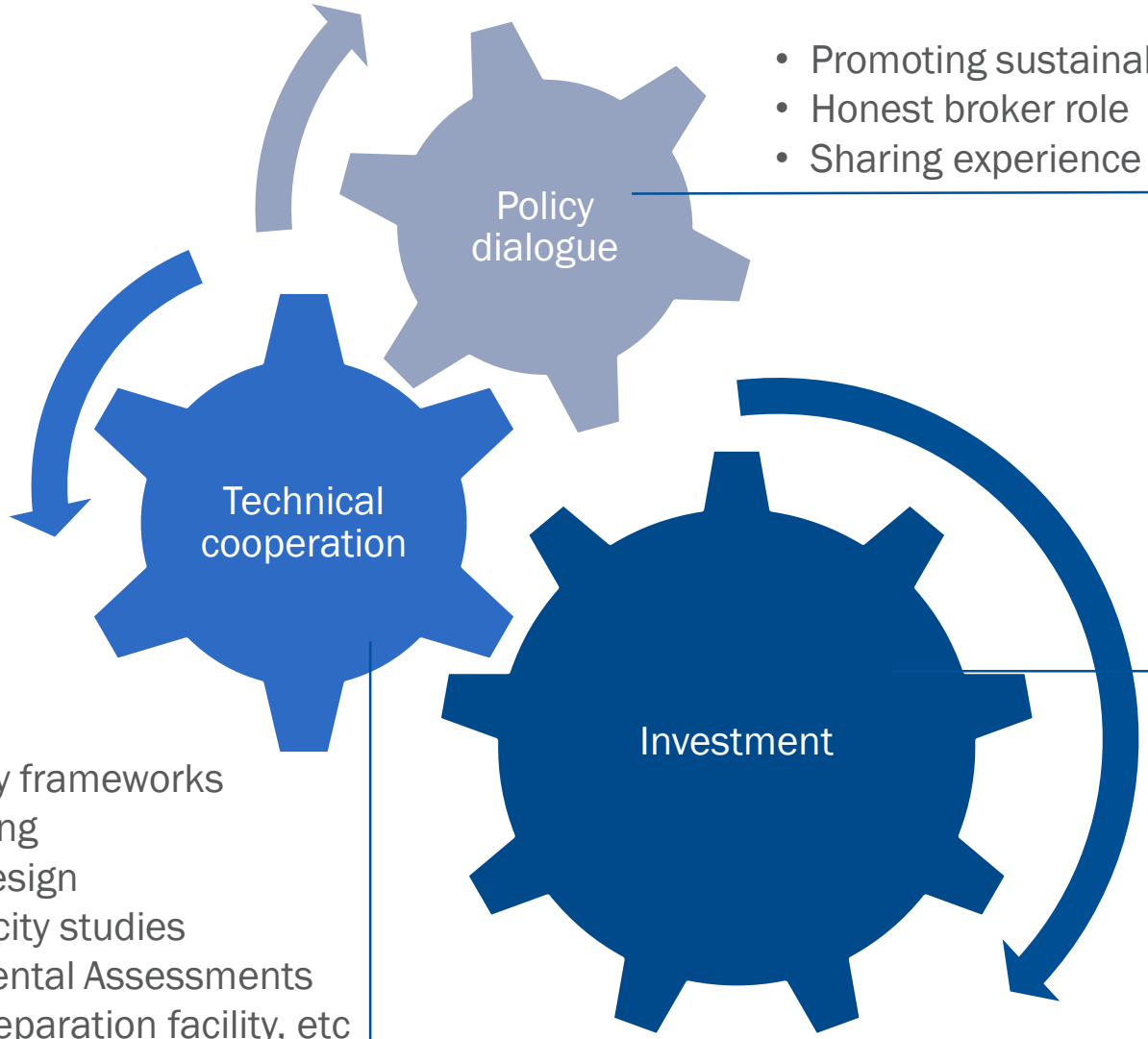
Energy Security Investments

Ukraine NAK Emergency Gas Finance. Up to EUR 300 million revolving credit facility to National Joint Stock Company "Naftogaz of Ukraine" to finance emergency gas supply. The transaction is part of EUR 1.0 billion package needed to buy up to one billion cubic metres of gas. The loan will be backed by the Ukraine's sovereign guarantee. In addition, EBRD shareholders will guarantee up to 66% (EUR 200 million) of the loan

Moldova Gas loan. EUR 300 million to boost energy security by acquiring strategic gas reserves to supplement those currently provided by Russia through Ukraine.

Renewables – Operational Approach

European Bank
for Reconstruction and Development



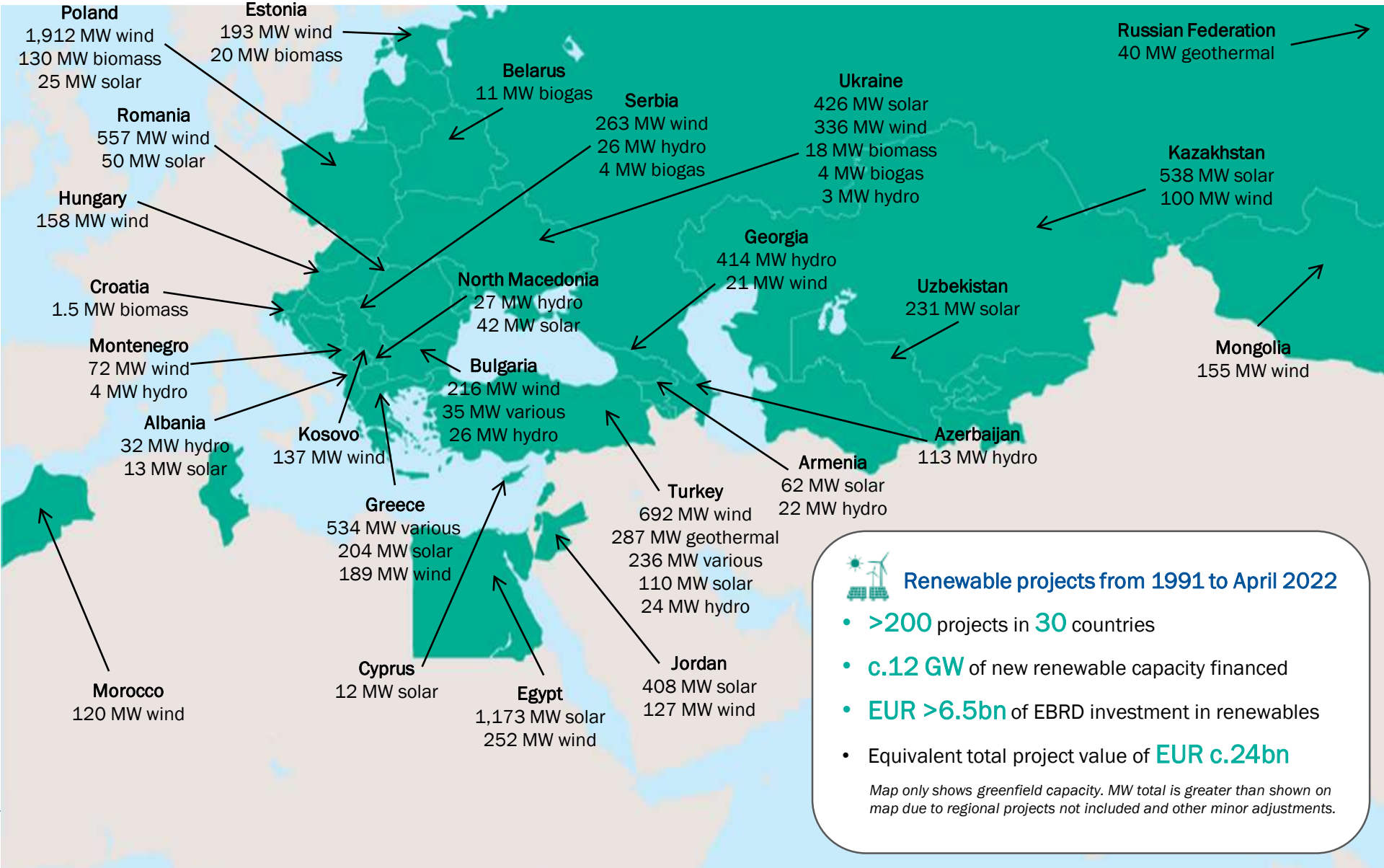
- Promoting sustainable energy
- Honest broker role
- Sharing experience and best practice

- Project finance
- Corporate loan
- Mezzanine
- Equity
- Investing in Bonds

- Regulatory frameworks
- PPA drafting
- Auction design
- Grid capacity studies
- Environmental Assessments
- Project Preparation facility, etc

EBRD and Renewables

European Bank
for Reconstruction and Development



Renewable projects from 1991 to April 2022

- >200 projects in 30 countries
- c.12 GW of new renewable capacity financed
- EUR >6.5bn of EBRD investment in renewables
- Equivalent total project value of EUR c.24bn

Map only shows greenfield capacity. MW total is greater than shown on map due to regional projects not included and other minor adjustments.

Energy investments in SEE

European Bank
for Reconstruction and Development

Bulgaria, AES, St Nikola Windfarm, 2008/21

- EUR119 million senior secured loan for the construction of 156MW Saint Nikola wind farm located in the Kavarna region of northeast Bulgaria. Project completed in 2010.
- Additional EUR 16 million in EBRD financing in 2021.
- Saint Nikola committed to support the development of a new renewable energy programme at the Technical University of Varna and fund scholarships for young people from coal regions.

Serbia, Various Sponsors, Windfarms, 2017

- Financing the development, construction and operation of Dolovo 158MW and Kovacica 104.5MW windfarms.
- Offtaker: EPS, with a 12-year PPA
- Dolovo: 300 EURm, o.w. EBRD 108 EURm. Sponsor: Masdar (60%), Taaleri (30%), DEG (10%)
- Kovacica: 190 EURm, o.w. EBRD 50 EURm. Sponsor: Enlight (100%)
- First large scale private renewable energy projects in Serbia.

Albania, KESH, Floating Solar PV, 2021

- Project finance loan for the first 12.9 MW Floating PV and hydropower hybrid plant on Vau i Dejës lake in Albania.
- Loan is the first commercial basis loan from an IFI to KESH contributing to commercialisation of this state utility.
- EUR 2.6 million WBIF funds to support innovative technology.

North Macedonia, ESM, Solar PV, 2019/22

- EUR 5.9 million loan to ESM for the construction and operation of a 10MW solar PV plant next to the coal-fired TPP Oslomej on an exhausted coal mine pit, near the town of Kicevo. Started operation April 2022.
- EUR 25 million to ESM to build additional 30MW solar PV on exhausted coal mine - 10 MW at Oslomej and 20 MW adjacent to the thermal power plant Bitola.

Energy investments in SEE (Cont.)

European Bank
for Reconstruction and Development

Greece, PPC, Share Capital Increase, 2021

- Equity investment of EUR 75.15 million, in the context of the share capital increase of Public Power Corporation S.A. ("PPC"), the incumbent power utility and the largest electricity generator and principal supplier in Greece.
- Greek state's controlling share reduced from 51% to a blocking majority of around 34%.
- Use of Proceeds: Accelerate PPC's upsized business plan for expansion in renewable energy in Greece as well the expansion into adjacent markets in SE Europe.

Greece, Mytilineos, CCGT, 2021

- EUR 75 million loan to of Mytilineos S.A for the construction and operation of a 826 MW CCGT power plant located at the Agios Nikolaos Energy Complex in Viotia, central Greece.
- The Project was compared to a low carbon counterfactual characterised by no new fossil fuels plants and the Bank has concluded it represents the most economic pathway for the Greek electricity sector to meet the Paris Agreement goal.

North Macedonia, ESM, Liquidity loan, 2022 (TBC)

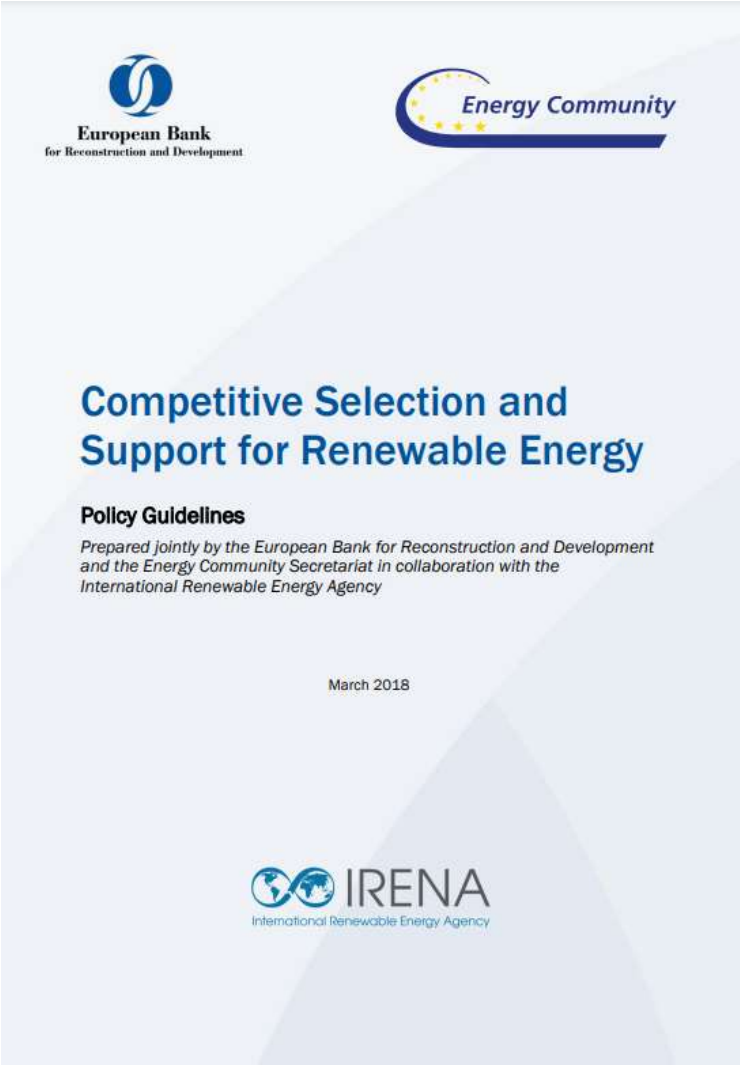
- Up to EUR 100m sovereign Guaranteed loan to ESM (subject to Board Approval) to support the Company's liquidity needs in the midst of the energy crises affecting North Macedonia.
- Associated policy support on decarbonisation and energy trading.

N.Macedonia, NER, Interconnector, 2022 (TBC)

- EBRD is considering participating as part of an EUR 54.4 million package to National Energy Resources, a state-owned joint stock company, for the construction and operation of the North Macedonian section of the Greece-North Macedonia gas interconnector.
- The project is subject to an assessment of its alignment with the Paris Agreement and Board Approval.

RES policy support

European Bank
for Reconstruction and Development


European Bank
for Reconstruction and Development

Energy Community

Competitive Selection and Support for Renewable Energy

Policy Guidelines

Prepared jointly by the European Bank for Reconstruction and Development and the Energy Community Secretariat in collaboration with the International Renewable Energy Agency

March 2018

IRENA
International Renewable Energy Agency

Albania

- 140MW solar PV at Karavasta – 50% capacity at 24.89 EUR/MWh for 15 years. Won by Voltalia (France).
- 100MW solar PV at Spitalle – 70% capacity at 29.89 EUR/MWh for 15 years. Won by Voltalia (France).
- 100MW wind auction. Request for Qualification closed 13 June 2022. RfP submission due May 2023.
- Offshore wind study.

North Macedonia

- 62MW solar PV on public and private land. Fixed feed-in-premium (FiP) caped at 15 EUR/MWh. Slovenia's GEN-I won 17MW.
- 100MW solar PV on former lignite mine at Oslomej. Site owned by ESM, the state energy company. Tendered 'revenue split' with ESM. Won by Bulgarian Solarpro Holding and Turkish Fortis Energy Electric – offering an 18% revenue split.

Ongoing support in:

- Serbia
- Montenegro
- Kosovo
- Greece (Offshore wind)
- Bulgaria RRF
- Romania CfD

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for Reconstruction and Development

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BayWa r.e.

BayWa r.e. Projects Greece

SEE’s transition to carbon neutrality

Cretan Energy Conference, Aurora Workshop, 03.07.2022

r.e.think energy

BayWa Group serves fundamental needs – BayWa r.e. is 100% focused on renewables

BayWa

Agriculture

- Agricultural Trade

- Agricultural Equipment

- Global Produce

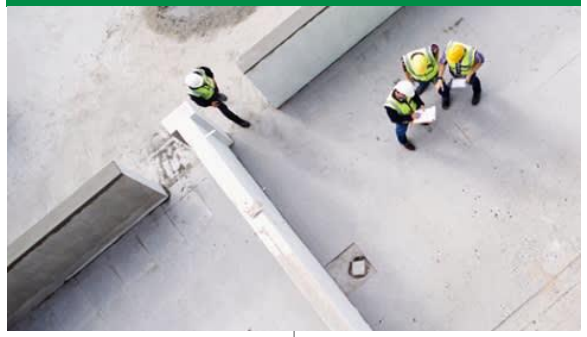
Energy

- Conventional Energy

- BayWa r.e.

49% owned by EIP AG

Building Materials



- Building materials

Innovation & Digitalisation

- Digital Farming & eBusiness

Facts & Figures 2021

BayWa r.e.

Turnover

3.6 billion €

EBIT

162 million €

Employees

3,300

Globally active

29 countries

BayWa

Turnover

19.8 billion €

EBIT

267 million €

Employees

21,500

Globally active

47 countries

Our portfolio covers a broad range of renewable energies

>4.5 GW installed capacity in wind and solar globally.

>21 GW global **project pipeline** solar and onshore and offshore wind.

10 GW under **operational management; digital asset operations** expertise and **technical managemen**t for solar, wind farms and biogas plants; services in energy trading.

7 GW direct marketing portfolio and broad energy trading services incl. PPA**.**

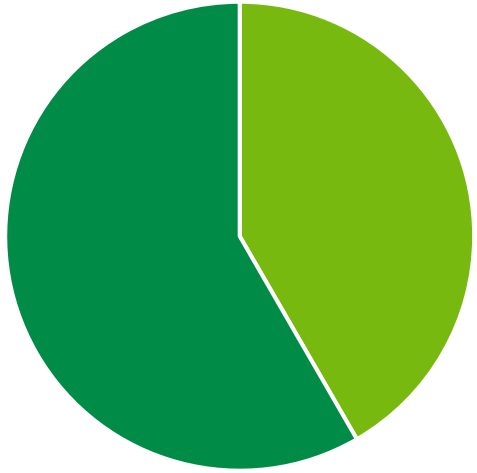
New **IPP portfolio**; plans to ramp up to 2.5 GW in the medium term.

30 years of **solar distribution experience**, a wide range of quality products and services for about **15,000 installation** and **sales partners** globally.

Tailor-made Energy Solutions for **commercial and industrial clients** from self-consumption to green energy supply.

BayWa r.e. is a leader in executing PPAs around the globe, has executed PPAs for 1.7 GW of renewables and plans to do so for all its solar projects in Greece

PPA track record



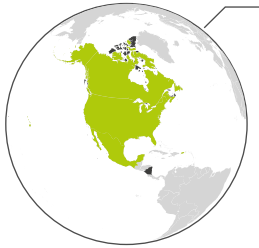
Utilities & Traders

TOTAL, NEAS ENERGY, aspo, VATTENFALL, Statkraft, holaluz

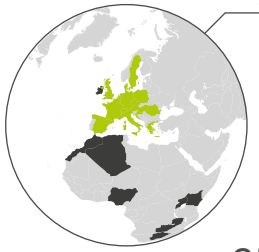
Corporates

HEIDELBERGCEMENT Group, Bloomberg, Nationwide Building Society, ABInBev, McDonald's, TESCO, Huhtamaki, BT

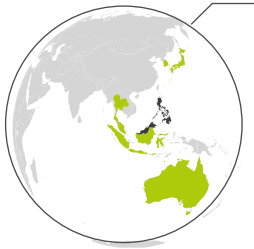
146 MW



1,496 MW



95 MW



1.7 GW of renewable PPAs signed,

thereof **~750 MW** with Corporates

Very tangible interest for PPAs from Greek projects from biggest German and European corporates

The European Commission and the Greek government are committed to moving towards a liberalised electricity market and market participants are preparing to comply

Regulatory perspective

- Regulators & government are committed to move from a subsidized to a liberalised electricity market
- Almost all required steps have been taken (with BESS still being in the works)
- Power Purchase Agreements are the preferred way to go

Market participants perspective

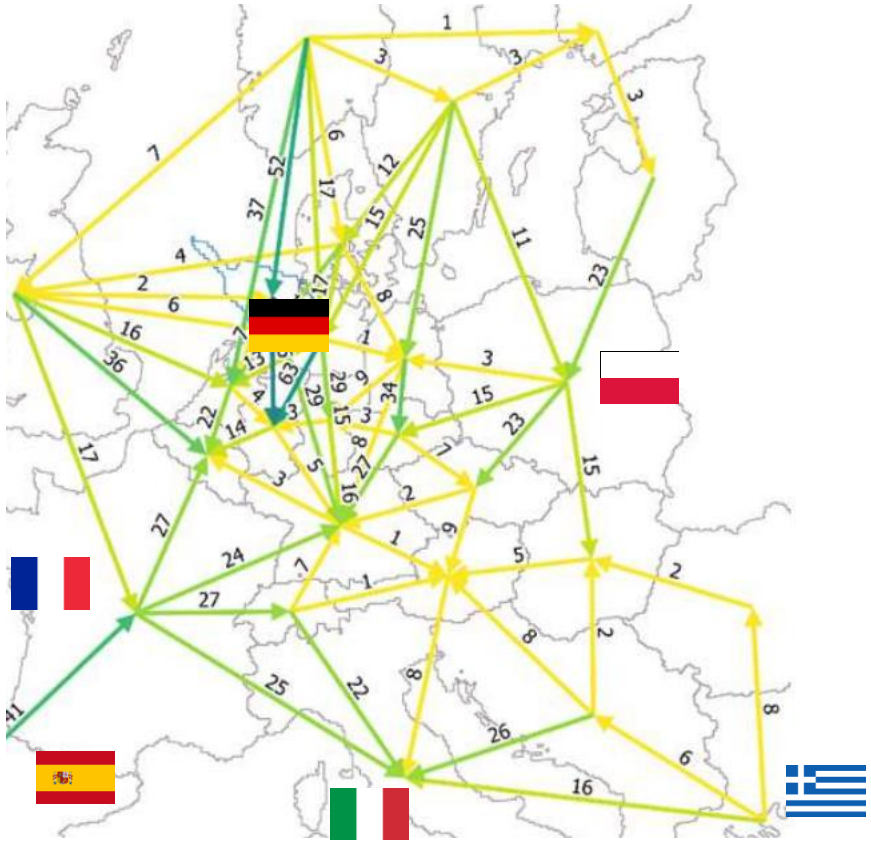
- Key players are preparing to execute PPAs, but many still have very limited experience
- Project owners, banks, aggregators and off-takers are lacking a track record with complex contractual structures

Key challenges

- Credit rating of many local players not sufficient for international counterparts
- Requirement of significant amounts of bank guarantees to back-up PPA contracts

The study concludes that by 2050 Greece will become the per capita EU export champion of green electricity by some distance

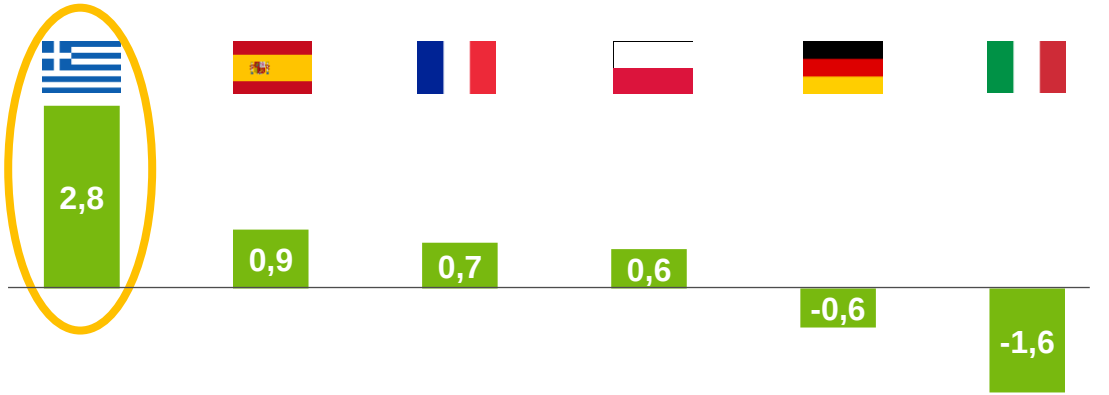
Electricity trading flows between countries as a central means for regional balancing



Net annual electricity flows between countries in 2050 in TWh for the scenario focusing on electrification.

Total net ex- and imports of electricity (TWh)

Per capita ex- and imports of electricity (TWh/mil.)



To establish green energies as the third export pillar of the Greek economy, significant expansion of the cross-border transmission grid and direct access for RES are required

Opportunity

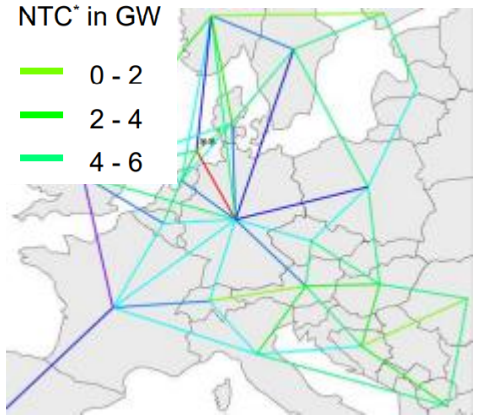
2019 Net electricity imports	2050 Net electricity exports
11 TWh	30 TWh
€ 760 mill.	€ 1,470 mill.

Overall impact on trade balance € 2.2 bn

A new Greek export hit

- Tourism
- Sea transport
- Renewable energy

Challenge



- Massive expansion of transmission grid required
  - within Greece
  - 2 – 6 GW NTC* each to Italy, Balkans and Bulgaria/Romania
- Necessity to allow & manage access of RES to transnational transmission grid to facilitate export

Tackle grid topic as quickly as possible to establish RES leadership much before 2050

Note: NTC = Net Transfer Capacity, describes the maximal possible transmission of electricity (in GW) between two bordering regions / countries.
Sources: www.OEC.world, Afry: "Quarterly Update Note – Wholesale Electricitiy Price Projections 2022-2060 for Greece, Fraunhofer ISI et. all. "Long-term scenarios for the transformation of the energy system in Germany", May 2021

Thank you

Philipp Kunze

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