



**COMILLAS**  
UNIVERSIDAD PONTIFICIA

ICAI

**MASTER IN THE ELECTRIC POWER INDUSTRY**

**MASTER'S THESIS**

**METHODOLOGIES FOR AN UTILITY TO EVALUATE  
& PRIORITIZE PROJECTS IN THE CONTEXT OF THE  
ENERGY TRANSITION & THE SPANISH RESILIENCE  
& RECOVERY PLAN**

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*To my family*

*To my friends*



## *Acknowledgments*

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Thank you!

Jon Garcia Garaizar





The ambition of ENGIE is to be the leader in the Zero Carbon Transition and to accompany its customers (industrials, local authorities) in their path towards decarbonization.

*Engie's Firm Commitment to Decarbonization*

In this sense, Engie is firmly committed to this recovery plan, the objectives of the plan being at the intersection of the two strategic priorities of the Group:

- Decarbonize energy production, contributing to the development of renewable energies: solar, wind, photovoltaic and hydrogen, improving the country's energy mix.

Increase the part of renewable in the energy mix (objective of ENGIE is to build and install 9GW by 2021 - in addition to the 24 GW existing one)

- Accompany clients in their decarbonization, working together with them to reduce costs, kWh and tons of CO2 emitted.





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# Summary

## **ABSTRACT**

The main challenge of the European Funds for utilities in the coming months is to decide, in a very short time, how to prioritize the available projects that are going to be assigned between 2021 and 2023. This Master Thesis aims to review in depth the state of the art of Next Generation funds for Spain that are materialized in the National Recovery Plan. The thesis, once the design said Plan has been studied, establishes a methodology to identify the energy projects likely to receive said funds. A series of examples cases application is also provided.

## **INTRODUCTION**

The response of the European Union (EU) to the economic and social impact of the COVID 19 pandemic has been swift, supportive and forceful. On July 21<sup>st</sup>, 2020, the European Council reached a landmark agreement on the never-funded stimulus package endowed with 750 billion euros, the Next Generation EU fund.

The aid will be integrated with the long-term budget of the EU (Multiannual Financial Framework, MFF), and must be destined to transformation vectors (digitization and energy transition).

At least **40%** should be dedicated to the **green transition**. The Europe that emerges from the crisis will therefore be

stronger, more competitive, more digital, and above all greener.

Spain will receive a large amount of resources (69 billion € direct and non-reimbursable subsidies.)

The energy transition has a preeminent position in the Plan (28 billion€)

## **ESPAÑA PUEDE**

The Spanish Recovery plan validated on July 13<sup>th</sup>, 2021 after a year of negotiations with Brussels is structured in 4 axes, green transition represents 40% and digitization 28%. These four lines of action are reflected in 10 lever policies with great capacity to generate activity and employment.

These ten lever policies encompass the 30 components of the coherent

investment and reform projects to modernize the economy.



Figure 1 Basic Achitecture Recovery Plan. Source [Esp21c]

The Plan, whose first version was sent in October 2020, has the aforementioned four axes that will backbone the Government's economic policy (ecological transition, digital transition, gender equality, and social and territorial cohesion) and the ten so-called “lever policies” that develop them, among which the ecological transition takes a preeminent place.

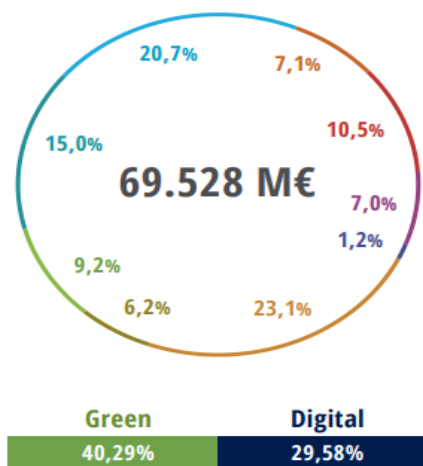


Figure 2 Investment Allocation Recovery Plan. Source: [Esp21c]

Non-reimbursable direct investments that will be deployed in the 2021-2023 period, for a total of close to 70,000

million €, with a significant concentration in the areas of green transformation (40.29%) and digital (29.58%). Access will also be facilitated to another 75,000 million € in soft loans

Large companies will play a key role in the context of European funds. Since for each public Euro invested the private sector will contribute between 3 and 4 Euros.

Much of the money expected for the energy transition will go to sustainable mobility, housing rehabilitation and transformation of strategic sectors.

The participation of large energy companies will essentially go through the deployment of renewables and green hydrogen.

More specifically, the current design of the plan foresees 7,500 million € will be allocated to energy solutions and the business of industrial assets.

These amounts will be broken down as follows:

- 1,500 million € to smart and distribution networks.
- 1,600 million € to Green Hydrogen
- 3,400 million € to Development of renewables that are not yet mature.

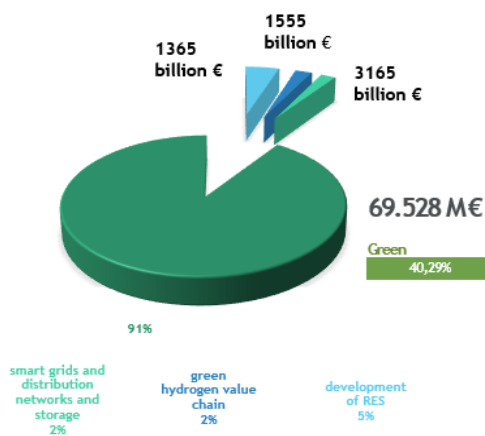


Figure 3 Energy solutions and industrial asset components

This Master Thesis proposes a Methodology for evaluating energy transition projects in the context of the Recovery Plan in order to prioritize their development and structuring, choosing the most susceptible to European funding.

Transferring the Hepburn et al (2020) analysis method to European funds and the National Recovery Plan, 9 archetypal projects of a utility in relation to the energy transition have been analyzed considering 6 dimensions: project maturity, alignment with the driving policies of the Plan, economic and environmental impact, social and territorial cohesion and resilience.

The analyzed projects represent different technologies and meet the following conditions:

- Projects must be aligned with the driving policies of the Recovery Plan.
- Projects must be compatible with the decarbonization dimension of the Integrated National Energy and Climate Plan
- The projects have to be compatible with the energy components.

As a result of said detailed analysis, a clear classification of attractiveness and potential for success of said projects is established. Therefore, three projects are proposed that contribute to the achievement of the economic and climatic objectives of the Recovery Plan. These are located in the desirable upper right quadrant and have a high score in the metrics associated with the Recovery Plan and project maturity:

- H Green hydrogen
- E Heat and cold networks
- D Recovery of waste

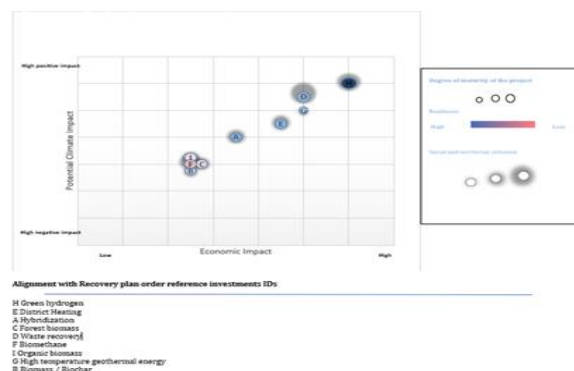


Figure 4 Target group mean MDI analysis results

## **RESUMEN**

El desafío principal de los Fondos Europeos para las utilities en los próximos meses es el de decidir, en muy poco tiempo, cómo priorizar los proyectos disponibles que se van a asignar entre 2021 al 2023. Esta Tesis de Máster tiene como objetivo revisar en profundidad el estado del arte de los fondos Next Generation para España que se materializan en el Plan Nacional de Recuperación y Resiliencia. La Tesis, una vez estudiado el diseño de dicho Plan establece una metodología para identificar los proyectos de transición energética susceptibles de recibir dichos fondos dando algo de claridad al proceso de participación de los mismos optar a las enormes cantidades de recursos disponibles en materia de transición energética. Se aporta además una serie de casos ejemplo de aplicación.

### **INTRODUCCIÓN**

La respuesta de la Unión Europea (UE) al impacto económico y social de la pandemia del Covid 19 ha sido rápida, solidaria y contundente. El 21 de julio de 2020, el Consejo Europeo alcanzó un acuerdo histórico sobre el paquete de estímulo nunca financiado y dotado con 750.000 millones de euros, el fondo Next Generation EU.

Las ayudas se integrarán con el presupuesto a largo plazo de la UE (Marco Financiero Plurianual, MFP), y deberán ser destinadas a vectores de transformación (digitalización y transición energética).

Se deberá dedicar al menos un 40% a la transición verde, La Europa que emerja de la crisis será, por tanto, más fuerte, más competitiva, más digital, y sobre todo más verde.

España recibirá una gran cantidad de recursos (69.000 M € subsidios directos y no reembolsables.)

La transición energética tiene una posición preeminente en el Plan (28.000 millones de €).

### **1. ESPAÑA PUEDE**

El plan de Recuperación Español validado el pasado 13 de Julio de 2021 tras un año de negociaciones con Bruselas se



estructura en 4 ejes, transición verde representa un 40% y la digitalización un 28%. Estos cuatro ejes de acción se reflejan en 10 políticas palanca con gran capacidad de generar actividad y empleo.

Estas 10 políticas palanca, a su vez, integran 30 componentes coherentes con reformas e inversiones que modernicen la economía.



Figura 1 Arquitectura Básica del Plan de Recuperación. Fuente[Esp21c]

El Plan, cuya primera versión fue enviada en Octubre de 2020, tiene los mencionados cuatro ejes que vertebrarán la política económica del Gobierno (transición ecológica, transición digital, igualdad de género, y cohesión social y territorial) y las diez denominadas “políticas palanca” que los desarrollan, entre las que la transición ecológica toma un lugar preeminente.

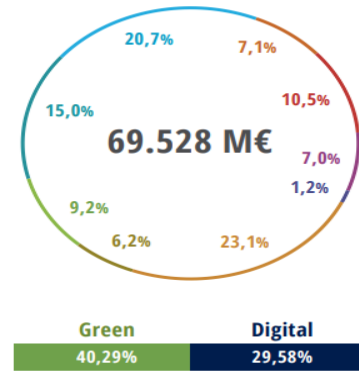


Figura2 Asignación de Inversiones del Plan de Recuperación Fuente: [Esp21c]

Las inversiones directas no reembolsables que se desplegarán en el periodo 2021-2023, por un total próximo a 70.000 millones de euros, con una concentración importante en los ámbitos de la transformación verde (40,29%) y digital (29,58%). Se facilitará el acceso además a otros 75.000 millones de euros en créditos blandos.

Las grandes empresas jugarán un papel fundamental en el contexto de los fondos europeos. Ya que por cada Euro público invertido el sector privado aportará entre 3 y 4 euros.

Gran parte del dinero esperado a transición energética se destinará a movilidad sostenible, rehabilitación de vivienda y transformación de sectores estratégicos.

La participación de las grandes empresas energéticas pasará esencialmente por el despliegue de renovables e hidrógeno verde.

Más en concreto, el diseño actual del plan prevé 7.500 millones de € se destinarán a soluciones energéticas y negocio de activos industriales.

Dichas cantidades se van a desglosar de la siguiente manera:

- 1500 millones de € a redes inteligentes y de distribución.
- 1.600 millones de € a Hidrógeno verde
- 3.400 millones de € a Desarrollo de renovables que aún no son maduras.

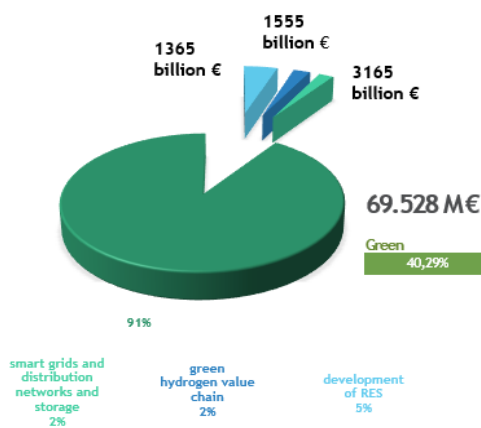


Figura 4 Soluciones energéticas y negocios de activos industriales.

Esta Tesis de Máster propone una Metodología de evaluación de proyectos de transición energética en el contexto

del Plan de Recuperación para así poder priorizar el desarrollo y estructuración de los mismos, eligiendo lo más susceptibles de financiación europea.

Trasladando el) a los fondos europeos y al Plan Nacional de Recupeación, 9 proyectos arquetipo de un utility en lo relativo a la transición energética han sido analizados considerando 6 dimensiones: madurez del proyecto, alineamiento con políticas tractoras del Plan, impacto económico y medioambiental, cohesión social y territorial y resiliencia.

Los proyectos analizados representan diferentes tecnologías y cumplen las siguientes condiciones:

- Proyectos tienen que estar alineados con las políticas tractoras del Plan de Recuperación.
- Proyectos tienen que ser compatibles con dimensión de descarbonización del Plan Nacional Integrado de Energía y Clima
- Los proyectos tienen que ser compatibles con los componentes energéticos.

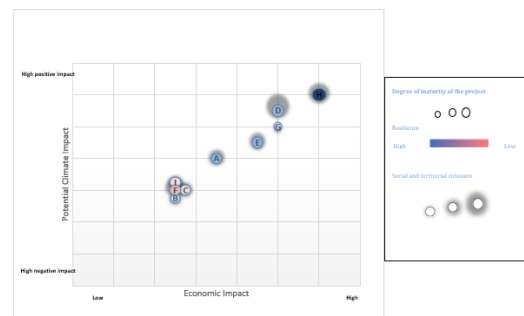
Como resultados de dicho análisis de detalle se establece una clasificación clara de atractivo y potencialidad de éxito de

dichos proyectos. Se propone por tanto tres proyectos que contribuyen al logro de los objetivos económicos y climáticos del Plan de Recuperación. Estos son los ubicados en deseable cuadrante superior derecha y tienen una puntuación alta en las métricas asociadas al Plan de Recuperación y madurez del proyecto:

H Hidrógeno verde

E Redes de calor y frío

## D Valorización de residuos



Alignment with Recovery plan order reference investments: IDs

- H Green hydrogen
- E District Heating
- A Hybridization
- C Forest biomass
- D [Waste recovery]
- F Biomethane
- I Organic biomass
- G High temperature geothermal energy
- B Biomass / Biogas

Figure 4 Target group mean MDI analysis results

# ***1. Introduction***

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The aim of this first chapter is to put into context the main motivations of the project in a way of introducing the topics that will be further developed in this Master Thesis.

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## ***1.1. Motivation***

The years 2020 and 2021 will forever reminded as the years of the COVID-19 health tragedy. We cannot begin this thesis without a heartfelt memory for all the victims.

The Covid-19 that emerged in March 2020 has had a significant impact on the Spanish economy, due to the strict containment measures for the virus and its impact on economic sectors.

The forceful reaction of national and European authorities from the outset has been effective in mitigating the social and economic impact, thus avoiding a disturbing economic and social scenario.

Indeed, the different actions have made it possible to preserve a large part of the productive structure, but the economies will operate below their potential level in the short and medium term.

In line with this, the EU proposes a new recovery instrument, Next Generation EU, with an emphasis on achieving a fairer and more resilient Europe for the next generations, investing 750 billion € to achieve it. In addition, the European Commission has a budget, its multiannual financial framework, for 2021-2027 of 1.1 trillion euros, a significant part of which is intended to be allocated to initiatives that are aligned with the European Green Deal. In total, we are talking about a budget of 1.85 trillion € of EU funds, for seven years. The capture of a part of these funds can also generate confidence in

investors and encourage private investments in Spain, which have been reduced due to COVID-19.

The strong European commitment to decarbonization has also been reflected in the development of guidelines for using recovery funds. These funds should be dedicated to a great extent to activities related to decarbonization and digitization, in a way that is fully aligned with the European Green Deal presented in 2019. Therefore, they can be a fundamental element, and an unbeatable opportunity, to advance in the decarbonization of the European energy system, if the member states use them properly.

Large utilities have the opportunity to make a very significant contribution to this green European reality and, for this reason, the time has come to explore the different energy transition projects eligible for funding.

The main challenge posed by the European Funds for companies in the coming months is to decide, in a very short time, how to prioritize the available resources in projects that maximize profitability. Therefore, the objective of this thesis is to offer a guide so that private sector decision-makers can prioritize and refine investment decisions in ecological transition taking into account different relevant criteria on the effectiveness of the different available projects, such as 1) the impact economic 2) environmental impact 3) degree of maturity of the project, and 4) resilience 5) social and territorial cohesion, 6) alignment with the driving policies and energy components of the State Recovery Plan.

In summary: Large Utilities have the historic opportunity to obtain huge amounts of financing to advance the transition towards a more efficient and sustainable energy model. However, it is essential to translate this strategy into specific projects that convey the correct signals of action to investors.

## ***1.2. European Green boost***

### ***1.2.1. Regulatory framework***

The European Union has traditionally been the driving force behind the fight against climate change. The endowment of an extensive and appropriate legal framework will allow it to continue being the standard bearer against the fight against climate change and will also allow it to meet the greenhouse gas reduction targets of 55% in 2030 compared to 1990. The roadmap European Green Deal, from December 2019, will lead us to a fairer, greener, and better socio-economic model, making the European Union the first climate-neutral continent in 2050.

The provision of this legal framework provides certainty so that the necessary investments are carried out and encourages consumers to participate actively in the energy transition.

#### **Green deal**

Climate change has been warned for a long time but there seems to be scientific unanimity that we are close to a point of irreversibility if we do not act, both in reducing greenhouse gas emissions and with adaptation actions.

In a determined commitment to green growth, the European Union launched the Green Deal in December 2019.

The main threats to the planet are environmental degradation and climate change, to face this enormous challenge the Green deal provides for a more efficient use of resources, a modern and more competitive economy, ensuring that:

- net greenhouse gas emissions have ceased by 2050
- economic growth is decoupled from resource use
- no people or places are left behind.

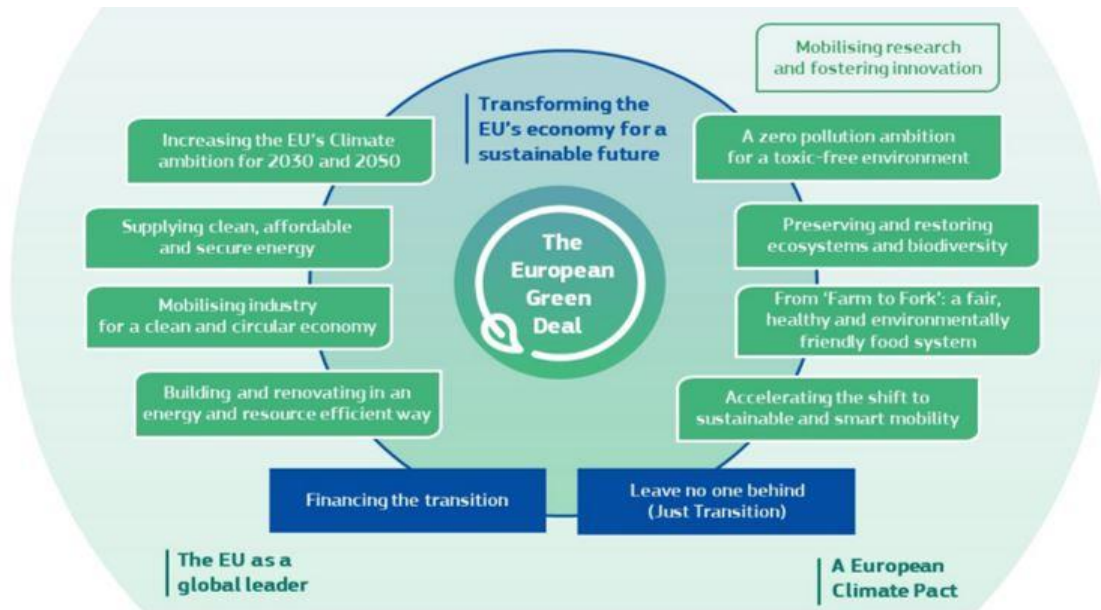


Figure 5 . Structure and contents of the European Green Deal (Source: COM (2019) 640 final)

The European Green Deal is also allowing us to get out of the COVID-19 pandemic. One third of the € 1.8 trillion in investments from the Next Generation recovery plan and the EU's seven-year budget will fund the European Green Deal.

### **Ecological transition requires a energy transition**

More than 75% of the EU's greenhouse gas emissions are related to the energy sector, the ecological transition is largely an energy transition.

The decarbonization of the energy sector will be essential for achieving the 2030 climate goal and climate neutrality in 2050.

The European Green Deal is based on three fundamental pillars to carry out the energy transition, it will have social and environmental implications.

1. ensuring a secure and affordable energy supply for the EU
2. develop a fully integrated, interconnected and digitized EU energy market
3. prioritize energy efficiency, improve the energy performance of our buildings and develop an energy sector based largely on renewable sources

The European Commission gave a strong response to the climate threat by adopting a policy that acts in different areas: climate, energy, transport, and taxation. The ultimate goal is to reduce emissions by 55% between now and 2030 compared to 1990.

The Green Deal focuses on a number of areas that are considered critical: renewable deployment, sustainable mobility, energy efficient buildings, or sustainable agriculture.

It can be seen that these critical areas have been, to a large extent, the same as those considered in the design of the Recovery Plan.

**Integrated National Energy and Climate Plan (PNIEC by its acronym in Spanish):  
Roadmap to a greener, fairer and more resilient economy**

A procedure is established to achieve climate objectives in a coordinated manner among all EU member states, following the criteria of coherence, comparability and transparency.

The National Integrated Energy and Climate Plans are road maps that guide major decisions in climate and energy policy in order to collectively advance in line with the 2015 Paris Agreement.

Spain has been one of the most committed countries in climate and energy matters, the PNIEC has been one of the axes of political action. The National Integrated Energy and Climate Plan gives greater security to investors and takes advantage of opportunities, it also tries to minimize social inequalities and protect the environment.

The investments and reforms of this Recovery Plan will make it possible to accelerate this energy transition process, bringing forward to 2023 the references of those efforts with the greatest leverage effect expected at the time for the year 2025. The description of the corresponding Components details, where appropriate, the alignment of the contribution to each of the objectives and measures of the PNIEC.

The measures contemplated in the PNIEC will make it possible to achieve the following results in 2030:

- 23% reduction in greenhouse gas (GHG) emissions compared to 1990.
- 42% of renewables on the final use of energy.



- 39.5% improvement in energy efficiency.
- **74% renewable energy in electricity generation.**

The ecological transition takes a prominent place in the Recovery Plan, it appears transversally in most lever policies, having a presence in half of the 30 lines of action or components. This transversality makes it difficult to extract the exact amount to energy transition, around 28,000 million euros for the period 2021-2023 will go to this transformation vector. The amount committed to loans (68,000 million, about 25,000 to energy transition, in any case they would be requested later due to the increase in debt that it entails.

## ***1.3. España Puede***

### ***1.3.1. A necessary Plan to boost recovery after the health crisis***

The emergence of Covid-19 in March 2020 has had a very high impact on the Spanish economy, the containment measures imposed by the Government to stop the virus have had a significant impact on economic sectors of great importance.

The rapid, forceful and supportive response of the national and European authorities from the outset has been effective in reducing the economic and social impact, thus avoiding an unimaginable scenario.

The first economic measures have been adjusted to the evolution of the pandemic. Liquidity measures with great macroeconomic impact were adopted in the most damaged sectors. The main objective was to re-float those sectors that suffered the most from the effects of the crisis.

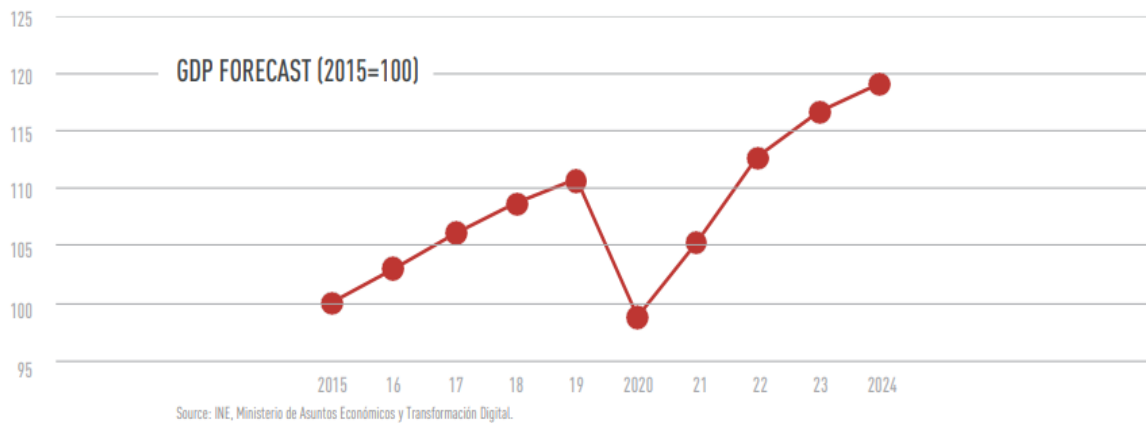


Figure 6. Recovery Plan macroeconomic impact on Spanish economy. Source: INE, Ministerio de Asuntos Económicos y Transformación Digital

The impact of the crisis in our country has been higher than in neighboring countries due to the fact that Spain carries structural imbalances from the past, the crisis has revealed the lack of solidity of our economy. Likewise, we must face future challenges shared with other economies, mainly: the ecological transition and digitization.

### ***1.3.2. Architecture of the Recovery, Transformation and Resilience Plan for the Spanish Economy***

The Recovery Plan, whose draft was sent to Brussels in October, approved by the Commission on June 23<sup>rd</sup> 2021, and finally validated by Ecofin on July 13<sup>th</sup> 2021, foresees the mobilization of 140 billion euros until 2026, Much of it will be executed in the first phase of the plan for the period 2021-2023, with the aim of carrying out an anti-cyclical policy by executing projects with a great multiplier effect and a great impact on the economy.

The Plan will mobilize more than 70,000 million euros in direct subsidies and another 70,000 million euros in loans. Spain will receive the transfers that do not have to be repaid, but declines to request the credits - which involve more debt - associated with European funds. The European Commission allows borrowing until July 2023. The huge

resources mobilized will give positive signals to investors in a situation of uncertainty and economic instability.

The plan is perfectly aligned with the Sustainable Development Goals of the United Nations 2030 Agenda and specific recommendations of the European institutions, more than 40% is allocated to energy transition and slightly more than 29% digitization.

The Plan is consistent with the recommendations for structural reforms of European Institutions, the Spanish Government, and the economic and social agents.

#### **Four cross-cutting lines of action for a green, digital, cohesive, and egalitarian Spain**

The Plan is built around 4 cross-cutting lines of action that are the backbone for the levers and components, all measures must favor these 4 pillars of the plan: (i) the green transition, (ii) the digital transformation, (iii) social and territorial cohesion and (iv) gender equality.



*Figure 7 Four pillars. Source [Esp21c]*

The plan is not designed to respond to immediate needs, but rather gives priority to those measures or reforms that produce a structural change in our economy. In particular, the Plan seeks to improve the well-being of future generations by investing in what allows us to face the challenges of the future, to protecting ecosystems and making the environment healthier and more sustainable.

These four lines of action are reflected in ten lever policies with a great capacity to generate economic activity and employment, especially with the 2023 horizon.



Figure 8 Ten lever policies. Source [Esp21c]

These ten lever policies encompass the 30 components of the coherent investment and reform projects to modernize the country.

The Plan includes a total of 212 measures, of which 110 are investments and 102 are reforms for 2021-2023.

The ambitious objectives set by the Commission can be met by the lines of action and investments related to the flagship initiatives. In September, the European Union published seven flagship projects that guide the policy of action to the rest of the Member States. These areas of action show great capacity to generate economic activity and employment, the Spanish Plan is fully aligned with the flagship initiatives. The first flagship is the one that has a direct relationship with the objective of the Thesis, but the following are related to the energy transition:

1. **Power up: acceleration of the development and use of renewable energies.**
2. **Renovate:** improving the energy efficiency of public and private buildings.
3. **Recharge and refuel:** accelerating the use of sustainable transport and charging and refueling networks.
4. **Reskill and upskill:** adaptation of educational and vocational training systems to new market needs.

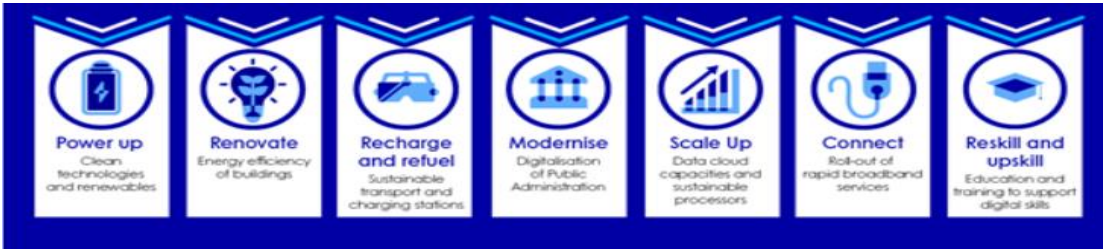


Figure 9 European Flagship initiatives

### 1.3.3. Investments

The Recovery Plan foresees an unprecedented mobilization of resources, the 70,000 million € of the first phase of the Plan (2021-2023) will have a multiplier effect and will induce the participation of the private sector in strategic areas.

Public investment in the Recovery Plan in the 2021-2023 period will focus on the transformation vectors of ecological transition (40%) and digitization (29%), but these structural changes in our economy would be insufficient without quality education (10,5%) and the commitment to innovation and development (7%)

27 billion € of the next generation funds have been included in the General State Budgets with the aim that public investment relaunch the economy by inducing private activity. Everything indicates that this year there will be fewer resources than those foreseen in the General State Budgets, about 9000 million € from the advance and another 10 billion € from the fulfillment of milestones and semester objectives.

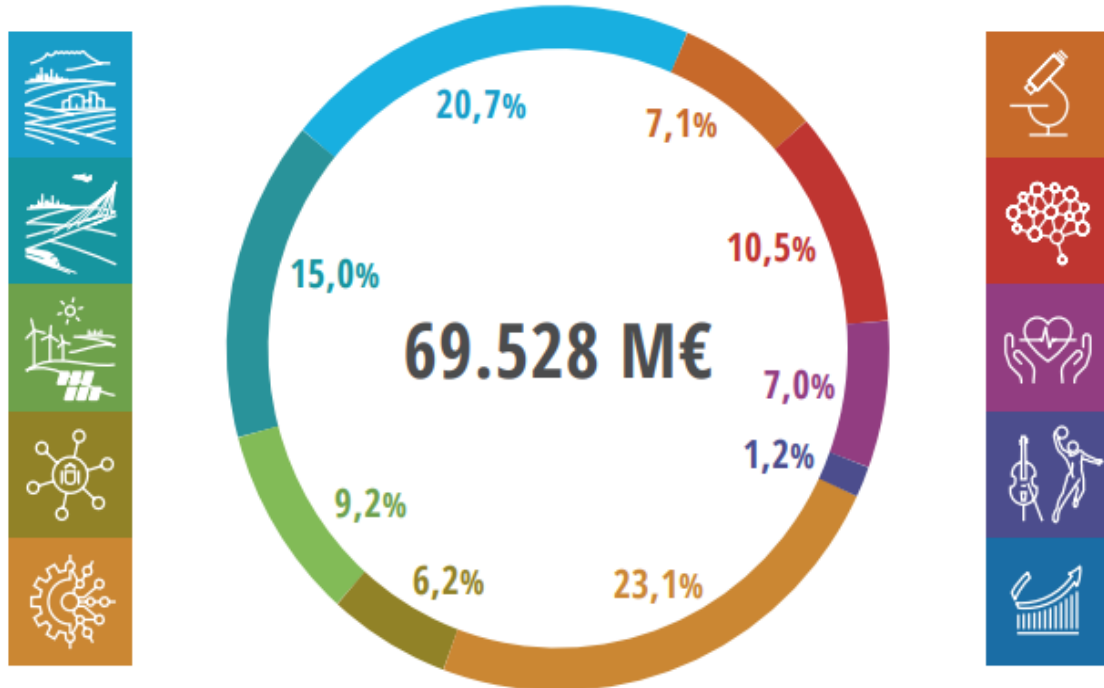


Figure 10 Investment Allocation Recovery Plan. Source [Esp21c]

The Recovery Plan fully responds to the specific recommendations of European institutions and requirements of the Next Generation EU instruments, in fact in June the European Commission approved the plan with a good rating.

The implementation of the Plan will not only generate a macroeconomic improvement in the short term, but the structural transformations that our country so badly needs will allow a lasting effect through an increase in productivity due to the reinforcement and modernization of the business fabric and of human and technological capital, scientific and natural.

### ***1.3.4. Governance and broad participation***

This Recovery Plan is national, the greater participation of economic and social actors should be sought. Likewise, the involvement of all levels of the Administration, although the Spanish decentralized system makes this point difficult.

To this end, new governance bodies have been created to ensure that the main actors, social and economic, participate. The necessary coordination mechanisms have been designed between the different levels of the Administration.

Royal Decree-Law 36/2020, of December 30, approving urgent measures for the modernization of the Public Administration and for the execution of the Recovery, Transformation and Resilience Plan.

It defines a governance that simplifies decision-making and ensures effective control and auditing of funds.

The **Royal Decree-Law 36/2020** aims to modernize the Public Administration and streamline the Administration for the effective management of funds. A governance is defined:

1. **Commission for Recovery, Transformation and Resilience**, headed by the President of the Government and of which all the Ministries are part. Its function is the direction and coordination of the Plan.
2. **Technical committee**, made up of a maximum of twenty members with skills and experience in the management of European funds and other profiles necessary for the management of the Plan.
3. **Monitoring Unit**, dependent on the Presidency of the Government, which has the objective of monitoring the Plan.
4. **Authority responsible for the Mechanism for Recovery and Resilience**, attributed to the General Secretariat of European Funds of the Ministry of Finance, which will respond to the European institutions.
5. **Supervisory authority of the Mechanism for Recovery and Resilience**, which falls on the General Intervention of the State Administration (IGAE). It will implement a financial management control and auditing system, which will be perfectly interoperable with the community systems.

A lot of importance has been attached to rigor in the administration of resources, applying the highest standards. The fundamental aspect is the control relative to milestones and objectives, as well as avoiding and, if necessary, correcting irregularities.

The broadest participation is sought, one of the central elements of co-governance will be the dialogue with the private sector for the articulation of the Recovery,

Transformation and Resilience Plan. This dialogue will allow to know the decarbonization possibilities offered by the business sector.

Calls of interest have been published to find out about the projects that the Spanish business fabric is working on.

Calls of interest are very useful to identify the most mature and impactful projects for the deployment of the Recovery Plan. The figure of Strategic Projects for Recovery and Economic Transformation (PERTE) has also been created, which brings together the public administration, companies, and various institutions. The purpose is to promote projects with great potential that are not yet competitive and that have a high carry-over effect.

The first PERTE announced is the electric vehicle.



## ***2. The strategic role that Utilities play in the context of the Recovery Plan***

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This chapter describes in detail the allocation of resources of the Recovery Plan and the investment typologies.

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### ***2.1. Investments***

The objective of this master's thesis is to offer a guide so that companies can prioritize and make timely and relevant decisions. The magnitude of the aid makes it especially important to detect which potential energy transition projects carried out by Utilities are the best fit. The allocation of resources is analyzed below, with special emphasis on energy investments.

The Recovery plan foresees 140 billion € between direct subsidies and loans with a 2026 horizon, much of which will be executed in the first phase of the plan (2021-23), in order to cause the greatest economic impact. In this first phase, countercyclical investments are expected to have a very high economic impact and a high speed of implementation, the automotive sector is the one that is best positioned due to its high drag effect.

In order to achieve an anti-cyclical effect, boost economic activity and employment already in the second part of the current year, the General State Budgets for 2021 foresee an investment of 27,000 million €. It seems that it will be 9,000 million € of the advance (13%) and 10,000 million € of the fulfillment of milestones and objectives that Spain will receive this year.

Energy transition and digitization account for a large part of the resources of the Recovery Plan (70%). The areas of action correspond to the European flagships with the ultimate objective of complying with the 2015 Paris Agreement.

The main lines of action of the plan correspond to urban rehabilitation and the deployment and integration of renewables, the infrastructure of the electric vehicle, green hydrogen, digitization (5G connectivity) and modernization and digitization of public administration, artificial intelligence and development of digital skills.

*Table 1 The programs driving investment [Esp21c]*

| <b>TABLE 2: The 20 programmes driving investment</b>                         | <b>€Bn 2021-23</b> |
|--|--------------------|
| 1. Safe, sustainable and connected mobility strategy                         | 13.20              |
| 2. Housing rehabilitation and urban renewal programme                        | 6.82               |
| 3. Modernisation of the public administration                                | 4.31               |
| 4. SMEs Digitalisation Plan  | 4.06               |
| 5. 5G roadmap  | 3.99               |
| 6. New Spain 2030 industrial policy and circular economy strategy            | 3.78               |
| 7. National Plan for Digital Skills  | 3.59               |
| 8. Modernisation and competitiveness of the tourism industry                 | 3.40               |
| 9. Development of the national science and innovation system                 | 3.38               |
| 10. Implementation and integration of renewable energies                     | 3.16               |
| 11. New care economy   | 2.49               |
| 12. New public policies for a dynamic, resilient and inclusive labour market | 2.36               |
| 13. Preservation of coastal areas and water resources                        | 2.09               |
| 14. Strategic plan for vocational training                                   | 2.07               |
| 15. Modernisation and digitalisation of the education system                 | 1.64               |
| 16. Conservation and restoration of ecosystems and biodiversity              | 1.64               |
| 17. Renewable hydrogen roadmap   | 1.55               |
| 18. Electrical infrastructure, smart networks and storage                    | 1.36               |
| 19. Renovation and modernisation of the health system                        | 1.06               |
| 20. National Strategy for Artificial Intelligence                            | 0.50               |

The main investments are those that refer to sustainability, connectivity, and sustainable mobility (of over 13 billion € in total. Rehabilitation of housing to improve energy efficiency and urban renewal (of almost 7 billion), which includes rental housing

program, the digitalization for SMEs (4 billion €), political industrial and circular economy (3.8 billion €), digital skill plan (3.6 billion €), the tourism plan (3.4 billion €), science and innovation boost (3.4 billion €) and Artificial Intelligence value chain.

The driving investment program 10 The implementation and integration of renewables has an endowment of 3.16 billion €, this investment program will be of special interest in this Master Thesis.

### 2.1.1. Energy levers and components

The Plan has four cutting- lines of action that serve as the backbone of all the levers and components. These four lines of action are reflected in policies with ten levers with great capacity to boost activity and, from the first phase of the Plan, facing 2023, to boost economic recovery in the short term and support a transformation process that increases the productivity of the Spanish economy and the potential for future growth.

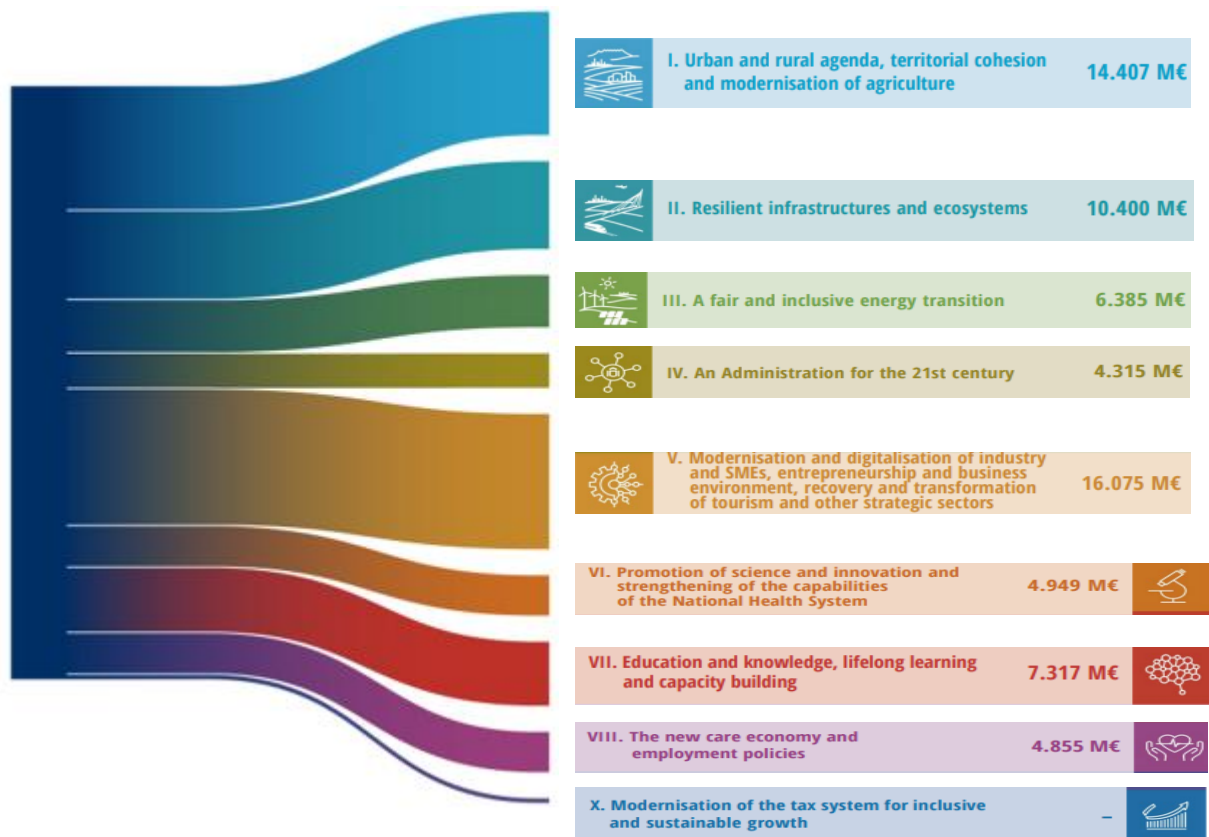


Figure 11 Shankey's diagram Lever policies Investment allocation

Shankey's diagram shows the investment allocation of the almost 70 billion mobilized in lever transfers. Of these, two are of interest for ecological transition projects.

### III. A fair and inclusive energy transition


|  | III. A fair and inclusive energy transition  | 6.38 | 9.2% |
|---|--|------|------|
|   | 7. Renewable energies implementation and integration   | 3.16 | 4.6% |
|   | 8. Electrical infrastructures, promotion of smart networks and deployment of flexibility and storage | 1.36 | 2.0% |
|   | 9. Renewable hydrogen roadmap and sectoral integration   | 1.55 | 2.2% |
|   | 10. Fair transition strategy   | 0.30 | 0.4% |

Figure 12 Lever policy III. A fair and inclusive energy transition. Source [Esp21c]

Leverage policy III refers to the deployment of renewables taking advantage of the great potential of our country. More than 6 billion are mobilized for this purpose.

Lever V is also related to energy transition, but in a more indirect way. In any case, the modernization of the industry ecosystem with an emphasis on the energy transition.

### V. Modernization and digitalization of industry and SMEs, entrepreneurship and business environment, recovery and transformation of tourism and other strategic sector.

The industry-services ecosystem needs to be modernized, with an emphasis on digitalization and energy transition, so that it can become more competitive and contribute to the Sustainable Development Goal. It is the lever policy to which more resources are allocated, just over 16 billion. The reorientation of the industry towards sectors with high added value that respond to the challenges of the future is essential.

|  | V. Modernisation and digitalisation of industry and SMEs, entrepreneurship and business environment, recovery and transformation of tourism and other strategic sectors | 16.07 | 23.1% |
|---|---|-------|-------|
|   | 12. Industrial Policy Spain 2030  | 3.78  | 5.4%  |
|   | 13. Fostering SME growth  | 4.89  | 7.0%  |
|   | 14. Modernisation and competitiveness of the tourism sector   | 3.40  | 4.9%  |

Figure 13 Lever policy V Source [Esp21c]

## Investment allocation by sector

Most of the money expected for energy transition will go to electric vehicle promotion, and energy efficiency on buildings, it is true that a significant part of the energy transition resources will go to the deployment of renewables and the circular economy.

More specifically, the current design of the plan foresees 7,500 million € will be allocated to energy solutions and the business of industrial assets.

These amounts will be broken down as follows:

- 1.4 billion to smart grids and distribution networks
- 1.6 billion to green hydrogen value chain
- 3.4 billion to development of RES energies which are not mature today

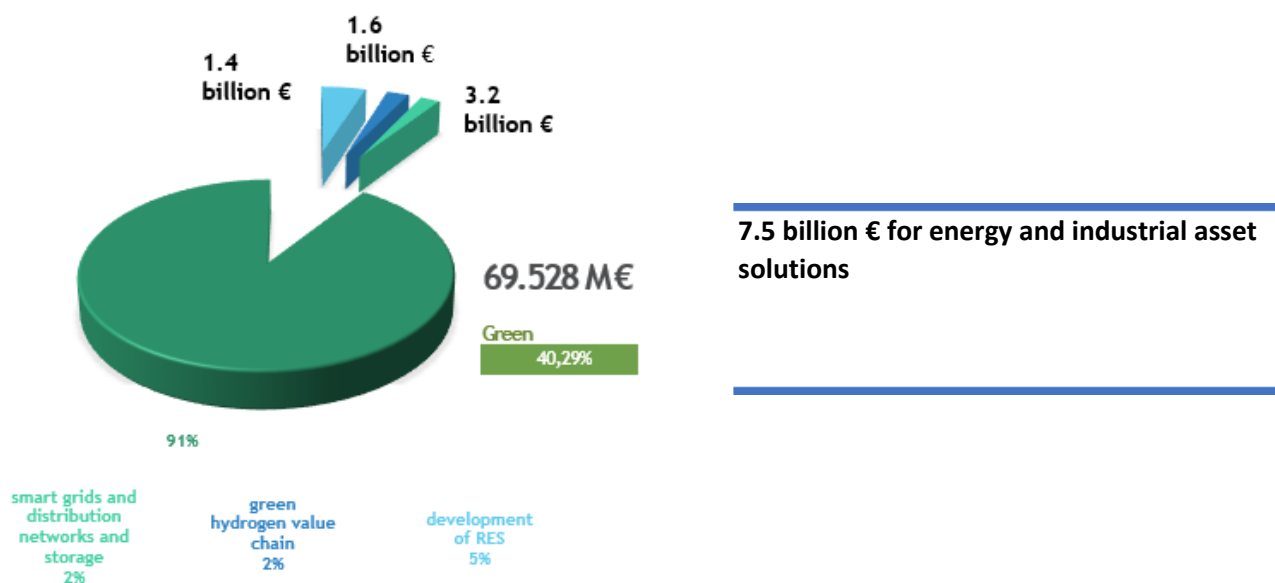


Figure 14 Investment allocation for energy and industrial asset solution

Additionally, the Ministry of industry will allocate 12 billion € for green transport, innovative and circular economy energy solutions, among these energy resources deserved special recognition lever V. Modernization and digitalization of industry and

SMEs, entrepreneurship and business environment, recovery and transformation of tourism and other strategic sectors.

## 2.2. The starting point of the ecological transition

A downward trend in greenhouse gas emissions has been observed since 2007, the starting situation allows one to be moderately optimistic. To contextualize the ecological transition, in Spain the energy sector represents 75% of greenhouse gas emissions, the deployment of renewables and integration in different sectors will be very important to achieve a drastic reduction in greenhouse gases and greenhouse gas emissions. pollutants to the atmosphere. The ecological transition will be an energy transition.

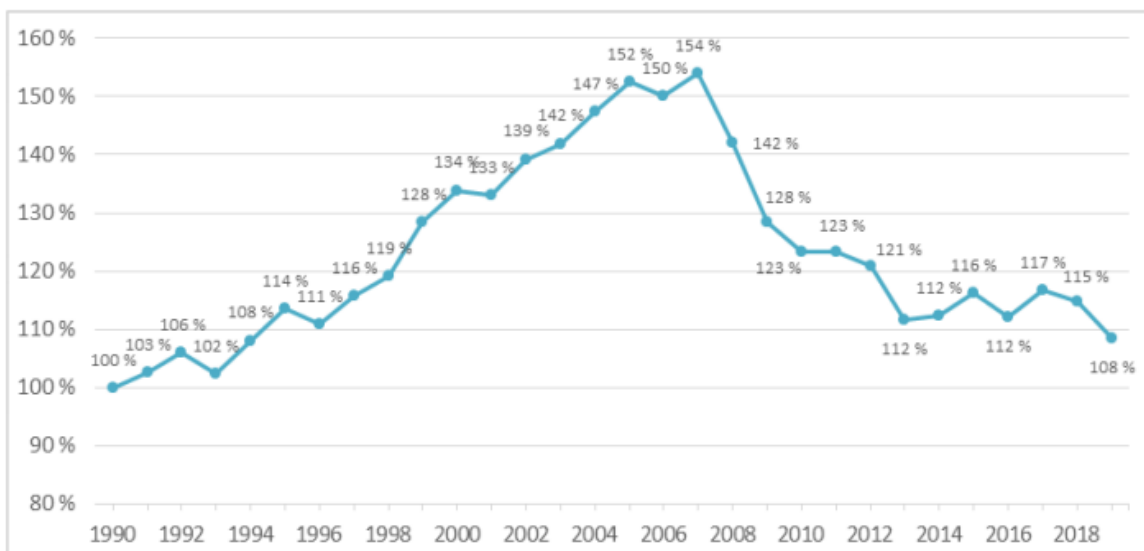


Figure 15 Index of evolution of the aggregate of emissions (1990: 100%) Source. [MIT20]

Gross emissions of greenhouse gases (GHG) at the national level fell by 5.6% compared to 2018, standing at 314.5 million tons of CO<sub>2</sub>-eq, in 2019. The total emissions represent a - 28.9% compared to 2005.

Table 2 Gross greenhouse gas (GHG) emissions Source. [MIT20]

|  | 1990    | 1995    | 2000    | 2005    | 2010    | 2015    | 2016    | 2017    | 2018    | 2019    |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Emissiones GEI (kt CO<sub>2</sub>-eq)</b> | 290.001 | 329.351 | 388.212 | 442.075 | 357.876 | 336.995 | 325.466 | 338.738 | 333.250 | 314.529 |
| <b>Variación respecto a 1990</b>             |         | 13,6%   | 33,9%   | 52,4%   | 23,4%   | 16,2%   | 12,2%   | 16,8%   | 14,9%   | 8,5%    |
| <b>Variación respecto a 2005</b>             |         |         |         |         | -19,0%  | -23,8%  | -26,4%  | -23,4%  | -24,6%  | -28,9%  |

### Total gross greenhouse gas emissions by sector

The objective of this Master Thesis is to detect which projects are eligible for funding, mainly those that allow the decarbonization of the industry and the residential sector (component 7, deployment and integration of renewables) will be analyzed.

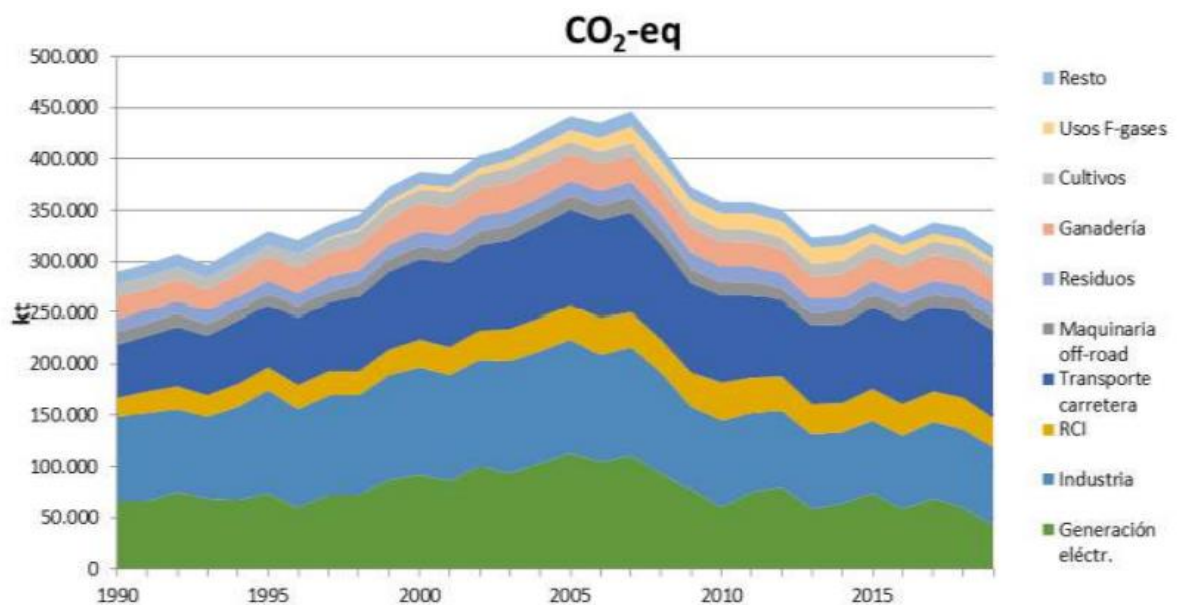


Figure 16 Sectorial evolution of emissions (1990: 100%) Source. [MIT20]

### ***2.2.1. Industry***

The industry sector represents 24.3% of total emissions (combustion and processes), in 2019 a small reduction of -0.7% is estimated.

Regarding the decarbonization of the industry, this sector is one of the most difficult to decarbonize.

The introduction of renewable energies in the industry contributes to moving towards the decarbonization of the economy and the use of competitive energy alternatives.

Electrification-substitution by systems that use electricity instead of fossil fuels in the case of thermal uses, the use of renewable sources –mainly biomass or green hydrogen.

### ***2.2.2. Residential sector***

Residential, Commercial, and Institutional (RCI) represents 8.9% of total emissions: the sector reduced emissions by 7.7% in a warm year, the sixth warmest since 1965.

In relation to the residential sector, the heat and cold networks will be analyzed.

## ***2.3. Component VII. Renewable deployment in the Spanish Recovery Plan.***

Refers to component VII. Deployment and integration of renewables. This implies the development of renewable electric energy generation, promotion of integrated renewable generation in the building, industrial and transport sectors, adequate territorial and environmental integration of renewables, promotion of thermal renewable energies, promotion of the industrial value chain, among others objectives.

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**€ 3,165 million directed to the deployment and integration of renewables**

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## **Technologies eligible for NGEU funds for the deployment of renewables**

The National Integrated Energy and Climate Plan (PNIEC 2021-2030) foresees a significant growth in the penetration of renewable energies in Spain, reaching 74% in the electrical field in 2030 and 42% on final use.

In the electrical field, mature renewable technologies, mainly solar photovoltaic and wind, are already economically competitive.

In addition to these mature technologies, which simply require predictability of income but not aid, given the state of technological development and the current insufficiency of market signals, there is a need to continue promoting technological developments, either in other sources of generation with high value added, such as the contribution to other factors such as the circular economy, either in solutions such as storage or hybridization that improve the manageability of renewable generation.

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**"Those immature technologies with great potential that maximize positive externalities and minimize negative ones will be eligible for funding"**

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The National Integrated Energy and Climate Plan includes a forecast of renewable electricity generation of 42% in 2020, 60% in 2025 and 74% in 2030, which represents an increase of approximately 60 GW of electricity generation capacity during the period 2021-2030

This Investment allows an early and accelerated approach to the needs identified for the deployment of renewables, their technological development and their integration both in productive sectors, buildings or the territory, in line with what is identified in the PNIEC Decarbonization Dimension. In this way, these additional investments that will be produced thanks to the recovery plan, will allow an accelerated technological evolution thanks to which many of the technologies that today cannot access the market without support, will be able to do so.

## **What types of investment will receive aid for the deployment of renewables?**

The aid programs will be aimed at different types of investment, which may include:

- Electricity self-consumption in industry and the service sector
- Electricity self-consumption in public administrations and individuals who do not carry out economic activity.
- Incorporation of electrical and thermal renewables in the agricultural sector.
- Use of thermal renewables in different sectors of the economy including the residential sector, and the option of using air conditioning networks with the use of renewable energies.
- Incorporation of thermal renewables in industrial processes and replacement of fossil systems in industry
- Innovative renewable facilities due to their integration into the territory, the environment, social participation or associated training and awareness activities.
- Deployment of hybrid installations on land connected to the network.
- Marine renewable pilot projects, with the possibility of including actions in port facilities.
- Development of bioenergy and its value chain, with special consideration for sustainability.
- Repowering, improvement and renewal of renewable projects

Of the different types of investment, those related to Utilities will be analyzed in the following section.

### ***2.3.1. Investment typologies for component 7: Incorporation of thermal renewables in industrial processes and replacement of fossil systems in industry and bioenergy development***

The technologies analyzed respond to the Government's criteria included in the Recovery Plan and the PNIEC information regarding the decarbonization dimension.

#### **Biomass**

According to estimates from the PNIEC, biomass will double the installed power in 2030, it seems to have the primacy in the short and medium term of the decarbonization of the industry.

Biomass is the name given to any organic matter of recent origin that has been derived from animals and plants because of the photosynthetic conversion process.

“Photosynthesis consists of the transformation of atmospheric CO<sub>2</sub> through sunlight into the carbon contained in plants. Therefore, when biomass is transformed into CO<sub>2</sub> to obtain energy (the reverse process of photosynthesis), only what had previously been fixed during plant growth is being returned to the atmosphere; hence it is said that net CO<sub>2</sub> emissions are zero. Coal and oil are also of plant origin, but their formation is not recent, so when we burn them, we emit the CO<sub>2</sub> that was captured millions of years ago into the atmosphere, contributing to a net increase in the current concentration of CO<sub>2</sub> in the atmosphere. Biomass is any material with high carbon content of plant and animal origin, such as wood from forests, residues from agricultural and forestry processes”

#### **Gregorio Marbán (National Coal Institute, INCAR-CSIC)**

The dependence on biomass as the main source of energy occurs in a large number of countries. The problem of biomass is the excessive use that does not allow replacement, which is why the environment is degraded (reduction of water resources, deforestation, less biodiversity).

One of the advantages of biomass and that makes it so interesting for decarbonization, especially industrial, is that the gases produced in combustion have a lower proportion of sulfur.

The use of biomass to produce electricity in thermal power plants reduces CO<sub>2</sub> and sulfur compound emissions.

The added value of biomass in addition to its use as renewable thermal energy is the revitalization of the rural environment, remember that one of the axes of the Plan is social and territorial cohesion, which makes it a very interesting technology, it can help the transition fair.

The management and use of biomass entail elements of added value in addition to its exclusively energy potential. In particular, biomass allows the revitalization of the rural environment and mitigate the risk of depopulation, as well as favor a better adaptation of certain territories to the effects of climate change. Biomass can also play an instrumental role in the just transition area.

### **Waste recovery**

Directive 2008/98 / EC of the European Parliament and of the Council establishes a legal framework for the treatment of waste in the European Union. Its objective is to protect the environment and human health by preventing the harmful effects of waste production and management. According to this directive, in order to better protect the environment, member states must adopt measures to treat waste in accordance with the following hierarchy of priorities:

- Prevention
- Preparation for reuse
- Recycling
- Other type of recovery, for example, energy recovery
- Elimination



*Figure 17 Waste recovery plant*

Recovery is defined as any operation whose main result is that the waste serves a useful purpose. The recovery includes all those circuits that allow the use of the resources contained in the waste and can be material or energy.

According to the Court of Justice of the European Union, an operation can be considered energy recovery when the waste replaces other materials that would have been needed to produce energy, when the energy obtained is greater than that consumed and most of it is used in the form of heat or to produce electricity.

Energy recovery is a very interesting technology due to the relevant role it can play in the circular economy and the decarbonization of one of the most difficult sectors to abate (industrial).

### **Biogas and Biomethane**

Biogas can play a very relevant role in the circular economy and the use of renewable energy.

It can be obtained from:

- Livestock and agro-industrial waste
- Urban wastewater treatment plants
- Organic fraction of urban solid waste

It can be used in mobility, electricity generation or heat and power systems.

Biogas can be used directly in a boiler adapted for combustion or transformation into biomethane in existing natural gas infrastructures.

The Government's commitment to this technology is clear, the Biogas Roadmap was recently published, which aims to deploy biogas in Spain, this renewable gas can play a very relevant role in the circular economy and as a thermal renewable one.

Biomethane or renewable gas is a combustible gas with a high concentration of methane, which is obtained from biogas or syngas (or synthesis gas), which have a methane content below 70%, this element being the one that gives it the characteristic of fuel.

Its main characteristics are:

- Chemical composition and energy power very similar to natural gas, so it can be used for the same uses:
  - Injection into the gas network: mixed with natural gas to be used in the heating and transportation sectors.
  - Production of electrical energy.
- 100% renewable, since the biogas or syngas from which it comes, can originate from biological waste, energy crops, sewage sludge or domestic and industrial organic waste.
- Contributes to the development of the circular economy as a sustainable alternative to waste treatment.
- It favors the energy transition, thus contributing to the constitution of a decarbonized energy system to meet the EU's emission reduction targets.

For these reasons, biomethane is promoted as one of the energies of the future, due to the technical potential available in the national territory.

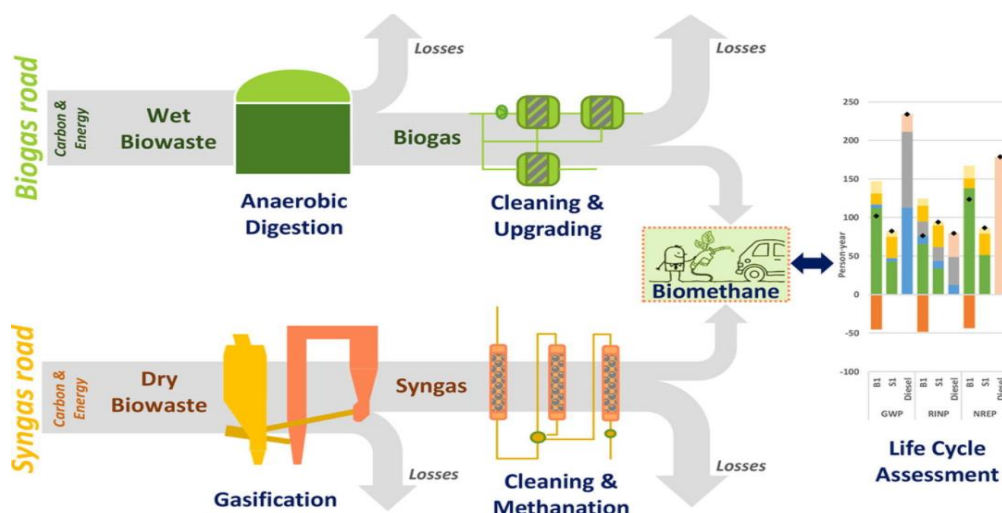


Figure 18 Biogas to Biomethane process. Source An LCA study on biogas and syngas roads

### 2.3.2. Investment typologies for Component VII: Use of thermal renewables in the residential sector

Energy consumption for thermal uses in 2015 in Spain accounted for more than 33% of total final energy consumption. In that same year, the contribution of renewable energies within the consumption of heating and cooling was around 16.8%. In order to achieve the objectives of this Plan, it will be necessary to double this contribution in 2030. The revision of the Renewable Energies Directive establishes that the Member States must take the necessary measures to increase the share of renewable energies in the consumption of heat and cold by 1, 3% per year from the value reached in 2020 (1.1% if residual heat is not considered.) Mainly, in everything related to the development of heating and cooling networks.

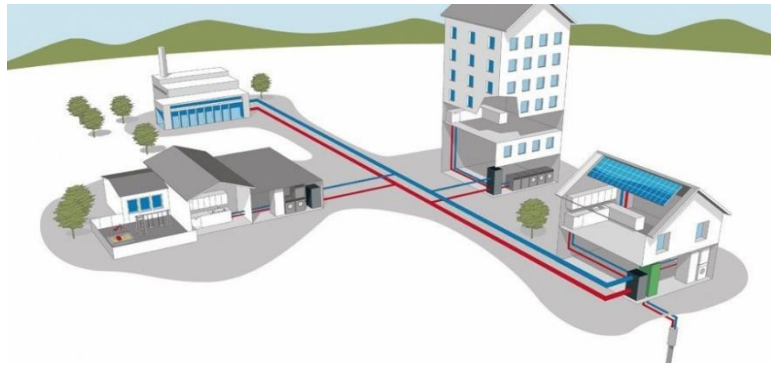
#### District Heating

It is the centralized production of heat and cold, which through a system of networks that transport thermal fluids, satisfy the demand for heating, sanitary hot water and cold, for those users who are connected through said network system.

One of the main benefits of said heat and cold networks is to increase energy efficiency in generation, integrating renewable energies (biomass, geothermal, solar thermal,

etc.), local resources that would otherwise be lost (natural cooling, heat or cold leftover from nearby industry, combined heat and cold, etc.), and high-efficiency production systems.

All of the above, together with an optimal fit in the generation-demand binomial, and continuous management and maintenance by professionals, contribute significantly to the objective of reducing energy consumption, carbon dioxide emissions, and pollution. air supply and the valued security of supply.



*Figure 19 Centralized production of Heat and Cool*

The heat and cold networks will play a fundamental role in the decarbonization of the residential sector.

### ***2.3.3. Investment typology of component VII: Deployment of hybrid ground installations connected to the grid.***

It is understood as those facilities that combine two or more renewable generation or storage technologies.

Hybridization will facilitate the massive integration of renewables in the electricity system, 74% of the technological mix of renewable electricity generation in 2030 according to the objectives of the PNIEC, optimizing the use of connection points and network permits by generators.

Advantages of hybridization:



- Better use of available network connection capacity
- More efficient use of the network and will facilitate the connection of new power at the node.
- At an environmental level, it reduces the project's footprint by concentrating renewable generation.

During the decade 2021-2030, approximately 22 GW of renewable electrical power will have exceeded their regulatory useful life and hybridization can provide a specific plan for the technological renewal of these projects.

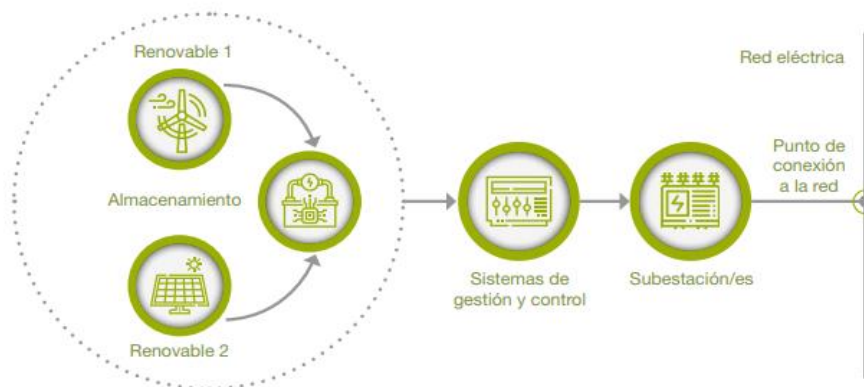


Figure 20 Hybridation technologies

## 2.4. Component IX. Green hydrogen: A country project

Green hydrogen will often be linked to the deployment of new renewable electricity generation as a source of the electrolysis process, together with energy storage systems. To the extent that they are specifically linked to the production of renewable hydrogen, the new renewable electricity generation facilities may be part of Component 9.

Given the strategic importance of hydrogen, it has been assigned an exclusive component, which aims to position Spain as a technological benchmark in the production and use of renewable hydrogen, creating innovative value chains. To this end, it is planned to reinforce the existing value chain, based on SMEs (small and

medium-sized enterprises) and technology centers, build on it a large-scale renewable hydrogen production and sectoral integration cluster and structure it territorially with pioneering projects. Ultimately, the national value chain and knowledge centers must be integrated into the European value chain through participation in community initiatives such as the IPCEI (Important Project of Common European Interest) for hydrogen.

The green hydrogen, which is obtained from renewable electricity surpluses, is an energy vector for the future and a key solution for storing energy from renewable sources. In addition, it has multiple applications as it can be used in all energy sectors (industry, mobility, domestic-commercial and electricity generation).

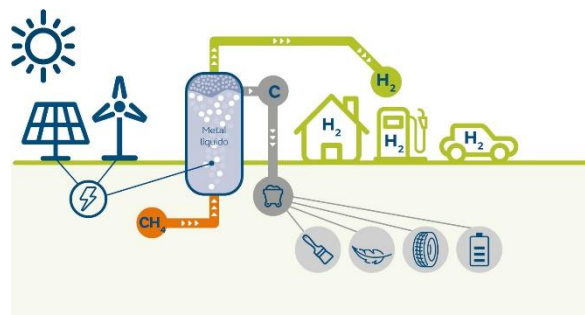


Figure 21 Hydrogen production from natural gas pyrolysis

Hydrogen can only be considered a renewable gas when it is obtained using 100% renewable electrical energy, through processes such as the electrolysis of water. The use of 100% renewable hydrogen contributes to a double objective: on the one hand, to reduce local pollutant emissions and greenhouse gases throughout the production and use cycle; on the other, take advantage of surplus electricity from renewable sources at times of low demand.

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**Green hydrogen has become the government's main commitment to decarbonize those sectors in which it is not possible to electrify**  
**€ 1.555 billion**

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On the path of decarbonization of the economy, there are technologies that are currently not technologically mature or at the market level and that have a high potential to contribute in the future to decarbonization, competitiveness and the technological and industrial positioning of the country and the European Union. by

creating innovative value chains. In this case, it seeks to promote technological knowledge, the deployment of infrastructure and the use of renewable hydrogen, as a replacement for the fossil hydrogen currently used in industry, as well as an energy vector that allows energy storage.

## ***3. Governance and participation instruments***

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In this chapter it presents the governance structure and government instruments used in the context of European funds to involve the maximum number of public and private actors.

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### ***3.1. Governance structure***

The urgency derived from the current situation and the effectiveness of the Plan requires having agile execution and control instruments, as well as a governance that ensures transparency, coherence of actions and their continuity over time, through a governance structure that guarantee

- (i) a participatory process to incorporate the proposals of the main economic, social and political agents,
- (ii) cooperation and coordination between different levels of government and administration
- (iii) the designation of a managing authority in accordance with the regulatory requirements of the Recovery and Resilience Mechanism.

In accordance with the provisions of Royal Decree-Law 36/2020, of December 30, which approves urgent measures for the modernization of the public Administration and for the execution of the Recovery Plan, the governance model is organized as follows:



Figure 22 Next Generation funds Governance Structure

### I Commission for Recovery, Transformation and Resilience

The monitoring of the plan and the powers of development and execution correspond to this body, in addition to other activities decided by the Council of Ministers in accordance with the provisions of Royal Decree-Law 36/2020.

#### II Technical Committee

It will act as a support body for the Commission, carrying out reports and analyzes required by the Commission, supporting the authority responsible for the Recovery Mechanism; approve the guidelines, procedure manuals or standard models of bidding documents, bases for calls for subsidies, grants or agreements or approve recommendations or guidelines on the adoption of computer or digital tools.

The Committee is made up of 20 Administration professionals, their choice must respond to technical criteria based on skills and experience in managing European funds.

#### III. Sectorial Conference of the Recovery Plan, with Autonomous Communities and Cities

Our country has a decentralized system, and it is especially important to channel governance between the different levels of administration. Cooperation and coordination mechanisms are established in the implementation of the Plan between different territories.

The Commission of Coordinators of European Funds is created, which will bring together those responsible for this matter from the different administrations and will also serve for multilevel coordination and collaboration in the development of the Plan.

The already created State Sector Conferences and the Autonomous Communities will contribute significantly to the development of the Plan, acting as monitoring and multi-level cooperation bodies.

#### *The XXIV Conference of Presidents of Salamanca*

At the end of July of this year the Sectorial Conference with the regional leaders took place in Salamanca, it seems that the autonomy will channel a large part of the funds but the corresponding decisions to the Central State.

The communities will manage 55% of the European funds that Spain incident in 2021, Spain incident 19 billion, so the Autonomous Communities will receive just over 10 billion.

#### IV. General Secretariat of European Funds

Attached to the Ministry of Finance, as the authority responsible for the Recovery Plan before the European Commission.

The General Directorate of European Funds is reinforced with the new General Directorate of the Recovery and Resilience Plan and Mechanism.

This unit will be in charge of developing the Plan and coordinating with the other Ministries, and the rest of the actors involved in the Plan. All of this is especially important for effective deployment. Let us remember that a series of milestones and objectives must be met in order to receive European funds, unlike previous funds.

The Ministry responsible for the component will be responsible for promoting the measures aimed at achieving milestones and objectives, through the execution of projects according to budget.

Incardination of the execution of the Plan in the General Budgets of the State will be subject to the control of the General Intervention of the State Administration.

In order to ensure the success of the Plan, a monitoring system will be established to provide information for the purposes of decision-making and, ultimately, of the result obtained. In its configuration, two basic levels can be distinguished.

The Government also approved the appointment of Mercedes Caballero as Secretary General of European Funds.

V. Authority Responsible for Mechanism for Recovery and Resilience

The General Intervention of the State Administration (IGAE by its acronym in Spanish) has long experience in the control of European funds, with independent status. It has the role of audit authority for European funds and Next Generation.

VI Monitoring Unit for the Plan

A Recovery Plan Monitoring Unit will be set up in the Department of Economic Affairs and G20 of the Cabinet of the Presidency of the Government, which will monitor the Recovery Plan, in order to keep the President of the Government informed directly and continuously.

Manuel de la Rocha will be the new Secretary General for Economic Affairs of the Presidency of the Government, which is why he rises in the organization chart of the Presidency of the Government, reinforcing his powers, before the management that he will carry out from the European Funds.

**Presidency Governance structure**



Figure 23 President Org Chart, Source [AG]

Within the scope of the functions assigned to the Cabinet of the Presidency of the Government, it is responsible for advising and providing the information of an economic

nature that is necessary for the exercise of the functions of the President of the Government. It will also monitor the Recovery Plan, playing a very relevant role in its development and execution.

## ***3.2. Participation instruments***

### ***3.2.1. Consultation process: Call of interest***

Given the enormous scope and transformative capacity of the Plan, the Government has tried to involve the maximum number of public and private actors through dialogue and collaboration. The contribution of the different public institutions, political groups, social agents and the business fabric will allow the design of the most effective reforms and investments in the achievement of the strategic objectives.

In both the regulatory frameworks and investment reforms, consultation with the business community has been crucial and has allowed for the design of the Plan that is more in line with the reality of the country.

The appearance of Expressions of Interest is an instrument not previously used in our country, inspired by consultation procedures of the European Union (a tool commonly used in the EU).

The main objective is to attend to the diversity and characteristics of the economic agents when designing the plan. The Expressions of Interest have been convened by lines of action, each Ministry depending on the type of MDI was the competent one, these have been convened in a coordinated manner and with a common pattern by the different Ministries.

The participation of the business community has been very high, giving a very broad response to this initiative, which implies a greater knowledge of the reality of the country when designing the Plan.

The different Ministries have been launching expressions of interest (MDI), these consultations have been very useful since they have allowed us to consider the diversity and characteristics of the projects.



The main objective is to prevent a major mismatch between the needs of the companies and the Plan's investments.

24 expressions of interest related to the Plan have been published following the requirements of the European Commission, in addition, a common format and criteria have been followed.

There has been a great response from companies, almost 18,000 submitted from the set of expressions of interest launched.

The expressions of interest have been very useful in directing the calls to those areas in which there are more mature projects and with the best guarantee of achieving results, in addition to accelerating initiatives and ideas that have crystallized into specific projects.

There is a perception that many of these projects will be a reality in the next few years beyond being finally financed by NextGenerationEU, although the funds will go to those projects with great potential that are not yet mature enough.

The following are of special interest because they are related to energy transition:

- (i) Renewable hydrogen (linked to component 9 of the PRTR)
- (ii) Local energy communities (linked to component 7 of the PRTR)
- (iii) Sustainable energy in the Islands (linked to component 7 of the PRTR)
- (iv) Renewables (linked to component 7 of the PRTR)
- (v) Infrastructures, networks and storage (linked to component 8 of the PRTR)
- (vi) Circular Economy in the field of the Company
- (vii) Tractor projects to face the demographic challenge and the fight against depopulation

### ***3.2.2. Strategic projects for economic recovery and transformation (PERTE)***

The PERTEs are strategic projects with great potential that are not yet competitive, the idea is to give them that last push through public investment. These projects have a great dragging capacity, that is, they have a very high multiplier effect and an integral vision of the value chain, in which specific projects are integrated that make up a program around a specific and defined objective and that will have a significant number of companies and administrations involved (In this type of strategic projects we seek to bring together a diverse group of public and private actors; companies, academic institutions, local or regional entities)

They are a new figure created in the context of European Next Generation funds, seeking to promote complex projects in which there is a clear market failure (their execution generates high positive externalities). This type of project, due to its great impact, has the capacity to transform the economy.

To carry them out, it is necessary to define a unique governance in favor of the transparency that the public administration requires, they are very complex projects in which the size and number of actors potentially involved in the PERTE recommends this regulation.

Likewise, all interested entities must sign a series of common standards for their accreditation in the new State Registry of entities interested in PERTE.

The PERTEs are approved by the Council of Ministers based on objective and transparent criteria.

The criteria for declaring a PERTE are:

- Important contribution to economic growth and employment,
- Knowledge combination
- Experience
- Resources and actors to remedy market failures
- Innovative character and added value in R + D + I

- Assume a high technological or financial risk
- Integration and growth of small and medium-sized companies

Projects with disruptive and ambitious research and innovation phases, beyond the state of the art in the sector, followed by a first industrial deployment.

The PERTEs, therefore, will bring together the commitment of different ministries involved in their development, under the leadership of the competent sector ministry. And within the strategic and transversal approach, these will be approved in the Council of Ministers.

The Council of Ministers of July 13, 2021 approved the launch of the first PERTE, the one dedicated to the Electric Vehicle. The rest of PERTE will be approved throughout the Plan's execution period.

### 3.3. Calls in the context of the European funds

The different public bodies dependent on the General State Administration, the Autonomous Communities and Town Councils publish calls for tenders and grants, the award of which is regulated by the Law on Public Sector Contracts and by the General Law on Grants.

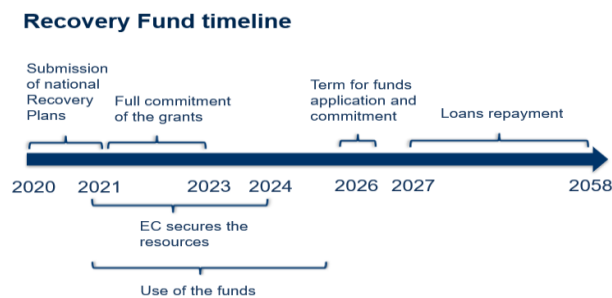


Figure 24 European Funds Timeline

One of the greatest challenges facing the Administration is the management of so many resources and the obligation to reach the companies in a short time. 19 billion have been approved for Spain in 2021, the third and fourth quarter expects a large number of calls, to date these are some of the main ones in energy transition:

Electric mobility

*MOVES SINGULAR PROJECTS II*

Grants for innovative projects related to electric vehicles (100 million €)

*MOVES III*

This is help for the purchase of the electric vehicle (400 M€)



*Figure 25 Electric vehicle*

The following section provides the specific website of the Recovery Plan where the calls can be consulted.

### ***3.4. Information dissemination***

A section has been set up on the website of the Presidency of the Government, dedicated to disseminating all the available information on the objectives and news related to the preparation of the Plan. Likewise, once the Plan has been approved by the European Commission, a specific web portal on the Recovery Plan has been developed

which will include information on the Plan, the programs, calls and projects that are being launched, with the. The purpose of serving as the main and unified information portal and facilitating access to the possibilities of participation to the target audience. In this sense, it is constituted as a specific investment of the Plan itself, since it involves the development of a key instrument to ensure the implementation of progress, implementation, monitoring and participation.

Web portal of the Recovery Plan, which serves as a means capable of centralizing and channeling the distribution of all the information on the same destined to the different potentially interested agents (companies, individuals and Administrations), which will increase the concurrence.

Likewise, the different Ministries associated with any component of the Plan have a section dedicated exclusively to the Recovery, Transformation and Resilience Plan.

Websites:

### Presidency of the Government

<https://www.lamoncloa.gob.es/serviciosdeprensa/notasprensa/presidencia/Paginas/2021/210721-web-recuperacion.aspx>

The screenshot shows the top navigation bar of the La Moncloa website. It includes the Spanish flag, the text 'GOBIERNO DE ESPAÑA' and 'PRESIDENCIA DEL GOBIERNO', the logo for the 'Plan de Recuperación, Transformación y Resiliencia', and the 'La Moncloa' logo. There is a search bar with the text 'Buscar ...' and a 'Contactar' link. Below the navigation bar, there is a breadcrumb trail: 'Está usted en: Inicio > Prensa > Actualidad > Presidencia del Gobierno'. The main content area features a blue button labeled 'Escuchar' and social media sharing options for 'Enviar', 'Imprimir', and 'Compartir en' (Facebook and Twitter). The headline reads: 'Planderecuperacion.gob.es, nueva página web del Gobierno con información sobre el Plan de Recuperación, Transformación y Resiliencia'. The date is 'Miércoles 21 de julio de 2021'. A blue box contains the text: 'El Gobierno de España ha publicado hoy una [nueva página web informativa](#) dirigida a ciudadanos, autónomos, pymes, empresas y organizaciones interesadas en acceder a los fondos del Plan de Recuperación, Transformación y Resiliencia.'

Figure 26 MITECO Recovery Plan webpage

## Specific website Recovery Plan

<https://planderecuperacion.gob.es/>

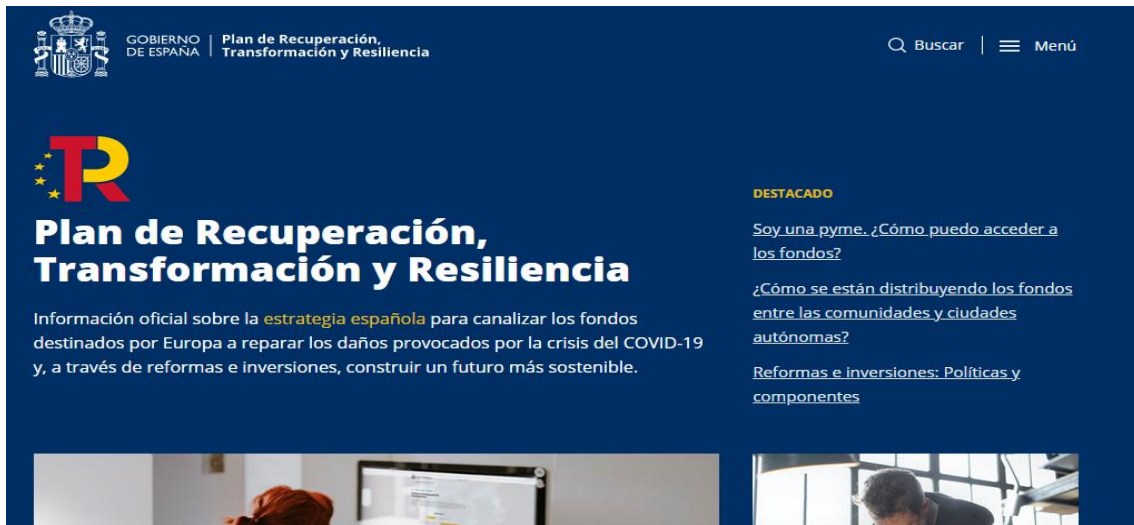


Figure 27 MITECO Recovery Plan webpage

## Ministry of Industry, Commerce and Consumption

<https://www.mincotur.gob.es/es-es/recuperacion-transformacion-resiliencia/Paginas/plan-recuperacion-transformacion-resiliencia.aspx>



Figure 28 MITECO Recovery Plan webpage

Ministry of Ecological Transition and Demographic Challenge

<https://www.miteco.gob.es/es/ministerio/recuperacion-transformacion-resiliencia/default.aspx>



Figure 29 MITECO Recovery Plan webpage

## 4. Criteria for prioritizing projects eligible for funding

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The lack of a public methodology in the context of European funds makes it necessary to establish a prioritization criterion to give certainty to companies.

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To identify the best investment opportunities, we will build on the analysis by Hepburn et al. (2020). It is a comprehensive and rigorous analysis of fiscal recovery archetypes across four dimensions: speed of implementation, economic multiplier, climate impact potential, and overall desirability.

Hepburn's analysis is transferred to the Next Generation funds, taking into account the objectives of the Recovery Plan, characteristics of the Spanish economy and the degree of maturity of the project.

The different projects will be analysed based on six criteria compatible with the aforementioned objectives:

1. **Economic impact:** Recovery packages should maximize short-term job recovery. This will be valued using employment data generated by the project in construction and maintenance, greater weight will be given to employment related to Capex.

A low impact implies a net loss. A high impact implies an increase in output that is a number of times greater than expenditure

- Left-hand quadrant: low (stimulus completely crowds-out private activity)
- Middle of the figure: high
- Right-hand quadrant: very high (stimulus crowds-in significant additional private activity)



2. **Environmental impact:** The main objective is the reduction of emissions; the projects will have to maximize the savings of emissions. To do this, it will be considered annual tn / CO2 estimation made by the person in charge of the project.

It will be considered the relative potential impact of each project on reducing greenhouse gas emissions if enacted

3. **Territorial and social cohesion:** One of the axes and pillars of the Recovery Plan is social and territorial cohesion, due to the characteristics of our Country, great inequalities are generated between territories. One of the most urgent European recommendations to Spain is to tackle the problem of the great heterogeneity of our territory. In this section, the improvement in depopulation and just transition will be assessed.

Social and territorial cohesion: We classify the actions as low, medium and high, following our own criteria.

4. **Resilience:** Energy dependence can be defined as the amount of primary energy that a country needs to import in order to supply itself, a more resilient country will have less dependence. This criterion will incorporate Economic resilience: reduction in external energy dependence and Climate resilience: ability to face future climate threats.
5. **Degree of maturity of the project:** It is related to the life cycle of the project or expression of interest and indicates in which phase it is, an initial phase indicates that it cannot be executed in the short term. One of the requirements of the funds is to have a project ready to receive the aid. In order to determine the degree of maturity, some form of expressions of interest have been created with a series of metrics (the model of the MDI form is shown below).
6. **Alignment with the driving policies and energy components of the Spanish Recovery Plan:** Alignment of the projects with the pillars, levers and energy transition components of the Recovery Plan.

## ***4.1. Systematization of project information: Call of Interest Sheets (MDI)***

Call of interest document is intended to serve as a guide for the evaluation of the different call of interest (MDI) presented and as an instrument to help decision-making in the projects that are finally presented.

The MDI files has been created to collect the relevant information for each dimension of the criteria for prioritizing energy transition projects.

Systematizing the information allows us to use the same criteria for all projects and compare them with each other.

The document must be filled in by the responsible for the call of interest (projects).

The document covers all the dimensions of the criterion and is structured as follows:

The MDI files are made up of 8 sections:

- Project general description:
- Actors participating in the project (Consortia)
- Status and characteristics of the project
- Economic impact (employment generated in construction and maintenance)
- Resilience
- Environmental impact (tn / Co2)
- Budget
- Next actions to develop.

Table 3 Model information document MDI

|                               |
|-------------------------------|
| <b>Call of interest (MDI)</b> |
|-------------------------------|

|                              |              |
|------------------------------|--------------|
| <b>Title of the project:</b> |              |
| <b>MDI applied:</b>          | <b>date:</b> |

|  |
|--|
| <b>1. General description of the project and justification</b>   |
| <b>1.1 Description of the starting point, needs and challenges that justify it</b>                                 |
|  |
| <b>1.2 Economic, legal, environmental and social viability. Barriers or difficulties</b>                           |
|  |
| <b>1.3 Is there an impact on social and territorial cohesion? Indicate low, medium, high and brief explanation</b> |
|  |

|   |
|---|
| <b>2. Actors involved in the definition and execution: Consortium, main partners or collaborators</b> |
|   |

|   |
|---|
| <b>3. Status and characteristics of the project</b> Indicate if it meets any of the following characteristics |
| <b>3.1 Features</b>   |
| <input type="checkbox"/> Has customer approval <input type="checkbox"/> Committee has passed                  |
| <input type="checkbox"/> SPV (Special Purpose Vehicles) <input type="checkbox"/> Detailed budget              |

|   |  |   |
|---|--|---|
| <b>3.2 Degree of maturity:</b> Indicate in which phase it is  |  |   |
| <input type="checkbox"/> Preliminary studies  | <input type="checkbox"/> Purchasing Process  | <input type="checkbox"/> Start of civil works |
| <input type="checkbox"/> Detail engineering   | <input type="checkbox"/> Basic engineering   |   |
| <b>3.3. Alignment with the driving policies and energy components of the State Recovery Plan:</b>                   |  |   |
| <input type="checkbox"/> Sustainable, safe and connected mobility crash plan in urban and metropolitan environments | <input type="checkbox"/> Deployment and integration of renewable energies  |   |
| <input type="checkbox"/> Housing rehabilitation and urban regeneration plan   | <input type="checkbox"/> Electrical infrastructures, promotion of smart grids and deployment of flexibility and storage. |   |
| <input type="checkbox"/> Industrial Policy Spain 2030   | <input type="checkbox"/> Renewable hydrogen roadmap and its sectoral integration   |   |

|  |
|--|
| <b>4. Short and long-term economic impact and carry-over effect (value chain)</b> Indicate low, medium, high and explain briefly |
|  |

|  |
|--|
| <b>5. Improved resilience<sup>1</sup> economic and climatic</b> Indicate low, medium, high and explain briefly |
|  |

|  |
|--|
| <b>6. Environmental impact tCo2 / year</b> |
|  |

| 7. Budget and planned financing                 |      |      |      |      |      |      |       |
|---|------|------|------|------|------|------|-------|
| TOTAL PROJECT                                   | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Total |
| Total budget (thousand €)                       |      |      |      |      |      |      |       |
| Paid by the promoter (%)                        |      |      |      |      |      |      |       |
| European recovery funds <sup>2</sup> (%)        |      |      |      |      |      |      |       |
| Other European funds (specify) <sup>3</sup> (%) |      |      |      |      |      |      |       |
| Other funds (specify) (%)                       |      |      |      |      |      |      |       |

| 8. Next development steps according to the person in charge of the MDI |  |
|--|--|
| Actions to develop   |  |
| 2021   |  |
| 2022   |  |

The main information of the MDI sheets, completed by those responsible, is found in tables 4.1 and 4.2.

## ***4.2. Application***

In this section, 9 archetypes of energy transition projects have been analyzed in order to identify which are eligible to European funds across six dimensions: maturity, economic impact, potential for climate impact, resilience and territorial social cohesion.

The main challenge for European funds is to reconcile the recovery of employment and economic activity in the short term, after the coronavirus crisis, with the selection of investments that are profitable, effective to move towards decarbonisation and that are aligned with the strategic or long-term objectives of the economy.

An unprecedented amount of resources will be mobilized in the coming months and the business fabric requires certainty to refine its investment decisions.

The objective of this master's thesis is to offer a guide in energy transition projects so companies can ensure the best allocation of resources to access funds.

### ***4.2.1. Decarbonization projects included in the assessment***

A set of 9 archetypes of energy transition projects, in the context of European funds they are called expressions of interest, - 7 renewable deployment and integration in different sectors (E, A, C, D, F, I, B), 1 Hydrogen green (H) and 1 Sustainability islands (G). Project D corresponds to two components: 7 renewables deployment and integration in different sectors and component 12 Industry Policy (circular economy).

The projects chosen are energy transition projects related to Utilities. Likewise, a review of the literature on green technologies that will allow the energy transition has been carried out.

The projects have been chosen considering the following criteria:

- Projects must be relevant to decarbonize, mainly industry or residential sector.
- Projects must be aligned with the driving policies of the Recovery Plan.

- Projects must be compatible with the decarbonization dimension of the Integrated National Energy and Climate Plan
- The projects must be compatible with the energy components.

*Table 4 Full description of energy transition projects included in the study*

|   |   |
|---|---|
| <p><b>A Hybridization</b></p> <p>Corresponds to component 7, I1.<br/>Deployment of renewables and integration in sectors</p>  | <p><b>F Biomethanization</b></p> <p>Corresponds to component 7, I1.<br/>Deployment of renewables and integration in sectors</p> |
| <p><b>B Biomass to Biochar</b></p> <p>Corresponds to component 7, I1.<br/>Deployment of renewables and integration in sectors</p>   | <p><b>G Geothermal</b></p> <p>Corresponds to component 7, I2.<br/>Sustainability in the Islands</p>                             |
| <p><b>C Forest biomass</b></p> <p>Corresponds to component 7, I1.<br/>Deployment of renewables and integration in sectors.</p>  | <p><b>H Green hydrogen.</b></p> <p>Corresponds to component 9.<br/>.</p>  |
| <p><b>D Waste recovery</b></p> <p>Corresponds to component 7, I1.<br/>Deployment of renewables and integration in sectors and Component 12 Industrial Policy (Circular Economy)</p> | <p><b>I Organic biomass</b></p> <p>Corresponds to component 7, I1.<br/>Deployment of renewables and integration in sectors</p>  |
| <p><b>E District Heating</b></p> <p>Corresponds to component 7, I1.<br/>Deployment of renewables and integration in sectors</p>   |   |

### ***4.2.2. Information provided by the MDI sheets regarding energy transition projects for subsequent analysis adapted from Hepburn et al (2020)***

Tables 5 and 6 summarize the data from the MDI files. It is observed that the information covers all dimensions with the exception of resilience, however this dimension appears in section 5 of the MDI file.

The environmental and economic impact, the central metrics, have been analyzed considering the estimations of those responsible for each MDI, since they are the ones who know the project best.

Another of the most important dimensions is the degree of maturity. It is determined considering the following elements of the MDI sheets:

- Consortium
- Project features
- Project life cycle
- Next actions to be developed
- Social and territorial cohesion as well (depopulation and just transition)

This prioritization criterion makes it possible to assess and compare various Call of Interest at a glance.

In annex 1 the files of the different calls of interest can be consulted.



Table 5 Summary MDI summative metrics

| Criterion used           | MDI                          |   |                   |                               | MDI Manager  |   |
|--------------------------|------------------------------|---|-------------------|-------------------------------|--|---|
| MDI                      | Environmental impact tn/ Co2 | Economic Impact ( n <sup>a</sup> workers) | Consortium        | Cohesion social / territorial | Features   | Upcoming Actions to develop   |
| Waste recovery D         | 43000                        | High in Opex, medium Capex                | Very consolidated | Just transition               | <input checked="" type="checkbox"/> He has passed committee (AN yes)   | 2021 Basic Engineering Development<br>Grant search (currently under study Large-Scale Innovation Funds).  |
| Heat and cold networks E | N / A                        | 12 Opex, 100 Capex                        | Consolidated      | Low income area               | <input checked="" type="checkbox"/> Has the client's approval <input checked="" type="checkbox"/> Has passed a committee | 2021 Development of basic engineering (CAPEX) and signing of the contractual modification 2022 Processing of licenses and start of work   |
| Biomass organic I        | 10500                        | 4 Opex, 200 Capex                         | Medium-high       | Rural area <5000 inhab.       | <input checked="" type="checkbox"/> Has customer approval  | 2021 Processing of the environmental license to obtain final requirements<br>Capex update required<br>Required packages and scopes configuration<br>Preparation of the binding economic proposal for the sale of steam to customer 2022 Contract negotiation customer<br>Project start phase: detail engineering and construction |
| Hibridization            |                              |   |                   | Rural area <5000              | <input checked="" type="checkbox"/> Has customer approval <input checked="" type="checkbox"/> Detailed budget            | 2021 We are developing the technical-economic proposal and the 2022 Business Plan Execution of the project  |

Table 6 Summary MDI summative metrics

| Criterion used                | MDI                          |  |                                 |            | MDI Manager  |  |
|-------------------------------|------------------------------|--|---------------------------------|------------|--|--|
| MDI                           | Impact environmental tn/ Co2 | Impact economical (n <sup>a</sup> workers) | Social cohesion and territorial | Consortium | Features   | Upcoming Actions to develop  |
| Hydrogen H                    | 50,000                       | High in Opex, Very high Capex              | Transition fair                 | Very high  | High maturity  |  |
| Biomethanization F            | 15000A                       | 12 Opex, 100 Capex                         | Low income are                  | high       | <input checked="" type="checkbox"/> Has the client's approval <input checked="" type="checkbox"/> Has passed a committee   | 2021 Development of basic engineering (CAPEX) and signing of the contractual modification<br>2022 Processing of licenses and start of work   |
| Geothermal high temperature G | 10500                        | 4 Opex, 200 Capex                          | Sustainability Island           | low        | Low maturity   |  |
| Forest Biomass C              | 8000                         | 15-20 Capex/ 5 OPEX                        |                                 | medium     | <input checked="" type="checkbox"/> Has customer approval<br><input checked="" type="checkbox"/> SPV (Special Purpose Vehicles)<br><input type="checkbox"/> Committee has passed<br><input type="checkbox"/> Detailed budget | 2021<br>Track customer funds and provision<br>Advance in the technical definition of the model with the technologists<br>Explore potential biomass suppliers<br>Define a business concrete model plan          |
| Biomass a Biocarbon B         | 13000                        | 15-20 Capex / 5 Opex                       | Rural area <5000 inhab.         | medium     | <input checked="" type="checkbox"/> Has customer approval<br><input checked="" type="checkbox"/> SPV (Special Purpose Vehicles)  | 2021 IDEA Grant Management<br>Formalization of Off-take of the biocarbon<br>2022 Environmental license management<br>Constitution of the SPV Project<br>Detail engineering<br>Construction planning and launch |

### 4.2.3. Alignment with the lever policies and components of the Recovery Plan and degree of maturity

Table 7 Alignment with Recovery Plan and maturity

| Technology         | PRTR Component                      | Investment typology                                   | Degree Maturity | PRTR |
|--------------------|-------------------------------------|---|-----------------|------|
| Hybridization      | Component 7, I1                     | Hybrid facility deployment                            | 3               | 4    |
| Organic Biomass    | Component 7, I1                     | Development bioenergy                                 | 4               | 4    |
| District & Heating | Component 7, I1                     | HVAC networks using renewables                        | 4               | 4    |
| Geothermal         | Component 7, I2                     | So energy sustainable on the islands                  | 2               | 4    |
| Waste recovery     | Component 7, I2<br>Component 12, I3 | Incorporation thermal renewables and circular economy | 4               | 4    |
| Green Hydrogen     | Component 9                         | Green Hydrogen Cluster                                | 4               | 5    |
| Biomethane         | Component 7, I1                     | Development bioenergy                                 | 3               | 4    |
| Biocarbon          | Component 7, I1                     | Development bioenergy                                 | 4               | 3    |
| Forest Biomass     | Component 7, I1                     | Development bioenergy                                 | 3               | 4    |

#### Rating scale

0 = No evidence

1 = Poor

2 = Acceptable

3 = Good

4 = Very good

5 = Optimal

\* The assessment depends on the information in the MDI files and the data entered by those responsible for the MDI

In order to evaluate the alignment of the projects with the driving policies of the Plan, its components have been analyzed in detail.

In relation to the evaluation of the maturity of the projects, a series of metrics of the characteristics and life cycle phase of the project have been used.

The expression of interest of the Hydrogen (H)It stands out above the rest, it has an optimal fit in the Recovery, Transformation and Resilience Plan and a very high degree of maturity.

Green hydrogen will be key for Spain to achieve climate neutrality and a 100% renewable electricity system no later than 2050, the Government is firmly committed with the intention of turning Spain into the industrial pole of green hydrogen. This determination is shown in the allocation of € 1,555 million for component IX. Green hydrogen roadmap and its sectoral integration.

Table illustrates one projects scored highly on degree of maturity but were not recognized for high alignment: Biocarbon (B). Conversely, 3 projects scored highly on alignment, but are not enough matures: Forest Biomass (C), Biomethane (F), Hybridation (A)

Projects highly scored on both, degree of maturity and alignment, make them really attractive: District & Heating (E), Waste Recovery (D) and Organic Biomass (I). The Waste Recovery Project stands out for its double link to the components, Component 9, I1 and Component 12, I3 (Circular economy).

Finally, high temperature geothermal energy has a very high Alignment score (Component 7, I2 Sustainability in the Islands), but its degree of maturity is low.

### 4.3. Results



Figure 26 Target group mean MDI analysis results

## Alignment with Recovery plan order reference investments IDs

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H Green hydrogen

E District Heating

A Hybridization

C Forest biomass

D Waste recovery

F Biomethane

I Organic biomass

G High temperature geothermal energy

B Biomass / Biochar

---

### Global assesment of energy transition projects

Positive results were foreseeable, since the 9 energy transition archetypes were developed based on a rigorous cataloging covering both the PRTR and the PNIEC requirements.

Energy transition projects perceived to be in the desirable upper-right quadrant of Figure 26 (large economic impact and strongly positive impact on climate) included [green hydrogen \(H\)](#), [waste recovery \(D\)](#), High temperature geothermal (G) and [District & Heating \(E\)](#). Geothermal High Temperature (G) has a low degree of maturity, so it does not meet the necessary condition for obtaining funds. Likewise, it is worth highlighting the social and territorial cohesion of the recovery of waste (D) and the resilience of Green Hydrogen (H)

Many projects clumped to the center left of the figure (positive economic impact and positive impact on climate) included: Organic biomass (I), Biacarbon (B), Forest biomass (C) and Biomethanization (F). Biomethanization (F) stands out for its high social and territorial cohesion.

Finally, hybridization (A) has a medium-high economic and environmental impact, also has a positive impact on social and territorial resilience and cohesion.

## 5. Conclusions

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This last chapter seeks to present the different conclusions reached within the study.

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In a context of unprecedented crisis, the European authorities have given a forceful and supportive response. The implementation of the Next Generation funds will mean a greener, more competitive and resilient Europe.

The European Recovery Fund is historic in terms of the amount of money it makes available for the reconstruction of the continent, but unlike previous fiscal stimulus packages, they are not directed at the most damaged sectors, but at transformation vectors (digitization and energy transition).

In the coming years, Spain will receive 69 billion in direct subsidies from recovery funds, 40% will be allocated to energy transition.

Identifying which projects are eligible for funds will be essential to optimize private sector resources, especially Utilities, which will play a very relevant role in the energy transition.

### **Recovery Plan resource allocation**

Most of the money expected for the energy transition will go to sustainable mobility, housing rehabilitation and transformation of strategic sectors.

7.5 billion will be allocated for energy solutions and industrial asset energy solutions and industrial asset business. Breakdown of this:

- 1.4 billion to smart grids and distribution networks
- 1.6 billion to green hydrogen value chain
- 3.4 billion to development of RES energies which are not mature today

Additionally, the Ministry of industry will allocate 12 billion € for green transport, innovative and circular economy energy solution.

**Resource endowment is relevant and investment decision must be taken cautiously to seize a historic opportunity.**

### **Technologies eligible for European funds**

The funds will be dedicated to the deployment of renewables not yet competitive. Technologies that are already competitive such as onshore wind or photovoltaic solar will be deployed through auction, as stated in the PNIEC.

**Immature technologies with great potential that maximize positive externalities and minimize negative ones are eligible for European funds.**

In 2030 the 74% of electrical energy in Spain will be generated with renewable sources, the deployment of renewables will be essential to meet the decarbonisation objective. Component 7 of the deployment of renewables has the main resource endowment of energy solutions and industrial asset business, the participation and contribution of Utilities will be essential to meet the strategic objectives.

The main types of investment related to Utilities compatible with this component are:

- Use of thermal renewables in different sectors of the economy including the residential sector, and the option of using air conditioning networks with the use of renewable energies.
- Incorporation of thermal renewables in industrial processes and replacement of fossil systems in industry
- Deployment of hybrid installations on land connected to the network.
- Development of bioenergy and its value chain, with special consideration for sustainability.

The decarbonization and deployment of renewables does not have a single recipe but will be carried out using different technologies.

Some of the most relevant and best positioned technologies to carry out the deployment of renewables, after a rigorous cataloging considering the PNIEC and the Recovery Plan, are: Biomass, Waste recovery, Hybridization, District & Heating.



**Utilities' participation in European funds will go through, mainly, the deployment of renewables and green hydrogen.** In fact, they are strongly interrelated since a high penetration of renewables requires an energy vector for the efficient operation of the electrical system.

### **Base case conclusions**

In this study we have identified the main investment opportunities in energy transition for a Utility. These will go, above all, through green hydrogen and the deployment of renewables.

In this Master's Thesis, 9 archetypes of decarbonization projects have been analyzed across 6 dimensions and it is combined with the cataloging of energy transition technologies by reviewing the Climate and Energy Integrated National Plan and the Spanish Recovery Plan. We emerge with the recommendation of **3 call of interest** that contribute to the achievement of the climate and economic objectives of the Recovery Plan. These are those located in the **desirable upper-right quadrant and have a high score in the metrics associated with the Recovery Plan and project maturity:**

H Green hydrogen

E Heat and cold networks

D Waste recovery

High-temperature geothermal energy, despite obtaining a high score in both core metrics economical and climate impact, does not meet a satisfactory degree of maturity.

# ***APPENDIX 1: Some examples of Call of Interest Sheets***

In the first place, to thank the effort made in presenting the different call of interest to those responsible for it.

An MDI sheet has been created to systematize the information of the MDIs that allows us to compare them with each other and determine the degree of maturity and fit in the Spanish Recovery Plan.

This document is intended to serve as a guide for the evaluation of the different MDIs presented and as an instrument to help make decisions about the projects that are finally presented.

The document has been filled in with the information previously sent from the MDIs. Those responsible for each MDI have reviewed the information and added any data they deem relevant, as well as points 3.1 and 8 must be completed by those responsible for the MDIs.

## **A.1 Biomass / Biorchar MDI sheet**

| <b>Call of interest (MDI)</b>   |                           |
|---|---------------------------|
| <b>Title of the project:</b><br><br>Biomass to biochar  |                           |
| <b>MDI applied:</b><br><br><b>PROMOTION OF THE CIRCULAR ECONOMY IN THE FIELD OF THE COMPANY</b> | <b>date:</b><br><br>02/21 |

|  |
|--|
| <b>1. General description of the project and justification</b>   |
| <b>4.1 Description of the starting point, needs and challenges that justify it</b>   |
| <p>ENGIE operates 18 mini hydroelectric plants in Spain for a total gross renewable capacity of 85 MW.</p> <p>The grating of the plants filters important amounts of biomass whose treatment is limited to that of an organic residue.</p> <p>The objective of the project is to convert this biomass recovered from the river into biochar using HTC (Hydrothermal Carbonization) technology. The facility will have the capacity to treat the biomass provided by ENGIE's facilities, as well as organic remains from local agricultural activities.</p>   |
| <b>4.2 Economic, legal, environmental and social viability. Barriers or difficulties</b>   |
| <p>Difficulties in deciding the viability of the project.</p> <p>The plant allows economic viability once the impact of capex necessary for the investment is saved. The project is based on the contributions of biomass and agricultural remains and the sale of the biocarbon produced and generates social benefits due to:</p> <ol style="list-style-type: none"> <li>1) reduction of waste management for disposal, which implies a substantial additional reduction due to the elimination of associated transport.</li> <li>2) reduction of local emissions by substituting a fossil source for biocarbon</li> <li>3) reduction of waste transfer.</li> <li>4) use of innovative technology of national origin with high replicability</li> <li>5) generation of local activity derived from the deployment of the project itself and the resources necessary for its implementation.</li> </ol> |
| <b>1.3 Is there an impact on social and territorial cohesion? Indicate low, medium, high and brief explanation</b>   |
| <p>The project is part of an area of low population density and in constant decline since 2010 (145,000 to 135,000 in the 2018 census).</p> <p>High impact.</p>  |

|  |
|--|
| <b>2. Actors involved in the definition and execution: Consortium, main partners or collaborators</b>                        |
| Consortium in training course with partners Additionally, investment partners have shown a possible interest in the project. |

|  |
|--|
| <b>3. Status and characteristics of the project</b> Indicate if it meets any of the following characteristics  |
| <b>3.1 Features</b>  |
| <input type="checkbox"/> Has customer approval <input type="checkbox"/> Committee has passed<br><input checked="" type="checkbox"/> SPV (Special Purpose Vehicles) <input type="checkbox"/> Detailed budget  |
| <b>3.2 Degree of maturity:</b> Indicate in which phase it is   |
| <input checked="" type="checkbox"/> Preliminary studies <input checked="" type="checkbox"/> Purchasing Process <input type="checkbox"/> Start of civil works<br><input checked="" type="checkbox"/> Detail engineering <input checked="" type="checkbox"/> Basic engineering   |
| <b>3.3. Alignment with the driving policies and energy components of the State Recovery Plan:</b>  |
| <input type="checkbox"/> Sustainable, safe and connected mobility crash plan in urban and metropolitan environments <input type="checkbox"/> Deployment and integration of renewable energies<br><input type="checkbox"/> Housing rehabilitation and urban regeneration plan <input type="checkbox"/> Electrical infrastructures, promotion of smart grids and deployment of flexibility and storage.<br><input checked="" type="checkbox"/> Industrial Policy Spain 2030 <input type="checkbox"/> Renewable hydrogen roadmap and its sectoral integration |

|   |
|---|
| <b>4. Short and long-term economic impact and carry-over effect (value chain)</b> Indicate low, medium, high and explain briefly  |
| The project foresees the hiring of 4 direct people for the supervision and management of the facilities. There will also be maintenance work that must be contracted with |

local specialized companies. It is estimated that during construction there may be a total of about 25 people involved between direct and indirect work outsourcing.

Innovative component generating added value: The project consists of the installation of an innovative process at an industrial level based on the carbonization of organic remains. This process will require construction teams and maintainers of the facilities, as well as suppliers of different spare parts and pieces. The model has a high replicability potential, providing a local solution for both the treatment of agricultural remains and access to energy resources for thermal production.

**5. Improved resilience<sup>1</sup> economic and climatic** Indicate low, medium, high and explain briefly

Reduction of dependence on external energy use biomass. Medium impact.

**6. Environmental impact tCo2 / year**

The project provides a solution for the treatment and carbon-free energy recovery of 10,800 t / y of biomass and organic remains.

**7. Budget and planned financing**

| PROJECT TOTAL                                   | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Total |
|---|------|------|------|------|------|------|-------|
| Total, budget (thousand €)                      |      |      |      |      |      |      |       |
| Paid by the promoter (%)                        |      |      |      |      |      |      |       |
| European recovery funds <sup>2</sup> (%)        |      |      |      |      |      |      |       |
| Other European funds (specify) <sup>3</sup> (%) |      |      |      |      |      |      |       |
| Other funds (specify) (%)                       |      |      |      |      |      |      |       |

**8. Next development steps according to the person in charge of the MDI**

Actions to develop

- |      |   |
|------|---|
| 2021 | <ul style="list-style-type: none"> <li>- IDEA grant management</li> <li>- Formalization of biocarbon off-take commitments.</li> </ul> |
|------|---|

|      |   |
|------|---|
|      | <ul style="list-style-type: none"> <li>- Formalization of supply commitments for organic remains from local agricultural activities in addition to the brushwood recovered from the river by hydroelectric plants.</li> </ul> <p>Study of a possible collaboration in the project in the framework of its evaluation of the scalability of the solution (possible pilot test.</p> |
| 2022 | <ul style="list-style-type: none"> <li>- Environmental license management</li> <li>- Constitution of the SPV Project</li> <li>- Detail engineering</li> <li>- Construction planning and launch</li> </ul>   |

## A.2 MDI Forest biomass MDI Sheet

### Expression of interest (MDI)

|  |              |
|--|--------------|
| <b>Title of the project:</b>   |              |
| Forest Biomass   |              |
| <b>MDI applied:</b>  | <b>date:</b> |
| <b>PROMOTION OF THE CIRCULAR ECONOMY IN THE FIELD OF THE COMPANY</b> | 02/21        |

|   |  |
|---|--|
| <b>1. General description of the project and justification</b>  |  |
| <b>4.3</b>  | <b>Description of the starting point, needs and challenges that justify it</b>       |
| <p>Biomass Use of field wastes for use in this technology after their treatment</p> <p>Use of renewable energy from thermal generation with the consequent reduction of greenhouse gas emissions by reducing the current use of fuels</p> |  |
| <b>4.4</b>  | <b>Economic, legal, environmental and social viability. Barriers or difficulties</b> |

Economic barriers derived from high return on investment. For its resolution, the request for aid to support thermal production through renewable energies is foreseen.

**1.3 Is there an impact on social and territorial cohesion?** Indicate low, medium, high and brief explanation

Biomass: Energy system resource, fire risk reduction, social cohesion and territorial rebalancing

Medium-high impact

**2. Actors involved in the definition and execution: Consortium, main partners or collaborators**

**3. Status and characteristics of the project** Indicate if it meets any of the following characteristics

**3.1 Features**

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Has customer approval | <input type="checkbox"/> Committee has passed |
| <input type="checkbox"/> SPV (Special Purpose Vehicles)   | <input type="checkbox"/> Detailed budget      |

**3.2 Degree of maturity:** Indicate in which phase it is

- |   |   |   |
|---|---|---|
| <input checked="" type="checkbox"/> Preliminary studies | <input type="checkbox"/> Purchasing Process           | <input type="checkbox"/> Start of civil works |
| <input checked="" type="checkbox"/> Detail engineering  | <input checked="" type="checkbox"/> Basic engineering |   |

**3.3. Alignment with the driving policies and energy components of the State Recovery Plan:**

- |   |  |
|---|--|
| <input type="checkbox"/> Sustainable, safe and connected mobility crash plan in urban and metropolitan environments | <input checked="" type="checkbox"/> Deployment and integration of renewable energies                                     |
| <input type="checkbox"/> Housing rehabilitation and urban regeneration plan   | <input type="checkbox"/> Electrical infrastructures, promotion of smart grids and deployment of flexibility and storage. |
| <input checked="" type="checkbox"/> Industrial Policy Spain 2030  |  |

Renewable hydrogen roadmap and its sectoral integration

**4. Short and long-term economic impact and carry-over effect (value chain)** Indicate low, medium, high and explain briefly

Conceptualization and engineering: 3-5 jobs. Low-medium impact

Value chain: Local subcontractors for installation and auxiliary services (electrical installation companies, general installations, civil works, among others)

**5. Improved resilience<sup>1</sup> economic and climatic** Indicate low, medium, high and explain briefly

Reduces dependence on external energy and the risk of fires. Medium-high impact

**6. Environmental impact tCo2 / year**

Reduction of emissions derived from the reduction of the use of fossil fuels for thermal generation.

Elimination of fires and emission of biogas without their thermal use

**7. Budget and planned financing**

| PROJECT TOTAL                                   | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Total |
|---|------|------|------|------|------|------|-------|
| Total budget (thousand €)                       |      |      |      |      |      |      |       |
| Paid by the promoter (%)                        |      |      |      |      |      |      |       |
| European recovery funds <sup>2</sup> (%)        |      |      |      |      |      |      |       |
| Other European funds (specify) <sup>3</sup> (%) |      |      |      |      |      |      |       |
| Other funds (specify) (%)                       |      |      |      |      |      |      |       |

**8. Next development steps according to the person in charge of the MDI**

Actions to develop

|      |                                    |
|------|------------------------------------|
| 2021 | Track customer funds and provision |
|------|------------------------------------|



|      |   |
|------|---|
|      | Advance in the technical definition of the model with the technologists<br>Explore potential biomass suppliers<br>Define a business plan for the specific model |
| 2022 | Run the plant if the estimated conditions are met   |

### A.3 Waste recovery MDI Sheet

|  |              |
|--|--------------|
| <b>Title of the project:</b>   |              |
| Waste recovery   |              |
| <b>MDI applied:</b>  | <b>date:</b> |
| <b>PROMOTION OF THE CIRCULAR ECONOMY IN THE FIELD OF THE COMPANY</b> | 02/21        |

|   |
|---|
| <b>1. General description of the project and justification</b>  |
| <b>4.5 Description of the starting point, needs and challenges that justify it</b>  |
| <p>The project consists of designing, executing and operating an energy infrastructure for the export of steam from the waste recovery plant to the Petrochemical complex</p> <p>The infrastructure must transport steam by public road with minimal energy and pressure losses, in order to meet the needs.</p> <p>It currently produces steam by consuming natural gas. This infrastructure would allow the recovery of urban solid waste to be used in the surrounding industry, establishing a symbiosis between the incinerator and the petrochemical complex in which the former improves its energy efficiency and the latter decarbonizes, saving 43,000 tons of CO<sub>2</sub> altogether. year.</p> |
| <b>4.6 Economic, legal, environmental and social viability. Barriers or difficulties</b>  |
| <p>Economic viability occurs when all actors have an economic improvement compared to their current situation.</p> <p>The legal viability has been studied. The public incinerator is required to launch a tender for the sale of steam (this tender has already occurred twice and has been deserted). In the event that the business model fits, it would be requested to launch</p>  |

a new tender to present an offer for the purchase of steam. With this, they would have a supply contract based on which ENGIE would invest and operate the system.

The environmental viability must be accredited based on an activity license, although it is not foreseen that there could be any obstacle in the case of an infrastructure that would pass through the subsoil and that would comply with all the security measures and other required regulatory criteria.

**1.3 Is there an impact on social and territorial cohesion?** Indicate low, medium, high and brief explanation

The project is expected to have an important social impact in the area, in which many people work in the petrochemical complex and the local society will understand that the energy recovery of its urban solid waste has repercussions in a use for the local industry, as a project of reference circular economy.

The improvement in competitiveness of both waste energy exporters and importers should be highlighted. This type of infrastructure anchors both companies in the territory and allows them to improve their long-term competitiveness.

Medium-high impact.

**2. Actors involved in the definition and execution: Consortium, main partners or collaborators**

The most important entities that support the project are, on the one hand, the incinerator interested in exporting steam, and the entity interested in consuming steam with lower carbon content and at a competitive price.

ENGIE SERVICIOS ENERGÉTICOS, SA

**3. Status and characteristics of the project** Indicate if it meets any of the following characteristics

**3.1 Features**

Has customer approval  Has passed committee (AN yes)

SPV (Special Purpose Vehicles)  Detailed budget

**3.2 Degree of maturity:** Indicate in which phase it is

Preliminary studies  Purchasing Process  Start of civil works

Detail engineering  Basic engineering

**3.3. Alignment with the driving policies and energy components of the State Recovery Plan:**

- |   |  |
|---|--|
| <input type="checkbox"/> Sustainable, safe and connected mobility crash plan in urban and metropolitan environments | <input checked="" type="checkbox"/> Deployment and integration of renewable energies                                     |
| <input type="checkbox"/> Housing rehabilitation and urban regeneration plan   | <input type="checkbox"/> Electrical infrastructures, promotion of smart grids and deployment of flexibility and storage. |
| <input checked="" type="checkbox"/> Industrial Policy Spain 2030  | <input type="checkbox"/> Renewable hydrogen roadmap and its sectoral integration   |

**4. Short and long-term economic impact and carry-over effect (value chain) Indicate low, medium, high and explain briefly**

Several jobs are expected to be created during the project phase, a large number of jobs during the construction phase and some for the operation phase, yet to be defined.

Maintaining the competitiveness of the petrochemical complex has a direct effect The activity of the petrochemical complex requires decarbonisation and this project greatly helps to meet this objective. The decarbonisation objective is currently being approached with various technologies (hydrogen, CO2 capture, etc.). The advantage that the petrochemical complex is so close to the incinerator favors the implementation of this circular economy project in the demographic challenge.

Medium-high impact.

**5. Improved resilience<sup>1</sup> economic and climatic Indicate low, medium, high and explain briefly**

Reduction of external energy dependence, possible intermittency of energy source, waste recovery.

Medium impact.

**6. Environmental impact tCo2 / year**

The project would save 43,000 tons of CO2 / year for the whole

| 7. Budget and planned financing                 |      |      |      |      |      |      |       |
|---|------|------|------|------|------|------|-------|
| PROJECT TOTAL                                   | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Total |
| Total budget (thousand €)                       |      |      |      |      |      |      |       |
| Paid by the promoter (%)                        |      |      |      |      |      |      |       |
| European recovery funds <sup>2</sup> (%)        |      |      |      |      |      |      |       |
| Other European funds (specify) <sup>3</sup> (%) |      |      |      |      |      |      |       |
| Other funds (specify) (%)                       |      |      |      |      |      |      |       |

| 8. Next development steps according to the person in charge of the MDI |  |
|--|--|
| Actions to develop   |  |
| 2021   | Basic Engineering Development<br>Search for grants (currently under study Large-Scale Innovation Funds). |
| 2022   |  |

| Expression of interest (MDI)  |       |
|---|-------|
| Title of the project<br>Hybridization   |       |
| MDI applied:<br>RENEWABLE ENERGIES: deployment of renewables, integration in sectors and innovation | 02/21 |

| 1. General description of the project and justification  |   |
|--|---|
| 4.7  | Description of the starting point, needs and challenges that justify it |
| The project consists of reaching a carbon-free configuration for steam production optimizing the economic aspects of the project throughout its useful life. |   |

In collaboration with GB FOODS, a roadmap was developed that includes: 1) installation of a solar thermal plant; 2) a forest biomass system; and 3) phased use of Biogmethane through certificates of origin.

**4.8 Economic, legal, environmental and social viability. Barriers or difficulties**

1) no technical risks are detected because they are proven technologies; 2) environmental risks subject to obtaining an Environmental License; and 3) economic risks associated with the long return period

**1.3 Is there an impact on social and territorial cohesion? Indicate low, medium, high and brief explanation**

The project is framed in a rural area at risk of depopulation and a large biomass resource, promoting the generation of employment at the local and regional level. Medium-high impact.

**2. Actors involved in the definition and execution: Consortium, main partners or collaborators**

Consortium

**3. Status and characteristics of the project** Indicate if it meets any of the following characteristics

**3.1 Features**

- Has customer approval
- Committee has passed
- SPV (Special Purpose Vehicles)
- Detailed budget

**3.2 Degree of maturity:** Indicate in which phase it is

- Preliminary studies
- Purchasing Process
- Start of civil works
- Detail engineering
- Basic engineering

**3.3. Alignment with the driving policies and energy components of the State Recovery Plan:**

- Sustainable, safe and connected mobility crash plan in urban and metropolitan environments
- Deployment and integration of renewable energies

- Housing rehabilitation and urban regeneration plan
- Industrial Policy Spain 2030
- Electrical infrastructures, promotion of smart grids and deployment of flexibility and storage.
- Renewable hydrogen roadmap and its sectoral integration

**4. Short and long-term economic impact and carry-over effect (value chain)** Indicate low, medium, high and explain briefly

Engineering and conceptualization: 5 direct people  
 Construction: 15-20 direct people  
 Operation and maintenance: 2-3 per  
 Innovative hybridization component. on site biomass and solar thermal; additional offsite biomethane integration.  
 Medium high impact

**5. Improved resilience<sup>1</sup> economic and climatic** Indicate low, medium, high and explain briefly

Reduction of external energy dependence. The greatest sensitivity in this regard is found in the acquisition of biomass, which must guarantee its guarantee of sustainability. Medium impact.

**6. Environmental impact tCo2 / year**

13,972 tCO2 / a (biomass, solar + biogas)

**7. Budget and planned financing**

| PROJECT TOTAL                                   | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Total |
|---|------|------|------|------|------|------|-------|
| Total budget (thousand €)                       |      |      |      |      |      |      |       |
| Paid by the promoter (%)                        |      |      |      |      |      |      |       |
| European recovery funds <sup>2</sup> (%)        |      |      |      |      |      |      |       |
| Other European funds (specify) <sup>3</sup> (%) |      |      |      |      |      |      |       |

|                           |  |  |  |  |  |  |  |  |
|---------------------------|--|--|--|--|--|--|--|--|
| Other funds (specify) (%) |  |  |  |  |  |  |  |  |
|---------------------------|--|--|--|--|--|--|--|--|

| 8. Next development steps according to the person in charge of the MDI |   |
|--|---|
| Actions to develop   |   |
| 2021   | We are developing the technical-economic proposal and the Business Plan |
| 2022   | Project execution   |

| Expression of interest (MDI)                           |                           |
|--|---------------------------|
| <b>Title of the project:</b><br>Heat and cold networks |                           |
| <b>MDI applied:</b><br><b>LOCAL ENERGY COMMUNITIES</b> | <b>date:</b><br><br>02/21 |

| 1. General description of the project and justification   |  |
|---|--|
| <b>4.9</b>  | <b>Description of the starting point, needs and challenges that justify it</b>       |
| Construction of a thermal energy generation plant (cold) for the urban heat and cold network, with ice water tanks and seawater cooling.<br><br>Supply of air conditioning to buildings in the area, linked to the Declaration of Climate Emergency |  |
| <b>4.10</b>   | <b>Economic, legal, environmental and social viability. Barriers or difficulties</b> |
| Validated economic viability based on reasonable profitability for this type of project.<br><br>Technical, legal and economic risks of the project, specifying their causes.<br>Authorizations to process   |  |





Creation of 12 permanent workers + 100 in the work phase (subcontractors). Medium-high impact

Innovative component generating added value: Improving the efficiency of cold production by incorporating ice water tanks and seawater cooling

**5. Improved resilience<sup>1</sup> economic and climatic** Indicate low, medium, high and explain briefly

Reduction of external energy dependence. Medium-high impact

Use of urban waste (RSI).

**6. Environmental impact tCo2 / year**

Savings in CO2 emissions, mitigation of the heat island effect, reduction of health risks

**7. Budget and planned financing**

| PROJECT TOTAL                                   | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Total |
|---|------|------|------|------|------|------|-------|
| Total budget (thousand €)                       |      |      |      |      |      |      |       |
| Paid by the promoter (%)                        |      |      |      |      |      |      |       |
| European recovery funds <sup>2</sup> (%)        |      |      |      |      |      |      |       |
| Other European funds (specify) <sup>3</sup> (%) |      |      |      |      |      |      |       |
| Other funds (specify) (%)                       |      |      |      |      |      |      |       |

**8. Next development steps according to the person in charge of the MDI**

| Actions to develop |  |
|--------------------|--|
| 2021               | Development of basic engineering (CAPEX) and signing of the contractual modification |
| 2022               | Processing licenses and start of work  |

|   |                           |
|---|---------------------------|
| <b>Call of interest (MDI)</b>   |                           |
| <b>Title of the project:</b><br>Meat waste gasification project                             |                           |
| <b>MDI applied:</b><br><b>PROMOTION OF THE CIRCULAR ECONOMY IN THE FIELD OF THE COMPANY</b> | <b>date:</b><br><br>02/21 |

|   |
|---|
| <b>1. General description of the project and justification</b>  |
| <b>4.11 Description of the starting point, needs and challenges that justify it</b>   |
| <p>The industrial process consumes Natural Gas and generates MBM as waste. Both NG (and associated CO<sub>2</sub>) and MBM residue are important energy costs for industry. With the proposed model, the MBM residue can be recovered thanks to the gasification equipment specifically designed for this. With this equipment, the MBM is transformed into a syngas that can be burned in a boiler with a burner for syngas and produce the steam that the industry needs. In this way, savings are generated both by reducing the consumption of NG, the cost of managing the waste and reducing the cost of CO<sub>2</sub> associated with the NG consumed. The industrial process generates an air atmosphere that has to be regenerated in a regeneration system that consumes Natural Gas.</p>          |
| <b>4.12 Economic, legal, environmental and social viability. Barriers or difficulties</b>   |
| <p>Difficulties in deciding the viability of the project.</p> <p>The plant allows economic viability once the impact of capex necessary for the investment is saved. The project is based on a legally established energy services contract and generates social benefits due to: 1) reduction of local emissions by substituting a fossil source (natural gas) for the residue from the activity; 2) reduction of waste management for disposal, which implies an additional reduction due to the elimination of associated transport; 3) elimination of odors by reducing waste transfer; 4) use of innovative technology of national origin with high replicability and 5) generation of local activity derived from the project's own deployment and the necessary resources for its materialization.</p> |

|  |
|--|
| <b>1.3 Is there an impact on social and territorial cohesion?</b> Indicate low, medium, high and brief explanation                           |
| The province,, loses population since 2008 (163 thousand inhabitants) until the last register (2018, 153 thousand inhabitants). High impact. |

|   |
|---|
| <b>2. Actors involved in the definition and execution: Consortium, main partners or collaborators</b>   |
| The company), specialist gasification of meat waste (MBM).<br><br>Engie Soluciones Energéticas as an investment, construction and maintenance company.<br><br>Various subcontractors for the execution of the works and subsequent maintenance. |

|   |
|---|
| <b>3. Status and characteristics of the project</b> Indicate if it meets any of the following characteristics   |
| <b>3.1 Features</b>   |
| <input checked="" type="checkbox"/> Has customer approval <input type="checkbox"/> Committee has passed<br><input type="checkbox"/> SPV (Special Purpose Vehicles) <input type="checkbox"/> Detailed budget   |
| <b>3.2 Degree of maturity:</b> Indicate in which phase it is  |
| <input checked="" type="checkbox"/> Preliminary studies <input type="checkbox"/> Purchasing Process <input type="checkbox"/> Start of civil works<br><input checked="" type="checkbox"/> Detail engineering <input checked="" type="checkbox"/> Basic engineering   |
| <b>3.3. Alignment with the driving policies and energy components of the State Recovery Plan:</b>   |
| <input type="checkbox"/> Sustainable, safe and connected mobility crash plan in urban and metropolitan environments <input checked="" type="checkbox"/> Deployment and integration of renewable energies<br><input type="checkbox"/> Housing rehabilitation and urban regeneration plan <input type="checkbox"/> Electrical infrastructures, promotion of smart grids and deployment of flexibility and storage.<br><input checked="" type="checkbox"/> Industrial Policy Spain 2030 <input type="checkbox"/> Renewable hydrogen roadmap and its sectoral integration |

**4. Short and long-term economic impact and carry-over effect (value chain)** Indicate low, medium, high and explain briefly

The project foresees the hiring of 4 direct people to supervise and conduct the installation. There will also be maintenance work that must be contracted with specialized companies. It is estimated that during construction there may be a total of about 200 people involved between direct and indirect work outsourcing.

Innovative component generating added value: The project consists of the installation of an innovative process at an industrial level based on the gasification of meat waste. This process will require maintenance teams at the facilities, as well as suppliers of different spare parts and pieces. On the other hand, in the area there are different meat companies, and the technology can be exported to other centers of the same nature as Saria. Furthermore, there is already a facility of a similar nature in the province, which could become a pole for the export of this technology to other areas. Medium-high impact.

**5. Improved resilience<sup>1</sup> economic and climatic** Indicate low, medium, high and explain briefly

Reduction in external energy dependence and certain variability of supply. Medium impact.

**6. Environmental impact tCo2 / year**

The project is planned to generate a total of 43 GWh / a in the form of steam (assuming a coverage of 99%) and provides savings of 90% in the form of a reduction in gas consumption (60 GWh / a), 97% of reduction of CO2 emissions of (10,500 tons) and cost of waste management (meat meal, MBM) (18,000 tons).

**7. Budget and planned financing**

| PROJECT TOTAL                                   | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Total |
|---|------|------|------|------|------|------|-------|
| Total budget (thousand €)                       |      |      |      |      |      |      |       |
| Paid by the promoter (%)                        |      |      |      |      |      |      |       |
| European recovery funds <sup>2</sup> (%)        |      |      |      |      |      |      |       |
| Other European funds (specify) <sup>3</sup> (%) |      |      |      |      |      |      |       |

|                           |  |  |  |  |  |  |  |  |
|---------------------------|--|--|--|--|--|--|--|--|
| Other funds (specify) (%) |  |  |  |  |  |  |  |  |
|---------------------------|--|--|--|--|--|--|--|--|

| 8. Next development steps according to the person in charge of the MDI |   |
|--|---|
| Actions to develop   |   |
| 2021   | Processing of the environmental license to obtain final requirements<br>Capex update required<br>Required packages and scopes configuration<br>Preparation of the binding economic proposal for the sale of steam to the customer |
| 2022   | Client contractual negotiation<br>Project start phase: detail engineering and construction  |

# APPENDIX 2: Organizational Charts in the context of the Next Generation funds in Spain

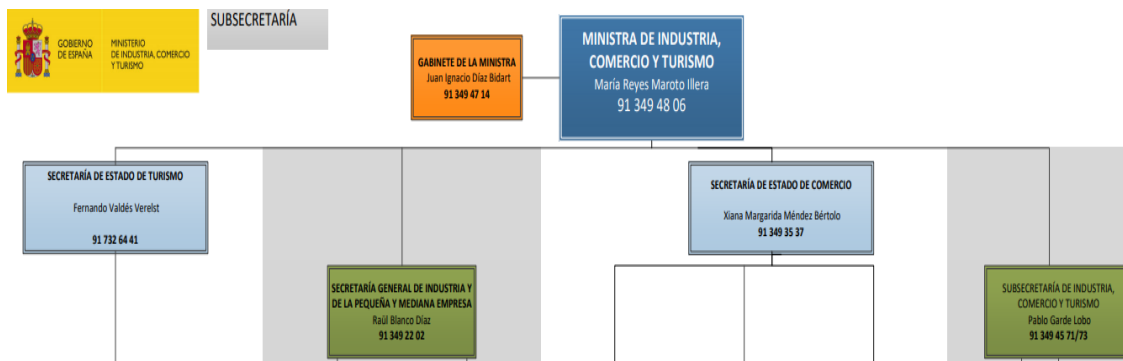


## B.1. Org Chart Prime Minister Office Source [AG]

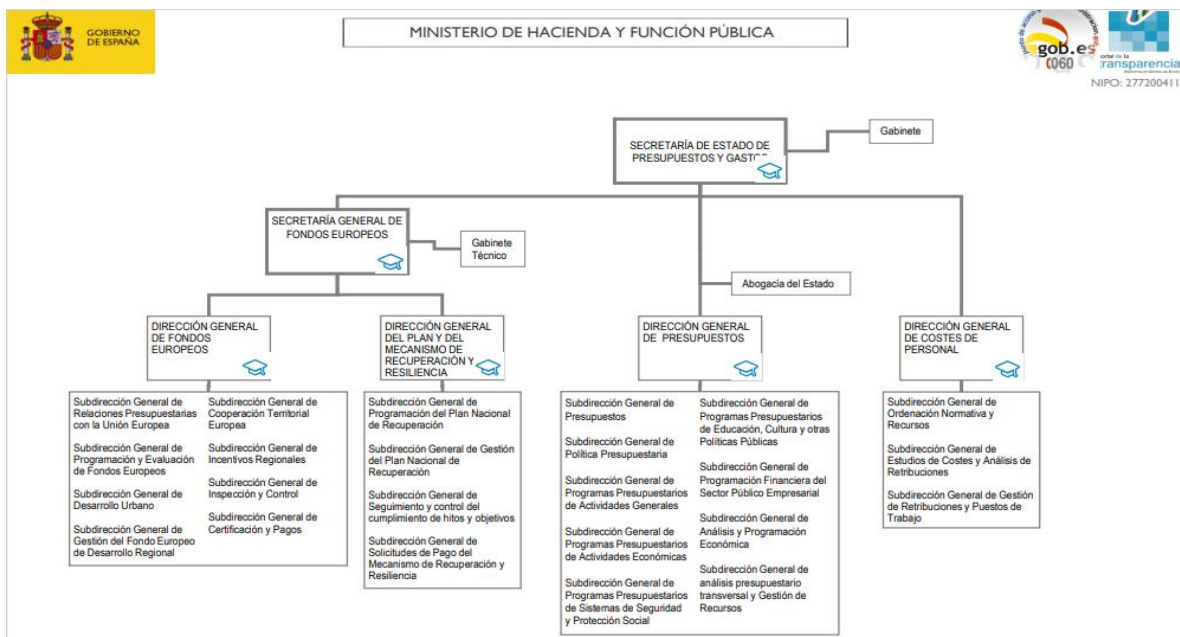
\* Due to the restructuring of the presidency, Oscar López replaces Iván Redondo



## B.2. Org Chart Energy Transition Ministry [AG]



### B.3 Org Chart European Funds Secretary-Genera. Source [AG]



### B.4. Org Chart Industry Ministry. Source Mincotur

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