local administrations present a request for disbursement associated with a grant.

Target population: The procedure related to the evaluation of local public transport refers to local Administrations acting as promoters of projects involving local public transport system projects with fixed installations. Citizens will also benefit from quicker development time for transport infrastructure for rapid mass transport services.

The procedure related to the payments acceleration refers to institutional bodies (Regions, Municipalities), local public transport service companies or subsidiary companies of institutional bodies. Citizens will also benefit from quicker development time for transport infrastructure for rapid mass transport services.

Timeline: This reform will be part of a forthcoming regulatory measures.

Reform 4: Adoption of national programs on air pollution control (in accordance with Directive (EU) 2016/2284 and with the Climate Decree Legislative Decree no. 111/2019).

Challenges:

The EU legislation promotes a progressive reduction in the concentrations of atmospheric pollutants to protect the environment and the health of citizens from possible damage caused by certain substances, as well as ambitious goals in terms of reduction of the climate-altering emissions, with clear reduction targets in both areas.

Italy has aligned its relevant national legislation with the approval of

- the legislative decree 30 May 2018, n. 81, transposing the directive, 2016/2284 setting National Emission Ceilings (NEC) for air pollutants;
- the law 12 December 2019, n. 141, converting the legislative decree 14 October 2019, n. 111 ("Climate legislative decree"), containing urgent measures for compliance with the obligations established by Directive 2008/50, on ambient air quality and cleaner air for Europe.

The full application of such reforms will require the adoption of some implementing acts, both at national and regional level, in order to develop the specific regulatory framework that is needed to translate the objective of the legislation into concrete measures.

Objectives:

The reform aims at aligning national and regional legislation, and introducing relevant accompanying measures, for the reduction of the emissions of the air pollutants (in compliance with targets set by Directive 2016/2284 on national emission ceilings) as well as the ones of climate-altering emissions.

Implementation: The reform proposed by the Ministry of Environment (MATTM) provides 5 measures, as detailed below:

- Adoption of a National air pollution control Program pursuant to EU Directive 2016/2284;
- Adoption of a Climate Legislative Decree with 4 implementing decrees;
- Implementation of a Reform Program for the Regions of the Po river basin;
- Implementation of legislative and financial initiatives through other regional agreements;
- Implementation of a monitoring system to support the implementation of measures included in the PNIEC.

The reform will be implemented through specific monitoring indicators, as follows:

- Spared emissions of the target pollutants of directive 2016/2284 expressed in t / y;
- Reduction of 33% CO2 emissions by 2030 compared to the target in 2005 in non-ETS sectors expressed in Mt CO2 eq.

Target population: Citizens, regional and local authorities, transport operators.

Timeline: The implementation period is estimated to be 2 years.

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1) Development and support for the supply chain of renewables.

Investment 1.1: Renewable Energy Sources (RES).

1.1.1 *Support for the development of the authorization of projects such as project pv floating and wind farms offshore, projects that are developed on PA sites (disposed in the last 3 years), or are low ground consumption or combined with storage technology*

Challenges:

The NECP set the renewable energy production target in 2030 to the 30% in gross final energy consumption (moving from the 18,3% in 2017) and assigned to renewable electricity the most challenging objective to cover the 55% of final electricity consumption (34,1% in 2017). To this purpose, the NECP provides the following considerations:

- The significant technically and economically feasible growth potential of photovoltaic installations and wind parks, thanks also to the reduction in costs associated therewith, points to a major development of these technologies, the production of which should triple and more than double, respectively, by 2030.
- In order to attain the targets on renewables identified for 2030, it will not only be necessary to stimulate new production, but also to preserve existing production and, if possible, actually increase it, by promoting the revamping and repowering of installations. In particular, the opportunity to promote investments in the revamping and repowering of existing wind power plants with more developed and efficient machines, by exploiting the excellent wind conditions at well-known sites that are already being used, will also help to limit the impact on soil consumption.

- A similar approach, based on a reduction in soil consumption, will be followed in order to guide the expansion of the significant growth capacity of photovoltaics that is projected for 2030, by promoting their installation primarily on buildings, roofs, car parks, service areas, etc. In order to attain the 2030 targets, it is nevertheless still vital to promote large ground-mounted photovoltaic installations, with priority being given, however, to unproductive areas that are not earmarked for other uses, such as areas not usable for agriculture. In this light, installations in former artificial areas (with reference to the National System for the Protection of the Environment (Italian initials SNPA) classification), preference should be given to contaminated sites, waste disposal sites and areas along the infrastructure system.

When considering mature technologies (e.g. onshore wind, grounded PV), a grid parity condition can be expected.

To explore renewable energy production from wind offshore and floating PV (likely to be far from grid parity) is identified by the NECP as an option, within the boundaries of environmental sensitivity and sea transport safety constraints.

Objectives:

In order to foster investments in renewable energy production, consistently with the considerations reported above, the investment action presented here foresees the following contribution to RES development:

- financial support through grants to support the development of floating PV and offshore wind projects, projects carried out on sites owned by the PA or with low land consumption or combined with storage technologies;
- financial support through loans (senior/junior loan and/or credit enhancement) for grid parity systems.

From a market perspective, different roles are assigned to grants and loans, respectively:

- Grants: they shall help mitigating merchant risk.
- Loans: they shall facilitate project bankability and/or financial sustainability with a specific focus on grid parity initiatives potentially at merchant and/or off-taker's risk

When preparing this measure, the assumption made is that a 4x leverage factor can be assigned to such instruments.

The overall target is to generate an increase of 4,5-5 GW of installed capacity in 2026 in order to support the 2025 NECP's target.

As reported by the milestones planning, it is foreseen to complete the allocation process of related financial resources by the first quarter of 2022, so complying with the EU Offshore Renewable Energy Strategy which provided that Member States shall be able to present

a pipeline of mature projects by the end of 2023.

Implementation:

This investment action will be implemented by the Ministry of Economic Development, which will assign grants support through call for tenders, while loans will be intermediated by an implementing body to be identified. Such procedures will be designed in a coherent manner with State-aid rules and submitted to EC's competition authorities before the implementation.

The implementation plan is coherent with the NECP's provisions, that is to accelerate renewable electricity plants authorisation and construction from 2021 onwards, in order to achieve the ambitious objectives of the Plan (to be revised according to the new climate actions of the Commission).

Depending on further considerations on technology maturity and market readiness, deployment actions for wave and tidal energy will be explored.

Target population: Renewable energy production project promoters, infrastructure project developers, related investors, renewable energy technology providers.

Timeline: The implementation period is estimated to be 5 years.

1.1.2 *Support to the development of innovative integrated offshore renewable plants construction.*

Challenges: According to the Italian Integrated National Energy and Climate Plan (NECP), Italy has set targets for the installation of 300MW and 900MW of offshore wind by 2025 and 2030, respectively.

To meet these targets, it is crucial to encourage both national and foreign financing institutions to invest in Italy strengthening national infrastructures while increasing the production of clean energy. In order to attract all types of investors some challenges need to be overcome.

The first challenge is the length of the authorization process. To ensure more attractive and efficient conditions to market players, Italy has to streamline and simplify the permitting process.

Another challenge is to overcome the lack of attractive financing schemes related to emerging technologies such as floating offshore wind. Supporting such technologies is, in fact, crucial for coastal countries with high levels of urbanization such as Italy to meet renewable energy production targets.

Objectives: In light of the Offshore Renewable Energy Strategy and the Strategy on Energy System Integration, through the initiatives described below, this Investment aims

at creating the pre-conditions to foster ambitious projects such as the realization of energy hubs combining energy production from different renewable sources.

The ambition is to realize integrated systems, first of their kind in Italy and in the Mediterranean Sea. The renewable energy would mostly come from offshore wind, either on fixed or floating foundations depending on water depths, and floating solar PV.

While the energy production is known to be intermittent in case of offshore wind and solar PV, the intermittency can be removed with the implementation of a dedicated system for energy storage. This investment aims at contributing to the decarbonization of the EU energy mix and supporting the transition to carbon neutrality of the European Union. Furthermore, it will contribute to the creation of a dedicated supply chain and it will create new highly technical skilled jobs.

All authorisation procedures (see also Reform 1) will comply with the EU environmental *acquis* (Environmental Impact Assessment, Habitats Directives) for individual projects and base their deployment on Maritime Spatial Planning (EU Directive 2014/89/EU).

Depending on technology maturity and market readiness of related components, investments can be made relying on recycled blades and batteries.

Implementation: In order to implement such projects, we might expect a public procedure focusing on innovative and sustainable technologies, system integration capacity and impact on Italian value chain. The implementation might involve Academic Research Centres while supporting the interaction with innovative start-ups.

In order to achieve these results, it is necessary for every wind farm to start with a wind measuring campaign. Since wind resource is of crucial importance in reducing the uncertainty in the predicted energy production of a wind initiative, this project will see the implementation of 4 measurement campaigns. They will be performed by floating lidar devices that will permit to measure the wind resource at multiple heights from near ground to above typical wind turbine hub heights. The wind monitoring campaigns will take not less than 12 months and will enable us to have accurate knowledge in terms of wind energy potential in the investigated areas.

Lidar fixed solutions can also be installed on existing offshore infrastructure, such as oil and gas platforms, located close to the investigated area. In this case additional costs of lidar floating solution will be avoided.

It is also crucial to strengthen the electrical infrastructure. Grid stability and appropriate capacity are key factors to consider. The implementation of intermittent renewable energies requires energy storage systems to balance the intermittency and capacity. Thus, the project will also see the upgrade and building of the required electrical infrastructure.

To support emerging offshore renewable technologies, 100Mw Floating PV plants will be engineered and installed in an area with a high irradiation in order to support and

integrate with Offshore wind turbines, therefore increasing total energy production.

The Floating PV technology targeted is able to resist significant wind streams and significant waves up to 4meters due to its flexible structures. An expected reduction of more than 70,000t CO2t per year is expected. This quantity is equivalent to removing from the road approximately 15,000 cars.

Target population: All local administrations are involved from the early phases to review the projects. The best onshore sites for the location of the activities are in the process of being selected in accordance with ongoing consultations with stakeholders involved safeguarding the marine flora and fauna.

Transmission system operators (TSO) are involved to review together storage capacity and grid stability. Avoiding intermittency in the injected power is a priority for the project.

Scouting of EU providers will be performed involving small and medium companies as well as start-ups for the supply of highly technological components.

For the Floating lidar campaigns subcontractors will be selected for the:

- Provision of a local marine facilities at the selected port
- Execution of local marine operations for commissioning
- Provision of suitable vessels
- Data management
- Service and maintenance as necessary, including vessel mobilisations
- Decommissioning including vessel mobilisations upon the end of the campaign

Floating PV will be engineered and installation performed relying on the EU value chain.

Fabrication of wind foundations will take place in national yards, thus creating new jobs but also widening the competences of existing yards.

For the procurement of smaller components, both for wind and solar, EU suppliers will also be considered. This approach will allow EU manufacturers and suppliers to have their references for a market in continuous expansion.

TSO will also contribute with their innovative solutions to overcome typical challenges with respect to grid connection. The involvement of national Transmission System Operator (TSO) will allow to establish a sound and robust collaboration that will result in a faster approach towards grid capacity evaluation and connection which will benefit future projects to come. All works required to upgrade the electrical infrastructure will likely involve EU contractors.

Timeline: The timeline foreseen for the investment is approximately 4 years.

1.1.3 *Promotion of RES for collective and individual self-consumption.*

Challenges: Italy has signed a plan characterized by very ambitious goals regarding the development of renewable energy for the next few years. In particular, among NECP targets, Italy has set that by 2030 the share of gross energy consumption covered by renewable sources will reach 30%, compared to a current figure of around 18%. Moreover, most likely, the 30% target will be further increased with a view to making the goal of total decarbonization by 2050 more feasible.

The achievement of these national objectives requires an important effort on many fronts, including: energy efficiency (to contain consumption and, consequently, also the increase in the effort on renewable sources), support for the penetration of renewable sources in the electricity sectors, thermal and transport, increase in RES production from small and medium power plants spread throughout the national territory To this purpose, this project focuses on supporting the energy communities and the self-consumption process.

Following the publication of the Renewable Energy Directive (RED II), Italy has planned to design regulatory framework and incentive systems for the increase of small-power renewable generation plants (residential use).

Objectives: The project aims to increase the number of RES plants, supporting the following configuration, through incentives.

- Energy communities;
- Self-consumption.

Specifically, this project aims to ensure the necessary financial resources to be able to install a new capacity of 1500 MW through the configuration of energy communities and of 1000 MW through the Self-consumption configuration. For both the configurations, it is expected that these can have an annual producibility of 1200 MWh / MW.

Implementation: Based on the national context and on the objectives set in the NECP, in order to concretely increase the number of RES plants and achieve 2500 Mw of new power generation capacity:

- 1600 ML € of loans would be allocated to energy communities
- 600 ML € of grants would be for self-consumption

Concerning the energy communities, the loans would be integrated with the financing mechanism introduced by DL 162/2019, converted by law 8/2020, and implemented with Arera resolution no. 318/2020 / R / eel of 4 August 2020 and decree of the MiSE.

Both the mechanism will be based on the amount of energy produced that is self-consumed by the members of the community, albeit "traveling" on the public network. The incentive is equal to 110 € / MWh and is recognized for 20 years (estimated life of the plant) is repaid through a contribution to electricity bills (Asos component). During the pre-

liminary investigation for the preparation of the decree, this value is associated with a shared energy level equal to 60% of that produced.

The financing mechanism on which the loans will be integrated consists of a part linked to the non-payment of the costs of transport and distribution of electricity and a part linked to the power of the plant. Considering a 100 kW plant, the explicit support mechanism currently in force (decree of 4 July 2019) provides for a premium on self-consumed energy of 10 € / MWh (only if self-consumption is greater than 40% of the produced) and an incentive of approximately 60 € / MWh (calculated as the difference between the recognized tariff of 105 € / MWh and the current market price of electricity), both recognized for 20 years.

Target population: local, regional and national administration; municipalities, renewable power producers, PV local installers.

Timeline: The implementation period is estimated to be 6 years.

Investment 1.2: Development of an Italian supply chain for renewable technologies production (PV cells and panels, and medium-large size wind turbines).

Challenges:

Photovoltaic technology has always played the role of driving technology in the energy transition process. In the next decades, the solar PV capacity is expected to increase from 795 GW in 2020 to 2440 GW in 2030. By 2030, solar power in Europe will grow from today's 152 GW to 442 GW and in Italy from 21 GW to 52 GW (source: BloombergNEF).

Italy has a background of innovative technologies and efficiencies potentially higher than conventional ones. Therefore, it is appropriate to strengthen EU capabilities able to compete in a market considered strategic for the energy transition, supporting manufacturing capacity building in the country, allocating the related financial resources through transparent and non discriminatory procedures to EU players.

This initiative will provide a substantial social impact at national and European level because it will foster the European technology leadership in the next generation of PV modules and cells impacting on the whole PV value chain, expertise and know-how.

Thanks to its recognized role in the Mediterranean basin Italy may become a pivot in the PV market for the whole area, which accounts for an additional installed PV capacity from today's 18 GW to 80 GW in 2030 (source: BloombergNEF).

Since the market for photovoltaic cells and modules is dominated by Asian producers (mainly Chinese) for about 70% and Europe currently accounts for less than 5% of the production capacity of PV modules, the project will contribute to build a lasting Ital-

ian and European technological independence from extra-EU PV producers in order to overcome the energy transition challenges.

As for wind energy, Italy has been working to strengthen the commitment to decarbonization roadmap and in light of the milestones set by the Green New Deal, Wind Turbine Technology will be playing an important role. According to NECP wind energy is expected to grow around 80%, from the present installed 10GW to 18GW (1GW offshore). The global Italian demand is expected to be split in 5GW dedicated to repowering existing wind farms and the remaining 13 GW for new plants to be developed within 2030.

The project is in line with the green and digital transition and green economy required by the RRF and European Green Deal.

Thanks to its Strategic position in the Mediterranean area, Italy may play a pivotal role in the wind turbine market for the whole area.

The creation of a new European player in wind turbine technology for medium-high power aerogenerators, offers the opportunity to develop an additional supply chain, increasing industrial production within Europe.

Objectives:

This investment aims to achieve the green transition and restore Italy's growth potential. It allows the creation of new jobs in the aftermath of the COVID-19 crisis. It promotes sustainable growth based on the use of renewable energy in line with the objectives of the Next Generation EU and the Integrated National Energy and Climate Plan.

Furthermore, this investment aims to relaunch of EU supply chain in the wind turbine sector with creation of a new player, expected to rapidly expand rapidly a market segment not fully covered today, generating employment in the aftermath of the COVID-19 crisis and creating a new competence in the EU, with impact on Italy (developing R&D capabilities). In agreement with European Green Deal the project will contribute to reduce social and territorial inequality.

It will develop:

- new jobs created in the country, focussing on southern regions;
- fixed capital: in high-tech industrial infrastructures and digital automation, research and development and production of intellectual property and know-how;
- human capital: by new technical and specialist skills
- natural capital: contributing to the renewable resources increase as required by the NECP.

The main objectives are to:

- establish a EU champion of advanced and proprietary green PV technologies production;

- consolidate and create proprietary know-how and skills, by an R&D in strong synergy with external Research Centers and Suppliers;
- set-up the necessary supply-chain, by restoring a European chain in photovoltaic industry;
- contribute to the national objective of CO2 emissions reduction spelled out in the National Energy and Climate Plan.

To achieve it, the use of other EU instruments like Horizon Europe (e.g. European Partnership for Clean Energy Transition) can be considered.

These actions will contribute to the national objective, spelled out in the National Energy and Climate Plan, to reduce the national objective of CO2 emissions and supporting the green & digital transition.

Implementation:

The project will enhance the technological skills and high-tech industrial infrastructures and digital automation of an existing Italian start-up specialized in the production of PV cells and modules. The production will increase from the current 200 MW/year to at least 2 GW/year in 2025 by establishing the new production line, the processes and the supply-chain along with the necessary R&D, IP and channels to the market. By early 2026, the proprietary technology upgrade will increase the production to at least 3 GW/year. The major steps of implementation are the following:

- Design for permitting and request submission to the relevant Authorities,
- Permit obtainment,
- Design specifications and procurement contracts,
- Cell and Module line tools manufacturing by Suppliers and shipment,
- Cell and Module line facility and equipment installation,
- Cell and Module line start up and setting up,
- Module production ramp up to 2 GW/year,
- Technology upgrade implementation and production ramp up to 3GW/year.

As for the wind turbine supply chain, the implementation is foreseen to be articulated on the following main steps:

- Set up of IP & technology (consolidation of existing capabilities and acquisition of missing technologies)
- Set up of a manufacturing facility
- Set up of a local supply chain
- Prototype Manufacturing and assembly phase
- Commissioning and Testing of a pilot unit
- In parallel with know how improvement and development

Target population: Local, regional, national administrations, renewable energy produc-

tion project promoters, renewable power producers, IPPs, investors in renewable energy project, EPCs, Distributors.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

Investment 1.3: Projects at local level (Municipalities)

Investment under definition

Investment 1.4: Reinforcement and digitalisation of power grid infrastructure.

1.4.1 *Installation of thermal energy storage systems.*

Challenges: The initiative supports the green energy transition, with a sustainable growth of renewable energy sources, allowing a larger reduction of renewable energy curtailment and a better balancing of its production in the national pool.

Reference is made to the italian TSO's (Terna) Development Plan 2020 future increasing of installed RES capacity, leading to additional curtailment due to overgeneration.

Objectives: The investment anticipates the installation of thermal storage systems to decouple the thermal and electrical flows of "must-run" CCGT (Combined Cycle Gas Turbines) plants enabling time shifting of the electrical production, while ensuring safe and continuous energy supply to industrial complexes, especially those subject to major accident risk (Seveso's directive).

These actions will contribute to the national objective, spelled out in the National Energy and Climate Plan (NECP), to increase renewable quota in the Italian energy mix (55,4% at 2030) and reach a storage capacity of 3,0 GW at 2025, and are in line with EU's decarbonization strategy.

Implementation: Total amount of the investment (50 M€) to be fully funded by RRF on a non-repayable basis (100% grant on capital expenditure); otherwise, a suitable regulatory framework, providing for a support mechanism, should be developed to make the project sustainable.

Target population: Italian transmission system operator, renewable energy producers, installers, engineering companies, EPC contractors, small and medium enterprises.

Timeline: The implementation period is estimated to be 5 years.

1.4.2 *Interventions to make electricity distribution networks smarter (Smart Grid).*

Challenges: The growth of distributed RES generation foreseen by the NECP is going to require large investments to increase (especially) distributed generation hosting capacity. Although DSOs' investments are remunerated by tariffs, additional public contributions are able to accelerate projects implementation while minimising the impact of such effort on energy bills.

According to available analysis (Ministry of Economic Development and DSOs estimation), in the NECP's implementation timeline, the hosting capacity gap between DSOs funding potential through tariffs and foreseen system needs is around 8.000 MVA.

Objectives: The investment aims to increase the hosting capacity of distribution networks, in order to integrate the growing share of RES produced by distributed plants and to contribute to CO2 emissions reduction, complying with the NECP and EU strategies.

Consistently with the gap analysis mentioned above, the overall objective of this measure is to build around 230 new primary stations for an equivalent hosting capacity of 8.000 MVA.

RRF's resources are going to be committed to this purpose in order to minimise (if not completely avoid, any impact on energy bills by increasing tariffs).

Implementation: The Administration has gained considerable expertise in the implementation of the measure, thanks to previous experience in the management of the ERDF Fund. Therefore, the procedure tested and used - even recently - for similar initiatives on resources of the PON-IC, which provides for the selection of projects submitted on the basis of a technical-economic evaluation, can be replicated.

Based on state aid rules in force, the measures can only be implemented in the assisted regions (Apulia, Calabria, Sicily, Basilicata, Campania, Sardinia). The planned budget would be entirely expendable in these regions. However, the Directorate has already moved steps to open to such throughout the national territory.

The potential risks (however low and related only to cases in which it is necessary the authorization to the realization of lines) are manageable in the indicated times. An IT monitoring platform for similar operations financed from ERDF resources and more generally a bimonthly monitoring system is in place and can be replicated.

Target population: DSOs, local and regional administrations, Municipalities and other stakeholders.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

1.4.3 *Interventions to increase the resilience of the distribution network.*

Challenges: Improving the resilience of the distribution network: in particular, increas-

ing the resilience of the system to extreme weather events. Although the investments of the concessionaires are remunerated in tariff, the need to support such investments with public contributions arises from the need to be able to count on the accelerating effect that only a public intervention can guarantee and that is fully justified in the face of the large investments provided for by the NECP on the network distribution for the achievement of the challenging objectives of the same NECP, both in terms of increasing the share of energy needs covered by energy from renewable sources and lower CO2 emissions. Non-repayable contribution of 100% of the investment made.

Objectives The investment aims to increase the resilience of the system to extreme weather events such as heat waves, ice sleeves, etc.

Implementation On the basis of the state aid rules in force, the measures can only be implemented in the assisted regions (Apulia, Calabria, Sicily, Basilicata, Campania, Sardinia). The planned budget would be entirely expendable in these regions, the Directorate has, however, already activated on this front so that such interventions are feasible throughout the national territory. The potential risks (however low and related only to cases in which it is necessary the authorization to the realization of lines) are manageable in the indicated times.

The bimonthly monitoring system currently used for other types of public support on the networks may be borrowed.

Target population: DSOs, local and regional administrations, Municipalities and other stakeholders.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

1.4.4 *Installation of integrated EV charging stations.*

Challenges: The NECP gives the transport sector a central role in the decarbonization path to 2030. To achieve the European targets on decarbonisation, a fleet of around 6 million electric vehicles is expected by 2030 (of which 4 million fully electric and 2 million plug-in hybrids)

According to the data published by ACI, as of 31.12.2019 they are registered in the PRA 39,545,232. 46% of the fleet is petrol powered, 44% diesel, 9.9% has alternative power (it was 9.3% in 2018). Alternative fuel cars, 3,896,923, recorded a growth of 7.9% and are broken down as follows: 2,574,287 petrol-LPG (6.5% share), 965,340 petrol-methane (2.4% share), 22,383 battery electric (+ 0.1%), 316,209 petrol hybrid (0.8%), 18,359 diesel hybrid (0.1%), other 6,195. 5,606 units (about a quarter of the electric car fleet in Italy),

Based on this scenario, it is therefore essential to promote the development of a network of charging stations to support the projected increase in the need for electric mobility.

The lack of widespread distribution appears to be, for many studies conducted in Italy, the main cause of the lack of purchases of electric cars in Italy.

The employment impact, calculated from a statistical processing Input / output matrix based on networks, returns a value of approximately 6.6 hires for every million euros invested.

Objectives The work carried out in the MISTEG, for the purpose of revising the National Plan for the development of electric charging infrastructures (PNIRE), to the aim of identify, for each type, the objectives in terms of electric charging infrastructures necessary to reach the NECP targets, the following number of EV charging stations. Therefore, this project aims to support the construction of the following recharging points

- Number of charging stations on motorway: 222
- Number of charging stations on sub-urban areas: 1800
- Number of charging stations on urban center areas: 3537
- Number of charging stations connected to storage: 100

The targets were design assuming a slightly higher utilization factor for plants in extra-urban areas, and a progressive growth over time of the electric fleet in circulation in these areas.

Implementation General coordination will be carried out by the MiSE, with the support of the other Administrations with technical qualification functions (MIPAAF, MATTM, MEF). In the first months of 2021, the primary regulation and the implementing decree should be issued with notification to the EC. From the second half of 2021, resources will begin to be assigned and transferred according to a work progress logic.

The proposal approach provides for a contribution, in compliance with the limits and intensity of aid provided for in the European framework, on the cost of construction and in any case not exceeding 40% -80%. Details of the different financial contribution (% of the total cost), for the different configurations, are provided below

- Charging stations on motorway: 40 %
- Charging stations on sub-urban areas: 40 %
- Charging stations on urban center areas: 40 %
- Charging stations connected to storage: 80 %

The factor that most affects the economics is, on the other hand, linked to the level of use of the charging station and, therefore, indirectly to the intensity of traffic on the road on which it is installed.

Assuming a slightly higher utilization factor for installations in non-urban areas, and a progressive growth over time in line with the expected growth of the electricity fleet in circulation, it is possible to arrive at first estimates of the economic payback time of the investment, 'IRR and NPV. The aid intensity has been set at 40%, except for the case in

which there are accumulations, for which a higher aid intensity appears necessary.

Target population: Local, regional, national administration, Municipalities, renewable power producers, DSOs, EV charging station installers, infrastructure project developers, stakeholders of the electrical mobility

Timeline: The implementation period is estimated to be 6 years.

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2) Promotion of clean hydrogen production and use.

Investment 2.1: Production of Hydrogen in brownfield sites.

Challenges: From an initial statistical survey of 2011, the total surface of the land dedicated to industrial areas in Italy was found to be 9.000 km2, an area approximately equal to that of the italian region of Umbria. Many of them are situated in strategic positions with untapped potential to contribute to build a more granular hydrogen network production & distribution to SMEs close by. The investment will provide the local use of H_2 in industry and SMEs, thus creating new Hydrogen Valleys with local production and utilisation.

Objectives: This investment has the objective of a new use of abandoned industrial areas to test unit hydrogen production from local RES in the industrial area and facility. The investment provides for a possible suitable re-use of industrial areas, avoiding further use of agriculture exploitation and becoming an engine for the revival of local economies, while providing a driving force for employment, economic growth and a widespread process of decarbonisation of the territories of the South Italy, enhancing production from renewable sources. The fallout in terms of employment can be quantified 25/50 units per system, according to capacity.

Implementation: - to be completed -

Target population: Hydrogen industrial players, research institutes, universities, SMEs, start-ups, municipalities and other stakeholders.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

Investment 2.2: Production of Electrolysers and Development of an Italian Hydrogen Supply Chain.

Challenges: In Italy, already existing industrial entities having expertise in high technology adjacent sectors could speed-up the technology development and the set-up of an industrial electrolyser OEM for massive production of electrolysers. The project aims to create an industrial center for the production of electrolysers to meet the growing

demand in the coming years. The industrial pole must be able to produce electrolysers of different sizes and types to meet the different needs of the market. At this stage the main types identified are: Alkaline, PEM, AEM. For the first two types, the objective is the reduction of final costs by leveraging economies of scale, for the AEM electrolysers the involvement of research bodies (see projects H_2 R&D) is expected to increase yields and in particular on the length of the life cycle.

The Electrolyser market should scale up quickly as well: it is foreseen to grow by ~600 times in the next decade, from the current 70 MW of installed capacity to 40 GW declared by the European Union strategy. Italy has already some national capabilities in the production of electrolysers, but the sector will require a significant scale up in the production output, in the development of end-to-end capabilities (from stack to electrolyser installation), and in the investments in R&D and pilot projects for large-size electrolysers (i.e. electrolysis capacity greater than 10 MW)

To kick-start the development of a hydrogen market, the Government envisions the installation of about 5 GW of electrolysis capacity by 2030 to meet part of the above mentioned demand. National production of green hydrogen may be complemented with imports – which can be leveraged to position the country as a hub for hydrogen trading – or other forms of low carbon hydrogen, such as blue hydrogen.

Objectives: This investment aims to create of a national supply chain based on the potential user basin, economic impact in terms of employment and social growth, specialized jobs (technical, contribute to the decarbonisation of the economy), reduction of dependence on oil, reduction of energy imports, spillover of new specialized companies, projection on international markets, creation of turnkey service formulas for the the industrial sector.

The programme foresees two main delivery milestones where two different electrolyser sizes will be released. This choice goes into the direction of risk reduction and anticipates as much as possible the diffusion of systems to produce green hydrogen.

Implementation: To satisfy a hydrogen demand of about 2% by 2030 (corresponding to about 0.7 Mton / year), the most favorable conditions will need to be identified to ensure production feasibility and a low commodity cost.

Create an industrial plant for the production of electrolysers to meet the growing demand in the coming years and create an Italian Supply Chain on H2.

1. Set -up IP framework;
2. Set up a development programme based on a modular approach to satisfy a wide range of application;
3. Construction of dedicate manufacturing facilities dedicated to: feedstock management, assembling, prototype tests;
4. Manufacturing of the first prototype 1:1 scale with respect to commercial version

for 1-5 MW scale;
5. Manufacturing of the first prototype 1:1 scale with respect to commercial version for > 10 MW scale;
6. Execution of an experimental campaign on the prototype to verify its behaviours in different operating conditions and obtained the proper certifications.

Target population: Power system manufacturers, power engineering companies, producers of electrolysers components, chemical industry, investors in electrolysers, infrastructure project developers, local municipalities and other stakeholders.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

Investment 2.3: Hydrogen use in "hard-to-abate" industry

Challenges: Hydrogen can help to decarbonize "hard-to-abate" sectors, characterized by a high intensity energy and lacking scalable electrification options. Two of them are the chemical products and oil refining sectors, in which hydrogen is already used as feedstock in the production of base chemicals, such as ammonia and methanol, and in a number of refining processes.

Hydrogen is mainly produced on-site in its "grey" form, i.e. from natural gas using Steam Methane Reformers (SMRs). This process is not emission free: emissions per kg of grey hydrogen produced are in the range of 7-9 kg CO2 / kg H2. To decarbonize it, a progressive switch to low carbon hydrogen would be a valid alternative. Current production is around 0.5 Mton H2 /year (a penetration of about 1% on final uses), therefore representing one of the most promising sectors to start using low carbon hydrogen and developing the market.

In Europe, several projects have been launched in the past few years to experiment low carbon hydrogen in refineries and chemical plants, with strong momentum mainly driven by the willingness to contribute to national environmental targets, and to relevant funding provided by regulatory agencies for pilots and projects in low carbon hydrogen production. The dimension of the projects is still small compared to the total hydrogen need of an average plant, but many of them are expected to be in full operation by the end of the next year.

In Italy, refineries and chemical plants are mainly concentrated in central- northern Italy and on the islands, with wide variations not only in terms of plant dimensions and emissions, but also physical characteristics (e.g. proximity to sea, availability of sunlight, etc.). Therefore, the switch to low carbon hydrogen will need a careful plant-by-plant evaluation to assess its technical feasibility.

Objectives: In the primary steel industry, hydrogen represents the only zero carbon alternative in the production of Direct Reduced Iron (DRI), which can be progressively

used to avoid the high emissions' production of cast iron from blast furnaces. Currently, DRI technology uses natural gas as a preferential commodity: with the declining cost of hydrogen as compared to natural gas, steel making plants could start to consider hydrogen blending for DRI production.

In the industrial sector – in addition to chemical production, oil refining and primary steel production – hydrogen has the potential to be used also in industrial heating, particularly for processes requiring high temperature (>1000°C, e.g. in steel or cement industry, glass and paper plants), in which electrification may not be the most efficient or feasible alternative due to the necessary upgrade of the existing infrastructure.

Implementation: - to be completed -

Target population: Hydrogen industrial players, research institutes, universities, SMEs, start-ups, municipalities and other stakeholders.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

Investment 2.4: Hydrogen Use in Heavy Goods Transport on Wheel.

Challenges: The long-haul truck segment is one of the heaviest-emitting sectors, accounting for 5-10% of overall transport. Currently, the regulatory landscape for the transport sector is evolving with concrete actions towards decarbonisation, setting new emission standards for Original Equipment Manufacturers (OEMs) in the next few years. In particular, new regulations for OEMs require emission reductions by 15% and 30% on new sales, by 2025 and 2030 respectively.

To comply with these new targets, OEMs are starting to invest in alternative powertrains, to progressive switch from diesel engines, currently the most used in heavy transport, to lower carbon fuels (hydrogen, biofuels, biomethane, etc.), electric powertrains or LNG. Not only cost competitiveness (i.e. Total Cost of Ownership - TCO) but also technical parameters (e.g. refuel time) drive customers' choice in this sector. For example, while the TCO of fuel cell trucks is currently not in competition versus other low carbon alternatives, its superior mileage and faster charging time compared to electric powertrain can pave the way for fast adoption of hydrogen based solutions. Moreover, the TCO of fuel cell trucks can become competitive with diesel trucks in the next decade, thanks to the declining cost of both vehicle and hydrogen price.

In Europe, the fuel cell truck market is starting to ramp up, with the first ten fuel cell long-haul trucks currently in full operation in Switzerland. Italy can follow a similar trajectory: it can be expected to witness a penetration of at least 2% of fuel cell long haul trucks by 2030, on a total national fleet of around 200,000 vehicles.

To sustain such market growth, a full scale-up of the fuel cell technology and investments

in relevant infrastructure should be undertaken. In particular, a dedicated grid with tens of refueling stations needs to be deployed, with priority given to strategic areas for heavy road transports (e.g. near inland terminals and on typical long-haul trucks' routes). For instance, the A22 Modena-Brennero or the West – East corridor (Turin – Trieste) highway could be a one of the possible starting points to install refueling stations and enable the fuel cell trucks' market growth. Further developments will take into account the update of DAFI Directive, foreseen within 2021.

The long-haul truck segment might experience a more significant penetration, and rise to 5-7% from the above mentioned 2% by 2030. This could be partially due to a more stringent target on overall emissions, likely to be approved in the context of the EU Green Deal. Moreover, the specific regulation on OEMs may require an additional effort in terms of climate impact (15% and 30% emission reduction on new sales by 2025 and 2030, respectively).

Objectives: This investment aims to create a hydrogen refuelling station network with up to 40 refuelling distributors suitable for trucks for a reduction of transport-related emission.

- *Reduction of emissions*: effect on climate and health;
- *Energy efficiency*: use of local energy from renewables;
- *National and regional economic cycles*: reduction of dependence on oil, reduction of energy imports, creation of economic value at local level;
- *Economic value*: connection with EU economy, tourism of the future tourism - flows to the Mediterranean;
- *Specialized jobs*: technical for asset management and maintenance;
- *Image*: Italy beacon for green technologies, tourism and eco-sustainable transport;
- *Replicability*: projects can be replicated throughout the country and abroad.

Implementation: - to be completed -

Target population: Local, regional, national administration, Municipalities, infrastructure project developers, investors in hydrogen technologies.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

Investment 2.5: Hydrogen Use in Railway Mobility

Challenges: Another sector of interest for hydrogen is the railway sector, in particular the passenger railway transport: in Italy, approximately one third of the railways are dedicated to diesel trains, accounting for a small portion of national transport emissions. Fuel cell trains can become cost-competitive with diesel trains in the next decade, therefore being one of the most promising sectors in which to kick-start the development of a national hydrogen market.

In some European countries (e.g. in Germany), passenger hydrogen trains are already fully operative and regularly used by customers. In the UK and France, some proposals have been made to completely substitute diesel trains with hydrogen trains in hard-to-electrify routes by the next two decades.

In Italy, up to half of the non-electrified national routes could be converted to hydrogen by 2030: in some regions, diesel trains have a high average age and should be substituted in the next few years, making this the right moment to switch to hydrogen. Potential first regions in which start the deployment are those with a high number of diesel trains serving a large number of passengers, such as Sardinia, Sicily, Piedmont or regions where there is a common consensus on using hydrogen to start decarbonizing and improving local railways.

In terms of infrastructures, relevant synergies with the refueling stations for long haul trucks will need to be identified to boost utilization. Freight villages are an example of places in which hydrogen demand for both trucks and trains may need to be satisfied in the next decade.

Objectives: This investment aims to introduce hydrogen-powered trains into the national rail network. Hydrogen can replace diesel where track electrification is not economically feasible. Several trials and pilot projects worldwide have successfully shown the adaptability of the FCH technology to the rail sector across various applications ranging from regional passenger trains. In particular, about 40% of the national routes are not supported by electrification. As a result, the development of hydrogen trains is an economic opportunity to substitute the old locomotives.

Implementation: To develop a complete system for the production, storage and use of hydrogen for non-electrified railway mobility in which to carry out the first experimental projects, in view of the subsequent replacement of the diesel train fleet with hydrogen-powered trains. Construction of prototypes of hydrogen refueling stations complete with the infrastructure necessary for the service of the diesel train fleet with hydrogen-powered trains.

Target population: Local, regional, national administration, Municipalities, infrastructure project developers, investors in hydrogen technologies.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

Investment 2.6: Hydrogen Research & Development

Challenges: The main challenges of this investment concern the technological demonstration in integrated and operational environments (Technology Readiness Level - TRL 8) of the various technological and system solutions developed. In particular, the implementation and demonstrate the different technologies for the production of hydrogen from

Renewable Energy Sources (RES), transport and distribution in mixture with natural gas (GN), or in pure form, in pipelines, up to use of hydrogen in the various application sectors, relating to energy, industry, sustainable mobility and transformation processes into synthetic products (gases / liquids).

The TRL increase will be achieved thanks to the integration and experimentation in a qualified and operational environment (Hydrogen demo Valley) of the various technologies belonging to the value of hydrogen. Hydrogen acts as the link to create the interaction between the RES and the energy system, overcoming the criticality of intermittence, ensuring use deferred over time. Electrolisers are the key element in transforming electricity into hydrogen.

Objectives:

The investment aims to improve knowledge of the implementation of the hydrogen vector in all phases: production, storage and distribution. Alongside the technologies, the reduction of costs through the growth of returns through experimentation in the main segments and the creation of prototypes aimed at verifying the industrialization phase of innovative processes. R&D is an important enabler and accelerator for the diffusion of hydrogen.

In particular, the R&D activities will have following specific objectives:

- Production of hydrogen from electrolysis through mature technologies to ensure adequate hydrogen production, by coupling the use of renewable energy produced on site with electricity of certified renewable origin from the grid;
- Production of hydrogen from different energy sources with emerging technologies and in the pre-commercial phase according to industrial needs;
- Production of 100% renewable synthetic methane from green hydrogen and CO2 of biological origin, in order to favor the transport and distribution of renewable gases in the network (in perspective for seasonal geological accumulation) and towards users
- Identification of enabling technologies, development of business models and creation of professional figures that favor the development of the hydrogen economy;
- Innovate and digitize energy systems and networks to increase the interconnection between physical assets, people and information through pervasive IoT sensors, artificial intelligence and advanced control systems that allow to increase the resilience and reliability of infrastructures in new energy scenarios.

Implementation

A real hydrogen network will be developed with the aim of testing diverse technologies as well as operation strategies for supply and demand matching, as well as to provide R&D and engineering services for industrial players in need of to-scale validation of their products in a holistic environment.

A network of sensors will be introduced for the monitoring of the pipelines and, at a higher level, an all-encompassing system for data acquisition and analysis (HW and SW), both for integrated management of the Hydrogen Demo Valley and for categorising in view of possible replication in similar contexts.

Target population: hydrogen industrial players, research institutes, universities, SMEs, start-ups, municipalities and other stakeholders.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

Investment 2.7: Hydrogen Combustion Technology Development for green power generation.

Challenges: In a system with an increasing share of variable electricity production from renewables, the high flexibility of gas turbine based power plants can effectively ensure grid stability and security of supply.

Objectives: The main objective of the investment is to make gas turbines an integral part of the future energy mix, meeting the incoming demand to extend the fuel flexibility of existing power generation infrastructure to incorporate green fuels, in particular Hydrogen.

The investment aims to improve the combustion technology for existing and new gas turbines to support, during and after Energy Transition, the green power generation. The vision is to meet GHG reduction targets, using as much as possible all the infrastructure already existing for Natural Gas, in line with circular economy principles.

Implementation: The strategy is to design retrofittable burners able to use Hydrogen, replacing NG, up to 70% corresponding to -40% CO2 emissions reduction with respect to standard configuration operated with 100% of Natural Gas, and produce the prototype for each of the gas turbine sizes.

The Milestones of the investment are defined as real application and test of the technologies. These applications and tests will be done on field, on real Engine in Commercial running condition. In this case also the User (Electric Utilities) will be involved with positive effects on their business.

Target population: Gas turbine manufacturers, power engineering companies, other stakeholders.

Timeline: The implementation period is estimated to be 5 years (2021-2026).

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3) Sustainable local transport, cycle paths and rolling stock renewal.

Investment 3.1: Investment in soft mobility (National Plan of Cycle Path)

Challenges: The number of cyclists in Italy is constantly increasing since 2013 (+ 41% to 2018) and brings an economic value of 7.6 billion euros per year, while the Cycle Internal Product is close to 12,000 million euros, representing a booster for the sector, implemented in synergy with the additional incentives for soft mobility undertaken by the other competent administrations (e.g. MATTM "mobility bonus").

Besides being a sustainable urban transport solution, cycling plays a significant role for tourist mobility. With regard to cycle tourists, according to the analysis performed by Isnart-Unioncamere and Legambiente (2020), the total number of overnight staying of cycling tourists in 2019 was 54.7 millions. The majority of cycling tourists are foreigners (63%), while only 37% are Italians. The impact on the Italian economy in 2019 accounted for more than 4 million euros, corresponding to an average of 75 euros of expenditure per cyclo-tourist.

The estimates provided by Legambiente foresee a significant impact of the Covid-19 pandemic outbreak on the cycling sector: a 20% increase in the number of Italian cycling tourists is expected in 2020 compared to the previous year.

The mobility by bicycle will have a fundamental role in the immediate future and can have a driving effect on the cycle-travel sector with extraordinary potential in consideration of the Italian landscape and cultural context.

Objectives: The objective of the measure is to promote the use of zero emission vehicles for individual private transport and to encourage passenger intermodality involving the use of bicycles and public transport services. The realization of new cycle path will produce the following benefits:

- increase the potential attractiveness of daily journeys in urban areas with the use of bicycles, promoting the creation of interconnection nodes with other modes of transport (the so-called "last mile"), both within the city cycle network and in the connection between the sub-urban areas of large urban centers with the suburbs;
- improve the design quality of cycle paths, construction and maintenance of cycle networks, cycle and pedestrian routes, and urban and interurban infrastructures dedicated to soft mobility;
- enhance the playful and cultural aspects of the various areas crossed for tourist or recreational purposes (in the area of regional, national and European tourist cycle paths).

Implementation: The total cost of the measure is 737.3 million euros: 200.0 million euros for the realization of 1,000 km of urban and metropolitan cycle paths and 537.3 million for the realization of 1,626 km of tourist cycle paths.[11] At least the 50% of the

[11] Additional resources for cycle routes deriving from national Funds (2014-2020 Infrastructure FSCs), addressed to the competent territorial bodies (Regions) with relative CIPE resolutions

resources will be allocated to the south regions.

The estimation of the cost for urban and metropolitan cycle paths was calculated as part of a technical-economic pre-feasibility analysis which assumes a unit cost of 200,000 euros per kilometer, with possible further increase of cost for metropolitan areas. The urban and metropolitan cycle paths will be developed in the 40 cities hosting major universities to be connected with railway or metro nodes. The main university centres will be identified on the basis of the number of students enrolled in the universities and the number of student travelers using the rail stations. The specific projects will be realised in compliance with the Decree of the Ministry of Infrastructure and Transport of 4 August 2017, n.397 and following amendments. The Decree among others establishes that, in case of municipalities with more than 100.000 inhabitants, the new cyclo paths must be part of the planned interventions of the relevant SUMP.

Moreover, the indication of adopting SUMPs is also in line with the decree 12.08.2020, n. 344, for the allocation of resources to local authorities (municipalities and metropolitan cities) for interventions on cycling. In particular, a reward for the bodies that had adopted, as of 30 April 2020, the SUMP in application of the decree of the Minister of infrastructures and transport 4 August 2017, n. 397 is provided.

The interventions will be implemented by the local authorities in compliance with the strategies defined in Law no. 2 of January 2018 and in line with the provisions of the Biciplans of Metropolitan Cities and Municipalities regarding the integrated planning of sustainable mobility. It has to be specified that the drafting of the National Cycling Plan in implementation of Law no. 2 of 2018 is nearing completion. At this purpose, the measure financed by the RRF will be integrated with the national resources already available.

The development of national priority tourist cycle routes involves internal green areas not subject to development deriving from mass tourism (e.g. Ciclovia Vento, along the Po river), and it is implemented through functional lots, with an extension of tens of kilometers. The new kilometers to be realized are cross-territories and they will be uniform in terms of design, sign and functionalities. Tourist cycle paths are listed in the table M2C2-1 on page 65.

Table M2C2-1: **Tourist cycle paths**

No	National priority tourist cycle
1	Ciclovia Vento, da Venezia a Torino attraverso le Regioni di Veneto, Emilia-Romagna, Lombardia, Piemonte lungo le sponde del fiume Po (732km)
2	Ciclovia Sole, da Verona a Firenze attraverso le Regioni di Veneto, Lombardia, Emilia-Romagna e Toscana (392 km)
3	Ciclovia GRAB, Anello ciclabile all'interno della città di Roma lungo la via Appia e il fiume Tevere (44 km)
4	Ciclovia dell'Acquedotto pugliese, da Caposele a Santa Maria di Leuca attraverso le Regioni di Campania, Basilicata e Puglia, lungo l'infrastruttura storica del Canale Principe dell'Acquedotto pugliese (537 km)
5	Ciclovia Adriatica, da Venezia al Gargano attraverso le Regioni di Veneto, Emilia-Romagna, Marche, Abruzzo, Molise e Puglia lungo la costa affacciata sul Mar Adriatico (1109 km)
6	Ciclovia Tirrenica, dal confine Italia-Francia (Ventimiglia) a Roma attraverso le Regioni di Liguria, Toscana e Lazio lungo la costa del Mar Tirreno (560 km)
7	Ciclovia del Garda, un itinerario ciclabile ad anello lungo le sponde del lago di Garda attraverso le Regioni di Lombardia, Veneto e Trentino Alto Adige (140 km)
8	Ciclovia della Sardegna, itinerario ad anello attraverso l'intera isola della Sardegna e i centri di Cagliari ,Oristano, Macomer, Sassari, Porto Torres, Olbia, Tortolì (1134 km)
9	Ciclovia della Magna Grecia, da Lagonegro a Pozzallo attraverso le Regioni di Basilicata, Calabria e Sicilia (1110 km)
10	Ciclovia Trieste-Lignano-Venezia, da Trieste a Lignano Sabbiadoro e Venezia attraverso le Regioni di Friuli Venezia Giulia e Veneto (150 km)

The aim of the measure is to have a reduction in air emissions. Considering that, for each kilometer traveled by bike instead of by car, the community is expected to save 97 euro cents for each kilometre of cycle path in terms of: health benefits, operating costs, travel time, noise, accidents, pollutants and GHG emissions from private vehicles (compared to the scenario in which the project is not implemented).

Target population: Regions, municipalities, provinces, metropolitan cities. The main beneficiaries are the citizens using bicycles for their daily trips in urban areas, as well as cyclo-tourists.

Timeline: The interventions will last 6 years, from 2021 to 2026. The cycle paths activation are progressive.

The interventions is coherent with the following timeline:

- realization of 1,000 km of urban and metropolitan cycle paths by 2022;
- realization of 1,626 km of tourist cycle paths by 2026.

Investment 3.2: Green local public transport and Rapid Mass Transport.

3.2.1 *Strengthening of the green transport industry, the related national supply chains and*

smart mobility.

The 2019 National Strategic Plan for Sustainable Mobility foresees the gradual replacement of busses for public transport with less polluting vehicles, particularly electric ones. Public transport in Italy currently accounts for only 14% of all motorised journeys, while 86% are made by car and motorbike. The LPT fleet in Italy has an average age of 10.5 years, is mainly Diesel Euro 2/5 and is characterized by a variable quality of service. The renewal of the LPT fleet implies an adequate production capacity, both in terms of its reconfiguration towards the development of innovative technologies and in terms of energy and environmental efficiency.

As part of the activities in support of the 2019 National Strategic Plan for Sustainable Mobility, the Ministry of Economic Development and the Ministry of Infrastructure and Transport commissioned Invitalia to carry out an analysis of the Italian bus production chain. This study revealed a varied landscape, in which, despite a few national bus manufacturers, there is a solid component supply chain. Currently the Italian bus production chain is made up of about 150 companies, most of which are small in size. The study also recommended strengthening the bus manufacturers' sector to cope with the technological transition that is required to meet the increasing demand for low and zero emissions busses.

The need of promoting the technological transition is also relevant for the hull construction sector, since the production of recreational crafts is not energy efficient and involves high carbon dioxide emissions.

Every year the public administration spends at least 150 billion on the purchase of goods and services and a relevant part of this is directed to investment in mobility. Through proper instruments, part of this spending could stimulate innovation and economic growth.

Objectives

The overall aim of the intervention is to promote the technological transformation - towards higher environmental and energy efficiency and smarter solutions - for the automotive, bus, nautical and maritime mobility supply chains.

A first action addresses specifically the bus sector. The intervention supports the investment in the bus production chain, in order to support the expansion of production capacity and the ecological transition to new feeding modes. The sum allocated can activate approximately 1 billion euros of investments for about 25-30 projects (this figure accounts also for the private business' investments).

A second action is intended to promote the purchase or construction of moulds prepared for the vacuum lamination of recreational craft units made of fibreglass infusion or prepregned fabrics, and for this purpose equipped with a perimeter flange.

A third action is aimed at stimulating innovation and industrial conversion towards new technologies for smart and sustainable mobility (electric / hybrid vehicles, digitalization, eco-design, etc.) of the small and medium enterprises active in the automotive, bus, nautical and maritime mobility supply chains. This, in order to lower the environmental impact of the sector and foster smart mobility.

Implementation

The cost of the measure is estimated to be 520 million euros: 300 million for the technological transformation of the busses supply chain; 20 million euros for the modernisation of recreational craft production facilities; and 200 million euros for Smarter Italy program to support innovation in the urban mobility supply chains.

The estimate of the intervention size for busses supply chain is estimated on the basis of the assessment carried out on the Italian companies that are active in the sector. Based on such analysis, the intervention shall allow the implementation of 25 to 30 industrial transformation projects through "Development contracts".

Development contract acts as an instrument to support the bus production chain as it finances strategic and innovative large-scale production investment programmes. Development contracts are reserved to both individual and associated companies and involve a negotiating mechanism for financial incentives through non-repayable grants or interest rate subsidies and subsidised loans.

The total value of each investment programme financed by a Development Contracts has to be at least 20 million euros.

With regard to the administrative requirements, a directive issued by the Ministry of Economic Development (MiSE) is provided for the definition of the guidelines and implementation methods of the intervention, after which the companies submit a development plan, subject to an examination through a negotiation mechanism. The intervention can be implemented immediately and avail itself of a specific counter set up by MiSE. The examination requires 6 months; projects have an average duration of 36 months, to which must be added up another 12 months for reporting and final checks. The measure remains active until the counter's resources are exhausted.

For what concerns the modernization of recreational craft production facilities, the use of infusion and fibreglass-resin processes results in a reduction in the overall weight of the hulls and consequently in fuel consumption. With a budget of 20 million, it is estimated that 200 moulds can be financed, for as many companies, through a tax credit from which the construction sites that build the hulls benefit.

The third action on the innovation and industrial conversion towards new technologies of the mobility supply chains will be supported under the Smarter Italy program, which is an innovation procurement program promoted by the Ministry of Economic Development

(MiSE), the Ministry of University and Research and the MID - Department for Digital Transformation of the Presidency of the Council of Ministers and implemented by the Agency for Digital Italy (AgID). Smarter Italy was established with the MiSE Decree of 31 January 2019, and it became operational with the agreement between MISE and AgID for the implementation of intelligent public procurement.

As part of this action a new specific line of the Smarter Italy program will be activated by a Ministerial Decree of the MiSE. Under this line innovative green and smart mobility products and services will be procured via pre-competitive tender procedures or early adoption systems activated by Regions and municipalities. Through this system the public contractor buys either: a) the innovation process, including research and development services (research and development procurement and pre-commercial procurement) or b) the product of innovation created by others (public procurement of innovation).

The cost of the action is calculated assuming that 5 innovation contracts will be finalised per year over a period of 4 years. The average cost of an innovative contract is assumed to be 10 million of euros based on the experience steaming from the ongoing implementation of the Smarter Italy program.

Target population

The beneficiaries of the busses supply chain measure are EU companies that present an investment programme, through a proposing company, which promotes the initiative and the subjects that carry out research, development and innovation projects.

The beneficiaries of the modernization of recreational craft production facilities are EU shipyards that manufacture recreational craft units with NACE codes 3012 and 3011 and with a manufacturer code (MIC) in operation for at least 3 years.

The beneficiaries of Smarter Italy program for urban mobility are the local authorities (e.g. Regions, Municipalities) which will benefit from innovative mobility solutions offered by small and medium enterprises in the automotive, bus, nautical and maritime mobility supply chains.

Timeline

- The implementation of the busses supply chain measure will last 3 years (from 2021 to 2023);
- The implementation of the modernization of recreational craft production facilities will last 4 years, from 2021 to 2024;
- The implementation of Smarter Italy for smart and sustainable mobility will last 4 years, from 2022 to 2025.

3.2.2 *Renewal of the regional public transport bus fleet with clean fuels vehicles.*

Challenges

The Italian bus fleet for public transport presents an average age significantly above the EU counterparts: i.e. 10.5 years vs 7 years (CDP, ASSTRA, 2019. *Investire nel TPL*) and, thus, it is characterised by high fuel consumption and high operating and maintenance costs.

In particular, the Italian bus fleet for local public transport is composed of 42,000 vehicles out of which almost 90% are petrol, diesel and dual fuel vehicles and more than 40% are high emissions vehicles (i.e. Euro 0, Euro 1, Euro 2, Euro 3, Euro 4).

The high average age of the fleet represents a critical element for the public transport sector: firstly, it entails an increase in the operating and maintenance costs (e.g. the average maintenance costs of a new bus are 6 times lower than those of a 15 years old one), secondly, it reduces the quality of the service and travel comfort. Furthermore, a low-quality service does not encourage the shift from private cars to public transport, thus resulting in urban congestion and higher emissions from private vehicles (CDP, ASSTRA, 2019. Investire nel TPL).

The adoption of environmentally friendly vehicles will also require the availability of dedicated charging or refuelling infrastructures: this is the case of zero emissions vehicles like full electric or hydrogen powered vehicles. Another aspect to be considered is that electric vehicles, which currently represent the cleaner solution for road transport, are characterised by a limited travel range: i.e. about 170-200 km with a full charge. Therefore new investments in recharging and refilling infrastructure will be required to meet the objectives set by the European Directive 2014/94/EU on Alternative Fuels Infrastructure (DAFI) and by the EU Country Specific Recommendations 2019 (COM(2019) 512 final) and 2020 (COM(2020)512 final).

This action is fully aligned with the European Green Deal, which sets the objective to cut, by 2050, 90% of the transport-related emissions. Indeed, the achievement of such objectives implies among others the renewal of the public bus fleet and more specifically the adoption of alternative fuels vehicles and the related charging and refuelling infrastructure.

Objectives

The goal of this measure is to achieve a reduction of 66% in 2026 of GHG emissions from a fleet of 5,139 bus vehicles that will be substituted with low and zero emissions vehicles.

The operational objective of this measure is to accelerate the renewal of the bus fleet with buses powered through alternative and environmentally sustainable fuels (i.e. electricity, hydrogen and methane). This action can be implemented by purchasing new buses and the construction of an adequate charging infrastructure. Specific objectives are:

- enhancement of the quality and availability of public transport services and dis-

courage the use of private vehicles;
- increase in user comfort and attractiveness of public road transport services;
- improvement of air quality, though the use of green fuels and innovative technologies in line with international agreements and regulatory provisions of the European Union;
- promotion the cohesion policy through the reduction of national gap as a result of the increase of bus equipment in Southern Italy.

Such objectives will be achieved through the renewal of about 12% of the overall bus fleet, corresponding to 5,139 vehicles that - if supported by the realisation of the dedicated infrastructure - would lead to the disposal of all Euro 0, Euro 1 and 96.5% of EURO 2 buses for local public transport by 2026.

Implementation

The implementation of the measure follows the national legislation as indicated National Strategic Plan for Sustainable Mobility (Piano Strategico Nazionale per la Mobilità Sostenibile - PSNMS). The plan covers the period between 2019-2033. Resources are assigned to local entities according to the provisions of the national legislative decree (Decree no. 1360 of April 2019). The list of beneficiaries local entities is defined through specific indicators aimed at measuring the environmental and socio-economic performance of the different municipalities/ regions: e.g. air pollution emissions and population.

The measure foresees the gradual renewal of buses for local public transport: 5,139 units by 2026. In detail, in the first two years of the intervention (2021-2023), the measure is mainly focused on CNG and LNG powered buses, rather than electric and hydrogen powered busses. Indeed, the use of methane as alternative fuel is faster to be implemented in the short-medium term due to the lack of adequate charging or refuelling infrastructure for electric or hydrogen vehicles. Resources allocated to electric and hydrogen-powered buses will significantly increase starting from 2024 compared to CNG and LNG powered buses.

Out of the total number of buses that will be renewed through the measure: 2,730 are GNC or GNL powered vehicles, 2,051 are electric powered vehicles and 358 are hydrogen powered vehicles.

The total investment cost for the measure accounts for 3,000 million euros, out of which 750 million euros for refill and recharge infrastructure and 2,250 million euros for purchasing new vehicles.

The investment cost for purchasing vehicles has been estimated by multiplying the average cost of buses - per type of fuel - and the number of buses to be acquired. The cost of a vehicle for local public transport depends on several factors, including: type, number of vehicles to be purchased with the same procedure, equipment and interior configuration.

Based on market benchmark[12], the total amount of the measure has been estimated considering the following average unit costs:

- GNC-GNL buses: 300,000 euro
- Electric buses: 550,000 euro
- Hydrogen buses: 850,000 euro

The 750 million euros for alternative fuels and recharge infrastructure are determined as the maximum cost recognized to beneficiary bodies. This sum is calculated according to the same parameters reported by the PSNMS, which establishes for an amount to be allocated to the construction of support infrastructures, up to 50% of the contribution for the first 3 years of each five-year period (art. 7 paragraphs 2 and 4 of the Prime Ministerial Decree of 17/04/2019). The intervention will therefore allow a complete implementation path for the green transition of road public transport, although, at the present stage, it is not possible to provide details about support infrastructures that will be implemented. The quantity and type of the support infrastructure will be defined according to the operational plans that will be proposed by the beneficiary bodies.

Target population: Resources are assigned to local entities according to the approach defined by the PSNMS. Thus, the new green buses will be operating in all such urban areas across the entire national territory. The beneficiaries are the local authorities, the public transport operators and the urban population.

Timeline: The implementation period will last 5 years, from 2022 to 2026 (cf. Table 3). In particular, in the first three years of the measure funding will be equally divided for the renewal of the bus fleet for public transport and for realisation of the charging infrastructure. In the last 2 years, funding will be entirely allocated to the renewal of the bus fleet.

3.2.3 *Renewal of the regional public transport railway fleet with clean fuels trains.*

Challenge

The italian train fleet for regional local public transport is composed of 479 trains which present an average age of 29.28 years. The fleet includes 221 diesel trains and 258 electric trains.

Investments on the regional rail fleet are essential to improve comfort and reliability of suburban rail connections, which in turn can result in modal shift from private cars. Furthermore, older trains present higher operating and maintenance costs.

Investments made in Italy in recent years on local rail transport have produced positive effects with a growing share of citizens who gave up private cars because there was an

[12]CONSIP procurement, 2017

alternative to car journeys that, however, still dominate mobility in Italy (Pendolaria, 2019). Hence, a renewed train fleet will be effective in promoting modal shift from private cars thus favouring reduction on traffic congestion and related GHG emissions.

The need for a renewed train fleet for local public transport is fully aligned with the goals of the European Green Deal, which sets the objective to cut, by 2050, 90% of the transport-related emissions. Indeed, the achievement of such objectives is contributed by ensuring modal shift from private cars to trains powered by electricity or hydrogen.

Objective

The main goal of this action is to improve air quality and reduce GHG emissions from regional trains through the use of innovative technologies in line with international agreements and with the regulatory provisions of the European Union. The yearly savings from year 2026 onward in terms of GHG emissions will be in the range of 9.050 to 20.960 tonCO2 depending on whether hydrogen is produced from fossil fuels or from renewable energy sources.

The general objective of this measure is to reduce the average age of the regional rolling stock fleet through the purchasing of electric powered train groups with semi-pilot and hydrogen powered trains. Specific objectives are:

- strengthen regional transport services by rail and discourage the use of private motor vehicles;
- improve the user comfort and increase attractiveness of regional rail transport services;
- promote the cohesion policy through the reduction of national gap as a result of the increase of rolling stock equipment in Southern Italy.

Such objectives will be achieved through the replacement of the most obsolete diesel trains with hydrogen trains, as well as the replacement of the oldest electric trains with new electric ones. As part of the intervention a total of 80 trains will be replaced resulting in a reduction of the fleet average age: from 29.28 years in 2020 to 27.72 years in 2026[13].

Implementation

The total number of trains to be purchased as part of the intervention is 80 units by 2026, out of which 59 are electric powered trains and 21 are hydrogen powered trains. These amounts have been estimated on the basis of a market assessment. The share of hydrogen and electric powered trains may be modified depending on the rolling stock supply chain and local needs.

The total investment cost for the measure accounts for 1,000 million euros. In particular: 748 million euros for electric powered vehicles and 252 million euros for hydrogen powered

[13]The projection was made assuming no train would have been replaced in the no intervention scenario.

vehicles.

The investment cost has been estimated by multiplying the unit cost of trains - per type of power - and the number of trains to be acquired. The following unit costs have been considered, based on available market information:

- Electric powered trains: 12.7 million euros;
- Hydrogen powered trains: 12.0 million euros.

Trains to be procured as part of this intervention are the ones used for regional services under public service contracts (PSC)[14].

Target population: New rolling stocks are assigned to local entities and the vehicles will be operated by the service operators within the territory of the local entities identified. The main beneficiaries are the regional railway passengers.

Timeline: The purchasing plan is developed over a period of 6 years, from 2021 to 2026 (cf. Table 3).

3.2.4 *Renewal of the regional public transport naval fleet with clean fuels naval units.*

Challenge

In a country like Italy, maritime transport plays a relevant role as public transport service for mobility in the coastal areas.

The Italian public transport naval fleet is composed of 51 units with an average age of 34.3 years: only 5 naval units are less than 25 years of age and only 3 naval units are less than 15 years old.

The advanced age of the fleet represents a critical element for the public transport sector, especially from a sustainable point of view: it hampers the service quality, the comfort of travel and impacts severely in terms of GHG emissions. Furthermore, a low-quality service does not encourage the use of such public maritime services.

The National Reform Program, under Priority no. 5, promotes the implementation of sustainable investments. To this extent, the "sustainable" solutions to the issue of local mobility include the encouragement to use waterborne public transport that promote intermodal transport (ship-bike) and new-generation ships, powered by LNG (liquefied natural gas) or alternative fuels (methanol or hydrogen).

Moreover, the renewal of the naval fleet contributes to goals of the EU Regulation 2018/1999 which encourages measures to achieve low-emission mobility (including transport electrification).

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[14]Therefore, this investment is not overlapping with the one proposed as part of M3C2.

Ministerial Decrees no. 52/2018 and no. 397/2019 allocate resources to the renewal of the public transport naval fleet but these are not deemed sufficient for the challenge identified.

Objective

The operational objective of the measure is to renew 25% of the total naval fleet for local public transport by purchasing low and zero emissions naval units (e.g. marine vehicles powered by LNG, electric or hydrogen). This action will allow for improving air quality and reducing emissions of climate change gasses. The yearly savings from year 2026 onward in terms of GHG emissions will be in the range of 45.300 ton of CO2. Furthermore the measure will allow for savings of about 16.40 ton/year of SOx.

The specific objectives are:

- improvement in social cohesion by ensuring territorial continuity via sustainable sea transport services;
- increase in the level of comfort of passengers;
- improvement in the user comfort and attractiveness of local maritime transport services;
- improvement of air quality and reduction of GHG emissions, through the use of alternative fuels;
- reduction of sea pollution;
- improvement of energy efficiency and security.

Such objectives will be achieved by purchasing new ro-ro pax and passengers-only ferries including high-speed naval units powered by hydrogen, LNG or electricity for the local and regional sea, lagoon (particularly the Venice lagoon), lake and river transport (cf. Legislative Decree no. 422 of 19.11.1997). Such units will be employed in transport services subject to public service obligations setting the following conditions: a) provision of an exclusive connection between municipalities within the same territory or region; b) continuous or periodical services with an undifferentiated offer to the public and pre-established itineraries according to Legislative Decree no. 422 of 19.11.1997; c) naval units pre-determined or approved by the competent authorities, pursuant to Article 16 of Legislative Decree no. 422 of 1997 d) contribution to the emission limits set by the EU Directive no. 2012/33 and by Regulation no. 2016/1628/EU.

The new naval units to be purchased must ensure:

- adoption of the criteria of the Energy Efficiency Design Index (EEDI) imposed by the IMO in order to reduce emissions (as a minimum) by 20% compared to the average emissions of a naval unit of the years 2000-2010;
- adoption of the latest automatic identification system (AIS) technology available on the market to locate other naval units in the vicinity;
- accessibility to people with reduced mobility;

- bicycle storage, except for vehicles destined for the Venice lagoon;
- suitable air conditioning on passengers' areas;
- availability of Wi-Fi in areas for passengers;
- luggage storages directly accessible to passengers with the possibility of securing them.

The measure will also strengthen the growth of the next-generation ship management market through the adoption of a tailored procurement plan for the purchasing of naval units.

Implementation

The total cost of the measure is 500 million euro: the purchase of 12 ro-ro and ro-ro pax ferries of about 30 million euros and the purchase of 10 high speed naval units (hydrofoil) of about 14 million euros.

The measure will be implemented by providing support to regional and local public transport companies through the adoption of a tailored procurement plan at central level for the purchasing of naval units.

In order to reach the the measure's objective, a "central direction cabin" will be set up at national level with the aim of monitoring the implementation of the plan: it will support, among other things, the establishing of procurement models (tenders), the subscription of contracts and the facilitation of economies of scale on a national basis.

Target population: New naval units are assigned to Regional authorities and the vessels will be operated by the service operators within the territory of the local entities identified. The main beneficiaries are the seaside population of densely populated regions.

Timeline: The implementation period will last 4 years, from 2022 to 2025 (cf. Table 3).

3.2.5 *Digitalization of local public transport.*

Challenge

The research and demonstration activities of recent years have amply demonstrated that the application of technologies can bring tangible and important benefits with considerably limited costs (for example, the benefit / cost ratio expected from cooperative services alone - C - ITS - is estimated at 3:1; the benefits deriving from the integrated use of innovative systems and services are much greater). Today's challenge consists in bringing benefits at a metropolitan scale, addressing the issues related to the expansion of the metropolitan area, starting from the dissemination of knowledge, by finding the necessary resources, not only financial ones - up to the provision of support in the creation of an efficient market (of components, systems and services) and an effective support framework.

Local public transport must accelerate its transformation by adopting new generation vehicles with electric traction and different charging systems according to use, connected to the infrastructure and equipped with operation control systems in order to guarantee road safety and the regularity of the service. In this scenario, it is necessary to boost a strong technological innovation.

The widespread use of ICT technologies for vehicles and roads is an essential component of the digital transition, as it also favors the development of new services for mobility in general, for both passengers and operators; finally, the availability of new data allows a new approach to the design, management and maintenance of urban networks.

Objective

The proposal aims at making public services safer, more versatile and connected through two specific actions:

A. the implementation of a national enabling platform with C-ITS services in urban areas within the city of Turin, Rome and Naples;
B. the creation of a living lab within the city of Milan that optimizes the most advanced solutions in terms of power trains for city buses, to adapt the infrastructure with C-ITS technologies as well as with 5G technologies in order to improve the safety of the vehicles and the service to end users.

The action A concerns:

- the design and implementation phases of the platform allowing the creation of a technical ecosystem for connected vehicles;
- the adaptation of local IT systems (monitoring, traffic management, information) also through the realization of new monitoring sensors, new cameras for monitoring and video analysis.

The action B, instead, concerns the implementation of pilot cutting-edge solutions both on public transport fleets and on urban infrastructure, favoring the development of new services for the citizen, the municipality and the public transport operator. In particular, this action includes:

- the purchase of 9 trolleybus and the installation of 6 charging infrastructures;
- the installation of digital infrastructure of 40.3 km of network through the implementation of smart systems and control traffic systems;
- the realization of infrastructure-vehicle communication system (I2V and I2X);
- the development of MaaS systems for the planning and use of services and traffic forecasting systems for travel planning.

Implementation

The total cost of the measure is 52,0 million euros: (A) 22,0 million euros for the imple-

mentation of a national enabling platform with C-ITS services and (B) 30,0 million euros for the creation of a "living lab". The following section describes the implementation of each action.

Action A: C-ITS

The design of the platform will be carried following functional requirements and equipment specifications. The phase of design includes the tender procedure for the realisation, the supply and the commissioning and start-up in the three cities involved by 2021. The design and implementation phase will be followed by a testing phase by 2023.

Simultaneously, the mobility management systems of the three cities will be upgraded in terms of both extension and capacity to be integrated within the IT Platform. The full integration of the services will be completed by 2025.

The interventions will be customised on each city's peculiarities and they will follow different roadmaps. Implementations will be subject to ex-ante / ex-post assessment, aimed at verifying the effects of C-ITS services in the urban area in the full-scale application, with particular reference to the effects in terms of sustainability of mobility. The impact assessment will be designed by following the best practices in the sector and adopting the indications of the pilot projects in progress in which the implementing bodies participate (e.g.: C-Roads Italy 2 and 3); consistently with the ex-ante / ex-post approach, the impact assessment will be initiated in the starting stages of the project and will last for its entire duration. The project is delivered in three phases:

- phase 1: verification and design of the platform and ex-ante assessment by 2021;
- phase 2: national platform in shared test and adaptation of local systems by 2023;
- phase 3: provision of C-ITS services, progressive extension of the areas covered by the short range services, traffic management systems, ex-post assessment by 2025.

Action B: - TPL 4.0

The interventions of the measure will be completed in 5 years by 2025. The project will be delivered according to the following steps:

- M12: renewal of 9 local public electric busses;
- M20: realisation of 6 charging infrastructures for the electric buses;
- M24: installation of 40.3 km of digital lanes infrastructure and of traffic control system;
- M30: development of advanced ADAS systems that make use of V2X communication;
- M36: development of the information and management system of smart grids; MaaS installation.

Target population: Metropolitan municipalities of Milan, Turin, Rome, Naples. The main beneficiary are passengers of urban mobility services.

Timeline: The intervention will last 5 years (cf. Table 3). In particular, Action A will last 5 years from 2021 to 2025, while Action B will last 3 years from 2021 to 2023.

3.2.6 *Development of Rapid Mass Transport systems (metro, streetcar, BRT).*

Challenge Sustainable Urban Mobility Plans (SUMPSs) promote sustainable mobility planning in urban areas: their aim is to ensure an adequate provision of sustainable and safe transport in cities. This is achieved through modal shift incentive policies, promotion of intermodality and the construction of new infrastructures.

In this context, measures to strengthen the rapid mass transportation system are fundamental for the implementation of an integrated transport system. The extension of rapid mass transport systems - which consist in networks of metropolitan railways, tramways, metro lines and BRT "Bus Rapid Transit" corridors - is of paramount importance to ensure the reduction of travel time for large passenger flows.

In 2016, Italy registered about 1,000 km of network equipped for rapid mass transport services in the city[15] (Pendolaria, 2016) against 155,000 km of road network (European Road Network, 2020). Private cars are the most used vehicles in Italy: 36 million people over 18 years old have used their car at least once during 2019 while two out of three people have used it every day (ISTAT, 2020). Private cars share on total passenger trips (including walking) is more than 60%, while public transport is just about 10% (data for 2019, Isfort, 2020). This can lead to traffic congestion, especially in metropolitan areas.

Hence in case of congested urban areas, the implementation of rapid mass transport systems would allow for shifting mobility demand from private cars. The sustained speed that these transport systems can offer, often guaranteed by dedicated areas and / or lanes which ensures they are not affected by congestion, makes such systems extremely attractive to commuters and occasional passengers.

Objective

The goal of this measure is to shift about 10% of total demand of road passengers transport by car by 2026 in affected urban areas.

The operational objectives of this measure are: (i) the construction of new lines and extension of existing lines of rapid mass transport systems; (ii) the enhancement of existing rapid mass transport systems by upgrading the infrastructure, plant and equipment with the aim of increasing the offered capacity; (iii).the increase of vehicle fleets of rapid mass transport systems aimed at improving the offered capacity.

As part of this measure, 195 km of network equipped for rapid mass transport systems will be newly built. This account for:

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[15]The city considered are Milan, Rome, Naples, Genoa, Turing and Catania

- the implementation of 57 km of tramway, including rolling stock;
- the implementation of 84 km of trolleybus, including vehicles;
- the implementation of 4 km of cableway, including cableway cars;
- the implementation of bus rapid transit systems of about 50km of lanes, including buses.

The measure contributes to the gradual decarbonisation of transport. The specific objectives are:

- modal shift of 10% of total demand of road passengers transport by car in the affected urban areas;
- reduction of GHG emissions.

Implementation

Table M2C2-2: **Tramways**

Municipality	**Intervention**	**Type**	**Length (km)**	**Number of rolling stocks**
Bergamo	Linea Tranviaria T2 della Valle Brembana, Bergamo - Villa D'Almè	TRAMWAY	10	11
Florence	Sistema tramviario di Firenze Linea 3 (II lotto) - Tratta Libertà - Bagno a Ripoli (3.2.1)	TRAMWAY	7	16
Genova	Sistema degli assi di forza per il TPL	TROLLEYBUS	45	145
Palermo	Sistema Tram Palermo - Fase II Tratte D, E2, F, G e parcheggi di interscambio	TRAMWAY	20	35
Rimini	2° stralcio "trasporto rapido costiero" (metro mare): tratta Rimini FS-Rimini Fiera	TROLLEYBUS	4	6
Rome	Funivia Battistini - Torrevecchia - Casalotti G.R.A. (Funivia Casalotti)	CABLEWAY	4	212
Rome	Tranvia Viale Palmiro Togliatti (Tramvia Togliatti)	TRAMWAY	8	20
		Total	**98**	**445**

The total cost of the measure is 2,000 million euros; the interventions covered by this cost have been divided in the following two macro-groups:

1. realization of 98 km of network equipped for rapid mass transport systems, out of which 45 of tramway and 49 of trolleybus, 4 cableway and the purchasing of 82 tam groups, 151 trolleybuses and 212 cable cars for a total amount of 1,642 million euros. The operation will involve the cities of Genoa, Bergamo, Rimini, Florence, Rome and Palermo;

2. realization of 97 km of network equipped for rapid mass transport systems, out of which 12 km of tramway, 35 km of trolleybus and 50 km for bus rapid transport systems, including purchasing of buses, for a total amount of 358 million euros.

The interventions included in macro-group A have been identified through a call for expressions of interest. They are reported in the table M2C2-2 at page 79.

The interventions to be included in macro-group B will be identified by launching a new call for expressions of interest which will be finalised by January 2021. The second EoI, according to the procedure already implemented for the first EoI with B.E.I, will consider the following criteria:

- The allocation of funding for interventions in the rapid mass transport sector is conditional on the drafting of the SUMP, as per Ministerial Decree 397/2017. Resources in fact, may be allocated exclusively to interventions included in these Plans or following a request for funding submitted by the competent local authority. Municipalities within a metropolitan city can access funding only in the presence of a SUMP for the urban area.
- The evaluation method for identifying projects to be funded as part of this measure is based on a standardized procedure that follows a specific in-depth and qualitative analysis. The analysis must assess the following indicators:
  - Technical-economic feasibility of the proposal with reference to the evaluation of the quality of the project, comparison of the unit cost of the infrastructure to the unit cost of similar transport systems, justification of the design choices and transport analysis;
  - Financial, managerial and administrative sustainability of the approval process and assessment of the project's activations capability;
  - Effectiveness of the investment and economic-social profitability in terms of satisfaction of mobility demand, rebalancing between public and private transport, energy saving effects, environmental impact, accident reduction and socio-economic benefits.

- Each local authority, whose request has been positively evaluated, signs an agreement with the Ministry of Infrastructures and Transport, in charge of regulating the financing, to ensure the implementation of the intervention.
- In addition, the funding beneficiaries sign specific agreements with economic operators to ensure the implementation of the intervention.
- For the purposes of an activation consistent with the timing of the RRF, interventions concerning metropolitan systems are not included in this proposal as they require longer implementation times and, especially in Italian cities with many archaeologically sensitive areas, could be affected by slowdowns not predictable in the project phase.

Target population: The following local authorities can be beneficiaries of the financing: