noemix®

Electric mobility breakthrough in FVG

WP3

Feasibility Study and business plan

D3.2

Financing Scheme

Expected date

M37

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PROJECT DETAILS

PROJECT ACRONYM	PROJECT TITLE
NOEMIX	New Mobility in Friuli Venezia Giulia
GRANT AGREEMENT NO:	TOPIC
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01/02/2016	

WP DETAILS

WORK PACKAGE ID	WORK PACKAGE TITLE
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WORK PACKAGE LEADER

Name Surname (BIT Spa)

DELIVERABLE DETAILS

DELIVERABLE ID	DELIVERABLE TITLE
D3.2	Financing Scheme

DELIVERABLE DESCRIPTION

Identify the innovative financing scheme that ensures acceptance by both public administration institutions and private mobility operators.

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PERSON RESPONSIBLE FOR THE DELIVERABLE

Daniele Ziveri (BIT Energia)

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Table of acronyms

ADAS	Advanced Driver Assistance Systems
BEV	Battery electric vehicle
EC	European Commission
NFG	National Focus Group
QP	Quality Plan
FG	Focus Group
GSE	Gestore dei Servizi Energetici
ICEV	Internal combustion engine vehicle
PA	Public Authority
FVG	Friuli Venezia Giulia
TP	Technical Partner
SPV	Special Purpose Vehicle
SHC	Specialized Human Capital

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1. Scope of Work

BIT SPA is in charge of defining the financing scheme, delivering a comprehensive report aimed at identifying the innovative financing scheme of Noemix Mobility Service that ensures acceptance by both public administration institutions and private mobility operators. BIT SPA in this document collects and analyses best practises on financing e-mobility schemes in Europe and Italy and focus on the most common and innovative financial instruments. In order to carry out this task, BIT SPA will take advantage of the partners' background and experience and also of its own network of financing organisations. Literary researches on the theme, analysis of projects and case studies will be examined. An in-depth analysis of the European and Italian regulatory framework on financing mobility projects and/or from renewable sources will be carried out. All the partners involved, coordinated by BIT SPA, will collaborate to identify the most suitable financing solutions to be adopted in each specific case. All the most common systems will be analysed, from more traditional solutions (long term leasing, loans, bonds) to more innovative forms (third party financing, public-private partnerships). The models will be examined, taking into account the needs and financing capabilities of the public administration and the profitability of the project to be financed. The analysis will consider the dimension of the institutions and number of vehicles involved. It will address questions such as: will the renters also supply the charging stations and the software or will it be necessary to carry out a separate tender? or, will the renters also supply the photovoltaic plants or will it be necessary to carry out a separate tender? The best solution will depend on several aspects, such as: direct financing costs (financing conditions, interest rates, fees), securities required by the financing institution, legal aspects, balance sheet and accounting implications. It will be evaluated if an agreement between banks and the regional PA is deemed necessary and/or more advantageous for the smooth carrying out of the project. It will also be considered if a guarantee fund, managed by the regional PA is necessary in order to cover the risk of the private company financing. The information gathered in this section will be used for the development of the most suitable financing solutions. If necessary, BIT SPA can mediate with financial institutes in order to obtain financing for the energy interventions. Primarily, BIT SPA will conduct a screening of institutes, taking advantage of its wide contact network and background. It will provide the institutes with basic information on the project and, in particular, investment costs and payback times. It will assess them on the basis of parameters such as securities required and financing costs that must be suitable in respect of the financial solution identified.

The resulting report will contain the following findings:

- financial scheme showing the difference between long term leasing vs. car-sharing;

- financial scheme for the charging stations;

- financial scheme for the photovoltaic plants;

- financial scheme for the management software.

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2. Introduction

In recent years the "green sensibility" of citizens, institutions and corporations has grown significantly. The social relevance of promoting environmental policies, projects of circular economy and practices founded on the renewability of resources is now being appreciated at an increasing rate. Consequently, major institutions at regional, national and international level are actively engaged in promoting such initiatives.

The "Noemix" project of electric mobility in Friuli Venezia Giulia (FVG), financed in the context of the Horizon 2020 EU program with a grant of €900.000 (grant agreement 754145), aims at raising some €21 million of investment via private-public partnerships.

A centralized service of electromobility and car management among a number of institutions in FVG represents the core of the Noemix project. The project involves the substitution of hundreds of outdated vehicles, building charging stations, the elaboration of management software and its implementation on the network, and, possibly, the generation of electric energy by means of renewable power plants. Payoff and benefits generated by the project can be conceived in a twofold perspective.

On the one hand, one has the **economies of scale and scope** (the variety of efficiency improvements) generated by centralized management of the car service, that amount to the optimization of the allocation of vehicles with respect to the timing, location, expected trajectories, and so on. Such innovations are supposed to generate substantial economic value that can be measured in monetary terms, and therefore admit explicit accounting representation. On the other hand, one has the social benefits generated by the green nature of the electromobility project, that aims, among other things, to reduce significantly the emission of CO_2. Such **environmental benefits** do not admit explicit monetary estimates; still, they represent the positive externalities that motivate the project. The combination of the two perspectives enlightens the true value added of the project: well beyond the supply of vehicles, such value unfolds in terms of overcoming resistance to change and enabling flexibility with respect to the evolution of technologies, demand for mobility services and management practices. That being the case, the *real options* embedded in the project represent a primary aspect that any valuation approach must take into account, albeit in a qualitative way. In fact, given the relevance of such benefits, FVG aims at becoming a European leader in electromobility practices.

Suitable financial support is necessary for the project to bring into effectiveness the aforementioned benefits. The present document elaborates on the properties of such arrangements, and is meant to become an input of the business plan. In particular, the analysis will be reflected in the calls for tenders for the supply of the aforementioned infrastructures and services.

The document has been elaborated by BIT SPA. The document has been validated by PPs, and subsequently fine-tuned after the Workshop to take into account the expert feedback by sector operators.

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2.1. Case studies

It was assumed in the initial conception of the Noemix project that one of the aims of Task 3.2 should be the analysis of existing projects and case studies of electromobility. Still, the development of the Noemix project thus far has displayed its **uniqueness** – in its connection with the uniqueness of the NeMo initiative – in its integrated approach to, on the one hand, mobility services, and, on the other hand, the establishment of physical and management software infrastructures. It seems therefore that no comparable case studies exist that may deserve attention. Definitely, this absence of comparisons does not seem to represent a problem for the proper advance of Noemix Tasks, that witness the technological and financial feasibility of the overall plan.

It is explicitly stated that FVG aims at becoming a leader in electromobility practices. The green sensibility underlying such an approach is not only in line with well established international visions on sustainable development, but, noticeably, with the more refined conceptions about technological leadership and its connection with the territory.

2.2. The current crisis and the sustainable future

The "Covid crisis" was unexpected, and, arguably, its economic consequences will represent a serious challenge for policymakers and advisors. On the other hand, it is somewhat natural to expect that the green sensibility at the foundations of the Noemix initiative will receive increasing attention in the future, for instance on account of the increasing emphasis that commentators, and media in general, are placing on the relevance of shaping more sustainable patterns of economic development after the Covid phase. Typical comments run as follows. "The Covid-19 pandemic has collided with the climate change emergency. We must integrate the solutions to both crises into a coherent response […] Large investors have set their sights on net-zero emission" (*Can we both tackle climate change and build a Covid-19 recovery?* Financial Times, 2020, May 8). To sum up, arguably, the relevance of the Noemix project may stand out even more clearly in the aftermath of the Covid drama.

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3. Financial architecture

As a necessary premise to the analysis of the financial schemes we are interested in, let us recall a few basic principles of corporate finance. The discipline shapes lines of reasoning concerning the financing of projects in terms of internal v. external resources (i.e. depreciation and retained earnings v. loans or debt issues) and concerning the overall capital structure of the company (the debt-equity mix). The essential ingredients of such problems are represented by tax advantages, information asymmetries, and agency problems (i.e. alignment of incentives); see Myers (2001).

It is well established why businesses characterized by intangible assets (among which the role of human capital stands out) are typically equity financed, being their expected profitability a nonstandard problem in information gathering and processing that markets or analysts are best suited to address; shareholders are typically willing to pay for such efforts. Well-known examples are represented by the technological frontier of the ICT sector, pharmaceutical companies and advertising firms. More 'standard' businesses running tangible assets, whose profitability estimates are substantially less information-sensitive, are largely financed in terms of loans or securitized debt.

Other well-known insights concern the disciplinary role of debt (the "free cash flow problem"), that generates strong incentives for managers not to embark into questionable projects and empire building using internal resources that might have been distributed to shareholders as dividends – recall the basic principle of the maximization of shareholder value. Not as well-known, but relevant for our purposes (see below), are the arguments set forth by Diamond and Rajan (2001) about the liquidity of lenders and the incentives for the proper allocation of human capital. We will find such considerations of significant interest. True, general principles of analysis do not apply straightforwardly to our Task 3.2; we need to identify the critical elements of our problem, and the grip that first principles may demonstrate on such grounds. Basic hints, needless to say, emerge from the evolution of the project from its preliminary phase of conception to the present status. Our analysis unfolds as follows.

To begin with, we shall sharpen the extent to which the Noemix project can be discussed in terms of a "company" or "vehicle", i.e. a **balance sheet** structure in which "assets", "liabilities" and "risk capital" can be given meaningful figures (point A). Subsequently, we shall discuss the nature and allocations of the **risks** inherent to the projects (point B). Then we shall address the **agency problems** that impinge on such figures (point C), and the sense in which points B and C are deeply entangled. This section is devoted to point A and project finance.

In business contexts, project finance has emerged for its specific approach to the problem of investment. Financing partners do appreciate the fact that a project is established as an isolated entity, whose ability to service debt (and, possibly, payoff risk capital) is insulated from the other activities of the firm. In the context of projects promoted by public institutions, project finance has emerged essentially as a sharp approach to agency problems (Brealey, Cooper, Habib, 1996) and for the alleviation of the financial burden that contemporary public institutions may not be in a position to bear. In Italy, the law 18 November 1998 called "Merloni-ter" set the basic framework.

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In the context of the Noemix project, the aim is to promote public-private partnerships and ignite virtuous circles of technological and human capital progresses in the implementation of electromobility (best) practices. It follows that a comparative analysis of the potential financial schemes that may suit the Noemix project entails not only measures of return on investment and patterns of cash flow projections, but, in the light of the specificity of the project, crucial is the role of the real options embedded in the project. The feasibility of the project depends on the incentives that can lead financing partners to enter the stage on account of convincing arguments concerning the capacity of the project to payoff adequately – in such respects, the cash flows generated by the project are relevant for the service of debt[1] – as well as the potential to become leaders in the green mobility panorama. All in all, in a well-known formula, "investors can't be told what to think, they have to be convinced" (Brealey and Myers).

Figure 1 represents the network of counterparties involved in a typical project financial architecture. The picture has both legal and economic relevance; a crucial point is that a comparative analysis of possible financing schemes cannot be reduced to estimates of expected profiles of cash inflows and outflows – and of the adjustment mechanisms thereof. After the great financial crisis of 2007-2009 a widespread awareness has become more refined of the fact that the sustainability of balance sheets is the pivotal problem: estimates of expected net present values (and higher moments) and of the price of risk do not encompass a critical class of risks and best responses of the entities (balance sheets) at play. In fact, as explicitly stated in the Grant Agreement, Task 3.2 is meant to shed light on the **balance sheet and accounting implications of the project finance mechanism**.

[1] Recall, projects can be ranked according to their capacity to service debt fully of partially in terms of the cash flows generated, as well as with respect to the alternative resources meant to play the same role.

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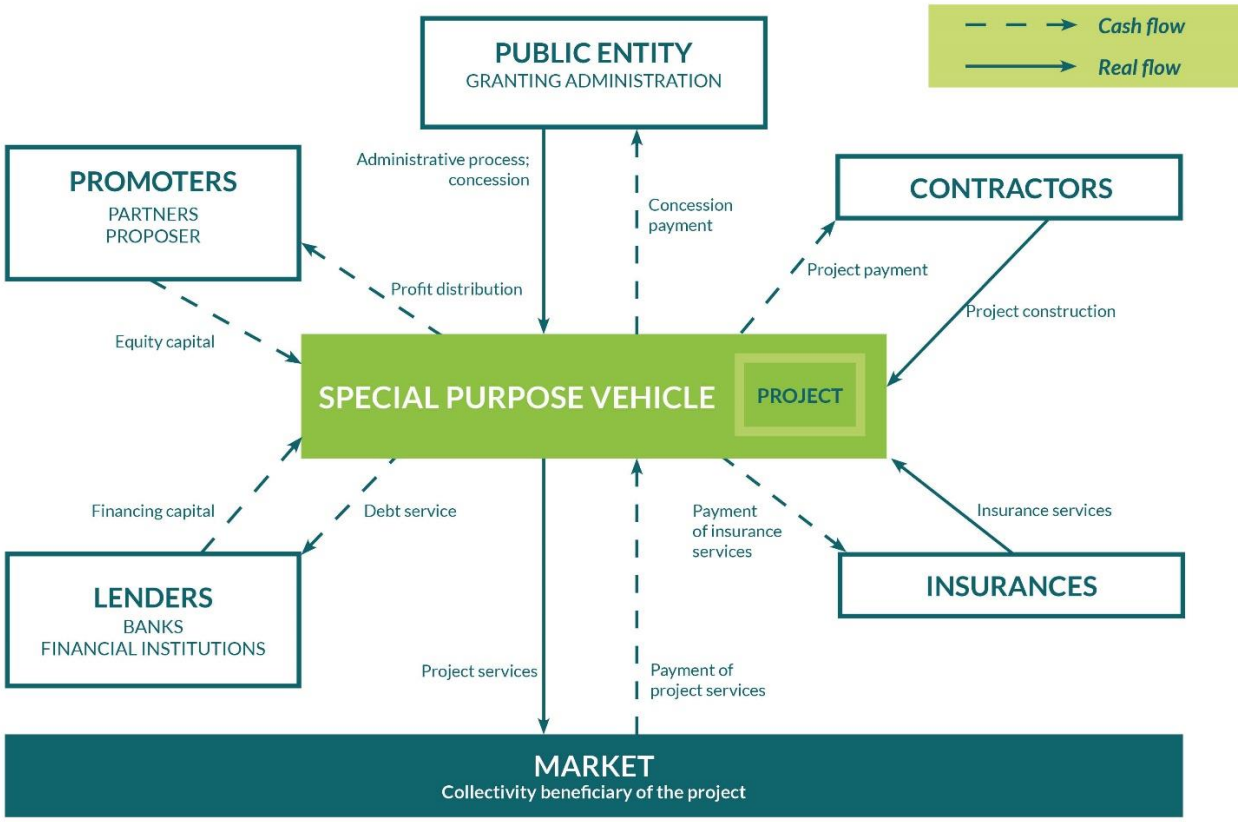

Figure 1 - A general scheme for project finance.

The various entities involved in the financial architecture have different objectives and are subject to different constraints, so that the search of the "optimality" of the financing scheme is a manifold problem that must balance different – possibly conflicting – performance targets. Therefore, Figure 1 is meant to provide a **conceptual map** for our elaborations. Different arrangements in principle exist in which definite players (service providers and financing partners) commit part of their balance sheets to the functions represented in Figure 1. One must therefore envision the "best" financing scheme not simply in terms of risk and reward for individual players, but in terms of multilateral agreements on the feasibility of the plan. It is in such respects that the relevance of the "advisor" and of the "arranger" emerge in the process of clustering potential players around shared views about the feasibility and desirability of the project.

The advisor is meant to provide a general assessment of the elements of the feasibility of a financing scheme, and elaborate a detailed document meant to illustrate the nature of the project to potential investors. Part of the role of the advisor, therefore, is to facilitate the coordination – possibly, to coordinate himself – the process of clustering the various parties around the selection of a definite scheme, and then support the subsequent bargaining steps concerning specific details and contractual clauses. The advisor is a third party that is not meant to participate actively in the financing mechanism.

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The arranger – typically, a credit institute – is meant to perform the twofold role of primary investor and manager/intermediary of the closing of the financial arrangement. The aim is to arrange a pool of financing institutions (banks and or nonbanks) with the specification of the precise extent to which each partner contributes to the funding operation.

As a preliminary to the discussion below, let us recall basic properties of leasing. In essence, leasing represents a substitute for buying capital equipment. The "lessee" pays a rent to the lessor in exchange for the right to use an asset for a specified period, and, possibly, exercise some option about the transfer of ownership rights on the assets at the expiry of the contract. The decision of whether to lease or buy depends on the specific problem. In the context of household consumption, the "lease or buy" problem is easily represented by a textbook example: if you need a car for one day you will surely rent it, if you need it for five years you will probably buy it. "In between there is a grey region in which the choice of lease or buy is not obvious" (Brealey and Myers) but reduces to comparing expenditure figures with little uncertainty. On the other hand, in a business context of capital investment, the problem may display a variety of aspects according to the degree of standardization of the service provided by the assets subject to the "lease of buy" choice. Typical examples of assets that are leased are IT infrastructures and aircraft, i.e. assets that combine some kind of standard properties with a significant complexity and costliness of maintenance practices.

As a general line of reasoning, a basic property is that the lessee bears the risk inherent to the working of the project. In our context, the risk associated with potential unexpected complexities arising in the development of the project is considered low. For our purposes what matters is the rationale for leasing, in that the financing scheme is meant to be functional to the smooth development of the project.

A noticeable point is that in Figure 1 the PA and the financing players are not linked by a direct explicit financial relationship. On the other hand, the arrangement we are envisioning pertains to an innovative project that entails non-standard features and an initial transient phase before the system reaches the steady state. That being the case, an explicit commitment to support (backstop) the smooth functioning of the financial arrangement may be part of the game. In fact, as stated in the Grant Agreement, "It will be evaluated if an agreement between banks and the regional PA is deemed necessary and/or more advantageous for the smooth carrying out of the project." Recall, financial schemes may admit complete or limited recourse. The relevance of such a difference is connected with the balance sheet implications of the financial arrangement.

Further implications emerge in the long-run perspective on the life of the project and the relationship between the public and the private players. Recall, in a "BOT" (build, operate, transfer) relationship, the vehicle is supposed to raise funds without any support by the public players, simply on account of the expected profitability of the project. The "standard" nature of the project enables outsiders to elaborate clear estimates of its payoff capacity. The construction of an infrastructure (say, a highway) and the management of the related services is a typical example. It is established at the outset that after a given number of years the public player will become the owner of the asset/infrastructure. Analogously standard properties of a project justify a "BOO" (build, operate, own) relationship, in which the private player retains the ownership of the assets once the contract terminates.

On the other hand, in a "BOOT" (build, operate, own, transfer) relationship, the private player builds and owns the assets that generate the services and the payoffs that gauge the profitability of the project itself,

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and a preliminary agreement is fixed concerning the conditions of transfer of ownership at expiry, at which, though, the parties are allowed to negotiate such conditions. The flexibility of such a phase may reflect the nature of a nonstandard project, whose proper development, and effectiveness in pursuing its goals, unfold over time. It is important to recognize the real options (see Brealey and Myers) embedded in the initial agreement. Arguably, elements of flexibility in the potential subsequent phases or renegotiation of claims over the assets may help align the incentives of the public and private players to commit to the best practices that must support the well functioning of the project.

The initial statement of Task 3.2 did recommend the analysis of the following Points:

I) financial scheme showing the difference between long term leasing vs. car sharing

II) financial scheme for the charging stations (currently estimated as one per two vehicles)

III) financial scheme for the photovoltaic plant

IV) financial scheme for the fleet management software

Proposition 1. From the financial viewpoint, the Noemix project is "riskless", to the extent that the expenditure commitment of the FVG PA shall imply deterministic and guaranteed cash flow profiles with respect to which to gauge (possibly contingent) financial claims and commitments for the private players involved. The "riskiness" of the Noemix project seems to be essentially confined to the "real" side, namely, to the extent to which private players shall be in a position to supply the services appropriately, in the senses defined by the calls for tenders. In addition, in a long-run business risk management perspective, one can envision interesting elements of "upside risk" (Damodaran, 2009) connected with the real options (Dixit and Pindyck, 1994) inherently embedded in the project. Such instances are reflected in the explicit statement according to which the region FVG aims at becoming a European leader in the realm of electromobility practices.

3.1. Financial scheme for the software

Consider the financing scheme for the supply of the management software meant to fit the Noemix project. During the preliminary phase of analysis, it has been concluded that such a service can be naturally bundled with the supply of vehicles; still, in order to frame the problem appropriately, it seems appropriate to start by assuming the software problem to be independent from other financing schemes. In a second round of analysis, one can consider the conjunction with other aspects.

The basic building blocks of the problem are represented by, on the one hand, the expenditure commitment of the PA, that results in a well-defined cash flow prospect, and, on the other hand, the financial resources that are necessary for a potential supplier to develop appropriately the product/service. About such essential

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analytic elements, one can pivot lines of reasoning. Recall, it is natural to consider the "best" financing scheme for our problem as fixing a "Pareto efficient" arrangement, i.e., one in which any modification of the scheme that would make an actor better off would necessarily make someone else worse off. This well known and accepted notion of optimality provides an intuitive perspective on the multilateral nature of the optimization problem we are dealing with, whose essentials can be sketched in the following simplified form.

Assume a candidate developer of the software requires a lump sum € *I* in period 0 to perform the task, and that it takes one year to develop the software and check its performance. Assume further that the PA commits to pay a constant yearly fee € *x* for the use of the software. These elements identify an investment profile with an initial negative cash flow € – *I* followed by a constant profile consisting of identical cash flows in years 1 to, say, 5 (expiry of the contract). For the sake of simplicity, let us assume a constant intensity of discounting/actualization, since more general assumptions would introduce unnecessary complications.

Net present value (NPV) and internal rate of return (IRR) are fundamental properties of cash flow profiles. Write δ for the discount factor and *r* for the discount rate, so that $\delta = 1/(1+r)$:

$$\text{NPV}(\delta; \text{at date } 0) = -I + x\,[\,\delta + \delta^2 + \ldots + \delta^5\,] = -I + x\,\delta\,[(1-\delta^5)/(1-\delta)]$$

$$\text{IRR} = 1/\delta_0 - 1 \qquad \text{such that} \quad \text{NPV}(\delta_0\,; \text{at date } 0) = 0$$

Well-known challenging questions concern the criteria for assessing the appropriate rate (or, more generally, actualization profile) at which to discount flows. A typical recipe consists of fixing a benchmark risk-free rate, to which one can add a "spread" reflecting the remuneration for riskiness of the flow profile. However, one might question the appropriateness of such a scheme for the problem at hand, given the institutional setting underlying the project, and in particular the expenditure commitment of the PA. More general criteria envision the discount rate as gauging intertemporal preferences, the price of liquidity, and so forth. Evidently, it is not the aim of Task 3.2 to answer such far reaching questions, that, after all, pertain to the desired remuneration of financing partners, and, secondarily, to the bargaining options available to the parties involved.

As a numerical example meant to sharpen intuition (with simple numbers not necessarily significant for our problem), consider $I = 20.000$, $x = 6.000$ and $\delta = 0{,}96$, so that *r* is roughly 4,17%. Then one has

$$\text{NPV}(0.96; \text{at date } 0)\,/\,1000 = -20 + 6\,[0.96 + \ldots + 0.96^5\,] \cong -20 + 6 \cdot 4{,}431 \cong 6.587$$

$$\delta_0 \cong 0.8686 \qquad \text{so that} \quad \text{IRR} = 1/0.8686 - 1 \cong 0{,}151 \quad \text{i.e. roughly } 15\%$$

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The above NPV estimate represents the "surplus" that can be generated by the project, namely, the value that the producer and the financing partner(s) are allowed to share, provided suitable agreement is reached on the terms of such a division. The specific financial instruments adopted in such a relationship imply technical aspects that impinge primarily of the form of the corresponding contract. In a stark form, it may be a loan guaranteed by cash flow commitment. Such a bilateral relationship may then represent the underlying of a securitization scheme by means of which a financing partner can intermediate claims and thereby widen the network of financing partners. As concerning the potential desirability of such practices, one may recall basic principles of analysis.

First, economies (and diseconomies) of scale are at play once a loan gets securitized and offered to a range of potential investors. Investors are typically interested in large-value investments, and not in securities whose notional lies below a definite threshold (say hundred thousand or million euros). Among the reasons, one has the informational problem of fixing the comparability of such security with more standard ones (government bonds, etc.).

Second, the liquidity of the cash flow profile supporting the remuneration of the investment (the fact that flows are deterministic and the profile is 'regular') provides the financing partner with a desirable pattern, that may not generate incentive to securitize such cash prospects (compare the incentives to securitize and sells pools of loans). Still, one may profit from the opportunity of 'selling' part of that liquidity (perhaps temporarily) to counterparties.

Further aspects of the problem pertain to the role of derivative instruments.

First, it seems reasonable to argue that the current environment of low-interest rates is going to last for some years to come, and even more so under the effects of the "coronavirus" crisis. It seems therefore unnecessary to consider the potential desirability of using interest rate derivatives (like Interest Rate Swaps) by means of which parties may hedge interest rate risk.

Second, assuming that the Eurozone represents a stable environment into which to embed the value generated by the project, no currency derivatives (e.g. Currency Swaps) may be necessary to hedge currency risk.

Third, as of default risk, to the extent that the institutional framework provides a robust environment for the expenditure commitment, the project can be considered "riskless" on the demand side. Then, the price of risk, arguably, should not be reflected *directly* in a spread with respect to a benchmark risk-free rate. That being the case, negotiation of financing rates is given more space – a fact that does matter in the present phase of low yields.

Fourth, these considerations do not matter exclusively for risk management, they also matter for enlightening the stability of the financial arrangement. For instance, one can compare the instabilities associated with holding positions financed by guaranteed short-term borrowing, that may be hardly sustainable once the market price of assets is subject to shocks.

On analytical grounds, one can notice further properties of flows. For instance, the "Macaulay duration" of our cash flow profile admits the twofold interpretation of effective measure of the time duration of the financial relationship and of the sensitivity of the NPV to the actualization rate. However, of greater

importance seems to be the linearity of the formula for the NPV in each of the flows. Such a property does matter for the possibility of computing additively the 'effects' that may impinge on the NPV via the flows, possibly, government incentives promoting electromobility practices, etc.

As concerning the relevance of the real options embedded in the Noemix project, at the expiry of the contract the parties have the obvious real option to renew the relationship on the basis of the (hopefully) satisfactory outcome of the project that far. Noticeably, obvious as the existence of such an option may seem, it is not that obvious to setup a valuation recipe for the real option to renew the contract or, possibly, invest further (Dixit and Pindyck, 1994).

3.2. Financial scheme for the supply of vehicles

A cost-benefit analysis concerning the substitution of seasoned vehicles underlies the very conception of the Noemix project, resulting in a plan to renew the fleet by leasing new electric vehicles. As already pointed out, the benefits of leasing – compared to the buying option – amount to a drastic simplification of the practices necessary for an investment set up and management practices, which are all imputed to the lesser, and typically result in financial advantages for both parties. For the problem under consideration, the lessee (the FVG PA) commits to pay a rent for the supply and proper maintenance of the fleet. It is assumed that the supply of vehicles entails a five-year period, at the end of which the supplier can capitalize on the right to resell vehicles at a value that is estimated around 30% of the initial value. It is not the aim of this document to fix an estimate for the rent per car that the PA shall be willing to pay for the service. Similarly to the previous scheme, it is the criteria for optimization that inform the following considerations. Among other things, it is relevant to enlighten the different nature of the electric fleet service with respect to the software service.

On the one hand, software is essentially intangible. Its physical 'elements' – the physical states that get activated on a server and the way the instructions are stored in some form of physical memory – are scarcely relevant to its merits. What matters is the instructions and the algorithms that the software embodies and activates. Both the production and the use of the software imply human capital as the fundamental input. On the other hand, vehicles are tangible, and are typical candidates for a "buy-or-lease" choice. It is typically physical capital that is the subject of such a question. For software it is typical to buy licences for use, and no question in fact is really asked because instructions are "nonrival" (Romer, 2000) whereas cars are "rival" (if I drive a car, nobody else can drive the same car). It is relevant for our purposes that the two services shall be bundled in a single call.

Again, NPV and IRR of the project are the fundamental analytical elements. In the previous case, the initial expenditure was meant to finance the development of software; in this case it is meant to finance the acquisition of new vehicles by the supplier of the car service. Like in the previous example, the simplest flow profile entails an initial expenditure (negative cash flow) followed by a number of constant positive flows according to the time horizon of the contract. Again, the NPV of the project represents the explicit value added that the supplier and its financing partner(s) are allowed to share in the proportions that the parties will agree upon. In addition, the **implicit** value added of the project pertains to real option embedded in the project, that unfold in a twofold perspective.

On one hand, at expiry, the PA and private supplier will be in a position to renew the contract. On the other hand, the expertise can put players in a preferred position for undertaking further in initiatives. Evidently, such figures do not admit a sharp quantitative assessment, and therefore do not admit clear balance sheet implications. Still, despite their **qualitative** nature, such benefits do matter for the evaluation of the profitability of the project for both suppliers and financing parties.

It has been concluded that the service under consideration will be the subject of a call in conjunction with the supply of the management software. Due to the linearity of the NPV formula in the flows, the NPV of the package is just the sum of the NPV of the software and of vehicles. It can be relevant though to differentiate the two services for taking into account effects like those associated with the government incentives tied to the energy efficiency certificates. True, such incentives are at play for private players. It will not be the PA to take direct advantage, and rather participants to the calls, that will have to demonstrate that the competitiveness of their offer takes into consideration the bonuses provided by institutional incentives.

3.3. Financial scheme for the charging infrastructure

The analysis of the financial scheme supporting investment in the charging infrastructures differentiates significantly from the previous ones. A separation has been conjectured to be optimal between the procedures concerning the previous themes and the call for the buildup of the charging infrastructure; such a decision has been justified along the following lines.

The natural issuer of the call for services previously discussed is Centrale Unica Committenza (CUC), an office of the regional administration meant to centralize the procedures concerning calls, so as to exploit the benefits resulting from centralized information gathering and processing, and the economies of scale in the management of multiple calls. On the other hand, calls for building infrastructure have different relevance. The specificity of the infrastructure under consideration has been considered as naturally suited for a call issued by Direzione Centrale Difesa dell'Ambiente, Energia e Sviluppo Sostenibile of the FVG regional authority. In fact, the philosophy underlying the Noemix project, according to which FVG aims at becoming a leader in electromobility, envisions the regional authority as the natural owner of the infrastructure. It seems questionable to let private players be the owners of the infrastructure; private actors are subject to market forces and do not enjoy the preferred status and public financial support that public institution can advocate.

All in all, the PA thus takes charge of the investment expenditure, that is supported by the EU grant (see the Introduction above). The analysis of the financing scheme therefore does not concern the relationship between the supplier and its financing partners; the regional authority provides itself the financing of the project in connection with its consolidated network of financing partners, and exploiting the resources made available by the EU grant.

Given these premises, the accounting implications follow that the infrastructure will represent a physical asset in the balance sheet of the FVG regional authority, and that investment costs will spread over the financial statements of subsequent years according to well-defined depreciation schedule that the PA is meant to design given the constraints at play.

A rent is current expenditure, whereas a depreciation profile is an investment expenditure.

As already anticipated, a relevant point concerns the real options embedded in the physical investment. The charging infrastructure shall represent a concrete platform upon which to build structural strategies for electromobility beyond the boundaries of the Noemix project. Such a perspective entails financial implications that are not strictly connected with the properties of cash flow commitments of the regional PA in the next few years, but in a long run perspective. The aim of FVG of becoming a European leader in electromobility practices establishes a fundamental connection between, on the one hand, the way cash flow claims and commitments fix the time development of the exchange of value generated by the project, and, on the other and, the real options connected with the first-mover advantages of having a leadership in the programming of extending infrastructures or the design-and-management of services. In this sense, the role of specialized human capital emerges as a fundamental economic degree of freedom, that impinges on the long-run value implications of the Noemix project, and, consequently on its financial assessment.

More subtle financial implications may pertain to the options of potential (ex-ante) programming patterns and (on-the-run) adjustments in the profile of cash flows that embody the cash claims and commitments that, after the call, may be subsequently reflected in the contracts. The key point is that flexibility has value. From the financial viewpoint, the value of liquidity amounts largely to the value of the strategic options made available by the trading opportunities associated with the availability of liquid resources. In such a perspective, the optimality of the financial scheme supporting the investment in charging stations may be partly connected with the value resulting from the opportunity of choosing among various time profiles that may finance the capital instalment.

3.4. Financial scheme for the photovoltaic plants

The construction of energy production plants from renewable sources is aimed at compensating the annual energy consumption required to recharge the electric vehicles of the project.

The solution identified to date is a direct investment by Aeroporto Friuli Venezia Giulia SpA, which will build a photovoltaic plant in its own premises.

3.5. Financial statements implications for FVG Region

We have already pointed out the relevance of the "green" instances underlying the Noemix project, whose social desirability is not to be inquired on financial grounds. We are not dealing with a business project in which it is "returns" (whether in the short or long run, and either measured by expected return on assets, or expected increase of market shares, or whatever) that gauge the desirability of undertaking the project. The choice of undertaking the Noemix project is a political one, and financial arrangements are meant to be **functional** to the smooth unfolding of the project. It is in this perspective that we envision the relevance of the accounting and balance sheet implications of such arrangements. The car-software service and the physical infrastructure define a twofold picture.

On the one hand, the substitution of outdated vehicles with new ones is part of the ordinary programming of renewal of assets in a PA – incidentally, it has emerged from the PA panel survey that the average life of

the currently circulating vehicles is somewhat greater than typically expected standards concerning safety and emission requirements. It has been previously outlined the extent to which the choice of whether leasing or buying new vehicles is connected with the electric nature of the new fleet. A direct accounting implication is that ownership of the new fleet would be accounted for in terms of tangible fixed assets (as is well known, general principles are established by International Accounting Standards – IAS – on Property, Plant and Equipment), whereas the leasing of the new fleet under consideration does not find a place in the asset side of the PA balance sheet. Arguably, though, on the liability side, the present value of hypothetic cash flow commitments pertaining either to financing the ownership of the fleet or the leasing of it, despite their different amounts and pertinence to different parts of the income statement ("conto economico"), can be expected to have a comparable impact.

On the other hand, not so ordinary is the innovative investment in the infrastructure of charging stations, which is specific to the green-electromobility nature of the Noemix project. The FVG PA has elected to assume the financial weight of the investment expenditure. On account of the strategic nature of the Noemix project, it seems reasonable to argue that the regional PA should be the natural owner of such infrastructure, that shall enter the consolidated balance sheet of FVG as a tangible fixed asset ("immobilizzazioni materiali"). In addition, it has been already pointed out that there exists a rationale for unbundling the two calls for tenders, and the nature of the infrastructure investment is part of the rationale.

A few number, pertaining to the consolidated balance sheet 2018 of the region FVG, gauge the orders of magnitude of the figures into which the Noemix accounting is meant to embed. The income statement ("conto economico") assesses approximately € 6 billion inflows from taxes, and roughly € 25 million earnings. The figures contained in the 2018 consolidated balance sheet ("stato patrimoniale") account for liquid resources amounting to more that € 2.7 billion. Fixed assets are subdivided into intangible ("immateriali") exceeding € 74 million, and tangible ("materiali"), exceeding 3 billion). Such orders of magnitude seem to assess the impact of the Noemix project – meant to raise some 13-14 million in a public-private partnership – as compatible with the health of the overall balance sheet of the regional PA. With that said, evidently, it is not the aim of this document to argue in favour or challenge the decisions of the PA under consideration.

The importance of liquidity

Over the last decade, as a consequence of the great financial crisis of 2007-2009, the relevance of liquidity and its elusive properties have been the subject of a profound rethinking on both academic and professional grounds (see for instance Tirole, 2011, and references therein). It is somewhat evident that the liquidity of a security is, in fact, a property of the financial market in which such a security is traded, and that such a property is contingent on the "phase" of the market. It is not straightforward, as academic research has amply demonstrated, to map the manifold implications of such a simple remark for the management of individual balance sheets and markets as a whole, a task that central banks are assuming with an increasingly systematic character. The relevance of Quantitative Easing policies (set in place by major central banks around the world, in primis the Federal Reserve, the European Central Bank and the Bank of England) has been amply discusses, in the clarification of the way the balance sheet itself of the central bank becomes an active player in the forward guidance of markets towards stabilization paths. Along such lines of thought, the liquidity of the balance sheet of the region FVG is given even more emphasis.

The current Covid crisis and its aftermath, unfortunately, will bring the problem of liquidity once more at the heart of political and economic debates. Central banks, in fact, are already engaged in the management

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of global scenarios. A positive element, in such respects, is that the lessons learned from the great financial crisis of 2007-2009 have been assumed at the foundations of current monetary policy debates, and therefore, hopefully, will provide a useful guide for navigating future events.

4. Risk allocation and risk capital

The above schemes embody the awareness, reached in the preliminary phase of analysis, that the constitution of a SPV may not represent an efficient approach, due to the administrative costs of setting a new company with dedicated human capital. Rather, a "mixed" society may turn out to better suit the nature of the project: an already existing society (perhaps, participated) enables the injection of competences, administration and management that need neither be created ex novo nor be acquired from the outside. This is the premise for a sound elaboration of point B, concerning risk allocation and risk capital.

In a standard business context, risk capital embodies the connection between ownership rights (including voting rights over strategies and management substitution) and risk sharing. In the context of the Noemix project represented as a balance sheet (whether SPV or "mixed" society), risk capital (or shares thereof) is meant to embody the commitment of a definite player (or more) to the optimal long-run allocation of resources and risks. Risk capital can be considered the fundamental balance sheet implication.

Among other things, it has been pointed out that in the absence of a clear statement by the PA about explicit expenditure commitments, uncertainty about the profitability of engaging in the project may result in deserted calls. It has been therefore concluded that it is sound for the PA to commit to clear expenditure figures. That being the case, the discussion about the financial scheme assumes a sharp form: the deterministic character of the profile of cash flows that the PA commits to pay – as a specified rent for each of the services under consideration – makes the evaluation build on transparent data, as discussed in the previous section. Therefore, the capacity of the private players to service debt is triggered by the ability of the participant to supply the service with a competitive cost structure, that will enable a reasonable – satisfactory – payoff to investors.

As is well known, the pricing of risks is among the fundamental problems of asset pricing models (Cochrane, 2005). In the present context, the commitment by the PA to pay specified rents makes the project "riskless" – on financial grounds – and the potential private provider of a service (in fact, one or more) is in a position to negotiate favourable rates with the financing partners. Evidently, the feasibility of financial arrangements boils down to the design of a "win-win game" for the various parties involved. Such a fact is particularly relevant in the present phase of low interest rates and yields. It matters to notice that the private subjects involved will reasonably become recognized leaders in the field, and offer the same products to other PAs, so as to exploit the real options embedded in the project.

5. Human capital and commitment

The concrete financial arrangements previously discussed are meant to be functional to the emergence of the true value added of the Noemix project, that does not reduce to financial figures that admit explicit accounting representation (environmental benefits can hardly be made to fit definite figures in financial

statements), and that unfolds in a long-run perspective. The project aims at representing an ambitious step in a widespread transition to green mobility, in the philosophy underlying the Noemix Project. Arguably, in a scenario in which the Noemix project aims at paving the way for the replication – and, possibly, improvement – of its architecture, the proper allocation of specialized human capital (SHC) seems to represent a pivotal element.

Noticeably, the relevance of the allocation and commitment of SHC for the efficient extension of credit represents a somewhat established line of research in financial economics. To quote but one example, Diamond and Rajan (2001) argue that the specificity of the capital structure of banks provides the right incentives **to make lenders and borrowers converge on a consistent allocation of SHC** (see Appendix 1). Such a "theory of banking" does not apply straightforwardly to our problem; still, the basic insights about the pivotal role of the commitment of SHC seem to fix a consistent logic for envisioning basic properties of suitable financial arrangements.

Any potentially feasible financial scheme, in terms of the associated net of contracts, fixes an arrangement of claims and "exit options" (overtaking asset management, liquidation of assets, etc.) that the financing partners can exercise under definite contingencies. Then, to the extent that the feasibility and sustainability of the Noemix project is gauged by the proper allocation of SHC, the best financial scheme is supposed to reflect some of the basic intuitions discussed by Diamond and Rajan (2001). The PA, the providers of services and the financing subjects shall be required to converge on a convincing economic and financial architecture in which the commitment to the best allocation of SHC is a cornerstone.

6. Regulations and incentives

In recent years the public subsidy to green mobility has manifested itself in explicit investment policies by public institutions. Manifold initiatives have been undertaken at all institutional levels; one can think for instance of bike-sharing services set in place by a large number of municipalities. In the present Task our interest is in the more specific realm of electromobility and renewable power plants, for which we review the following interesting facts.

6.1. Battery electric vehicles

At national level, the so called "Ecobonus 2019" (fixed in "Legge di Bilancio") establishes the government incentives for buying electric or hybrid vehicles. Contributions range from €1500 to €4000 according to the degree of reduction of emission of vehicles, and from €2000 to €6000 in case the substituted vehicle is eliminated (scrapped). The vehicles subject to such measures are those of class M1.[2]

[2] According to document 2007/46/EC as last amended by 385/2009, a vehicle belongs to the class M1 provided it is a motor vehicle with at least four wheels desiged and constructed for the carriage of passengers with no more than eight seats beyond the driver's seat.

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As is known, vehicles included in this project are purely electric and for this reason we consider as applicable a contribution of €4000, which turns into €6000 in case of concomitant scrapping.

Similar measures have been adopted at regional level but, as in the case of Friuli Venezia Giulia region, allocated contributions are only in favour of physical persons, so they are not applicable to this project.

Energy Efficiency Certificates are an additional incentive tool, related to end-use energy savings achieved through projects aimed at increasing energy efficiency in the final uses of energy. Regarding electric vehicle fleets, these Certificates can contribute to reduce the initial investment cost. Please note that Energy Efficiency Certificates cannot be cumulated with the ecobonus.

Another kind of incentive connected to electric mobility is the annulment of the car tax, which is generally valid for 5 years, for being then requested in a reduced amount. Concerning the case under analysis, for the entire useful life of the project, it is estimated that the impact of the car tax will be zero, thus indirectly reducing the fee for the PA.

6.2. Renewable energy plants

This chapter summarises what is currently in place with regard to incentives for renewable source plants, with particular reference to photovoltaic, which has been identified as a suitable type of plant for the Noemix project.

DECREE 04 JULY 2019 – DM2019

Photovoltaic plants built on Agricultural landscape cannot access to Feed In Tarif, according to what established by "Romani Decree".

For the others, on the basis of DM2019, new photovoltaic plants with nominal power higher than 1MW can obtain Incentives if previously participate on a public auction procedure.

Tabella 1 – Schema delle modalità di accesso agli incentivi per impianti nuovi, riattivazioni, integrali ricostruzioni e potenziamenti (*)

Gruppo di appartenenza	Tipologia impiantistica	Categoria di intervento	Potenza (*)
			1 kW · 20 kW · 1.000 kW
Gruppo A	Eolico on-shore	Nuova costruzione Integrale ricostruzione Riattivazione Potenziamento	Registro / Asta >1 kW – 1.000 kW
	Fotovoltaico	Nuova costruzione	Registro / Asta >20 kW – 1.000 kW

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Nr. Procedura	Periodo di presentazione richieste di iscrizione		Data ultima di pubblicazione della graduatoria
	Data di apertura	Data di chiusura	
1	30 settembre 2019	30 ottobre 2019	28 gennaio 2020
2	31 gennaio 2020	1 marzo 2020	30 maggio 2020
3	31 maggio 2020	30 giugno 2020	28 settembre 2020
4	30 settembre 2020	30 ottobre 2020	28 gennaio 2021
5	31 gennaio 2021	2 marzo 2021	31 maggio 2021
6	31 maggio 2021	30 giugno 2021	28 settembre 2021
7	30 settembre 2021	30 ottobre 2021	28 gennaio 2022

Figure 1: ***on top, the power division for access to registry or auction procedure; below the calendar of registry and auction procedure.***

The procedure aims to define a list of those plants that can request incentives set by the DM2019.

The list is based on a percentage of discount offer respect the incentive. The higher the percentage the higher in the list are placed the project. The list stops when the power limits set in the decree are reached.

If some projects offer the same percentage of discount other criteria must be applied.

- LEGALITY RATING OF AT LEAST 2 "STARS" (ART. 5-TER DL 1/2012);
- PLANTS BUILT ON CLOSED AND RESTORED LANDFILLS AND LANDFILL LOTS, QUARRIES NOT SUSCEPTIBLE TO FURTHER MINING EXPLOITATION FOR WHICH THE AUTHORITY RESPONSIBLE FOR ISSUING THE AUTHORIZATION HAS CERTIFIED THE COMPLETION OF THE RECOVERY AND ENVIRONMENTAL RESTORATION ACTIVITIES PROVIDED FOR IN THE AUTHORIZATION IN RESPECT OF THE REGIONAL REGULATIONS IN FORCE, AS WELL AS ON AREAS, ALSO INCLUDED IN SITES OF NATIONAL INTEREST, FOR WHICH THE CERTIFICATION OF SUCCESSFUL RECLAMATION PURSUANT TO ART. 242, PARAGRAPH 13, OF THE LEGISLATIVE DECREE 3 APRIL 2006, N. 152 OR FOR WHICH THE PROCEDURE PURSUANT TO ART. 242, PARAGRAPH 2, OF THE SAME LEGISLATIVE DECREE

Nr. Procedura	GRUPPO A [MW]	GRUPPO B [MW]	GRUPPO C [MW]
1	500	5	60
2	500	5	60
3	700	10	60
4	700	15	60
5	700	15	80
6	800	20	100
7	1600	40	200
TOTALE	5500	110	620

Figure 2: ***the power limit for auction procedure list.***

To participate to the auction is necessary to obtain the authorization.

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To request the incentives, the official communication for *Start of Work* has to be presented to the authority after the inclusion in the GSE' auction lists.

The incentives are **paid on** the net produced **electricity** and **fed into the grid** by the plant.

The D.M. 04/07/2019 provides **three different tariff** definitions:

- the **Reference Tariff** (***Tariffa di Riferimento)*** is determined, depending on the source and type of plant and its power, by applying:

1. the rates and any reductions envisaged by the Ministerial Decree 23/6/2016 for successful non-photovoltaic plant applicants to the Registers, whose plants are connected within one year of the Ministerial Decree 04/07/2019 coming into effect and that did not benefit from specific priority criteria set by the decree.
2. the tariffs referred to in Annex 1 of the Ministerial Decree 04/07/2019 for all the other plants

- the **Offered Tariff** (*Tariffa Offerta*) is calculated by applying to the reference tariff any reductions requested by the successful participant when applying to the Registers or the Auctions, in order to benefit from available priority criteria.
- the **Due Tariff** (*Tariffa Spettante*) is calculated by applying the additional reductions envisaged by the Ministerial Decree 04/07/2019 to the rate offered to successful participants ranked in the registers and auctions and subsequently admitted to incentives.

There are **two different incentive mechanisms**, depending on the power of the plant:

- the **All-Inclusive Tariff** (TO – *Tariffa Omnicomprensiva*) consisting of a single tariff, corresponding to the due tariff, which also remunerates the electricity drawn by the GSE;
- an **Incentive** (I – *Incentivo*), calculated as the difference between the due tariff and the regional hourly price of the energy, as the generated energy remains at the operator's disposal.

For systems with power **up to 250 kW it is possible to choose** either incentive mechanisms, with the possibility of switching from one mode to the other no more than twice during the entire incentive period.

Plants with a power **exceeding 250 kW** can instead apply **only for the Incentive**.

All-inclusive and incentive rates are distributed by the GSE starting from the connection date of each plant and for a specific period of time, which is equal to the useful life of the plant itself. The **date of commercial connection and commissioning** may be chosen by the operator, as long as it is within 18 months from the connection of the plant.

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7. Non-economic benefits

In addition to economic benefits, incentives and opportunities underlined in this document, it is worth to underline how the transition towards electric mobility include some non-economic benefits as well. Here is a list of some of those benefits, whose explanation and investigation are out of the scope of this document, but that we consider, at any rate, important to listed.

Less local air pollution

Transition towards electrified mobility allows a dramatic reduction in global air pollution. A reduction for NO_x, SO_2, CO, COV, PM_{10} has been estimated.

	ICEV EURO6 petrol to BEV [g/km]	ICEV EURO6 diesel to BEV [g/km]
NO_x	-0,030	-0,215
SO_2	-0,001	-0,001
CO	-0,322	-0,061
COV	-0,004	-0,011
PM_{10}	-0,026	-0,027

Source: INEMAR – ARPA Lombardia, Romeo Danielis (UNITS)

Lower CO2 emissions

Transition towards electric mobility moves the problem of CO2 emissions within the manufacturing of vehicles and in the production of the energy that is necessary for its use. Life Cycle Analysis studies agree that, considering the European energy mix, global CO2 emissions for the life of an electric vehicle are significantly lower than those of an equivalent endothermic vehicle. It is also noted that as the penetration of renewable sources in the energy mix increases, the corresponding CO2 emissions will decrease.

	ICEV EURO6 petrol to BEV [g/km]	ICEV EURO6 diesel to BEV [g/km]
CO_2	-167,4	-164,4

Source: Danielis, R. (2017) Le emissioni di CO2 delle auto elettriche e delle auto con motore a combustione interna. Un confronto per l'Italia tramite l'analisi del ciclo di vita, Working papers SIET – ISSN 1973-3208

Less noise pollution

The problem of noise pollution has important impacts especially in residential areas and cities, with social and health impacts. The transition towards electric mobility allows a significant reduction in noise pollution associated to internal combustion engines.

Considering that, according to Mahajan and Rajopadhye (2013), about 70% of ICEV noise is attributable to the internal combustion engine, a 70% reduction in noise impact can be attributed to the transition to BEV.

Greater safety for car occupants and vulnerable road users

Thanks to the replacement of obsolete vehicles with new vehicles that meet the latest safety standards, in addition to the progressive adoption of ADAS systems, it is clear that the safety of occupants and vulnerable road users will be improved. The new vehicles will also allow to reduce the amount of road accidents and their consequences thanks to improved dynamic, safety and driver assistance performance and collision prevention.

Greater comfort and reduced driving fatigue and stress

The new vehicles meet latest comfort standards, which are significant improved in comparison of the obsolete vehicles that are today in use by the public administrations. Besides the general drive comfort (climate control, ergonomics, improved night visibility, etc.) the driving assistance systems help to reduce the driving fatigue resulting in less driving stress related condition.

Increased use of energy from renewable sources

As foreseen by the project objectives, the electric fleet is going to use energy from renewable sources (guarantee of origin assured by GSE), and this will result in a direct support of those technologies and relevant market share increase.

Lower administrative impacts

The result will be a fleet that can be monitored, accounted, scheduled and managed by a supervision system. Besides vehicles' improved usage factor, a better efficiency regarding administrative-operative tasks related to the fleet management, accounting (e.g. for refueling), maintenance operations, etc. is expected.

Access to Restricted Traffic Zones and bus/taxi lanes

Electric fleets can generally access any urban area, including restricted traffic zones and reserved lanes.

8. Calls for tenders

On the basis of the previous arguments and more general discussions, the parties involved in the preliminary phase of the project have agreed on the appropriateness of issuing differentiated calls for tenders inviting private operators to offer packages of services in **one or more** of the activities pertaining to the Noemix project. More specifically, as already stated, the supply of vehicles shall be bundled with that of management software, whereas the charging infrastructure will the subject of a call of its own. Both institutional/administrative factors and economic factors underlie the choice.

On the one hand, the conjunct supply of vehicles and management software will be the subject of a call issued by Centrale Unica Committenza (CUC FVG), that represents the natural issuer of calls for buying services in the market. On the other hand, economies of scope underlie the choice of bundling the two

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services: it is typical for the supplier of cars to have already developed a fleet management software that accompanies the service. One such already existing software will evidently need to be customized in order to be embedded into the Noemix requirements; still, economies of scope, arguably, remain after the adaptation. On the other hand, the building of the charging infrastructure will be the subject of a call issued by the regional institution FVG (via Direzione Ambiente Territorio ed Energia), that commits to assume entirely the financial investment in physical capital.

Participants to calls will be required to display due awareness of the financial mechanisms previously discussed, as well as of the relevance of the pathbreaking project, in terms of which FVG aims at becoming a European leader in electromobility practices. In such respects, the above remarks concerning of the real options (Dixit and Pindyck, 1994; Damodaran, 2008) embedded in the project shed light on the reach of such a theme.

It is quite firmly established that, in a medium and long run perspective, the "green economy" paradigm is going to play a crucial role in shaping economic policies of governments and institutions at national and international levels. A major consequence of such foreseeable scenarios is that the **coherence** of development patterns shall represent a pivotal element for the efficiency with which such progress shall be pursued and implemented in concrete terms. In such respects, the role of specialized human capital both within institutions and at private companies will become more and more significant, and the connections that shall be established in the context of the Noemix project, hopefully, will represent a premise and a catalyst for future developments.

In a previous section, the relevance of devising arguments in terms of a "mixed" company has been emphasized: an already existing society (perhaps, participated) enables the injection of competences, administration and management that need neither be created ex novo nor be acquired from the outside. This is a concrete manifestation of the relevance of SHC.

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Appendix 1: Diamond and Rajan's (2001) theory of banking

Loans that finance capital investments are in general illiquid. The profitability of nonstandard projects is typically uncertain, and in particular contingent on the properness of the use of the assets involved; in such contexts, information asymmetries preclude a clear valuation of the project by outsiders, as well as a proper appreciation of its inner working. Therefore, a loan that finances one such project can hardly be liquid. In fact, banks invest in technologies that allow them to screen loan applicants and to monitor their projects. It is customary to consider the notion of "monitoring" as encompassing the strategies to prevent moral hazard, as well as the punishment mechanisms fixed in contracts. Banks have comparative advantages in monitoring, given economies of scale (so that a bank finances a large number of projects) and low cost of delegating monitoring; see Freixas and Rochet (2008) and references therein. Such problems are well known; still, it is far from straightforward to envision the full range of consequences for the dynamics of credit extension. Diamond and Rajan (2001) engage in one such exercise.

The Authors envision a stylized but convincing representation of the fundamental activities of banks. On the asset side, banks make loans to 'difficult' borrowers, i.e. projects whose expected performance represents a nonstandard problem in information processing that only specialized lenders can address. On the liability side, banks create liquidity for depositors – that indirectly finance the aforementioned projects – and at the same time shield the borrowing entrepreneurs from the liquidity needs of depositors. In this sense, banks perform valuable activities on both sides of their balance sheets. Crucial, in such respects, is the commitment to the proper allocation of specific human capital (SHC).

Specific strategic problems arise between a borrowing entrepreneur and a lender once the project to be financed is a nonstandard one that requires dedicated SHC to be implemented and managed properly. And the poor substitutability of the dedicated SHC has relevant consequences. The borrowing entrepreneur may have limited ability (incentives) to commit to the allocation of SHC to the project on behalf of others. For instance, the borrower may threaten to quit at an interim stage, and this gives him bargaining power over the division of the surplus generated by the project. As a consequence, the lender is not in a position to threaten credibly to overtake the project, a decision that may significantly impact on the performance of the project.

Building on such premises, Diamond and Rajan (2001) establish that the "fragile" capital structure of banks – one in which demandable deposits are potentially subject to runs – facilitates the alignment of incentives of lenders and borrowers, namely, the incentive for lenders not to overtake or liquidate the projects, and the incentives for the borrowing entrepreneurs not to reallocate the dedicated SHC to other projects. The fragility of the capital structure of the bank enables the bank itself **to borrow against the full value of the illiquid loan**: the point is the wedge between the full value against which the bank can borrow and the partial value at which the project might sell.

The theory developed by Diamond and Rajan (2001) has been recognized as an important building block of our understanding of banks, as witnessed by Freixas and Rochet (2008, p. 33).

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