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Public–private partnerships value in bioenergy projects: Economic feasibility analysis based on two case studies

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ABSTRACT

Greece and Italy are facing serious energy challenges concerning sustainability and greenhouse gas emissions as well as security of supply and the competitiveness of the internal energy market. These challenges require investments by the public sector, while the countries have seen in the last years their debts rising. A solution to promote bioenergy business, without rising public debt, could be the use of PPP (Public–Private Partnership). This paper presents a methodology to develop agro-energy business using PPP in two rural areas: the municipality of Evropos (in Greece) and the municipality of Montefalco (in Italy). At first biomass availability is studied, then the optimal technology is selected. Once technological issues have been analyzed PPP value for money has to be assessed. Conventional methods to evaluate economic viability of a project are not enough and a Public-Sector Comparator (PSC) has to be calculated. Typical risks of bioenergy projects are identified, estimating their probabilities and consequences. This will lead to associate a monetary value to each risk. Then the identified risks are allocated among private and public partners, establishing synergies. The allocation of risks will have consequences on the preparation of PPP contract and on partner selection procedure.

1. Introduction

1.1. PPP definition and types of PPPs

The term PPP (Public–Private Partnership) has its origin in the USA, initially relating to joint public–private funding for educational programs, but came to wider use in the 1960 to refer to public–private joint ventures for urban renewal [1]. After 1978 the Power Purchase Agreement (PPA), developed in USA provided the template of modern PPP contracts and encouraged the construction of cogeneration plants. If we talk about project based or contract based PPPs these can be identified by the following characteristics [1]: a long-term contract between a public-sector party and a private sector party; for the design, construction, financing and operation of public infrastructure by the private sector party; with payments over the life of the PPP contract to the private sector party for the use of the facility; with the facility remaining in public-sector ownership, or

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Nomenclature

CAPEX	Capital Expenditure, €
CF	Cash Flow, €
CP	Conventional Procurement, –
DB	Design Build, –
DBB	Design Bid Build, –
DBFOM	Design Build Finance Operate Maintain, –
IRR	Internal Rate of Return, %
NPC	Net Present Costs, €
NPV	Net Present Value, €
OPEX	Operating Expenditure, €
PSC	Public-Sector Comparator, –
r	Discount rate, %
SB	Shadow Bid, –
SP	Simple payback Years
TPR	Third Party Revenues, €
VOR	Value of Risk, €

reverting to public-sector ownership at the end of the PPP Contract. The most important difference between Conventional Procurement and PPP is that while PPP deals with the integration of two or more phases of the project (for example design, construction, operation, maintenance etc.) into a contract lasting for all the concession period, in conventional public procurement each phase is procured separately. Besides PPP contracts are output-based, payment is done upon delivery, there is private financing and private sector project stewardship; while conventional public procurement contracts are input-based, there are monthly payments, private financing is limited and project stewardship is under public responsibility [2]. In Conventional Procurement (CP or DBB) even the construction phase is considered under public body responsibility. PPPs can be classified, based on private partner involvement. In the case of DBFO, for example, the risks of construction and ownership belong to the private sector, that on the other hand receives the payment of a toll (for example) from the users of the facility or service that has been built. In DBFO the property of the facility can be public or private. In DB (Design Build) the private partner designs and builds the facility that will be operated by the public. At the moment few studies deal with the application of PPPs to the renewable energy sector, one of the most important is that of Martins et al. [3], in which we find a case study on a wind power plant tender. In that analysis important issues are taken into account, like: private partner selection (through bids analysis), contract structure, risk sharing and contract management. Public-Sector Comparator is not taken into account, but it is important as a value for money calculation method in PPP projects [4], especially if they deal with bioenergy projects. This kind of projects has an important difference, respect to wind power projects: there are often two useful products, power and heat, instead of only one (power). In this case, while electricity could be sold on the national grid by the private or the public partner or by a shared public–private society (for example an S.P.V.), it is desirable that the heat produced will be used in public heat sinks (such as sport facilities, education service offices, hospitals etc.). So the public body can reduce the expenses linked with space heating, while the private partner will receive an income for the service performed. Once the convenience of PPP contracts has been proven, they can be the solution to the credit availability problem of public bodies in Spain, Greece, Portugal, but also in Italy. Greece and Italy don't have at the moment a formal methodology for PPPs value for money analysis.

Table 1 – Number of PPPs projects in Italy and Greece.

Sector	Italy (UTFP 2002–2012)	Greece (Special PPP Secretariat 2002–2012)
Water, Energy and Telecommunication	3303	0
Tourism	987	1
Urban green, urban qualification, hygiene, monuments	3722	4
Multipurpose centers	88	1
Cemeteries	757	0
Commerce and artisanship	1684	0
Directional & Administrative	31	25
Sport infrastructures, Parks, Free time	4659	3
Health	460	4
Education and social	495	1
Transport	195	1
Others	397	3

To know some statistics on PPP contracts implemented in Greece and in Italy data can be collected from the two national agencies: UTFP for Italy (UTFP is the Italian Unit of Project Financing, belonging to the Inter-ministerial committee for prices -CIPE-) and the Special Secretariat for Public–Private Partnerships of the Ministry of Economy and Finance, for Greece. A summary of the main PPP projects in Greece and Italy updated to 2012 is proposed on Table 1 [5,6].

From Table 1 we can see that Greece has no PPPs in the energy sector, while Italy has an interesting number, but few of them regard bioenergy projects. At the moment there aren't reliable statistics on the approved PPPs, dealing with bioenergy projects, in Italy and Greece. The number of PPPs realized in Italy is very big, compared to that realized in Greece, but this can be explained with the fact that the budget of the average Greek PPP (equal to 95 M€) is greater respect to that of the average Italian PPP (equal to 4 M€). For these reasons, the paper finds its originality in the design of an effective methodology for a successful use of PPP schemes to promote agro-energy business in two case studies.

1.2. *Bioenergy projects and PPPs*

During the development of a project, especially dealing with bioenergy, different risk typologies can be faced: plant reliability, plant economics and contracts and warranties [7]. The risks faced in a bioenergy project can be controlled comparing plant performances, improving training and maintenance services, analyzing correctly plant economics and plant guarantees. Besides an important advantage of PPPs is represented by the fact that plant reliability risk and in general technology risk can be allocated or transferred to the private partner, selecting and fixing the required warranties in the contract. Risks and or

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