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Shari'ah-Compliant Finance: A Possible Novel Paradigm for Green Economy Investments in Italy

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Abstract: In Italy, the dramatic reduction of government incentives has caused a decrease of investments in the renewable energy sector. For this reason, it is necessary to rethink funding techniques, extending the analysis to different cultural and financial models. In this paper, we study the incentive-dependency of an Italian case study in the wind energy sector in order to reach grid parity, comparing the obtained results with those of Islamic finance and conventional finance. In particular, we propose that Sukuk Islamic finance instruments be used for the realization of real assets in Shari'ah-compliant finance that prohibits interest rates, as in conventional financial markets, and we present the building cost thresholds necessary to achieve grid parity. Our results highlight the importance of incentives and the applicability of the use of Sukuk instruments for sustainable investments in the wind energy sector, which is crucial in the framework of current efforts against climate change as well as efforts to reduce greenhouse gas emissions.

Keywords: Islamic finance; wind energy; renewable energy; grid parity; CO_2 emission

1. Introduction

In recent years, the energy crisis and the deteriorating environmental conditions have promoted the development of renewable sources [1,2]. The Energy Union Framework Strategy set out the ambition to move away from an economy dependent on fossil fuels [3]. The share of renewable energy sources reached 16.7% of the gross final energy consumption of the European Union (EU) in 2015 (this indicator is equal to 20% in the Europe 2020 strategy). Furthermore, European countries agreed on a new 2030 Framework on climate and energy, which aims to reach at least 27% renewable energy consumption by 2030 [4].

The widespread development of renewable energy sources (RESs) is mainly driven by the goals of preventing climate change and reducing greenhouse gas (GHG) emissions, in addition to the reduction of energy dependency that characterizes most European countries [5].

In 2017, the EU wind power reached a cumulative power level of 169.3 gigawatts (GW); Italy was in fifth place with 9.5 GW. In the EU, between 2005 and 2017, wind power generation more than tripled and has become the second largest contributor to renewable electricity, taking over biomass. The 2017 EU wind power production reached 336 terawatt-hours (TWh) and wind energy satisfied on average 11.6% of the electricity demand of the 28 EU countries, boosted by Denmark, Portugal, and Ireland as the top three countries in term of percentage of the average annual electricity demand covered by wind (in Italy, this percentage was 5.2% as compared to the EU average of 11.6%) [6].

In Europe, and particularly in Italy, there are country-specific regulatory frameworks (and incentives) to support the use of renewable energy, especially wind energy. Furthermore, the European experience suggests that a feed-in tariff offers more cost-effective support than a tradable green certificate, because it is less risky and allows capital-intensive projects to be viable with a lower cost of capital [7].

In spite of this result, in Italy, the wind energy market rapidly dropped when compared to the last decade, when government incentives were sensibly reduced. Although incentives played a major role, other factors caused this trend. Still, this downward trend has been very different from one country to another, as reflected by the increase in the levelized cost of electricity (LCOE) [8]. Investments in the field of renewable energy decreased, the changing political support created a climate of uncertainty, and the so-called "grid parity" became more complex and challenging. Grid parity is the parity between the cost of producing electricity from a renewable plant (or its LCOE) and the purchase cost of energy itself from the network. It is a condition in which a plant is able to repay its costs even without direct economic incentives for energy production. Grid parity is a concept that requires the define of the kilowatt-hour cost produced by the plant, taking into account construction, installation, maintenance, insurance and management costs, final return, and invested capital return—a remuneration that, in addition to balancing the inflation rate, guarantees the producer an adequate risk premium [9].

In this scenario, a steady progression of the green economy would be ensured by reconsidering the subsidization of systems and the employed financing tools, extending the examination of the diverse social and financial models available [10,11]. In that sense, the instruments proposed by Islamic finance could represent valuable tools for financing the renewable energy sector [12–16].

In the search of resources, the Italian industry will be forced to look at money where it is; we believe the future megatrend in the world economy will be Islamic finance, which reached 2.5 trillion dollars in 2017 (expected 3.5 trillion dollars at the next assessment) and represented about the 1% of the world's total assets in 2014 (about 2 trillion dollars). This indicates a fantastic growth rate, similar to the bitcoin currency. Islamic finance has sensibly developed worldwide during the last decades, and is constantly growing, though Islamic banking still makes up only a fraction of the world's total assets. The employment of Islamic finance is a possibility for all countries, for the general improvement of the transparency and efficiency of financial systems. Moreover, it can bring about: the improvement of the living conditions of the less well-off classes, as favored by the mutualism of the Islamic system; the establishment of preferential channels for the penetration of MENA (Middle East and North Africa) countries' markets; and the integration of immigrants into the national social fabric. An important aspect of Islamic finance is that it allows legislators to carry out a reclamation of social behavior, countering the malpractice of corruption [17–19].

In this kind of finance, there is no separation between religion and social-political aspects. In fact, Islamic finance is compliant with Islamic Law, the Shari'ah jurisprudence. Also, prohibition is strict on activities related to alcohol, tobacco, and other drugs, as well as pork products, gambling, pornography, armaments, and destructive weapons [20–22]. Other principles state that these financial instruments and the related exchanges must avoid speculation, gambling, unreasonably uncertain or ambiguous contracts, taking advantage of a counterpart's ignorance, corruption, and more importantly, financial returns not correlated to a real activity with a certain level of risk, i.e., the concept of usury also intended as interest. Among several differences between conventional and Islamic finance (Table 1), the most striking difference is the Islamic ban on usury, which translates into a prohibition on interest rates, as is employed in conventional financial markets [13,23].

Such instruments represent interest-free loans used for the realization of real assets that provide a reasonable and fair remuneration for the investment in the form of a fixed share (i.e., a commission). That means they are closely linked to the real economy, not a mere liquidity retrieval tool that does not confer the utilization of the liquidity itself [24].

Table 1. Comparison of Islamic and conventional finance [13,23].

	Islamic Finance	Conventional Finance
Advantages	Attribution of equal importance to ethical, moral, social, and religious (HARAM) dimensions Prohibition of interest payment related to the temporal factor (RIBA) Prohibition of unreasonable uncertainty (GHARAR) Prohibition of speculation (MAISIR) Capital traceability system	Freedom and ease in the global scenario Greater diffusion in the world Greater support from governments Reliable and guaranteed deposit yield
Disadvantages	Minor diffusion in the world Less support from governments Not suitable for risk-averse subjects Loss of fixed interest on deposits	Calls for risky, unstable, and uncertain profit maximization Interest payment related to the temporal factor Possibility of inefficient allocation of resources

In recent years, similar studies have been dedicated to investment feasibility in the renewable energy sector. Among others, Campisi et al. [25,26] analyzed the adoption of light emitting diode (LED) luminaries to replace conventional lamps in public-lighting systems of Rome (Italy), using real options and economic-financial analyses. Biondi and Moretto [27] discussed the solar grid parity in Italy using real options analysis. Foley et al. [28] studied, in the long term, the conversion of pumped hydro storage to firm wind power. In an overview of wind energy in the world, Kaplan [29] evaluated the current wind energy policies in Turkey. Campisi et al. [9], Sgroi et al. [30], and Squatrito et al. [31] investigated the energy and economic performance of photovoltaic systems in Italy. Gu Choi et al. [32] evaluated the cost-competitiveness of renewable energy technologies in terms of grid parity. Monjas-Barroso and Balibrea-Iniesta [33] conducted a comparative study in three countries (Denmark, Finland, and Portugal), evaluating an investment project on renewable energy based on wind power. Muzathik et al. [34] investigated the investment feasibility of a renewable energy mix in Malaysia. Blanco [35] evaluated the generation costs of wind energy investments in Europe, both onshore and offshore. Kjærland [36] studied an investment in hydropower in Norway, and Campisi et al. [37] analyzed the energy and economic efficiency in the Italian residential building sector using a multi-criteria analysis.

All these studies showed that an incentivization policy is needed in order to achieve positive margins and grid parity, given a fixed building cost of the power system.

In the public debate following the 2007 economic and financial crisis, Islamic finance was progressively proposed as an attractive basis for changing the worldwide monetary framework. However, the recent developments faced a highly polarized debate, making it very hard to disseminate a profound and final comprehension of Islamic finance tools and their applicability in Eastern countries [38–43]. It should also be noted that current studies addressing the applicability of Islamic finance tools to the Eastern economy and their outputs used heuristic tools and classical profit-maximizing assumptions of conventional finance [44–47].

The worldwide debate has produced notes and papers that address particular strategy issues related to Islamic banking and managing [48–50]. Some studies argued that Islamic banks are less prone to deposit withdrawals and that they granted more loans during the financial crisis and are less sensitive to changes in deposits [51]. Also, according to Manaf et al. [52], Islamic banks are more stable than ordinary banks. However, most recent research in the field sensibly differs and it was concluded that the stability of a bank system may dramatically change among various nations and banks [9,53,54].

In that sense, the instruments proposed by Islamic finance could represent valuable tools for financing the renewable energy sector [12–16]. Among the main Islamic financial instruments, there are Murabaha, Mudaraba, Ijara, and Sukuk. Murabaha is a contract of sale in which the lender buys an asset at the specific request of the debtor and then sells it for an amount equal to the purchase cost plus a mark-up and a deferred price over time. Mudaraba is a partnership contract between a party that provides risk capital and another party that manages the agreed and approved project. The profits are allocated according to a specific agreement and the losses are borne by the party that provides the capital. Ijara is comparable to a leasing contract. The lender does not lend money by applying interest, but obtains a remuneration by charging the debtor with periodic fees for the rented asset. The totality of the fees includes a mark-up compared to the purchase cost due to the risk assumed by the lender. Sukuk (plural of Sakk, which literally means "instrument") are securities that represent the ownership of a real asset. Sukuk are defined by the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) as securities of equal denomination representing individual ownership interests in a portfolio of eligible existing or future assets. Sukuk represent an instrument to reach a tangible scope, determined by and closely linked to the real economy, not a mere liquidity retrieval tool that does not take into account the use of the liquidity itself. Sukuk can be compared to asset-backed securities—interest-free loans used for the realization of real assets [48].

Several projects have recently been financed with the issuance of Green Sukuk, Islamic finance securities of equal denomination representing individual ownership interests in a portfolio of eligible existing or future assets, for example the One Solar Watt Per Person project in Indonesia and the Orasis project in France [55].

In the literature, a study has not been found that addresses energy performance and dependence on the incentives of wind power plants in Italy in the expected regulatory framework of 2018 (Decree FER 1 ('Fonti Energetiche Rinnovabili 1')) using Islamic finance and conventional finance tools, with a comparison of the obtained results. Our research aims to fill this gap.

In this paper, we study the energy performance and the incentive-dependency of a wind farm. We evaluate the building cost thresholds that allow the investment to be profitable and bankable, as well as the system necessary to reach grid parity. The goal of achieving grid parity consists, in this case, in reaching parity between the energy purchase cost and the cost of electricity production from the case study wind energy farm [9]. In the expected regulatory Italian framework of 2018 (Decree FER 1 ('Fonti Energetiche Rinnovabili 1')), we propose an alternative financing tool, Islamic finance, and we introduce the utilization of Green Sukuk, which are Shari'ah-compliant instruments potentially applicable to the Italian context. Also, we present the threshold of building costs necessary to achieve grid parity without the use of incentives. Then, we repeat the analysis using conventional finance, comparing results with those of the Islamic finance case and showing the dependency of such investments by the governmental incentive policy in both cases. The results will capture the attention of strategy experts in the field, and drive the future application of an alternative financing instrument that is able to limit the extent of operating leverage associated with financing in the framework of energy projects devoted to the reduction of GHG emissions and the consequent negative effects of climate change [55].

The paper is organized in four sections. Section 1 provides the subject-specific and legal background that motivated this research topic. Section 2 describes the Italian regulatory framework, presents information with respect to the case study, and explains the methodology for the evaluation of its profitability and bankability, using Islamic finance and conventional finance. Section 3 summarizes the main results, providing and contrasting different key performance indicators (KPIs) relevant to project financing. Finally, Section 4 discusses the obtained results, providing concise recommendations for future research efforts.

2. Materials and Methods

2.1. Italian Regulatory Framework

Currently, the 'Gestore Servizi Energetici' (GSE), the Italian company responsible for subsidies for renewable energy production and energy efficiency, offers a feed-in tariff system. In fact, government incentives devoted to helping the renewable energy sector achieve grid parity ceased in Italy with the Ministerial Decree (D.M.) of 5 July 2012, after a decade of steady growth from the time of its introduction in the Italian legislative framework [56]. In the feed-in tariff system, a reward is provided for the electricity production from renewable sources through a single regulated tariff (€/megawatt-hour (MWh)). Producers can then sell the electricity, according to the D.M. of 23 June 2016 [57].

The incentive mechanism is represented by the 'Tariffa Onnicomprensiva', an alternative to the 'Green Certificates', consisting in a fixed tariff applicable to the electricity sold by producers operating qualified plants powered by renewable sources. This tariff remains fixed and applicable for all plants that came into operation after 1 January 2013, extending the criteria stated in the D.M. of 6 July 2012 and the D.M. of 23 June 2016 [56,57]. The rate is called 'comprehensive' because its value includes an incentive component and a component taking into account the electricity actually fed into the grid.

Referring to the expected regulatory Italian framework of 2018 (annex 1 of draft Decree FER 1 ('Fonti Energetiche Rinnovabili 1')), for wind power, the different tariffs according to wind farm size are presented in Table 2 [58]. Please note that in the current study, we consider the 'Tariffa Onnicomprensiva' reported in Table 2 as the only component of the selling price of the electricity produced by the wind farm.

Table 2. 'Tariffa Onnicomprensiva' for electricity generated by wind farms in Italy, according to the expected regulatory Italian framework of 2018 (annex 1 of draft Decree FER 1 ('Fonti Energetiche Rinnovabili 1')) [58].

Type of Wind Farm	Power (P) (kW)	Tariff (€/MWh)	Useful Life (years)
Onshore	$1 < P \leq 100$	140	20
Onshore	$100 < P \leq 1000$	90	20
Onshore	$P > 1000$	70	20

2.2. The Italian Case Study

The case study is a hypothetical Italian onshore wind farm used for the production of electrical energy with an installed capacity of 1 MW, composed of 50 small generators JIMP of 20 kW each. It is not a specific project, but rather a generic project of a common type of wind farm in Italy.

In the case of a real investment project, the process would begin with the location of a construction site, the compilation of meteorological data, and preliminary measurements of wind speed. In our case, assuming an average wind speed of 4.85 m/s on a tower of 18 m and a Weibull distribution of the probability density distribution over the wind speed, we estimated the energy production using WAsP software, which is commonly employed for comparable simulations in academic research [59]. The simulation input factors and results are listed in Table 3.

Table 3. Simulation input factors and results for a wind turbine (20 kW) (source: author's elaboration).

Input Factors	Results
Average wind speed (m/s) = 4.85	Hub average wind speed (m/s) = 5.46
Weibull K = 2.00	Air density factor (%) = 0.00
Site altitude (m) = 0.00	Average output power (kW) = 3.48
Wind shear = 0.20	Daily energy output (kWh) = 83.60
Anemometer height (m) = 10.00	Annual energy output (kWh) = 30,514
Tower height (m) = 18.00	Monthly energy output = 2543
Turbulence factor (%) = 10.00	Percent operating time (%) = 72.20

The net annual energy production of a single wind turbine was about 30.5 MWh. Therefore, the annual wind farm energy production reached about 1500 MWh.

Disregarding the uncertainty of the production costs and the price of electricity, subsidies, and other regulatory aspects, we assumed that the wind farm would generate cash flow from its implementation (construction set to begin in 2018, start-up in 2019) until the end of the average life expectancy of the turbines, which is assumed to be 20 years. Furthermore, to evaluate the sustainability and profitability of the investment, the following parameters were taken into account in the analysis:

- Regulated tariff ('Tariffa Onnicomprensiva') for electricity generated by the wind farm (1 MW): 90 €/MWh [58].
- Construction cost: €2,000,000 (€/kilowatt (kW) 2000), based on market values [60].
- Annual operation and maintenance costs: estimated at 2.5% of net annual production, based on market values [60].
- Annual insurance cost: estimated at 1% of the construction cost, based on market values [60].
- Concerning the sources of financing, we assumed 20% of the investment as equity and the remaining (80%) as debt, following other studies [9].
- Fixed equity: €400,000 (20% of the investment).
- Green Sukuk issued (the remaining investment (80%)): €1,600,000 (equal to the bank loan in the conventional finance case) [55].
- According to Italian civil law, amortization is assumed to be equal to 4.5% of the building cost in the first year (2019), 9% of the building cost for the following 10 years (from January 2020 to December 2029), and the remaining is accounted for in the last period (2030).
- Weighted average cost of capital (WACC): set to be equal to 5%, according to market values [60] and previous studies [9,33].
- Corporate income tax in Italy (i.e., IRES): estimated at 24% of earnings before taxes (EBT) and assumed to be constant over the period examined [61].
- Annual Islamic finance commission: 2% of the Green Sukuk investment, according to the Islamic Interbank Benchmark Rate (IIBR) and the London Interbank Offered Rate (LIBOR) [55].

2.3. The Evaluation of Profitability and Bankability

The indicators and parameters considered to evaluate the profitability and bankability of the project were the net present value (NPV), the internal rate of return (IRR), the weighted average cost of capital (WACC), the average debt service cover ratio (ADSCR), and the average loan life cover ratio (ALLCR) [62–66].

The evaluation of the profitability and bankability of the proposed wind farm project was carried out by identifying the regulatory frameworks, as well as estimating the cash flows and the uncertainties for the project. The following conditions were taken into account [63,65,66]:

$$\text{NPV (WACC)} > 0 \tag{1}$$

$$\text{IRR} > \text{WACC} \tag{2}$$

$$\text{ADSCR} > 1 \tag{3}$$

$$\text{ALLCR} > 1 \tag{4}$$

3. Results

The values of available cash flows represent the input for the NPV analysis. A discount rate equal to the WACC (5%) was applied to the project. The calculation of annual available cash flows was obtained from EBITDA (earnings before interests, taxes, depreciation, and amortization), equal to the annual revenue minus the annual total expenses (operation, maintenance, and insurance). The annual revenues were obtained by multiplying the net electricity produced (Table 3) by the sale price of electricity (Table 2), assuming that both values are constant over time. If we subtract from EBITDA the Corporate income tax (i.e., IRES, in Italy) and the annual payment of debt (repayable capital constituting more interest in conventional finance, or repayable capital constituting more Islamic commission when we consider Islamic finance), we can finally obtain the available annual cash flow.

The NPV is null when the discount rate is equal to the IRR.

The inputs for the calculation of annual cover ratios (DSCRt (Debt Service Cover Ratio for the year t), LLCRt (Loan Life Cover Ratio for the year t)), which are necessary to obtain their respective average values (ADSCR, ALLCR), are the annual available cash flow and annual payment of debt (as defined above), with a discount rate equal to the WACC (5%).

Using Islamic finance, the indicators are out of the admissibility range. Therefore, the investment should be rejected. In particular, it was evidenced that a negative level of NVP, as well as the ADSCR and ALLCR indicators, were out of the desirable range. Investment recovery could be guaranteed only by decreasing the parametric cost of building the wind farm. Using Green Sukuk instruments as a financing tool of the investment in order to reach grid parity, according to the expected regulatory Italian framework of 2018 (annex 1 of draft Decree FER 1 ('Fonti Energetiche Rinnovabili 1')) and considering electricity market constraints, the building cost was progressively reduced from €2,000,000 (Table 4). The cost threshold corresponding to NPV = 0 and IRR = WACC = 5% consisted of €944,458 (Tables 4 and 5).

Table 4. Parametric cost thresholds for investment recovery, profitability, and bankability of the project, using Islamic finance (source: author's elaboration).

Wind Farm Building Cost (€)	Equity (€)	Annual Payment (€)	WACC (Weighted Average Cost of Capital) (%)	NPV (Net Present Value) (€)	IRR (Internal Rate of Return) (%)	ADSCR (Average Debt Service Cover Ratio)	ALLCR (Average Loan Life Cover Ratio)
2,000,000	400,000	112,000	5	−1,970,711	-	−0.35	−0.38
1,600,000	400,000	84,000	5	−1,219,830	-	−0.10	−0.15
1,200,000	400,000	56,000	5	−472,768	−5.74	0.40	0.32
1,000,000	400,000	42,000	5	−102,756	2.54	0.90	0.77
950,000	400,000	38,500	5	−10,253	4.74	1.08	0.94
944,458	400,000	38,112	5	0	5.00	1.10	0.96
930,000	400,000	37,100	5	26,748	5.68	1.16	1.02
830,000	400,000	30,100	5	201,837	10.73	1.65	1.49
750,000	400,000	24,500	5	333,705	15.80	2.23	2.04

Table 5. Threshold of the parametric cost for NPV = 0: financial and economic analysis, using Islamic finance (source: author's elaboration).

	2018 (t = 0)	2019 (t = 1)	2020 (t = 2)	... (...)	2037 (t = 19)	2038 (t = 20)
Net annual energy production (MWh)	-	1500	1500	...	1500	1500
Development of revenues (€)	-	135,000	135,000	...	135,000	135,000
Development of costs (€)	-	46,945	46,945	...	46,945	46,945
Investment (€)	944,458	-	-	-	-	-
Equity (€)	400,000	-	-	-	-	-
Loan (€)	544,458	-	-	-	-	-
Annual payment (€)	-	38,112	38,112	...	38,112	38,112
INCOME STATEMENT						
Total revenues (€)	-	135,000	135,000	...	135,000	135,000
Total costs (€)	-	46,945	46,945	...	46,945	46,945
EBITDA (earnings before interest, taxes, depreciation, and amortization) (€)	-	88,055	88,055	...	88,055	88,055
Amortization (€)	-	42,501	85,001	...	0	0
Net operating margin (€)	-	45,554	3054	...	88,055	88,055
Islamic commission (€)	-	10,889	10,889	...	10,889	10,889
EBT (earnings before taxes) (€)	-	34,665	−7835	...	77,166	77,166
Corporate income tax (IRES) (€)	-	8320	0	...	18,520	18,520
Profit or loss (€)	-	26,345	−7835	...	58,646	58,646
CALCULATION OF AVAILABLE CASH FLOW						
EBITDA (€)	-	88,055	88,055	...	88,055	88,055
IRES (€)	-	8320	0	...	18,520	18,520
Cash flow for debt service (€)	-	79,735	88,055	...	69,535	69,535
Islamic commission (€)	-	10,889	10,889	...	10,889	10,889
Repayable capital (€)	-	27,223	27,223	...	27,223	27,223
Available cash flow (€)	-	41,623	49,943	...	31,423	31,423
NPV (€)	0	-	-	-	-	-
IRR (%)	5.00	-	-	-	-	-
DSCR	-	1.09	1.31	...	0.82	0.82
LLCR	-	1.14	1.15	...	0.83	0.83
ADSCR	1.10	-	-	-	-	-
ALLCR	0.96	-	-	-	-	-

The analysis was repeated using the conventional models of interests on the traditional bank loan instead of supposing the use of Green Sukuk. In the conventional finance scenario, the threshold of parametric cost which would guarantee investment recovery was €912,057 (approximately 3.43% less than the parametric cost threshold obtained using Islamic finance), producing the same negative results expected (Tables 6 and 7).

Table 6. Parametric cost thresholds for investment recovery, profitability, and bankability of the project, using conventional finance (source: author's elaboration).

Wind Farm Building Cost (€)	Equity (€)	Annual Payment (€)	WACC (%)	NPV (€)	IRR (%)	ADSCR	ALLCR
2,000,000	400,000	128,388	5	−2,170,196	-	−0.44	−0.47
1,600,000	400,000	96,291	5	−1,369,443	-	−0.22	−0.27
1,200,000	400,000	64,194	5	−568,690	−11.20	0.22	0.13
1,000,000	400,000	48,146	5	−172,994	0.55	0.65	0.53
950,000	400,000	44,133	5	−74,638	3.03	0.81	0.68
912,057	400,000	41,089	5	0	5.00	0.95	0.81
860,000	400,000	36,912	5	102,404	7.91	1.18	1.02
800,000	400,000	32,097	5	217,880	11.69	1.51	1.33
705,000	400,000	24,473	5	382,982	18.95	2.24	2.04

Table 7. Threshold of the parametric cost for NPV = 0: financial and economic analysis, using conventional finance (source: author's elaboration).

	2018 (t = 0)	2019 (t = 1)	2020 (t = 2)	... (...)	2037 (t = 19)	2038 (t = 20)
Net annual energy production (MWh)	-	1500	1500	...	1500	1500
Development of revenues (€)	-	135,000	135,000	...	135,000	135,000
Development of costs (€)	-	46,621	46,621	...	46,621	46,621
Investment (€)	912,057	-	-	-	-	-
Equity (€)	400,000	-	-	-	-	-
Loan (€)	512,057	-	-	-	-	-
Annual payment (€)	-	41,089	41,089	...	41,089	41,089
INCOME STATEMENT						
Total revenues (€)	-	135,000	135,000	...	135,000	135,000
Total costs (€)	-	46,621	46,621	...	46,621	46,621
EBITDA (earnings before interest, taxes, depreciation, and amortization) (€)	-	88,379	88,379	...	88,379	88,379
Amortization (€)	-	41,043	82,085	...	0	0
Net operating margin (€)	-	47,336	6294	...	88,379	88,379
Interest (€)	-	25,603	24,829	...	3820	1957
EBT (earnings before taxes) (€)	-	21,733	−18,535	...	84,559	86,422
Corporate income tax (IRES) (€)	-	5216	0	...	20,294	20,741
Profit or loss (€)	-	16,517	−18,535	...	64,265	65,681
CALCULATION OF AVAILABLE CASH FLOW						
EBITDA (€)	-	88,379	88,379	...	88,379	88,379
IRES (€)	-	5216	0	...	20,294	20,741
Cash flow for debt service (€)	-	83,163	88,379	...	68,085	67,638
Interest (€)	-	25,603	24,829	...	3820	1957
Repayable capital (€)	-	15,486	16,260	...	37,269	39,132
Available cash flow (€)	-	42,074	47,290	...	26,996	26,549
NPV (€)	0	-	-	-	-	-
IRR (%)	5.00	-	-	-	-	-
DSCR	-	1.02	1.15	...	0.66	0.65
LLCR	-	1.00	0.99	...	0.65	0.64
ADSCR	0.95	-	-	-	-	-
ALLCR	0.81	-	-	-	-	-

The Islamic finance case produced better profitability and bankability indicators, reducing the gap between the current situation and that of a profitable and bankable project. In fact, at the same construction cost, we obtained the following comparisons: NPV of alternative A (use of Islamic Finance) > NPV of alternative B (use of conventional finance); IRR of alternative A > IRR of alternative B; ADSCR of alternative A > ADSCR of alternative B; ALLCR of alternative A > ALLCR of alternative B.

Further analysis of the Islamic finance scenario, imposing the abovementioned profitability and bankability criteria, indicated that the construction cost should be lower than or equal to €930,000

(Table 4) in order to make the investment profitable and bankable. Meanwhile, using conventional finance, the aforementioned value should be lower than or equal to €860,000 (Table 6).

To summarize, it was evidenced that the investment may be recovered when the cost of building the wind farm is approximately 47.22% of the start-up cost of the case study (€2,000,000), using Islamic finance, or approximately 45.60% of the start-up cost of the case study, using conventional finance. Tables 4 and 6 reveal how until the breakeven point is reached; the ratio of fixed equity on total costs increases (more using conventional finance and in correspondence with the breakeven point) while the costs in the parametric analysis decrease.

4. Discussion and Conclusions

The economic and financial analysis of an Italian onshore wind farm case study investment was presented, showing a strong dependency on incentives in order to reach grid parity. An alternative financing model was introduced, based on the use of Islamic finance Green Sukuk instruments. Also, using Sukuk instead of traditional finance instruments, the achievement of grid parity for an onshore wind farm comparable to that analyzed in the case study, according to the expected regulatory Italian framework of 2018 (annex 1 of draft Decree FER 1 ('Fonti Energetiche Rinnovabili 1')), is strongly dependent on incentives, as well as on wind availability, the amount of investments, the taxation system, the use of the produced energy, and the electricity market prices. In Italy, after the reduction of government incentives, wind farms similar to that presented in the case study were no longer implemented. However, it is argued that the increasing innovation and development in the renewable energy field could lead to a reduction of building costs so that would be possible to partially compensate this reduction of incentives [12,13]. According to this study, as well as other studies [9,27,35], the results underlined that grid parity is still not achieved in Italy for such technologies. According to the analysis presented, it is possible to identify the gap between the actual cost of wind energy technology and what it should cost in order to maintain economic independence, without considering any government incentives. Our analysis revealed how a significant reduction of the initial investment costs will be the main force for the development of wind energy, because it is a capital-intensive technology [7].

Our considerations are sustained by the collapse of wind energy costs in Germany, Mexico, Chile, and Brazil in 2017 [67], which allowed market parity (the condition in which the cost of energy from renewable sources is lower than that of traditional sources) to be reached in these countries, as well as by the positive trend of wind energy production in Italy seen in 2017 [68]. A recent study estimated the achievement of 100% renewable energy in Italy by the middle of the century [69]—a difficult but possible challenge.

This research provides Italian political decision-makers with information about the value of incentives (which can also be spent in non-conventional forms, such as tax deductions) that indicates that, today, such incentives would be necessary for the sustainability of a wind farm with characteristics similar to those of the farm presented in our case study.

A limitation of this study is that only one type of wind farm is considered, as the size of the wind farm was kept constant in our calculations. It would be interesting to study the measure of the cross-fertilization effect derived from the adoption of multiple sources of renewable productions using cost-benefit analysis. This is left to further researches.

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