Financing Options for Solar Power Capacity in Hungary*

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The past period has highlighted that the more efficient use of renewable energy sources is crucial in terms of sustainability, environmental protection, energy supply security and the national economy. It is essential that efficient financing structures, attracting the full spectrum of financial and capital market resources, are put in place to finance new investments. This article explores the question of what new investments and financial market and capital market funds are needed to support the growth of renewable energy, and discusses new financing structures that support the growth of renewable energy investments.

1. Introduction

Making the greatest possible use of renewable energy is essential for sustainable energy management. This not only helps protect our environment and mitigate the negative impacts of climate change,[1] it also contributes to reducing dependence on imported fuels and enhances security of supply. In addition, the expansion of renewable energy is also good for the national economy, as it creates new investments and jobs.[2]

Recognising the long-term importance of renewable energy, Hungarian energy policy has put a strong emphasis on increasing solar power capacity in particular and has included this in strategic documents: the National Clean Development Strategy,[3] the National Energy and Climate Plan[4] and the National Energy Strategy.[5] Hungarian solar power capacity increased from 349 MW in 2017 to 3,837 MW in 2022 (*Figure 1*) and is expected to grow significantly in the coming years to reach the target of 6,000 MW in 2030, as set out in the National Energy Strategy.

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* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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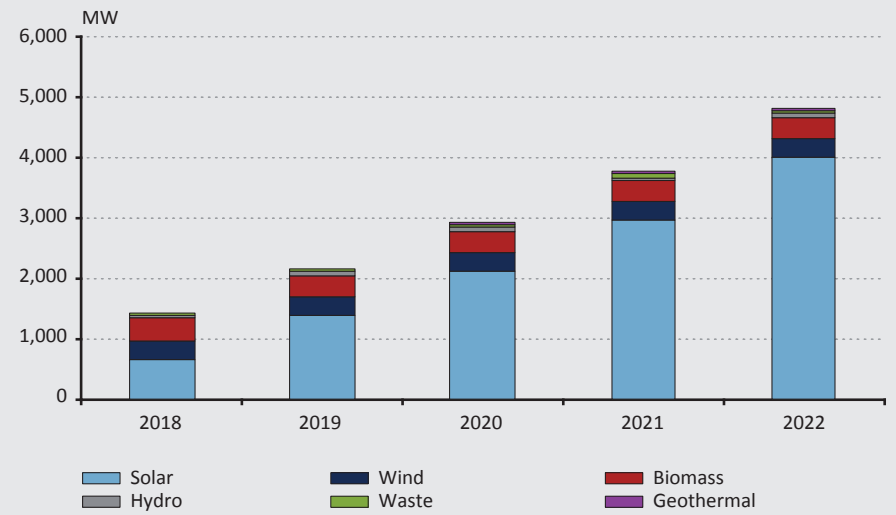
This technical article follows up on the Solar Energy Forum organised by the Zero Carbon Centre and considers the investment and financing aspects raised at that event (*Zero Carbon Centre 2022*) as well as individual research findings.

[1] *Chen et al.* (*2022*)
[2] *Gielen* (*2019*)
[3] *ITM* (*2020a*)
[4] *ITM* (*2020b*)
[5] *ITM* (*2020b*)

Figure 1
Increase in installed renewable power capacities (MW) in Hungary

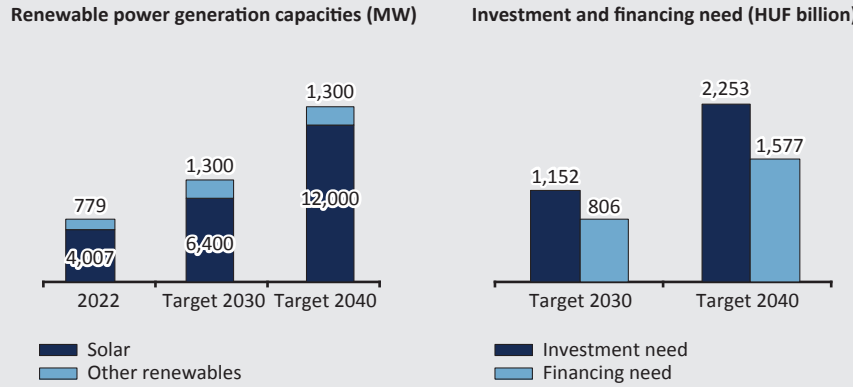


Source: Hungarian Electricity Transmission System Operator Ltd. (MAVIR): Energy MIX - Power generation capacities and PV statistics (31 December 2022) https://www.mavir.hu/documents/10258/245818953/BT_2015-20221231_ig_BR+NT_HU_v2.pdf/8a194c9e-aa9d-14a7-75ad-0290b97afb0b?t=1676311480461. Downloaded: 27 February 2023.

Based on the analysis of *Baji-Gál Imréné Szarvas et al.* (2020), approximately HUF 2,250 billion of new investment will be needed to build the solar power capacity planned for 2040. This represents annual greenfield investments amounting to HUF 112 billion.[6] This could potentially require new PV bank loans of HUF 1,600 billion (*Figure 2*). However, the electricity transmission and distribution system also faces a huge challenge in accommodating such a large volume of weather-dependent generation capacity. In its current state, the system cannot accommodate new capacity or can only do so conditionally, and it is thus necessary to build flexibility reserves and upgrade the network, which may cost up to HUF 500 billion.

[6] 2020. Calculations are based on annual price levels.

Figure 2
Objectives of the National Energy Strategy and the resulting investment and financing need



Source: MNB; Baji-Gál Imréné Szarvas et al. (2020), Figure 1

The total financing needs, estimated at HUF 2,100 billion, would account for nearly 6 per cent of the loan volume of credit institutions and 17 per cent of loans granted to corporates,[7] which exceeds the volume of banks' exposure to the commercial real estate sector in Hungary.[8] The Hungarian banking sector has played a significant role in financing the solar power capacity that has been built so far, but with the changing macroeconomic environment, investors and financers face new challenges. To maintain the momentum in renewable energy investment and green financing, innovative financing solutions need to be developed to meet the challenges.

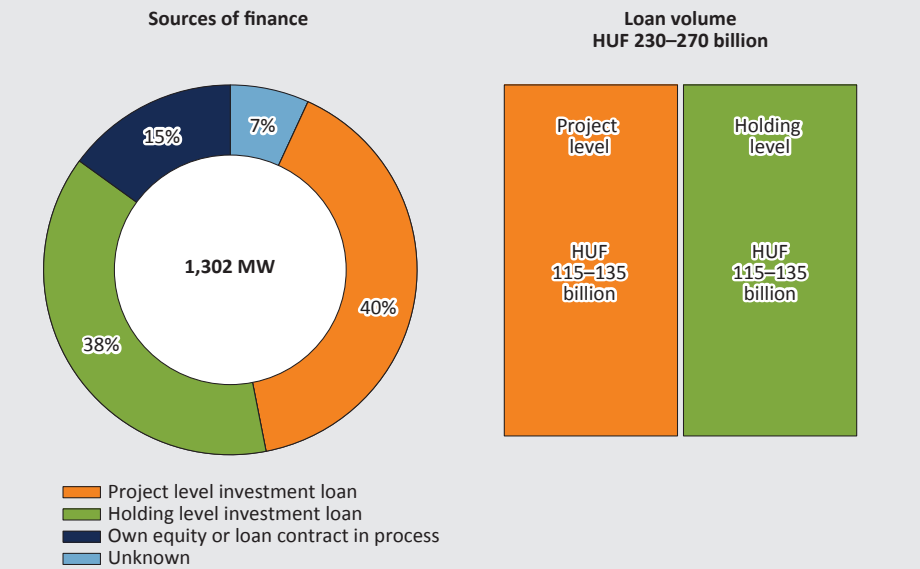
2. Current forms of renewable energy financing in Hungary

2.1. Project finance

According to a 2020 analysis of the Magyar Nemzeti Bank (central bank of Hungary, MNB),[9] renewable energy plants that received a power generation permit in Hungary by 30 September 2019 were predominantly financed through project finance (*Figure 3*). Lending for renewable energy investments was also facilitated by the *Preferential Capital Requirement Programme for Green Corporate and Municipality Financing*[10] announced by the MNB, which is available from 2021 for banks financing sustainable projects.

[7] Source: MNB: Credit institutions sector data at end of 2022 Q3 (December 2022). https://statisztika.mnb.hu/timeseries/data-5203. Downloaded: 25 January 2023.
[8] *MNB* (*2022*)
[9] *Baji-Gál Imréné Szarvas et al.* (*2020*)
[10] https://mnb.hu/letoltes/zold-vallalati-es-onkormanyzati-tokekovetelmeny-kedvezmeny.pdf. Downloaded: 25 April 2023.

Figure 3
Financing sources and outstanding loan amounts for built solar power plants



Source: Baji-Gál Imréné Szarvas et al. (2020), Figure 9

Project finance is an excellent tool for financing innovative and greenfield investments. The advantage for project sponsors is that financing is limited to the project, and thus its risks can be separated from the sponsors' other activities. The project is valued on a stand-alone basis, independently of the parent company's balance sheet, and is therefore suitable for financing growth beyond the size of the owner company and achieving maximum leverage. In addition to the above, the assets of the project company as well as the financing, permits and contracts are exclusively linked to the project company and can be sold together with it. Project finance provides strong lender control over the assets built and the cash flows they generate, limiting the financing risks and thus achieving lower interest rates than other financing structures, which is of paramount importance from a sponsor and return perspective. Last but not least, project loans can be restructured in the case of an unexpected market or other event adversely affecting the project, and financing conditions can be flexibly adapted to cash flow volatilities.

However, a stricter structure is also rigid, which may limit further growth in a mature market. The bureaucratic steps of lender approval may slow down sponsor decisions and the implementation of projects. An example is the distribution of free cash flow generated by the project, which is not only an administrative burden to authorise, but also affects sponsor returns through mandatory cash sweep mechanisms.

In addition to the constraints, the project financing structures currently penetrating the renewable energy market also carry a number of risks, which have been highlighted by recent macroeconomic uncertainties. Exposure to unhedged FX and interest risks may jeopardise project returns, especially in the phase of project development, design and construction, when own equity is spent, project agreements[11] are signed and bank financing is still in process. During this period, investment costs may be strongly affected EUR and USD volatility, while financing costs may be affected by interest rate fluctuations. At a weighted average cost of capital (*WACC*)[12] level at 6–8 per cent, the financing cost may reach one third of the total cost base, which has a fundamental impact on the project return.

2.2. General (plain vanilla) corporate bonds

Issuing bonds is an important financing tool for mature markets. Its main advantage is flexibility: while lenders impose a number of contractual commitments on assets and cash flows, bonds are issued in clean, bullet[13] structure with free use of funds. This is because the debt service of bonds relies on the financial strength of the issuing company, with no restrictions. It also has the advantage of attracting institutional investors, which can be important if bank financing sources are limited. However, the costs of bonds are typically higher. In addition to documentation, review and advisory fees, yields are also higher than lending rates, reflecting the higher risks associated with a looser financing structure.

Bond issuance requires sufficient financial strength of the issuer and is typically only available as an option for mature companies. The disadvantage of bonds is that the commitments cannot be limited to specific projects, so the risks of individual projects and business lines cannot be separated. Another drawback is that the typical 5- to 10-year bond tenor does not perfectly match that of renewable energy projects, which require 15 to 20 years of financing, causing a refinancing need at maturity.

Under the Bonds for Growth Programme announced by the MNB, nine issuers in the energy sector, including five dedicated solar power issuers, have come forward, but a number of issuers in other industries have also used the bond proceeds for installing PV capacities.

[11] Such as technology supply and works contracts.
[12] *Juhász* (*2019*)
[13] Repayment due in one lump sum at maturity.

3. Possible future forms of renewable energy financing

3.1. Green bonds

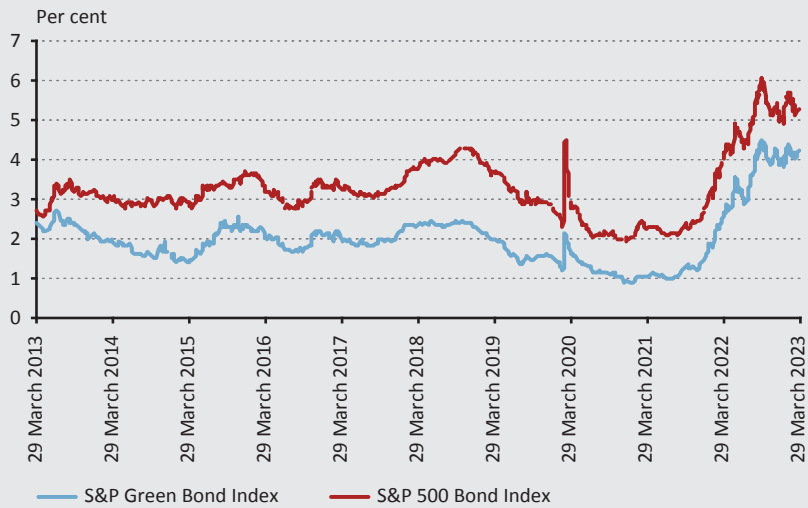
Green bonds are a novel instrument for financing renewable energy. The use of green bond proceeds is linked to sustainable goals, which the issuer ensures are met by publishing a green framework, an allocation report demonstrating the use of proceeds and an impact report presenting the environmental impact of the green projects. The green framework defines the principles, internal processes and levels of responsibilities that govern the selection of green projects and the use and management of proceeds as well as reporting. Further details on the issuance of green bonds can be found in the MNB's *Guide on Issuing Green Bonds* (*Baji-Gál Imréné Szarvas et al. 2022*).

The constraints of green bonds are also their main advantage: they provide more favourable financing for sustainable investments at lower yields; this yield difference is called the greenium. Buyers of green bonds (green bond investors) have a focus on sustainability goals, aiming to increase the proportion of sustainable securities in their portfolio, and they are ready to accept lower yields, for example on green bonds, to achieve this. The motivation for building a sustainable securities portfolio is, for example, the popularity of ESG investments (e.g. investment funds) and compliance with European sustainability regulations[14] for financial institutions. From a project point of view, bond funds are similar to loans, with bond yields representing an expense item corresponding to loan interest. Lower green bond yields provide lower financing costs for renewable power plants, thereby reducing project expenses and boosting profits. The greenium therefore increases the profitability of renewable power plants by reducing their financing expenses, making them more attractive to sponsor companies and promoting the spread of renewable energy.

Figure 4 and *Table 1* illustrate the level of the greenium in international bond markets.

[14] *SFDR Regulation (EU 2019/2088) and EU Implementing Regulation 2022/2453 on Pillar 3 of the CRR Regulation on ESG disclosures.*

Figure 4
Comparison of S&P green bond and traditional bond index yields



Source: S&P

Table 1
Comparison of S&P green bond and traditional bond index yields

	Yield to Maturity (%)		
	24 April 2013	**24 April 2018**	**24 April 2023**
Total Return S&P Green Bond Index	2.24	2.37	4.24
Total Return S&P 500 Bond Index	2.6	3.93	5.31

Source: S&P

The greenium lowers the cost of financing for companies engaged in sustainable activities, reducing the weighted average cost of capital and improves the return on investment in renewable energy power plants.[15]

$$NPV = \sum_{i=0}^{n} \frac{CF_i}{(1+WACC)^i} \qquad 0 = NPV = \sum_{i=0}^{n} CF_i\,(1+IRR)^{-i} \qquad WACC = \frac{D}{(E+D)} r_d + \frac{E}{(E+D)} r_e$$

NPV: net present value
CF: investments' Cash Flow
IRR: internal rate of return
WACC: weighted average cost of capital
n: number of periods

D: financial debt, loans and bonds
r_d: cost of financial debt, credit and bond sources
E: own equity
r_e: cost of equity

[15] *Delapedra-Silva et al. (2022)*

The special documentation of green bonds also entails additional costs: external review is required to verify compliance with international green bond standards and to audit post-issuance reports. It is worth noting, however, that a green framework can be linked to the issuance of more green bonds and even green loans, so the costs can be significantly reduced at the transaction level.

Green bond investments can be reported as sustainable investments based on the European sustainability reporting regulations, and bank investors may benefit from prudential capital relief under the *Preferential Capital Requirement Programme for Green Corporate and Municipality Financing*[16] introduced by the MNB.

3.2. Leasing

In the renewable energy market in Western Europe, there are several examples of power plants being financed through leasing (*Dunlop – Roesch 2016*). The main advantage is that operative leasing does not burden the balance sheet of the sponsor company, and thus financing constraints can be loosened and the debt structure improved. Project development companies may be attracted to a sale-and-lease-back structure, where the sponsor builds the power plant on own equity and sells it to a leasing company after connecting to the grid, and at the same time a lease contract is signed for the power plant. This structure gives the sponsor complete freedom during the construction phase, and then the opportunity for an equity recap, which may be used for the development further projects.

3.3. Covered bonds

Covered bonds can be an innovative way of financing renewable energy projects, combining the advantages of bond issuance and project financing. The primary source of payments for covered bonds are the assets financed and collateralised, thus limiting the risks to a specific project or portfolio (*Damerow et al. 2012*). The collaterals behind the bond reduce bond investor risk, which may have a favourable impact on financing costs, while the presence in the capital markets can also attract funds from institutional investors.

Covered bonds also have their limitations. The maturity does not perfectly match the pay-back period of the assets financed, and accordingly refinancing may be required. Covered bonds also have to meet consistent yield payment requirements, which implies continuous, steady cash flow generation. This can only be achieved through carefully built project portfolios which are diversified both legally and in terms of grid connection date. In the case of bonds, restructuring is very cumbersome, so construction risks are difficult to manage. This problem could be simplified by building a portfolio of power plants, which are already connected and

[16] https://mnb.hu/letoltes/zold-vallalati-es-onkormanyzati-tokekovetelmeny-kedvezmeny.pdf. Downloaded: 25 April 2023.

operating. The remaining pay-back period of these projects is also shorter and more in line with the maturity of bonds, thus reducing refinancing risk.

3.4. Securitisation

In the future, securitisation[17] could open up a new funding opportunity, primarily for financing banks rather than project sponsors. Securitisation is a process in which the loan portfolio of a bank is clustered into maturity- and risk-wise homogenous units, which, together with their assets and cash flows, serve as collateral for the securities issued. This form of financing could also indirectly channel fresh institutional investor funding into the renewable energy market and loosen sector limits on bank financing.

4. Challenges and opportunities of innovative financing products

The development of renewable energy financing requires combining the advantages and overcoming the limitations of the financing structures described above, which is possible through market development and the creation of a supportive legal environment.

4.1. Loans

The bureaucratic burden of bank loans may be reduced by the development of "plain vanilla" solar project loans, offering a simplified loan product with standardised terms and conditions for fit-in-average renewable projects, rather than tailor-made structures. This would speed up the administration time of financing both on the sponsor and the bank side, but is conditional on the preparation of problem-free projects that meet the standards acceptable to banks.

The flexibility of bank lending may be increased by the development of portfolio-based project financing, which, with a sufficient portfolio-building track record, could help diversify lender risk and give the sponsor greater flexibility in the terms and conditions of individual projects (e.g. cash sweep, mandatory reserves).

Recent interest rate fluctuations have highlighted the importance of fixed-interest loan products in project finance. To promote renewable energy production, it is essential to develop fixed-interest loan programmes or financing schemes that mitigate interest rate fluctuations.

[17] Regulation (EU) 2017/2402 of the European Parliament and of the Council of 12 December 2017 laying down a general framework for securitisation and creating a specific framework for simple, transparent and standardised securitisation, and amending Directives 2009/65/EC, 2009/138/EC and 2011/61/EU and Regulations (EC) No 1060/2009 and (EU) No 648/2012: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2402&from=EN

To reduce the need for subsidies in the renewable energy system, market penetration of PPA-based[18] renewable energy generation[19] is needed, which could be facilitated by shorter-term, partially amortising loans. At the end of the maturity of the PPA contract (e.g. 5 years), the refinancing risk may be managed by concluding a new PPA. This could be a new opportunity, especially for sponsors with a good track record in managing renewable power plants and PPA contracts.

4.2. Bonds

Portfolio-based bond financing can combine the flexibility of bonds with the non-recourse nature of project finance. The issuance of portfolio-based bonds primarily faces legal obstacles.[20] Currently, there is no clear legal regime for the management of bond collaterals (e.g. collateral pool, collateral agent or consignee) and investor representation (e.g. collateral collection or restructuring decisions). The proliferation of project-based or portfolio-based covered bonds would require, first and foremost, the establishment of sufficient legal regulation.

From a business perspective, the issuance of portfolio-based bonds requires diversified, stable project portfolio building, a precondition for which is a stable regulatory environment in the fields of permits, subsidies, taxation, grid connection, settlements and other regulations. Better alignment between bond maturities and the project pay-back period is also needed, as the pay-back period of renewable energy projects is significantly longer than the 5- to 7-year maturity typical in the Hungarian bond market. There are several solutions to this. For example, by building a portfolio consisting exclusively of completed, operational projects, which may also represent a more acceptable bond risk by excluding the construction period. Another solution could be to exempt renewable power plants from paying the Robin Hood tax, which would significantly improve project returns and shorten the financing period of projects. Given that the investment costs of renewable power plants are mainly denominated in EUR and USD, and that free-market energy trading is essentially EUR-based, it may be reasonable to increase the rate of EUR-based bonds in the renewable energy sector, which could reduce the currency and interest rate risks of projects and shorten their pay-back period.

4.3. Leasing

The main obstacle to the financing of renewable power plants via leasing is the management of the leased asset: as an official permit-based activity, the assets cannot be leased on their own, they must be accompanied by ownership of the real estate where the plant is located and the business share of the project company holding the renewable energy production licence, which raises legal issues in the

[18] Power Purchase Agreement
[19] *IRENA* (*2022*)
[20] *Deloitte Legal Göndöcz and Partners* (*2021*)

case of the acquisition of the leasing company. More favourable legislation would facilitate the leasing of renewable power plants and their further construction.

4.4. Securitisation

The use of securitisation would help to raise funds for banks and relieve sector constraints, but it faces legal obstacles and therefore a clear legal framework is needed. Similarly to covered bonds, there is a need to establish regulation and legal practices for collateral management, investor representation and related legal instruments. In addition to the regulation, securitisation could become a preferred form of financing by introducing a bank-based renewable energy securitisation programme to initiate transactions and market development.

5. Conclusion

Solar power is currently mainly financed in a project finance structure, which allows projects to be managed on a stand-alone basis and finances the growth phase of the market and sponsors, but may hinder further growth and does not manage interest rate and currency risks well in the construction phase. Further growth in renewable energy investments could be supported by several innovative forms of financing. Simple, standardised "plain vanilla" solar project loans could improve the predictability and planning of financing, thus speeding up the project preparation phase, especially for medium- or smaller-scale projects. Secured bonds could attract capital market funding to finance a portfolio of power plants. This would require appropriate legislation, a stable regulatory environment and grid connectivity. Programmes to manage the foreign exchange and interest rate risks associated with renewable power plant projects (e.g. loan guarantee schemes or fixed interest rate financing sources) would reduce sponsor and financer risks, improve project returns and help maintain financer and sponsor appetite. The renewable energy market could then develop further, subsidy requirements could be reduced, and renewable energy technologies could move further towards the desired grid parity.[21]

[21] Grid parity: power generation that is cost-competitive with the cost of producing the energy mix running on the electricity grid.

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