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*Agence Nationale pour  
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# TUNISIA: Derisking Renewable Energy Investment

Selecting Public Instruments to Promote Renewable  
Energy Investment for the Tunisian Solar Plan NAMA

Summary Report



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This is an abbreviated version of the report, composed of the **Key Points for Decision Makers and Executive Summary**.

The following versions of the report are also available:

- A **Full Report** version
- A **Sensitivity Analyses** document

# Acronyms

<b>ANME</b>	National Agency for Energy Conservation of Tunisia (Agence Nationale pour la Maîtrise de l'Energie)
<b>BAU</b>	Business as usual
<b>CSP</b>	Concentrated Solar Power
<b>DREI</b>	Derisking Renewable Energy Investment
<b>EUR</b>	Euro
<b>FiT</b>	Feed-in Tariff
<b>GDP</b>	Gross Domestic Product
<b>GEF</b>	Global Environment Facility
<b>IEA</b>	International Energy Agency
<b>IPP</b>	Independent Power Producer
<b>kW</b>	Kilowatt
<b>kWh</b>	Kilowatt-hour
<b>LCOE</b>	Levelised Cost of Electricity
<b>MRV</b>	Monitoring, Reporting and Verification
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt-hour
<b>NA</b>	Not Applicable/Available
<b>NAMA</b>	Nationally Appropriate Mitigation Action
<b>O&amp;M</b>	Operations and Maintenance
<b>PDD</b>	CDM Project Design Document
<b>PPA</b>	Power Purchase Agreement
<b>PRI</b>	Political Risk Insurance
<b>PV</b>	Photovoltaic
<b>RCREEE</b>	Regional Centre for Renewable Energy and Energy Efficiency
<b>STEG</b>	Tunisia National Electricity and Gas Utility (Société Tunisienne de l'Electricité et du Gaz)
<b>TSP</b>	Tunisian Solar Plan
<b>UNDP</b>	United Nations Development Programme
<b>USD</b>	United States Dollar





# Key Points for Decision-Makers

In support of the Tunisian Solar Plan, this report sets out the results of a modelling analysis of the cost-effectiveness of public derisking measures<sup>1</sup> to promote private sector investment in large-scale wind energy and solar photovoltaic energy (solar PV) in Tunisia.

The modelling performs a detailed quantification of the financing costs and risk environment for wind energy and solar PV in Tunisia today.

“Power market risk, transmission risk and currency risk are all big contributors to higher financing costs.”

- **Financing costs (the cost of equity and the cost of debt) in Tunisia for wind energy and solar PV are high.** For example, it is estimated that the current cost of equity (EUR)<sup>2</sup> for large-scale wind energy and solar PV in Tunisia today is 15.0%, compared with 8.0% in Germany.
- **These higher financing costs in Tunisia reflect a range of investment risks for wind energy and solar PV.** By a clear margin, the risk category that contributes most to higher financing costs is “power market risk”. This category concerns power market regulation, such as the need for well-functioning, transparent contractual and pricing mechanisms for the sale of electricity. Other risk categories, including “grid/transmission” risk and “macroeconomic/currency” risk, also make significant contributions to higher financing costs.

For each of wind energy and solar PV, the modelling examines two scenarios to achieve the 2030 Tunisian Solar Plan investment targets: a *business-as-usual* scenario, assuming today's risk environment for investors is maintained; and a *post-derisking* scenario, assuming that public derisking measures are implemented, resulting in an investment environment with reduced risks and lower financing costs.

“Derisking creates savings of EUR 712m (wind energy), and EUR 359m (solar PV), over 20 years.”

- For wind energy, public derisking measures catalyse EUR 1.855 billion in private sector investment, and result in wind energy's generation cost falling from EUR 7.5 cents per kWh (*business-as-usual* scenario) to EUR 5.8 cents per kWh (*post-derisking* scenario). **This creates overall economic savings for Tunisia of EUR 712 million over 20 years.** The cost of these derisking measures is estimated at EUR 287 million until 2030 (or EUR 20.5 million per year until 2030<sup>3</sup>). As such, investment in public derisking measures more than pays for itself in terms of economic savings.
- For solar PV, public derisking measures catalyse EUR 935 million in private sector investment, and result in solar PV's generation cost falling from EUR 9.9 cents per kWh (*business-as-usual* scenario) to EUR 7.7 cents per kWh (*post-derisking* scenario). **This creates overall savings for Tunisia of EUR 359 million over 20 years.** The cost of these derisking measures is estimated at EUR 145 million until 2030 (or EUR 8.5 million per year until 2030<sup>3</sup>). Again, investment in public derisking measures more than pays for itself in terms of economic savings.

<sup>1</sup> Public derisking measures can be understood to be domestic government interventions in the form of policies and programmes. These instruments can be non-financial or financial in nature.

<sup>2</sup> Euro-denominated cost of equity.

<sup>3</sup> Annual costs are given in 2014 Euros.

The modelling identifies a comprehensive set of public derisking measures to achieve the 2030 Tunisian Solar Plan's investment targets. These measures include, for example, a well-designed regulatory framework, technical specifications for management of the electricity grid, and public loans for renewable energy developers. A detailed list and costing of the public derisking measures is found in the report.

In comparing these two scenarios, **the results clearly demonstrate how investing in public derisking measures creates significant direct economic savings in achieving the Tunisian Solar Plan.** Instead of paying for investment in wind energy and solar PV at higher generation costs, public derisking measures should be prioritised, thereby resulting in investment at lower generation costs and more affordable electricity for Tunisian citizens.

The development of the Tunisian Solar Plan as a Nationally Appropriate Mitigation Action (NAMA) will entail further development of this analysis of public derisking measures and will serve to itemise their costs. The NAMA will also identify the sources of funding for the public derisking measures, with the opportunity to seek international support for these costs.

“Public derisking measures should be prioritised, resulting in more affordable electricity for Tunisian citizens.”





# Executive Summary

## Introduction

The analysis set out in this report forms part of UNDP's support to the Government of Tunisia in the development of a Nationally Appropriate Mitigation Action (NAMA) for the Tunisian Solar Plan (TSP). UNDP is providing this support under a Global Environment Facility ("GEF")-financed project entitled "NAMA Support to the Tunisian Solar Plan" (the "NAMA TSP Project"). The project's national implementing partner is the Tunisian National Agency for Energy Conservation (Agence Nationale pour la Maîtrise de l'Energie, ANME). The NAMA TSP Project will be implemented between 2015-2019.

The Tunisian Solar Plan, originally formulated in 2012 and revised in 2015, is Tunisia's official long-term plan for attracting renewable energy investment in the electricity sector. The TSP seeks to achieve a renewable energy penetration target of 30% of the electricity generation mix by 2030.<sup>4</sup> Recognising the scale of the investment required by 2030, the TSP envisages that 80% of the required financing will come from the private sector.

Tunisia is also undertaking voluntary measures to reduce its greenhouse gas emissions in the form of NAMAs submitted under the United Nations Framework Convention on Climate Change (UNFCCC). While there is no formal definition of the information to be included in a NAMA, Box 1 below sets out the likely components of a NAMA in the power sector.

The NAMA TSP Project aims to assist the Government of Tunisia in drawing together these parallel strands of work, on the TSP and NAMAs, to develop the TSP itself as a NAMA and thereby create an enabled environment to attract the needed investment and to reduce greenhouse gas emissions in a transparent and verifiable manner.

“The TSP envisages that 80% of the required financing will come from the private sector.”

### Box 1: Typical components of a power sector NAMA

A practical understanding of the core components of a typical NAMA in the power sector is now emerging. These are likely to include:

- A **voluntary long-term, time-bound investment** target for low-carbon activities in the power sector. A breakdown of the target will be provided by technology (installed capacity, target years).
- The identification and implementation of a **package of public instruments** to create an enabled environment to attract this targeted investment. The investment will come from a mix of public and private sources, with the majority of investment typically coming from the private sector.
- A breakdown of the **anticipated costs and incremental costs** to achieve the NAMA's investment target, differentiated between financing sources: public and private, domestic and international, as well as market mechanisms (e.g. carbon markets).
- An assessment of the anticipated **socio-economic and environmental co-benefits** that will arise from the targeted investment, including economic growth, job creation and sustainable development benefits.
- An **MRV framework**, with appropriate indicators, to measure, report and verify the emission reductions that will be generated by the investment in low-carbon activities under the NAMA.

<sup>4</sup> The TSP's 2030 targets in terms of total installed capacity are 1,755 MW (wind energy), 1,510 MW (solar PV) and 460 MW (CSP) (ANME, 2012).

## The Derisking Renewable Energy Investment Methodology

In 2013, UNDP issued the Derisking Renewable Energy Investment report (the “DREI report”) (Weissbein *et al.*, 2013). The DREI report introduced an innovative methodology (the “DREI methodology”), with an accompanying financial tool in Microsoft Excel, to quantitatively compare the cost-effectiveness of different public instruments in promoting renewable energy investment. The analysis of Tunisia set out in this report is based on the DREI methodology.

A key focus of the DREI methodology is on financing costs for renewable energy. While technology costs for renewable energy have fallen dramatically in recent years,<sup>5</sup> private sector investors in renewable energy in developing countries still face high financing costs (both for equity and debt). These high financing costs reflect a range of technical, regulatory, financial and informational barriers and their associated investment risks. Investors in early-stage renewable energy markets, such as those of many developing countries, require a high rate of return to compensate for these risks.<sup>6</sup>

In seeking to create an enabled environment for private sector renewable energy investment, policy-makers typically implement a package of public instruments.<sup>7</sup> From a financial perspective, the public instrument package aims to achieve a risk-return profile for renewable energy that can cost-effectively attract private sector capital. Figure 1 below, from the DREI report, identifies the four key components of a public instrument package that can address this risk-return profile.

The **cornerstone instrument** is the centrepiece of any public instrument package. For large-scale renewable energy, the cornerstone instrument is typically a Feed-in Tariff (FiT) or a tendering process, either of which allows independent power producers (IPPs) to enter into long-term (e.g. 15-20 year) power purchase agreements (PPAs) for the sale of their electricity. The cornerstone instrument can then be complemented by three core types of public instruments:

- **Instruments that reduce risk**, by addressing the underlying barriers that are the root causes of investment risks. These instruments utilise policy and programmatic interventions. An example might involve a lack of transparency or uncertainty regarding the technical requirements for renewable energy project developers to connect to the grid. The implementation of a transparent and well-formulated grid code can address this barrier, reducing risk. The DREI methodology terms this type of instrument “**policy derisking**”.
- **Instruments that transfer risk**, shifting risk from the private sector to the public sector. These instruments do not seek to directly address the underlying barrier but, instead, function by transferring investment risks to public actors, such as development banks. These instruments can include public loans and guarantees, political risk insurance and public equity co-investments. For example, the credit-worthiness of a PPA may often be a concern to lenders. In order to address this, a development bank can guarantee the PPA, taking on this risk. The DREI methodology terms this type of instrument “**financial derisking**”.

“Public instruments for renewable energy act in one of three ways, reducing, transferring or compensating for risk.”

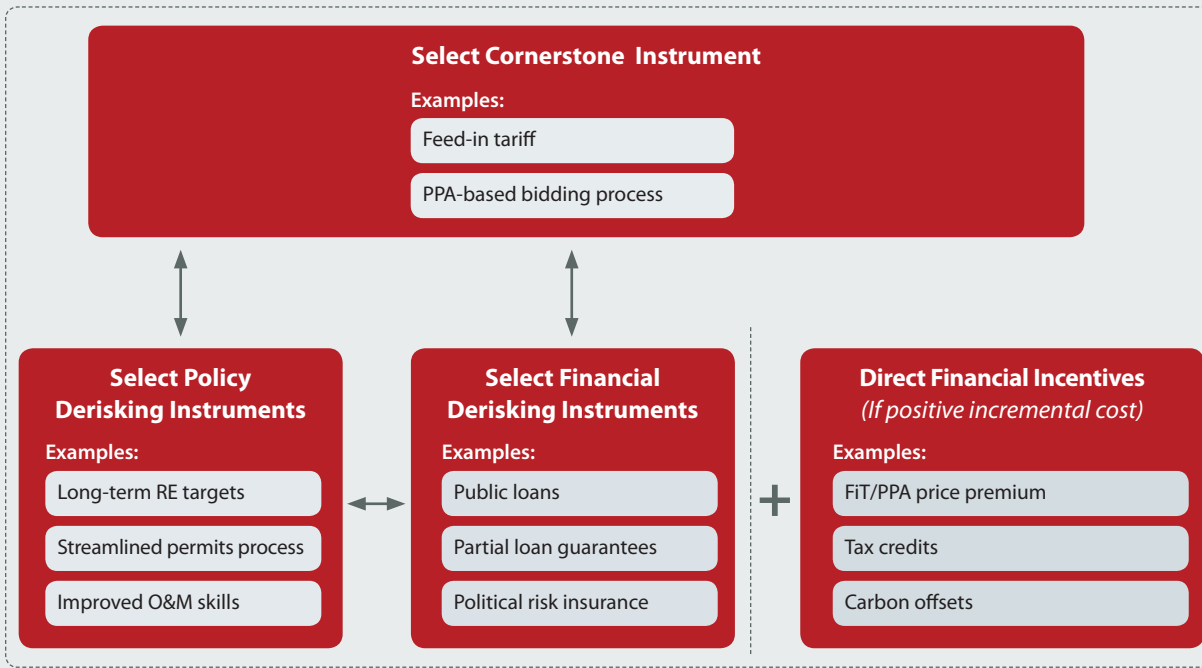
<sup>5</sup> For example, in the case of solar photovoltaic, module costs have experienced a near 98 percent reduction from 1979 to 2012 (IRENA, 2012)

<sup>6</sup> Indeed, as is shown later in this report, interviews with project developers identified higher financing costs for wind energy and solar PV investment in Tunisia in comparison to Germany, a more established market. For example, the cost of equity (EUR) is estimated at 15% in Tunisia today, in comparison to 8% in Germany.

<sup>7</sup> Public instruments can be understood to be domestic government interventions in the form of policies and programmes. These instruments can be non-financial or financial in nature.

- **Instruments that compensate for risk**, providing a financial incentive to investors in the renewable energy project. When risks cannot be reduced or transferred, residual risks and costs can be compensated for. These instruments can take many forms, including price premiums as part of the electricity tariff (either as part of a PPA or FiT), tax breaks and proceeds from the sale of carbon credits. The DREI methodology calls these types of instruments “**direct financial incentives**”.

**Figure 1: Typical components of a public instrument package for large-scale renewable energy**



Source: Derisking Renewable Energy Investment (UNDP, 2013)

## Modelling Results

This report, using the DREI methodology, sets out the results of modelling to select public instruments to attract private sector investment to meet the TSP’s 2030 targets for large-scale wind energy and solar PV.

## Risk Environment

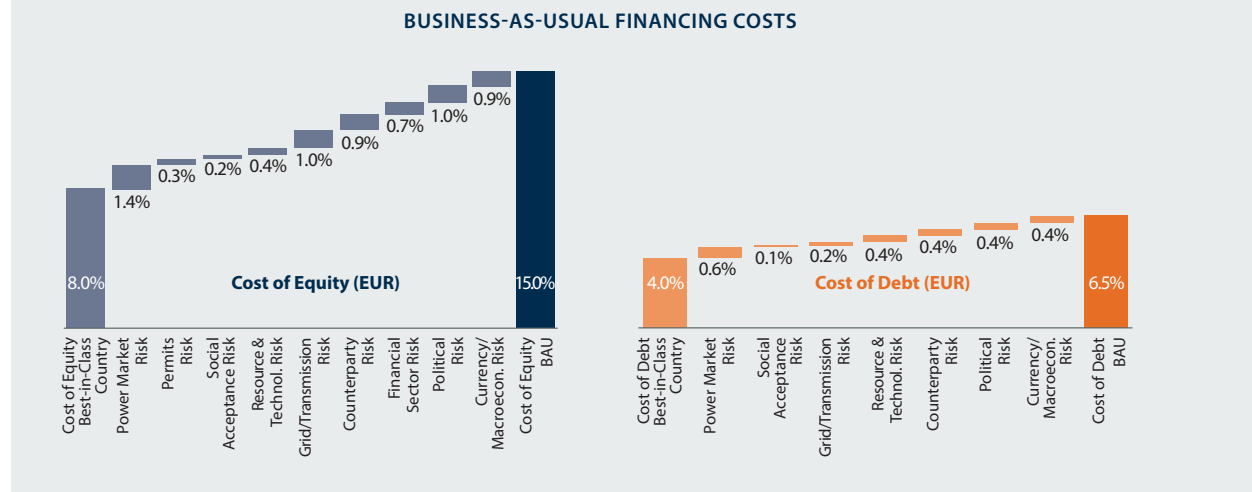
Data on the risk environment were obtained from structured interviews held with 12 domestic and international project developers who are considering, or actively involved, in wind energy and solar PV opportunities in Tunisia.

“Financing cost waterfalls quantify how different investment risks contribute to higher financing costs in Tunisia.”

The results estimate that financing costs for wind energy and solar PV in Tunisia today are 15.0% for the cost of equity (EUR), and 6.5% for the cost of debt (EUR).<sup>9</sup> These are substantially higher than in the best-in-class country, Germany, which is estimated at 8.0% for the cost of equity (EUR), and 4.0% for the cost of debt (EUR). As is shown in later results, over the long life-time of energy investments, the impact of Tunisia’s higher financing costs on the competitiveness of renewable energy is significant.

Figure 2 shows how a range of investment risks currently contribute to these higher financing costs for wind energy and solar PV in Tunisia. The risk category with the largest impact on elevated financing costs is power market risk, which relates to accessing power markets and the price paid for renewable energy. Other risk categories with large impacts include grid/transmission risk, counterparty risk, political risk and macroeconomic/currency risk.

**Figure 2: Impact of risk categories on financing costs for wind energy and solar PV investments in Tunisia, business-as-usual scenario<sup>8</sup>**



Source: interviews with wind energy and solar PV investors and developers; modelling; best-in-class country is assumed to be Germany; see Annex A for details of assumptions and methodology.

<sup>8</sup> The financing cost waterfalls shown here were calculated using one single, common set of assumptions and data for both large-scale wind energy and solar PV. It is recognised that the risk profiles of large-scale wind energy and solar PV can differ, most notably for Resource & Technology risk. However, the results of the interviews with wind energy and solar PV investors made clear that these differences are minimal in the Tunisian context. As such, a single, common approach was adopted in order to bring simplicity to the analysis and to avoid multiple result sets.

<sup>9</sup> Euro- denominated cost of equity and debt.

## Public Instrument Selection

The modelling uses 2030 targets, based on the TSP, for both large-scale wind energy (1,404 MW) and solar PV (736 MW).<sup>10</sup> It then models the implementation of a package of public instruments, containing both policy and financial derisking instruments, to promote investment to achieve these targets. The instruments are selected in order to specifically target the risk categories identified in the financing cost waterfalls. A list of these public derisking instruments is shown in Table 1. For wind energy, the costs until 2030 for policy derisking instruments are estimated as being EUR 8.5 million, and for financial derisking instruments EUR 279.0 million. For solar PV, the policy derisking instruments are estimated as costing EUR 4.4 million, and the financial derisking instruments EUR 140.6 million.

**Table 1: The selection of public instruments to achieve the TSP investment targets for wind energy and solar PV.**

RISK CATEGORY	POLICY DERISKING INSTRUMENTS	FINANCIAL DERISKING INSTRUMENTS
<b>Power Market Risk</b>	<ul style="list-style-type: none"> <li>• Long term renewable energy targets</li> <li>• Regulatory framework</li> <li>• FIT/PPA tender (standardised PPA)</li> <li>• Independent regulator</li> </ul>	NA
<b>Permits Risk</b>	<ul style="list-style-type: none"> <li>• Streamlined permitting; one-stop shop; recourse mechanism</li> </ul>	NA
<b>Social Acceptance Risk</b>	<ul style="list-style-type: none"> <li>• Awareness-raising campaigns</li> <li>• Promote/pilot community-based approaches</li> </ul>	NA
<b>Resource &amp; Technology Risk</b>	<ul style="list-style-type: none"> <li>• Resource assessment</li> <li>• Technology support (solar PV)</li> </ul>	NA
<b>Grid/Transmission Risk</b>	<ul style="list-style-type: none"> <li>• Transparent, up-to-date grid code</li> <li>• Grid management/planning</li> </ul>	<ul style="list-style-type: none"> <li>• Take or pay clause in PPA<sup>11</sup></li> </ul>
<b>Counterparty Risk</b>	<ul style="list-style-type: none"> <li>• Strengthen utility's management</li> </ul>	<ul style="list-style-type: none"> <li>• Government guarantee of PPA</li> </ul>
<b>Financial Sector Risk</b>	<ul style="list-style-type: none"> <li>• Domestic financial sector reform</li> </ul>	<ul style="list-style-type: none"> <li>• Concessional public loans to IPPs</li> </ul>
<b>Political Risk</b>	NA	NA
<b>Currency/Macroeconomic Risk</b>	NA	<ul style="list-style-type: none"> <li>• Partial indexing of PPA tariffs to foreign currencies<sup>12</sup></li> </ul>

Source: modelling. See Annex A for a full description of these instruments. "NA" indicates "Not Applicable".

“The modelling identifies a comprehensive package of public instruments to target investment risks.”

<sup>10</sup> The model's 2030 investment targets focus on private-sector investment and large-scale renewable energy, adjusting for the portion of the TSP 2030 targets accounted for by public sector investment and small-scale solar PV, respectively.

<sup>11</sup> A “take-or-pay” clause is a clause found in a Power Purchase Agreement (PPA) that essentially allocates risk between parties in the scenario where transmission line failures or curtailment (required by the grid operator) result in the IPP being unable to deliver electricity generated by its renewable energy plant.

<sup>12</sup> Partial indexing involves tariffs in a local-currency denominated PPA being partially indexed to foreign hard currencies, such as EUR or USD. In this way, IPPs are partially protected against currency fluctuations. If a PPA tender process is used, IPPs can be asked to specify the maximum degree of partial indexing they require, thereby minimising the cost to the public sector.

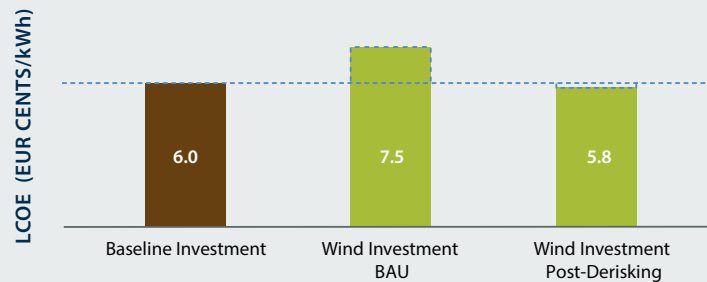
## Levelised Costs

The modelling is performed for two risk environment scenarios; first, a *business-as-usual* scenario, representing the current risk environment (with today's financing costs); and second, a *post-derisking* scenario, after implementing the public instrument packages (resulting in lower financing costs).

The results for generation costs (the Levelised Cost of Electricity, LCOE) are shown in Figures 3 and 4:

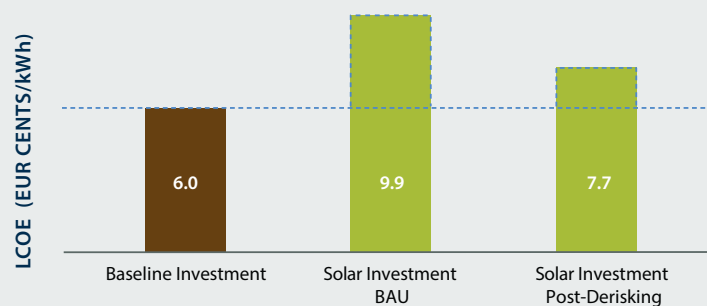
- In the *business-as-usual* (BAU) scenario, wind energy and solar PV are more expensive than the baseline. In other words, wind energy and solar PV are more expensive than the baseline technology – combined cycle gas turbines – that Tunisia currently relies on to increase its electricity generation capacity. The baseline generation cost is calculated as being EUR 6.0 cents per kWh. In comparison, wind energy today in Tunisia is estimated at EUR 7.5 cents per kWh, and solar PV at EUR 9.9 cents per kWh. This means that, today, both wind energy and solar PV require a price premium (EUR 1.5 cents per kWh and EUR 3.9 cents per kWh, respectively) over the baseline energy technology.

**Figure 3: LCOEs for the baseline and wind energy investment in Tunisia**  
LEVELISED COST OF ELECTRICITY (LCOE)



Source: modelling; see Table 7 and Annex A for details of assumptions and methodology.

**Figure 4: LCOEs for the baseline and solar PV investment in Tunisia**  
LEVELISED COST OF ELECTRICITY (LCOE)



Source: modelling; see Table 8 and Annex A for details of assumptions and methodology.

“With derisking measures, wind falls from 7.5 to 5.8 EUR cents per kWh; solar PV falls from 9.9 to 7.7 EUR cents per kWh.”



- In the *post-derisking* scenario, the cost of wind energy falls to EUR 5.8 cents per kWh, and the cost of solar PV falls to EUR 7.7 EUR cents per kWh. As such, following government interventions to derisk the investment environment, and with resulting lower financing costs, wind energy becomes competitive with – in fact cheaper than – the baseline energy technology. Solar PV remains more expensive than the baseline and will still require a price premium (EUR 1.7 cents per kWh) over the baseline.

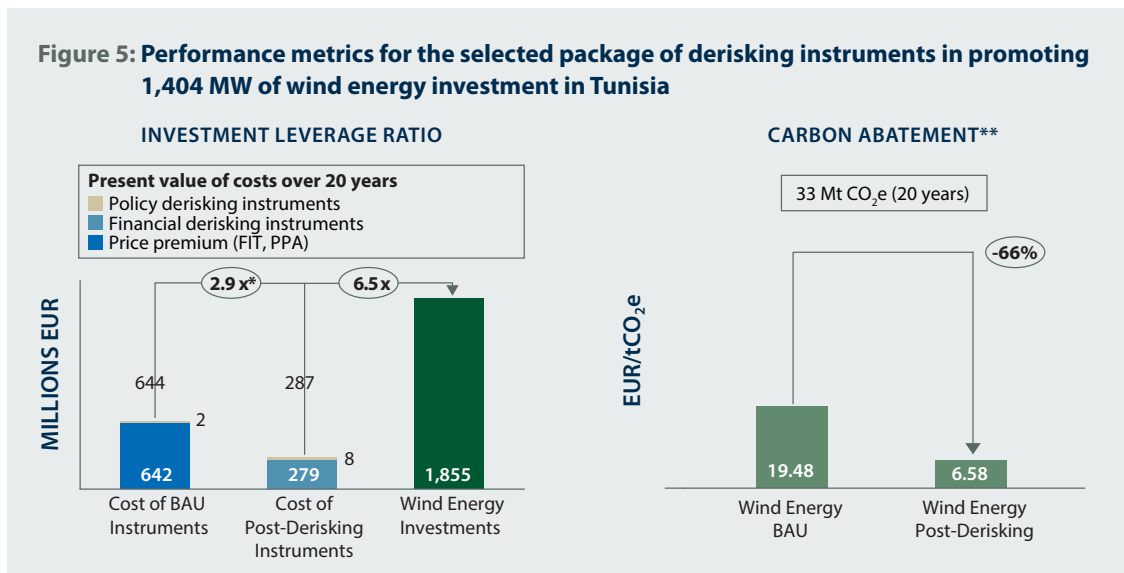
### Evaluation of public instruments' effectiveness

The DREI methodology uses four performance metrics to analyse the impacts of the selected public instrument package to promote investment, each metric taking a different perspective: the ability to catalyse investment (leverage ratio); the economic savings generated for society (savings ratio); the resulting electricity price for end-users (affordability); and the efficiency in mitigating greenhouse gas emissions (carbon abatement).

Figure 5 shows the results for the leverage ratio and carbon abatement metrics for wind energy:

- For the leverage ratio, achieving the 2030 target of 1,404 MW in installed wind capacity equates to EUR 1.855 billion in private sector investment. In the business-as-usual scenario, the model estimates that achieving this target will require a direct financial incentive in the form of a price premium over 20 years of EUR 642 million. This results in a leverage ratio (the ratio of the cost of public instruments to investment catalysed) of 2.9x. In the *post-derisking* scenario, the model estimates that this same investment target can

“Investing in derisking measures totaling EUR 287m, catalyzes EUR 1.8bn in private sector investment in wind energy.”



Source: modelling; see Table 7 and Annex A for details of assumptions and methodology.

\* In the BAU scenario, the full 2030 investment target may not be met.

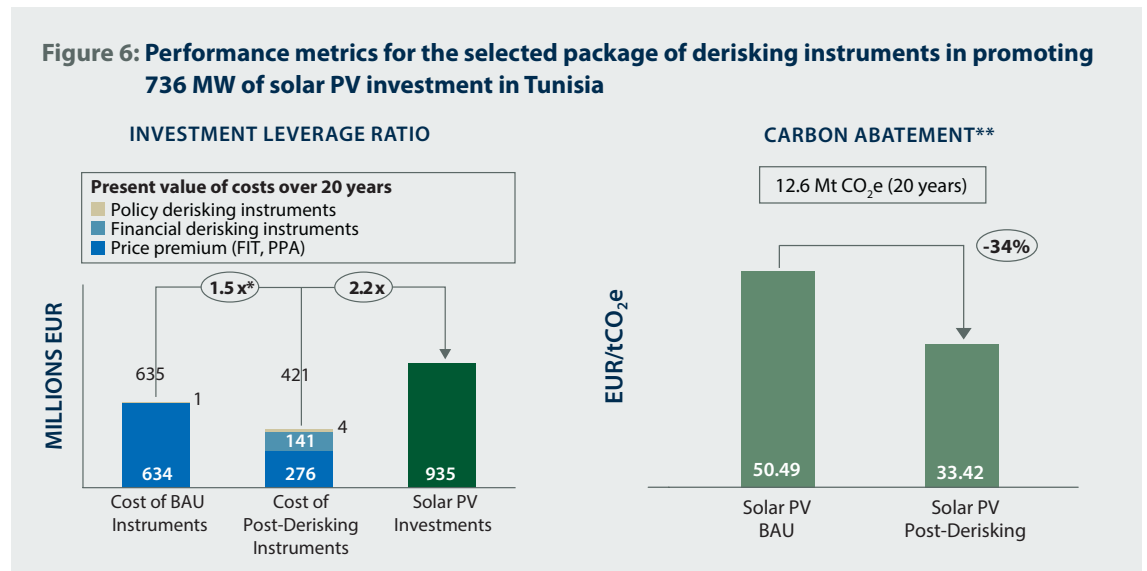
\*\* Components of carbon abatement figures: *business-as-usual* scenario: policy derisking instruments EUR 0.05, financial derisking instruments EUR 0.00, price premium EUR 19.43. *Post-derisking* scenario, EUR 0.26, EUR 8.44 and EUR -2.11 respectively.

be achieved with a package of derisking instruments valued at EUR 287 million, with no need for any direct financial incentive (price premium). This raises the leverage ratio to 6.5x, indicating a higher efficiency in terms of the costs of public instruments.

- For carbon abatement, achieving the 2030 target of 1,404 MW in wind energy is estimated to result in a total reduction of 33 million tonnes of CO<sub>2</sub> over the lifetime of the wind plants. In the business-as-usual scenario, the abatement cost of the investment in wind energy is EUR 19.43 per tonne of CO<sub>2</sub>e. Or, in other words, the cost of public instruments – in this case a direct financial incentive – equates to EUR 19.43 for every tonne of CO<sub>2</sub>e reduced by the investment in wind energy. In the *post-derisking* scenario, this cost falls to EUR 6.58 per tonne of CO<sub>2</sub>e. This performance metric is helpful in terms of understanding a carbon price that is necessary to promote investment, and in comparing the relative costs of different low-carbon options.

As such, both the leverage ratio and carbon abatement metrics from the modelling on wind energy show improved cost-effectiveness from government measures to derisk the investment environment.

Figure 6 shows selected results for solar PV in Tunisia, this time with the 2030 target of 736 MW of large-scale solar PV private sector investment. As with wind energy, the results demonstrate the beneficial impact of derisking. In this case, however, the LCOE of solar PV remains above the baseline cost, even after derisking.



Source: modelling; see Table 8 and Annex A for details of assumptions and methodology.

\* In the BAU scenario, the full 2030 investment target may not be met.

\*\* Components of carbon abatement figures: *business-as-usual* scenario: policy derisking instruments EUR 0.06, financial derisking instruments EUR 0.00, price premium EUR 50.42. *Post-derisking* scenario, EUR 0.35, EUR 11.17 and EUR 21.90 respectively.

## Sensitivities

Sensitivity analysis of the modelling identifies the inputs for: (i) investment costs, (ii) capacity factors, (iii) gas costs and (iv) financing costs (cost of debt, cost of equity) as all being key assumptions which can impact the results.

The assumptions for investment costs (i.e., the cost of hardware, such as wind turbines and solar panels) have particular potential for improving the overall competitiveness of wind energy and solar PV in Tunisia. Globally, the costs of renewable energy hardware have shown consistent reductions over time. The model's base case uses data for current (2014) investment costs for this assumption. Should investment costs continue to fall, the sensitivity analysis examines a scenario which uses lower (2022) investment costs.<sup>13</sup> The results of this sensitivity analysis are shown in Table 2 below, where significant reductions can be seen for both wind energy and solar PV generation costs. For example, wind energy generation cost in the *post-derisking* scenario falls from EUR 5.8 cents per kWh to EUR 5.2 cents per kWh.

**Table 2: Sensitivity analysis of wind energy and solar PV investment costs in Tunisia.**  
(All units EUR cents per kWh)

TECHNOLOGY	TYPE OF SENSITIVITY	ASSUMPTION	BAU LCOE	POST-DERISKING LCOE
Wind	Base Case	Assuming 2014 costs: EUR 1.241 million/MW	7.5 cents	5.8 cents
	Lower Investment Costs	Assuming 2022 costs: EUR 1.117 million/MW	6.8 cents	5.2 cents
Solar PV	Base Case	Assuming 2014 costs: EUR 1.190 million/MW	9.9 cents	7.7 cents
	Lower Investment Costs	Assuming 2022 costs: EUR 1.010 million/MW	8.5 cents	6.6 cents

“Sensitivity analyses modelling continued falls in investment costs result in significant reductions in generation costs.”

Source: modelling; see Tables 7 and 8, Annex A and the Sensitivity Analyses document for details of assumptions and methodology.

<sup>13</sup> The modelling period is 2014-2030. The year 2022 is selected as it reflects the mid-point of this period.

# Conclusions

## Implications for promoting renewable energy in Tunisia

The results confirm that financing costs for wind energy and solar PV in Tunisia are currently high, particularly in comparison to countries with more favourable investment environments. The cost of equity for wind energy and solar PV in Tunisia today is estimated at 15.0% (EUR), and the cost of debt at 6.5% (EUR).<sup>14</sup> The modelling identifies nine different risk categories that contribute to these higher financing costs in Tunisia. Power market risk – which concerns risks relating to regulations and pricing mechanisms for renewable energy – is identified as the most significant risk category, contributing an estimated 1.4% to the cost of equity. Four other categories – grid/transmission risk, counterparty risk, political risk and currency/macroeconomic risk – are also large contributors to high financing costs, increasing the cost of equity by approximately 1.0% each.

A key conclusion from the modelling is that investing in derisking measures to target these investment risks is a cost-effective approach for achieving the investment objectives of the Tunisian Solar Plan. The derisking measures that are modelled bring down the generation cost of wind energy from EUR 7.5 cents per kWh to EUR 5.8 cents per kWh, and solar PV energy from EUR 9.9 cents per kWh to EUR 7.7 cents per kWh. These lower generation costs have important affordability implications for Tunisian end-users. The modelling also demonstrates that investing in derisking measures is good value for money when measured against paying a premium price for wind energy and solar PV.

- For wind energy, in the *business-as-usual* scenario, the modelling estimates that a premium price totalling EUR 642 million will be required over the next 20 years to achieve the TSP target. However, if a total investment of EUR 287 million is made in derisking measures (EUR 20.5 million per year until 2030<sup>15</sup>), wind energy will become cheaper than the baseline energy cost, eradicating the need for a premium price and saving EUR 712 million in generation costs over 20 years.
- For solar PV, in the *business-as-usual* scenario, the modelling estimates that a premium price totalling EUR 634 million will be required over the next 20 years to achieve the TSP target. However, if a total investment of EUR 145 million is made in derisking measures (EUR 8.5 million per year until 2030<sup>16</sup>), solar PV generation costs fall, and the premium price is reduced by EUR 359 million in generation costs over 20 years. The new premium price requirement is EUR 276 million over 20 years.

Overall, the results indicate that all derisking instruments that can be immediately implemented should, if possible, be prioritised before resorting to premium prices to compensate for any residual risks.

<sup>14</sup> Euro-denominated cost of equity and cost of debt.

<sup>15</sup> Annual costs are given in 2014 Euros.

<sup>16</sup> The modelling period is 2014-2030. The year 2022 is selected as it reflects the mid-point of this period.

“A key conclusion is that investing in derisking measures is a cost-effective approach to achieving the investment objectives of the Tunisian Solar Plan.”

### Applicability of DREI methodology to NAMA design

This report represents the first instance of the DREI methodology being used to assist with the design of a country's NAMA. The results indicate that the DREI methodology appears to be well suited to NAMA design. It provides a structured framework to quantify and itemise the various components of a NAMA, including the costs of investments, the selection and cost of public instruments, and the anticipated greenhouse gas emission reductions.

Following the initial analysis in this report, the DREI methodology will be applied in full under the ANME-implemented, GEF-financed NAMA TSP project as one of the methodological approaches to developing the NAMA TSP.

### Next steps

The results in this report should not be interpreted as a definitive quantitative analysis of wind energy and solar PV in Tunisia but, rather, as one contribution to the larger policy decision-making process. It is hoped that the findings in this report can be compared, contrasted and combined with other analyses.

The modelling team has identified a number of areas of further work for future applications of the DREI methodology in Tunisia, including examining the role of fossil fuel subsidies, additional sensitivity analyses and work on the costs of public instruments.

ANME and UNDP look forward to working with our partners in Tunisia to advance the NAMA design, and to bring the benefits of reliable and affordable renewable energy to the citizens of Tunisia.

“The DREI methodology will now be applied to develop the NAMA for the Tunisia Solar Plan.”



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