Mapping the cost of capital for solar and wind energy in South Eastern European Countries

Findings from the Pricetag project

Fabian Wigand (Ecofys), Mak Đukan (Starfish Energy)
The Pricetag Project

The Diacore project

- Funded by the EU COM
- Analysis of RES investment risk profiles in Member States and recommendations on how to design risk-conscious RES policies
- [Report](#) available online

The pricetag project

- Funded by the European Climate Foundation
- Project team: Ecofys, eclareon, Starfish Energy
- Focus: South East Europe (Bulgaria, Croatia, Greece, Hungary, Romania Slovakia)
- Technologies: wind onshore and ground-mounted PV
- [Report](#) available online
Findings: WACC for wind onshore
Findings: WACC for ground-based PV

[Image of map showing weighted average cost of capital (WACC) for Photovoltaic systems in various countries, with Slovenia at 4.5-6.0%, Croatia at 6.8-7.6%, Hungary at 7.3-8.75%, Romania at 7.4%, Bulgaria at 7.0-9.5%, and Greece at 7.3-12.4%.]

© ECOFYS | sustainable energy for everyone
Additional risk premium for RE projects as compared to infrastructure investments
LCOE of Wind onshore can be reduced by 7%-30% - and more

LCOE Optimised: key parameters taken as for ‘best in class’ in Europe
- cost of equity 8%
- cost of debt 2%
- debt/equity ratio 80/20%

<table>
<thead>
<tr>
<th>Country</th>
<th>Wind onshore</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LCOE</td>
<td>LCOE - optimised</td>
</tr>
<tr>
<td></td>
<td>[€/MWh]</td>
<td>[€/MWh]</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>103</td>
<td>83</td>
</tr>
<tr>
<td>Croatia</td>
<td>98</td>
<td>76</td>
</tr>
<tr>
<td>Greece</td>
<td>96</td>
<td>68</td>
</tr>
<tr>
<td>Hungary</td>
<td>78</td>
<td>66</td>
</tr>
<tr>
<td>Romania</td>
<td>100</td>
<td>84</td>
</tr>
<tr>
<td>Slovakia</td>
<td>92</td>
<td>85</td>
</tr>
</tbody>
</table>
Main conclusions from analyses so far

• Policy schemes have to be designed at national and European level to allow for adequate RE business cases and trigger private investments.

• Countries can benefit from a low WACC only if adequate policies are in place.

• In addition, ‘WACC-aware’ policies and policy instrument designs can have a significant influence on the cost of capital and hence on the costs of the support schemes.
Impact of changes to FIP and tendering on bidder risk

• Changing to a FIP:
  • FIT provides the highest level of revenue stability: a fixed amount is paid per kWh produced.
  • The revenue risk is increased in a FIP: premium is paid on top of the electricity market

• Changing to tendering procedure:
  • Risk of not bid not being selected (in spite of project pre-development costs)
  • “Price” risk due to uncertainty about the level of competition
  • “Penalty” risk, if not able to realize projects or only with delays
Impact of changes to FIP and tendering on bidder risk

- Results from DiaCore study (2016)
  - Reference case: typical onshore wind project with a sliding FIP

![Changes of WACC under changing policy designs compared to FIP<sub>s</sub>](chart.png)

<table>
<thead>
<tr>
<th>Sliding Feed-in Premium</th>
<th>Sliding Feed-in Premium, No Premium if Prices &lt; 0</th>
<th>Fixed Feed-in Premium</th>
<th>Sliding Feed-in Premium with Tender</th>
<th>Fixed Feed-in Tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basis Points (bp)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-150</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Interest to expand the project to the Energy Community countries
Wide variation in WACC assumptions affects LCOE and brings uncertainty to private investors.

Very broad range of WACC assumptions in LCOE and RES potentials studies.

Source: IRENA, Joanneum Research and University of Ljubljana (2017), Cost-Competitive Renewable Power Generation: Potential across South East Europe, International
WACC increasing policy: PPA design & granting procedure in BiH

- investor receives final PPA (and support) only after the project has been constructed (in FBIH and RS)

- requirement to pay 1% of investment costs as bank guarantee and submit this within 30 days or receiving preliminary PPA from Operator for Renewable Energy Sources and Efficient Cogeneration – but in P-PPA stage investor still does not know if he will receive the final PPA and what its exact conditions will be (in FBiH)

- PPA not viewed by banks as bankable document – lack of experience with large projects and generally weak PPA from investor security perspective
WACC decreasing policy: new PPA package Serbia

- “Single PPA” - Ability to conclude PPA immediately after receiving the Temporary Privileged Producer (TPPP) status [1]

- Change-in-regulations clause – “Changes in legislation which ultimately lead to an increase in producer’s expenses, shall result in the corresponding increase in FIT” [1]

- Political force majeure – if any competent authority fails to issue, upkeep, amend or prolong any public authorization without the fault of the generator or the off-taker, the agreement shall remain in force, but its legal effects shall be suspended for the period of duration of the force majeure event [2]

Risks of new policy design: effect of changing from FIT to FIP in Croatia

- Market with experience in FIT ≈ 48 MW solar PV, 26 MW biomass, 28 MW biogas and 412 MW onshore wind etc.

- Renewable energy law (NN 100/2015) mandates change from FIT to FIP and auctioning > implementation delayed to early 2018 (NN 123/2016)

- What are the effects on risk perception? What are lessons learned for others in Western Balkans?
Risks of new policy design: effect of changing from FIT to FIP in Croatia

Research base

- 8 interviews in total conducted for Pricetag in Croatia
- 3 with heads of project and structural financing departments of major Croatian commercial banks: Unicredit Group (ZABA), Erste Bank, Raiffeisen Bank

Main conclusion

- Irregular revenue flows from FIP schemes (due to fluctuation in electricity prices) and delays in implementation negatively affect risk perception
- Compared to FIT the envisaged FIP scheme valued as more risky, but with no hard conclusions available due to lack or experience
Why should we know more about risk and WACC for RES in Western Balkans?

- Systematics investigation on barriers exists but without direct connection to costs of financing (example: IRENA et al 2017)

- Creation of WACC aware policies could decrease the cost of financing renewables in Western Balkans

- Better WACC understanding enables more precise design of current (FIT) and future (FIP) policy schemes and LCOE estimates
Thank you for your attention!

For more information:

Ecofys – Fabian Wigand, Corinna Klessmann
f.wigand@ecofys.com, c.Klessmann@ecofys.com
www.ecofys.com

Starfish Energy – Mak Đukan
mak@starfishenergy.org
www.starfishenergy.org
Backup: Methodology: approximating the policy risk premium

- Risk premium in WACC
  - Premium in cost of equity:
    CoE from interviews
    - Country risk premium (CRP) in CoE from economic literature
    = Risk premium related to renewable energy technology and policies
  - (Premium in cost of debt (not quantified))
  - (Difference in debt/equity ratio (not quantified))
Backup: Active RE support schemes?
Backup: 2015 wind onshore/PV installed capacity and WACC
Backup: General risk examples in Western Balkans

• Administrative procedures – often very long and unclear

• Grid risk – ability of the grid to take variable RES

• Sudden policy change – frequent changes in government structures and lack of stability

• Policy design risk – changes from Feed in Tariffs to Feed in Premiums

• Legal risk – design of the PPA
Impact of changes to FIP on bidder risk

**Price based support**

- **Fixed feed-in tariff (FIT)**
  - No market price risk

- **Feed-in premium (FIP)**
  - Limited market price risk

- **Quota**
  - Full electricity market price risk
    - Green certificate market risk

**Volume based**

- Green certificate revenues

**Electricity market price risk**

- RES-E producer sells directly to the market and is responsible for scheduling and balancing RES-E

Source: Ecofys