KPMG

Irish Solar Energy Association

Strike price sensitivity analysis

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KPMG Sustainable Futures

Reference Case solar project – sensitivity analysis

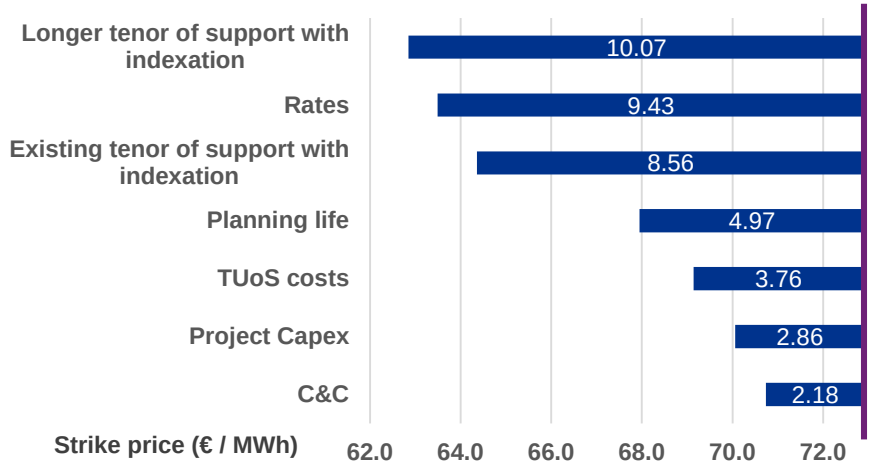
Executive summary

- The recent Renewable Electricity Support Scheme ("RESS") auction was widely recognised by the renewable energy industry as being a success for solar energy deployment in Ireland given projects totalling almost 800 Megawatts ("MW") were successful in the auction. Indeed, it is interesting to note that based on the average RESS price, solar projects will require a lower support level than existing Renewable Energy Feed-in Tariff ("REFIT") wind projects which is a watershed moment for the industry.
- The average strike price for RESS projects was €72.92 / MWh. Whilst the final mix of projects progressing to operational stage may vary to the projects that were successful in the RESS auction, and the resultant average price for solar may change as a result, based on current data €72.92 / MWh is the best representation of a strike price required to provide a project with a viable commercial return. This strike price remains relatively high when compared to European counterparts for an auction of this nature.
- A shared common objective of all stakeholders in Ireland's solar industry is to ensure the successful development and construction of viable solar projects. In order to achieve this it is important that these projects are commercially viable to ensure future deployment of the technology and that the strike price required for this represents value for the consumer through a lower Public Service Obligation ("PSO").
- It is based on this backdrop that the Irish Solar Energy Association ("ISEA") have commissioned KPMG to carry out a piece of bespoke financial modelling, to identify the impact single assumption changes to a Reference Case project can have on the required strike price for the project to ensure the same project return.

Key findings of the modelling work include:

- **Tenor and indexation:** It is clear and unsurprising that applying indexation to the existing or a longer tenor of support (e.g. 20 years) has the most material impact on the day one strike price required, however it is noted that this adjustment leaves indexation risk with the PSO.
- **Rates:** Rates are a significant cost component in all projects. The analysis found that any adjustment to rates has a material impact on the required strike price for the Reference Case project to generate a set return. Indeed removal of rates altogether would reduced the required strike price by €9.43 / MWh.
- **Planning life:** The extension of planning life to 35 or 40 years has the potential to reduce the required strike price by €4.97 / MWh if projects are then similarly valued for the corresponding term (assuming any asset life extension capex is offset by a higher yield) it would also assist in funding options reducing the overall cost of capital for projects.
- **TUoS costs:** Applying Transmission Use of Service ("TUoS") costs on a MWh basis would be considered more equitable to solar projects relative to other technologies with higher capacity factors such as wind than the current charging regime on a MW basis. The sensitivity considered this charging mechanism would result in a decrease of €3.76 / MWh in the required strike price.
- **Project Capex:** Grid costs are a significant portion of the project capital expenditure and by their nature are incurred in the early years of project development / construction. As a result they have a material impact on project returns. A 20% reduction in grid costs was found to reduce the required strike price by €2.86 / MWh.
- **Constraints and curtailment:** Finally, the model work carried out found that compensation for forecasted constraints and curtailment can reduce the required strike price by €2.18 / MWh.

Summary findings of sensitivities considered



Reference Case solar project – sensitivity analysis

Introduction

- ISEA commissioned KPMG to carry out an analysis of a Reference Case solar project to understand and quantify the impact that adjusting a specified project assumption has on the viability of a project and the project returns. Further it was considered what RESS strike price or Contract for Difference ("CfD") price would be required to achieve the same project return as the Reference Case project once the sensitivity is modelled.
- In order to carry out this analysis a Reference Case project was agreed upon. The assumptions for the Reference Case project were compiled by KPMG in conjunction with ISEA and it presents what is considered a standard size project with relatively standard input cost assumptions as have been observed in the market both by KPMG, ISEA and a number of its members.
- The Reference Case project was modelled using a RESS strike price of €72.92 / MWh, which represents the current average clearing price in the RESS 1 auction for solar projects. Thereafter, standard project assumptions for development, asset life and operational costs were applied as summarised on page 4. The Reference Case project was modelled to generate a 5% post-tax internal rate of return ("IRR") for the project on an unlevered basis.
- A number of input assumptions were then adjusted to the model which resulted in a change to the overall project returns.
- The following sensitivities have been considered:
  - Planning life;
  - Indexation;
  - Tenor of support;
  - Commercial rates;
  - Constraints and curtailment;
  - TUoS costs; and
  - Project Capex.

Project sensitivities considered

- Planning life
- Indexation
- Tenor of support
- Commercial rates
- Constraints and curtailments
- TUoS costs
- Project Capex

Reference Case solar project – sensitivity analysis

Reference case project

- For the development of the Reference Case project, the project, revenue and operational expenditure ("opex") assumptions were agreed upon between KPMG and ISEA and are outlined in the table adjacent. Whilst no two projects are the same, the assumptions are considered to be broadly representative of a standard solar project within Ireland.
- A number of notable assumptions are as follows:
  - **Capacity**: The capacity of the project is 30MW.
  - Whilst there are a range of projects being developed in the country including a large number of <10MW projects and number of larger projects (up to 100MW+), and it is also recognised that solar projects often benefit from economies of scale, with the larger solar projects benefiting from a lower average asset management cost or average capex cost, 30MW has been selected as being broadly a representative project to what is under development in Ireland at present.
  - **Asset life**: A 30 year asset life has been assumed for the Reference Case. Whilst planning life in Ireland is currently typically granted for 25 years, it is common for developers and investors to value projects for a period beyond the expiration of planning permission. Page 5 considers planning in further detail.
  - **Constraints & Curtailment**: The Reference Case assumes combined constraints and curtailment to be -2% per annum and that no compensation is received by the project in relation to constraints and curtailment.
- The yield of the Project is 12.47%, this is regarded as higher than average, but was applied in order to generate a post tax pre finance IRR of 5.0%.

PROJECT ASSUMPTIONS:	
Capacity	30MW
Asset life	30 years
Yield	12.47% (based on MWp)
DC / AC ratio	1.4
Capex (including EPC, Grid costs and devex)	€0.60 / Wp
Constraints and curtailment	-2% p.a. for combined C&C
REVENUE / OPEX ASSUMPTIONS:	
CfD price (MWh) and period / Merchant price	€72.92 for 15 years; Central merchant curve
Land lease	€160k per annum
O&M	€5.25k per MW (DC) per annum
Asset management	€3.0k per MW (DC) per annum
Insurance	€600 per MW (DC) per annum
Utilities & Other	€100 per MW (DC) per annum
Balancing cost	€2.00 per MWh
Grid O&M cost	€5k per annum
Community payment	€2.00 per MWh
Local business rates	€7.5k per MW (AC) per annum
Substation own consumption	10,000 kWh per annum
Transformer own consumption	5,000 kWh per annum
TUoS cost	€7,200 per MW (AC) per annum

Executive Summary | Reference Case Project | Planning life | Indexation | Tenor of support | Commercial rates | Constraints & Curtailment | TUoS costs | Project Capex

Reference Case solar project – sensitivity analysis

Planning life

- Planning permission for solar projects in Ireland is typically granted on a 25 year basis. Notwithstanding this, many market participants are now valuing projects on the basis of 30 year project life assumption and in some cases longer. Implicit in this assumption is that the planning permission will be extended in the future, otherwise the project would need to be decommissioned at the end of its planning life.
- It is acknowledged that various market stakeholders would not attribute value to projects beyond their planning life (for example this would be the typical position of commercial banks along with some categories of investors).
- **Sensitivity 1 – 3:** For the purposes of our Reference Case, it is assumed that the project is modelled on the basis of a 30 year asset life. For planning life sensitivities, three cases have been considered – 25 year planning life, 35 year planning life and 40 year planning life. The results are presented adjacent.
- It is notable that assuming a 25 year asset life in line with the typical planning duration of a project results in the requirement of a significantly higher CfD price than the average clearing price in the recent RESS 1 auction. This suggests that for projects with similar characteristics to the Reference Case, developers are already assuming an asset life for a period greater than the duration of the planning period in order to generate the Benchmark Return.
- The reduction in the required CfD price in the scenario of a 35 year or 40 year asset life is reflective of the fact that the asset is valued over a longer useful economic life period.
- Whilst not quantified in the sensitivity, from a commercial perspective it is noted that the System Life of a solar project can be up to 40 years, whereas if planning life is granted for 25 years it limits the basis on which a project can be modelled from a funding perspective. A longer planning life could facilitate longer asset life assumptions, which in turn could result in greater financing options for projects attracting lower costs of capital and ultimately reducing the up front strike price required.

€ / MWh	Required CfD price to generate 5% unlevered IRR	CfD variance from Reference Case
Reference Case: 30 years	**€72.92**	**-**
Sensitivity 1: 25 years	**€76.55**	**€3.63**
Sensitivity 2: 35 years	**€70.19**	**€(2.73)**
Sensitivity 3: 40 years	**€67.95**	**€(4.97)**

Note 1: All other assumptions were held constant to the Reference Case project assumptions as set out on page 4. Applying the sensitivities set out above at the relevant CfD price resulted in a post tax pre finance unlevered IRR of 5%.

Note 2: The sensitivities assumes the Reference Case project can be valued over for the duration of the planning life. The forecasted cashflows for the extended life periods are in line with preceding years for simplification of modelling purposes. No asset life extension capex or corresponding asset optimisation yield has been assumed for these extended asset life years.

Reference Case solar project – sensitivity analysis

Indexation of the CfD price

- The Reference Case assumes no indexation to the CfD strike price, in line with the current parameters of the RESS scheme.
- For the purposes of the sensitivity analysis the following scenarios have been considered:
  - **Sensitivity 1:** The impact of applying indexation for the entire CfD period; and
  - **Sensitivity 2:** The impact of applying partial indexation – for the first 8 years of the CfD period.
- The results are shown in the table adjacent.
- For the purposes of the analysis an indexation factor of 1.3% was applied for FY21 and 2% per annum thereafter.
- The results illustrate that there is a reduction in the required CfD price for the Reference solar project to €64.36 / MWh in the event that indexation is applied for the full CfD period, and a reduction to €66.04 / MWh in the event that it is applied for the first 8 years of the CfD period.
- In addition, the introduction of indexation is likely to result in greater project finance options as funders are no longer taking indexation risk which would potentially attract lower overall costs of capital finance which could reduce the required strike price further.

€ / MWh	Required CfD price to generate 5% unlevered IRR	CfD variance from Reference Case
Reference Case: No indexation	**€72.92**	**-**
Sensitivity 1: Apply indexation for full 15 year period of CfD	**€64.36**	**€(8.56)**
Sensitivity 2: Apply partial indexation for initial 8 year period	**€66.04**	**€(6.88)**

Note: All other assumptions were held constant to the Reference Case project assumptions as set out on page 4. Applying the sensitivities set out above at the relevant CfD price resulted in a post tax pre finance unlevered IRR of 5%.

Executive Summary | Reference Case Project | Planning life | Indexation | Tenor of support | Commercial rates | Constraints & Curtailment | TUoS costs | Project Capex

Reference Case solar project – sensitivity analysis

Tenor of support

- The current standard tenor of support for the CfD under RESS 1 is for a 15 year period.
- For the purposes of the sensitivity analysis the following scenarios have been considered:
  - **Sensitivity 1:** The impact of extending the CfD support for 20 years on an unindexed basis; and
  - **Sensitivity 2:** The impact of extending the CfD support for 20 years on an indexed basis.
- The results of the sensitivity analysis are shown in the table adjacent.
- For sensitivity 1 where the support was applied for 20 years, the project required a higher strike price of €73.89 / MWh. This is reflective of the fact that the merchant curve is at a greater price than the Reference Case strike price in year 16 when the CfD expires.
- For sensitivity 2, when indexation is applied to a 20 year CfD there is a reduction price to €62.85 / MWh to generate the same project return.
- The indexation factor applied was 1.3% was for FY21 and 2% per annum thereafter.

€ / MWh	Required CfD price to generate 5% unlevered IRR	CfD variance from Reference Case
Reference Case: 15 years	**€72.92**	**-**
Sensitivity 1: Apply support for 20 years	**€73.89**	**€0.97**
Sensitivity 2: Apply support for 20 years with indexation	**€62.85**	**€(10.07)**

Note: All other assumptions were held constant to the Reference Case project assumptions as set out on page 4. Applying the sensitivities set out above at the relevant CfD price resulted in a post tax pre finance unlevered IRR of 5%.

Reference Case solar project – sensitivity analysis

Commercial rates

- The commercial rates assumption for the Reference Case project is c.€7.5k / MW.
- For the purposes of the sensitivity analysis the following scenarios have been considered:
  - **Sensitivity 1**: The impact of reducing the average commercial rates amounts by 50% to €3.75k / MW (AC); and
  - **Sensitivity 2**: The impact of removing commercial rates for solar projects.
- The results of the sensitivity analysis are shown in the table adjacent.
- Where commercial rates are reduced to 50% of the Reference Case at €3.75k / MW the required CfD price is €68.20 / MWh.
- Where commercial rates are reduced to nil, the required CfD price is €63.49 / MWh.
- From a commercial risk perspective, it is noted that uncertainty in relation to rates costs results in the additional risk being factored into the overall project risk, which has an impact on the required price of a project to generate its required return. Greater certainty on a fixed rates position over the long term would reduce this risk and could result in lower strike price requirements for projects.

€ / MWh	Required CfD price to generate 5% unlevered IRR	CfD variance from Reference Case
Reference Case: €7.5k / MW (AC)	**€72.92**	**-**
Sensitivity 1: €3.75k / MW (AC) (50% of Reference Case)	**€68.20**	**€(4.72)**
Sensitivity 2: No rates	**€63.49**	**€(9.43)**

Note: All other assumptions were held constant to the Reference Case project assumptions as set out on page 4. Applying the sensitivities set out above at the relevant CfD price resulted in a post tax pre finance unlevered IRR of 5%.

Reference Case solar project – sensitivity analysis

Constraints and curtailment

- Constraints and curtailment assumptions vary from project to project. A flat combined constraints and curtailment assumption of 2% has been assumed in the Reference Case.
- For the purposes of the sensitivity analysis the following scenarios have been considered:
  - **Sensitivity 1:** The impact of reducing constraints and curtailment to 1% (which would be the equivalent from a modelling perspective of the project receiving compensation for 50% of the constraints and curtailment of the project); and
  - **Sensitivity 2:** The impact of reducing constraints and curtailment down to zero (which would be the equivalent from a modelling perspective as the project receiving full compensation for the constraints and curtailment of the project).
- The results of the sensitivity analysis are shown in the table adjacent.
- For sensitivity 1, the required CfD strike price reduces to €71.82 / MWh.
- For sensitivity 2, the required CfD strike price reduces to €70.74 / MWh.

€ / MWh	Required CfD price to generate 5% unlevered IRR	CfD variance from Reference Case
Reference Case: 2% Constraints and Curtailment	**€72.92**	**-**
Sensitivity 1: 1% Constraints & Curtailment (i.e the equivalent of 50% compensation)	**€71.82**	**€(1.10)**
Sensitivity 2: 0% Constraints & Curtailment (i.e. the equivalent of 100% compensation)	**€70.74**	**€(2.18)**

Note: All other assumptions were held constant to the Reference Case project assumptions as set out on page 4. Applying the sensitivities set out above at the relevant CfD price resulted in a post tax pre finance unlevered IRR of 5%.

Reference Case solar project – sensitivity analysis

TUoS costs

- For the TUoS costs a standard rate has been assumed at €7,200 / MW (AC) per annum.
- **Sensitivity 1:** Our sensitivity analysis considers what the impact would be if the TUoS cost was charged on a MWh basis as opposed to a MW basis. The rationale for this is that the TUoS cost is disproportionately high on a solar project relative to an onshore wind project under the current charging regime, due to solar projects lower capacity factor relative to onshore wind.
- Based on a sample of locations considered for this report (and following the approach outlined above as a means of better aligning the TUoS cost applied to solar with that for wind), our sensitivity assumes a reduction in TUoS cost of €3,000 / MW (AC), i.e. reducing the TUoS cost in our Reference project to €4,200 / MW (AC) per annum.
- After applying this sensitivity, the required CfD strike price reduces to €69.14 / MWh.

€ / MWh	Required CfD price to generate 5% unlevered IRR	CfD variance from Reference Case
Reference Case: €7,200 / MW (AC) p.a.	**€72.92**	**-**
Sensitivity 1: Reduction in TUoS cost to €3,000 / MW (AC), based on applying MWh approach to TUoS derivation.	**€69.14**	**€(3.78)**

Note: All other assumptions were held constant to the Reference Case project assumptions as set out on page 4. Applying the sensitivities set out above at the relevant CfD price resulted in a post tax pre finance unlevered IRR of 5%.

Reference Case solar project – sensitivity analysis

Project capex

- Capital expenditure varies from project to project and is quite sensitive to project specific issues, in particular grid connection cost, and the economies of scale of a particular project.
- For the Reference Case project, a capex requirement of €0.60 / Watt or €600k / MW has been assumed.
- 75% of this capex is assumed to be attributable to development expenditure and EPC costs.
- 25% of the total capex is assumed to be attributable to grid costs, with grid assumed to cost €150k / MW or €0.15 / Watt.
- **Sensitivity 1 & 2:** Two sensitivities were considered whereby the grid capex amount was reduced by 10% and 20% respectively.
- The results of the sensitivity analysis are shown in the table adjacent.
- For sensitivity 1, the required CfD strike price reduces to €71.49 / MWh.
- For sensitivity 2, the required CfD strike price reduces to €70.06 / MWh.

€ / MWh	Required CfD price to generate 5% unlevered IRR	CfD variance from Reference Case
Reference Case: €0.60 / Watt	**€72.92**	**-**
Sensitivity 1: 10% reduction in grid capex	**€71.49**	**€(1.43)**
Sensitivity 2: 20% reduction in grid capex	**€70.06**	**€(2.86)**

Note: All other assumptions were held constant to the Reference Case project assumptions as set out on page 4. Applying the sensitivities set out above at the relevant CfD price resulted in a post tax pre finance unlevered IRR of 5%.

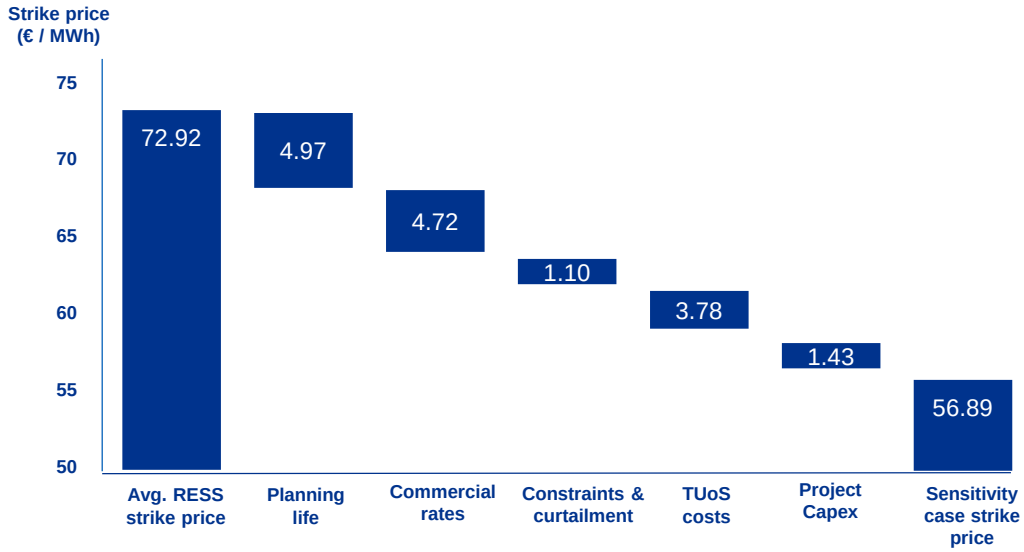
Executive Summary | Reference Case Project | Planning life | Indexation | Tenor of support | Commercial rates | Constraints & Curtailment | TUoS costs | Project Capex

Reference Case solar project – sensitivity analysis

Sensitivity case strike price

- As set out, this Report seeks to identify the impact single assumption changes to a Reference Case project can have on the required strike price to ensure the same project return.
- The adjacent chart illustrates the combined impact that a selection of sensitivities considered in this Report have to result in a Sensitivity case strike price which is required to deliver the same project return as the Reference Case project.
- For the purposes of the Sensitivity case strike price, adjusted scenarios around indexation and tenor of support have not been included in order to compare the RESS strike price with the Sensitivity case strike price on a like for like basis.
- The sensitivities illustrated in the waterfall chart adjacent are:
  - **Planning life**: 40 years planning life assumed *(note 1).*
  - **Commercial rates**: €3.75k / MW (AC) (50% of Reference Case).
  - **Constraints and curtailment**: Reduced from a combined 2% to 1% (which would be the equivalent from a modelling perspective of the project receiving compensation for 50% of the constraints and curtailment of the project);
  - **TUoS costs**: Reduction in TUoS cost from €7,200 / MW (AC) to €3,000 / MW (AC), based on applying MWh approach to TUoS derivation.
  - **Project capex**: reduction in grid capex by 10%.
- Combining these adjustments results in a Sensitivity Case strike price requirement of €56.89 / MWh.
- It is acknowledged that this analysis is somewhat simplistic by applying a sum of the parts approach, and ultimately the overall commercial risks of a project factor into the required strike price for a project to deliver a fixed return. Notwithstanding this, it provides an indication of the level of impact that each specific assumption is likely to have on a required strike price to ensure the project delivers a fixed return.

Average RESS strike price to Sensitivity case strike price waterfall



Notes

1. This assumes the project is valued with a corresponding project life of 40 years. No life extension costs or further yield optimisation have been assumed in this scenario.

Important notice

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