

A guideline for public entities on cost-efficient procurement of PV assets

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INTRODUCTION

Traditionally, when public entities buy an asset under an Engineering, Procurement and Construction (EPC) contract, the screening of the responses to the request for proposals is done in two stages: In a filter stage, all proposals that are technically not acceptable because they do not fulfil certain firm criteria with regard to scope, quality or performance are excluded. In the second stage, proposals are then evaluated according to the financial offer (in most cases this will be the EPC lump-sum price in million Euros).

In the case of buying a PV asset, this approach can be problematic, because evaluating proposals based on EPC price will inevitably lead to the tenderers offering only the minimum required installed capacity (in kWp) at the minimum quality, because any "over-delivery" in terms of scope or quality will lead to an increase in EPC price and thus to a lower chance of winning the tender. The CSIR Energy Centre therefore developed a methodology that can be applied by public entities in South Africa and elsewhere in the world to allow the procurement of PV assets at the lowest possible lifetime cost, measured in Levelised Cost of Electricity (LCOE). The methodology was successfully implemented in the procurement of the CSIR's first 560 kWp, ground-mounted, single-axis tracker PV system on the main campus of the CSIR in Pretoria, South Africa. A very competitive LCOE and a very high quality PV system were achieved.

AIM

To define a methodology that can be applied by public entities in South Africa and elsewhere in the world to allow the procurement of PV assets at the lowest possible lifetime costs, measured in LCOE.

METHODOLOGY

The procurement of assets by a public entity based on lifetime cost considerations is generally desirable, but often very difficult to achieve, because the lifetime benefits of an asset are difficult to forecast. It is however possible if the right methodology is applied. This is specifically true for PV plants, because the performance is easy to measure (energy output in kWh).

The CSIR Energy Centre developed a methodology which is the first of its kind in the South African public procurement context for PV that allows evaluation of proposals for the purchase of a PV asset in an EPC contract based on LCOE. The methodology includes a "control loop" to ensure actual delivery of the promised LCOE.

RESULTS AND DISCUSSIONS

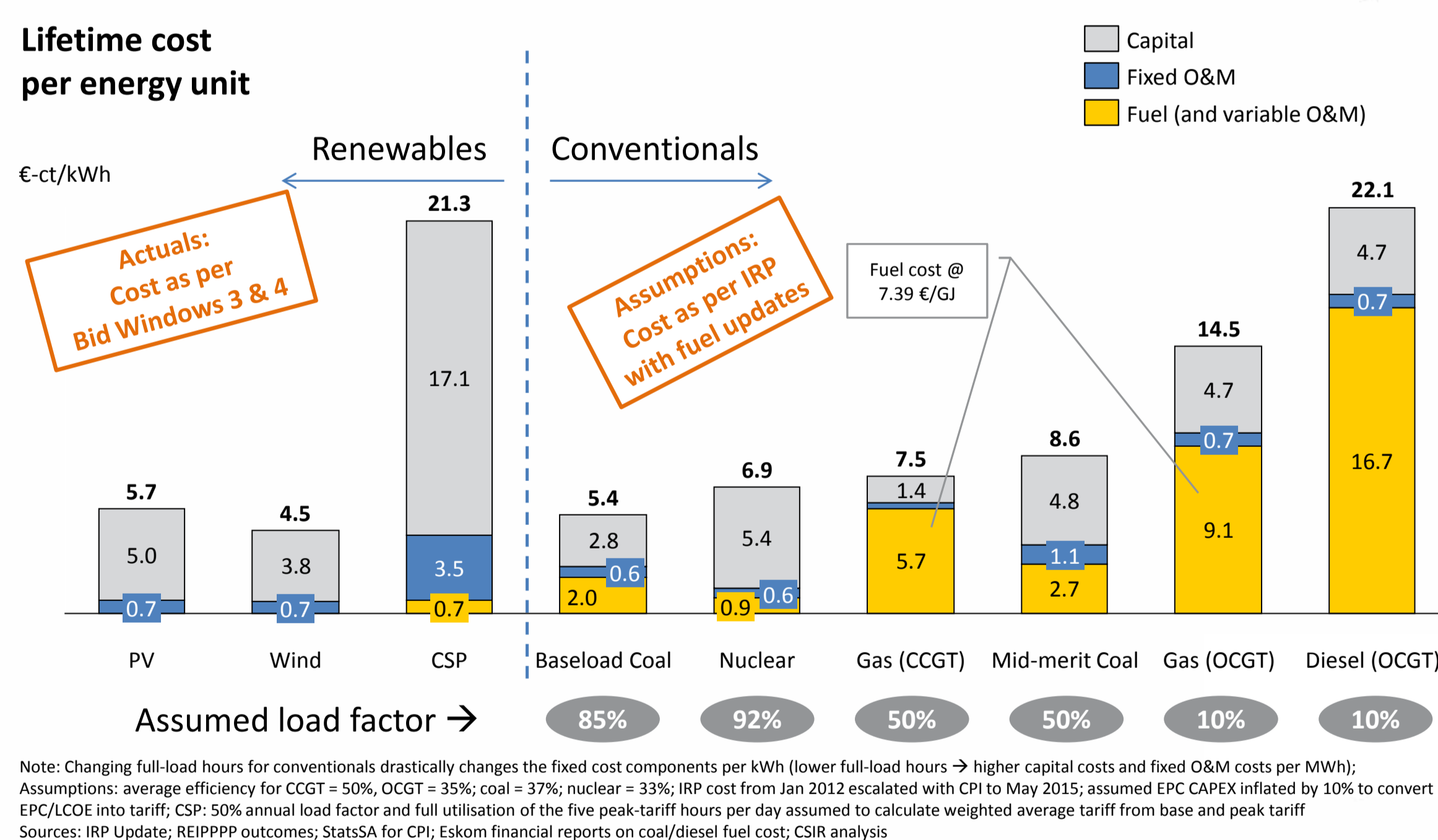


Figure 1: Cost comparison of alternative new-build options for the South African power system

- Wind and solar PV have reached "new-build" parity
→ LCOE from wind/PV ≤ LCOE of all new build options (system view)
- LCOE of roof-top PV in South Africa (5.7-6.4 €-ct per kWh) is below residential electricity tariffs (7.9-10 €-ct/kWh /kWh without VAT) "retail grid parity" already achieved!
→ huge incentives for public entities who are also electricity customers (e.g. schools, hospitals, government buildings etc.) to install PV systems to supplement their grid supply ("first movers")
- Care should be taken to buy PV assets at lowest LCOE as opposed to EPC price

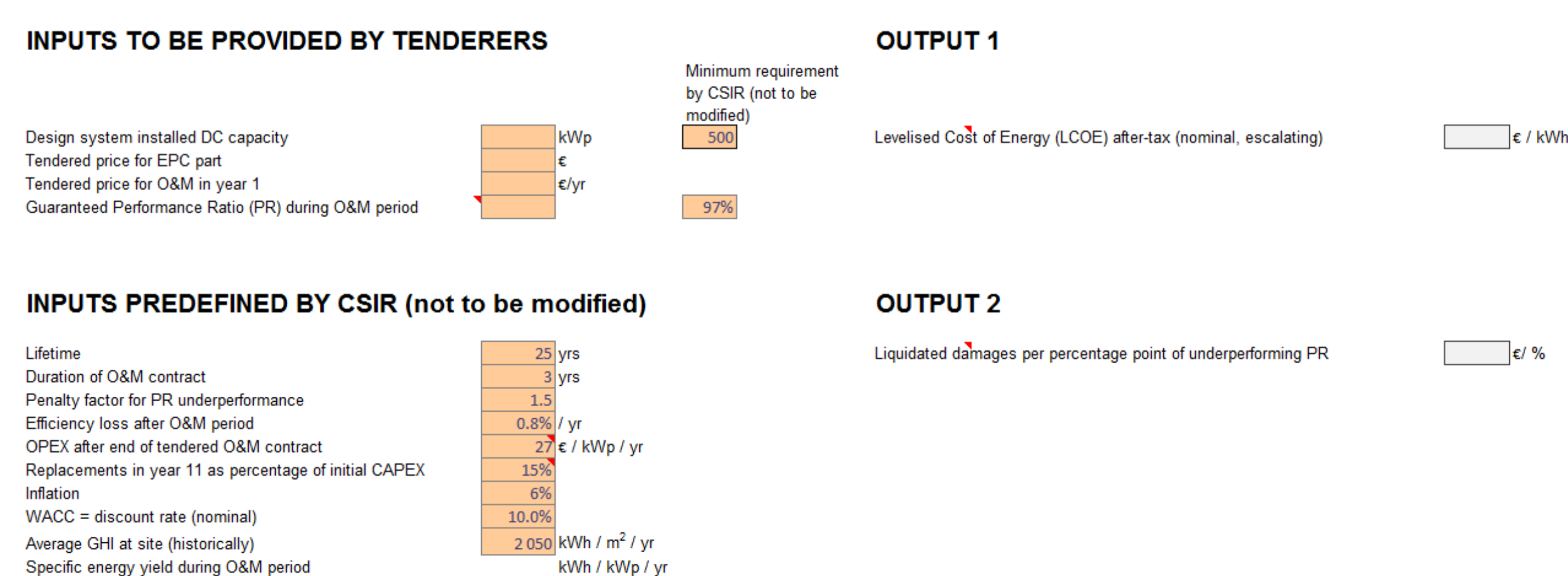


Figure 2: Screenshot of CSIR-developed Excel-based model showing inputs requested from bidders, predefined parameters by the CSIR LCOE calculation and outputs

- A model based on LCOE is proposed to determine the price ranking
- Bidders need to provide four inputs into the model
- A number of quality criteria are defined as gatekeepers to filter the proposals
- The model calculates two outputs: LCOE and Liquidated damage

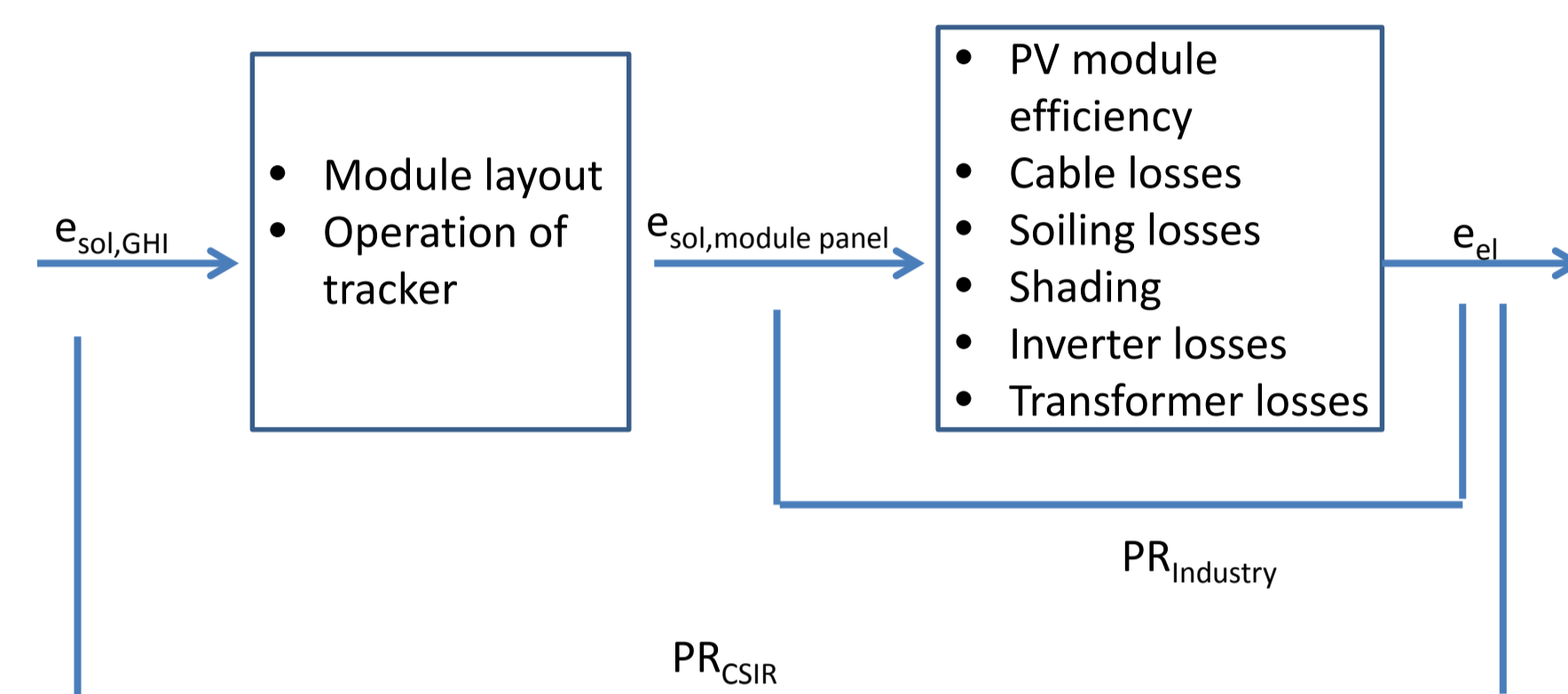


Figure 3: Justification behind using GHI for PR calculations

- PR_{industry} takes the solar radiation in module plane as reference
→ other design related losses such as improper module layout, tracker operational issues are excluded
- PR_{CSIR} takes all losses into consideration
→ EPC contractors are forced to take responsibility for all design issues and optimize better plant performance

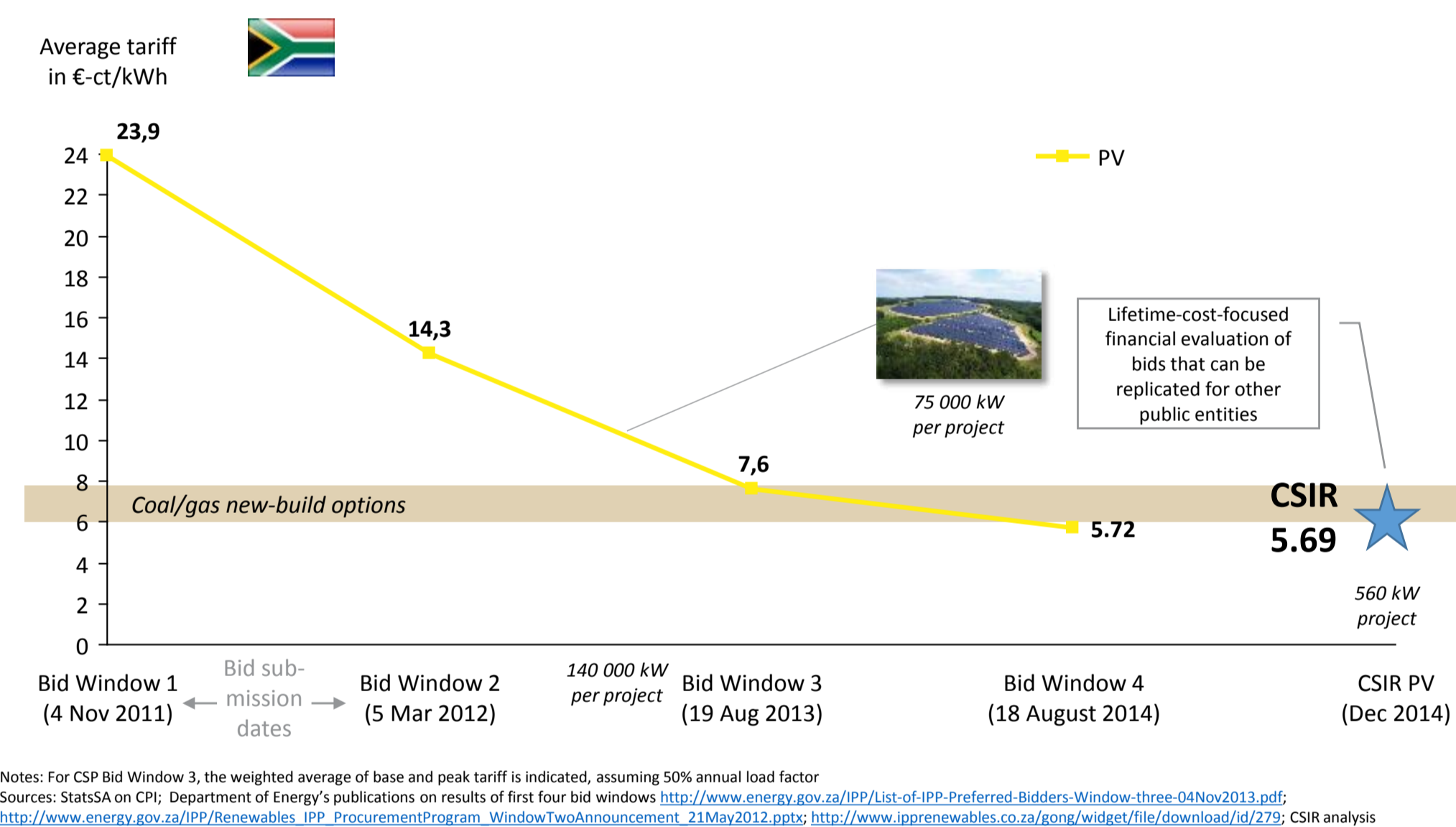


Figure 4: Comparison of the results of the first four Bid Windows of the South Africa's Department of Energy procurement programme for renewable energy Independent Power Producers (IPPs) with the CSIR's PV plant

- Across the four windows of REIPPP, the price of PV dropped by 75 %
- The price of 5.72 €-ct per kWh compares favorably with the 5.69 €-ct cents per kWh pricing from Round 4 REIPPPP
→ a PV plant of relatively small scale in Pretoria, not the sunniest region in South Africa, can compete very well with large, utility-scale projects in the sunniest parts of South Africa



Figure 5: Picture of the CSIR PV plant after 8 weeks

CONCLUSION

An approach of procuring PV assets which looks at LCOE of a PV investment was developed for incorporation into the evaluation process of a public EPC tender. The defined methodology was applied in the procurement of a first 560-kWp PV system with single-axis tracker configuration and achieved very competitive LCOE of 5.69 €-ct per kWh. It will now be made available to other public entities as a guideline to procure PV assets (rooftop or ground-mounted) lifetime-cost optimally.

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