

Guidance Note for Use of Life-Cycle Costing (LCC) in Procurement of Goods and Works Contract for IsDB- financed Projects



This Guidance Note is intended to complement the Guidelines for Procurement of Goods and Works and related services under Islamic Development Bank Financing, approved by the Board of Executive Directors (BED) of the Islamic Development Bank, and published in April 2019. This document may be used and reproduced for non-commercial purposes. Any commercial use, including without limitation reselling, charging to access, redistribute, or for derivative Works such as unofficial translations based on these documents is not allowed.

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Common Abbreviations and Defined Terms

Common abbreviations and defined terms that are used in this Guidance Note.

Abbreviation / term	Full terminology / definition
Annex	An Annex to this Guidance Note
Beneficiary	A Beneficiary is the recipient of IsDB Project Financing. This term includes any entity involved in the implementation of an IsDB financed project on behalf of the Beneficiary.
Bid	An offer, by a Bidder, in response to a Request for Bids, to provide the required Goods, and/or Works and/or related services.
Bidder	A Firm that submits a Bid for the provision of Goods, and/or Works and/or related services.
Consultant	A Consultant Firm or Individual Consultant that provides Consultant Services. A Consultant is independent of both the Beneficiary and IsDB.
Consultant Service(s)	A Consultant Firm or Individual Consultant that provides Consultant Services. A Consultant is independent of both the Beneficiary and IsDB.
Goods	A category of procurement that includes, for example: consumables, equipment, machinery, vehicles commodities, raw materials or industrial Plant. The term may also include related services, such as: transportation, insurance, installation, commissioning, training or initial maintenance.
Non-consulting Services:	Services which are not Consulting Services. Non-consulting Services are normally Bid and contracted on the basis of performance of measurable outputs, and for which performance standards can be clearly identified and consistently applied. Examples include: drilling, aerial photography, satellite imagery, mapping, and similar operations.
Procurement	The function of planning for, and sourcing Goods, Works, Non-consulting Services, and/or Consulting Services to meet required objectives.
Procurement Documents	A generic term used in these Guidelines to cover all Procurement Documents issued by the Beneficiary. It includes: GPN, SPN, EOI, REOI, Prequalification document, RFB and RFP, including any addenda.
Procurement Process	The whole Procurement lifecycle that starts with the identification of a need and continues through planning, preparation of specifications/ requirements, budget considerations, selection, contract award, and contract management. It ends on the last day of the warranty period.
Project Procurement Guidelines	Covers the Project Procurement Guidelines known as 'Guidelines for the procurement of Goods, Works and related services under IsDB

COMMON ABBREVIATIONS AND DEFINED TERMS

Abbreviation / term	Full terminology / definition
	Project Financing, April 2019' and Guidelines for the Procurement of Consultant Services under IsDB Project Financing, April 2019.
Proposal	An offer, by a Proposer, in response to a Request for Proposal to provide the required Consultant Services.
Proposer	A Firm that submits a Proposal for the supply of the required Consultant Services.
Rated Criteria	Rated criteria is when price and technical factors are rated, the contract price and the total combined score of the successful Bid/Proposal. Rated criteria may include but are not limited to: i) quality of methodology and work plan; ii) performance, capacity, or functionality features; and iii) sustainable procurement.
Standard Bidding Documents (SBDs)	Standardized procurement documents issued by IsDB to be used by Beneficiaries for IsDB financed projects. These include IsDB's standard documents for, e.g.: GPN, SPN, Prequalification, LOI, RFB and RFP.
Substantially Responsive Bid	A bid that is assessed to be complete and without major deviations from the eligibility, technical and commercial requirements in the Procurement Documents.
Value for Money (VfM)	VfM means obtaining the optimum benefits with the effective, efficient, fair and economic use of resources. This requires an evaluation of relevant costs and benefits, along with an assessment of risks, and non-price attributes and/or life cycle costs, as appropriate. The lowest price alone may not necessarily represent VfM.
Works	A category of procurement that refers to construction, repair, rehabilitation, demolition, restoration, maintenance of civil work structures, and related services such as transportation, insurance, installation, commissioning, and training.

Other Acronyms

ASCE	American Society of Civil Engineers
BDS	Bid Data Sheet
BMZ	German Federal Ministry for Economic Cooperation and Development
CCFRPM	Centrifugally Cast Fiber Reinforced Polymer Mortar
CCPP	Combined Cycle Power Plant
DEFRA	UK Department for Environment, Food and Rural Affairs
EIRR	Economic Internal Rate of Return
EPEAT	Electronic Product Environmental Assessment Tool
EU	European Union
FG	Functional Guarantee
IsDB	Islamic Development Bank
INF	Infrastructure Department (IsDB)
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
LD	Liquidated Damages
MDB	Multilateral Development Bank
MRI	Magnetic Resonance Imaging
NPV	Net Present Value
OPSD	Operations Policy and Services Department (IsDB)
PAD	Project Appraisal Document
PDSID	Plant Design Supply Install Document
PPR	Project Procurement Division (IsDB)
SBD	Standard Bidding Document
TS	Technical Specification
VFM	Value for Money
WB	World Bank
WLC	Whole Life Costing
WWTP	Waste Water Treatment Plant

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Section 1 - Introduction

1.1 Overview

The Islamic Development Bank (IsDB/the Bank) is engaged in fostering economic development and social progress of member countries and Muslim communities in the world. The IsDB's procurement policies (2019) are harmonized with other MDBs, which requires procurement process to be carried out with due attention to economy and efficiency with a view to ensure that funds are used for the purpose intended¹.

The Board on 2nd September 2018 approved new Guidelines for the Procurement of Goods, Works and Consultant Services. The Guidelines which govern procurement under all IsDB Financed Operations provide flexibility and introduces several new concepts to enable tailoring procurement solutions according to specific requirements of a project. These Guidelines are mainstreamed and applied in all IsDB Operations since April 2019.

IsDB has since issued twenty-four Guidance Notes intended to assist Beneficiaries by expanding on and explaining IsDB's 2019 Project Procurement Guidelines².

The Guidance Note is intended to the Beneficiary in appropriate application of LCC for the entire procurement process which may be defined as: "the process that starts with the identification of a need and continues through planning, preparation of specifications/ requirements, budget considerations, selection, contract award, and contract management. It ends on the last day of the warranty period". Though there may be contracts with requirements for suppliers/contractors to meet their post-warranty obligations.

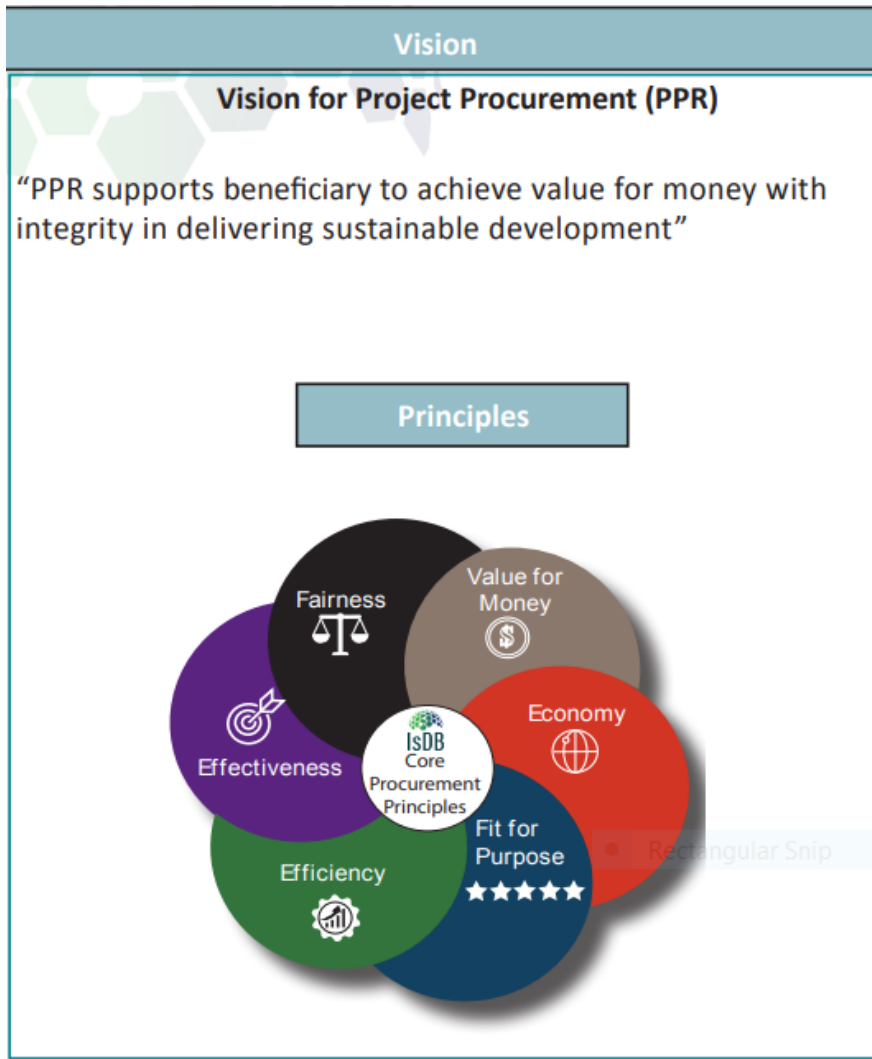
The main objective of this Guidance Note is to assist the beneficiaries in proper application on use of Life Cycle Costing (LCC) principles for the entire procurement cycle including in bidding documents, at evaluation stages in order for the Beneficiaries to incorporate these provisions in the contract and finally to ensure that these are implemented at the stage of performance and guarantee tests.

This Guidance Note provides suitable cases and examples and templates to apply and track LCC principles for the entire procurement process to achieve VfM.

This Guidance Note is consistent with the requirements of "Operational and Strategic Concepts in Project Procurement" issued in June 2020 with a vision for Project Procurement (PPR) as depicted in the following diagram:

¹ Article 12 of the IsDB Articles of Agreement states that "IsDB has an obligation to ensure that its resources and facilities are used only to their intended purposes."

² [Project Procurement \(isdb.org\)](https://www.isdb.org)



As per the above vision statement “PPR supports beneficiary to achieve value for money with integrity in delivering sustainable development. In accordance with Paragraph 2.83 of Procurement Guidelines (April 2019) “... evaluation and comparison of Bids is used to determine the cost to the Beneficiary of each responsive Bid in a manner that permits a comparison on the basis of their evaluated cost in order to select the Bid offering maximum VfM”.

Application of Life Cycle Costing in procurement is critical for achieving VfM and for sustainable procurement. Goals of Sustainable Public Procurement typically focus on reducing demand for resources and minimizing any negative impact of goods, works and services across their life cycle.

1.2 Applicability- when to use LCC?

While the concept of Life Cycle Costing is valid for any kind of project as part of project design, for example in the building and construction assets, in the context of procurement, its application is relevant for contracts where operating and maintenance cost in terms of consumption of electrical energy, fuel, water, chemical is a significant cost over the life of the asset compared to the initial cost of the facility.

Few examples are: Combined Cycle Power Plant or a Waste Water Treatment Plant. The procurement of these facilities typically follows Standard Bidding Document for Procurement of Plant Design Supply and Installation which may include responsibility of operating and maintaining plant for initial years or a contract for Design, Build and Operate (DBO). In procurement of Goods a typical example is Power Transformer where transformer losses need to be minimized over the life of the asset or procurement of a construction equipment that has maintenance and fuel consumption as a significant cost.

In all the above cases, the application of LCC in procurement needs to incentivise reduced consumption of a measurable and verifiable amount of electrical energy or fuel over the life of the asset, which is used as a factor in economic evaluation of bids offering equipment with varying efficiencies/consumption and to select a bid offering maximum Value -for-Money (VfM).

Further guidance on this topic is elaborated in Sections 2, 3 and 4 with examples

Section 2 – Important considerations and linkage of application of LCC

2.1 Important Considerations

For procurement of equipment and facilities following considerations are important for application of LCC:

- Where value of the contract is significant;
- Where there is potential for savings over the life-cycle of goods, works or services on energy water and fuel and further on maintenance and replacements;
- Equipment and facility are complex and specially engineered; and
- Subject to bidders meeting the specified technical requirement, advantages on efficiency parameters or lower fuel/power consumption as offered by bidder/contractor could be verified and demonstrated before taking over of the facility

In accordance with Guidelines and applicable bidding document, evaluation of bids may also include an assessment of life cycle costs. For example, in complex facilities and equipment following Plant Design, Supply and Installation of large value (say in a contract of above US\$10 million) the economic evaluation factors must contain incentive/advantage to those bids that offer equipment with better efficiency or lower consumption of fuel/electricity for the given output than specified. It is possible that in a very small value contract, like US\$1 million, the principle of LCC may be analysed and embedded as part of technical specification requirement requiring energy efficient equipment requiring a specified maximum consumption of electricity or fuel for a given output at specified conditions.

To elaborate further the above considerations, the principle of VFM does not necessarily mean selecting the lowest price, but rather total cost of ownership (or lifecycle cost) over a specified period, generally the useful life of an asset. VFM represents the optimum combination of total cost of ownership and quality (or fitness for purpose) to meet the buyer's requirements. It allows the relative benefits of different Bids/Proposals to be measured by taking into account all costs including for example: a) purchase price or upfront costs of acquisition; b) installation and commissioning costs; c) cost of operation and maintenance including costs of materials, servicing, spare parts, etc. over the useful life: and d) sustainability savings e.g. lower fuel consumption: Life-cycle costing should be used when the costs of operation and/or maintenance over the specified life of the Goods or Works are estimated to be considerable in comparison with the initial cost and may vary among different Bids/Proposals. It is evaluated on a net present value (NPV) basis. The economic evaluation factors should capture key parameters and provide a quantitative measure (in Dollar terms), a methodology to evaluate bids offering different efficiency and consumption, while these bids meet the requirements of technical specification.

Based on ISO 15686-5³, the potential for value improvement is maximum at design appraisal stage. A supplement to ISO has been published as Standardized Method of Life Cycle Costing for Construction Procurement for guidance.⁴ Technical specialist and consultant of Beneficiaries need to consider the method of analysis recommended in these publications

Therefore, application of LCC has to be incorporated in the first instance as part of procurement planning and strategy and then for all the subsequent phases of procurement cycle till the facility is taken over. The above concept on importance of LCC is reinforced further with paragraph 3.2.2 on Strategic Assessment of IsDB document on Sustainable Procurement⁵ which states that: "The objective of assessing sustainability needs in the first stage is to identify the significant sustainability impacts and issues that occur and the opportunities to manage them. The Beneficiary should develop a prioritized

³ ISO 15686-5 Building and Constructed Assets- Part 5- Life Cycle Costing (First edition 2008-06-15)

⁴ Standardized Method of Life Cycle Costing for Construction Procurement (PD 156865) – A Supplement to BS ISO 156865- Building and Construction Assets – Service Life Planning- Part 5 Life Cycle Costing (2008)

⁵ Guidance Note on Social, Gender and Sustainable Public Procurement in Islamic Development Bank

list of sustainability needs, opportunities and risks and designs how these will be managed throughout the procurement process. To minimize subjectivity when analyzing sustainability impacts: (i) Refer to previous requirements/specifications and determine what worked well and what could be improved; (ii) examine the key sustainability impacts at each stage in the life cycle, from raw components to delivered products and through to the process of disposal; and (iii) inquire with a wide range of manufacturers, vendors, industry experts, and end-users about new and innovative approaches”.

Sustainable procurement considerations are embedded in the Standard Bidding Document as **sustainable procurement technical requirements** as part of Technical Specification generally as a pass/fail criterion, and if possible, monetary adjustments may be applied to Bid Prices for comparison purposes on account of Bids that exceed the specified minimum requirements.

2.2 Linkage of LCC principles to Guidelines and Standard Bidding Documents

The Bank’s Guidelines for Procurement of Goods and Works which call for obtaining maximum Value for Money (VfM) under IsDB financing by effective, efficient and economic use of resources. This requires an evaluation of relevant cost and benefits, along with an assessment of risks and non-price attributes including life-cycle costs. In such cases lowest price alone may not necessarily represent VfM.

Application of LCC principles is referenced in following Guidelines, Standard Bidding Document and Guidance as per New Procurement Framework:

- Guidelines for Procurement of Goods, Works and Related Services paragraphs 2.83 and 2.86 (April 2019)
- Standard Bidding Document for Plant Design, Supply and Installation (January 2019) Section III (One Stage Bidding and Two Stage Bidding)
- Standard Bidding Document for Procurement of Goods and Related Services (January 2019) Section III
- NPF Training Material on Procurement Strategy and Procurement Plan (PS-PP) and Guidance Note – April 2019

Paragraph 2.83 of the Guidelines as quoted in previous section requires determination of the cost to the Beneficiary of each responsive Bid in a manner that permits a comparison on the basis of their evaluated cost in order to select the Bid offering maximum VfM. In accordance with paragraph 2.86 from Guidelines for Goods and Works: “In addition to the Bid price, adjusted for arithmetical errors, other factors may be taken into consideration, such as the time of completion of construction, the reliability of construction methods proposed, payment schedules, delivery times, operating costs or the efficiency and compatibility of the equipment, the availability of service and spare parts, and related training for technology transfer and safety. To the extent practicable, these factors shall be expressed in monetary terms according to criteria specified in the Bidding Documents”

Beneficiaries need to refer to relevant provisions of bidding document for application of LCC. These are explained with examples in later sections. Extracts from Bidding Document for Plant, Section III Evaluation and Qualification Criteria is given at ANNEX

Section 3 –Application of LCC in Procurement Process – Critical Points to be considered

3.1 Procurement Process

The procurement process is defined as “The whole Procurement lifecycle that starts with the identification of a need and continues through planning, preparation of specifications/ requirements, budget considerations, selection, contract award, and contract management. It ends on the last day of the warranty period”.

This section describes in brief the points to be considered by the Beneficiary and their technical consultants at each stage of the procurement process. These are elaborated further with suitable examples in subsequent sections with regard to appropriate application as a criterion in economic evaluation of bids

3.2 Project Concept and Design and Procurement Strategy Stage

At project concept and design stage of the project, the Beneficiary and their project preparation consultants need to assess appropriate procurement arrangements based on nature of the project to deliver better outcomes.

Beneficiaries need to consider and check the following aspects:

- To examine if LCC tools for international standards such as (BS ISO 15686-5)⁶ at design/ concept stage to find choices between alternative designs, alternative components all of which have acceptable performance levels
- To identify items of plant and equipment where performance- based specification are appropriate.
- To examine for major plants and equipment for the project, if costs of operation and/or maintenance is significant compared to the initial costs for a facility and where use of LCC would bring substantial cost savings
- To ensure an industry/supplier engagement to guide procurement strategy to get a feedback from such engagement. For example, what could be an ideal plant configuration for a given range of output to lower capital cost, achieve higher efficiency resulting in lower fuel consumption and lower environmental pollution, shorter lead time for construction and modular installation, smaller number of operating and maintenance personnel, while maximizing competition and VfM.
- To examine contractual arrangements to be adopted to mitigate risks, delays and cost overruns in the plant construction contract.
- To examine options for a well thought out maintenance plan that increases availability of the plant after operational acceptance. For example, could there be a Maintenance Service Contract as part of initial selection, with limited operation support from the Original Equipment

⁶ Standardized Method of Life Cycle Costing for Construction Procurement (PD 156865) – A Supplement to BS ISO 156865- Building and Construction Assets – Service Life Planning- Part 5 Life Cycle Costing (2008)

Manufacturer (OEM) based on industry practice to coincide with extended defect liability period (3-7 years).

- The objective at this stage should be examine all options to deliver a quality infrastructure to provide services as per performance standards over the useful economic life of the asset.

Beneficiary should examine all the above aspects as part of Procurement Strategy- Procurement Plan (PS-PP) Template under the section Value-for- Money (VfM)

3.3 Bidding/Tender Document Preparation and Review stages:

The Beneficiary at this stage needs to decide use of appropriate Standard Bidding Document and adapt or modify the specific clauses consistent with the requirements of Technical Specification/ Employer's Requirement. The adaptation or modifications are to be carried in Bid Data Sheet, Evaluation and Qualification Criteria, Bidding Forms, Price Schedules Particular Conditions to prepare a fit-for-purpose bidding document.

For example, for facility like Combined Cycle Power Plant, Water Treatment Plant use of Plant Design, Supply, Installation (DSI- one stage or two stage bidding) may be adopted as justified. If responsibility for Operation and Maintenance for a specified period (like 3-7 years) is to be entrusted to the same bidder/contractor who is responsible for DSI, the bidding document needs to be modified as indicated above.

The Beneficiary needs to ensure that:

- Related to application of LCC, the different sections of bidding/tender documents, like Employer's Requirements/Technical Specifications, Instructions to Bidder/ Bid Data Sheet, Economic Evaluation Criteria, Functional Guarantees (on Output, efficiency/major items of consumption like water, energy, chemicals for the rated output and compliance to environment norms) are consistent.
- LCC principles are followed as a factor in evaluation in choosing the firm providing the best Value-for-Money and the selected firm is required to take responsibilities, which are verifiable and demonstrable, in execution of contract which is the basis of selection.

Beneficiary's procurement staff and technical specialist need to pay attention to provisions referred in the following paragraphs related to Procurement of Plant Design Supply Installation- One stage Bidding (April 2019). Similar provisions are applicable for Two Stage Bidding and similar principles are applicable for Goods document (like for procurement of Power Transformer or Construction Equipment), in accordance with Standard Bidding Document Section III on Evaluation and Qualification Criteria

- **Employer's Requirements/Technical Specifications:** The procurement staff and technical specialist of the Beneficiary need to analyze and understand process flow, output, efficiency, environmental norms and check factors that are to be used a factor for economic evaluation of bids related to LCC and factors that used a Functional Guarantee. Functional Guarantees are part of technical specification to be demonstrated in accordance with General Condition GC 5.3 at the time of performance and guarantee test. Some of the Functional Guarantee requirements like efficiency or fuel and power consumptions are specified as economic evaluation criteria (defined as FUNC in Section IV of Bidding Form).

- **Instructions to Bidder/ Bid Data Sheet ITB/BDS 17 on Bid Prices and Discount:** In case Operation and Maintenance services for a specified period after the operational acceptance is required to be entrusted to the same bidder/contractor responsible for construction of facility, an additional price schedule needs to be added, with a method of quoting prices for each year and formula given under evaluation criteria to discount such O&M services to arrive at Net Present Value of such future costs. The additional Price Schedule in Section IV should indicate in a table the different elements of prices to be quoted by bidders for each year as per the requirements/scope of operation/maintenance services

- **Instructions to Bidder/ Bid Data Sheet ITB/BDS 26.8 on Bid Opening: BDS to be modified to state that** Guarantee figures used in Economic Evaluation any other critical parameters like output/availability shall be read out at the time of bid openin (Refer Form FUNC in Section IV Bidding Form)

- **Instructions to Bidder ITB 35 on Technical Evaluation:** These provisions *inter alia* requires overall completeness and compliance with the Employer’s Requirements; conformity of the Plant and Installation Services offered with specified performance criteria, including conformity with the specified minimum (or maximum, as the case may be) requirement corresponding to each functional guarantee, as indicated in the Specification and in Section III, Evaluation and Qualification Criteria; suitability of the Plant and Installation Services offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the Bid.

The procurement staff of the Beneficiary need to discuss with technical specialist the required performance criteria which are factors for performance guarantee and as economic evaluation criteria

- **Economic Evaluation Criteria Section III Evaluation and Qualification Criteria Section 1.2 (b) on Life Cycle Costing**

These provisions stipulate following options: Option 1 or Option 2 or any other. Option 1 is described as under:

Option 1:

The operating and maintenance costs factors for calculation of the life cycle cost are:

- (i) number of years for life cycle: ____ *[Insert number of years]*
- (ii) operating costs *[state how they will be detrmined]*
- (iii) maintenance costs, including the cost of spare parts for the initial period of operation *[state how they will be determined]*, and
- (iv) Discount rate: _____ *[insert discount rate in percent]* to be used to discount to present value all annual future costs calculated under (ii) and (iii) above for the period specified in (i).

Beneficiary should select this option when operation and maintenance services is the responsibility of bidder/contractor for a stated number of years (like 3-7 years). In that case a table on method discounting future prices should be specified as part of economic evaluation criteria. If bidders/contractors are not responsible and accountable for O&M services, Option 1 is not applicable.

Option 2

The comparison and evaluation of bids offering efficiency or consumption better than specified may be used as stated in technical specification/Functional Guarantee by using Option 2

The factors like years for life cycle, efficiency/fuel consumption and applicable discount rate may be used in engineering/financial calculation to determine advantage to be given to bidders for each percentage of higher efficiency or lower fuel consumption, which are guaranteed and verified before the facility is taken over by the Employer

The comparison and evaluation of bids offering efficiency or consumption figures better than specified may be used as stated in technical specification/Functional Guarantee by using Option 2. The Standard Bidding Document stipulates the following table for Functional Guarantee of the facilities:

Functional Guarantees of the Facilities: The minimum (or maximum) requirements stated in the Specification for functional guarantees required in the Specification are:

Functional Guarantee	Minimum (or Maximum, as appropriate) Requirement
1.	
2.	
3.	
...	

These provisions stipulate that for the purposes of evaluation, for each percentage point that the functional guarantee of the proposed Plant and Installation Services is below the norm specified in the Specification and in the above table, but above the minimum acceptable levels also specified therein, an adjustment of _____ will be added to the Bid price. If the drop below the norm or the excess above the minimum acceptable levels is less than one percent, the adjustment will be prorated accordingly.

The same principle of adjustment to bid price due to “ the drop below the norm or the excess above the minimum acceptable levels” may be adopted by making no adjustment to bid price for a responsive bid that has offered the best efficiency or lowest fuel/electricity consumption, and an adjustment applied by a prespecified monetary value (representing Net Present Value of each percentage point of lower efficiency or higher fuel/electricity consumption, over the life of the asset, compared to the best offered efficiency or consumption figures). This is a simplified method that permits a comparison on the basis of the evaluated cost in order to select the Bid offering maximum VfM.

Functional Guarantees (on Output, efficiency/major items of consumption like water, energy, chemicals for the rated output and compliance to environment norms) needs to analyzed in consultation with technical specialist and adjustment factors specified as a dollar figure in this Section III.

A simplified differential price adjustment approach is explained with an example in **Section 4** of this Guidance Note.

- **Section IV on Bidding Forms – Form FUNC on Functional Guarantees**

This section of Bidding Forms stipulates that the Bidder shall copy in the left column of the table below, the identification of each functional guarantee required in the Specification and stated by the Employer in Section III, Evaluation and Qualification Criteria, and in the right column, provide the corresponding value for each functional guarantee of the proposed plant and equipment.

Functional Guarantee [as required by the Employer in Section III]	Functional Guarantee value offered by the Bidder
1.	
2.	
3.	
...	

(The above table should be read out at the time of bid opening for each bidder and this table should identify those guarantees which are factors in economic evaluation (like efficiency/consumption of fuel or electricity) and others to determine the responsiveness to meet the critical technical parameters like output and environment norms (all these parameters should be part of Appendix 8 on Functional Guarantees)

- **Sustainable procurement:** This part of economic evaluation criteria stipulates that if specific sustainable procurement technical requirements have been specified in Section VII- Specification, Beneficiary should either state that (i) those requirements will be evaluated on a pass/fail (compliance basis) or otherwise (ii) in addition to evaluating those requirements on a pass/fail (compliance basis), if applicable, specify the monetary adjustments to be applied to Bid prices for comparison purposes on account of Bids that exceed the specified minimum sustainable procurement technical requirements. However, such monetary adjustment should be based on justified criteria and not arbitrary

- **General Conditions 5.3 on Functional Guarantees:** These provisions inter alia states that if, for reasons attributable to the Contractor, the Functional Guarantees specified in the Appendix to the Contract Agreement titled Functional Guarantees, are not attained either in whole or in part, but the minimum level of the Functional Guarantees specified in the said Appendix to the Contract Agreement is met, the Contractor shall, at the Contractor’s option, either(a) make such changes, modifications and/or additions to the Facilities or any part thereof that are necessary to attain the Functional Guarantees at its cost and expense, and shall request the Employer to repeat the Guarantee Test or (b)pay liquidated damages to the Employer in respect of the failure to meet the Functional Guarantees in accordance with the provisions in the Appendix to the Contract Agreement titled Functional Guarantees.

The figures for liquidated damages failure to meet the Functional Guarantees as specified in Particular Condition and in Appendix should be either the same as value used for economic evaluation criteria or maximum 1.5 times of such values. For Functional Guarantee figures which are not used for economic evaluation like guaranteed availability or output should be related a genuine pre-estimate of revenue loss to the Beneficiary and not punitive or arbitrary.

- **Defect Liability Period:** Based on the provisions of Standard Bidding Document (GC/ PC 5.2.2), the Defect Liability Period shall be five hundred and forty (540) days from the date of Completion of the Facilities (or any part thereof) or one year from the date of Operational Acceptance of the Facilities (or any part thereof), whichever first occurs, unless specified otherwise in the PC pursuant to GC Clause 5.2.10.

The Employer/ Beneficiary should not extend the Defect Liability Period beyond the period prescribed in GC Clause 5.2.2, except where it is commercial practice for critical components in that type of Facilities, and in which case the relevant period shall be specified in the PC under GC Clause 5.2.10

The critical components covered under the extended defect liability needs to be specified in PC or a reference should be made to the related paragraph in the Employer's Requirements], and the period shall be limited shall not exceed five (5) years. (This provision is to be inserted in PC only when an extended defect liability is requested).

It is recommended that in case where responsibility for Operation and Maintenance Services is given to the Contractor responsible for construction of the facility, extended defect liability period may be matched with period for which O&M services are envisaged after Operational Acceptance for better accountability and responsibility of the contractor and to minimize disputes.

- **Section X Contract Form: Appendix 8 on Functional Guarantees:** The text in Appendix 8 of Standard Bidding Document is related to a process plant facility. The terminology used in this section on output, availability, efficiency, fuel consumption should be based on the technical specification and functional guarantees as per Employer's Requirement and these provisions should be consistent with the applicable section of the Technical Specification.

In general, this Appendix sets out(a)the functional guarantees referred to in GC Clause 5.3 (Functional Guarantees); (b)the preconditions to the validity of the functional guarantees, either in production/output and/or consumption; (c)the minimum level of the functional guarantees(d) the formula for calculation of liquidated damages for failure to attain the functional guarantees.

Failure to Attain Functional Guarantees: It is possible that based on guarantee tests the Contractor is not able to achieve the Functional Guarantee figures as per the contract and as offered at the time of bidding, but still it meets technical specification requirements, in that case if Contractor elects to pay liquidated damages to the Employer in lieu of making changes, modifications and/or additions to the Facilities then the Contractor shall pay liquidated damages at the rate which is equivalent to those used as economic evaluation factor or maximum 1.5 times of such factor for each unit of deficiency (like for reduced efficiency or higher fuel consumption).

If any amount is specified for Functional Guarantee related to other factors like output or environmental norms, any figure which is specified should be justified and represent a genuine pre-estimate of loss to the Beneficiary (like revenue losses) and not punitive.

Appendix 8 on Functional Guarantee provides that a rate be specified. Similarly, for capacity/consumption parameters there is a range given (95% or 105%) which are outer limits. These figures or percentage needs to be defined in the bidding document carefully to provide an incentive for bidders to carefully design and manufacture the facility to stay within the range and not pay LD

Bidding document stipulate Liquidated Damages for Shortfall in performance for different parameters like efficiency, consumption, output which might be a specified figure or a percent of contract price, with overall limit generally as 10% of contract price

Appendix 8 on Functional Guarantee provides that a rate be specified. Similarly, for capacity/consumption parameters there is a range given (95% or 105%) which are outer limits. These figures or percentage needs to be defined in the bidding document carefully to provide an incentive for bidders to carefully design and manufacture the facility to stay within the range and not pay LD

Technical consultant of the Beneficiary needs to cross -refer Appendix 8 with economic evaluation criteria and performance guarantee section of the technical specification and ensure consistency among these provisions referred above.

3.4 Bid Opening, evaluation and award of contract stage:

To examine if evaluation methodology related to LCC is applied transparently and as per specified evaluation criteria in bidding document in determination of winning bid. In particular, Beneficiary needs to ensure the following:

- Evaluation methodology related to LCC is applied transparently – bidders understand its application upfront – need to include it as part of bidding document and explained in pre-bid conference (refer to **Annex** that provides an illustration on how bids would be evaluated including those related to)
- Guaranteed figures (like fuel consumption, heat rate, efficiency) which are used as factors in economic evaluation of bid are read out at the time public bid opening and recorded in minutes (Form FUNC – on performance guarantee)
- Apply LCC strictly as per the methodology described in economic evaluation criteria- no clarification should be asked on guarantee figures as read out at the time opening that will change the substance of the bid
- Check if bidders have provided the same figures on consumption like on chemical consumption or electricity consumption (even to the last decimal points) or if there is wide variation which is technically unexplainable. Beneficiaries need to highlight these situations in the evaluation reports to be submitted to IsDB for appropriate resolution in accordance with Guidelines for Procurement
- To incorporate conditions of performance guarantees in the contract in Particular Condition or Appendix, Employer’s Requirements/ Technical Specifications which are consistent which do not vary from the conditions which were the basis of evaluation and comparison of bids
- To avoid complaints through transparent handling and expeditious decision on award of the contract

3.5 Contract Implementation, performance guarantee including post-warranty stage

To Implement the contract, as per agreed conditions. In particular, in the context of LCC and VfM, to ensure the following:

- Suitable mechanism exists on contractor following adequate quality control measures in sourcing, manufacture and installation of facility to provide an assurance that facility as delivered meets the specification and quality standards for the intended life of the asset.
- To check compliance of guarantees and performance at the stage of inspection and/or factory acceptance test

- That the contractor fulfilled its obligation as per contract terms and performance guarantees were met
- That in case of shortfall applicable liquidated damages are applied.
- Contractor meeting the availability, extended warranty and any other post-warranty obligations
- Service agreements are in place to properly maintain and service the facility

3.6 Sine Qua Non (Indispensable conditions)

The application of LCC as described above must be accompanied by the following Sine Qua Non.

Indispensable Conditions and Qualification- LCC: For any meaningful life-cycle costing in procurement as concept of quality starts at the project design and technical specification stage, important considerations to ensure quality and life of the equipment/facility are as under:

- (i) Performance – based specifications;
- (ii) Use of international codes and standards;
- (iii) What kind of type tests are to be specified in the bidding document that provides evidence of a proven design;
- (iv) Incorporation of quality plan as part of bidding document to be used as a basis for inspection (example, what tests are required at material induction stage, what tests are to be witnessed by the Employer or his representative before critical items are shipped);
- (v) Define codes and standards for testing in factory or as part of performance and guarantee test;
- (vi) How proven is the factory where items are manufactured?
- (vii) What are the qualification and experience requirements for the bidders?
- (viii) What is the proven-ness of critical components supplied by the manufacturer and more importantly the sub-vendor?
- (ix) Need for extended warranty on critical component, servicing/overhaul agreement to extend life of the product;
- (x) Training of Operational and Maintenance personnel of the Beneficiary before the facilities are taken over.

These important provisions are required to be examined and incorporated as applicable as part of Bidding Document/ Technical Specifications/Employer’s Requirements in combination with guidance similar to ISO 15686-5 as per international industry codes and standards and good practices.

The technical consultants of the Beneficiary are expected to examine the above indispensable conditions as part of the task on preparation of the Technical Specification/Employer’s Requirements and in contract implementation

Section 4 – How to use LCC as a factor in economic evaluation of bids?

4.1 Framework and Methodology of evaluation

This section describes with examples how to use LCC as a factor in economic evaluation of bids, how to evaluate different options in aggregating the combination of initial cost and differential cost between bids offering varying efficiencies, consumption of fuel/electricity and consequences of not meeting functional guarantees. The purpose of this section is also to illustrate how to simplify the evaluation criteria by following an approach which is consistent with the provisions of the Guidelines/Standard Bidding Document.

It is essential that the comparison of bids is carried out based on provisions in bidding document which are contractually binding between the bidder and Purchaser/Employer with a view to select the Bid offering maximum Value-for- Money (VfM).

It is the relative benefits of different Bids/Proposals which needs to be evaluated. In accordance with Paragraph 2.83 of Procurement Guidelines (April 2019) “... evaluation and comparison of Bids is used to determine the cost to the Beneficiary of each responsive Bid in a manner that permits a comparison on the basis of their evaluated cost in order to select the Bid offering maximum VfM”.

In any process there are three main parameters which are related to application of LCC:

- *Output/Capacity*: This is defined as required by the technical specification requirements. Depending upon the requirement there may be margins specified which are acceptable;
- *Efficiency or consumption of fuel, electricity or water per unit of output*;
- *Environmental (like noise, emission, odour)* as determined by the technical specification with margins, but required to be within limits.

The procurement experts of the beneficiary and their technical consultants need to interact at the stage of preparation of bidding document, to understand the process diagram of the facility, output/capacity, efficiency/consumption and environmental parameters to determine factors that are to be used as factors for economic evaluation of bids. These factors are part of technical specification requirements and functional guarantee.

In the context of application of LCC as economic evaluation criteria technical specification is a pass/fail criterion like output and capacity (generally within margins). Functional Guarantee like efficiency or consumption of fuel may be offered by competing bidders as better than specified efficiency or lower than specified consumption

Whereas it is possible to calculate the measurable economic cost of lower output/capacity and lower efficiency or increased consumption of fuel and electricity, the environmental parameters/norms are set by regulations. For any environmental parameters which in actual is better than required, it is difficult to quantify the measurable economic benefit. But based on sustainability criteria, there may be a possibility to specify advantage to be given for environmental norms which are better than the norm.

Any other factor which are neither demonstrable nor verifiable have got no relevance as a factor in deciding the bid providing best VFM (examples: Operations and Maintenance cost in future which is

beyond the contractual period or an assumed fixed percentage of O&M cost as a fixed percentage of initial cost or an estimated overhaul cost say after 15 years facility being in operation for which Contractor is not responsible).

The purpose of evaluation is not to determine a total cost of ownership (initial cost plus operation and maintenance cost minus residual value at the end-of-life cycle), as absolute figure which may not be contractually binding. These absolute figures may have relevance in assessment for economic or financial analysis for determination of rate of return, based on the quoted price of bids or value of contract to be awarded

In practice, as economic evaluation factor, there is a need to carry out an engineering/economic calculation to determine benefit to the Beneficiary for saving for each percentage point increase in efficiency or lower consumption (of fuel/electrical energy) to compare bids offering varying efficiencies/consumption. The evaluation process requires comparing these savings/benefits as Net Present Value (Dollar / unit of saving) over the life of the asset by using discount rate is as a proxy for average cost of borrowing for the Beneficiary.

An Illustration on Application of LCC as Economic Evaluation Criteria

As an illustration in a simplified example suppose a coal-based power plant needs to have a capacity of 500 MW with a maximum heat- rate of 2500 kcal/kWh (heat energy input per unit of electrical energy output) for a specified coal quality and operating conditions.

It is possible that employer specifies that any facility offering a capacity of less than 500 MW is unacceptable. Further based on Life-Cycle Costing (and economic modeling) a dollar value (say US\$100,000) for each kcal/kWh is specified in the bidding document as economic evaluation criteria for any machine offering a heat rate better than the maximum. In comparison of bids a bidder (A) offers say a heat rate of 2450 kcal/kWh and another bidder (B) offers 2350 kcal/kWh.

In the given example, suppose both the bids are offering machines of required output and both bids are responsive. As an application of Life-Cycle Costing, on the bid price of bidder (A) an amount of US \$ 100,000 X 100 = US\$ 10,000,000 will be added to compare the bid which offers a better heat rate (efficiency) for comparison.

This heat rate for both the bidders should be based on their past data on similar machines, demonstrable at the time of factory test/performance and guarantee test. If bidder (B) is a winning bidder and at the time of Performance and Guarantee test the achieved heat rate is say 2400 kcal/kWh, the Contractor will be liable for payment of Liquidated Damages for Shortfall in performance at a pre-specified rate say in the range of 1.5 times of the rate specified for evaluation (or at least equivalent to the rate specified for evaluation).

For example, if the rate specified was US\$ 150,000 for each kcal/kWh in the given case, the contractor would be required to pay LD of US\$ 150,000 X 50 = US\$7,500,000

Technical specification criteria/requirements should be embedded as: (i) specifying minimum required efficiency or maximum fuel or chemical consumption, specified output (within a range) or minimum availability; (ii) incorporating energy efficient products with proven performance for minimizing Life

Cycle Cost; or (iii) other requirements for replacement of wear parts that fail earlier than guaranteed hours

Environmental norms on emission to be complied with as required by regulations

Example of Procurement of Combined Cycle Power Plant following Plant Design Supply and Installation

In the context of LCC, the main objective of economic evaluation is to compare bids by adding to initial cost the Net Present Value the differential cost (relating to efficiency, consumption of fuel, electricity) among competing technically and commercially responsive bids/proposal. The efficiency, consumption figures should be demonstrable before taking over of the facility and not just a promise in future when contractors have no relationship with the Employer. For example, if a contractor is responsible for one year of operation after design-build stage, the Operator needs to demonstrate the efficiency or consumption figures which was the basis of economic evaluation and in case of shortfall liquidated damages needs to be applicable which represents loss to the Employer as NPV of shortfall on promised guarantee.

For complex facilities (like Combined Cycle Power Plant), it is best to use differential NPV cost for heat rate/efficiency that stipulates economic advantages of better heat rate (like kcal/kWh or kj/kWh) where no cost compensation is done to the most efficient facility and a pre-specified dollar value (which is calculated for advantage over the life of the plant) is added to those facilities that offer less efficient machines (or worse heat rate) compared to the best (Option 2 of economic evaluation criteria). In this differential cost method, there is no need to include the complex economic model in the bidding document. Technical/economic calculation to arrive at evaluation factor which is NPV of dollar value for each unit of better efficiency, should be prepared by technical consultant of the Beneficiary and these calculations are an internal document of the Employer/ Beneficiary. In such a complex facility Option 1 of total cost of owning (NPV of Operating and Maintenance for life of the asset) is not applicable

Combined Cycle Power Plant produces electricity and uses both a gas turbine and a steam turbine together to produce up to 50% more electricity from the same fuel than a traditional simple -cycle plant with only a gas turbine. The gas turbine compresses air and mixes it with fuel that is heated to a very high temperature. The hot air-fuel mixture moves through the gas turbine blades, making them spin. The fast-spinning turbine drives a generator that converts a portion of spinning energy into electricity. A Heat Recovery Steam Generator (HRSG) captures exhaust heat from the gas turbine that would otherwise escape through the exhaust stack. The HRSG creates steam from the gas turbine exhaust heat and delivers it to the steam turbine. The steam turbine sends its energy to generator drive shaft where it is converted into additional electricity

A simplified example with the parameters of range of output and guaranteed net heat rate at specified site conditions of a Combined Cycle Power Plant is as under:

- (1) **Guaranteed net** total base load capability at site Condition (35°C, 1,013 bar, 98% relative humidity)

For Combined mode. : 450±20% MW

- (2) **Guaranteed net heat rate** at site Condition (LHV, 35°C, 1,013 bar, 98% relative humidity) Shall be without introducing any ancillary equipment, such as water/steam injection, evaporator, chillier

etc for combined mode. : < 6700kj/kwh

The above figures show a range of output 450±20% MW and maximum heat rate < 6700kj/kwh, which is the amount of thermal energy required for producing one unit of electricity. A higher thermal energy would require more fuel consumption. In this case the bidders are required to offer a Combined Cycle Power Plant that minimizes fuel consumption and output is in the given range.

For evaluation and comparison of say two bids, a bid offering maximum VfM would be one that would minimize the combination of initial cost of the facility with net present value of annual fuel consumption. As an evaluation factor in LCC, minimizing fuel consumption is critical as NPV of such costs may be in the range of 60-70% of total evaluated cost on the basis on initial cost plus NPV of fuel cost over the life of the asset.

The bid with the lowest cost per kW (output) of such combination of initial cost and NPV of annual fuel cost is selected for award.

In the given example there are other parameters as Functional Guarantees like Plant Availability and Emission Norms, all of which must be met and demonstrated before the facility is taken over by the Employer.

For this example, the Employer used a formula to combine the initial cost with the NPV of annual fuel consumption and Operation and Maintenance cost that has several variables like plant life of 25 years, plant load factor, cost of natural gas, need for using a weighted net heat rate as plant would operate at varying load conditions where heat rate vary, and a discount rate, which is the average cost of borrowing for the Employer.

In the given case, use of a detailed formula (sometimes with inclusion of annual operating and maintenance for, which is constant for all bidders) is unnecessary and there is a need to simplify the evaluation criteria by selecting only those parameters for evaluation and comparison of bids that differ between say two bids (or more), like heat rate or fuel consumption.

How to simplify the evaluation criteria?

The evaluation should be carried out by specifying a figure in money terms that represents an adjustment for better heat rate in terms of US Dollar or local currency value for each unit of kJ/kwh (heat energy per unit of electricity), which represents saving of fuel as NPV over the life of the asset.

It is recommended that under Option 2 of economic evaluation criteria in Section III of the Bidding Document an amount in USD or local currency be specified. The Beneficiary may provide a basis for arriving at such figures in Technical Specification without any need for giving a detailed formula.

As a simplified example, based on technical consideration and financial calculation, if a figure of USD 100,000 is arrived at (without considering weighted average of heat rate at varying load conditions), for each unit of kJ/kwh (heat energy per unit of electricity), which represents saving of fuel as NPV over the life of the asset (25 years), this value may be specified in Section III Option 2 and the basis of arriving at figures explained in the Technical Specification. The bidder in its offer shall guarantee other parameters like output and environmental norms as per Functional Guarantee/ technical Specification including the heat rate which shall be read out at the time of bid opening

In the given case no adjustment for a Bidder B shall be made that offers the best heat rate like 6000 kJ/kWh (which is less than specified **6700kJ/kwh at 100 % load**) and making an adjustment for other **Bidder A which offers heat rate like 6500 kJ/KWh**, as US\$ 100,000X 500= US\$ 50,000,000 to be added to the initial cost of Bidder A for comparison of evaluated cost. The value of US \$ 50 million = LC 5000 million at 1 USD = 100 Local Currency (LC). The evaluated position is as under:

Figures in Million LC

Bidder	Evaluated Initial Cost (assume no adjustment on bid price)	Adjustment as NPV for better heat rate		Evaluated cost	Output in MW	Evaluated cost LC/MW
Bidder A	20000	5000		25000	400	62.5
Bidder B	24000	NIL		24000	400	60.0

The above output is within the range of minus 20% of specified output of 450 MW and heat rates are within the specified limits of the bidding document

In the given example, **Bidder A** has offered a lower initial cost, but considering NPV of advantage for better heat rate and lower fuel consumption, the bid with the lowest evaluated cost combination, which is **Bidder B** is considered as bid offering maximum VfM and selected for award at the offered bid price of 24000 million LC (as per bid in foreign and local currencies)

At the time of performance and guarantee tests, **Bidder B** must meet the Functional Guarantee including the heat rate. In case of shortfall from the offered/guaranteed figures the contractor (Bidder B) shall pay liquidated damages as specified (1.5 times the figure used for evaluation) each unit of kJ/kwh (heat energy per unit of electricity) for example USD 150,000 given in the Functional Guarantee table. If **Bidder B** achieves a heat rate of 6100 kJ/kWh instead of guaranteed 6000 kJ/kWh, an amount of USD 100 X 150,000= USD 15 million is payable to the Employer by **Bidder/Contractor B**

The Contractor shall also be required to pay any other Liquidated Damages for Shortfall in performance like if Output as achieved in Performance and Guarantee Test is 395 MW instead of 400 MW the unit then a prespecified amount like USD 1 million for each MW of shortfall which is USD 5 million shall be payable by Bidder/ Contractor B. However, Beneficiaries should indicate a figure of such liquidated

damages in the Functional Guarantee table which is reasonable as a genuine pre-estimate of loss suffered by the Beneficiary/Employer and not a punitive amount

The contractor is also required to achieve specified and guaranteed emission limits including stack emission, NOx, Co, CO2, thermal emissions, noise

The Contractor's aggregate liability to pay liquidated damages for failure to attain functional guarantees is generally specified (in Contract Forms in Appendix 8) as 10% of the Contract price

Option 1 of evaluation criteria under Section Economic Evaluation Criteria is relevant provided O&M services is the responsibility of the contractor in the initial years (example 3 to 6 years)

An example

Net Present Valuation of the Operation Service Proposal Price, the annual amounts in the Operation Service price schedules, as adjusted in accordance with economic evaluation criteria and shall be discounted using a discount factor of [.....] %. The discount base year shall be the year preceding the first year of the Operation Service Period.

For greater certainty, net present values shall be determined by applying the following discount factors to the annual amounts in the Proposal forms during the Operation Service Period.

Operation Period	Discount factor to be applied
Year 1	
Year 2	
Year 3	
<i>etc.</i>	

This application is relevant for facilities like Waste Water Treatment Plant, Information System where the responsibility of O&M for a limited period is stipulated in addition to the responsibilities under Design-Supply-Installation contract.

For example, in case Procurement of Information Technology System, the LCC may be applied by adding follow-on costs, for example, three years of warranty period (N) plus three years of recurrent cost on post warranty Period (M) on the following basis:

The Evaluated Bid Price (C) for each responsive bid will be determined as the sum of the Adjusted Supply and Installation Costs (P) plus the Recurrent Costs (R)

The Recurrent Costs (R) are reduced to net present value and determined using the following formula:

$$R \equiv \sum_{x=1}^{N+M} \frac{R_x}{(1+I)^x}$$

Where,

N = number of years of the Warranty Period, defined in Special/Particular Conditions

M = number of years of the Post-Warranty Services Period, as defined in Special/Particular Condition

x = an index number 1, 2, 3, ... N + M representing each year of the combined Warranty Service and Post-Warranty Service Periods.

R_x = total Recurrent Costs for year “x,” as recorded in the Recurrent Cost Sub-Table.

I = discount rate to be used for the Net Present Value calculation, as specified in the Bid Data Sheet

In some cases, the Option 1 and Option 2 could be used in combination. Option 2 would capture the advantages due to better heat rate, lower fuel consumption, higher efficiency as NPV over the life of the asset, and Option 2 covers, NPV of O&M services provided by the bidder/contractor for a limited duration for which the contractor is responsible.

Section 5 – Role of Different Stakeholders

5.1 Role of the Bank

a) Role of the Regional Hubs and Sectoral Global Practices Departments:

- At the concept stage of the project, an analysis to be made to determine contracts where application of LCC will bring substantial savings in follow-on costs due to better efficiency of facility/items and lower consumption. During the project appraisal/preparation stage, a discussion to be held with Beneficiaries on applicability and relevance of LCC. An assessment should also be made whether the Beneficiary has experience of operating and maintaining the plant or there is a need for O&M contract.
- Should review the analysis made by the Beneficiary and/or Project Consultant on critical parameters to be considered for LCC i.e. output, efficiency, consumption, and environmental requirement before incorporating them into the Bidding Documents. Should ensure that bidding documents, including Invitation for Bids and price schedule are modified to allow for guarantee figures, which are factors for economic evaluation. Should also ensure whether need for O&M contracts for certain number of years, if required, are clearly specified in the Bidding Documents.
- Should ensure that the evaluation is carried out strictly in accordance with LCC criteria stated in the Bidding Documents.
- Should ensure that the Contract or Contracts include/s Functional Guarantee figures and Testing requirement and LD figures.
- Should ensure contract implementation in accordance with stated schedule of work.

b) Role of the Project Procurement Division:

- To participate in discussions, at the concept/appraisal stage of the project, on applicability and relevance of LCC.
- To develop methodology and approaches for use of LCC approaches. conduct workshop/capacity building session to Beneficiary's staff on use of LCC methodology, if need be.
- To ensure proper application of LCC in the Bidding Documents, including Invitation for Bids and respective contracts.
- To ensure that the evaluation is carried out strictly in accordance with LCC criteria stated in the Bidding Documents.

5.2 Role of the Beneficiary

- Should conduct analysis on critical parameters to be considered for LCC like output, efficiency, consumption and environmental requirement.
- Should develop draft Bidding documents taking into account guarantee figures, specification and Performance requirements.
- Should ensure that all guaranteed figures are read out at the time of bid opening and recorded in minutes of meeting, as this is a major factor in economic evaluation.
- Should conduct evaluation of bids strictly in accordance with LCC criteria stated in the Bidding Documents. There should be complete correspondence between prices quoted competitively and evaluated price for comparison. If O&M contract for certain period of

years is part of bidder's responsibility then the evaluation of bids should be on that basis after considering Net Present Value (NPV) of such costs.

- Should incorporate Functional Guarantee figures and Testing requirement and LD figures in the final contract before signature.
- Should implement the Contract in accordance with stated schedule of work with special attention on timely review of design/drawing by the employer, change in sub-vendor/subcontractor to be carefully review so that quality and proven-ness of critical components are not compromised. Regular factory visits to be undertaken to ensure that items are being manufactured.

5.3 Role of the Consultant to the Beneficiary

- Should determine or assist the Beneficiary in determining critical parameters to be used as economic evaluation criteria. Should also develop a back-up calculation and provide it to the Beneficiary for arriving at dollar value based on NPV or levelized cost basis.
- Should develop or assist the Beneficiary in developing draft Bidding Documents, which reflect all parameters of LCC.
- Should assist the Beneficiary, if required, in evaluation of bids in accordance with LCC criteria stated in the Bidding Documents.
- Should implement the Contract in accordance with stated schedule of work with special attention on timely review of design/drawing by the employer, change in sub-vendor/subcontractor to be carefully review so that quality and proven-ness of critical components are not compromised. Regular factory visits to be undertaken to ensure that items are being manufacture

The above roles and responsibilities are elaborated further in **Annex**

Section 6 – Check-list on Recommended Options on Use of LCC and examples

6.1 For Design- Supply Installation Contracts

The provisions under design supply installation contract have been covered in detail in Section 3 of this Guidance Note. Design Supply Installation like Combined Cycle Power Plant or Waste Water Treatment Plant or Underground Gas Storage Plant

- Use Option 2 of specifying a methodology with Functional Guarantee as an economic evaluation criterion.
- Bid offering best efficiency to be treated as base (zero adjustment/loading) in evaluation. Others to be cost compensated based on each percentage drop in efficiency (or part thereof) compared to the best efficiency based on a pre-specified dollar value (representing NPV loss over the life of the asset which is verifiable and demonstrable at the time of taking over of the facility),
- Provided the offered efficiency meets the minimum norm of efficiency or maximum consumption of fuel or chemical or electrical energy (Technical Specification requirement)
- In case of shortfall on Guaranteed value of Efficiency or increase in consumption in Performance and Guarantee test Liquidated damages for shortfall (at a pre-specified value representing NPV of losses over the life of the asset) to be paid by the Contractor at the time of taking over of the facility.
- In combination with Option 2 use Option 1 of adding Net Present Value of Operation and Maintenance Cost (exclude fuel cost) provided O& M is the responsibility of the contractor for a certain number of years (like 5 years based on the nature of the equipment and market practices)
- Such O&M cost (or Maintenance cost with limited operation staff support or just maintenance) is part of the economic evaluation of bids and the same bidder responsible for Design, Supply and Install takes the responsibility for initial years of operation and maintenance with a defined scope of services in the Employer's Requirement/Technical Specification
- For Design, Supply Install Contract for Information Technology System use the approach of aggregating initial cost with NPV of recurrent cost in initial six years.

6.2 For Supply of Goods and Equipment Contracts

The principles in case of Supply of Goods and Equipment are the same as Design, Supply Install contracts, which is to select critical parameters like efficiency and consumption of fuel/electricity which vary among different bids and use these as economic evaluation criteria Annex of this Guidance Note provides Extracts from Bidding Document for Goods Section III Evaluation and Qualification Criteria (January 2019). The recommended applications are described as follows

Use of LCC as Guaranteed Losses in Power Transformer

- Use a method of bidder providing a guarantee on transformer losses and NPV of such losses over the life of asset to be used a factor in evaluation and liquidated damages for excess losses compared to Guaranteed Figures to be deducted at the time of taking over. There are standard formula available and technical specialist can help the Beneficiary in selecting a formula based on design considerations that uses no load loss factor, load loss factor, power consumption of cooling equipment to arrive at a US\$ figure to calculate NPV cost of losses over the life of the asset. The reference

document of this Guidance Note provides a link to some of recommendations by major manufacturers, but Beneficiary should take help of technical specialist/consultants for appropriate application

Use of LCC as Performance and Productivity Guarantee for example in Construction Equipment

- The adjustment will be evaluated based on drop in guaranteed performance or efficiency in a bid below a norm of 100 using a specified methodology for evaluation and for assessing losses compared to guaranteed figures (provided these figures meet Technical Specification Requirement)

Use of LCC for Minimum Guaranteed Life of Wear Parts

- Use Minimum Guaranteed Life of Wear Parts (Like a for a Pulveriser in Vertical Mill in a Coal Based Power Plant). Specify a period like 5 years or number of hours of operations. In case of shortfall due to premature failures get replacement to cover shortfall in wear life for a plant life of 25 years.

Use of LCC for Medical Equipment or goods where value is not very high

- Use energy efficient equipment, proven technology, strict quality requirements as part of specification, checking conformance to quality in manufacture and in installation, use of service or maintenance contract as per industry practice

6.3 Other good practices, templates, examples

Use LCC through better guarantees and Lifetime Extension practices:

- It is also considered essential how suppliers could find ways to minimize LCC through better maintenance practices or improved material and technology. Technical experts of the Beneficiary/Consultants assisting Beneficiaries and also from Financing Agency for the project may find out how these factors could be factored in technical specification and Employer's Requirements based on the latest industry practice.

Track Application of LCC including post-warranty for full procurement cycle

- It is recommended that the Beneficiary tracks the application of LCC for full procurement cycle from design and planning till Performance and Guarantee Tests and post warranty obligations **to build** quality infrastructure and achieve VfM. The template for tracking is given at **Annex** (Excel Table)

Section 7 – International Practices on Use of LCC

7.1 Overview

An attempt was made to find out from the published information examples on use of LCC in public procurement for developed economies like EU, other MDBs, Governments. These may be of use to the Beneficiary in specific cases.

Related to Green Public Procurement and Life Cycle Costing most of information is available in the public domain and this section has highlighted the important ones which may be useful for types of equipment and product being procured by IsDB's Beneficiaries. However, it is important these practices are to be adapted for use in IsDB financed contract based on the requirements of Beneficiaries and country specific practices.

For example, Based on practice in European Commission, it is possible to apply environmental award criteria, provided those criteria: (i) are linked to the subject-matter of the contract; (ii) do not confer an unrestricted freedom of choice on the contracting authority; (iii) ensure the possibility of effective competition; (iv) are expressly mentioned in the contract notice and tender documents, together with their weightings and any applicable sub-criteria; and (v) consistent with laws of the country.

There may be environmental performance beyond the minimum requirements set in the specifications, if so specified. Adopting a life-cycle costing approach reveals the true costs of a contract. Considering energy and water consumption, maintenance and disposal costs in evaluation may indicate that the greener option is also the cheaper option over the full life-cycle. Labels and other forms of third-party evidence can assess how well a tender performs against chosen award criteria, and to verify tenderers' claims.

European Commission practices recommend application of LCC concept in procurement of common use items like Vending Machines, Computers and Monitors, Outdoor Lighting, Imaging Equipment, Indoor Lighting⁷

Other references on international practices are given in the **Annex**

The application of any LCC tool should be consistent with IsDB's procurement principles and guidelines and Beneficiaries are advised to seek guidance from IsDB to ensure correct application of LCC principles and sustainable procurement practices.

⁷ Buying Green! -A handbook on green Public Procurement – 3rd edition (European Union 2016)

[Life cycle costing - GPP - Environment - European Commission \(europa.eu\)](http://europa.eu)

Section 8 – Conclusion

The Guidance Note should assist the Beneficiaries in appropriate application of LCC for the entire procurement process to achieve VfM. It provides practical examples as to how to use LCC as economic evaluation factor. However, Beneficiaries are advised to work with their technical specialist/consultant for fit-for-purpose application of LCC by appropriate analysis at the stage of Procurement Planning and Procurement Strategy, adoption of appropriate bidding document and by simplifying the evaluation criteria. The advantages of a simplified evaluation criteria are as follows:

- The Employer/Beneficiary, based on the technical configuration of the equipment, output, efficiency and plant operating conditions, is able to convert a complex engineering/financial calculation as one number or few numbers of critical parameters with dollar value for each unit of saving (of fuel, electricity, chemical) as NPV over the life of asset which is used for comparison of bids.
- Evaluation criteria represented by one or few critical parameters in dollar terms in the bidding document, is easily understood by Bidders. Bidders can then quote initial bid price plus guarantee/consumption/efficiency/heat rate figures which are competitive
- These few numbers on functional guarantees are read out at the time of bid opening and therefore bidders are well aware of how their evaluated bid prices stand compared to their competitors taking into account guaranteed efficiency/consumption figures
- It increases the transparency of bidding process and reduces the possibility of complaints by losing bidders
- All functional Guarantees, including those used as evaluation criteria, are to be demonstrated during performance and guarantee test and liquidated damages for shortfall required to be paid by the winning bidder based a dollar value for each unit of deficiency, which is set at a value not less than the value for which any advantage was given at the time of evaluation and comparison of bids

The Annex to the Guidance Note provides further elaboration with specific guidance in a box on the use of the specific Annex. Training material on application of Life Cycle Costing is also available on PPR website. Beneficiaries are encouraged to seek further guidance from technical /procurement specialist of IsDB on use of LCC.

Annex to the Guidance Note

A consolidated list Annex of and its use: The Annex to the Guidance Note provides further details with a box on guidance on use at the end of each Annex

Reference	Description
Annex I	Bidding Document for Goods Section III Evaluation and Qualification Criteria
Annex II	When and how to use LCC in SBD for Plant and Goods?
Annex III	How to differentiate between Technical Specification and Performance Guarantee?
Annex IV	Example of an Evaluation Table with simplified economic evaluation criteria
Annex V	Suggested Responsibility Matrix
Annex VI	LCC Tracking Template
Annex VII	References on international practices
Annex VIII	List of references and websites

Annex I

Extracts from Bidding Document for Goods Section III *Evaluation and Qualification Criteria*

Life Cycle Costs

If specified in BDS 34.6, an adjustment to take into account the additional life cycle costs for the period specified below, such as the operating and maintenance costs of the Goods, will be added to the Bid price, for evaluation purposes only. The adjustment will be evaluated in accordance with the methodology specified below and the following information:

[Note to Purchaser: Life cycle costing should be used when the costs of operation and/or maintenance over the specified life of the goods are estimated to be considerable in comparison with the initial cost and may vary among different Bids. Life cycle costs shall be evaluated on a net present value basis. If life cycle costs apply, then specify the factors required to determine them for evaluation purposes.]

[Either amend the following text as required, or delete if life cycle cost is not applicable]

- (i) number of years for life cycle cost determination *[insert the number of years]*;
- (ii) the discount rate to be applied to determine the net present value of future operation and maintenance costs (recurrent costs) is *[insert the discount rate]*;
- (iii) the annual operating and maintenance costs (recurrent costs) shall be determined on the basis of the following methodology: *[insert methodology]*;
- (iv) and the following information is required from bidders *[insert any information required from bidders, including prices]*.

<p>Guidance: <i>To use this option when operating and maintenance is the responsibility of the bidder/contractor for stated number of years, example medical equipment</i></p>

Performance and productivity of the equipment. *[insert one of the following]*

(i) Performance and productivity of the equipment. An adjustment representing the capitalized cost of additional operating costs over the life of the plant will be added to the bid price, for evaluation purposes if specified in the BDS 34.6. The adjustment will be evaluated based on the drop in the guaranteed performance or efficiency offered in the bid below the norm of 100, using the methodology specified below. *[insert the methodology and criteria if applicable]* **or**

(ii) An adjustment to take into account the productivity of the goods offered in the bid will be added to the bid price, for evaluation purposes only, if specified in BDS 34.6. The adjustment will be evaluated based on the cost per unit of the actual productivity of goods offered in the bid with respect to minimum required values, using the methodology specified below.

[insert the methodology and criteria if applicable].

- (g) Specific additional criteria

<p>Guidance: <i>May be used for equipment with output, efficiency and environmental norms criteria as per requirements of technical specification, for example procurement of construction equipment</i></p>

WHEN AND HOW TO USE LCC AS A FACTOR IN ECONOMIC EVALUATION AND SUGGESTED AMENDMENT TO SBD THROUGH ECONOMIC EVALUATION CRITERIA/ BID DATA SHEET

Type of Facility/ Equipment (estimated useful economic life in years)	Standard Bidding Document of MDB	A Typical Value in MDB contracts	LCC to be used (Cost of Owning including O&M cost as Option 1/ Differential Efficiency Parameters as Option 2)	Energy efficient product to be incorporated or minimum efficiency to be specified as pass/fail criteria or product with longer life and better quality to be specified	Recommended Options/Amendment to the Bidding Document through Economic Evaluation Criteria/Bid Data Sheet (In all cases Bid Data Sheet to be modified to include announcing efficiency figures and performance guarantees to be read out at the time of bid opening).
Medical Equipment, Computer (5-10 years)	Goods	USD 1-5 million	Option 1	Yes	Option 1 if O&M is the responsibility of the supplier. Better to specify minimum efficiency/max power consumption/energy efficient product through technical specification.
Power Transformer (15 -20 years)	Goods	USD 5-10 million	Yes (Option 2) on iron/copper/cooler losses	Yes	A technical/economic calculation required to find out Bid Evaluation Factor in US\$/KW. Consult technical specialist
School Bus/ Fleet of vehicles (5-10 years)	Goods	USD 1-5 Million	Yes (Option 1)	Yes	Option 1 provided O&M is the responsibility of the supplier. It is better to specify the maximum

Type of Facility/ Equipment (estimated useful economic life in years)	Standard Bidding Document of MDB	A Typical Value in MDB contracts	LCC to be used (Cost of Owning including O&M cost as Option 1/ Differential Efficiency Parameters as Option 2)	Energy efficient product to be incorporated or minimum efficiency to be specified as pass/fail criteria or product with longer life and better quality to be specified	Recommended Options/Amendment to the Bidding Document through Economic Evaluation Criteria/Bid Data Sheet (In all cases Bid Data Sheet to be modified to include announcing efficiency figures and performance guarantees to be read out at the time of bid opening).
					fuel consumption and test it before taking over. No need to include LCC as economic evaluation criteria
Supply and Installation of Sewer Pipes (50-100 years)	Goods/Civil Works	USD 5- 10 Million	No	Yes	Delete provisions of LCC. LCC concept to be applied through specifying material/design criteria for longer life, better quality and lower maintenance cost.

Type of Facility/ Equipment (estimated useful economic life in years)	Standard Bidding Document of MDB	A Typical Value in MDB contracts	LCC to be used (Cost of Owning including O&M cost as Option 1/ Differential Efficiency Parameters as Option 2)	Energy Efficient Product to be incorporated or Minimum Efficiency to be specified as pass/fail criteria or facility/product with longer life to be specified	Recommended Options/Amendment to the Bidding Document through Economic Evaluation Criteria/Bid Data Sheet (In all cases Bid Data Sheet/ price schedule to be modified to include announcing efficiency figures and performance guarantees to be read out at the time of bid opening)
450 MW Combined Cycle Power Plant	Plant Design Supply and Install	USD 400 Million	Option 2(as per Technical Specification/Performance Guarantee)	Yes	Critical parameters like heat rate/fuel consumption to be used as factor in economic evaluation based on NPV of US\$ value for each unit of extra consumption of fuel. Option 1 (Operation and Maintenance Cost) may be used in combination, if O&M is the responsibility of bidder/contractor for stated number of years (5-7 years), also to coincide with extended defect liability period of critical equipment
Construction of 400 kV Transmission Line	Plant Design Supply and Install	USD 100 Million	No	Yes	LCC not to be used
IT System for modernization of revenue administration system	Information Technology System	USD 50 million	Yes	Yes	Evaluated Bid Price to be determined as sum of Installation Cost and Recurrent Cost
Road Rehabilitation	Large Civil Works	USD 100 Million	No	Yes	LCC concept to be applied through specifying material/design criteria for longer life, better quality and lower maintenance cost.

Guidance: As per the last column of the table

HOW TO DISTINGUISH BETWEEN TECHNICAL SPECIFICATION AND FUNCTIONAL GUARANTEE

ANNEX III

REVIEW BY THE BANK- DRAFT BIDDING DOCUMENT ON DESIGN, SUPPLY AND INSTALLATION OF RAPID SAND FILTRATION PLANT FOR CITY WATER SUPPLY SYSTEM- PARAMETERS AND RECOMMENDED TREATMENT AS TECHNICAL SPECIFICATION, ECONOMIC EVALUATION CRITERIA FOR LIFE CYCLE COSTING AND FUNCTIONAL GUARANTEE – MDB EXAMPLE

Parameter	Value in Section III Economic Evaluation and Functional Guarantee	Technical Specification	Factor for Life Cycle Costing in Economic Evaluation for 20 years	Functional Guarantee	Margin at Performance and Guarantee Test in Appendix 8	Bank's remarks/ comments in the review process
Volume of Treated Water	Minimum 120,000 Cubic Meter per day	Yes	No	Yes	Yes	Margins to be indicated like 95% (based on design criteria) with a reasonable LD value for shortfall in performance.
Electricity Consumption	132,000X365 Cubic Meter per year at a price of 0.003650 USD/kWh	Yes	Yes	Yes	Yes, subject to a maximum of 100Wh/Cubic Meter	It is recommended that value of LD should to be between 1 to 1.5 times of NPV of value considered at the time of economic evaluation.
Maintenance Spares and Lubrication Cost	No	No	No	No	No	This provision should be deleted from economic evaluation as Bidders tend to give optimistic figures to win contracts and there is no mechanism to enforce it for 20 years. If this is used as a factor then it should be for 3-5 years and NPV of costs included for evaluation and contractor should be responsible for supplying such spares and lubricants.
Maximum Backwash Water Consumption	5% of Filtered Water	Yes	Yes, subject to Max as specified	Yes	Yes	Based on the cost of treated water a dollar value to be fixed and used for NPV. In case of shortfall LD to be 1.5 times (or at least equal to value used for economic evaluation)
Turbidity of Filtered Water when raw water is <20mg/l And >20mg/l of suspended solid	Max 0.6 NTU And Max1.0NTU	Yes	No	Yes	Yes	A margin of 105% and LD value to be given as percentage of contract price as a reasonable amount. Public health and environmental norms to be enforced.

Guidance: This table was analyzed by the Bank staff and it was found that there was no clarity on parameter on Technical Specification and Functional Guarantee and the above analysis in the last column by the Bank staff helped the Beneficiary in modifying and improving the draft bidding document **and making section III and Aggregate limitation of liability for payment of Liquidated Damages for shortfall in performance to be indicated as 10% in para 4.4 of Appendix 8 of Functional Guarantee. Appendix 8 needs to be consistent with Section III on Economic Evaluation and Performance Guarantee Test section of Technical Specification**

Example of an Evaluation Table with simplified economic evaluation criteria

Extracts from bidding document for Main Plant Package for a gas-based combined cycle power project (MDB-financed)- Design/Supply/Installation
Illustration of Evaluation method based on Efficiency Considerations (Heat Rate). This method will be applicable for items like Turbine, Boiler based on a fixed output (with or without margin of 5% as specified). However, this efficiency method is modified for Combined Cycle Power Station to take into account a wider range of output based on industry practice and to enhance competition. The table below was part of bidding document with a statement that method of evaluation as explained in Clause 24.0 and 25.0 of the Bidding Document shall be followed as illustrated under:

	Bidder "A"	Bidder "B"
1. Quoted bid price without taxes & Duties [after considering arithmetical errors conversion to Rupee based on exchange rate as on the date of bid opening]	Rs. P	Rs. Q
2. Cost Compensations [Technical]	Rs. R	Rs. S
3. Cost Compensations [Commercial]	Rs. T	Rs. U
4. Deficiency in Mandatory Spares [if any]	Rs. V	Rs. W
5. [a] Efficiency/Performance Adjustments for Combined cycle	$15750 \times \Delta HR_{cc} \times Y_{cc}/1000$	Base
[b] Efficiency / Performance Adjustments for Open cycle	$3385 \times \Delta HR_{oc} \times Y_{oc}/1000$	Base
	Bidder "A"	Bidder "B"
6. Add Domestic Price Preference	Rs. DP1	Rs. DP2
7. Evaluated bid price	FEP1 [1+2+3+4+5+6]	FEP2 [1+2+3+4+6]
8. Net output of the plant	380	445

9. Evaluated bid price per MW	FEP1/380	FEP2/430
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Note:

- (i) The values for “Net Output of the plant” indicated above are only assumptions for illustrating the method of evaluation.
- (ii) Bid for plant of capacity below 330 MW will not be accepted.
- (iii) For bids offering net output of the plant more than 430 MW, the net output of the plant will be considered as 430 MW. Accordingly, while dividing the evaluated bid price by the net output at Sl. No. 9 above, the net output of the plant has been considered as 430 MW and not 445 MW.
- (iv) The terminology at item 5 above relates to dollar value for each kcal/kWh of advantage in heat rate both in Open Cycle and Combined Cycle modes based on expected operating conditions. Open Cycle was to be commissioned in 18 months after award of work and combined cycle, 12 months thereafter, that is, in 30 months after award of work.

Guidance: *This Annex illustrate the example of bidding document of a combined cycle power plant where an evaluation table as a sample was part of bidding document and in the pre-bid conference the method of using differential guaranteed parameters (heat rate) among two bids as evaluation factor and as a simplified evaluation method was explained*

Suggested Responsibility Matrix

Annex V

Stage of Implementation	Task to be Carried out	Primary Responsible Agency (Review Responsibility / association)	Remarks / Action
Project Appraisal and Procurement Planning	<ol style="list-style-type: none"> 1) An analysis to be made to determine contracts where application of LCC will bring substantial savings in follow-on costs due to better efficiency of facility/items and lower consumption. 2) Discussion to be held with Beneficiaries on applicability and relevance of LCC. 3) An assessment to be made if Beneficiary has experience of operating and maintaining the plant or there is a need for O&M contract. 	<ol style="list-style-type: none"> 1) Implementing Agency /Project Management Consultant (IsDB project staff/technical specialist) 2) Project Officer (PO)/ Project Management Specialist (PMS) and Operations Team Lead (OTL) 3) Field Procurement Officer (FPO)/Regional Procurement Officer (RPO) 	<ul style="list-style-type: none"> - LCC to be used for large design supply install packages like Water Treatment plant, Combined Cycle Power Station. Also, in supply packages like power transformers, IT System. - Effective use of LCC will require training of the Beneficiaries on the methodology of application.
Bidding Documents and Bid Opening	<ol style="list-style-type: none"> 1) An analysis to be made on critical parameters to be considered for LCC like output, efficiency, consumption, environmental requirement. 2) Bidding documents and price schedule to be modified to allow for guarantee figures which are factors for economic evaluation to be announced at the time of bid opening. 3) It should be clearly specified if O&M contract say for initial 5-years is part of bidder's responsibility and if so the evaluation of bids should on the 	<ol style="list-style-type: none"> 1) Beneficiary / Project Management Consultant (IsDB Project Officer) 2) Beneficiary (Project Officer/ Project Management Specialist and Operations Team Lead (OTL). 3) Beneficiary/ Project Management consultant (IsDB Project Officer/ Project Management Specialist and Operations Team Lead (OTL). 	<ul style="list-style-type: none"> - It should be part of technical consultants TOR to integrate specification and Performance and Guarantee Test requirement with Functional Guarantees to be used as economic evaluation criteria and to determine methodology for application in evaluation and for fixing Liquidated Damages figures for shortfall in performance. All parameters to be used for economic evaluation should be verifiable based on past data and demonstrated either in factory test or on-site testing through applicable codes and standards. Technical consultants to determine critical parameter to be used as economic evaluation criteria and a back-up calculation should be given to the recipient for arriving at dollar value based on NPV of extra fuel/power consumption over the life of the asset. Bidding document may indicate the factors that were considered while arriving at such figures, but there is no need to provide an economic model or excel table. Evaluation methodology to be

Stage of Implementation	Task to be Carried out	Primary Responsible Agency (Review Responsibility / association)	Remarks / Action
	<p>basis after considering NPV of such costs.</p> <p>4) Bidding documents to include quality plan which will be the basis of inspection and factory test and on-site test.</p>		<p>simplified. Section III on economic evaluation criteria to provide a figure in USD/Local Currency for adjustment for extra fuel or power consumption. The bidding document should contain a table on bid evaluation summary template as an illustration and explain in pre-bid conference</p> <ul style="list-style-type: none"> - Technical consultant to provide back-up calculation for economic evaluation figures and LD figures for each parameter. - If maintenance and supply of spares for a longer duration is used as an economic evaluation criterion, bidder/contractor to be made responsible for this activity or a suitable mechanism given in the contract to ensure performance (example wear part guarantee for boiler, replacement of critical spares for hot gas path for gas turbine). - For HDE Sector Beneficiaries and technical Consultant may incorporate energy efficient product in technical specification. - For large civil works procurement, alternative designs and construction methodology may be evaluated at design stage to apply LCC principles including concept of value engineering. - Guaranteed figure for factors used for economic evaluation criteria and performance guarantee figures to be read out at the time of bid opening

Stage of Implementation	Task to be Carried out	Primary Responsible Agency (Review Responsibility / association)	Remarks / Action
Evaluation of Bids	Evaluation to be carried out strictly in accordance with LCC criteria stated in the Bidding Documents. There should be complete correspondence between prices quoted competitively and evaluated price for comparison.	1) Beneficiary (IsDB Project Officer/Project 2) Project Officer (PO)/ Project Management Specialist (PMS) and Operations Team Lead (OTL) 3) Field Procurement Officer (FPO)/Regional Procurement Officer (RPO)	If prices are asked on competitive basis like mandatory spares for first three years of operation) or Maintenance contract cost for 5 years, the evaluation should include such prices.
Award of Contract	Contract Agreement to include Functional Guarantee figures and Testing requirement and LD figures.	Beneficiary (IsDB Project Officer)	Basis of award to be the same as evaluation. For example, if 5-year maintenance contract was a factor in determination of lowest evaluated bid, the award should be made on the same basis. Separate O&M or Maintenance contract may be signed
Contract Implementation	Contract to be implemented in accordance with stated schedule of work with special attention on timely review of design/drawing by the employer, change in sub-vendor/subcontractor to be carefully review so that quality and proven-ness of critical components are not compromised. Regular factory visits to be undertaken to ensure that items are being manufactured.	Beneficiary/ Project Implementation Consultant	IsDB staff may provide implementation support without assuming the responsibility of the Beneficiary. This is possible by regular site visits and portfolio fiduciary review (like an intensive mission with participation of locally-hired engineers) to ensure that implementation is done with quality. O&M engineers of the Beneficiary may be trained before the facility is commissioned at similar facilities elsewhere as part of contractor's obligation. Based on given sample cases in IsDB bidding documents, there is no clarity on this aspect.
Performance and Guarantee Tests	In line with contract agreement	Beneficiary	IsDB staff to watch that these are conducted in terms of contract in a timely manner and payments to contract released in line with contract provision. Generally, this is a point of dispute in case of other MDBs.
Post –Warranty Obligations	In line with contract agreement	Beneficiary	Agreements to be enforced through suitable performance guarantees (critical items, high value wear parts, hot gas path items).

Guidance: Beneficiary to discuss and finalize the responsibility matrix with IsDB at the time of project preparation as part of Procurement Planning and Procurement Strategy (PP-PS) task

LCC Tracking Template

Annex VI



IsDB- LCC Template
DEC 2020.xls

Guidance: *Beneficiary to track application of LCC for the full procurement cycle to confirm that Value -for-Money was achieved and to draw lessons for improvements for future projects*

International Practices- References

This Annex provides reference to use of LCC by advanced economies and refers to publications by the World Bank and European commission and governments on use of energy efficient equipment.

In 1993 the US Federal Government decided to purchase only the “Energy Star” compliant IT equipment. As the federal government is major single largest purchaser of IT equipment in the world, the subsequent compliance to this standard led to huge savings in electricity costs. (More information on <http://www.energystar.gov/>)

Use of LCC by UK Chartered Institute of Purchasing that requires savings in use of water and energy to be incorporated to promote environmental considerations. (more information on <http://www.cips.org>)

Life Cycle Guidelines by Government of South Australia – State Procurement Board (January 2011) is also a good reference source (more information at www.spb.sa.gov.au).

The Government of Canada has published Guidance notes (updated July 2012) on use of LCC (Section 3.140) which supports application of PROC (Product, Resources, Operating, and Contingent) costs in procurement. A paper on **LCC by International Institute for Sustainable Development, Canada** (December 2009) has identified 24 issues on LCC (like Issue #4 Capital and revenue budgets conflict in terms of organization and time frames. This favors procurement decisions based on cheapest upfront costs) and issue #18 that points out that application of LCC would require multi-disciplinary skills and continuous skill building of procurers).

Publication from the World Bank Public Procurement of Energy Efficient products: Lessons from Around the World (August 2012): on energy efficiency and life cycle cost calculators, technical specification catalogues, energy- efficient and green production lists and information on energy labels. This publication provides an exhaustive list of resources and experience from several countries.⁸ Three notable examples in the **WB publication** in the context of LCC are as under:

(a) **Lifecycle costing and the US Federal Energy Management Program:** FEMP was established in 1995 under the Department of Energy’s Office of Energy Efficiency and Renewable Energy. In purchasing program, FEMP offers energy and cost saving calculators for energy efficient product. These LCC tools allow Federal agencies to enter their own input values like utility rates and hours of use. For example, one tool enables users to commercial unitary air-conditioners. It requires only six parameters (condenser type, capacity, Energy Efficiency (EE) ratio, and annual hours of operation, energy cost, and quality of units) and has default value for each. The tool then calculates the lifetime cost for user’s selection against a base model, the FEMP-designated (recommended model) and the best model available;

(b) **China’s Energy Efficient Product List:** It requires public institutions to give priority to energy-saving products. Energy Efficient Product List (EEPL) has been developed. There are 28 products in 2011 that includes 22 energy-saving categories and 6 water-saving categories; and

(c) **Corporate Sustainability at the World Bank.** WB is seeking to reduce its environmental impact. The goal of the policy is for 40% of total purchases of electronic equipment by corporate procurement of WB to meet environmentally preferable product criteria. The most recent purchase for computer monitor has several green features like elimination of environmentally sensitive material, end-of-life recycling or re-use, use of energy efficient power supply. This procurement incorporated Electronic Product Environmental Assessment Tool (EPEAT) in addition to Energy Star.

⁸ [World Bank Document](#)

Green Purchasing Network of Japan⁹ which was established in 1996 and it advocates the following principles:

- Consider whether a product is needed before purchasing it.
- Consider the Life-Cycle of Products and Services: Consider environmental impacts from the overall life cycle of a product, including those incurred through a service provided – from extraction of raw materials to disposal.
- Consider Supplier Efforts: Select products and services offered by suppliers who make a conscious effort to care for the environment.
- Collect and Use Environmental Information: Gather information on products, services, and their respective suppliers, and employ that information when purchasing them.

Few selected references to practices from European Commission publications

Based on EU directive of 2014, LCC approaches can be used as part of public procurement procedures reference Article 68(2) of Directive 2014/24/EU and Article 83(2) of Directive 2014/25/EU. LCC tools developed by the EC: The European Commission is in the process of developing a series of sector specific LCC calculation tools which aim to facilitate the use of LCC amongst public procurers". **Unquote.** Further details on LCC are available in the document: Life Cycle Costing; State of the Art Report (March 2017)¹⁰. As per State-of-the-Art Report: *"one of the recommendations of the European Commission working group on Life Cycle Costs in Construction is to carry out LCC at early design stage, where the opportunities for modifying the costs of a project are greatest"*

Life Cycle Costing; State of the Art Report (March 2017)¹¹. As per State-of-the-Art Report: *"one of the recommendations of the European Commission working group on Life Cycle Costs in Construction is to carry out LCC at early design stage, where the opportunities for modifying the costs of a project are greatest"*

Based on EC publication¹², Value for money Contracting authorities have an obligation to get the best value for taxpayers' money for everything they procure. Identifying the most economically advantageous tender does not necessarily mean going only for the cheapest offer. It means finding a solution, which meets the requirements you have identified – including environmental ones – in the most cost-effective way. Best value not only measures the cost of goods and services, but also takes into account factors such as quality, efficiency, effectiveness and fitness for purpose. Protection of the environment can be one of these factors and can therefore act as an equal consideration amongst others for the award of the contract. Lifespan – The frequency with which a product needs to be replaced will have a major impact on its cost, especially over a longer period. A cheap product which needs to be replaced frequently may well cost more over the long term than a higher-priced product which lasts for many years. This should be taken into account when determining over how many years you wish to make a life-cycle cost comparison

⁹ <https://www.gpn.jp/english/>

¹⁰ www.sppregions.eu and Life Cycle Costing; State of the Art Report (March 2017)

¹¹ www.sppregions.eu and Life Cycle Costing; State of the Art Report (March 2017)






¹² Buying Green! -A handbook on green Public Procurement – 3rd edition (European Union 2016)

Based on practice in European Commission¹³, it is possible to apply environmental award criteria, provided those criteria: (i) are linked to the subject-matter of the contract; (ii) do not confer an unrestricted freedom of choice on the contracting authority; (iii) ensure the possibility of effective competition; (iv) are expressly mentioned in the contract notice and tender documents, together with their weightings and any applicable sub-criteria; and (v) consistent with laws of the country. There may be environmental performance beyond the minimum requirements set in the specifications, if so specified. Adopting a life-cycle costing approach reveals the true costs of a contract. Considering energy and water consumption, maintenance and disposal costs in evaluation may indicate that the greener option is also the cheaper option over the full life-cycle. Labels and other forms of third-party evidence can assess how well a tender performs against chosen award criteria, and to verify tenderers' claims.

Based on European Commission practices, it is important LCC concept is used in procurement of common use items like Vending Machines, Computers and Monitors, Outdoor Lighting, Imaging Equipment, Indoor Lighting as depicted in the following diagram¹⁴:

LCC tools developed by the EC

The European Commission has developed a series of sector specific LCC calculation tools which aim to facilitate the use of LCC amongst public procurers.

<p>Vending Machines</p> <ul style="list-style-type: none"> • User Guide • LCC Tool 	<p>Imaging Equipment</p> <ul style="list-style-type: none"> • User Guide • LCC Tool 
<p>Computers and Monitors</p> <ul style="list-style-type: none"> • User Guide • LCC Tool 	<p>Indoor Lighting</p> <ul style="list-style-type: none"> • User Guide • LCC Tool 
<p>Outdoor Lighting</p> <ul style="list-style-type: none"> • User Guide • LCC Tool 	

The National Agency for Public Procurement in **Sweden** have several product-specific LCC calculation tools available online which also includes guide on innovation through Sustainable Procurement¹⁵

Another useful publication from EU is: "The Procure+ Manual – A Guide to Implement Sustainable Procurement – 3rd edition (2016)"¹⁶ which stresses the interdependence among social, environmental and

¹³Buying Green! -A handbook on green Public Procurement – 3rd edition (European Union 2016)

¹⁴ [Life cycle costing - GPP - Environment - European Commission \(europa.eu\)](#)

¹⁵ [SMART SPP - ::Home:: \(smart-spp.eu\)](#)

¹⁶ [Procuraplus Manual Third Edition.pdf](#)

economic factors and need for making sure that the products and services procured by organizations achieve value for money on life cycle cost basis

EU has published Clean Vehicle Directives¹⁷. There are several case studies like procurement of Clean Fleet of Vehicles by the City **Council of Stockholm in Sweden**¹⁸. beneficiaries by adapting the LCC practices to the local environmental rules and regulations

Few examples from technical specification considerations and supplier recommendations

- **Related the procurement of Power Transformers** some of suppliers have published application of Life Cycle principles. These are listed in the reference. But technical specialist of the Beneficiary and their consultant make a careful application based on their requirements and after study of relevant industry practice.
- **“Life-Cycle Costing consideration in Sewer Pipes” (June 2010)** publication states advantage of Centrifugally Cast Fiber Reinforced Polymer Mortar (CCFRPM) with a conclusion that: “Based on results of recent acid strain corrosion tests, CCFRPM pipes’ performance exceeds the ASTM D3262 requirements for chemical resistance by more than 35 percent. Because of this corrosion resistance, the ASTM analysis of the strain corrosion test data predicts a life of far in excess of 100 years for the average pipe installed”. Similarly, modern construction methodology like micro-tunneling in laying sewer pipes in busy city locations could result in cost-saving. However, these are topics of LCC analysis at design stage in order to determine appropriate technical specification or construction methodology¹⁹.
- **Another example of minimizing LCC is given in EC publication- Buying Green Handbook (September 2011)** as under: “In some cases the greenest alternative will be one which is designed to maximize the period until replacement and minimize the amount of maintenance work which needs to be done. For example, use of ground granulated blast furnace slag in concrete may increase the lifespan of building and at the same time reduce the amount of efflorescence (saltpetering) requiring maintenance. This could reduce total life-cycle cost when compared with other types of concrete” (Chapter 5 on evaluation of tender)
- **How suppliers could find ways to minimize LCC through better maintenance practices or improved material and technology.** In case of **Gas Turbines**, it was observed that manufacturer “A” has suggested ways to minimize scheduled and unscheduled maintenance to increase availability (like Type A/ Type B visual inspection or Type-C **Hot Gas Path Inspection procedures**. Manufacturer “B” offers Inspection Interval Extension Product (IIEP) and Lifetime Extension (LTE) Programs to increase availability and reduce LCC. Manufacturer “C” has recommended that a rigorous maintenance program will minimize overall costs, keep outage downtime to minimum, improve starting and running reliability and provide increased availability and revenue earning ability of gas turbine users. These technical considerations are beyond the scope of this study, but technical staff of the Beneficiary and consultant may find out how these factors could be factored in technical specification to minimize LCC. These recommendations of the manufacturers which are in the public domain are given as references in this report.²⁰

¹⁷ https://ec.europa.eu/transport/themes/urban/clean-vehicles-directive_en

¹⁸ https://clean-fleets.eu/fileadmin/files/CF_case_study_sweden_04.pdf

¹⁹ [Life-Cycle Cost Considerations for Sewer Pipe | Water Finance & Management \(waterfm.com\)](https://www.waterfm.com/life-cycle-cost-considerations-for-sewer-pipe/)

²⁰https://www.ge.com/content/dam/gepower-pgdp/global/en_US/documents/technical/ger/ger-3620p-heavy-duty-gas-turbine-operating-maintenance-considerations.pdf

Guidance on use of this Annex: *It is seen that related to Green Public Procurement and Life Cycle Costing host of information is available in the public domain and this section has highlighted the important ones which may be useful for types of equipment and product being procured by IsDB's Beneficiaries. However, it is important that these practices are to be adapted for use in IsDB financed contract based on the requirements of Beneficiaries and country specific practices and the local environmental rules and regulations. Further the application of any LCC tool should be consistent with IsDB's procurement principles and guidelines and Beneficiaries are advised to seek guidance from IsDB to ensure correct application of LCC principles and sustainable procurement practices.*

References

1. European Commission- Buying Green- A handbook on green public procurement 2nd edition (2011)
2. International Institute for Sustainable Development, Canada- Life Cycle costing in Sustainable Public Procurement: A Question of Value (December 2009)
3. ISO 15686 -5 on Building & Constructed Assets- Service Life Planning: Life Cycle Costing (2008-06-15)
4. Public Procurement of Energy Efficiency Services- Lessons from International Experience (2010)
5. World Bank- “Green” Procurement in Selected Environmental Policy Framework- Background paper – Review of World Bank’s Procurement Policies and Procedures (July 2012)
6. Procurement of Goods, Works and related services under IsDB Project Financing (April 2019)
7. ISO 15686-5 Building and Constructed Assets- Part 5- Life Cycle Costing (First edition 2008-06-15) Standardized Method of Life Cycle Costing for Construction Procurement (PD 156865) – A Supplement to BS ISO 156865- Building and Construction Assets – Service Life Planning- Part 5 Life Cycle Costing (2008)
8. Guidance Note on Social, Gender and Sustainable Public Procurement in Islamic Development Bank
9. Life Cycle Costing; State of the Art Report (March 2017)

Websites and links

[Project Procurement \(isdb.org\)](#)

<https://www.worldbank.org/en/projects-operations/products-and-services/brief/procurement-new-framework>

<https://ec.europa.eu/environment/gpp/lcc.htm>

[CIPS USA](#)

[Whole Life Costing \(cips.org\)](#)

[Policies & Guides | State Procurement Board \(spb.sa.gov.au\)](#)

[Life Cycle Costing - Standards Australia](#)

[Microsoft PowerPoint - TCO Method Basics.pptx \(abb.com\)](#)

[Total Cost of Ownership \(TCO\) - Lifetime costs for transformers \(abb.com\)](#)

[Life cycle costing - GPP - Environment - European Commission \(europa.eu\)](#)

[World Bank Document](#) (Public Procurement of Energy Efficient Product – Lessons from around the World (2012))



For any additional information, such as Standard Bidding Documents (SBDs), Guidance, training materials and briefing, please see

www.isdb.org/procurement

