
TERMS OF REFERENCE FOR THE APPOINTMENT OF A SERVICE PROVIDER TO COLLECT DATA AND DEVELOP A REPORT ON GREENFIELDS OR BROWNFIELDS SUPPLY-SIDE COSTS AND TECHNICAL PARAMETERS FOR CURRENT AND FUTURE REFINING TECHNOLOGIES GLOBALLY AVAILABLE (INCLUDING CRUDE OIL REFINERIES, GAS-TO-LIQUID PLANTS AND COAL-TO-LIQUID PLANTS) AND ASSOCIATED INFRASTRUCTURE FOR A PERIOD OF TWELVE (12) MONTHS

1 BACKGROUND

- 1.1 The Department of Energy develops a National Integrated Energy Plan (IEP) which seeks to ensure security of energy supply in South Africa.
- 1.2 Energy planning requires extensive cost and performance data for various energy supply technologies. Determining the future liquid fuels supply options for South Africa will not only depend on the financial viability of building new production capacity versus importing but will also take into consideration policy imperatives such as security of supply, macroeconomic impacts and socio-economic implications such as job creation. The cost of new refining¹ technology is a significant factor in determining the future of the fuel supply landscape.
- 1.3 Understanding the associated costs of refining technologies together with the technical parameters or characteristics and skills requirements is a critical factor that needs to be taken into account during the development of the IEP.
- 1.4 The output from this study will provide global benchmarks of current “pace-setter” refining technology options, together with their associated capital investment costs, operating costs (both fixed and variable), efficiencies, typical feedstocks and product slates, availabilities, reliabilities and other operational, environmental and construction characteristics. The study should also provide a credible basis of determining how such characteristics are likely to change

¹ Throughout the document “Refining” refers to crude oil refining, synthetic fuel production from the coal-to-liquid and gas-to-liquid or any other feedstock.

going forward, with clear reasons of the assumptions therein.

- 1.5 The study should be informed by knowledge obtained and/or expertise gained from previous, current and planned refinery construction projects in different countries across the globe.
- 1.6 The output of this study will be used as input into (existing) energy planning models for the purposes of determining the most optimal solution for ensuring the supply of refined fuel products to meet requirements and specific South African objectives.

2 SCOPE OF WORK

- 2.1 To conduct a study to determine the supply-side costs and various other technical parameters for current and future refining technologies and associated infrastructure based on international trends and “pace-setter” developments. The consultant is required to agree with the Department on the basis for capital cost estimation and how the costs of the various supply side technologies will be brought to a comparable basis. The same principle applies to the determination of operating costs and other technical parameters. An agreed supply side cost estimation philosophy is an early deliverable as it will affect development of subsequent deliverables.
- 2.2 To develop a methodology for determining average ranges and projecting future trends of the costs and technical characteristics of the relevant technologies and implications for South Africa. Such methodologies are to be presented to the Department for agreement as an early deliverable.
- 2.3 To compile a report with all key assumptions and supporting data.
- 2.4 To collect data on average performance and other technical characteristics on liquid fuel production plants and projects in different countries globally and determine the relevant S-curves for these throughout the lifecycle of the plant.
- 2.5 To collect data on average construction, operation and maintenance costs of liquid fuel production plants globally and conduct projections of these costs into the future. This data must reflect practical capacity ranges and configuration options for both the type of technology and also in the context of security of supply of liquid fuels in South Africa for the longer term.

- 2.6 Plant types, either greenfields or brownfields modifications are to include crude oil refineries, gas-to-liquid plants, coal-to-liquid plants, associated blending facilities and tankage and any other relevant auxiliary facilities. As the feedstock type and production slate have a significant impact on the costs and performance of a refinery, the configuration of the plants should also be taken into account. More specifically:
- 2.6.1 The configuration of plant types should take into account feedstock type, for example sweet/light crude versus heavy crude diet for oil refineries; and high-ash versus low-ash for coal-to liquids; and indigenous shale gas versus imported LNG for gas-to-liquids plants.
- 2.6.2 The configuration of plant types should also consider the product slate, i.e. petrol-biased, diesel biased and balanced plant configurations.
- 2.7 The scope should include all technologies that are configured to produce transportation fuels meeting the South African Clean Fuels 2 specifications.²
- 2.8 It should be assumed that all new plants/refineries are able to meet the Clean Fuels 2 specification standards as defined by the Department of Energy at a minimum (refer to **Annexures A and B**). In the case of brownfields plants, the implications of upgrading refineries to meet fuel specifications should be described and quantified.
- 2.9 As all new recent projects that have been developed and commissioned have been outside of the South African borders, a methodology for localizing all the relevant data to South African conditions should be developed and applied. The methodologies for localization (e.g. conversion of US Gulf coast cost data to RSA conditions) must be an early deliverable and agreed with the Department. Practical existing constraints in South Africa should be taken into consideration in this regard, however future national plans to address such constraints should also be taken into account where relevant.
- 2.10 When contextualizing the cost and performance implications for South Africa, three broad project-type scenarios should be considered, namely: The construction of a greenfields refinery; the expansion or upgrade of existing refineries for meeting future fuel quality standards and specifications and/or increasing capacity.

² Clean Fuels 2 as defined in Annexures A and B or as further amended as the case may be.

- 2.11 The Final report must detail the methodologies applied for the various elements of the project, detailed assumptions and provide all actual data. (Preferably in Microsoft Word with supporting Excel spreadsheets).
- 2.12 The Department is in the process of finalizing the biofuels framework, the implications of the mandatory blending of biofuels with petroleum products needs to be included and explicitly accounted for as sensitivities. The Base Case for evaluation however is without any requirement for biofuels blending (i.e. plants must be able to achieve on-specification products without the need for biofuels blending).
- 2.13 A significant part of the project will require engagement with and collection of relevant data from the seven (7) oil companies which currently have refining capacity in the country. All data collected from oil companies or other stakeholders is to be deemed as confidential as the case may be.

3 SPECIFIC DATA TO BE COLLECTED

- 3.1 For crude oil refineries, data and assumptions on new plants should be based on different projects across the globe.
- 3.2 For gas-to-liquid plants and coal-to-liquid plants, data and assumptions should be obtained from the oil companies who have deployed the relevant technologies in South Africa.
- 3.3 The data should be collected for different project sizes for a particular technology type. In the case that the sizes and characteristics of individual projects vary too significantly, a methodology for grouping projects within certain size ranges into an average project size should be developed. The methodology should clearly indicate how the average size has been determined together with the associated characteristics.
- 3.4 For each technology type and project size, and either greenfields or brownfields option, the following data is required as a minimum (3.5 to 3.12):
- 3.5 General Characteristics:**
- 3.5.1 Technology type
- 3.5.2 Nominal capacity
- 3.5.3 Plant economic life or operational life

3.5.4 Product slate

3.5.5 Feedstock/Fuel type(s)

3.6 **Plant Performance Trends:** These should be determined/calculated as averages for each year over the operational life of the plant assuming a certain level of maintenance and changes in yield throughout the operational life.

3.6.1 Plant availability (This should include both maintenance/planned outages as well as unplanned outages)

3.6.2 Plant utilisation

3.6.3 Plant throughput (yield)

3.7 **Plant Operational Characteristics:** These should be determined/calculated as averages for each year over the operational life of the plant assuming a certain level of deterioration on plant performance. This should be calculated per unit of output (e.g. water usage per unit of final product for each product type) as well as per unit of input (e.g. water usage per barrel of crude oil equivalent)

3.7.1 Energy usage (i.e. electricity or other non-feedstock energy sources)

3.7.2 Plant water usage

3.7.3 Plant CO₂ emissions

3.7.4 The following atmospheric emissions/pollutants should be included: Methane, Sulphur Dioxide, Nitrogen Oxide, Particulates and other atmospheric pollutants as per the Minimum Air Quality standards.

3.7.5 The costs of pollution control equipment, waste management and any required health and environmental protection measures. This includes measures required by law. If any pollution control technologies included have an impact on the technical characteristics of the plant, the impact thereof should be explicitly stated. The residual emissions for each plant technology type should also be specified.

3.8 **Investment Costs:**

3.8.1 A high-level project implementation schedule must be provided to support estimated front end loading, detail design, construction, and commissioning. In consultation with the Department of Energy, the implementation schedule should also take into account relevant decision making and approval points.

3.8.2 A high-level project expense schedule (based on 3.8.1 above) must be provided to support the total installed cost expressed as a cost at an agreed base date. Escalations assumed in the various cost elements are to be made explicit. Technology cost curves for the different types of plant should be calculated. The accuracy of total installed costs for the various options are expected to be presented on a comparable basis. Where this is not the case, the varying expected accuracies are to be made explicit with an appropriate rationale.

3.9 **Fuel/feedstock Costs:** Assumptions on cost of feedstock should be provided for each year over the operational life of the plant. The price at reference date and assumptions on expected escalation must be explicitly indicated. Cost of feedstock should further be split into primary fuel, blending fuels and other additives. Assumed feedstock pricing and product pricing must be on the same basis.

3.10 **Operations requirements and costs:** These should be provided for each year over the operational life of the plant. The price at reference date and assumptions on expected escalation must be explicitly indicated.

3.10.1 Energy requirements and energy costs (i.e. electricity or other non-feedstock energy sources)

3.10.2 Labour requirements (manpower) and labour costs

3.10.3 Other Non-Energy requirements and costs (excluding labour – specify which)

3.11 **Maintenance requirements and costs:** These should be provided for each year over the operational life of the plant. The price at reference date and assumptions on expected escalation must be explicitly indicated.

3.11.1 Labour requirements and costs

3.11.2 Material costs

3.11.3 Type of maintenance required with frequency of such maintenance

3.12 Expansion or Upgrade Costs of existing refineries:³ (To increase capacity and / or meet RSA clean fuels 2 specifications)

- 3.12.1 Lead times and proposed phasing in of upgrades across the industry
- 3.12.2 Upgrade cost (high-level expense schedule to support upgrade costs)
- 3.12.3 Any changes in plant performance, operational characteristics or any other key elements should be explicitly stated as a result of the upgrades (e.g. reduced throughput of the refinery or requirement for importation of blend stocks or exports of lower quality fuels etc.)

4 DELIVERABLES

- 4.1 An inception report detailing the planned project approach and methodology/ies for executing the various elements of the project should be developed within the first month after the signing of the project contract. Some the key methodologies to be delivered in the early stages of the project include: project execution methodology; technology grouping methodology; data localization methodology; methodology for estimating future trends and developments; and relevant assumptions.
- 4.2 Data collected with all key assumptions and sources of data delivered in a user-friendly format compatible with the Microsoft Operating System and user software. (Preferably this should be in Microsoft Excel spreadsheets). The consultant must also supply all information, data and reports in native format where relevant (in addition to documentation supplied in PDF format).
- 4.3 Milestone presentations at key milestones of the project (e.g. detailed project methodology, technology grouping methodology, data localisation methodology, methodology for estimating future trends and developments, key assumptions).
- 4.4 Final report detailing the methodologies embarked on for the various elements of the project, detailed assumptions, description of models and actual data. (Preferably in Microsoft Word with supporting Excel spreadsheets). The final

³ It is assumed that data relating to the costs of upgrading refineries to comply with the new fuel standards (CF2) would have already been collected by the Department and that the final decision regarding this would have already been made by the Department at the time at which the study commences. However as this data would still need to be factored into the long-term energy planning models, the consultant will be expected to obtain the data already provided to the Department and incorporate/consolidate it with the other data sets.

report is to be provided in the form of electronic copies (CD's) and hard copies. The final electronic report shall include all native files as well as PDF files.

- 4.5 Supporting documentation to the report should include sources of data and assumptions and also indicate where consultations were held to localise the assumptions to South African conditions.

5 REPORTING REQUIREMENTS

- 5.1 The service provider shall report to the Chief Director: Energy Planning on a monthly basis. A written monthly report is expected, summarising work completed, planned work ahead, and a breakdown of current and cumulative costs versus planned costs. It is expected that any schedule changes that are requested and deemed justifiable by the Department, follow a defined and well controlled process that is approved by the Department.
- 5.2 Milestone presentations should be delivered at the Department head office unless otherwise explicitly agreed upon with the Department.
- 5.3 The service provider will be expected to work closely with the Department's technical team (comprised of officials from the Petroleum Policy and Energy Modelling Directorates) throughout the period of the study to ensure adequate skills transfer.

6 INTELLECTUAL PROPERTY

- 6.1 The analysis tools and data (including models) together with accompanying assumptions will be the property of the Department of Energy.
- 6.2 Information provided by the Department is to be handled as confidential unless otherwise stated. Relevant non-disclosure agreements will need to be executed as necessary.
- 6.3 The service provider may be requested to sign additional confidentiality/non-disclosure agreements with providers of data if so requested. However such confidentiality undertakings must explicitly indicate that the data so collected is on behalf of the Department for the purposes of this study and will be handed over to the Department.

7 EVALUATION METHODOLOGY

7.1 Cost and schedule

7.1.1 The service provider will be requested to provide an all-inclusive fixed price quote regarding the work to be undertaken for this project.

7.1.2 The total cost must be VAT inclusive and should be quoted in South African currency (i.e.rands). A clearly costed project plan should include the following:

- (i) Total Costing and Resource Allocation for each deliverable and associated activities outlined in section 4. The costing must be broken down into various disciplines, discipline rates, and the expected man hours for each discipline. If sub-contracts are proposed, then a clear scope of work for such sub-contracts shall be attached, with a commensurate proposal by the sub-contractor including a breakdown of their costs (i.e. including discipline man hours and rates). A full disbursement breakdown is also to be provided including expectations of travel, accommodation and other expenses. Disbursements approved by the Department of Energy must be included in the final all-inclusive quote.
- (ii) For each deliverable, the activities associated with its completion should be outlined.
- (iii) Each work element/activity should specify the amount to time involved in completing the task. For example, data collection and transformation is five (5) days; modelling three (3) days etc.
- (iv) A comprehensive study execution schedule, indicating all key activities, milestones, review points and deliverables is to be provided. Where early deliverables have been requested, these shall be indicated on the schedule.

7.2 Broad Based Economic Empowerment

7.2.1 Provisions of the Preferential Procurement Policy Framework Act (PPPFA 2011) and its regulation will apply in terms of awarding points.

7.2.2 Bidders are required to submit original and valid B-BBEE Status Level Verification Certificates or certified copies thereof together with their bids, to substantiate their B-BBEE rating claims.

7.2.3 Bidders who do not submit their B-BBEE status level verification certificates or are non-compliant contributors to B-BBEE will not qualify for preference points for B-BBEE.

7.2.4 The table below depicts the B-BBEE status level of contribution

B-BBEE Status Level of Contributor	Number of points(90/10 system)
1	10
2	9
3	8
4	5
5	4
6	3
7	2
8	1
Non-compliant contributor	0

7.3 Company Experience

7.3.1 The service provider should at least have fifteen (15) years' experience in providing the following relevant types of services: process industry consulting, technology selection and operations consulting, process engineering, refinery design, technology performance improvement and benchmarking as well as the provision of capital cost estimates for the refining industry as is relevant to this scope of work. All of which must be in the refined petroleum production industry.

7.3.2 Experience relating to 7.3.1 obtained in multiple technology environments (i.e. crude oil refining, gas-to-liquids and coal-to-liquids) will be an added advantage.

7.3.3 The service provider must provide a full list of services provided to the industry over the last 15 years. Proof accompanied by correspondence from at least three (3) contactable referees indicating where the relevant expertise has been applied, must be submitted.

7.3.4 By failure to submit the above track record of experience and correspondence from contactable referees, bidders will forfeit functionality points in this category.

7.4 Team Leader and Team member Experience

7.4.1 Team leader must have a minimum of ten (10) years experience in process industry consulting, technology selection and operations consulting for the petroleum industry or relevant experience within petroleum refining (e.g. process engineering, refinery design and configuration, technology performance improvement and benchmarking, as well as solid understanding of capital cost estimation principles and methodologies relevant to this scope of work). The team leader must have at least 3 years experience in a team leadership role.

7.4.2 Team members must have a minimum of five (5) years experience in process industry consulting or technology selection and operations consulting for the petroleum industry or relevant experience within petroleum refining (e.g. process engineering, refinery design and configuration, technology performance improvement and benchmarking and capital cost estimation).

7.4.3 The curriculum vitae of both the team leader and team members must be attached to the technical proposal as proof. The CV's must clearly demonstrate some or all of the following aspects:

- i. Experience in the process industry or technology consulting for clients in the petroleum industry. Such consulting must include technology performance improvement and benchmarking.
- ii. Experience and work executed in process engineering or refinery design.
- iii. Supply optimisation and refinery configuration.
- iv. In depth understanding of the South African petroleum/petrochemical industry.
- v. Experience in capital cost estimation principles within the petroleum refining industry.

7.4.4 Experience related to 7.4.3 obtained in multiple technology environments (i.e. crude oil refining, gas-to-liquids and coal-to-liquids) will be an added advantage.

7.5 **Qualifications**

7.5.1 The team leader and team members must have qualifications in chemical engineering, petrochemical engineering, process engineering or other technical qualifications relevant for the professional execution of this scope of work.

7.6 **Project Plan Methodology**

7.6.1 In line with the detailed study schedule, the proposal must include a detailed project approach and methodology indicating how the technical work will be executed.

7.6.2 The service provider should provide evidence of the ability to use their existing methodologies, tools and research capabilities to determine technical requirements for this study. A description of the in-house tools and databases (including cost estimation database) must be included. A description of how the databases are developed and maintained must be included.

7.6.3 The chosen project methodology should be accompanied by a detailed project plan which outlines:

- (i) Key deliverables with clear timelines and key dependencies
- (ii) Key milestones
- (iii) Any potential project constraints and risks, and how these risks will be mitigated.

8 EVALUATION CRITERIA

8.1 Bids will be evaluated on 90/10 point system as outlined in the PPPFA of 2011.

The proposals will be evaluated in two phases:

Phase 1: Bidders will be evaluated based on functionality. The minimum threshold for functionality is **70 out of 100 points**. Bidders who fail to meet the minimum threshold will be disqualified and will not be evaluated further for price and preference points for B-BBEE.

No.	Functionality Criteria	Weights
1	<p>Company Experience/ Track Record:</p> <ul style="list-style-type: none"> ❖ The service provider should at least have fifteen (15) years experience in providing the following relevant types of services: process industry consulting, technology selection and operations consulting, process engineering, refinery design, technology performance improvement and benchmarking as well as the provision of capital cost estimates for the refining industry as is relevant to this scope of work. All of which must be in the refined petroleum production industry. ❖ Experience related to the above which has been obtained in multiple technology environments (i.e. crude oil refining, gas-to-liquids and coal-to-liquids) will be an added advantage. <p><i>(Correspondence from contactable referees must be attached to the proposal; failure to do so will result in bidders forfeiting points in this category.)</i></p>	<p>20</p> <p>10</p> <p>10</p>

2	<p>Team Leader and Team Members' Experience:</p> <ul style="list-style-type: none"> ❖ Team leader must have a minimum of ten (10) years experience in process industry consulting, technology selection and operations consulting for the petroleum industry or relevant experience within petroleum refining (e.g. process engineering, refinery design and configuration, technology performance improvement and benchmarking, as well as solid understanding of capital cost estimation principles and methodologies relevant to this scope of work). ❖ The team leader must have at least 3 years experience in a team leadership role. The Curriculum Vitae of the team leader must be attached to the technical proposal as proof. ❖ Team members must have a minimum of five (5) years experience in process industry consulting or technology selection and operations consulting for the petroleum industry or relevant experience within petroleum refining (e.g. process engineering, refinery design and configuration, technology performance improvement and benchmarking and capital cost estimation). The Curriculum Vitae of team members must be attached to the technical proposal as proof. <p><i>(Certified copies of qualifications and details of contactable referees must be attached to the proposal; failure to do so will result in bidders forfeiting points in this category.)</i></p>	15 5 5 5
3	<p>Team Leader and Team Member's Qualifications:</p> <ul style="list-style-type: none"> ❖ The team leader must have a qualification in chemical engineering, mechanical engineering, petrochemical engineering, process engineering or other technical qualifications relevant for the refining technology or petroleum 	10 5

	<p>industry.</p> <ul style="list-style-type: none"> ❖ The team members must have a qualification in chemical engineering, mechanical engineering, petrochemical engineering, process engineering or other technical qualifications relevant for the refining technology or petroleum industry. <p><i>(Certified copies of qualifications and details of contactable referees must be attached to the proposal; failure to do so will result in bidders forfeiting points in this category.)</i></p>	5
4	<p>Project Plan and Methodology</p> <ul style="list-style-type: none"> ❖ The proposal must include a detailed project approach and methodology indicating how the technical work will be executed. 20 ❖ The service provider demonstrates that extensive in-house tools (including that for cost estimation and localisation) and databases (of local and global information) exist to support the scope and deliverables of this study and demonstrates evidence of the ability to use their existing methodologies, previous projects and research capabilities to determine all the technical requirements for the study. 15 ❖ The chosen project methodology must indicate a full understanding of the scope of work and required deliverables and must be accompanied by a detailed project schedule which outlines: <ul style="list-style-type: none"> ○ Key deliverables with clear timelines and key dependencies. 4 ○ Key milestones 3 	55

	<ul style="list-style-type: none"> ○ Any potential project constraints and risks ❖ The service provider demonstrates a solid understanding of the current supply of liquid fuels in South Africa ❖ The study schedule is within the expected time frames for the scope. A shorter (but still realistic schedule) is preferable. 	3 5 5
	Total	100

For purpose of evaluating functionality, the following values will be applicable:

1=	Poor	Will not be able to fulfill the requirements
2=	Average	Will partially fulfill the requirements
3=	Good	Will be able to fulfill the requirements
4=	Very Good	Will be able to fulfill the requirements adequately
5=	Excellent	Will fulfill the requirements exceptionally

Phase 2: Price and B-BBEE

Price	90
B-BBEE compliance	10

9 FORMAT AND CONTENT OF THE PROPOSAL

- 9.1 All the standard bidding documents (SBD) that are included in the bid document must be completed in all respects by bidders. Failure to comply will invalidate a bid.
- 9.2 Bidders are requested to submit two (2) copies: 1 original plus 1 copy of the proposal and bid documents.

10 COMPULSORY BRIEFING SESSION

10.1 A compulsory briefing session for all bidders will be held on **11 APRIL 2017 at 13H30**, at the Department of Energy Head Office.

Address:

**Department of Energy
Corner Visagie and Paul Kruger Streets
Pretoria**

Failure to attend the briefing session will automatically disqualify a bid.

11 CLOSING DATE

11.1 Proposals must be submitted on or before **21 APRIL 2017 at 11h00** to the Department of Energy, Corner Visagie and Paul Kruger Streets, Pretoria. **No late bids will be accepted.**

12 ENQUIRIES

TECHNICAL ENQUIRIES:

Mr Robin Naidoo

Tel: 012 406 7790

E-mail: Robin.naidoo@energy.gov.za

BID ENQUIRIES:

Ms Keitumetse Pitse/ Ms Daisy Maraba

Tel:012 406 7742/ 406 7748

E-mail: Keitumetse.pitse@energy.gov.za/Daisy.maraba@energy.gov.za