

Information Document

Service Proposals and Cost Estimating

ID #2015-002R



Information Documents are not authoritative. Information Documents are for information purposes only and are intended to provide guidance. In the event of any discrepancy between an Information Document and any Authoritative Document(s)¹ in effect, the Authoritative Document(s) governs.

1 Purpose

This Information Document relates to the following Authoritative Documents:

- Section 504.5 of the ISO rules, *Service Proposals and Cost Estimating* (“Section 504.5”)

The purpose of this Information Document is to provide guidance on preparing service proposals and cost estimates for a transmission facility project. This Information Document will be of interest to the legal owner of a transmission facility (“TFO”) that the AESO requests to provide a service proposal and/or a cost estimate for a transmission facility project.

2 Service Proposal

The service proposal provides an overview of the transmission facility project,² including: a project summary; an overview of the TFO’s scope of work; a cost estimate; the planned schedule; and any assumptions and risks. In accordance with subsections 2 and 3 of Section 504.5, the AESO may request that the TFO provide a service proposal, along with a service proposal cost estimate, within a specified time period. Typically, the AESO issues this request before directing the TFO to submit a transmission facility proposal (“facility application”) to the Alberta Utilities Commission (“AUC” or “Commission”) for approval. The service proposal is to be completed in accordance with the Service Proposal Guidelines in Appendix 1.³

For the purpose of preparing a needs identification document (“NID”), the AESO relies on information provided by the TFO in the service proposal to satisfy certain information requirements in AUC Rule 007, *Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations and Hydro Developments* (“AUC Rule 007”). Service proposals completed in accordance with the Service Proposal Guidelines in Appendix 1 generally provide the AESO with a sufficient level of detail to satisfy the applicable AUC Rule 007 information requirements.

3 Cost Estimate

To ensure that cost estimates prepared by TFOs are consistent, the AESO created a Cost Estimate Template, which is posted on the AESO website. The Cost Estimate Template is used for all classes of cost estimates set out in Table 1 below.

Pursuant to subsection 9(1) of Section 504.5, a TFO is required to ensure that a cost estimate is “accurate, complete and in an appropriate level of detail”. The term “accurate” in this regard means “free from material error.” The term “complete” means that all applicable sections have been filled in, or that the TFO has provided reasons in the “Assumptions” column of the Cost Estimate Template in sufficient detail

¹ “Authoritative Documents” is the general name given by the AESO to categories of documents made by the AESO under the authority of the *Electric Utilities Act* and regulations, and that contain binding legal requirements for either market participants or the AESO, or both. AESO Authoritative Documents include: the ISO rules, the Alberta reliability standards, and the ISO tariff.

² For service proposals and cost estimates, the AESO will use “project” to refer to the proposed transmission development only. This differs from the use of the term “project” in relation to system access service requests where “project” includes both the proposed transmission development and any Rate STS, *Supply Transmission Service*, or Rate DTS, *Demand Transmission Service*, requests.

³ See the definition of “service proposal” in the AESO’s *Consolidated Authoritative Documents Glossary*.

to explain why the information was not provided. The phrase “in an appropriate level of detail” means that the cost estimate should include a reasonable level of detail requested in the Cost Estimate Template.

3.1. Use of Association for the Advancement of Cost Engineering Practices

The Association for the Advancement of Cost Engineering (“AACE”) is a non-profit association that provides cost management practices for various industries. The AESO adopted the AACE practices as a foundation for estimating the costs of transmission facility projects. The AESO has aligned Section 504.5 and the Cost Estimate Template with AACE practices. However, where AACE Class Estimates are inconsistent with legislation or AUC rules, the legislation or AUC rules will govern.

AACE practices relating to cost management are available on the AACE website (www.aacei.org) to members free of charge and to non-members for a fee.

TABLE 1: AACE Class Level Estimates

AACE Class Level Estimate	Class 5	Class 4	Class 3	Class 2	Class 1
Project Definition	0% to 2%	1% to 15%	10% to 40%	30% to 75%	65% to 100%
Accuracy Range	L: -20% to -50% H: +30 to +100%	L: -15% to -30% H: +20 to +50%	L: -10% to -20% H: +10 to +30%	L: -5% to -15% H: +5 to +20%	L: -3% to -10% H: +3 to +15%
Industry Usage	Order of Magnitude (OOM)	Needs Identification Document Estimate	Service Proposal Estimate	Post Permit and License Estimate (180 days after permit and license)	Final Cost Estimate

3.1.1. Project Definition

For the purpose of Table 1, the project definition is a percentage of the total project deliverables that have been completed throughout the life of the project. Deliverables include project scope, requirements documents, specifications, project plans and schedules, drawings, learnings from past projects, calculations, and other necessary information to complete the project. The set of deliverables becomes more complete as the project progresses; therefore, the project definition has a correlation with the various AACE classes.

3.1.2. Class Levels

The AACE class level estimates are labeled Class 1, 2, 3, 4 and 5, to correspond with the levels of project definition. A Class 5 estimate is based on the lowest percentage of project definition and a Class 1 estimate is based on the highest percentage of project definition (see Table 1). AACE practices contain additional detail on the characteristics of each of the AACE classes.

3.1.3. Estimate Accuracy Ranges⁴

Estimate accuracy range is an expression of a cost estimate's predicted closeness to final costs for a given project. It is typically expressed as high/low percentages by which actual results may be over or under the estimate. As the project definition increases, the expected accuracy of the estimate tends to improve, as indicated by a narrower high/low accuracy ranges. The estimate accuracy is affected by the project definition and other systemic risks such as:

- complexity of the project;
- quality of reference cost estimating data;
- quality of assumptions used in preparing the estimate;
- experience and skill level of the estimator;
- level of non-familiar technology on the project;
- estimating techniques employed; and
- time and level of effort budgeted to prepare the estimate.

The accuracy range can also reflect unexpected or unknown changes in costs, unknown risks, and minor changes in the quality of the estimate for various project items that are not accounted for in the contingency (which accounts for known risks – see below in Section 3.1.4).

In accordance with subsection 3 of Section 504.5, the AESO may request the TFO to provide a class level estimate within a specified accuracy range, as shown in Table 1. The AESO retains the flexibility to request that a TFO provide a cost estimate in a narrower high/low accuracy range than the maximum upper and lower limits of the ranges in Table 1. This narrower accuracy range may be suitable for smaller, less complex projects.

3.1.4. Project Risk & Contingency⁵

The Cost Estimate Template includes a contingency / risk register that is to be used for the determination of the contingency allowance for a project.

Project contingency is an allowance added to a cost estimate for items, conditions or events where the state, occurrence or effect is uncertain and is likely to result in additional costs. At the early stages of a project, contingency may not be easily identifiable or is assumed, becoming more defined later in the project. Significant known risks are factored into the contingency calculation. As such, contingency is an allowance for "known" risks, while estimate accuracy range is an allowance for systemic or "unknown" risks.

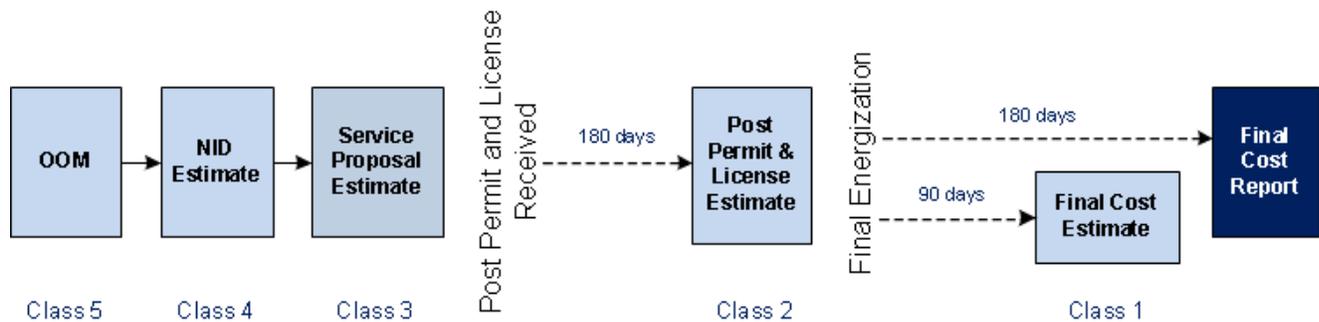
Since risk generally decreases as the amount of work completed increases, the contingency amount included in the cost estimate will typically decrease as a project advances, and reduce to zero once the project is completed. The contingency allowance is not used as a source of funding for scope changes, which must be managed through the change proposal process.

⁴ AACE® International Recommended Practice No. 17R-97, Cost Estimate Classification System, TCM Framework: 7.3 – Cost Estimating and Budgeting, Rev. November 29, 2011, Page 2.

⁵ AACE® International Recommended Practice No. 10S-90, Cost Engineering Terminology, TCM Framework: General Reference, Rev. November 14, 2014, Page 27. <http://www.aacei.org/avectramembers/welcome.asp>

3.2. Industry Usage Estimates

As illustrated below, class level estimates are prepared throughout the project life cycle:



3.2.1. Long Term Plan Estimate / System Access Service Request

In developing the transmission system plan, the AESO prepares and relies on high-level cost estimates, commonly referred to as order of magnitude (“OOM”) cost estimates or Class 5 estimates, which are used to assess and screen transmission development alternatives during the planning stage.

In responding to system access service requests, a Class 5 estimate are required in Stage 2 of the AESO Connection Process.

3.2.2. Needs Identification Document Estimate

As the AESO advances the system development outlined in the long term transmission plan, the estimates are further refined and included in the NID filed with the Commission. A NID estimate or Class 4 estimate may be requested to screen alternatives

As the AESO responds to system access service requests, the AESO may request Class 4 estimates to screen alternative(s).

3.2.3. Service Proposal Estimate

A Class 3 estimate is included with the service proposal provided to the AESO by the TFO. A summary of this same estimate is included with the facility application filed with the Commission.⁶

The Class 3 estimate is defined as the “original budget” in subsection 6 of Section 504.5 as it is considered the baseline estimate for the project against which cost performance will be measured and assessed.

3.2.4. Post-Permit and License Estimate

If the Commission approves a facility application, it grants permits and licenses to the TFO. After permit and license has been granted, a Class 2 estimate in accordance with subsection 7(1) of

⁶ For combined filings, the AESO requests that Class 3 estimates align with TFO facility application requirements. AUC Rule 007 requires the AESO to provide Class 4 estimates, and the AESO requests such estimates for sequential filings.

Section 504.5 may be required within 180 days after receipt of permits and licenses, or as provided in the AESO's direction letter to the TFO.

3.2.5. Final Cost Estimate

After construction and energization of the transmission facilities, a Class 1 estimate in accordance with subsection 8(1) of Section 504.5 may be required within 90 days after final energization, or as provided in the AESO's direction letter to the TFO. The final cost estimate is a Class 1 estimate that includes actual costs and any remaining cost estimates for activities that are required to be completed before the project is closed.

4 Final Cost Report

Under subsection 10 of Section 504.5, the TFO provides the AESO with a final cost report within 180 days after final energization. The final cost report includes all final actual costs for the transmission project. If the 180 day time limit cannot be met, the TFO must apply for an extension, subject to the AESO's approval.

Revision History

2017-11-09	Revisions to subsection 3.2.4 and subsection 3.2.5 Addition of Service Proposal Guidelines as Appendix 1
2017-05-08	Addition of footnotes 2 and 3 for clarification. Administrative Amendments
2016-09-28	Administrative amendments
2016-04-29	Initial release

Appendix 1 – Service Proposal Guidelines (“Guidelines”)

A completed service proposal submitted to the AESO in accordance with subsection 2 of Section 504.5 is comprised of four parts:

- Main report
- Appendix A – Figures
- Appendix B – Cost Estimate
- Appendix C – Project Schedule

These Guidelines are organized as an annotated table of contents intended to provide instruction on the structure and content of the main report of the service proposal. Although these Guidelines are not a template, the AESO encourages TFOs to organize the main report by the following headings and subheadings.

1 Project Overview

The project overview section provides a brief summary of the project, including the scope, total capital cost estimate, and scheduled in-service date. This section also:

- a) confirms that all parts of the service proposal meet the requirements outlined in the AESO’s direction letter, functional specifications, Authoritative Documents, and other technical requirements; or
- b) provides a clear rationale for why these requirements are not applicable.

A bullet list or table may be used to present information about the project.

2 Scope of Work

The scope of work section includes sufficient information to:

- a) discern units of measure;
- b) demonstrate that the TFO’s proposed design meets the requirements described in the AESO’s functional specifications for the project; and
- c) support the TFO’s cost estimate for the project.

This section is organized in a list or table under subheadings for each facility type, such as transmission lines, substations, and telecommunication facilities. Facility descriptions are drafted in a clear and comprehensive manner in the service proposal, however the TFO may find it useful to include additional details in the Cost Estimate Template.

If the proposal exceeds the AESO’s requirements, the scope of work section includes rationale for the additional equipment. Any additional information within the TFO’s knowledge that supports the project’s functional requirements or cost estimate may be included in this section.

2.1. Transmission Lines

Relevant information for transmission line equipment includes:

- Location, nominal voltage, line length, and list of any studies conducted by the TFO;
- Structure type;
- Conductor type, bundled, including overhead shield wire description;

- Meteorological, geotechnical and mechanical design parameters;⁷
- Line impedance, surge impedance and charging;
- Basic insulation levels and current ratings, both seasonal continuous and emergency ratings for winter and summer;
- Special or unique engineering and design standards utilized for the project;
- Right-of-way survey and preparation, access right-of-way, clearance, brushing and environment impact mitigations (e.g., access matting);
- Line foundation work scope;
- Major line crossings, including rivers, highways and other lines;
- Mobilization and de-mobilization areas;
- Camp requirements;
- Laydown / storage yards; and
- Alternating current mitigation on pipeline.

2.2. Substations

Relevant information for substation equipment includes:

- Location of facility, size, configuration, major equipment additions complete with description(s) and list of any studies conducted by the TFO;⁸
- Conceptual substation diagrams, including location, single line diagrams and bus layout drawings (see Appendix A for reference);
- Equipment descriptions with voltage, basic insulation levels, current ratings, quantity of current transformers and potential transformers where appropriate;⁹
- An overview and proposed implementation of protection schemes and control schemes, including any remedial action schemes;
- Supervisory control and data acquisition (“SCADA”) and synchrophasor measurement unit;
- Special or unique engineering and design standards utilized for this project, as applicable;
- Site preparation, access and grading environment impact mitigations (e.g., access matting);
- Mobilization and de-mobilization areas;

⁷ Meteorological, geotechnical and mechanical design parameters are based on the TFO's knowledge at the service proposal stage. It is advisable to include data such as wind, snow, soil conditions and any special considerations for line design that affects the cost estimate.

⁸ Typical studies conducted by a TFO for substations can include, but are not limited to: grounding; system protection coordination; insulation coordination; power quality and harmonic study. Additional studies may be required by the AESO, such as sizing of line shunt reactors.

⁹ Current transformer and potential transformer locations must be shown on the single line diagrams.

- Camp requirements;
- Laydown / storage yards;
- Grounding requirements and design;
- Control and switchgear building description, including size, structure, and physical security;
- Alternating current station power supply and backup generator, if required; and
- Meter, including revenue meter.

2.3. Telecommunications Facilities

Relevant information for telecommunication facility equipment includes:

- Location, communication medium (e.g., fibre, microwave) and a list of studies conducted by the TFO;
- Description of the proposed development and equipment additions;
- Telecommunication tower height and type (e.g., guyed, self-support) if applicable;
- Quantity and type of radio equipment;
- Quantity and type of routers or multiplexers;
- Quantity of fiber and synchronous optical networking (“SONET”) equipment;
- Building description, including size, structure, and physical security;
- Battery or backup generator, if applicable; and
- Special or unique engineering and design standards utilized for this project, as applicable.

2.4. Salvaged Equipment

Salvaged equipment includes any equipment that will be discontinued from transmission service. Relevant information that pertains to salvaged equipment includes the TFO’s plan for the discontinued equipment (e.g., whether it will be refurbished, retired or stored) and how the costs of salvage will be paid.

2.5 Spatial and Technical Diagrams

The spatial and technical diagrams section provides a brief overview of the spatial and technical diagrams, which are attached as Appendix A to the service proposal. These diagrams include, but are not limited to:

- *Project Area Map*: provides a bird’s eye view map of the project area. The map should identify: the facilities that are being added as a part of the project; access routes; nearby infrastructure and geographic features; surrounding communities, First Nation reserves and Metis settlements; provincial and federal parks; and protected areas.
- *Conceptual Substation Single Line Diagram*: provides a single line diagram showing current transformers, potential transformers, and metering locations. The diagram indicates the facilities that are being added as a part of the transmission facility project.
- *Substation Layout*: shows the top view of substation(s).

- *Protection and Control and Metering Drawings*: shows the type of protection and installation locations of meters.
- *Telecommunication System Map*: shows the telecommunication facility proposed to meet the AESO's functional specification, Authoritative Documents and other technical requirements.

3 Cost Estimate

The cost estimate is a cost baseline that informs the AESO's Needs Identification Document ("NID") and/or the TFO's facility proposal submitted to the Alberta Utilities Commission ("Commission"). The cost estimate follows the requirements of the functional specification, and takes into account all applicable AESO Authoritative Documents and technical standards. This section of the service proposal specifies the currency used to prepare the Cost Estimate Template (e.g., CAD, USD).

3.1. Cost Estimate Template

The cost estimate is prepared using the Cost Estimate Template and is attached as Appendix B to the service proposal. It is recommended that the file is named: **P[4-digit AESO project no.] Service Proposal Cost Estimate V1.xlsx**

The cost estimate considers the following:

- Site visits, engineering, design and due diligence sufficient to achieve the accuracy range stipulated by the AESO.
- Estimated costs broken down into system-related and participant-related costs as per the ISO tariff Section 8, as shown in the Cost Estimate Template.
- Material and labour costs as available.
- Escalation costs, including costs and calculations under Tab 7 of the Cost Estimate Template.
- The period of time for which the cost estimate is valid.

If the TFO is proposing exceptions to the scope of work described in the AESO functional specification, then the cost estimate includes:

- a) the rationale for each proposed exception; and
- b) a description of the incremental costs or savings resulting from each proposed exception.

3.2. Additional Work

Section 8 of the ISO tariff outlines the requirements that apply if the costs for proposed additional work (including operations and maintenance work) for a project is "deemed to be in excess of those required by the good electric industry practice".

Cost estimates and explanations for the proposed additional work are outlined in this section of the service proposal, not in the Cost Estimate Template. Along with estimated costs, the following information is included in this section:

- A description of the proposed additional work;
- A clear rationale for the proposed additional work, including any advantages related to carrying it out in conjunction with the project; and
- The timing of the proposed additional work relative to the project schedule (e.g., will capital maintenance be delayed to coincide with the project schedule?).

4 Project Schedule

The detailed project schedule is attached as Appendix C to the service proposal. The AESO prefers the detailed project schedule to be submitted in a table format (e.g., Excel). The schedule enables the AESO, the TFO and the customer to share a common timeline throughout the project life that is based on a single source.

The AESO normally provides the implementation schedule to the Commission. For combined filings, the AESO relies on the TFO to provide the implementation schedule in its facility application. The service proposal project schedule is, therefore, consistent with the project implementation schedule the TFO includes with its facility application.

The project schedule section of the service proposal contains a summary of the detailed project schedule, including:

- a list of the schedule and project milestones, where applicable, organized under subheadings for transmission lines, substation(s), and telecommunication facilities;
- the scheduled in-service date(s); and
- a description of construction limitations and constraints.

4.1. Transmission Line(s)

- *Engineering Schedule:* preliminary and detailed beginning and end dates.
- *Procurement Schedule:* beginning and end date for procurement of major equipment and miscellaneous materials (e.g., conductor, poles, insulators and hardware).
- *Construction Schedule:* beginning and end date for construction and installation of foundations, assembly, erections and stringing (including impacts of weather and environmental constraints).
- *Commissioning Schedule:* beginning and end date for commissioning activities, including required outages.

4.2. Substation(s)

- *Engineering Schedule:* preliminary and detailed beginning and end dates.
- *Procurement Schedule:* beginning and end date for procurement of major equipment (e.g., transformers, breakers, instrument transformers, capacitor banks, reactors, and steel) and miscellaneous materials (e.g., hardware, bus pipe and conductor).
- *Construction Schedule:* beginning and end date for construction and installation (including impacts of weather and environmental constraints) for: site preparation; foundations; assembly and erections; equipment installation; protection and controls; and functional checks.
- *Commissioning Schedule:* beginning and end date for commissioning activities, including required outages.

4.3. Telecommunication Facilities

- *Engineering Schedule:* preliminary and detailed beginning and end dates.
- *Procurement Schedule:* beginning and end date for procurement of major equipment (e.g., radios, multiplexers, and towers) and miscellaneous materials (e.g., hardware).

- *Construction Schedule*: beginning and end date for construction and installation (including the impacts of weather and environmental constraints) for: site preparation; foundations; assembly and erections; equipment installation; and functional checks.
- *Commissioning Schedule*: beginning and end date for commissioning activities, including required outages.

4.4. Scheduled In-Service Date

The scheduled in-service date is the date when the project is expected to be energized.

4.5. Construction Limitations and Constraints

The schedule includes potential limitations and constraints that might affect the in-service date, with regard for the environmental factors and assessments required by the Commission, including those listed below.

- *Construction window limitations*: description of no-construct periods.
- *Wildlife studies schedule*: preliminary and detailed beginning and end dates.
- *Schedule for any other required studies and approvals*: preliminary and detailed beginning and end dates.

5 Assumptions

This section lists the assumptions provided by the TFO in the Cost Estimate Template, including but not limited to the following:

- *Scope*: assumptions used to determine work scope and cost estimate.
- *Weather and Environmental*: assumptions about the weather and environment that impact the project scope or cost.
- *Operational Outages*: assumptions regarding outages for construction, line crossings and energization.
- *Allowances*: allowances for funds used during construction and/or construction work in progress.
- *Escalation*: assumptions that were used to calculate the estimated cost of escalation for the project, including: an itemized list of the project-related costs for which escalation was calculated; the annual escalation factor that was assumed for each itemized project-related cost; and the number of years of escalation that was applied for each itemized project-related cost.

6 Deviations from the Functional Specification

This section describes any deviations from the AESO's functional specification, and includes a brief description addressing the rationale for each deviation.

7 Risk Management

The risk management section summarizes project-specific risks, including project delays, along with contingencies and mitigation for these risks.

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8 Operation and Outages

The operation and outages section of the service proposal contains an outage schedule to identify significant planned outages or required outages, in addition to their duration and impact on other operational facilities, in the AESO planning area.

9 Approvals

The TFO signs and approves the completed service proposal before submitting it to the AESO.