AACE International Recommended Practice No. 69R-12

COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN ENGINEERING,
PROCUREMENT, AND CONSTRUCTION FOR THE HYDROPOWER INDUSTRY
TCM Framework: 7.3 – Cost Estimating and Budgeting

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Note: As AACE International Recommended Practices evolve over time, please refer to www.aacei.org for the latest revisions.

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COST ESTIMATE CLASSIFICATION SYSTEM – AS
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PURPOSE

As a recommended practice of AACE International, the *Cost Estimate Classification System* provides guidelines for applying the general principles of estimate classification to project cost estimates (i.e., cost estimates that are used to evaluate, approve, and/or fund projects). The *Cost Estimate Classification System* maps the phases and stages of project cost estimating together with a generic project scope definition maturity and quality of inputs matrix, which can be applied across the hydropower industry.

This addendum to the generic recommended practice (17R-97) provides guidelines for applying the principles of estimate classification specifically to project estimates for engineering, procurement, and construction (EPC) or other contractual arrangements and execution venues, both for owners and service providers, and their related work in developing hydropower projects. This addendum supplements the generic recommended practice by providing:

- a section that further defines classification concepts as they apply to the hydropower industry and their unique differences to other industries
- a section on the regulatory requirements and resulting impacts that are specific to hydropower projects
- a chart that maps the extent and maturity of estimate input information (project definition deliverables) against the class of estimate.

As with the generic recommended practice, the intent of this addendum is to improve communications and consensus among all of the stakeholders involved with preparing, evaluating, and using project cost estimates specifically for the hydropower industry.

The overall purpose of this recommended practice is to provide the hydropower industry with a definition deliverable maturity matrix which is not covered in 17R-97. This RP provides an approximate representation and logical linage of the relationship of specific design input data and design deliverable maturity to the estimate accuracy and methodology used to produce the cost estimate.

The estimate accuracy range is driven by many other variables and risks, so the maturity and quality of the scope definition available at the time of the estimate is not the sole determinate of accuracy; risk analysis is required for that purpose.

This document is intended to provide a general guideline, not a standard. It is understood that each enterprise may have its own project and estimating processes and terminology, and may classify estimates in their own particular ways. This guideline provides a generic and generally acceptable classification system for the hydropower industry that can be used as a starting point for the basis of comparison. This RP should allow each user to better assess, define, and communicate their established and developed procedures and standards in light of generally-accepted cost engineering practice.

INTRODUCTION

For the purposes of this RP, the term "hydropower industry" is assumed to include private and public utilities involved with the production of electrical power, exclusive of transmission and distribution, using natural gravitational force of falling or flowing water, excluding tidal forces, to drive a turbine that powers a generator.

January 25, 2013

The common thread among private and public utilities (for the purpose of estimate classification) is their reliance on user requirements, statement of objectives, design reports (i.e. geotechnical investigations, sourcing borrow materials and hydraulic design/modeling) and/or environmental data collection and studies as primary scope defining documents. These documents are key deliverables in determining the degree of project definition, and thus the extent and maturity of estimate input information.

Cost estimates for hydropower facilities are typically composed of key features such as:
- Reservoir area preparation (e.g., clearing, removal of structures and earthmoving).
- River management (e.g., cofferdams, diversion channels or tunnels, sediment management plans, environmental monitoring programs).
- Principal structures (e.g., dams, dykes, intakes, penstocks, powerhouse(s), low level outlet(s), power tunnel(s), de-silting basin(s), and spillway structure(s)).
- Permanent infrastructure (e.g., access roads, railroads, bridges, offices, warehouse and housing).
- Temporary infrastructure (e.g., construction camp, site access roads, airport, workshops, construction power etc).
- Environmental mitigation features (e.g. fish ladder(s), water bypass and creation of new fish or wildlife habitat).
- Owner's costs (e.g., stakeholder involvement, licensing, studies and investigations, administration and overhead, catering.).

Some, but not all, of these features are unique to the hydropower industry.

Typical hydropower facilities may include: turbines, generators, exciters, governors, transformers, gates for intake, spillway and draft tubes, and supporting electrical, mechanical, telecom, protection, and control systems. The water storage reservoir is typically required to support the operations of the hydropower facility.

This RP does not specifically address cost estimate classification for other industries such as commercial building construction, environmental remediation, transportation infrastructure, process (oil & gas), "dry" processes such as assembly and manufacturing, mining and mineral processing, transmission and distribution of electricity, thermal, wind, solar, tidal and geothermal generation, "soft asset" production such as software development, and similar industries.

The cost estimates covered by this RP are primarily for engineering, procurement, and construction (EPC) work during implementation. Planning and regulatory compliance cost during the identification and definition phases of the project and final testing and commissioning at close-out is also covered under this RP. Operation and maintenance during the life of the hydropower facility are not addressed in this RP.

This RP reflects generally-accepted cost engineering practices and is based upon consolidated practices from the hydropower industry that covers its major production facilities.

CIMFP Exhibit P-03176   Page 4

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   3 of 14
Construction for the Hydropower Industry

January 25, 2013

COST ESTIMATE CLASSIFICATION MATRIX FOR THE HYDROPOWER INDUSTRY

ESTIMATE CLASS	*Primary Characteristic*	*Secondary Characteristic*		
	MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges [a]
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Notes: [a] The state of technology, availability of applicable reference cost data, and many other risks affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

Table 1 – Cost Estimate Classification Matrix for the Hydropower Industry

Table 1 provides a summary of the characteristics of the five estimate classes. The maturity level of project definition is the sole determining (i.e., primary) characteristic of a corresponding Class. In Table 1, the maturity is roughly indicated by a % of complete definition; however, it is the maturity of the defining deliverables that is the determinant of estimate class, not the percentage. The specific deliverables, and their maturity, or status, are provided in Table 3. The other characteristics are secondary and are generally correlated with the maturity level of project definition deliverables, as discussed in the generic RP[1]. The characteristics are typical for the hydropower industry but may vary from application to application depending on location and output of power profile.

This matrix and guideline outlines an estimate classification system that is specific to the hydropower industry. Refer to the generic estimate classification RP[1] for a general matrix that is non-industry specific, or to other RPs for guidelines that will provide more detailed information for application in other industries. These will provide additional information, particularly the project definition deliverable maturity matrix which determines the class in those particular industries.

Table 1 illustrates typical variation of expected accuracy ranges that are associated with the hydropower industry. Depending on the technical maturity, complexity, project deliverables, contracting strategy (and other variables) and risks associated with each estimate, the accuracy range for any particular estimate is expected to fall into the ranges identified (although extreme risks can lead to wider ranges).

In addition to the degree of project definition, estimate accuracy is also driven by other systemic risks such as:
- Labor market conditions.
- Level of new technology in the project.
- 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.

CIMFP Exhibit P-03176   Page 5

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   4 of 14
Construction for the Hydropower Industry

January 25, 2013

- Estimating techniques employed.
- Time and level of effort budgeted to prepare the estimate.
- Experience of the project execution team.

Systemic risks such as these are often the primary driver of accuracy; however, project-specific risks (e.g. risk events) also drive the accuracy range [5]. Project risks that are typical and often significant for the hydropower industry include the following:

- Project duration length (including studies and investigations) that is often measured in decades.
- Large areas where sub-surface geotechnical conditions are unknown due to restricted access (i.e. environmental regulatory restrictions, hazardous conditions).
- Difficulties in completion of transmission connection.
- Hydrology and hydraulic studies.
- Management or prevention of scouring and sediment transport due to construction.
- Safety accidents unique to in-water work.
- Mass material sources and utilization (e.g., concrete and aggregate).
- Excavated material disposal.
- Construction season (restrictions due to environmental regulation, weather).
- Limited supplies of quality hydropower equipment and delivery delays.
- Ambiguous environmental regulation with respect to the industry.
- Environmental mitigation measures (terrestrial, avian, fish).

Another way to look at the variability associated with estimate accuracy ranges is shown in Figure 1. Depending upon the technical complexity of the project, the availability of appropriate cost reference information, the degree of project definition, and the inclusion of appropriate contingency determination, a typical Class 5 estimate for a hydropower project may have an accuracy range as broad as -50% to +100%, or as narrow as -20% to +30%.

Figure 1 also illustrates that the estimating accuracy ranges overlap the estimate classes. There are cases where a Class 5 estimate for a particular project may be as accurate as a Class 3 estimate for a different project. For example, similar accuracy ranges may occur for the Class 5 estimate of one project that is based on a repeat project with good cost history and data and the Class 3 estimate for another project involving new technology. It is for this reason that Table 1 provides a variation in the expected accuracy range values. The accuracy range is determined through a detailed and thorough risk analysis of the specific project.

CIMFP Exhibit P-03176   Page 6

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   5 of 14
Construction for the Hydropower Industry
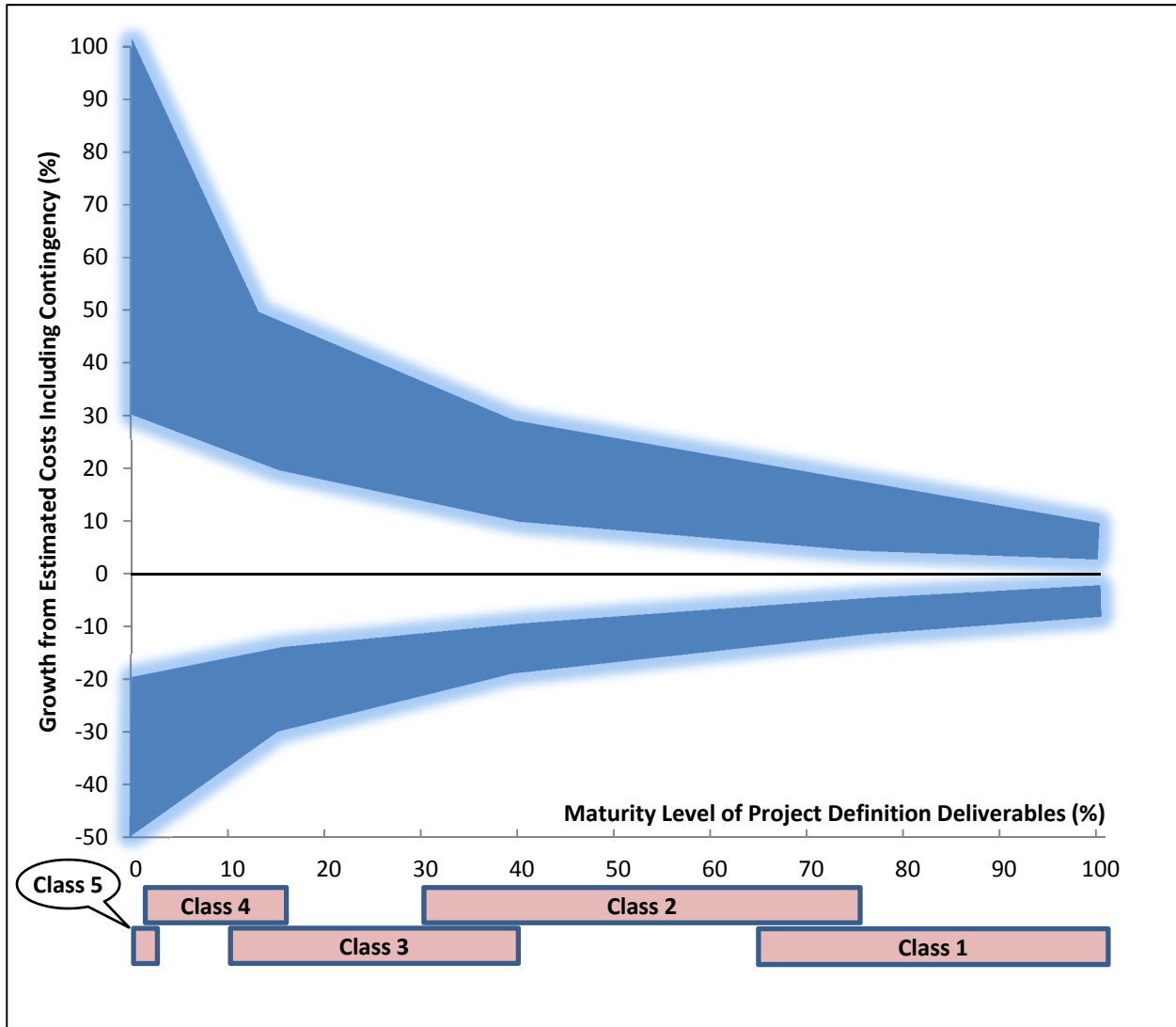
January 25, 2013

Figure 1 – Example of the Variability in Accuracy Ranges for a Hydropower Industry Estimate

DETERMINATION OF THE COST ESTIMATE CLASS

The cost estimator determines the cost estimate class based upon the maturity level of project definition which is based on the status of specific key planning and design deliverables. The percent design completion may be correlated with the status as a valuable indicator, but the percentage should not be used as the class determinate. While the determination of the status (and hence class) is somewhat subjective, having standards for the design input data, completeness and quality of the design deliverables, will serve to make the determination more objective.

CHARACTERISTICS OF THE ESTIMATE CLASSES

The following tables (2a through 2e) provide detailed descriptions of the five estimate classifications as applied in the hydropower industry. They are presented starting in the order of least-defined estimates and progressing to

CIMFP Exhibit P-03176   Page 7

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   6 of 14
Construction for the Hydropower Industry

January 25, 2013

the most-defined estimates. These descriptions include brief discussions of each of the estimate characteristics that define an estimate class. For each table, the following information is provided:

- **Description:** A short description of the class of estimate, including a brief listing of the expected estimate inputs based on the maturity level of project definition deliverables. The "minimum" inputs reflect the range of industry experience, but would not generally be recommended.

- **Maturity Level of Project Definition Deliverables (Primary Characteristic):** Describes a particularly key deliverable and a typical target status in stage-gate decision processes, plus an indication of approximate percentage of full definition of project and technical deliverables. For the hydropower industry, and for that matter other related process/construction related industries, this correlates with the percentage of engineering and design complete.

- **End Usage (Secondary Characteristic):** A short discussion of the possible end usage of this class of estimate.

- **Estimating Methodology (Secondary Characteristic):** A listing of the possible estimating methods that may be employed to develop an estimate of this class.

- **Expected Accuracy Range (Secondary Characteristic):** This is the typical variation in low and high ranges after the application of contingency (determined at a 50% level of confidence that the costs will over-run or under-run). Typically, this represents about an 80% confidence interval that the actual cost will fall within the bounds of the low and high ranges. The estimate confidence interval or accuracy range is driven by the reliability of the scope information available at the time of the estimate in addition to the other variables and risk identified above.

- **Alternate Estimate Names, Terms, Expressions, Synonyms:** This section provides other commonly used names that an estimate of this class might be known by. These alternate names are not endorsed by this recommended practice. The user is cautioned that an alternative name may not always correlate and could mislead in selecting the appropriate class of estimate as identified in Tables 2a-2e.

CIMFP Exhibit P-03176   Page 8

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   7 of 14
Construction for the Hydropower Industry

January 25, 2013

CLASS 5 ESTIMATE	
Description: Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. As such, some companies and organizations have elected to determine that due to the inherent inaccuracies, such estimates cannot be classified in a conventional and systematic manner. Class 5 estimates, due to the requirements of end use, may be prepared within a very limited amount of time and with little effort expended—sometimes requiring less than a day to prepare. Often, little more than a proposed facility layout, location, and generation capacity based on a statement of objectives are known at the time of estimate preparation. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: General arrangement diagram/sketch that defines the project location and statement of objectives agreed by key stakeholders and project sponsor/initiator. 0% to 2% of full project definition. **End Usage:** Class 5 estimates are prepared for any number of strategic business planning purposes, such as but not limited to market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location selection studies, evaluation of resource needs and high level budgeting, long-range capital planning, etc.	**Estimating Methodology:** Class 5 estimates generally use stochastic estimating methods such as cost/capacity curves and factors, historical data and other parametric and modeling techniques. **Expected Accuracy Range:** Typical accuracy ranges for Class 5 estimates are -20% to -50% on the low side, and +30% to +100% on the high side, depending on the technological complexity of the project, appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Factored, ballpark, blue sky, seat-of-pants, WAG, first cut, idea study, conceptual level estimate, order-of-magnitude estimate, guesstimate, rule-of-thumb, top down.

Table 2a – Class 5 Estimate

CIMFP Exhibit P-03176   Page 9

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   8 of 14
Construction for the Hydropower Industry

January 25, 2013

CLASS 4 ESTIMATE	
Description: Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, alternative concept evaluation, and definition phase (preliminary) budget approval. Typically, engineering is from 1% to 15% complete, and would comprise at a minimum the following: Feasibility design for several alternative layouts to include design criteria, generation capacity, feasibility level drawings, preliminary one-line diagrams, and comprehensive user requirements. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: Feasibility design report for feasible alternative schemes. 1% to 15% of full project definition. **End Usage:** Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business case development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, selection of a feasible alternative and preliminary budget approval to proceed to next stage of the project (definition phase).	**Estimating Methodology:** Class 4 estimates generally use stochastic estimating methods such as cost/capacity graphs or curves and factors, historical data and other parametric and modeling techniques. **Expected Accuracy Range:** Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Screening, top-down, feasibility level, definition phase authorization, factored, pre-design, pre-study.

Table 2b – Class 4 Estimate

CIMFP Exhibit P-03176   Page 10

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   9 of 14
Construction for the Hydropower Industry

January 25, 2013

CLASS 3 ESTIMATE

Description:	**Estimating Methodology:**
Class 3 estimates are generally prepared to form the basis for budget authorization, appropriation, and/or funding. As such, they typically form the initial control estimate against which all actual costs and resources will be monitored. Typically, engineering is from 10% to 40% complete, and would comprise at a minimum the following: Preliminary general arrangement drawings, powerhouse, intake and spillway drawings and specifications, essentially complete geotechnical investigations and hydrotechnical studies, preliminary earthwork drawings for excavation defining unclassified and rock, rock support and foundation treatment and for embankment c/w definition for various zones, complete one-line diagrams, equipment performance specifications complete for turbines, generators, governors, and exciters, preliminary auxiliary mechanical and electrical systems, and preliminary piping and instrument/protection & control/telecom systems. Also, procurement strategy identifying long lead items of equipment.	Class 3 estimates generally involve more deterministic estimating methods than stochastic methods. They usually involve predominant use of unit cost line items, although these may be at an assembly level of detail rather than individual components. Factoring and other stochastic methods may be used to estimate less-significant areas of the project.
Maturity Level of Project Definition Deliverables:	**Expected Accuracy Range:**
Key deliverable and target status: Preliminary design report complete with project description. 10% to 40% of full project definition.	Typical accuracy ranges for Class 3 estimates are -10% to -20% on the low side, and +10% to +30% on the high side, depending on the technological complexity of the project, appropriate reference information, and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks.
End Usage:	**Alternate Estimate Names, Terms, Expressions, Synonyms:**
Class 3 estimates are typically prepared to support full project funding requests, and become the first of the project implementation phase control estimates against which all actual costs and resources will be monitored for variations to the budget.	Budget, scope, sanction, semi-detailed, authorization, preliminary control, preliminary design level estimate, target estimate, bottom-up.

Table 2c – Class 3 Estimate

CIMFP Exhibit P-03176   Page 11

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   10 of 14
Construction for the Hydropower Industry

January 25, 2013

CLASS 2 ESTIMATE	
Description: Class 2 estimates are generally prepared to form a detailed contractor control baseline (and update the owner control baseline) against which all project work is monitored in terms of cost and progress control. For contractors, this class of estimate is often used as the bid estimate to establish contract value. Typically, engineering is from 30% to 75% complete, and would comprise at a minimum the following: final geotechnical investigations, and hydrotechnical reports, professional engineer sealed drawings and specifications for general arrangements, earthwork excavation and embankments, powerhouse, intake and spillway (for all engineering disciplines), for major equipment (i.e. turbines generators, governors and exciters), auxiliary mechanical and electrical systems, one-line diagrams, and piping, instrument, protection and control and telecom systems, and permanent/temporary infrastructure. Vendor quotations, detailed project execution plans, procurement strategy identifying all major items of equipment, resourcing and work force plans, etc. would also be required. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: Tender specifications, reports, background information and drawings complete for tender purposes. 30% to 75% of full project definition. **End Usage:** Class 2 estimates are typically prepared as the detailed contractor control baseline (and update the owner control baseline) against which all actual costs and resources will now be monitored for variations to the budget, and form a part of the change management program.	**Estimating Methodology:** Class 2 estimates generally involve a high degree of deterministic estimating methods. Class 2 estimates are prepared in great detail, and often involve thousands of line items. For those areas of the project still undefined, an assumed level of detail takeoff (forced detail) may be developed using unit cost line items in the estimate instead of relying on factoring methods. **Expected Accuracy Range:** Typical accuracy ranges for Class 2 estimates are -5% to -15% on the low side, and +5% to +20% on the high side, depending on the technological complexity of the project, appropriate reference information, and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Detailed control, forced detail, execution phase, master control, engineer's estimate, bid, tender, change order estimate, bottom-up.

Table 2d – Class 2 Estimate

CIMFP Exhibit P-03176   Page 12

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   11 of 14
Construction for the Hydropower Industry

CLASS 1 ESTIMATE

Description:

Class 1 estimates are generally prepared for discrete parts or sections of the total project rather than generating this level of detail for the entire project. The parts of the project estimated at this level of detail will typically be used by subcontractors for bids, or by owners for check estimates. The updated estimate is often referred to as the current control estimate and becomes the new baseline for cost/schedule control of the project. Class 1 estimates may be prepared for parts of the project to comprise a fair price estimate or bid check estimate to compare against a contractor's bid estimate, or to evaluate/dispute claims. Typically, overall engineering is from 65% to 100% complete (some parts or packages may be complete and others not), and would comprise virtually all engineering and design documentation of the project, and complete project execution and commissioning plans.

Maturity Level of Project Definition Deliverables:

Key deliverable and target status: All deliverables in the maturity matrix complete. 65% to 100% of full project definition.

End Usage:

Generally, owners and EPC contractors use Class 1 estimates to support their change management process. They may be used to evaluate bid checking, to support vendor/contractor negotiations, or for claim evaluations and dispute resolution.

Construction contractors may prepare Class 1 estimates to support their bidding and to act as their final control baseline against which all actual costs and resources will now be monitored for variations to their bid. During construction, Class 1 estimates may be prepared to support change management.

Estimating Methodology:

Class 1 estimates generally involve the highest degree of deterministic estimating methods, and require a great amount of effort. Class 1 estimates are prepared in great detail, and thus are usually performed on only the most important or critical areas of the project. All items in the estimate are usually unit cost line items based on actual design quantities.

Expected Accuracy Range:

Typical accuracy ranges for Class 1 estimates are -3% to -10% on the low side, and +3% to +15% on the high side, depending on the technological complexity of the project, appropriate reference information, and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks.

Alternate Estimate Names, Terms, Expressions, Synonyms:

Full detail, release, fall-out, tender, firm price, bottoms-up, final, detailed control, forced detail, execution phase, master control, fair price, definitive, change order estimate.

Table 2e – Class 1 Estimate

ESTIMATE INPUT CHECKLIST AND MATURITY MATRIX

Table 3 maps the extent and maturity of estimate input information (deliverables) against the five estimate classification levels. This is a checklist of basic deliverables found in common practice in the hydropower industry. The maturity level is an approximation of the completion status of the deliverable. The completion is indicated by the following letters.

- **None (N):** Development of the deliverable has not begun.
- **Started (S):** Work on the deliverable has begun. Development is typically limited to sketches, rough outlines, or similar levels of early completion.
- **Preliminary (P):** Work on the deliverable is advanced. Interim, cross-functional reviews have usually been conducted. Development may be near completion except for final reviews and approvals.
- **Complete (C):** The deliverable has been reviewed, approved and issued for design as appropriate.

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and
Construction for the Hydropower Industry

12 of 14

January 25, 2013

To produce an estimate of a certain class, without qualifications, all deliverables listed in Table 3 must be advanced to the level of completion associated with the estimate class.

MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES	ESTIMATE CLASSIFICATION				
	CLASS 5	**CLASS 4**	**CLASS 3**	**CLASS 2**	**CLASS 1**
	0% to 2%	**1% to 15%**	**10% to 40%**	**30% to 75%**	**65% to 100%**
General Project Data:					
Project Scope of Work Definition	S	S	P	P	C
Facility Output Profile & Nameplate Capacity	S	P	C	C	C
Site Infrastructure (Access, Construction Power, Camp etc.)	N	S	P/C	C	C
Principal Works (Location)	S	P	C	C	C
Hydraulic & Hydrology	S	P	C	C	C
Topography & Bathymetry	S	P	P/C	C	C
Geotechnical Investigation	N	S	P/C	C	C
Material Utilization (Borrow Sources)	S	P	P/C	C	C
Environmental Studies	S	P	C	C	C
Environmental Monitoring (During Construction & Operations)	N	N	N	S	P
Stakeholder Engagement	N	S/P	P	P/C	C
Regulatory Approval & Permitting	S	P	C	C	C
Integrated Project Plan	S	P	C	C	C
Project Schedule Baseline	S	P	P/C	C	C
Work Breakdown Structure (WBS)	S	P	P/C	C	C
Workforce Estimates	N	S	P	C	C
Project Code of Accounts (Control Accounts)	N	S	P	C	C
Equipment Procurement Strategy (Owner vs. Contractor)	N	S	C	C	C
Contracting and/or Outsourcing Strategy	N	S	C	C	C

CIMFP Exhibit P-03176   Page 14

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Hydropower Industry

13 of 14

January 25, 2013

	ESTIMATE CLASSIFICATION				
	CLASS 5	**CLASS 4**	**CLASS 3**	**CLASS 2**	**CLASS 1**
MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES	**0% to 2%**	**1% to 15%**	**10% to 40%**	**30% to 75%**	**65% to 100%**
Engineering Deliverables * (Specifications and/or Drawings)					
General Arrangement Design & Drawings	S	S/P	P / C	C	C
Project Parameters	S	P	C	C	C
PMF and Hydraulic Design	S	P	C	C	C
Dam Design & Drawings	N	S	P	P/C	C
Intake Design & Drawings	N	S	P	P/C	C
Penstock Design & Drawings	N	S	P	P/C	C
Power House Design & Drawings	N	S	P	P/C	C
Spillway Design & Drawings	N	S	P	P/C	C
De-Silting Basins	N	S	P	P/C	C
Power Tunnel/Canal	N	S	P	P/C	C
Gates and Cranes Design & Drawings	N	S	P	P/C	C
Turbine and Generator Design & Drawings	N	S	P	P/C	C
Electrical One-Line Drawings	N	N	S	P	C
Auxiliary Mechanical Design & Drawings	N	N	S	P	C
Auxiliary Electrical Design & Drawings	N	N	S	P	C
Protection & Controls System Design & Drawings	N	N	S	P	C
Telecommunication System Design & Drawings	N	N	S	P	C
Spare Parts Spec (Commissioning & Operation)	N	N	S	P	C
Mitigation Measures (Aquatic, Terrestrial, Avian, Clearing, Heritage etc.)	N	S	P	C	C

Table 3 – Estimate Input Checklist and Maturity Matrix

*Some of the above engineering deliverables may not be applicable to all projects.

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CIMFP Exhibit P-03176   Page 15

69R-12: Cost Estimate Classification System – As Applied in Engineering, Procurement, and   14 of 14
Construction for the Hydropower Industry

January 25, 2013

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