Calpine Standard Progress and Schedule Management System

I. Purpose

"Calpine Construct" is an integrated solution to the project development and implementation process. One feature of this methodology is the ability to capture the advantages associated with combining separate engineering and construction contractors with Calpine major equipment suppliers.

The ability to seamlessly integrate the detailed schedules for all elements of the project lifecycle becomes key to the success of the project.

This specification establishes the basis that will be used to enable this integration, resulting in the uniform, objective reporting of project progress. This reporting will be used to:

- Evaluate Plans for Execution of Work
- Validate Progress

II. Responsibilities

A. Calpine – Owner

Calpine places great value on the ability to develop and execute effective plans, measure progress against these plans and proactively investigate actions that will positively affect the outcome of our projects. Calpine is also sensitive to the confidential nature of some of the information required to accomplish this, and will accordingly maintain the confidentiality of all information provided in support of this program.

Calpine will oversee the overall integration of the project schedules. In order to facilitate this, stringent standards will be placed on the development, initial review, acceptance, and subsequent updates of the Project Schedules.

Periodically, Calpine will perform unannounced audits of the Project Schedule, supporting documentation, work processes and procedures employed by the Engineering and/or Construction Contractors. These audits will focus on compliance with Section E - Calpine Standard Progress and Schedule Management System Criteria.

The Project Schedule, in conjunction with Select Milestones will be utilized to determine Progress Payments.

Calpine will provide at Contract Award

- An update to the Project Milestone Schedule, which was originally submitted in the Request for Proposal.

- A copy of the Calpine Schedule Standards, containing Activity Codes, Resources, Layouts, Filters and Reports. This will be in the form of a Primavera backup.

- An Excel Workbook to be used for the Generation of Resource, Commodity, Major Equipment Curves, as well as Progress Payment (Invoice) Support. Sample curves, along with a Sample Data Sheet are shown as Attachment A.

- A list of Progress Milestones and the associated payment value.

B. Engineer / Contractor

The fact that Calpine will oversee the integration of the project schedules does not relieve the requirements for coordination between Engineering Contractors, Construction Contractors, or Vendors. Adequate resources will be required, from all involved parties, to facilitate effective schedule control of the project.

1. Schedule Requirements

Schedule requirements will include, but not be limited to:

a) Projects will be developed in Primavera Project Planner version 2.0b or 3.0

b) An acceptable Project Schedule will represent the entire Project in terms of:

- Engineering Man-Hours
- Construction Man-Hours
- Engineering Released Commodities
- Construction Installed Quantities
- Major Equipment Purchases

c) Within 10 working days of the Engineering Limited Notice to Proceed, a Preliminary Engineering Schedule will be developed which supports the Project Milestone Schedule as well as the detailed requirements for the generation of the Construction Request for Proposal.

d) After Construction Contractor selection (Letter of Intent), the Engineering Contractor, Construction Contractor and Owner Representatives will jointly develop the Project Execution Schedule. The original submittal of the Project Execution Schedule shall occur within 10 working days of the Letter of Intent. The final Baseline Project Execution Schedule (BPES) is due within 20 working days of Letter of Intent.

- The BPES will be maintained as the Primavera Target Schedule.

e) A copy of the BPES will be made. This copy will be periodically updated, and will be called the Current Project Execution Schedule (CPES).

- CPES Updates are to be emailed to CMSchedules@calpine.com with the subject line formatted as follows:

Schedule Update;XXXX;Z;YYMMDD

Example: Schedule Update;1042;C;010129

Where "XXXX" is the Calpine assigned Project Number

"Z" identifies the type of schedule

E	Engineering
P	Procurement
C	Construction
V	Startup

"YYMMDD" indicated the progress (data) date for the schedule update.

f) All Tasks contained in the schedule shall have:

(1) Appropriate resource and / or commodity loading.

(2) Durations that are representative of the crews and machinery required to complete the task.

(3) Durations of 20 working days, or less. (exceptions being made only for Level of Effort activities).

g) Tasks definitions shall fall into one of the following three categories:

(1) Progressed - Clear, verifiable relationships can be established with elements of the "Bucket Reports" described in section 6.

(2) Milestone - Direct observation can be made that completes the task.

(3) Level of Effort - Progress will be based on expended duration compared to remaining duration.

h) Since Calpine will integrate the submitted schedules into Project Group Schedules as well as Program Summary Schedules, the Primavera Activity Id's used shall be a maximum of 8 Characters in length.

i) The first 8 Fields (25 Characters) of the Activity Code dictionary must reflect the attached Calpine Work Breakdown Structure.

j) All tasks will be properly coded to all elements of the Calpine Work Breakdown Structure.

k) All Manpower Resources, Commodity Quantities, and Equipment Costs shall be loaded in accordance with the attached Calpine Resource and Commodity designators.

l) To the greatest extent practical, predecessors and successors will be applied to all tasks, in such a manner that the Early Start dates reflect the planned commencement for the execution of the tasks.

m) In order to maximize the value of the scheduling effort, the use of Lags, Constraints and other artificial means of timing activities will be minimized.

n) Calpine will make use of the Open End, Out of Sequence Progress and Constraint listings to evaluate the various components of the Master Project Schedule.

o) Current Project Execution Schedule will be compared to the Baseline Project Execution Schedule for Progress and/or Schedule Variances in accordance with section F – Variance Calculations. Calpine will periodically ask for analysis of these variances.

2. Progress Curves

The following progress curves will be generated from the applicable schedule update:

- Engineering Hours by Discipline
- Construction Hours by Craft

3. Commodity Curves

The following commodity curves will be generated from the applicable schedule update:

- Engineering Quantities Released
- Construction Quantities Installed

4. Procurement Logic

The BPES procurement logic for the contactor furnished engineered equipment will be developed to reflect the correct sequencing of procurement activities. Logic will include as a minimum the following activities:

- Preliminary Specification development and review
- Bid and Review
- Issue of Purchase Order
- Receipt and Review of Vendor Information
- Fabrication
- Delivery

5. Submittal Process

Progress Curve Updates are to be emailed to CMSchedules@calpine.com with the subject line formatted as follows:

Progress Curves;XXXX;Z;YYMMDD

Where "XXXX" is the Calpine assigned Project Number

Example: Progress Curves;1042;E;010129

"Z" identifies the type of schedule

E	Engineering
P	Procurement
C	Construction
V	Startup

"YYMMDD" indicated the progress (data) date for the progress curves.

6. Progress Payments

Progress Payments will be based on the Actual Progress (Earned Value) as follows:

- Major Equipment – plan will be established by completing a histogram of the required disbursements for each of the 7 major equipment categories. The current progress payment will be based on actual disbursements, to be supported by proof of payment.

- Engineering Labor – will be represented by applying a work-hour cost factor to the 6 engineering discipline hours. The current progress payment will be based upon application of these work-hour cost factors to the man-hour value of the work that has actually been completed.

- Bulk Material value will be represented through the application of quantity cost factors to the 8 construction commodities. The current progress will be base upon applying these quantity cost factors to the commodity value of the work that has actually been completed.

- BOP Equipment - plan will be established by completing a histogram of the required disbursements. Since BOP Equipment is often estimated as a function of Bulk Materials, the current progress payment for BOP Equipment will be represented through the application overall progress of the Bulk Materials to the value of BOP Equipment.

- The Labor Value of the Construction Contract will be represented by applying a work-hour cost factor to the 10 construction disciplines. The current progress payment will be based upon application of these work-hour cost factors to the man-hour value of the work that has actually been completed.

- The Milestone value will be represented through the application of lump sum values to the following suggested milestones:

  Site Mobilization
  Completion of Piling
  Completion of Underground Trenches
  Completion of Circ. Water Piping
  Commission Water Treatment System
  Completion of HRSG Foundations
  Completion of CTG Foundations
  Completion of STG Foundations
  Backfeed
  Complete HRSG Hydro
  CTG First Fire
  Place STG on Turning Gear
  Mechanical Completion

  The current progress payment will be based upon applying these Lump sum values to the completed milestones.

7. Quantity Tracking (Bucket) Reports

The following quantity tracking reports will be required for engineering:

- Civil Drawings
- Structural Drawings
- Cable Tray
- Conduit
- Terminations
- Piping Isometrics
- Electrical Arrangements

The following quantity tracking reports will be required for construction:

- Piling
- Concrete
- Structural Steel
- Piping
- Cable Tray
- Conduit
- Pulled Cable
- Terminations

Calpine understands that most Engineering and Construction Contractors already have developed quantity-tracking systems that are part of their internal work process. It is the intent to use, where possible, output from these systems to validate schedule task progress. Output formats from these systems, along with information management work process descriptions will be submitted to Calpine for approval. Once the formats and information management work processes are approved, quantity reports are to be submitted in conjunction with the CPES updates.

III. Calpine Work Breakdown Structure

A. Calpine Phase

(Name – CPA, Length = 3 Characters)

300 Milestones
301 Interconnect Costs
302 Major Equipment Procurement
304 Engineering
305 Construction Costs
400 Commissioning

B. Calpine Area

(Name – CPB, Length = 3 Characters)

The Project Controls Team for the project (consisting of the constructor's scheduler, the engineer's scheduler and the Calpine Construction Analyst) will come up with the Area codes as a team. This exercise will consist of a review of the project site general arrangement during the schedule integration kickoff meeting.

Some examples of Calpine Area code are as follows:

BLW WATER TREATMENT BLDG / FIRE PUMPHOUSE
CTU COOLING TOWER U/G
CTW COOLING TOWER
HRS HRSG
STG STEAM TURBINE GENERATER / GSU

C. Calpine Responsibility

(Name CPC, Length = 1 Character)

R Licensing /Permit Regulatory Agency
O Owner
E Engineer
V Vendor (i.e. Power Island Equipment)
C Contractor
H Host (i.e. steam and / or power host)

D. Calpine System

(Name CPD, Length = 3 Characters)

ACW	Auxiliary Cooling Water System
AEX	Air Extraction System
AST	Ammonia Storage and Transfer System
AXB	Auxiliary Boilers
BBS	Boiler Blowdown System
BCW	Bearing Cooling Water System
BFW	Boiler Feed Water
BLA	Administration and/or Control Building
BLC	Cooling Tower (area) Building
BLD	Buildings and Structures (General)
BLP	Power Distribution Building
BLS	Shop and/or Warehouse Building
BLW	Water Treatment Building
BPT	Boiler Pre-Treatment System
BSS	Boiler Sampling System
CEB	Cycle Energy Balance
CCF	Cycle Chemical Feed System
CCW	Closed Cooling Water System
CEM	CEMS System
CO2	CO2 Fire Suppression System
CND	Condenser
CNS	Condensate System
CPS	Cathodic Protection System
CRS	Cable Raceway System
CTG	Combustion Turbine
CTW	Cooling Towers
CWB	Cycle Water Balance
CWS	Circulating Water System
DBU	Duct Burner Unit
DMN	Demineralizer System
DCS	Distributed Control System
EHA	High voltage AC System (over 34000 V)
ELA	Low Voltage AC System Power (<1000V)
ELB	Low Voltage AC System Power (<300V)
ELC	Low Voltage AC Lighting & Convenience Power (<300V)
EMA	Medium Voltage AC (1000 to 5000V)
EMB	Medium Voltage AC (over 5000 to 8000V)
EMC	Medium Voltage AC (over 8000 to 34000V)
EDC	DC Power System
EUP	Uninterruptible Power System
EGS	Emergency Generator System
ELS	Emergency Lighting System
FAS	Fire Alarm System
FGS	Fuel Gas Supply System
FOS	Fuels Oil Supply System
FPS	Freeze Protection System
FWS	Fire Water System
GND	Grounding System
GSS	Gland Seal System

(Calpine System continued)

GSU	Generator Step Up Transformer
HCS	Hydrogen Cooling System
HSO	Hydrogen Seal Oil System
HRF	HRSG - Flue Gas Side
HRS	HRSG - Steam Side
HVA	HVAC System
IAS	Instrument Air System
LAS	Lightning Arrestor and Protection System
LOS	Lube Oil System
LSI	Landscaping and Irrigation
NIT	Nitrogen System
PCR	Process Condensate Return
PCS	Plant Communication System
PLS	Plant Lighting System
PRK	Pipe Rack
PSS	Plant Security System
PWS	Potable Water System
RWS	Raw Water Treatment System
SAP	Sampling Analysis Panel
SAS	Service Air System
SCR	SCR System
SDS	Storm Drain System
SST	Station Service Transformer System
STG	Steam Turbine
SHP	Steam System (High Pressure)
SIP	Steam System (Intermediate Pressure)
SLP	Steam System (Low Pressure)
SRH	Steam System (Reheat)
SPS	Process Steam Supply
SSW	Sanitary Sewer
STW	Site Work
SUU	Site Underground Utilities
SWS	Service Water System
TCF	Cooling Tower Chemical Feed
UAT	Unit Auxiliary Transformer System
WSD	Water Wash Drain
WWC	Waste Water Collection
WWT	Waste Water Treatment
ZDS	Zero Discharge System

E. Calpine Train (Loop)

(Name CPE, Length = 1 Character)

0	General Plant
1	Train One
2	Train Two
3	Train Three
L	Linears
C	Commissioning

Note: Steam turbine generators (STG's) will begin with the next consecutive number after the CTG's. **For example:** A plant with a configuration of two CTGs, two HRSGs, and one STG, the STG would be Train Three.

F. Calpine Accounting Resource Category – Owner Furnished Equipment

(Name CPF, Length = 5 Characters)

00010	Civil
00012	Mechanical
00015	Electrical
00018	Instrumentation
00020	Building
00022	Indirects
10100	DCS
10105	Gas Turbine
10110	HRSG
10115	Steam Turbine w/ Generator and Condenser
10120	Water Treatment
10125	Aux Boiler
10130	Aux Transformer
10135	Step-up Transformer
10140	Cooling Tower
10145	Boiler Feed Water Pump
10150	Condensate Pump
10155	Circulating Water Pump
10160	Generator Breaker
10165	High Voltage Breaker
10170	ISO Phase Bus
10175	Misc. Equipment
12105	Electrical Substation Contractor
12110	Electrical Transmission Contractor
12115	Gas Interconnect Contractor
12120	Gas Pipeline Contractor
12125	Water & Discharge Contractor
12130	Misc. Contractor

G. Calpine Procurement Step – Category

(Name CPG, Length = 3 Characters)

P10 Eng Iss Prel Dsn Spec
P12 Owner Rvw Prel Dsn Spec
P14 Eng Iss Fnl Dsn Spec
P16 Contr Iss Bid
P18 Contr Rcv Bid
P20 Contr Comm Eval
P22 Owner Tech Eval
P24 Eng Tech Eval
P26 Contr Iss PO
P28 Vndr Fab
P40 Rcv Prel Civil Info From Vndr
P42 Rvw Prel Vndr Civil Info
P44 Rcv Fnl Civil Info From Vndr
P50 Rcv Prel Mech Info From Vndr
P52 Rvw Prel Mech Info From Vndr
P54 Rcv Fnl Mech Info From Vndr
P60 Rcv Prel Elect Info From Vndr
P62 Rvw Prel Elect Info From Vndr
P64 Rcv Fnl Elect Info From Vndr
P70 Rcv Prel Instr Info From Vndr
P72 Rvw Prel Instr Info From Vndr
P74 Rcv Fnl Instr Info From Vndr
P90 Vndr Shipped
P92 Contr Rcv

H. Calpine Package Listing – Category

(Name CPH, Length = 6 Characters)

The Project Controls Team will create the Calpine Package Listing codes during a review of the project scope at the schedule integration kickoff meeting.

Calpine Resources and Commodities

A. Engineering Disciplines

Resource Code	Description	Unit of Measure
CE*	Calpine Design	MH
CEA	Architectural Engineer	MH
CEC	Civil Engineer	MH
CED	Plant Design Engineer	MH
CEE	Electrical Engineer	MH
CEI	Instrument Engineer	MH
CEM	Mechanical Engineer	MH

B. Construction Crafts

Resource Code	Description	Unit of Measure
CC*	Calpine Construct	MH
CCB	Boilermakers / Welders	MH
CCC	Cement Masons	MH
CCE	Electricians	MH
CCF	Carpenters	MH
CCI	Ironworkers	MH
CCL	Laborers / Other	MH
CCM	Millwrights	MH
CCO	Operating Engineers	MH
CCP	Pipe Fitters	MH
CCT	Teamsters	MH
CPX *	Calpine Startup	MH

* CPX Resource Loading not required by Contractor (Calpine Internal)

The Construction Craft resource coding structure will be valid for union and nonunion work alike. Any subcontractor hours included in the project execution schedule will be coded to the appropriate craft classification.

V. Engineering Commodities

Resource Code	Description	Unit of Measure
CQRC	Concrete	CY
CQRT	Cable Tray	LF
CQRD	Conduit	LF
CQRX	Terminations	EA
CQRL	Piping – Large	LF
CQRP	Piping – Small	LF
CQRU	Piping – Underground	LF
CQRS	Structural Steel	TN

A. Construction Commodities

Resource Code	Description	Unit of Measure
CQIC	Concrete	CY
CQIT	Cable Tray	LF
CQID	Conduit	LF
CQIX	Terminations	EA
CQIL	Piping – Large	LF
CQIP	Piping – Small	LF
CQIU	Piping – Underground	LF
CQIS	Structural Steel	TN

B. Major Equipment Purchases

Resource Code	Description	Unit of Measure
CEQD	D.C.S.	DOL
CEQG	Gas Turbines	DOL
CEQH	HRSG (s)	DOL
CEQS	STG (s)	DOL
CEQT	Transformers	DOL
CEQW	Water Treatment	DOL
CEQO	Oil Purification Skid	DOL

VI. Criteria

A. Organization

1. Define the Project Objectives as the Contract Milestone Schedule.

2. Assign all schedule tasks the appropriate Calpine Work Breakdown Structure codes.

3. Identify the project's organizational structure, including the major subcontractors responsible for accomplishing the work, and define the organizational tasks in which work will be planned and controlled.

4. Provide for the integration of the project's planning, scheduling and progress measurement processes with each other, the Calpine Work Breakdown Structure and the project's organizational structure.

5. Provide for integration of the Calpine Work Breakdown Structure and the project's organizational structure in a manner that permits schedule performance measurement by either CWBS Task or responsible organization.

B. Planning and Budgeting

6. Schedule the tasks in a manner that describes the sequence of work and identify significant interdependencies required to meet the project objectives.

7. Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.

8. Establish and maintain a resource-loaded schedule, against which task level schedule performance can be measured. For those items where progress measurement is not practical, a level of effort approach may be used.

9. Progress payments will be based, in part, on the Actual Completed effort as indicated in the accepted Schedule.

C. Analysis and Management Reports

10. With each reporting period, each responsible organization shall compare the amount of planned progress and the progress earned for work accomplished in accordance with the levels set forth in the Calpine Work Breakdown Structure. This comparison provides basis the Variance Calculations.

11. With each reporting period, identify the significant differences between planned and actual progress, document and report the reasons for the variance (s), along with corrective or recovery plans.

12. Implement corrective or recovery plans developed as the result of variance analysis.

13. Develop revised progress estimates based on performance to date, and estimates of future conditions. Compare this information with the project schedule baseline to identify probable completion variances

D. Revisions and Data Maintenance

14. Incorporate approved scope changes in a timely manner, recording the effects of such changes schedules.

15. Control retroactive changes to schedules that would change previously reported progress. Adjustments must be owner approved, and should be made only for correction of errors, effects of customer or management directed changes, or to improve the project schedule baseline integrity and accuracy of performance measurement data.

16. Control changes and revisions to the Baseline Project Execution Schedule (limit to authorized changes only)

17. Document changes to the project schedule baseline.

VII. Variance Calculations

A. Terms

BQWS – Budgeted Quantity of Work Scheduled is the time-phased value of work to be completed (plan)

BQWP – Budgeted Quantity of Work Performed is the time-phased value of work that has actually been completed (earned value)

BCWS – Budgeted Cost of Work Scheduled is the time-phased value of work to be completed (plan)

BCWP – Budgeted Cost of Work Performed is the time-phased value of work that has actually been completed (earned value)

Progress Variance is the difference between planned progress and actual progress measured in the appropriate Quantity.

Schedule Variance is the difference between planned progress and actual progress as measured in Schedule Duration (days).

B. Calculations