CITY OF SUNNYVALE
PRIMARY TREATMENT DESIGN
DESIGN INFORMATION MEMORANDUM
NO. 10

POWER SUPPLY AND STANDBY POWER

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APPENDIX – DIM Meeting 4 Minutes (May 15, 2014)

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1.0 PURPOSE

The purpose of this Design Information Memorandum (DIM) is to provide the basis of design for the new power distribution system at the City of Sunnyvale’s (City’s) Water Pollution Control Plant (WPCP). The new power distribution system will provide power to the new primary treatment facilities. The system will also be configured to support future process upgrades at the WPCP.

2.0 BACKGROUND

The configuration of the power distribution system was determined in a technical memorandum (TM) as part of the City’s WPCP Master Plan prepared by Carollo/HDR. The key findings and recommendations from the Final Electrical and Combined Heat and Power Plan (ECHP) TM dated April 2014 include:

- Primary power distribution will be at 12 kilovolts (kV):
  - Utility power will be a single Pacific Gas and Electric (PG&E) feed.

- Primary power will be a radial system:
  - This is a change from the loop system proposed in the ECHP Master Plan due to site considerations evaluated during the DIM process (see discussion in Section 3.1).
  - Each substation will receive power from the main switchgear via two independent paths.

- Standby power will be provided by one diesel engine generator under the Primary Treatment Project and a second engine will be provided in the future (both sized at 2000 kV):
  - Each generator will be housed in a separate walk-in enclosure.
  - Fuel storage will be double-walled, above ground tanks (one per each generator).

- The 12-kV main switchgear will be located in a constructed building.

- The 12-kV main switchgear will be sized to provide two power feeds to six major process substations:
  - Headworks.
  - Aeration.
  - Thickening/Dewatering.
Secondary Treatment.
– Cogeneration.
– Disinfection.

- Under the Primary Treatment Project, a single power feed will be provided to the existing switchgear. The existing switchgear is single-ended so a redundant connection is not possible.

- A small substation is planned to supply 480-volt and 120/208-volt power for the Switchgear Building.

- A single feed will be provided for future connection to the Administration Building.

- Secondary power will be 480 volts.

- The secondary distribution system will be secondary selective with a main-tie-main low voltage switchgear.
  - A selective secondary system allows the operator configure the substation to and feed the loads three different ways.
  - Under normal conditions, both main breakers are closed and the tie breaker is open. The process loads are fed from both transformers.
  - Either main breaker may be opened and the tie breaker closed feeding the entire substation through one transformer.

### 3.0 BASIS OF DESIGN

#### 3.1 Primary Power

Figure 10.1 is a block diagram of the main switchgear that will be installed during the primary treatment project. The primary power feed from the electric utility, PG&E, will be connected to two main breakers, creating an “A” electrical bus and a “B” electrical bus. The plant electrical loads will be split between the A and B busses for process redundancy and operational flexibility.

Although the ECHP TM recommended proceeding with the design of a “Loop System” for primary power, Figure 10.1 and subsequent figures reflect a “radial system.” This change from the ECHP TM recommendation was made to reduce the site area devoted to switches provided at each substation and to simplify phasing of future construction.

The radial system provides two feeds to each substation via an independent path similar to the loop system. Each feed and transformer will be sized to accommodate the entire substation load as required by the Master Plan Electrical Design Standards. In the event of an equipment failure, (cable or transformer), the substation can be operated in a “single-ended” manner maintaining complete plant operations.
Figure 10.1
ONE-LINE DIAGRAM
PRIMARY TREATMENT DESIGN
CITY OF SUNNYVALE
The ECHP Master Plan indicated an increase of approximately $500,000 in construction costs to implement a radial system for the entire site. This did not take into account the potential construction phasing savings (which is difficult to estimate).

3.2 Standby Power

Standby power will be provided by diesel engine generators. The switchgear is configured to allow the generators to provide power to either bus or both electrical busses. The ECHP Master Plan indicates that two generators will ultimately be required to power the standby critical loads (as defined in the ECHP Master Plan). For conventional activated sludge, the size of each standby generator is projected to be 2,000 kW. The Primary Treatment Project will install the first of the two generators and make provisions for installation of the second generator.

Each generator will be provided with low impedance grounding to limit damage in the event of an electrical fault in the generator.

3.3 Standby Power Operation

The standby generator (and ultimately both generators) will supply power to the entire WPCP during a PG&E electric utility outage. Both manual and automatic modes of operation will be provided. In the automatic mode, the transfer-retransfer sequence will function as follows:

- Following a loss of PG&E power an adjustable time delay (approximately 5 minutes) will be initiated to ensure the outage is not a momentary interruption.
- When the loss of utility timer has elapsed, the switchgear main breakers will open automatically and the generator(s) will be started.
- When the generator(s) reach rated voltage and frequency, the switchgear generator breaker(s) will close automatically.
- The switchgear tie breakers will close automatically providing power to the WPCP.
- The Automated Control System (ACS) will restart the process equipment.
- Once PG&E power has been restored another time delay (approximately 5 minutes) will be initiated to ensure the stability of the service.
- When that timer has elapsed, the operator will be notified that the electrical system is ready to retransfer. The operator will shut down the process in an orderly manner for the open transition retransfer.
- When initiated by the operator, the switchgear generators breaker(s) and tie breakers will open.
• Following an adjustable short time delay (approximately 30 seconds), the switchgear main breakers will close automatically.

• The ACS will restart the process equipment.

In the manual mode, the operator will have to start the generator(s) manually and then operate the main, tie and generator breaker accordingly.

While operating on standby power the cogeneration system will be disconnected. The disconnection will need to be either at the cogeneration switchgear main breaker or at the connection breaker in the existing switchgear. The breaker connection in the new main switchgear and main breaker in the existing switchgear must remain closed to allow the standby generator to power the existing plant.

3.4 Power Distribution

Primary power will be distributed through the site at 12 kV. The duct banks from the A bus and the B bus will be separated by a minimum of 5 feet. The physical separation is to provide redundancy in the case of future construction related accidents. If one duct bank is damaged, the other duct will remain in service. Manholes will be provided at the limits of the Primary Treatment Project construction to extend the 12-kV duct banks for future projects. Figure 10.2 shows the planned duct banks for the Primary Treatment Project and the 12-kV duct bank corridors anticipated to accommodate future projects.

3.5 Secondary Power

The secondary power system (480 volts) will be a secondary selective system. Each area substation will consist of two 12-kV to 480-V transformers and a low voltage switchgear. The low voltage switchgear will be a main-tie-main configuration. The transformers and the low voltage switchgear will both be sized to carry the full substation load providing full process redundancy from either the A bus or the B bus. Interlocks will be used to prevent both main breakers and the tie breaker from being closed at the same time.

The transformers will be oil-filled pad-mount style. The oil will specified as Envirotemp FR3 which is an all natural bio-degradable oil. The Envirotemp FR3 has better electrical and fire properties than the more traditional mineral oil or silicone.

The low voltage switch will be installed in the Headworks Electrical Building and will have a NEMA 1 enclosure.
4.0 COGENERATION

The existing cogeneration facility may remain in operation for at least the next ten years. In the ECHP Master Plan, the intent was to leave the existing cogeneration facility tied into the existing switchgear. The facility will still be available to offset the power increase due to the primary treatment electrical loads.

Final design of the Primary Treatment Project will include discussions with PG&E on their requirements for bringing the facility into compliance with the latest Rule 21 Tariff.

5.0 ELECTRICAL BUILDINGS

5.1 Switchgear Building

The Switchgear Building will be a concrete masonry unit (CMU) or concrete constructed building. The Switchgear Building will house the main switchgear, switchgear and generator controls, switchgear battery system, and an ACS server room. As shown on Figure 10.3, the building will be separated into multiple rooms for functionality and safety by design. The battery room is separated from the main switchgear room for compliance with Fire Code requirements.

5.2 Headworks Electrical Building

The Headworks Electrical Building will also be a CMU or concrete constructed building. It will house the headworks programmable logic controllers (PLCs), communication rack, low voltage switchgear, and other electrical distribution equipment. The PLCs and communication rack will be installed in a separate room for operator and technician safety. Figure 10.4 shows the preliminary layout of the Headworks Electrical Building.

5.3 Generator Enclosure

The standby generator will be housed in a custom-built walk-in enclosure furnished by the generator manufacturer as shown on Figure 10.5. The enclosure will be specified to have minimum 6 feet clear working space on each side of the generator. A lifting device for heavy components will also be provided. The enclosure will also be specified complete with electrical equipment for lights and generator components (jacket water heater, battery charger).
6.0 SUPPORT FACILITIES

6.1 Lighting

Lighting for the Primary Treatment Project will be in accordance with the Electrical Master Plan Design Standards.

6.2 Diesel Fuel Storage

Diesel fuel for the standby generator will be stored in an above-ground, double-walled, concrete-encased tank. One 5,000-gallon tank will be installed under the Primary Treatment Project. The second tank will be installed with the future generator. The need for a diesel fuel maintenance system, which could be City-owned or provided by an outside service, will be discussed with the City staff prior to the 30 percent submittal.

6.3 Heating, Ventilation, and Air Conditioning (HVAC)

All the electrical rooms will be provided with HVAC to maintain the electrical room temperature between 65 F and 90 F.

The PLC and ACS server room HVAC systems will keep the temperatures between 65 F and 75 F.

The above temperatures will keep the equipment within its maximum operation temperature limit and provide a comfortable working environment for the maintenance technicians.

6.4 Generator Load Bank

A single resistive load bank will be provided to exercise the generators under load. The load bank will be connected to the generators though the 12-kV switchgear. This will allow the generators to be exercised under load without disturbing normal plant operations. In the event of a power failure during generator exercising, the load bank will be disconnected, allowing the generator(s) to supply power to the WPCP.

6.5 Harmonic Mitigation

The variable frequency drives for the influent pumps and other large motors (50 horsepower and greater) will be clean power. Other harmonic mitigation measures will be used to ensure compliance with IEEE 519. Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
6.6 Neutral Grounding

Each standby generator will be equipped with a low impedance neutral grounding element to limit the fault current and prevent damage to the generator in the event of an electrical fault.

7.0 SUMMARY

The following summarizes information presented in this DIM.

- Primary power will be a 12-kV radial distribution with two separate electrical busses.
- Standby power will be diesel engine generators connected to the 12-kV primary distribution system.
- Secondary power will be secondary selective, allowing the WPCP to operate from either 12-kV electrical bus.
- The Switchgear and Electrical Buildings will be constructed of CMU or concrete.
- The diesel engine generators will be located in enclosures supplied by the generator manufacturer.
CONFERENCE MEMORANDUM

Project: Primary Treatment Design  Conf. Date: May 15, 2014
Client: City of Sunnyvale  Issue Date: May 30, 2014
Location: WPCP Training Room

Attendees:
City:
- Bryan Berdeen
- Leonard Espinoza
- Dan Hammons
- Pat Lenoir
- Tanner McGinnis
- Craig Mobeck
- Bhavani Yerrapotu

Carollo:
- Ron Burdick
- Chris Carvalho
- Jim Hagstrom
- James Wickstrom

CDM Smith:
- Ed Fernbach
- John Mariano
- Dave Parry
- Sarvin Tabatabali

HDR:
- Ted Kontonicas
- Dana Hunt
- Dave Reardon
- Theresa Rearick

Ekster Associates:
- Alex Ekster

Purpose:
Design Information Memoranda (DIM) Meeting 4
Review DIMS 10, 11 and 12: Power Supply and Standby Power, SCADA and Facility Automation, and Utility Building

Discussion:
The following is our understanding of the subject matter covered in this conference. If this differs from your understanding, please notify us.

1. Decisions: The following decisions were made and will be added to the Decision Log and will be reflected in the draft DIM submittal to be reviewed by the City.

A. Influent Pump Station (IPS)
   1) Temporary truck mounted cranes will be used to retrieve influent pumps from the dry well. Do not provide a monorail or bridge crane for pump retrieval. Incorporate access for truck mounted crane into site layout.

B. Electrical
   1) Distribute primary power at 12 kV in a loop configuration. (Confirms Master Plan ECHP Technical Memorandum (TM) finding)
   2) Locate switchgear in a constructed building. (Confirms TM finding)
   3) Provide standby power using diesel generators. Install one standby generator under the Primary Treatment Project. Provide a second standby generator as part of a later expansion. (Confirms TM finding)
   4) Locate generators in walk-in enclosures. (Confirms TM finding)
5) Distribute secondary power at 480 volts using a secondary selective configuration. Divide process equipment loads as evenly as possible between A and B sides of electrical gear. (Confirms TM finding)

6) Locate the new ACS server room in the new Switchgear Building.

7) Over-size the standby generator walk-in enclosure to provide a minimum 6 feet clearance between equipment and enclosure wall on both sides of generator.

8) Provide a crane or other lifting device on the interior of the enclosure to allow staff to remove equipment for maintenance.

9) Include standby generator load bank in the design.

10) Provide above ground diesel fuel storage tanks for the standby generators.

C. Instrumentation and Controls

1) Use single mode fiber for control system backbone. (Confirms Master Plan ACS Technical Memorandum (TM) finding)

2) Provide a looped network with communication cabinets in each process area. (Confirms TM finding)

3) Specify Allen-Bradley (Rockwell) PLCs. (Confirms TM finding)

4) Use digital bus instrumentation where it makes sense. (Confirms TM finding)

5) Use smart motor control centers (MCCs). (Confirms TM finding)

6) Specify Wonderware or Rockwell object oriented HMI software. (Confirms TM finding)

7) Split communication cabinets into two separately locked sections. The bottom will contain equipment for the plant PLC network while the top portion will contain equipment for the City’s business network.

8) Extend fiber network to the existing Primary Control Building and provide communications cabinet to support work stations in that location for access by plant operations personnel.

9) Specify an ACS simulator that includes spare hardware and software for use by City staff to model programming changes prior to downloading changes onto the actual ACS system.

10) Redundant hot standby PLC processors will not be provided.

11) Locate local, wired control switches and pilot devices in the field, adjacent to process equipment.

12) In general, do not restart process equipment automatically on loss of power or when a failure alarm is reset.

13) Provide pilot lights in the field in same panel as the field switches to indicate whether the equipment is operating or stopped.

D. Utility Building

1) The existing plant air demands served by the Power Generation Facility and Tertiary Treatment Building will continue to be served by those facilities.

2) No work will be performed on the existing plant air systems under the Phase 1 Project (Primary Treatment Design Project). Upgrades to those systems/facilities and possible DAF optimization will be completed under future projects.

3) The new plant air system to be located in the new Utility Building will serve plant air demands on the east side of the plant including demands for the Phase 1 Project (Primary Treatment Design Project) and future demands for new facilities to be located on the east side of the plant.
4) Existing equipment located in the Primary Control Building will not be reused/relocated to the new Utility Building.

5) The new Utility Building plant air system will not be inter-tied to the existing plant air systems served by the Power Generation Facility and Tertiary Treatment Building. No demands for the Tertiary Treatment Building will be provided by the plant air system in the New Utility Building.

6) Backup equipment will be provided for critical plant air equipment in the new Utility Building such as a backup air compressor.

7) A conservative approach will be taken when sizing the plant air system in the new Utility Building to account for some future demands not yet identified.

8) Bubblers will not be used in on future facilities at the plant.

9) Pneumatic valves and gates will not be used on future facilities at the plant.

10) New plant air compressors in the new Utility Building will be non-lubricated type.

11) Separate service air and instrumentation air compressors will not be used for the Utility Building plant air system. Rotary screw air compressors will be used.

12) An additional air receiver should be installed in the new Maintenance Building when it is constructed to balance out pressure fluctuations in the system.

13) A cast iron sectional type boiler should be used if a boiler is ultimately recommended.

2. Action Items:

   A. Carollo:
      1) None.

   B. HDR:
      1) HDR will provide additional analysis of options for discussion with the City and Program Manager related to the hot water loop under the ECHP work to determine how to proceed with the Utility Building. The City and Program Manager will provide thoughts, input and information to HDR at a meeting or conference call related to the options to be further analyzed which may include providing a boiler, exhaust heat recovery on the existing cogeneration engines, adding a 3rd cogeneration engine, and/or others.

      2) HDR will re-confirm with Carollo that no additional plant air demands are envisioned for the Phase 1 Project (Primary Treatment Design Project) or future facilities identified in the master plan that would be served by the new Utility Building than those noted below.

   C. City:
      1) The City and Program Manager will further discuss and provide thoughts, input and information to HDR at a meeting or conference call related to options for the hot water loop with respect to providing a boiler, exhaust heat recovery on the existing cogeneration engines and/or adding a 3rd cogeneration engine.

      2) City staff will prepare a list of current demands supplied by the existing Plant Air Systems. In particular, a list of any existing demands that need to be served by the new plant air system in the new Utility Building shall be provided to HDR. Include any air demands served by the existing Primary Control Building that will remain after the Phase 1 Project (Primary Treatment Design Project) is completed and the existing Primary Control Building and associated equipment is demolished. (Such demands may be associated with the existing digesters).
3. Introduction/Agenda Review
   A. DIM and Design Approach
      1) The DIMs will be used to communicate the preliminary design to the City. The DIMs will also be used internally by the design team as a guiding document for the development of the final design.

4. Review DIM Meeting 3 Decision and Action Items
   A. DIM Meeting 3 Action Items
      1) Item 186: City staff indicated that a temporary truck mounted crane would be used to pull the influent pumps and other equipment out of the influent pump station dry well. A monorail, bridge crane, or other permanent lifting design was not required. Access for a truck mounted crane would be incorporated into the site layout

5. Utility Building (DIM No. 12)
   A. Plant Air System
      1) The existing plant air systems were discussed: Primary Control Building (including backup portable engine driven air compressor), Power Generation Facility, and Tertiary Treatment Building.
         a) It was noted that the systems are not inter-tied to each other for normal back-up use. The systems are currently tied together with manual valves, but they are kept in the closed position and are not used for backup.
         b) Normally one compressor operates at the Tertiary Treatment Building, but they are in lead/lag arrangement.
         c) It was noted that the systems serve both service air and instrument air from the same compressors. The plant may separate service air and instrument air at these locations in the future.
         d) No work will be performed on the existing plant air systems under the Phase 1 Project (Primary Treatment Design Project).
      2) The new plant air system will be located in the new Utility Building to serve plant air demands on the east side of the plant including demands for the Phase 1 Project (Primary Treatment Design Project) and future demands for new facilities to be located on the east side of the plant.
         a) Existing equipment located in the Primary Control Building will not be reused/relocated to the new Utility Building. It is past its useful life.
         b) The existing plant air demands served by the Power Generation Facility and Tertiary Treatment Building will continue to be served by those existing facilities. Upgrades to those systems/facilities and possible DAF optimization will be completed under future projects.
         c) The new Utility Building plant air system will not be inter-tied to the existing plant air systems served by the Power Generation Facility and Tertiary Treatment Building.
            (1) No demands for the Tertiary Treatment Building will be provided by the plant air system in the New Utility Building.
            (2) Backup equipment shall be provided for critical plant air equipment in the new Utility Building such as a backup air compressor.
         d) Air demands for the new plant air system to be located in the new Utility Building were discussed. Only minimal service air is needed for utility air stations (assume
4 stations will be used at a time) plus minimal instrumentation air for air cleaning of analyzers. These are the only anticipated air demands for the new plant air system at the Utility Building.

1) A conservative approach will be taken when sizing the plant air system in the new Utility Building to account for some future demands not yet identified.

2) Bubblers will not be used in on future facilities at the plant. No demands for bubblers will be included for the new plant air system at the Utility Building. No demands for pneumatic operators will be included for the new plant air system at the Utility Building.

3) Pneumatic valves and gates will not be used on future facilities at the plant.

4) Plant staff to confirm if any existing air demand currently served by the existing Primary Control Building will remain after the Phase 1 Project (Primary Treatment Design Project) is completed and the existing Primary Control Building and associated equipment is demolished that need to be served by the new Utility Building (such as at the existing digesters).

5) HDR will re-confirm with Carollo that no additional plant air demands are envisioned for the Phase 1 Project (Primary Treatment Design Project) or future facilities identified in the master plan that would be served by the new Utility Building.

e) New plant air compressors in the new Utility Building will be non-lubricated type due to demands for air cleaning of analyzers.

f) Separate air systems were discussed for serving service air and instrument air needs at the plant. Although it was agreed that this should be the future vision for plant and the existing systems may be separated under future projects, it was not desired to separate the systems for the Utility Building plant air system due to the small demands, type of demands and increase in distribution system pipe.

g) A future air receiver will be provided at the new maintenance building when it is constructed.

B. Hot Water Loop Equipment

1) A cast iron sectional type boiler was recommended over a fire tube boiler.

2) Dave Parry indicated that the CDM’s work indicated that one existing co-generation unit with jacket water and external heat recovery has sufficient capacity for the heat loop demands. There is currently only jacket water heat recovery, but no exhaust heat recovery on the engines.

3) It was noted that installing heat recovery on the existing engines would not be a throw away since it could likely be re-used on the new co-generation facility in the future and would provide significant payback between now and then.

4) The question if a boiler should be included in the Utility Building or if a new 3rd co-generation engine should be added was raised. In addition, the question if heat recovery should be provided on the existing and potentially new third cogeneration engine was raised. It was noted that the decision needs to account for any permit related issues. The City and Program Manager will further discuss and provide direction to HDR whether a boiler should be included in the Utility Building. A conference call with the City and Program Manager with HDR (and Carollo) will be set up after the initial discussion between the City and Program Manager.

5) The draft Utility Building DIM will be delayed until direction is provided to HDR on if a boiler should be included in the Utility Building. The design team requested that
direction be provided as soon as possible since it impacts the Utility Building size and siting.

6) It was noted that the existing heat loop is in poor condition and needs to be replaced in the future. It was recommended to not direct bury it. The existing heat loop will not be replaced on the Phase 1 Project (Primary Treatment Design Project), but any new heat loop piping shall be routed above grade or within a utility trench.

7) The existing heat loop system operates at about 180 degrees F with a 20 degree F drop.

8) Reducers should be provided at the 3-way valve in the system.

9) The plant has no steam demands.

10) Future buildings may or may not be heated from the hot water loop system. The decision has not been made.

6. Power Supply and Standby Power (DIM No. 10)
   A. Key Decisions from Master Plan: The group reviewed and confirmed the following key decisions from the master plan
      1) Distribute primary power at 12 kV in a loop configuration.
      2) Locate switchgear in a constructed building.
      3) Provide standby power using diesel generators. Install one standby generator under the Primary Treatment Project. Provide a second standby generator as part of a later expansion.
      4) Locate generators in walk-in enclosures.
      5) Distribute secondary power at 480 volts using a secondary selective configuration. Divide process equipment loads as evenly as possible between A and B sides of electrical gear.

   B. Primary Treatment Project Power Distribution Loop
      1) Plant staff indicated that their preference would be to provide power from the Power Generation Facility (PGF) to the new equipment provided under the Primary Treatment Project. The existing PGF facility feeds the existing 4160 volt power distribution system.
      2) Carollo will further examine the existing cogeneration system and review PG&E requirements (i.e. Rule 21) to determine the best way to incorporate the existing PGF facility into the new power distribution system. The new 12 kV distribution system will be set up to accommodate the addition of the future cogeneration facility at 12 kV.

   C. Power Distribution Building
      1) The new Switchgear Building will house the 12 kV switchgear, related equipment and controls and include a server room for the ACS system.

   D. Standby Generator
      1) The walk-in enclosure surrounding the generator will be over-sized to provide a minimum 6 feet of clearance at the narrowest point on both sides of the generator. The intent is to provided access to staff for regular maintenance.
      2) City staff indicated that crane or similar lifting device should be provided on the interior of the enclosure to allow staff to remove equipment for maintenance.

   E. Electrical Site Plan
1) Plant staff indicated that the 12 kV feed into the plant is from the south and runs underground from the south side of the plant to the step down transformer and switchgear at the north side of the plant.

2) The site plan presented showed auxiliary electrical rooms at the grit handling building and primary sedimentation tanks. These rooms would be fed from the Headworks Electrical Building to accommodate vendor control panels, power and lighting panels, PLC panels and other distributed electrical equipment local to that area. Distributing equipment in this manner would reduce the size of duct banks routed through the congested area between the process structures. These concepts will be further developed as part of the 30 percent level design.

3) Standby generator load bank will be included in the design and site layout.

4) Above ground diesel fuel storage tanks will be included in the design.

F. Headworks Electrical Building
   1) City staff expressed concern about the quality of power fed to VFD driven equipment such the influent pumps. The electrical design will account for harmonics and address potential power quality issues.

G. General
   1) The group reviewed and confirmed the master plan decision to utilize standby diesel generators as a redundant power source instead of installing second PG&E feed. The dual feed approach was eliminated due the high cost for supplying a truly redundant 12 kV feed connected to a separate substation.

7. SCADA and Facility Automation (DIM No. 11)
   A. Key Decisions from Master Plan: The group reviewed and confirmed the following key decisions from the master plan
      1) Use single mode fiber for control system backbone.
      2) Provide a looped network with communication cabinets in each process area.
      3) Specify Allen-Bradley (Rockwell) PLCs.
      4) Use digital bus instrumentation where possible.
      5) Use smart motor control centers (MCCs).
      6) Specify Wonderware or Rockwell object oriented HMI software.
   B. Communication Cabinets
      1) Communication cabinets will split into two separately locked sections. The bottom will contain equipment for the plant PLC network while the top portion will contain equipment for the City's business network.
   C. PCS Block Diagram:
      1) City staff questioned whether there would be a location for staff to access ACS control system.
      2) Carollo indicated HMI screens would available at process control cabinets and a work station would be provided in the server room at the Switchgear Building. However finished office space with desks, etc., intended to be used for extended periods by operations staff were not part of the design.
      3) The fiber network will be extended to the existing Primary Control Building and work stations will be provided in that location for access by plant operations personnel. This area will serve as the center for operational control of the new headworks and primary facilities until a new administration building is constructed.
4) Carollo will specify an ACS simulator ("sandbox") that includes spare hardware and software. The ACS simulator would be used by City staff to model programming changes prior to downloading changes onto the actual ACS system.

D. Headworks PLCs
1) The group discussed the need to provide installed standby PLC processors in each PLC cabinet.
2) Redundant hot standby PLC processors will not be provided.

E. Field Controls
1) Local, wired control switches and pilot devices will be located in the field, adjacent to process equipment.
2) Plant staff indicated a preference for process equipment to not re-start automatically on loss of power or when a failure alarm is reset. Consequently, most equipment will feature Local-Off-Remote (LOR) switch with Start and Stop pushbutton controls.
   a) Placing the LOR switch in Remote will enable automatic controls by the PLC.
   b) Placing the LOR in Local will enable field located Start and Stop controls.
3) Local-Stop-Remote (LSR) switches with Open-Close field controls will be provided at gate and valve actuators.
4) Hand-Off-Auto switches may be used in some locations. These locations will be reviewed with City staff during final design.
5) Pilot lights will be located in the field to indicate whether the equipment is operating or stopped.
   a) Pilot light colors will match the HMI graphics colors for consistency between ACS screens and local indication.

8. Next Steps:
   A. Carollo/HDR will submit draft DIM No. 10, Power Supply and Standby Power and draft DIM No. 11, SCADA and Facility Automation.
   B. Draft DIM No. 12, Utility Building will be delayed until a decision on whether to provide a boiler in the Utility Building is made.
   C. DIM Meeting No. 5 is scheduled for June 19, 2014.

Prepared By:

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Attachment: Decision Log