START UP NOTES 1

DISK 332(a)

CIC 4-9

MSU PP4 start up meeting notes

MSU RRA start up meeting notes

I. **8:31:41 AM - August 24, 1992**

A. **Agenda**

1. **Review bag house network with Gary Phillips and David Sanger**
2. **Complete & issue bag house network issue #6**
3. **Inspect project**
4. **Initiate discussions re plant start up with MSU staff**

B. **Bag house meeting and job inspection - am**

1. **Those attending**
   a) David Sanger - MSU field inspector
   b) Gary Phillips - Environmental Elements field construction superintendent
   c) Ralph J. Stephenson - Consultant

C. **Start up conference - pm**

1. **Those attending**
   a) Jim Simons - Field representative
   b) Bob Ellerhorst - Utility director
   c) Doug MacDonald - Mechanical engineer
   d) Roy Gies - Operations supervisor
   e) Ralph J. Stephenson - Consultant
2. **Agenda**
   a) Who is in charge? Who will spearhead the effort?
   b) Discuss laundry list - nature, content and method of preparation
   c) Discuss training
3. **Questions and random comments**
   a) Are we including the curing refractory and chemical cleaning in the start up?
      (1) What fuel and heat will be used for start up operations?
      (2) Jim indicated we must decide where the curing heat is to come from.
      (3) Cannot use natural gas in boiler without sand.
   b) Must circulate sand to avoid impingement on the opposite wall.
   c) When, where and how should Tampella be involved?
   d) Set pattern for next meeting
4. **Organization**
   a) Mr. Roy Gies was appointed the Start Up Manager
   Mr. Gies will be responsible for, and have the authority to make, most management decisions concerning start up. He will also have the MSU construction, design, general construction, and dfi (design, fabricate and install) group from which to draw technical help as needed.
   b) Discussed organizational structure of start up operations

II. **8:50:42 AM - August 31, 1992**

A. **Phone call to Purdue University re start up**

1. **Those involved**
   a) Wayne Kjonaas - Director of Utilities - Purdue University
   b) Bob Ellerhorst - Director of Utilities - Michigan State University
   c) Dick Wever - Construction Superintendent - Michigan State University
   d) Don Clendenan - Shift first engineer - Michigan State University
   e) Ralph J. Stephenson - Consultant
2. **Notes**
   a) Start up staff
      (1) Design team
      (2) Owner team

b) Method of starting up
  (1) Organization of start up team
    (a) Selected university staff member for start up coordinator
    (b) Initially used a combination of the design team and university operators to manage the start up work.
    (c) Found it best to tie start to and with the actual plant operation
    (d) Start up responsibility and authority were gradually shifted to the start up coordinator.
    (e) The pco was actually in charge of starting up the systems
  (2) How start up team solved problems
    (a) Tried to identify current and future problems early so as to anticipate the difficulties they might cause.
      i) Engineering problems
      ii) Construction problems
    (b) Attempted to resolve problems before they adversely affected the start up process.
    (c) pco went back to the construction project manager and the design team for technical help in solving problems.

c) Performance testing
  (1) How to determine if and when the boiler unit is performing?
    (a) pco was in charge
    (b) Foster Wheeler had engineers on site to help the pco
    (c) Other engineers helped the pco
  (2) Engineers assigned to each system
    (a) Utility engineering was responsible for all systems (?)

d) Systems - preliminary list given on phone without reference to faxed list below
  If a system had its own start up it was included as a unit system in the start up
  (1) Limestone system
  (2) Ash system
  (3) Compressed air system
  (4) Material handling system
  (5) Boiler feed water pumps
  (6) Steam systems
    (a) Broken down by pressures
  (7) Other? - Mr. Kjonaas will fax Bob full list of systems Purdue used in starting up.

e) Major categories of start up work
  (1) Mr. Kjonaas faxed Bob Ellerhorst list of categories - the list sent on 08/31/92 included the following for the Purdue power plant
    (a) Dodge - lead engineer
      i) Boiler feedwater
      ii) 15# steam piping
      iii) Elevator
    (b) Dwyer - lead engineer
      i) 650# steam piping
      ii) Coal handling
      iii) Emissions monitoring
      iv) Compressed air and gas
    (c) Miller - lead engineer
      i) Distributed control
      ii) Building lighting
      iii) Building communications

(d) Nethercutt/Dwyer - lead engineers
  i) Boiler
(e) Nethercutt - lead engineer
  i) Combustion air
  ii) Flue gas
(f) Porte - lead engineer
  i) Electrical power systems
(g) Rafacz - lead engineer
  i) Limestone handling
  ii) Condensate and demineralized water
  iii) 125# steam piping
  iv) Fire protection bldg and ct
(h) Rodgers - lead engineer
  i) Process water and steam sampling
  ii) Ash and inerts handling
  iii) Building heating and ventilation
  iv) Blowdown

f) Start up definition
Any time a system had to be started it was a part of start up. Boiler start up & sand is a good example.

On simple systems start up began as far along as after 95% construction complete.

On complex systems such as the bag house, the pre startup was Foster Wheeler's work until the university began to be involved.

When a university employee started an actual operational action, this was considered to be the beginning of the start up operation. Purdue supplied all labor for operational activities.

g) Regulatory involvement
  (1) Indiana Department of Environmental Protection was major state agency.
  (2) University staff kept in close touch with the Indiana Department of Environmental Protection.
    (a) During start up operations kept in constant communication with the DEP
  (3) Unsupported 1st coal firing trigged permit requirement considerations.
  (4) Refractory cure out - used gas burners for curing - not considered to be a firing
  (5) CEM's operable at first firing

h) Miscellaneous
  (1) University added coal crusher just ahead of silo - everything is crushed to 3/4" or smaller going into the silo..

i) Turbine project at Purdue
  (1) Will probably start in early 1993

B. Meeting notes

1. Those attending
a) Bob Ellerhorst - MSU director of utilities
b) Dick Wever - MSU construction superintendent
c) Don Clendenan - Shift first engineer
d) Ralph J. Stephenson - Consultant

2. Agenda
a) Decide on key players and what they are going to do
b) Set approach to planning start up

3. **Key players - during start up**
   a) Roy Gies - Operations supervisor & start up manager
   Responsible for and has the authority to make decisions re start up. He will have technical help available from the MSU construction, design, general construction, and design, fabricate and install contractors as may be needed and related to start up.
   b) Shift first engineers
   Will be involved as start up events occur on their shift, or as special start up assignments appear to which they can contribute special skills.
      (1) Don Clendenan - Shift first engineer
      (2) Gil Davis - Shift first engineer
      (3) Bob Lee - Shift first engineer
      (4) Jack Hubbard - Shift first engineer
      (5)
   c) Doug MacDonald - Mechanical engineer
   Provides technical liaison between design, construction & start up of power plant #4. Also responsible, with Bob Ellerhorst, for procurement and quality assurance of fuel, stone & sand needed for start up.
   d) Rick Johnson - Electrical engineer
   Responsible for technical electrical liason between design, construction, and start up in conjunction with Bob Ellerhorst and Jim Simons.
   e) Black & Veatch - Architect engineer of record
   Duties in start up are as defined by contract.
   f) Others to be defined
      (1) Dick Wever
      (2) Jim Simons
      (3) Bob Nestle
4. **Definitions**
   a) Start up
   The work leading to commercial operation by the am of 09/07/93, which is triggered by the a university staff member in starting an actual operational action on a major start up system.

   (This definition is to be refined)
   b) Others to be added as the start up is planned
5. **Laundry lists**
   a) To be defined within the major system classes
6. **Main system classes**
   a) Control system start up
   b) Plant start up
   c) Turbine start up
   d) Boiler start up

III. **8:46:25 AM - September 11, 1992**
   A. **msu pp #4 notes - d 329**
   B. **Agenda**
      1. **Define start up**
      2. **Continue listing systems as a part of the start up**
   C. **Those attending**
      1. **Bob Ellerhorst - MSU utility director**
      2. **Roy Gies - MSU operations supervisor**
      3. **Rick Johnson - MSU electrical engineer**
      4. **Dave Munroe - A/C field superintendent**

5. **John Hucul - A/C project manager**
6. **Ralph J. Stephenson - Consultant**

D. **General notes**

1. **Dave Munroe described how A/C wants to turn over the system.**
2. **Decisions - preliminary for final review**
   a) A/C wants to turn over each system as completely as possible to the utility group.
   b) Decision was made that A/C will work with Roy Gies as the single point contact representative with MSU.
   c) Definition of start up
      (1) Draft #2
      Start up is the period from where construction of a system is considered complete through to commercial operation of the plant by the am of 09/07/93. The startup period for a system begins when the start up manager receives the initial turnover card.
         (a) Turnover card is prepared by A/C
         Represents that construction of a designated system is complete in accordance with A/C understanding of the contract scope. The turnover card when completed is signed off on by A/C, its subs, and the MSU construction staff.
         (b) The turnover card is sent to Roy Gies who is the official startup manager for MSU. Roy Gies formally acknowledges by his signature that he has received the completed turnover card, and that he is taking over responsibility for MSU work in starting up the system.
         (c) As the turnover proceeds the turnover card provides a vehicle by which responsibility for required corrections, adjustment, and other changes that may be required can be transferred to and from A/C from and to MSU.
         (d) When the turnover card no longer returns to A/C the system is considered accepted by the MSU startup team for their work.
3. **Systems**
   a) Plant system start up - major category of start up work
      (1) Cooling tower system start up
         (a) Mechanical construction items
            i) hrc
            ii) hre
            iii) Chemical feed
            iv) etc.
         (b) Electrical construction items
      (2) Control system start up
      (3) Turbine system start up
      (4) Boiler system start up
      (5) Bag house system start up
4. **Process of planning start up actions**
   a) Identify systems
   b) Establish dependencies
   c) Set priorities
   d) Establish the time frame.
5. **<u>Plant system start up</u> - major categories of start up work. Preliminary - for review & comment only.**
   a) Control system start up (1)
      (1) Bailey systems software

b) Cooling tower system start up (2)
  (1) Mechanical construction systems
    (a) wsc - raw water system - make up water to hrc system
    (b) hrc - circulating water systems
    (c) fpu - fire protection system
    (d) hre - chemical feed systems
    (e) cab - instrument air system
    (f) cab - control air system
    (g) etc.
  (2) Electrical construction systems
    (a) High voltage system
    (b) Low voltage system
    (c) Control system
  (3) dcs systems
    (a) Software system
  (4) Calgon system
c) Turbine system start up (3)
  (1) Mechanical construction systems
    (a) sgg - main steam system
    (b) tea - extraction steam
    (c) hrc - circulating water system
    (d) hra - condensate systems
    (e) cab - instrument air system
    (f) ecb - closed cooling water system
    (g) cab - control air system
  (2) Electrical construction systems
    (a) High voltage system
    (b) Low voltage system
    (c) Control system
    (d) Relaying system- multilin electrical relaying system
    (e) etc.
  (3) dcs systems
  (4) General Electric systems
    (a) Turbine systems
      i) Lube oil system
      ii) Control oil system
    (b) Generator systems
    (c) etc.
d) Boiler system start up (4)
  (1) Mechanical construction systems
    (a) ecb - closed cooling water system
    (b) cab - control air system
e) Bag house system start up (5)
  (1) Mechanical construction systems
    (a) cab - instrument air system
    (b) asg - ash collection
    (c) ecb - closed cooling loop system
    (d) cab - control air system
  (2) Electrical construction systems
  (3) dcs systems
  (4) Environmental Elements systems

f) Continuous emissions monitoring system (6)
(1) Environmental Elements systems
(2) Mechanical construction systems
(a) cab - control air system
(3) Electrical construction systems

IV. **Monday, September 14, 1992**
A. **msu pp #4 notes - d 329**
B. **Agenda**
1. **Review definitions**
a) Start up procedures
b) A/C turnover procedures
2. **Begin preparing start up networks with Roy Gies**
C. **Those attending**
1. **Bob Ellerhorst - MSU utility director - in meeting part time**
2. **Jim Simons - MSU project representative - in meetings part time**
3. **Roy Gies - MSU operations supervisor & start up manager**
4. **Dave Munroe - A/C field superintendent - in meetings part only**
5. **John Hucul - A/C project manager - in meetings part time only**
6. **Rick Johnson - MSU electrical engineer - in meetings part time only**
7. **Ralph J. Stephenson - Consultant**
D. **Major categories of start up**
1. **Decided to use the following category tree**
a) Plant #4 start up
(1) 100 - Control system start up
(a) Bailey systems software
(2) 200 - Cooling tower system start up
(a) Mechanical construction systems
i) wsc - raw water system - make up water to hrc system
ii) hrc - circulating water systems
iii) fpu - fire protection system
iv) hre - chemical feed systems
v) cab - instrument air system
vi) cab - control air system
vii) etc.
(b) Electrical construction systems
i) High voltage system
ii) Low voltage system
iii) Control system
(c) dcs systems
i) Software system
(d) Calgon system
(3) 300 - Turbine system start up
(a) Mechanical construction systems
i) sgg - main steam system
ii) tea - extraction steam
iii) hrc - circulating water system
iv) hra - condensate systems
v) cab - instrument air system
vi) ecb - closed cooling water system
vii) cab - control air system

(b) Electrical construction systems
i) High voltage system
ii) Low voltage system
iii) Control system
iv) Relaying system- multilin electrical relaying system
v) etc.
(c) dcs systems
(d) General Electric systems
i) Turbine systems
(1) Lube oil system
(2) Control oil system
ii) Generator systems
iii) etc.
(4) 400 - Boiler system start up
(a) Mechanical construction systems
i) ecb - closed cooling water system
ii) cab - control air system
(5) 500 - Bag house system start up
(a) Mechanical construction systems
i) cab - instrument air system
ii) asg - ash collection
iii) ecb - closed cooling loop system
iv) cab - control air system
(b) Electrical construction systems
(c) dcs systems
(d) Environmental Elements systems
(6) 600 - Continuous emissions monitoring system start up
(a) Environmental Elements systems
(b) Mechanical construction systems
i) cab - control air system
(c) Electrical construction systems

2. **General information**
a) Must have a startup card for all construction systems that make up a plant operating system
(1) All contractors must prepare a startup card - construction
(a) Fabric filter building contract - Environmental Elements (62.0203)
(b) Distributed control work contract - Bailey (62.0212)
(c) Cooling tower contract - Thermal Dynamics (62.0601)
(d) Turbine generator contract - General Electric (62.1001)
(e) Circulating fluidized bed system generator - Tampella (62.3401)
(f) Electrical equipment - CPC (63.0000) - assigned to Quality
(g) Architectural/mechanical contract - A/C (71.0200)
(h) Electrical construction work contract - Quality (73.0200)
(i) Electrical configuration work contract - Hatzel Buehler/MSU (purchase order)
(j) (?)Alberici/Clark assignments (?)

V. **8:59:08 AM - Tuesday, October 6, 1992**
A. **Location - MSU PP #4 conference room**
B. **Those attending**
1. **Dave Munroe - Field superintendent - A/C**

2. **Dave Sadler - Project director - A/C**
3. **John Hucul - Project manager - A/C**
4. **Dick Wever - Construction superintendent - MSU**
5. **Jim Simons - Field representative - MSU**
6. **Bob Nestle - Director of engineering - MSU**
7. **Bob Ellerhorst - Director of utilities - MSU**
8. **Roy Gies - Start up manager - MSU**
9. **Ralph J. Stephenson - Consultant**

C. **General notes - meeting started at 9:12:59 AM**

1. **Dick Wever introduced subject of start up**
2. **Reviewed startup card process**
3. **Start up crew would like to continue with the intenal planning**
4. **rel mentioned that the different portions of the construction team have different perceptions of the start up sequence.**
   a) Bailey
5. **How do we announce the sequence of start up to all members of the project team?**
6. **Bailey is affected by the confusion.**
7. **Confusion on which set of dates are being used for planning.**
   a) Contract dates
   b) A/C dates
   c) Are we talking about steam blow - rel says no.
8. **How do we do this?**
9. **What is the best milestone measurement method?**
10. **jhu**
    a) No correlation between Bailey, their programmers and the sequence of construction.
    b) What is the sequence?
    c) GE has given jhu the start up the material.
11. **rel**
    a) Can we give the sequence in relation to the six major
12. **dsa said the operations people must give the contractors the information they need to deliver the project in an orderly meeting.**
13. **Bailey system seemed to be the biggest difficulty at the present time. Must get their software track in line with the startup plan.**
14. **Bailey at present is working hardest on the boiler and the turbine sequence**
15. **Systems sequence as stated by rel - this was tentatively agreed on by those attending.**
    a) Bailey - on each of the systems
       (1) jhu said they will need Bailey in late January, 1993
    b) Cooling tower
    c) Boiler
    d) Bag house
    e) Turbine
    f) Continuous emissions monitoring system
16. **It is the desire of the plant to have the turbine first - rel**
17. **How do we relate the work of Black and Veatch to the start up**
18. **From whom do we get start up cards**
    a) Alberici/Clark
    b) Bailey
19. **Card systems**
    a) dmu not certain why TAM needs a card
    b) jhu said the TAM and GE knows what their start up card represents.
    c) rne asked if the GE and TAM card is all that is needed.

d) dmu said that GE and TAM will have start up crews here to work with MSU start up
e) dmu said all their subsystems are on the turnover card.

20. **dwe said that A/C is doing the same thing for all their systems just as TAM is doing for their boiler system.**
21. **Who's on the team? Must define this.**
22. **Heavy discussion about formal vs informal process for correcting deficiencies.**
23. **When the turnover package comes to rge, it is assumed by the contractors have completed all their work as they understand it is defined in their contract.**
24. **b&v will be involved in the turnover**
    a) Should define how they might be involved
25. **Bailey could well use the turnover card**
26. **rel described the method of Bailey turning over and the red tag system.**
    a) What is the red tag? - rge knows how this works.
    b) The red tags are on the system as it arrives. They are removed as the systems are brought on line.
    c) rwe asked when Ron McClintic is involved
        (1) rel said in the design and layout of the hardware configuration and design.
27. **Bailey and MSU is going to ask for support and help according to rel**
    a) Using multifunction processor
    b) Setting up 5 ois stations in December, 1992 in their plant. Vendors should go to the plant and see if Bailey has assembled their components correctly.
        (1) Vendors must gain a benefit from the mockup
        (2) How do we motivate the vendors
        (3) Start up manager will be there for a full month
        (4) TAM will probably be asked to go
        (5) Look at graphics and the information in the system
        (6) Need an ois (DEC) machine to view. Built on an IBM systems.
        (7) rmc thought he was the one to go to
        (8) The ois simulation is to be attended by rge
28. **Fuel used for drying is still construction according to EPA**
    a) Don't need to monitor emissions during drying out
    b) Must change permission to build to decision to operate
    c) Have 180 calendar days to fine tune and submit to the DNR
        (1) Starts when boiler is brought up to temperature and pressure with any fuel.
        (2) Calibration will be done during the 180 days
        (3) Sequence will be to bring up to temp and pressure, run, and to calibrate.
29. **jhu said A/C probably will provide MSU their first turnover card and packet in February, 1993.**
30. **Checked the responsiblity patterns for the start up card preparation.**
31. **rel asked about tagging elements of a system that have been turned over. dhu said it is a good process by which the field staff knows.**
32. **dhu wants to know when the start up crew will need each of systems for start up.**

VI. **8:45:50 AM - Friday, October 9, 1992**

A. **Location - MSU facities office conference room**
B. **Those attending**
    1. **Roy Gies - Start up manager - MSU**
    2. **Dick Wever - Construction superintendent - MSU**
    3. **Jim Simons - Field representative - MSU**
    4. **Ralph J. Stephenson - Consultant**
C. **Agenda for Friday, October 9, 1992**
    1. **Review & update summary network as may be needed**

2. **Prepare laundry list for main systems**
    a) Controls - cox
    b) Heat rejection cycle (cooling) - hrx
    c) Steam generation (boiler) - sgx
    d) Turbine generator - tgx
    e) Combustion gas cleaning (bag house) - ccx
    f) Continuous emissions monitoring - cem
3. **Code elect const laundry list for cooling tower equipment - practice coding**
4. **Set list of abbreviations**

D. **Abbreviations used today**

The abbreviations below follow generally the convetions set by Black & Veatch in their project instruction manual, appendix D, list of systems. An x following the first two letters of the abbreviation indicates that there are subheadings assigned by Black & Veatch, or others to, the main system designated.

1. **ccx - Combustion gas cleaning system (fabric filter)**
2. **cem - Continuous emissions monitoring system**
3. **cox - Controls system**
4. **hrx - Cooling tower system**
5. **sgx - Steam generation system (boiler)**
6. **tgx -Turbine generator system**

E. **Material to be given to rgi**

1. **Close out check list**
2. **√Electrical construction check list**
3. **Full list of management people on project**
4. **Copies of all rjs disks for the project**
5. **Full sets of pertinent minutes and other documents**
6. **Full and current list of abbreviations**
    a) rjs
    b) b&v
    c) a/c
    d) etc

F. **Material to be discussed with rgi**

1. **Obtaining accurate construction record drawings**
2. **Obtaining adequate maintenance and operating manuals**
3. **Obtain all equipment and material installation instructions from contractors - ongoing**

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September 30, 1992

Given Dan Munroe to check TP steps on 10/6/92

September 14, 1992 (wd 435)

- Began defining start up procedures.
- Began preparing logic plans for major systems start up.
- Continued discussions of start up card procedures and responsibilities.

September 23, 1992 (wd 442)

- Inspected project.
- Reviewed current status with various project team members.
- Reviewed contractor's work scope with Mr. Wever and Mr. Simons.

Summary:

September 11, 1992 (wd 434) & September 14, 1992 (wd 435)

These meetings were concentrated on start up procedures as viewed by the owner and the general project manager, Alberici/Clark. Working notes were taken at each of the sessions described above. I have rough edited these and they are attached to this monitoring report for reference.

The start up process was discussed and refined as the various elements of the start up were identified. The turnover procedure from the contractors to MSU is very important since it represents the point in time where a MSU employee will actually take a start up action. A/C suggested that the starting point begin with the transmission of a turnover card from the project construction staff to MSU's utility staff. The sequence is expected to be roughly as follows:

1. The turnover card is prepared by the construction team.

The turn over card contains a detailed list of all construction elements making up a working system, and is a tabulation of components installed by the contractor. It attests that the construction of a designated system is complete in accordance with the responsible contractor's understanding of the contract scope.

2. The turnover card is given to the MSU construction field staff by the constructing party responsible.

The MSU construction staff verifies that the system is complete, or indicates where a need for additional construction is required for completion.

Once the construction contractors and the MSU construction staff are satisfied that the work in place is in accordance with the contract and represents a complete and workable system, the MSU field staff signs the turnover card.

3. The signed card is transmitted by the MSU construction staff to the MSU utilities staff.

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September 30, 1992

The MSU construction staff is represented by Mr. Jim Simons and the MSU utility staff is represented by Mr. Roy Gies.

Upon delivery of the turnover card Mr. Gies acknowledges that he has received the turnover card, and that he is taking over the responsibility for MSU utilities work in starting up the system as defined.

10/6/92 Dan will Comment

4. The turnover card is used to officially convey information from the MSU utilities staff to the MSU construction staff, and back.

As startup proceeds, the turnover card is used to identify required construction changes, adjustments and other revisions. The card is transferred from and to the MSU utilities group and the MSU construction staff as required.

5. When the turnover card no longer returns to the MSU construction staff it can be generally considered the system defined on the card is accepted by the MSU start up team.

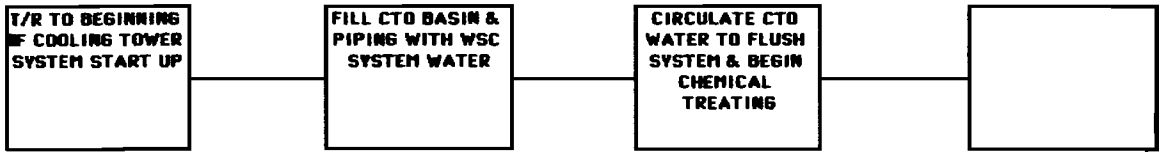
It will be essential that Mr. Simons and Mr. Gies remain in close contact with each other throughout start up. This is because there will undoubtedly be a need for input from the general project manager (A/C), the design, furnish and install (dfi) contractors, and the architect/engineer (B & V) of record to the start up staff.

The above is a broad outline of the general procedure under consideration at present. Mr. Munroe and Mr. Hucul of A/C will prepare an outline and mock up of the contents and form of the turnover card for discussion with MSU construction, and MSU utilities.

A/C next described how they intend to classify the mechanical systems being installed under the mechanical construction contract. This document was converted from the listing prepared by Mr. Munroe into a data base format. Copies were distributed at the meeting. A copy is attached to this report and is designated Attachment A.

It was stressed by A/C that the material contained in attachment A is preliminary and is to be reviewed further by them.

Later in the meeting the MSU staff discussed further details of the various systems in the plant that must be considered in setting the logic plans and schedules for the start up. We continued reviewing the fundamental systems descriptions and rearranged the data in the preliminary data runs described on pages 3, 4, and 5, in monitoring report #21, dated September 1, 1992. The rearranged data shown by level of detail is contained in Attachment B enclosed with this report. Notice that the level 1 main system is designated as Plant Start Up. The level 2 systems are controls, cooling tower, turbine, boiler, bag house and continuous emissions. These are further subdivided into level 3, 4 and 5 systems under the six main sub headings.



Beginning of start up is the point where the start up manager receives the initial turnover card (this is the card to be given to Roy Gies by Jim Simons that signifies all construction contract materials and equipment making up the system have been put in place in accordance with the construction contract requirements.)

To begin cooling tower system start up the following must be complete & accepted by MSU construction & the turnover card has been given to the power plant #4 start up manager.

- **Cooling tower structure and other Thermal Dynamics work complete.**
- **All water, chemical and control systems complete**
- **Electrical,power & control systems complete**
- **DCS software & hardware checked & operative**
- **Chemical treatment systems checked and operative**

- **02.0000 - Cooling tower system - dfi contractor - Thermal Dynamics**

02.01 - Mechanical
- **02.0101 - wsc - raw water make up system**
- **02.0102 - hrc - circulating water system**
- **02.0103 - fpu - fire protection system**
- **02.0104 - hre - chemical feed systems**
- **02.0105 - cab - control air systems**
- **02.0106 - ??? - instrumentation**

02.02 - Electrical
- **02.0201 - High voltage systems**
- **02.0202 - Low voltage systems**
- **02.0203 - Control systems**

02.03 - DCS
- **02.0301 - Software systems**

02.04 - Chemical
- **02.0401 - Tanks, pumps, controls**

02.05 - Thermal Dynamics
- **02.0501 - Structure**
- **02.0502 - Fire protection system**
- **02.0503 - Lightning protection**
- **02.0504 - Cooling tower fans**
- **02.0505 - Tower lighting system**

Issue #1 - September 14, 1992
11 cooling tower start up
d?

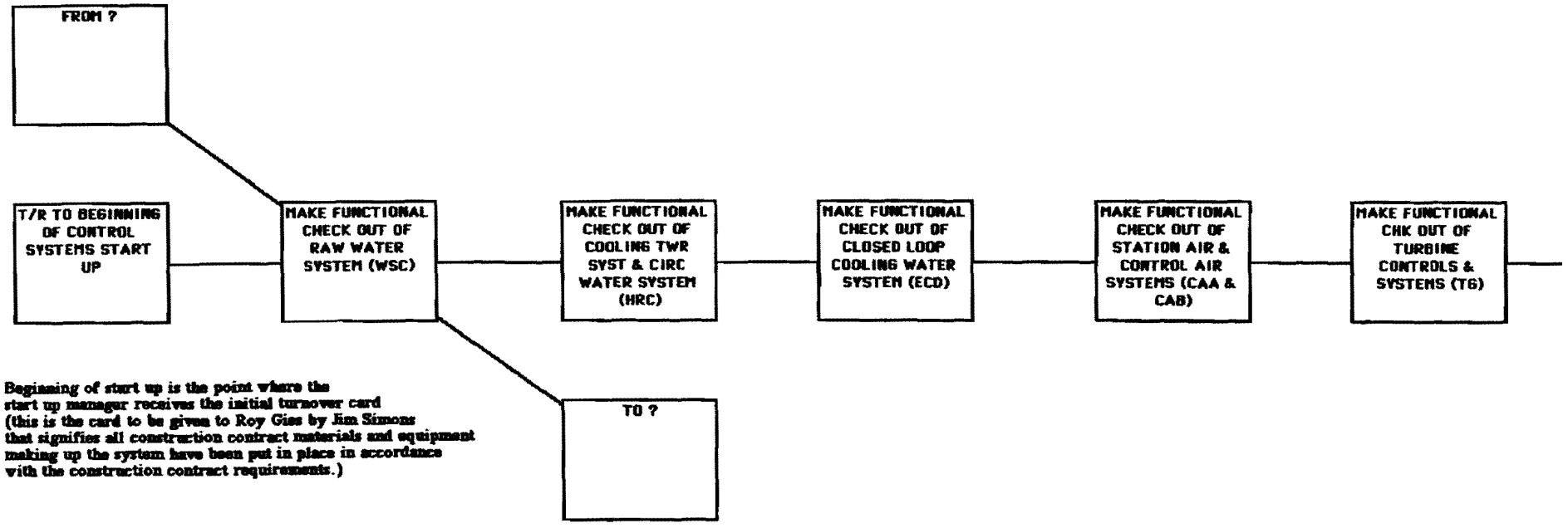
- 200 Cooling Tower Start Up

Network Model for T. B. Simon Power Plant Unit 4 Michigan State University East Lansing, Michigan

Roy Gies - Start up manager
Jim Simons - Construction Project Representative

Ralph J. Stephenson P.E. P.C.
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858
ph 517 772 2537

Sheet #ct1



Beginning of start up is the point where the start up manager receives the initial turnover card (this is the card to be given to Roy Gies by Jim Simons that signifies all construction contract materials and equipment making up the system have been put in place in accordance with the construction contract requirements.)

To begin control systems start up, the following must be complete and accepted by MSU construction and the turnover card has been given to the power plant #4 start up manager.

- 13.8 kv buss energized.
- 4160 v buss energized
- 480v buss energized
- Motor control centers energized
- Lighting transformer operational
- UPS system operational
- Power battery system operational
- Required DCS cabinets operational (to be defined)

See turnover cards for details of each component above

The reconfiguration work required is:

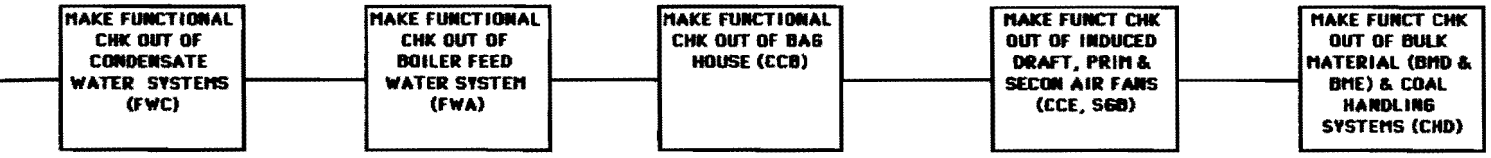
- 13.8 kv buss
- 13.8 kv buss control
- 1, 2, 3 turbine control
- 4160 v & 480 v house service power

01.0000 - Controls system - dfi contractor - Bailey

01.01 - Electrical systems
- 10.0101 - Motor control centers
- 10.0102 - Node cabinets

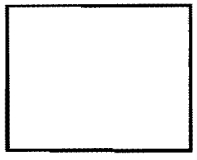
02.02 - DCS
- 02.0301 - hardware systems
- 02.0302 - software systems
- 02.0303 - DCS wiring systems

- 07.0000 - High voltage & control reconfiguration - Hatzel Buehler



TOTAL FLOAT
EARLY START

DURATION
EARLY FINISH



LATE START

LATE FINISH

Activity Key

Issue #1 - September 14, 1992
11 controls systems start up
d?

• 01 - Control Systems

Network Model for T. B. Simon Power Plant Unit 4 Michigan State University East Lansing, Michigan

Roy Gies - Start up manager
Jim Simons - Construction Project Representative

Ralph J. Stephenson PE PC
Consulting Engineer
323 Hiawatha Drive
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Sheet #sy1

	system #	main system class	sub system class	level A actions	level B actions	notes
1	100.0000	control system start up - 100				
2	101.0000	control system start up - 100	power	Start UPS		
3	102.0000	control system start up - 100	control	Start dcs gate		
4	102.0100	control system start up - 100	control	Install operator interface stations		
5	200.0000	plant start up - 200				
6	201.0000	plant start up - 200	power	Complete unit 4 13800 v buss		
7	201.0101	plant start up - 200	power	Complete unit 4 13800 v buss	Calibrate 480v breaker metering	
8	201.0102	plant start up - 200	power	Complete unit 4 13800 v buss	Start 480v transformer	
9	201.0201	plant start up - 200	power	Complete unit 4 13800 v buss	Calibrate lighting sub metering	
10	201.0202	plant start up - 200	power	Complete unit 4 13800 v buss	Start lighting substation	
11	201.0300	plant start up - 200	power	Complete unit 4 13800 v buss	Start plant paging system	
12	202.0000	plant start up - 200	fire water	Complete raw water piping		
13	202.0100	plant start up - 200	fire water	Complete raw water piping	Start fire safety system	
14	203.0000	plant start up - 200	cooling water	Complete ct 480 v feed		
15	204.0000	plant start up - 200	cooling water	Complete ct 120 v feed		
16	204.0100	plant start up - 200	cooling water	Complete ct 120 v feed	Start ct dcs nodes	
17	204.0200	plant start up - 200	cooling water	Complete ct 120 v feed	Start cooling tower make up	
18	204.0300	plant start up - 200	cooling water	Complete ct 120 v feed	Start cooling tower chemical feed	
19	204.0400	plant start up - 200	cooling water	Complete ct 120 v feed	Start cooling tower acid feed	
20	205.0000	plant start up - 200	cooling water	Complete condenser piping		
21	206.0000	plant start up - 200	cooling water	Complete cooling tower system		
22	206.0100	plant start up - 200	cooling water	Complete cooling tower system	Start ct circulating pumps	
23	206.0200	plant start up - 200	cooling water	Complete cooling tower system	Start ct fans	
24	207.0000	plant start up - 200	cooling water	Complete ct security fencing		

disc #826
START UP ACTIONS
PP #12

	system #	main system class	sub system class	level A actions	level B actions	notes
25	208.0000	plant start up - 200	cooling water	Complete ccw plant piping		
26	208.0100	plant start up - 200	cooling water	Complete ccw plant piping	Start Bailey dcs nodes	
27	208.0200	plant start up - 200	cooling water	Complete ccw plant piping	Start ccw system	
28	209.0000	plant start up - 200	instrument air	Complete plant air piping		
29	209.0100	plant start up - 200	instrument air	Complete plant air piping	Start Bailey dcs nodes	
30	209.0200	plant start up - 200	instrument air	Complete plant air piping	Start instrument air dryer	
31	209.0300	plant start up - 200	instrument air	Complete plant air piping	Start instrument air compressor	
32	210.0100	plant start up - 200	heat	Complete bldg heating system	Strt bldg prv station (90# to 20# stm)	
33	210.0200	plant start up - 200	heat	Complete bldg heating system	Start bldg heating system (20# stm)	
34	210.0300	plant start up - 200	heat	Complete bldg heating system	Start condensate system	see 306.0100 & 213.0200
35	211.0000	plant start up - 200	feed water	Complete feed water header		
36	211.0100	plant start up - 200	feed water	Complete feed water header	Start deareator & heater	
37	212.0000	plant start up - 200	main steam	Complete main stm hdr (900#) system		
38	212.0100	plant start up - 200	main steam	Complete main stm hdr (900#) system	Start main steam prv (900# to 90#)	
39	213.0000	plant start up - 200	sendout steam	Comp 90# stm hdr		
40	213.0100	plant start up - 200	sendout steam	Complete 90# stm hdr	Start desup spray	
41	213.0200	plant start up - 200	sendout steam	Complete 90# stm hdr	Start condensate system	see 210.0300 & 306.0200
42	214.0100	plant start up - 200	demin water	Complete mixed bed tie in	Start mixed bed demineralizer	
43	300.0000	turbine start up - 300				
44	301.0100	turbine start up - 300	control	Complete turbine generator	Start turbine dcs	
45	301.0101	turbine start up - 300	control	Complete turbine generator	Start turbine dcs	
46	301.0200	turbine start up - 300	control	Complete turbine generator	Start vibration monitor	
47	302.0100	turbine start up - 300	piping & valves	Complete turbine generator	Check turbine valves	
48	303.0100	turbine start up - 300	oil system	Complete turbine generator	Start lube oil system	

	system #	main system class	sub system class	level A actions	level B actions	notes
49	303.0200	turbine start up - 300	oil system	Complete turbine generator	Start control oil system	
50	303.0300	turbine start up - 300	oil system	Complete turbine generator	Start vapor extractor	
51	303.0400	turbine start up - 300	oil system	Complete turbine generator	Start to warm oil (from 90# system)	
52	304.0100	turbine start up - 300	turning gear	Complete turbine generator	Start turning gear	
53	305.0102	turbine start up - 300	steam seal	Complete turbine generator	Start shaft seals	
54	306.0201	turbine start up - 300	condenser operation	Complete turbine generator	Start condensate system	see 210.0300 & 213.0200
55	306.0203	turbine start up - 300	condenser operation	Complete turbine generator	Start hot well system	
56	306.0204	turbine start up - 300	condenser operation	Complete turbine generator	Start steam ejector	
57	307.0100	turbine start up - 300	stm chest operation	Complete turbine generator	Operate admission valve	
58	307.0200	turbine start up - 300	stm chest operation	Complete turbine generator	Operate turbine trip valve	
59	308.0100	turbine start up - 300	generator operation	Complete turbine generator	Start generator cooler	
60	308.0201	turbine start up - 300	generator operation	Complete turbine generator	Calibrate exciter meter	
61	308.0202	turbine start up - 300	generator operation	Complete turbine generator	Operate generator exciter	
62	308.0203	turbine start up - 300	generator operation	Complete turbine generator	Test exciter metering	
63	308.0300	turbine start up - 300	generator operation	Complete turbine generator	Operate sych cabinet	
64	308.0401	turbine start up - 300	generator operation	Complete turbine generator	Calibrate generator metering	
65	308.0402	turbine start up - 300	generator operation	Complete turbine generator	Operate generator breaker	
66	308.0403	turbine start up - 300	generator operation	Complete turbine generator	Test generator metering	
67	400.0000	boiler start up - 400				
68	401.0101	boiler start up - 400	power	Complete cfb (boiler)	Calibrate 4160 metering	
69	401.0102	boiler start up - 400	power	Complete cfb (boiler)	Start 4160 substation	
70	401.0103	boiler start up - 400	power	Complete cfb (boiler)	Start 480 mcc's	
71	402.0000	boiler start up - 400	control	Complete cfb (boiler)	Start boiler dcs	
72	403.0000	boiler start up - 400	sand	Complete cfb (boiler)	Start sand system	

	system #	main system class	sub system class	level A actions	level B actions	notes
73	404.0100	boiler start up - 400	gas	Complete cfb (boiler)	Start inbed gas system	
74	404.0200	boiler start up - 400	gas	Complete cfb (boiler)	Start main gas system	
75	405.0100	boiler start up - 400	air	Complete cfb (boiler)	Start primary air fans	
76	405.0200	boiler start up - 400	air	Complete cfb (boiler)	Start secondary air fans	
77	406.0101	boiler start up - 400	bag house - power	Complete cfb (boiler)	Close 4160 v breaker	
78	406.0102	boiler start up - 400	bag house - power	Complete cfb (boiler)	Start 480 v mcc's	
79	406.0201	boiler start up - 400	bag house - control	Complete cfb (boiler)	Start bag house dcs	
80	406.0300	boiler start up - 400	bag house	Complete cfb (boiler)	Start id fans	
81	406.0400	boiler start up - 400	bag house	Complete cfb (boiler)	Start reverse air fans	
82	406.0500	boiler start up - 400	bag house	Complete cfb (boiler)	Start opacity monitor	
83	406.0600	boiler start up - 400	bag house	Complete cfb (boiler)	Start CEM's	
84	407.0000	boiler start up - 400	limestone	Complete cfb (boiler)	Start limestone system	
85	408.0000	boiler start up - 400	coal	Complete cfb (boiler)	Start coal system	
86	409.0000	boiler start up - 400	ash	Complete cfb (boiler)	Start ash handling system	

	oen	level 1	level 2	level 3	level 4	level 5
1	1	a) Plant #4 start up				
2	2		(1) 100 - Control system start up			
3	3			(a) Bailey systems software		
4	4		(2) 200 - Cooling tower system start up			
5	5			(a) Mechancial construction systems		
6	6				i) wsc - raw water system - make up water to hrc system	
7	7				ii) hrc - circulating water systems	
8	8				iii) fpu - fire protection system	
9	9				iv) hre - chemical feed systems	
10	10				v) cab - instrument air system	
11	11				vi) cab - control air system	
12	12				vii) etc.	
13	13			(b) Electrical construction systems		
14	14				i) High voltage system	
15	15				ii) Low voltage system	

B

listed in systems heirarcy order

	oen	level 1	level 2	level 3	level 4	level 5
16	16				iii) Control system	
17	17			(c) dcs systems		
18	18				i) Software system	
19	19			(d) Calgon system		
20	20		(3) 300 - Turbine system start up			
21	21			(a) Mechanical construction systems		
22	22				i) sgg - main steam system	
23	23				ii) tea - extraction steam	
24	24				iii) hrc - circulating water system	
25	25				iv) hra - condensate systems	
26	26				v) cab - instrument air system	
27	27				vi) ecb - closed cooling water system	
28	28				vii) cab - control air system	
29	29			(b) Electrical construction systems		
30	30				i) High voltage system	

	oen	level 1	level 2	level 3	level 4	level 5
31	31				ii) Low voltage system	
32	32				iii) Control system	
33	33				iv) Relaying system- multilin electrical relaying system	
34	34				v) etc.	
35	35			(c) dcs systems		
36	36			(d) General Electric systems		
37	37				i) Turbine systems	
38	38					(1) Lube oil system
39	39					(2) Control oil system
40	40				ii) Generator systems	
41	41				iii) etc.	
42	42		(4) 400 - Boiler system start up			
43	43			(a) Mechanical construction systems		
44	44				i) ecb - closed cooling water system	
45	45				ii) cab - control air system	

	oen	level 1	level 2	level 3	level 4	level 5
46	46		(5) 500 - Bag house system start up			
47	47			(a) Mechanical construction systems		
48	48				i) cab - instrument air system	
49	49				ii) asg - ash collection	
50	50				iii) ecb - closed cooling loop system	
51	51				iv) cab - control air system	
52	52			(b) Electrical construction systems		
53	53			(c) dcs systems		
54	54			(d) Environmental Elements systems		
55	55		(6) 600 - Continuous emissions monitoring system			
56	56			(a) Environmental Elements systems		
57	57			(b) Mechanical construction systems		
58	58				i) cab - control air system	
59	59			(c) Electrical construction systems		

	oen	b & v p&id #	discipline	discipline system	system code	target turnover date to MSU (prelim - to be confirmed)	notes	major system start up category
1	1	M2029	mechanical	building drains & vents	DPA	11/27/92		cooling tower
2	2	M2012	mechanical	service water	WSC	11/27/92		cooling tower
3	3	M2012	mechanical	fire protection	FPU	2/1/93		cooling tower
4	4	M2016	mechanical	heater vents & miscellaneous drains	TEF	11/27/92		cooling tower
5	5	M2016	mechanical	heater drains	TED	11/27/92		cooling tower
6	6	M2015	mechanical	steam unit heaters & air handling unit	SCA	11/27/92	for partial use only - phase 1 - see also SCA phase 2	cooling tower
7	7	M2010	mechanical	control air	CAB	2/12/93		cooling tower
8	8	M2003	mechanical	condensate	FWC	3/5/93	see PMA systems	
9	9	M2003	mechanical	condensate air extraction	HRB	3/5/93		
10	10	M2003	mechanical	condensate	HRA	3/5/93		
11	11	M2005	mechanical	circulating water chemical feed	HRE	1/8/93		
12	12	M2005	mechanical	cycle chemical feed	FWE	1/15/93		
13	13	M2007	mechanical	circulating water	HRC	1/29/93		
14	14	M2006	mechanical	closed cycle cooling water	ECB	1/15/93		
15	15	M2010	mechanical	station air	CAA	2/12/93		
16	16	M2013	mechanical	chemical clean	PMA	1/29/93	pre boiler chem clean - FWC, FWA & FWG - from 01/15/93 to	
17	17	M2028	mechanical	attemporator spray water	FWG	3/5/93	see PMA systems	

	oen	b & v p&id #	discipline	discipline system	system code	target turnover date to MSU (prelim - to be confirmed)	notes	major system start up category
18	18	M2002	mechanical	feed water	FWA	3/5/93	see PMA systems	
19	19	M2002	mechanical	desuperheater water	FWH	3/5/93		
20	20	M2003	mechanical	demineralized water	FWF	3/5/93		
21	21	M2014	mechanical	sampling & analysis	SAC	3/5/93		
22	22	M2023	mechanical	boiler drains & vents	SGF	4/9/93		
23	22	?	mechanical	natural gas	SGE	4/9/93		
24	23	M2001	mechanical	main steam	SGG	4/9/93		
25	24	M2025	mechanical	steam blow piping	SGK	4/16/93		
26	25	M2016	mechanical	extraction traps & drains	TEC	4/16/93		
27	26	M2016	mechanical	extraction steam	TEA	4/16/93	turbine ready to go	
28	27	M2015	mechanical	building space conditioning	SCA	4/30/93	for phase 2 - see other SCA for phase 1	
29	28	M2010	mechanical	soot blower air	CAC	2/12/93		
30	29	M?	mechanical	coal handling system	CHD	6/1/93	requires CHC	
31	30	M2009	mechanical	limestone handling	BMD	6/1/93		
32	31	?	mechanical	sand handling (inert)	BME	6/1/93		
33	32	M2008	mechanical	ash collection	ASG	6/1/93		
34	33	M2008	mechanical	combustion waste storage	ASF	6/1/93		

	oen	b & v p&id #	discipline	discipline system	system code	target turnover date to MSU (preiim - to be confirmed)	notes	major system start up category
35	34	M4009	mechanical	vacuum cleaning	PMC	6/1/93	bag house ready to come on line.	
36	35							

Start up notes

I. **General notes - to be updated as project proceeds**

II. **8:59:08 AM - Tuesday, October 6, 1992**

A. **Location - MSU PP #4 conference room**

B. **Those attending**

1. **Dave Munroe - Field superintendent - A/C**
2. **Dave Sadler - Project director - A/C**
3. **John Hucul - Project manager - A/C**
4. **Dick Wever - Construction superintendent - MSU**
5. **Jim Simons - Field representative - MSU**
6. **Bob Nestle - Director of engineering - MSU**
7. **Bob Ellerhorst - Director of utilities - MSU**
8. **Roy Gies - Start up manager - MSU**
9. **Ralph J. Stephenson - Consultant**

C. **General notes - meeting started at 9:12:59 AM**

1. **Dick Wever introduced subject of start up**
2. **Reviewed startup card process**
3. **Start up crew would like to continue with the intenal planning**
4. **rel mentioned that the different portions of the construction team have different perceptions of the start up sequence.**
   a) Bailey
5. **How do we announce the sequence of start up to all members of the project team?**
6. **Bailey is affected by the confusion.**
7. **Confusion on which set of dates are being used for planning.**
   a) Contract dates
   b) A/C dates
   c) Are we talking about steam blow - rel says no.
8. **How do we do this?**
9. **What is the best milestone measurement method?**
10. **jhu**
    a) No correlation between Bailey, their programmers and the sequence of construction.
    b) What is the sequence?
    c) GE has given jhu the start up the material.
11. **rel**
    a) Can we give the sequence in relation to the six major
12. **dsa said the operations people must give the contractors the information they need to deliver the project in an orderly meeting.**
13. **Bailey system seemed to be the biggest difficulty at the present time. Must get their software track in line with the startup plan.**

14. **Bailey at present is working hardest on the boiler and the turbine sequence**
15. **Systems sequence as stated by rel - this was tentatively agreed on by those attending.**
    a) Bailey - on each of the systems
       (1) jhu said they will need Bailey in late January, 1993
    b) Cooling tower
    c) Boiler
    d) Bag house
    e) Turbine
    f) Continuous emissions monitoring system
16. **It is the desire of the plant to have the turbine first - rel**
17. **How do we relate the work of Black and Veatch to the start up**
18. **From whom do we get start up cards**
    a) Abericil/Clark
    b) Bailey
19. **Card systems**
    a) *dmu not certain why TAM needs a card*
    b) jhu said the TAM and GE knows what their start up card represents.
    c) rne asked if the GE and TAM card is all that is needed.
    d) dmu said that GE and TAM will have start up crews here to work with MSU start up
    e) dmu said all their subsystems are on the turnover card.
20. **dwe said that A/C is doing the same thing for all their systems just as TAM is doing for their boiler system.**
21. **Who's on the team? Must define this.**
22. **Heavy discussion about formal vs informal process for correcting deficiencies.**
23. **When the turnover package comes to rge, it is assumed by the contractors have completed all their work as they understand it is defined in their contract.**
24. **b&v will be involved in the turnover**
    a) Should define how they might be involved
25. **Bailey could well use the turnover card**
26. **rel described the method of Bailey turning over and the red tag system.**
    a) What is the red tag? - rge knows how this works.
    b) The red tags are on the system as it arrives. They are removed as the systems are brought on line.

c) rwe asked when Ron McClintic is involved
(1) rel said in the design and layout of the hardware configuration and design.

27. **Bailey and MSU is going to ask for support and help according to rel**
a) Using multifunction processor
b) Setting up 5 ois stations in December, 1992 in their plant. Vendors should go to the plant and see if Bailey has assembled their components correctly.
(1) Vendors must gain a benefit from the mockup
(2) How do we motivate the vendors
(3) Start up manager will be there for a full month
(4) TAM will probably be asked to go
(5) Look at graphics and the information in the system
(6) Need an ois (DEC) machine to view. Built on an IBM systems.
(7) rmc thought he was the one to go to
(8) The ois simulation is to be attended by rge

28. **Fuel used for drying is still construction according to EPA**
a) Don't need to monitor emissions during drying out
b) Must change permission to build to decision to operate
c) Have 180 calendar days to fine tune and submit to the DNR
(1) Starts when boiler is brought up to temperature and pressure with any fuel.
(2) Calibration will be done during the 180 days
(3) Sequence will be to bring up to temp and pressure, run, and to calibrate.

29. **jhu said A/C probably will provide MSU their first turnover card and packet in February, 1993.**
30. **Checked the responsiblity patterns for the start up card preparation.**
31. **rel asked about tagging elements of a system that have been turned over. dhu said it is a good process by which the field staff knows.**
32. **dhu wants to know when the start up crew will need each of systems for start up.**

III. **8:45:50 AM - Friday, October 9, 1992**
A. **Location - *MSU facities office conference room***
B. **Those attending**
1. **Roy Gies - Start up manager - MSU**
2. **Dick Wever - Construction superintendent - MSU**
3. **Jim Simons - Field representative - MSU**
4. **Ralph J. Stephenson - Consultant**
C. **Agenda for Friday, October 9, 1992**
1. **Review & update summary network as may be needed**

2. **Prepare laundry list for main systems**
   a) *Controls - cox*
   b) Cooling tower - ctx - in work
   c) Steam generation - sgx
   d) Turbine generator - tgx
   e) Combustion gas cleaning - ccx - bag house
   f) Continuous emissions monitoring - cem
3. **Code elect const laundry list for cooling tower equipment - practice coding**
4. **Set list of abbreviations**

D. **Abbreviations used today**

The abbreviations below follow generally the convetions set by Black & Veatch in their project instruction manual, appendix D, list of systems. An x following the first two letters of the abbreviation indicates that there are subheadings assigned by Black & Veatch, or others to, the main system designated.

1. **ccx - Combustion gas cleaning system (fabric filter)**
2. **cem - Continuous emissions monitoring system**
3. **cox - Controls system**
4. **ctx - Cooling tower system**
5. **sgx - Steam generation system (boiler)**
6. **tgx -Turbine generator system**

E. **Material to be given to rgi**

1. **Close out check list**
2. **√Electrical construction check list**
3. **Full list of management people on project**
4. **Copies of all rjs disks for the project**
5. **Full sets of pertinent minutes and other documents**
6. **Full and current list of abbreviations**
   a) rjs
   b) b&v
   c) a/c
   d) etc

F. **Material to be discussed with rgi**

1. **Obtaining accurate construction record drawings**
2. **Obtaining adequate maintenance and operating manuals**
3. **Obtain all equipment and material installation instructions from contractors - ongoing**

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
1	1.000	Ground cable tray						que			
2	2.000	Install cable tray						que			
3	3.000	Install instrument conduit to junction boxes						que			What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
4	4.000	Pull instrument wire from ? to ?						que			What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
5	5.000	Make instrument wiring final connections						que			What is included in this set of activities?
6	6.000	Install isolated instrument grounding						que			
7	7.000	Install lighting conduit from ? to ?						que			Does this include the Unistrut support grid?
8	8.000	Install 110 V power conduit from ? to ?						que			What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
9	9.000	Install lighting panels						que			Could start at different time than lighting conduit
10	10.000	Pull lighting wire from ? to ?						que			
11	11.000	Pull 110 v power wire from ? to ?						que			
12	12.000	Make final 110 v power connections						que			To what equipment?
13	13.000	Install light fixtures						que			TC up to start (on flip chart - what does this mean?)
14	14.000	Install Unistrut support system						que			

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
15	15.000	Install equipment power conduit						que			How does this differ from oen 8? - What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
16	16.000	Pull equiment wire						que			Is a wiring plan needed for this activity?
17	17.000	Make final equipment power connections						que			
18	18.000	Prepare & submit bus duct location drawings						msu/bai			15 kv & 600 v ?
19	19.000	a/e review & approve bus duct location drawings						b&v			15 kv & 600 v ?
20	20.000	dafd (Detail, approve, fab & deliver) mcc's 41 & 42						msu/wes/bai/b&v	8/28/92		ofe - Owner furnished euipment - to begin shipping 08/28/92, will deliver one pair per week
21	21.000	dafd dcs cabinets 428 & 429						msu/bai/b&v			ofe - Owner furnished euipment
22	22.000	dafd 13.8 kv distribution switch gear						msu/cpc?/b&v			ofe - Owner furnished euipment
23	23.000	dafd mcc's 43 & 44 with dcs (distributed control system?) cabinets 431 & 432)						msu/wes/bai/b&v/	8/28/92		ofe - Ower furnished equipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs
24	24.000	dafd mcc's 45 & 46 with dcs (distributed control system) cabinets 411 & 412						msu/wes/bai/b&v	8/28/92		ofe - Owner furnished euipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs
25	25.000	dafd free standing dcs cabinets						msu/bai/b&v			ofe
26	26.000	dafd 4160 v substation (transformers ?)						msu/wes/b&v		x	ofe
27	27.000	dafd 480 v substation (transformers ?)						msu/wes/b&v/		x	ofe
28	28.000	dafd ess 2-4 batteries						msu		x	ofe

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
29	29.000	dafd mcc 47						msu/	8/28/92		ofe
30	30.000	dafd mcc 48						msu/wes/b&v	8/28/92		ofe
31	31.000	dafd ess distribution panel						msu			ofe ?
32	32.000	dafd ess ac power panels						que			
33	33.000	dafd ess inverter						msu			ofe ?
34	34.000	dafd ess dc power panels						que			
35	35.000	dafd ess battery chargers (3)						msu/		x	ofe ?
36	36.000	Set mcc's 41 & 42		851'0" - col line E12	4APC-MCC-42			que/			ofe - Owner furnished euipment - to begin shipping 08/28/92, will deliver one pair per week
37	37.000	Set dcs cabinets 428 & 429						msu/bai/b&v			ofe - Owner furnished euipment
38	38.000	Set 13.8 kv distribution switch gear						msu/cpc?/b&v		x	ofe - Owner furnished euipment
39	39.000	Set mcc's 43 & 44 with dcs (distributed control system?) cabinets 431 & 432)		875' 0" col line - E14				que/	8/28/92	x	ofe - Ower furnished equipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs
40	40.000	Set mcc's 45 & 46 with dcs (distributed control system) cabinets 411 & 412		875'0" - col line B11				que/	8/28/92		ofe - Owner furnished euipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs
41	41.000	Set free standing dcs cabinets						msu/bai/b&v			ofe
42	42.000	Set 4160 v substation (transformers ?)						msu/wes/b&v		x	ofe

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
43	43.000	Set 480 v substation (transformers ?)		861'4 1/2" - col line K12				que/		x	ofe
44	44.000	Set ess 2-4 batteries						msu		x	ofe
45	45.000	Set mcc 47		Cooling tower				que/	8/28/92		ofe - set with mcc 48
46	46.000	Set mcc 48		Cooling tower				que/	8/28/92		ofe - set with mcc 47
47	47.000	Set ess distribution panel						que/		x	ofe ?
48	48.000	Set ess ac power panels						que		x	
49	49.000	Set ess inverter						que/		x	ofe ?
50	50.000	Set ess dc power panels						que			
51	51.000	Set ess battery chargers (3)		890' 0" - col line K12				que/		x	ofe ?
52	52.000	dafd alternate source transformer						msu			ofe
53	53.000	Set alternate source transformer						que			
54	54.000	dafd lighting switchgear substation						que/b&v /			
55	55.000	Set lighting switchgear						que			
56	56.000	dafd lighting panels						que			

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
57	57.000	Pull main feed from cable vault to chemical electrical building						que			
58	58.000	Pull main feed to cooling tower						que			
59	59.000	Pull main feed in pp #4 from n end cable vault to s end pull box						que			
60	60.000	mfc to equipment as noted in 60.000 series from 4160 substation 41					4160 substation 41				
61	60.001	mfc to 1A equipment spare *(?)					4160 substation 41				
62	60.002	mfc to bfw pump 1A		851'0" - col line D11	4FWAE-100501	4FWA-P-1A	4160 substation 41A	abc/tam?			Who's responsible for this action?
63	60.003	mfc to id fan 1A		877'0" - col line AA12	4CCBE - 100501	4CCB-FAN-1A	4160 substation 41A	abc/tam?			Who's responsible for this action?
64	60.004	mfc to pt (potential transformers) compt					4160 substation 41A				
65	60.005	mfc to pt (potential transformers) compt					4160 substation 41B				
66	60.006	mfc to id (induced draft) fan 1B		877'0" - col line AA14	4CCBE-100502	4CCB-FAN-1B	4160 substation 41B	abc/tam ?			Who's responsible for this action?
67	60.007	mfc to ct (current transformer) compt					4160 substation 41A				
68	60.008	mfc to bfw pump 1B		851'0" - col line D11	4FWAE-100502	45GA-P-1B	4160 substation 41B	abc/tam			Who's responsible for this action?
69	60.009	mfc to equipment spare (no connection to be made)*					4160 substation 41				No connection. Does't need to be made
70	60.010	mfc to spare*					4160 substation 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
71	60.011	mfc to pa fan 1B		930'9" - col line B13	4SGAE-100502	45GA-FAN-1B	4160 substation 41B	abc/tam ?			Who's responsible for this action?
72	60.012	mfc to ct (current transformer)trans compt					4160 substation 41B				
73	60.013	mfc to main bkr					4160 substation 41A				
74	60.014	mfc DELETED									
75	60.015	mfc to tie brk*					4160 substation 41				
76	60.016	mfc to main bkr				4SGA-FAN-1A	4160 substation 41B				
77	60.017	mfc to pa fan 1A		930'9" - col line A13	4SGAL-100501		4160 substation 41	abc/tam			Who's responsible for this action?
78	60.018	mfc to spare*					4160 substation 41				
79	60.019	mfc to attemporator spray pump			4FWGE-100502	4FWG-P-1B	4160 substation 41B				
80	60.020	mfc to attemporator spray pump			4FWGE-100501	4FWG-P-1A	4160 substation 41A				
81	61.000	mfc to equipment as noted in 61.000 series from 480 v substation 41				4APC-SUS-41	480 v substation 41	que/			
82	61.001	mfc to instruments - same as 61.004*					480 v substation 41	tam/que			tam installs from instrument to a junction box. Quality installs from junction box to substation
83	61.002	mfc to battery charger #24C		890'0" - col line K12	CAPHE 100611	CAPH-CHGR-24C	480 v substation 41B				
84	61.003	mfc to equipment spare*					480 v substation 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
85	61.004	mfc tol instruments 2 ?- same as 61.001?*					480 v substation 41	tam/que			tam installs from instrument to a junction box. Quality installs from junction box to substation
86	61.005	mfc to equipment*					480 v substation 41				
87	61.006	mfc to mcc 41 - main breaker			4APCE-100601	4APC-MCC-41	480 v substation 41				
88	61.007	mfc to instruments 3 ?*					480 v substation 41	que/tam			tam installs from instrument to a junction box. Quality installs from junction box to substation
89	61.008	mfc to main bkr 1 - bus duct (600V)					480 v substation 41				
90	61.009	mfc blank 1*					480 v substation FMR 41A				
91	61.010	mfc to ltg sub			4APBE-100601	4APB-LSUB-41	480 v substation 41B				
92	61.011	mfc main breaker to mcc 48		Cooling tower	4APC-100608	4APC-MCC-48	480 v substation 41B	que/			
93	61.012	mfc spare*					480 v substation 41				
94	61.013	mfc main breaker to mcc 46		875'0" - col line B11	4APC-100654	4APC-MCC-4L	480 v substation 41B	msu/que			
95	61.014	mfc main breaker to mcc 44			4APC-100604	4APC-MCC-44	480 v substation 41B	que			
96	61.015	mfc main breaker to mcc 42		851'0" - col line E12	4APC-100602	4APC-MCC-42	480 v substation 41	que/			
97	61.016	mfc to tie breaker*					480 v substation 41				
98	61.017	mfc blank 2*					480 v substation 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
99	61.018	mfc to fire pump / cntrl cab		851'0" - col line E14	4FPU - 100609	4FPU-P-1	480 v substation 41A	que			
100	61.019	mfc to battery charger 24A		890' 0" - col line K12	CAPH-100610	CAPH-CHGR-24A	480 v substation #41B	que/		x	
101	61.020	mfc spare 3*					480 v substation 41				
102	61.021	mfc main breaker to mcc 43		875'0" - col line E14	4APC-100603	4APC-MCC-43	480 v substation 41A	que/			
103	61.022	mfc main breaker to mcc 45		875'0" - col line B11	4APC-100651	4APC-MCC-45	480 v substation 41A	que/			
104	61.023	mfc main breaker to mcc 47		chemical / electrical building	4APC-100607	4APC-MCC-47	480 v substation 41A	que/			
105	61.024	mfc to main bkr					480 v substation FMR 41B				
106	61.025	mfc blank 3*					480 v substation 41				
107	61.026	mfc to battery charger 24B		890' 0" - col line K12	CAPH	CAPH-CHGR-24B	480 v substation #2	que/		x	
108	62.000	mfc to equipment as noted in 62.000 series from substation 2					substation 2				
109	62.001	mfc to battery charger 24B		890' 0" - col line K12	CAPH-100601	CAPH-CHGR-24C	480V sub station #2	que/			
110	63.000	mfc to equipment as noted in 63.000 series from substation 6					substation 6	que/			
111	63.001	mfc from substation #6 to mcc 1A, 1B & 1C			CAPCE-100601		480V sub station #6	que/			
112	64.000	mfc to equipment as noted in 64.000 series from boiler / turbine mcc 41					boiler / turbine mcc 41	que/			

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
113	64.001	mfc to bfw pump lube oil pump 2A			4FWAE 120101	2A 4FW A -P - 2A	boiler / turbine mcc 41				
114	64.002	mfc to turb lube oil vapor exhauster			4TGDE 120101	4TGD - EXH -1	boiler / turbine mcc 41				
115	64.003	mfc to turb gen main lube oil pum 1A			4TGDE 120102	1A 4TGD - P -1A	boiler / turbine mcc 41				
116	64.004	mfc to bed ash screw cooler feeder 3A			4SGAE 120101	3A 4SGA - CLR - 3 A	boiler / turbine mcc 41				
117	64.005	mfc to attemporator spray pump 1A			?	1A 4FWG-P-1A	boiler / turbine mcc 41				
118	64.005	mfc to attemporator spray pump 1B			4ECBE-120102	1B 4FWG-P-1B	boiler / turbine mcc 42				√check the oen for this equipment - it is a duplicate number.
119	64.006	mfc to stm seal inlet blk vlv			4TGCE 120104	4TGC - BV - 0001	boiler / turbine mcc 41				
120	64.007	mfc to turb ms drip leg			4SGGE 120101	4SGG - MBV - 0012	boiler / turbine mcc 41				
121	64.008	mfc to close cycle cooling water pump			4ECBE 120101	4ECB - P - 1A	boiler / turbine mcc 41				
122	64.009	mfc to attemp spray mxd air comp			4FWAE-120101	4FWG - CMP - 1	boiler / turbine mcc 41				
123	64.010	mfc to mxd bed demin recycle pump			4FWGE 120104	4FWG - P - 2	boiler / turbine mcc 41				
124	64.011	mfc to turb css extn stm vlv			4TEAE-120101	4ETA - MBV - 0005	boiler / turbine mcc 41				
125	64.012	mfc to condenser hotwell pump			4FWCE-120101	1A 4FWC - P - 1A	boiler / turbine mcc 41				
126	64.013	mfc to turb gen drain valve			4TGCE-120101	1 4TGC - DR - 1	boiler / turbine mcc 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
127	64.014	mfc to turb gen drain valve			4TGCE-120102	2 4TGC - DR - 2	boiler / turbine mcc 41				
128	64.015	mfc to turb gen drain valve			4TGCE-120103	3 4TGC - DR - 3	boiler / turbine mcc 41				
129	64.016	mfc to enc fluid pump			4TGFE-120101	1A 4TGF - P - 1A	boiler / turbine mcc 41				
130	64.017	mfc to bldg htng condensate return pumps 1A & 1B			4SCAE-120101	4SCA - P - 1A & 4SCA - P - 1B	boiler / turbine mcc 41				
131	64.018	mfc to boiler area 480 v pwr pnl 41		851'0" - col line B.4-12	4APC-120101	41 4APC - PPL -	boiler / turbine mcc 41	que			
132	64.019	mfc to attemp spray cross tie isol			4FWAE-120103	4FWA - MBV - 0023	boiler / turbine mcc 41				
133	64.020	mfc to turb uncntrl extrn stm vlv			4TEAE-120102	4TEA - MBV - 0001	boiler / turbine mcc 41				
134	64.021	mfc to turb extrn dripleg vlv 2			4TECE-120101	2 4TEC - MBV - 0002	boiler / turbine mcc 41				
135	64.022	mfc to turb extrn dripleg vlv			4TCEC-120102	8 4TEC-MBV- 0008	boiler / turbine mcc 41				
136	64.023	mfc incoming from 480 v sus bus			4APC-120101	41A 4APC-SUS-41	boiler / turbine mcc 41				
137	64.024	mfc to turb cnrl extn after blk vlv drip leg			4TECE-120105	4TGC-DR-3	mcc 41				
138	65.000	mfc to equipment as noted in 65.000 series from boiler / turbine mcc 42					boiler / turbine mcc 42	que/			√
139	65.001	mfc to bfw pump lube oil pump 2B			4FWAE-120102	2B 4FWA-P-2B	boiler / turbine mcc 42				√
140	65.002	mfc to turb gen aux lube oil pum 1B			4TGDE-120103	1B 4TGO-P-1B	boiler / turbine mcc 42				√

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
141	65.003	mfc to bed ash screw cooler feeder 3B			4SGAE-120102	3B 4SGA-CLR-3B	boiler / turbine mcc 42				√
142	65.004	mfc to turb ms drip leg			4SGGE-120102	4SGG-MBV-0037	boiler / turbine mcc 42				√
143	65.005	mfc to closed cycle cooling water pump 1B			4ECBE-120102	1B 4ECB-P-1B	boiler / turbine mcc 42				√
144	65.006	mfc to attemp spray pp lub oil pump			4FWGE-120105	4FWG-P-3A	boiler / turbine mcc 42				√
145	65.007	mfc to condenser hotwell pump 1B			4FWCE-120102	1B 4FWC-P-1B	boiler / turbine mcc 42				√
146	65.008	mfc to ehc fluid pump 1B			4TGFE-120102	1B 4TGF-P-1B	boiler / turbine mcc 42				√
147	65.009	mfc to bldg htng condensate rtn pumps 2A & 2B			4SCAE-120102	2A & 2B, 4SCA-P-2A, & 4SCAJ-P-2B	boiler / turbine mcc 42				√
148	65.010	mfc to attemp spray pp lube oil pump			4TWGE-120106	4FWG-P-3B	boiler / turbine mcc 42				√
149	65.011	mfc to incoming from 480 v sus bus 41B			4APC-SUS-41	41B 4APC-SUS-41	boiler / turbine mcc 42				√
150	65.012	mfc to turning gear			4TGAE-120101	4TGA-TGR-1	boiler / turbine mcc 42				√
151	65.013	mfc to gland steam condenser blower			4TGCE-120105	4TGCJ-BLO-1	boiler / turbine mcc 42				√
152	65.014	mfc to service water booster pump cab (vfd)			CWSCE-120102	CWSC-VDR-1	boiler / turbine mcc 42				√
153	65.015	mfc to turb underfloor dry pipe air comp 4FPU-CMP-1			4FBUE-120101	4FPU-CMP-1	boiler / turbine mcc 42				√
154	65.016	mfc to main steam header drip leg lvl cntrl vlv			4SGGE-120103	4SGF-LCV-0013	boiler / turbine mcc 42				√

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
155	65.017	mfc to main steam header drip leg lvl cntrl vlv			4SGGE-120104	4SGF-LCV-0014	boiler / turbine mcc 42				√
156	65.018	mfc to turb css extn drip leg vlv 14			4TECE-120103	14 4TEC-MBV-0014	boiler / turbine mcc 42				√
157	65.019	mfc to turb css extn drip leg vlv 20			4TECE-120104	20 4TEC-MBV-0020	boiler / turbine mcc 42				√
158	65.020	mfc to cond outlet valve			4HRCE-120101	4HRC-MBV-16	boiler / turbine mcc 42				√
159	65.021	mfc to cond inlet valve			4HRCE-120102	4HRC-MBV-17	boiler / turbine mcc 42				√
160	65.022	mfc Deleted - 9/22/92									
161	65.023	mfc to boiler area 480 v pwr panel 42		851'0" - col line E12	4APC-100602	4APC-PPL-42	boiler / turbine mcc 42	que/			√
162	65.024	mfc to turb before stop vlv drip leg			4SGGE-120102	4SGG-MBV-0037	boiler / turbine mcc 42				
163	65.025	mfc to bfw pump lube oil pump 2B			4FWAE-120102	4FWAE-P-2B	boiler / turbine mcc 42				
164	66.000	mfc to equipment as noted in 66.000 series from boiler turbine mcc 43					boiler / turbine mcc 43	que/			
165	66.001	mfc to coal conveyor drive system			4CHDE-120210	4CHD-BLT-1	boiler / turbine mcc 43				
166	66.002	mfc to coal handling tripper drive system			4CHDE-120211	4CHD-BLT-1	boiler / turbine mcc 43				
167	66.003	mfc to sand chute gate 1A			4BMEE-120201	1A 4BME-CHE-1A	boiler / turbine mcc 43				
168	66.004	mfc to coal tripper fire protection air compressor			4FPUE-120201	4FPU-CMP-2	boiler / turbine mcc 43				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
169	66.005	mfc to control air compress 1A			4CABE-120201	1A 4CAB-CMP-1A	boiler / turbine mcc 43				
170	66.006	mfc to coal discharge gate 2A			4CHDE-120202	2A 4CHD-GAT-2A	boiler / turbine mcc 43				
171	66.007	mfc to coal discharge gate 2B			4CHDE-120203	2B 4CHD-GAT-2B	boiler / turbine mcc 43				
172	66.008	mfc to coal feed chute gate 3A			4CHDE-120206	3A 4CHD-GAT-3A	boiler / turbine mcc 43				
173	66.009	mfc to coal feed chute gate 3B			4CHDE-120207	3B 4CHD-GAT-3B	boiler / turbine mcc 43				
174	66.010	mfc Deleted - 9/22/92									
175	66.011	mfc to incoming from 480 v sus bus 41A			4APC-120201	41A 4APC-SUS-41	boiler / turbine mcc 43				
176	66.012	mfc to boiler area 480 v pwr pnl 43		875'0" - col line C.3 - 14	4APC 120201	43 4APC-PPL-43	boiler / turbine mcc 43	que/			
177	66.013	mfc to battery room air handling unit			4SCAE-120201	4SCA-AHU-1	boiler / turbine mcc 43				
178	67.000	mfc to equipment as noted in 67.000 series from boiler / turbine mcc 44					boiler / turbine mcc 44	que/			
179	67.001	mfc to attemp spray blk vlv 4FWG -MBV-25			4FWGE 120201	4FWG -MBV-25	boiler / turbine mcc 44				
180	67.002	mfc to incoming line from 480 v sus bus 41B			4APC-USU-41	41B 4APC-USU-41	boiler / turbine mcc 44				
181	67.003	mfc to coal discharge gate 2C			4CHDE 120204	2C 4CHD-GAT-2C	boiler / turbine mcc 44				
182	67.004	mfc to coal discharge gate 2D			4CH2E 120205	2D 4CHD-GAT-2D	boiler / turbine mcc 44				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
183	67.005	mfc to coal feed chute gate 3C			4CHDE 120208	3C 4CHD-GAT-3C	boiler / turbine mcc 44				
184	67.006	mfc to coal feed chute gate 3D			4CHDE 120209	3D 4CHD-GAT-3D	boiler / turbine mcc 44				
185	67.008	mfc to sand rotary screw feeder 4BME-FDR-1			4BMEE 120203	4BME-FDR-1	boiler / turbine mcc 44				
186	67.009	mfc to control air compressor 1B			4CABE 120202	1B 4CAB-CMP-1B	boiler / turbine mcc 44				
187	67.010	mfc to sand discharge gate			4BMEE 120204	4BME-GAT-1	boiler / turbine mcc 44				
188	67.011	mfc to sand chute gate 1B			4BMEE 120202	1B 4BME-CHE-1B	boiler / turbine mcc 44				
189	67.012	mfc to unit 4 elevator 4BSA-ELEV-2			4BSAE 120203	4BSA-ELEV-2	boiler / turbine mcc 44				
190	67.013	mfc desc dryer cntrl panel			4CABE 120201	4CAB-PNL-1	boiler / turbine mcc 46				
191	68.000	mfc to equipment as noted in 68.000 series from fabric filter mcc 45					fabric filter mcc 45	que/			
192	68.001	mfc to urea bldg 480 v pwr pnl 45		851'0" - urea building	4APC 120302	45 4APC-PPL-45	fabric filter mcc 45	que/			
193	68.002	mfc to fluoseal blower 1A			4SGAE 120301	1A 4SGA-BLO-1A	fabric filter mcc 45				
194	68.003	mfc to primary air fan 1A outlet damper			4SGAE 120303	4SGA-DMPR-1A	fabric filter mcc 45				
195	68.004	mfc to secondary air fan 2A outlet damper			4SGAE 120305	4SGA-DMPR-2A	fabric filter mcc 45				
196	68.005	mfc to secondary air fan 2A			4SGAE 1203O7	2A 4SGA-FAN-2A	fabric filter mcc 45				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
197	68.006	mfc to soot blower cont cab			4SGIE 120301	4SGI-CAB-1	fabric filter mcc 45				
198	68.007	mfc to limestone rotary feed valve 2A			4BMDE 120303	2A 4BMD-FDR-2A	fabric filter mcc 45				
199	68.008	mfc to ash conditioner 4ASF-MIX-1			4ASFE 120302	4ASF-MIX-1	fabric filter mcc 45				
200	68.009	mfc to ash handling vacuum exhauster 1A			4ASGE 120301	1A 4ASG-EXH-1A	fabric filter mcc 45				
201	68.010	mfc to limestone discharge gate 1A			4BMDE 120301 ?	1A 4BMO-GAT-1A	fabric filter mcc 45				
202	68.011	mfc to limestone conveying sys blower 1A			4BMDE 120301 ?	1A 4BMD-BLO-1A	fabric filter mcc 45				
203	68.012	mfc to rev air gas fan 2A			4CCBE 120301	2A 4CCB-FAN-2A	fabric filter mcc 45				
204	68.013	mfc to noxout sncr sys circ pump 1A			4SGLE 102301	1A 4SGL-P-1A	fabric filer mcc 45				
205	68.014	mfc to noxout sncr sys water pump 3A			4SGLE 120301	3A 4SGL-P-3A	fabric filer mcc 45				
206	68.015	mfc to incoming line from 480 v sus bus 41A			4APE 100651	41A 4APC-SUS-41	fabric filer mcc 45				
207	69.000	mfc to equipment as noted in 69.000 series from fabric filter mcc 46					fabric filter mcc 46				
208	69.001	mfc to noxout sncr sys circ pump 1B			4SGLE 120302	1B 4SGL-P-1B	fabric filter mcc 46				
209	69.002	mfc to limestone rotary feed valve 2B			4BMDE 120304	2B 4BMD-FDR-2B	fabric filer mcc 46				
210	69.003	mfc to noxout sncr sys water pump 3B			4SGLE 120304	3B 4SGL-P-3B	fabric filter mcc 46				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
211	69.004	mfc to incoming line from 480 v sus bus 41B			4APCE 100653	41B 4APC-SUS-41	fabric filter mcc 46				
212	69.005	mfc to limestone discharge gate 1B			4BMDE 120306	1B 4BMD-GAT-1B	fabric filter mcc 46				
213	69.006	mfc to limestone conveying sys blower 1B			4BMDE 120302	1B 4BMD-BLD-1B	fabric filter mcc 46				
214	69.007	mfc to rev air bas fan 2B			4CCBE 120302	2B 4CCB-FAN-2B	fabric filter mcc 46				
215	69.008	mfc to ash silo fldzg air heater 4ASF-HTR-1			4ASFE 120303	4ASF-HTR-1	fabric filter mcc 46				
216	69.009	mfc to ash unloading room vent fan 4SCA-FAN-1			4SCAE 120301	4SCA-FAN-1	fabric filter mcc 46				
217	69.010	mfc to primary air fan 1B outlet damper 4SGA-DMPR-1B			4SGAE 120304	4SGA-DMPR-1B	fabric filter mcc 46				
218	69.011	mfcto ash handling vacuum exhauster 1B			4ASGE 120302	1B 4ASG-EXH-1B	fabric filter mcc 46				
219	69.012	mfc to secondary air fan 2B outlet damper			4SGAE 120302	4SGA-DMPR-2B	fabric filter mcc 46				
220	69.013	mfc to secondary air fan 2B			4SGAE 120308	2B 4SGA-FAN-2B	fabric filter mcc 46				
221	69.014	mfc to fabric filter 480 v hop htr cntrl pnl			4CCBE 120304	4CCB-CPL-1	fabric filter mcc 46				
222	69.015	mfc to fluoseal blowr 1B			4SGAE 120302	1B 4SGA-BLO-1B	fabric filter mcc 46				
223	69.016	mfc to boiler area 480 v pwr pnl 44		875'0" - col line E14	4APCE 120301	44 4APC-PPL-44	fabric filter mcc 46	que/			
224	69.017	mfc to unit 4 overhead equipment hoist			4BSAE 120301	4BSA-HST-1	fabric filter mcc 46				

1 2 3 4 5 6 7 8 9 10 11 12

	oen	activity or item / action	system (main category)	location	circuit # (BSV)	equip # (BSV)	make final conn from	resp	deliv date	on job	Remarks
225	69.018	mfc to ash silo outlet valve			4ASFE 120301	4AST-MOV-0005	fabric filter mcc 46				
226	69.019	mfc to rev. air gas fan 2B			4CCBE 120302	4CCB-FAN-2B	fabric filter mcc 46				
227	70.000	mfc to equipment as noted in 70.000 series from cooling tower mcc 47	HRX				cooling tower mcc 47	que/			
228	70.001	mfc to cooling tower fan 1B	HRX		4HRCE 120406	1B 4HRC-MFAN-1B	cooling tower mcc 47				
229	70.002	mfc to cooling tower 480 - 120/208 v ltng xfmr 47	HRX	chemical / electrical building	4APBE 120401	47 4APB-LXF-47	cooling tower mcc 47	que			
230	70.003	mfc to cooling tower fan 1A	HRX		4HRCE 120405	1A 4HRC-MFAN-1A	cooling tower mcc 47				
231	70.004	mfc to cooling tower bypass valve	HRX		4HRCE 120413	4HRC-MBV-0014	cooling tower mcc 47				
232	70.005	mfc to circ water pump 1A	HRX		4HRCE 120409	1A 4HRC-P-1A	cooling tower mcc 47				
233	70.006	mfc to circ water pump 1B	HRX		4HRCE 120410	1B 4HRC-P-1B	cooling tower mcc 47				
234	70.007	mfc to incoming line from 480 v sus bus 41A	HRX		4APCE 100607	41A 4APC-SUS -41	cooling tower mcc 47				
235	71.000	mfc to equipment as noted in 71.000 series from cooling tower mcc 48	HRX	Cooling tower	4APCE 100608		cooling tower mcc 48	que/			
236	71.001	mfc to circ water pump 1C	HRX		4HRCE 120411	1C 4HRC-P-1C	cooling tower mcc 48				
237	71.002	mfc to circ water pump 1D	HRX		4HRCE 120412	1D 4HRC-P-1D	cooling tower mcc 48				
238	71.003	mfc cooling tower 480 v ltng xfmr 48	HRX		4APBE 120402	48 4APB-LXF-48	cooling tower mcc 48				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
239	71.004	mfc to cooling tower fn 1D	HRL		4HRCE 120408	1D 4HRC-MFAN-1D	cooling tower mcc 48				
240	71.005	mfc to cooling tower fn 1C	HRL		4HRCE 120407	1C 4HRC-MFAN-1C	cooling tower mcc 48				
241	71.006	mfc to electrical unit heaters	HRL		4SCEE 120401	4SCE-EUHT-3, 2, 1	cooling tower mcc 48				
242	73.000	mfc to 15 kv switchgear									
243	74.000	mfc to 5 kv switchgear									
244	75.000	mfc to 600 v switchgear									
245	76.000	mfc to dcs 428, 429, 437, 432, 411 & 412 on mcc's						que/			
246	77.000	mfc to free standing dcs cabinets									
247	78.000	mfc to high voltage transformers									
248	79.000	mfc to new ois at existing control room									What is an ois?
249	80.000	Owner furnish dafd ois equiment						msu			
250	81.000	Test all systems						all			To be defined with utilities operating staff of msu in conjunction with the installing contractors - see sect 16d of specifications
251	82.000	Test all equipment						all			To be defined with utilities operating staff of msu in conjunction with the installing contractors
252	84.000	mfc (make final connections) from lighting substation 41		861'4 1/2 col J, row 12		4APB-LSUB-41	lighting sub 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
253	84.001	mfc to 120/208 v lighting panel 41			4APBE 160101	4APB-LPL-41	lighting sub 41				
254	84.002	mfc to 120/208 v lighting panel 43			4APBE 160103	4APB-LPL-43	lighting sub 41				
255	84.003	mfc to 120/208 v lighting panel 45			4APBE 160105	4APB-LPL-45	lighting sub 41				
256	84.004	mfc to 120/208 v power panel 41			4APBE 160111	4APB-PPL-41	lighting sub 41				
257	84.005	mfc to fab filter baghouse 120/208 v L. P. L. 41			4CCBE 160101	4CCB-LPL-41	lighting sub 41				
258	84.006	mfc to 120/208 v lighting panel 42			4APBE 160102	4APB-LPL-42	lighting sub 41				
259	84.007	mfc to 120/208 v lighting panel 44			4APBE 160104	4APB-LPL-44	lighting sub 41				
260	84.008	mfc to 120/208 v lighting panel 46			4APBE 160106	4APB-LPL-46	lighting sub 41				
261	84.009	mfc to 120/208 v power panel 42			4APBE 160112	4APB-PPL-42	lighting sub 41				
262	84.010	mfc to 120/208 v power panel 43			4APBE 160113	4APB-PPL-43	lighting sub 41				
263	84.011	mfc to ess 2 -4, 120/v alternate source isolation XFMER 24			CAPIE 160101	CAPI-XF-24	lighting sub 41				
264	85.000	mfc from ess distribution panel 41A				4API-PPL-41A	ess dist panel 41				
265	85.001	mfc to mcc 41 & 42 dsc term pnl 428			4COAE 160601	4API-PPL-41A	ess dist panel 41				
266	85.002	mfc to mcc 45 & 46 dsc term pnl 411			4COAE 160603	4API-PPL-41A	ess dist panel 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
267	85.003	mfc to dsc node 401			4COAE 160605	fab filter	ess dist panel 41				
268	85.004	mfc to dsc node 408			4COAE 160607	pa fans	ess dist panel 41				
269	85.005	mfc to dsc node 417			4COAE 160609	blr drum	ess dist panel 41				
270	85.006	mfc to dsc node 424			4COAE 160611	blr combust.	ess dist panel 41				
271	85.007	mfc to dsc node 438			4COAE 160613	condenser	ess dist panel 41				
272	85.008	mfc to dsc node 445			4COAE 160615	cooling tower	ess dist panel 41				
273	85.009	mfc to mcc 43 & 44			4COAE 160602	dsc term pnl 431 (equip?)	ess dist panel 41				
274	85.010	mfc to mcc 46 & 47			4COAE 160604	dsc term pnl 443 (equip?)	ess dist panel 41				
275	85.011	mfc to dsc node 405			4COAE 160606	ash	ess dist panel 41				
276	85.012	mfc to dsc node 414			4COAE 160608	blr pumps	ess dist panel 41				
277	85.013	mfc to dsc node 420			4COAE 160610	bnr mngmnt	ess dist panel 41				
278	85.014	mfc to dsc node 434			4COAE 160612	turbine	ess dist panel 41				
279	85.015	mfc to dsc node 440			4COAE 160614	swgr	ess dist panel 41				
280	85.016	mfc to dsc sync. panel			CC0AE 160601		ess dist panel 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
281	85.017	mfc to dsc gateway panel			CC0AE 160602		ess dist panel 41				
282	86.000	mfc from ess power panel 41B		890'0"		4API-PPL-41B	ess dist panel 41 (or 21?)				what is the ess 120v ac dist panel 21 - 2API-PPL-21? What field or relation does it have to power panel #41B?
283	86.001	mfc to mcc 41 & 42 dcs term pnl 428			4COAE 160621	4COA-TPL-0428	ess dist panel 41 (or 21?)				
284	86.002	mfc to mcc 45 & 46 dcs term pnl 411			4COAE 160623	4COA-TPL-0411	ess dist panel 41 (or 21?)				
285	86.003	mfc to dcs node 401 term pnl (fab filter)			4COAE 160625	4COA-TPL-0401	ess dist panel 41 (or 21?)				
286	86.004	mfc to dcs node 408 term pnl (pa fans)			4COAE 160627	4COA-TPL-0408	ess dist panel 41 (or 21?)				
287	86.005	mfc to dcs node 424 term pnl (blr combust)			4COAE 160631	4COA-TPL-0424	ess dist panel 41 (or 21?)				
288	86.006	mfc to dsc node 438 term pnl (condenser)			4COAE 160633	4COA-TPL-0438	ess dist panel 41 (or 21?)				
289	86.007	mfc to dsc node 445 term pnl (unit 4 cooling tower)			4COAE 160635	4COA-TPL-0445	ess dist panel 41 (or 21?)				
290	86.008	mfc to mcc 43 & 44 dcs term pnl 431			4COAE 160622	4COA-TPL-0431	ess dist panel 41 (or 21?)				
291	86.009	mfc to mcc 46 & 47 dcs term pnl 443			4COAE 160624	4COA-TPL-0443	ess dist panel 41 (or 21?)				
292	86.010	mfc to dsc node 405 term pnl (-ash)			4COAE 160626	4COA-TPL-0405	ess dist panel 41 (or 21?)				
293	86.011	mfc to dsc mpde 414 term pnl (blr pumps)			4COAE 160628	4COA-TPL-0414	ess dist panel 41 (or 21?)				
294	86.012	mfc to dcs node 420 term pnl (burner mngmnt)			4COAE 160630	4COA-TPL-0420	ess dist panel 41 (or 21?)				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
295	86.013	mfc to dsc node 434 term pnl (turbine)			4COA3 160632	4COA-TPL-0434	ess dist panel 41 (or 21?)				
296	86.014	mfc to dsc node 440 term pnl (swgr)			4COA3 160634	4COA-TPL-0440	ess dist panel 41 (or 21?)				
297	86.015	mfc to dsc sync panel			CCOAE 160603	CCOA-TPL-0606	ess dist panel 41 (or 21?)				
298	86.016	mfc to dsc gateway panel			CCOAE 160604	CCOA-TPL-?	ess dist panel 41 (or 21?)				
299	87.000	mfc from ess panel 41c		battery room elev 890'0"	4APIE 130103	4API-PPL-41C	ess dist panel 41				
300	87.001	mfc to boiler operator crt #1			4COAT 160641	4COA-CRT-1	ess dist panel 41				
301	87.002	mfc to boiler operator crt #3			4COAT 160643	4COA-CRT-3	ess dist panel 41				
302	87.003	mfc to boiler operator crt #5			4COAT 160645	4COA-CRT-5	ess dist panel 41				
303	87.004	mfc to dsc local cont panel #2			4COAE 160647	4COA-CPL-2	ess dist panel 41				
304	87.005	mfc to rcpt - dcs cont room printers			4COAE 160648	?	ess dist panel 41				
305	87.006	mfc to cem computer			4COGE 16060	4COG-CPU-1	ess dist panel 41				
306	87.007	mfc to blr burner mgmt. cab.			4COAE 160649	4COA-CAB-1	ess dist panel 41				
307	87.008	mfc to boiler operator crt #2			4COAE 160642	4COA-CRT-2	ess dist panel 41				
308	87.009	mfc to boiler operator crt #1			4COAE 160644	4COA-CRT-4	ess dist panel 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
309	87.010	mfc to dcs local control panel #1			4COAE 160646	4COA-CPL-1	ess dist panel 41				
310	87.011	mfc to engineering work station			CCOAE 160605	CCOA-CPU-1	ess dist panel 41				
311	87.012	mfc to cem analyzer			4COGE 160602	4COG-ANZ-1	ess dist panel 41				
312	87.013	mfc to fire protection panel			4FPAE 160601	4FPA-CPL-1	ess dist panel 41				
313	87.014	mfc to unit 4 generator excitation			4TGBE 160601	COMPT 60	ess dist panel 41				
314	88.000	mfc from 120/208v power panel board 41 - boiler/turbine area		el 851'0" col 12, row E		4APB-PPL-41	power panel board 41				
315	88.001	mfc to phosphate solution tank mixer			4FWEE 160501	4FWE-MIX-1	power panel board 41				
316	88.002	mfc to oxygen scavenger feed pump			4FWEE 160506	4FWE-P-3	power panel board 41				
317	88.003	mfc to phosphate feed pump 1A			4FWEE 160502	4FWE-P-1A	power panel board 41				
318	88.004	mfc to phosphate feed pump 1B			4FWEE 160503	4FWE-P-1B	power panel board 41				
319	88.005	mfc to morpholine feed pump 2A			4FWEE 160504	4FWE-P-2A	power panel board 41				
320	88.006	mfc to morpholine feed pump 2B			4FWEE 160505	4FWE-P-2B	power panel board 41				
321	88.007	mfc to unit heaters 1 & 2			4SCAE 160521	4SCA-UHT-01, 02	power panel board 41				
322	88.008	mfc to unit heaters 5, 6 & 7			4SCAE 160522	4SCA-UHT-05, 06, 07	power panel board 41				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
323	88.009	mfc to unit heaters 13, 14 & 15			4SCAE 160521	4SCA-UHT-13, 14, 15	power panel board 41				
324	88.010	mfc to unit heaters 16, 17 & 18			4SCAE 160524	4SCA-UHT-16, 17, 18	power panel board 41				
325	88.011	mfc to turb/gen lub oil & ehc oil heaters			4TGDE 160501	4TGD-HT-1, 2	power panel board 41				
326	88.012	mfc to dsc local control panel 1			4COAE 160501	4CDA-CPL-1	power panel board 41				
327	88.013	mfc to dsc local control panel 2			4COAE 160502	4CDA-CPL-2	power panel board 41				
328	88.014	mfc to unit 4 generator space htrs.			4TGBE 160501	4TGB-JBX-???	power panel board 41				
329	88.015	mfc to unit 4 generator pmg compt light			4TGBE 160502	4-RECPT	power panel board 41				
330	89.000	mfc from 120/208 v power panel board 42 (?) - boiler turbine area				4APB-PPL-42	power panel board 42				
331	89.001	mfc to boiler bldg grav roof vents 1A - 1C, 1E - 1G & 1I - 1N			SCAE 160501	4SCA-PNL-01	power panel board 42				
332	89.002	mfc to combustion air biasing dmp 3A			4SCAE 160511	4SCA-MCD-3A	power panel board 42				
333	89.003	mfc to unit heaters 37, 38			4SCAE 160510	4SCA-UHT-37, 38	power panel board 42				
334	89.004	mfc to unit heaters 34, 35, 363			4SCAE 160505	4SCA-UHT-34, 35, 36	power panel board 42				
335	89.005	mfc to steam gen. drum site (sight?) glass backlights			4SGAE 160501	4SCG-SG-1	power panel board 42				
336	89.006	mfc to combustion air biasing dmp SB			4SCAE 160512	4SCA-MCD-3B	power panel board 42				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
337	89.007	mfc to coal grav wgh feeder 1A			4CHDE 160501	4CHD-FDR-1A	power panel board 42				
338	89.008	mfc to coal grav wgh feeder 1B			4CHDE 160502	4CHD-FDR-1B	power panel board 42				
339	89.009	mfc to coal grav wgh feeder 1C			4CHDE 160503	4CHD-FDR-1C	power panel board 42				
340	89.010	mfc to coal grav wgh feeder 1D			4CHDE 160504	4CHD-FDR-1D	power panel board 42				
341	90.000	mfc from 120/203 V power panel board 43 - boiler turbine area				4APB-PPL-43	power panel board 43				
342	90.001	mfc to turbine bldg. grav roof vent 2A & 2B			4SCAE 160502	4SCA-PNL-02	power panel board 43				
343	90.002	mfc to unit 4 chem sample panel			4SCAE 160509	4SCA-PNL-03	power panel board 43				
344	90.003	mfc to limestone grav wgh feeder 1A			4BMDE 160501	4MBD-FDR-1A	power panel board 43				
345	90.004	mfc to limestone grav wgh feeder 1B			4BMDE 160502	4MBD-FDR-1B	power panel board 43				
346	90.005	mfc to unit heaters 19, 20, 21			4SCAE 160525	4SCA-UNT-19, 20, 21	power panel board 43				
347	90.006	mfc to unit heaters 22, 23, 24			4SCAE 160526	4SCA-UNT-22, 23, 24	power panel board 43				
348	90.007	mfc to unit heaters 25, 26, 27			4SCAE 160527	4SCA-UNT-25, 26, 27	power panel board 43				
349	90.008	mfc to unit heaters 28, 29			4SCAE 160508	4SCA-UNT-28, 29	power panel board 43				
350	90.009	mfc to unit heaters 30, 31, 32			4SCAE 160507	4SCA-UNT-30, 31, 32	power panel board 43				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
351	90.010	mfc to battery room dmpr1			4SCAE 160515	4SCA-MCD-1	power panel board 43				
352	90.011	mfc to unit heater 33			4SCAE 160506	4SCA-UHT-33	power panel board 43				
353	90.012	mfc to battery room dmpr 2			4SCAE 160516	4SCA-MCD-2	power panel board 43				
354	91.000	mfc from 120/208 V power panel board 48 - cooling tower				4APB-PPL-48	power panel board 48				
355	91.001	mfc to c. t. fire protection air compressor			4HRCE 160501	4HRC-JBX-751	power panel board 48				
356	91.002	mfc to 6" fire line & valving freeze prot.			4APBE 160501	4HRC-HT-1	power panel board 48				
357	91.003	mfc to circ water bldg elect room prv-1			4SCEE 160501	4SCE-PRV-1	power panel board 48				
358	91.004	mfc to circ water bldg chem room prv-2			4SCEE 160502	4SCE-PRV-2	power panel board 48				
359	91.005	mfc to unit 1, 2 & 4 acid pumps - CHRE-P-3 & 4			CHREE 160504	4AAA-JBX-068	power panel board 48				
360	91.006	mfc to unit 1, 2 & 4 sludge pumps - CHRE-P-5A & 5B			CHREE 160505	4AAA-JBX-065	power panel board 48				
361	91.007	mfc to unit 1, 2 & 4 chromate pumps			CHREE 160501	4HRE-P-1 & 2	power panel board 48				
362	91.008	mfc to unit 1, 2 & 4 penetrant pumps			CHREE 160502	4HRE-P-3 & 4	power panel board 48				
363	91.009	mfc to unit 1, 2 & 4 biocide pumps			CHREE 160503	4HRE-P-5A & 5B	power panel board 48				
364	91.010	mfc to unit 1, 2 & 4 biocide pumps			CHREE 160506	4CHRE-P-5A & 5B	power panel board 48				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
365	92.000	mfc to mfc from 480 V panel board 41		el 851'0" col 12, row B.4		4APC-PPL-41	panel board 41				
366	92.001	mfc to welding recepts - elev 851'0"		el 851'0"	4APC 161007		panel board 41				
367	92.002	mfc to welding recepts - elev 851'0"			4APC 161008		panel board 41				
368	92.003	mfc to motor operated overhead doors 5 & 6			4BSAE 161003	4BSA-DEN-1005 & 1006	panel board 41				
369	92.004	mfc to unit heaters 8 & 9			4SCAE 161005	4SCA-UHT-08 & 09	panel board 41				
370	92.005	mfc to unit heaters 10, 11 & 12			4SCAE 161006	4SCA-UHT-10, 11 & 12	panel board 41				
371	93.000	mfc from 480V panel board 42		el 851'0"		4APC-PPL-42	panel board 42				
372	93.001	mfc to welding recepts			4APCE 161006		panel board 42				
373	93.002	mfc to welding recepts			4APCE 161004		panel board 42				
374	93.003	mfc to unit heater fans 3 & 4			4SCAE 161004	4SCA-UHT-03 & 04	panel board 42				
375	93.004	mfc to ash pit sump pump control panel			4DPAE 161001	4DPA-PNL-1	panel board 42				
376	93.005	mfc to motor operated overhead door 1 - turb/gen bay			4BSAE 161001	4BSA-DEN-1001	panel board 42				
377	93.006	mfc to fire water system press. maint pump			4FPUE 161001	4FPU-P-2	panel board 42				
378	94.000	mfc from 480 V panel board 43		el 875'0" col 14, row C.3		4APC-PPL-43	panel board 43				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
379	94.001	mfc to welding recepts			4APCE 161001		panel board 43				
380	94.002	mfc to welding recepts			4APCE 161003		panel board 43				
381	94.003	mfc to welding recepts			4APCE 161002		panel board 43				
382	94.004	mfc to id fan equipment hoist			4BSAE 161005	4BSA-HST-5	panel board 43				
383	94.005	mfc to primary air/sec air fan hoist 2			4BSAE 161005	4BSA-HST-2	panel board 43				
384	94.006	mfc to fab filter area dcs enclosure roof ventilator			4SCAE 161007	4SCA-PRV-3	panel board 43				
385	94.007	mfc to coal gravimetric feeder 1A			4CHDE 161003	4CHD-FDR-1A	panel board 43				
386	94.008	mfc to coal gravimetric feeder 1B			4CHDE 161004	4CHD-FDR-1B	panel board 43				
387	94.009	mfc to limestone system gravimetric feeder 1A			4BMDE 161001	4BMD-FDR-1A	panel board 43				
388	94.010	mfc to fabric filter dcs enclosure elec unit heater			4SCAE 161008	4SCA-EUHT-3	panel board 43				
389	95.000	mfc to mfc from 480 V panel board 44		el 875'0" col 14, row E		4APC-PPL-44	panel board 44				
390	95.001	mfc to welding recept.			4APCE 161105		panel board 44				
391	95.002	mfc to coal tripper power & control cable reels			4CHDE 161110	4CHD-CR-1 & 2	panel board 44				
392	95.003	mfc to elevator room power roof ventilator			4SCAE 161102	4SCA-PRV-2	panel board 44				

	oen	activity or item	system	location	circuit #	equip #	make final conn from	resp	deliv date	on job	Remarks
393	95.004	mfc to coal bunker bin vent blower			4CAFE 161101	4CHF-BLO-1	panel board 44				
394	95.005	mfc to coal tripper room power roof vent			4SCAE 161101	4SCA-PRV-1	panel board 44				
395	95.006	cmfc to oal gravimetric feeder 1C			4CHDE 161101	4CHD-FDR-1C	panel board 44				
396	95.007	mfc to coal gravimetric feeder 1D			4CHDE 161102	4CHD-FDR-1D	panel board 44				
397	95.008	mfc to limestone gravimetric feeder 1B			4BMDE 161101	4BMD-FDR-1B	panel board 44				
398	96.000	mfc from 480 V panel board 45		el 851'0" urea bldg		4APC-PPL-45	panel board 45				
399	96.001	mfc to unit heaters			4SCAF 161104	4SCA-EUHT-1 & 2	panel board 45				
400	96.002	mfc to bag house upper enclosure vent fan 3			4CCBE 161102	4CCB-FAN 3	panel board 45				
401	96.003	mfc to bag house upper enclosure vent fan 4			4CCBE 161104	4CCB-FAN 4	panel board 45				
402	96.004	mfc to hopper enclosure vent fan control panel 2			4CCBE 161101	4CCB-CPL-2	panel board 45				
403	96.005	mfc to urea metering pumps 2A & 2B			4SGLE 161101	4SGL-P-2A & 2B	panel board 45				
404	96.006	mfc to fabric filter equip hoist 3			4BSAE 161101	4BSA-HST-3	panel board 45				
405	96.007	mfc to hopper vibrator control panel			4CCBE 161104	4CCB-PNL-1	panel board 45				
406	96.008	mfc to sncr tank heater			4SGLE 161104	4SGL-HT-2	panel board 45				

Ralph J. Stephenson, P. E., P, C.
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858
ph 517 772 2537
October 19, 1992

Subject: Start up planning material

Project: Michigan State University
T. B. Simon Power Plant Unit 4 Addition
East Lansing, Michigan

To: Robert Nestle - MSU project manager
Richard Wever - MSU construction superintendent
Jim Simons - MSU project representative
Roy Gies - MSU operations supervisor & start up manager

From: Ralph J. Stephenson P. E.

Re: Data listing and bar chart for Steam Generator (sgx) start up

rjs project: 91:14

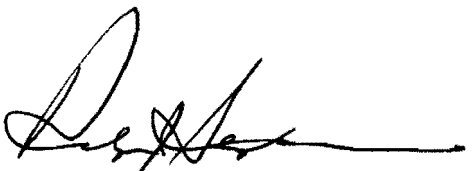
At our planning meeting on steam generator start up held Friday, October 16, 1992 (wd 459), Mr. Gies and I completed issue #3 of the network model for the steam generator (sgx) startup process. This network issue was sent to you as an attachment to my monitoring report #23.

Mr. Gies and I also translated the material into a data listing and a bar chart, both of which are enclosed for your further information and use.

The data listing shows all activities in the network with their descriptions, other major systems which relate to the activity, early starts, early finishes, late starts and late finishes.

The bar charts show all activities in the network with their descriptions and major related systems. In the time scaled portion are shown the graphic time lines of the early start and finish dates in filled bars. Late start and finish dates are shown by the open bars.

If you have any questions, please call.



Ralph J. Stephenson, P. E.

	activity	major systems	early start	early finish	late start	late finish	days
37	SG034 - RECHECK VALVING ON NATURAL GAS SYSTEM - .5	SGX/FG	7/28/93	7/28/93	7/28/93	7/28/93	0.5
38	SG035 - RECHECK INERT SYSTEMS READY TO FEED - .5	SGX/BM/	7/28/93	7/28/93	8/10/93	8/10/93	0.5
39	SG036 - RESTART UP CONTINUOUS EMISSIONS MONITORING SYSTEM - 2	SGX/CO	7/28/93	7/30/93	7/28/93	7/30/93	2
40	SG037 - READMIT START UP GAS GUNS TO SERVICE & CHECK BURNER LOGIC - 2	SGX/FG/CO	7/30/93	8/3/93	7/30/93	8/3/93	2
41	SG038 - REFIRE GAS TO CONTROL & COMP REFRACTORY CURE - 5	SGC/FG/C0	8/3/93	8/10/93	8/3/93	8/10/93	5
42	SG040 - RECLOSE VENTS & DRAINS - .5	SGX	8/10/93	8/10/93	8/11/93	8/11/93	0.5
43	SG039 - READMIT INERT BED MATERIAL AS NECESSARY - 1	SGX/BM	8/10/93	8/11/93	8/10/93	8/11/93	1
44	SG051 - RESTART FLUORSEAL BLOWERS & SYSTEM - 1	SGX/EC	8/11/93	8/12/93	8/11/93	8/12/93	1
45	SG052 - REFIRE MAIN GAS GUNS AS NECESSARY - 1	SGX/FG/CO	8/11/93	8/12/93	8/11/93	8/12/93	1
46	SG053 - FIRE COAL & LIMESTONE - 1	SGX/FG/BM/CH	8/12/93	8/13/93	8/12/93	8/13/93	1
47	SG054 - PUT BAG HOUSE IN SERVICE - .5	SGX	8/13/93	8/13/93	8/13/93	8/13/93	0.5
48	SG056 - PULL FLY ASH AS NECESSARY - .5	SGX/AS	8/16/93	8/16/93	8/17/93	8/17/93	0.5
49	SG055 - CONT(1) INCREASING BOILER LOADING - 2	SGX	8/16/93	8/17/93	8/16/93	8/17/93	2
50	SG057 - PULL BED MATERIAL AS NECESSARY - .5	SGX/AS	8/18/93	8/18/93	8/18/93	8/18/93	0.5
51	SG058 - AT THIS POINT BOILER IS STEAMING ON COAL AND AIR PERMITTING PROCESS BEGINS	SGX/CO	8/18/93	8/18/93	8/18/93	8/18/93	0

	activity	major systems	early start	early finish	late start	late finish	days
1	SG001 - T/R TO BEGINNING OF STEAM GENERATION - SGX - START UP	SGX	6/1/93	6/1/93	6/1/93	6/1/93	0
2	SG004 - POWER UP MCC 41 - .5	SGX/AP/PP	6/1/93	6/1/93	6/1/93	6/1/93	0.5
3	SG005 - POWER UP MCC 42 - .5	SGX/AP/PP	6/1/93	6/1/93	6/1/93	6/1/93	0.5
4	SG006 - POWER UP MCC 43 - .5	SGX/AP/PP	6/1/93	6/1/93	6/2/93	6/2/93	0.5
5	SG007 - POWER UP MCC 44 - .5	SGX/AP/PP	6/1/93	6/1/93	6/2/93	6/2/93	0.5
6	SG009 - POWER UP MCC 46- .5	SGX/AP/PP	6/1/93	6/1/93	6/2/93	6/2/93	0.5
7	SG003 - POWER UP DCS CONTROL SYSTEMS FOR SGX - 1	SGX/CO/AP/PP	6/1/93	6/1/93	8/6/93	8/9/93	1
8	SG002 - LINE UP VALVING ON BOILER FEED WATER SYSTEM - .5	SGX/FW/HR	6/1/93	6/1/93	8/9/93	8/9/93	0.5
9	SG008 - POWER UP MCC 45 - .5	SGX/AP/PP	6/1/93	6/1/93	8/12/93	8/12/93	0.5
10	SG011 - LINE UP & START HRX SYSTEM FROM MCC'S 41 & 42 - 1	SGX/HR/EC/WS	6/1/93	6/2/93	6/1/93	6/2/93	1
11	SG013 - START CONTROL AIR COMPESSORS FROM MCC 43 & 44, & CONTROL AIR DRYER FROM MCC 46 - .5	SGX/CA/EC/HR	6/2/93	6/2/93	6/3/93	6/3/93	0.5
12	SG010 - LINE UP VENTS & DRAINS ON BOILER - .5	SGX	6/2/93	6/2/93	8/9/93	8/9/93	0.5
13	SG012 - WALK DOWN BOILER, BAG HSE, DUCTWK, OPEN GUILLOTINE DAMPERS, & CLOSE ALL DOORS - 1	SGX/CC	6/2/93	6/3/93	6/2/93	6/3/93	1
14	SG014 - FILL & PRESSURIZE FEED WATER SYSTEMS - 1	SGX/FW/EC/HR	6/2/93	6/3/93	8/10/93	8/10/93	1
15	SG017 - START UP INDUCED DRAFT FANS - .5	SGX/CO/EC/HR	6/3/93	6/3/93	6/3/93	6/3/93	0.5
16	SG015 - SELECT WATER SOURCE OF FWA, FWC, FWF & FILL BOILER TO LIGHT OFF LEVEL - 1	SGX/FW/HR	6/3/93	6/4/93	8/11/93	8/11/93	1
17	SG016 - SET BAG HOUSE FOR START UP, TURN ON HOPPER HEATERS - 1	SGX/CC	6/3/93	6/4/93	8/12/93	8/13/93	1
18	SG019 - START UP PRIMARY AIR FANS - .5	SGX/EC/HR/SC/CO	6/4/93	6/4/93	6/4/93	6/4/93	0.5

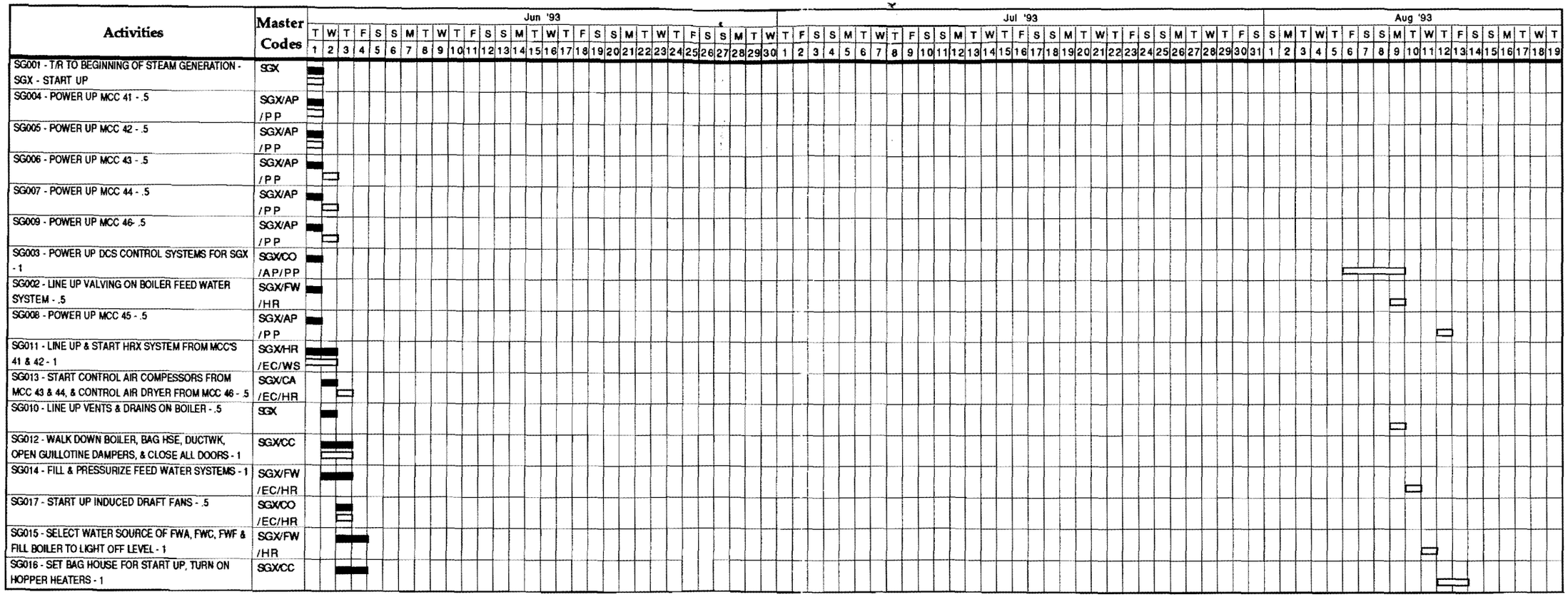
	activity	major systems	early start	early finish	late start	late finish	days
19	SG020 - START UP SECONDARY AIR FANS - .5	SGX/EC/HR/CS/ CO	6/4/93	6/4/93	6/4/93	6/4/93	0.5
20	SG021 - PURGE BOILER - .5	SGX/CO	6/4/93	6/4/93	6/4/93	6/4/93	0.5
21	SG018 - START CHEMICAL FEED SYSTEMS & MONITOR - .5	SGX/SA/FW	6/4/93	6/4/93	8/12/93	8/12/93	0.5
22	SG025 - CHECK VALVING ON NATURAL GAS SYSTEM - .5	SGX/FG	6/7/93	6/7/93	6/7/93	6/7/93	0.5
23	SG022 - CHECK INERT SYSTEMS READY TO FEED - .5	SGX/BM/	6/7/93	6/7/93	6/24/93	6/24/93	0.5
24	SG024- CHECK COAL SYSTEMS READY TO FEED - .5	SGX/CH	6/7/93	6/7/93	8/12/93	8/12/93	0.5
25	SG026 - START UP CONTINUOUS EMISSIONS MONITORING SYSTEM - 2	SGX/CO	6/7/93	6/9/93	6/7/93	6/9/93	2
26	SG023 - CHECK LIMESTONE READY TO FEED - .5	SGX/BM	6/7/93	6/11/93	8/5/93	8/12/93	5
27	SG027 - ADMIT START UP GAS GUNS TO SERVICE & CHECK BURNER LOGIC - 2	SGX/FG/CO	6/9/93	6/11/93	6/9/93	6/11/93	2
28	SG026 - FIRE GAS TO CONTROL & COMP REFRACTORY CURE - 5	SGC/FG/C0	6/11/93	6/18/93	6/11/93	6/18/93	5
29	SG028 - CLOSE VENTS & DRAINS - .5	SGX	6/18/93	6/18/93	6/25/93	6/25/93	0.5
30	SG041 - TAMPELLA CHEMICAL CLEAN BOILER - 4	SGX	6/18/93	6/24/93	6/18/93	6/24/93	4
31	SG027 - ADMIT INERT BED MATERIAL AS NECESSARY - 1	SGX/BM	6/24/93	6/25/93	6/24/93	6/25/93	1
32	SG029 - START FLUORSEAL BLOWERS & SYSTEM - 1	SGX/EC	6/25/93	6/28/93	6/25/93	6/28/93	1
33	SG030 - FIRE MAIN GAS GUNS AS NECESSARY - 1	SGX/FG/CO	6/25/93	6/28/93	6/25/93	6/28/93	1
34	SG031 - STEAM BLOW MAIN STEAM PIPING SYSTEMS - 10		6/28/93	7/13/93	6/28/93	7/13/93	10
35	SG032 - SHUT DOWN & REMOVE STEAM BLOW PIPING - 10		7/13/93	7/27/93	7/13/93	7/27/93	10
36	SG033 - REPURGE BOILER - .5	SGX/CO	7/27/93	7/27/93	7/27/93	7/27/93	0.5

T. B. Simon Power Plant Unit 4
Michigan State University

Steam Generator (SGX) Start Up

Roy Gies - Start up Manager
Jim Simons - Project Representative

Monday, October 19, 92



Activities	Master Codes
SG001 - T/R TO BEGINNING OF STEAM GENERATION - SGX - START UP	SGX
SG004 - POWER UP MCC 41 - .5	SGX/AP /PP
SG005 - POWER UP MCC 42 - .5	SGX/AP /PP
SG006 - POWER UP MCC 43 - .5	SGX/AP /PP
SG007 - POWER UP MCC 44 - .5	SGX/AP /PP
SG009 - POWER UP MCC 46- .5	SGX/AP /PP
SG003 - POWER UP DCS CONTROL SYSTEMS FOR SGX - 1	SGX/CO /AP/PP
SG002 - LINE UP VALVING ON BOILER FEED WATER SYSTEM - .5	SGX/FW /HR
SG008 - POWER UP MCC 45 - .5	SGX/AP /PP
SG011 - LINE UP & START HRX SYSTEM FROM MCC'S 41 & 42 - 1	SGX/HR /EC/WS
SG013 - START CONTROL AIR COMPESSORS FROM MCC 43 & 44, & CONTROL AIR DRYER FROM MCC 46 - 5	SGX/CA /EC/HR
SG010 - LINE UP VENTS & DRAINS ON BOILER - .5	SGX
SG012 - WALK DOWN BOILER, BAG HSE, DUCTWK, OPEN GUILLOTINE DAMPERS, & CLOSE ALL DOORS - 1	SGX/CC
SG014 - FILL & PRESSURIZE FEED WATER SYSTEMS - 1	SGX/FW /EC/HR
SG017 - START UP INDUCED DRAFT FANS - .5	SGX/CO /EC/HR
SG015 - SELECT WATER SOURCE OF FWA, FWC, FWF & FILL BOILER TO LIGHT OFF LEVEL - 1	SGX/FW /HR
SG016 - SET BAG HOUSE FOR START UP, TURN ON HOPPER HEATERS - 1	SGX/CC

Derived from network model - issue #3, sht sg 1, dated 10/09/92

- **filled bars show early starts & finishes**
- **open bars show late starts & finishes**

T. B. Simon Power Plant Unit 4
Michigan State University

Steam Generator (SGX) Start Up

Roy Gies - Start up Manager
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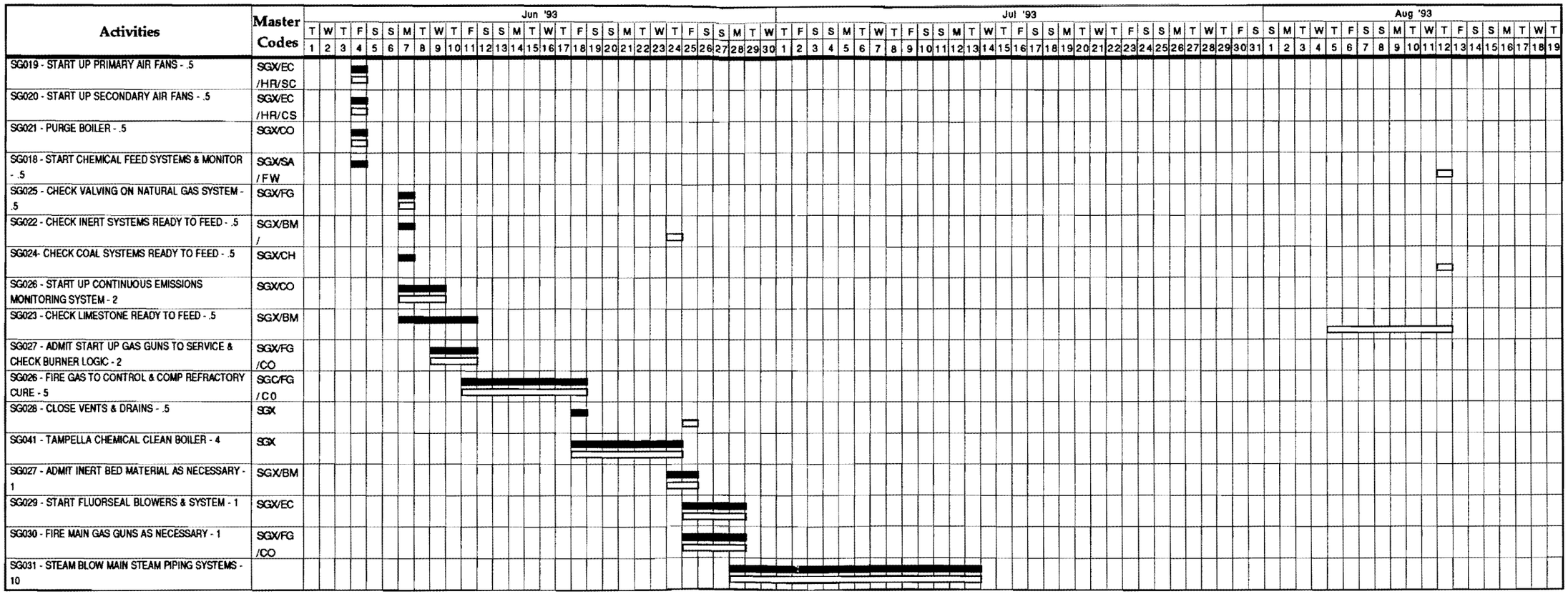
Monday, October 19, 92



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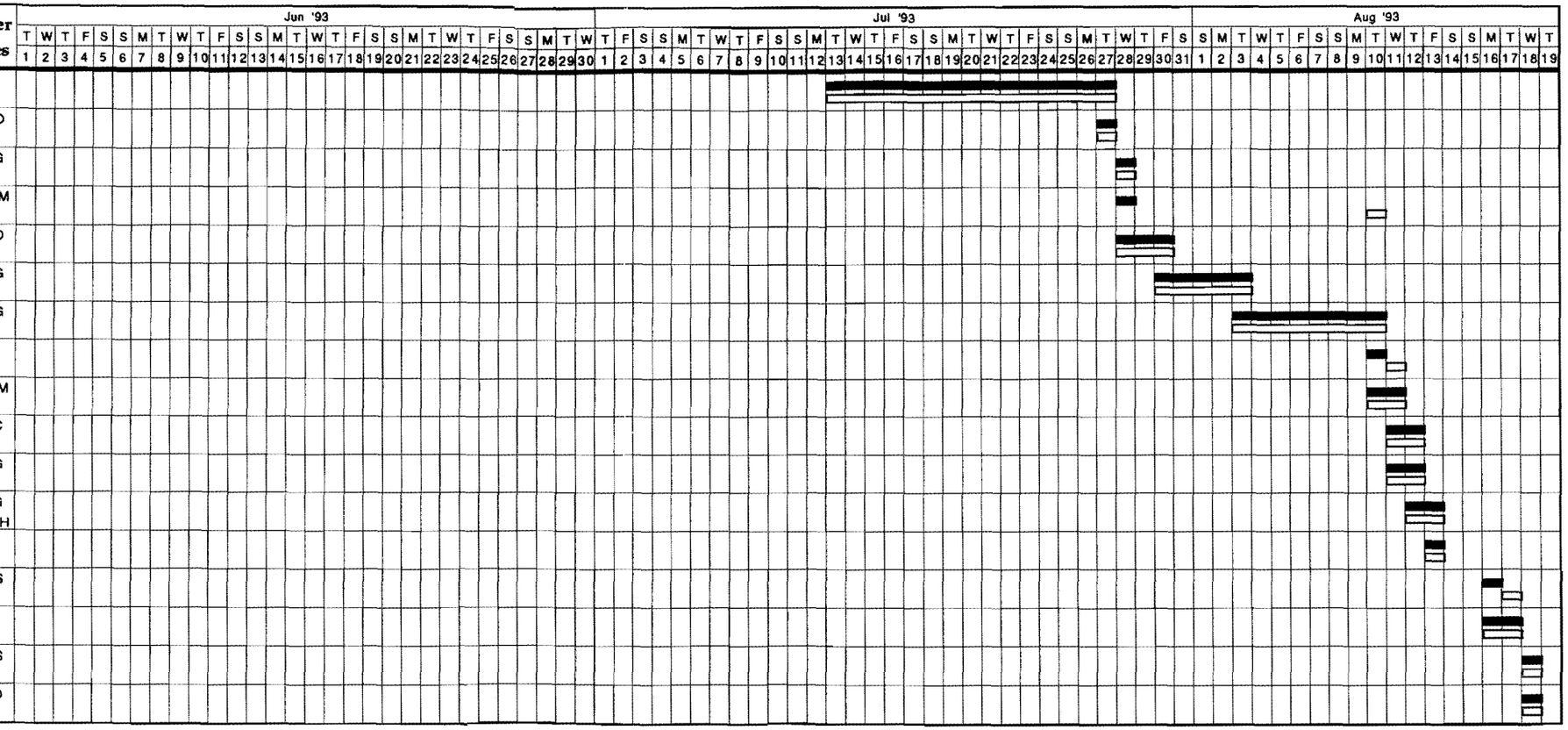
T. B. Simon Power Plant Unit 4
Michigan State University

Steam Generator (SGX) Start Up

Roy Gies - Start up Manager
Jim Simons - Project Representative

Monday, October 19, 92

Activities	Master Codes
SG032 - SHUT DOWN & REMOVE STEAM BLOW PIPING - 10	
SG033 - REPURGE BOILER - .5	SGX/CO
SG034 - RECHECK VALVING ON NATURAL GAS SYSTEM - .5	SGX/FG
SG035 - RECHECK INERT SYSTEMS READY TO FEED - .5	SGX/BM /
SG036 - RESTART UP CONTINUOUS EMISSIONS MONITORING SYSTEM - 2	SGX/CO
SG037 - READMIT START UP GAS GUNS TO SERVICE & CHECK BURNER LOGIC - 2	SGX/FG /CO
SG038 - REFIRE GAS TO CONTROL & COMP REFRACTORY CURE - 5	SGC/FG /C0
SG040 - RECLOSE VENTS & DRAINS - .5	SGX
SG039 - READMIT INERT BED MATERIAL AS NECESSARY - 1	SGX/BM
SG051 - RESTART FLUORSEAL BLOWERS & SYSTEM - 1	SGX/EC
SG052 - REFIRE MAIN GAS GUNS AS NECESSARY - 1	SGX/FG /CO
SG053 - FIRE COAL & LIMESTONE - 1	SGX/FG /BM/CH
SG054 - PUT BAG HOUSE IN SERVICE - .5	SGX
SG056 - PULL FLY ASH AS NECESSARY - .5	SGX/AS
SG055 - CONT(1) INCREASING BOILER LOADING - 2	SGX
SG057 - PULL BED MATERIAL AS NECESSARY - .5	SGX/AS
SG058 - AT THIS POINT BOILER IS STEAMING ON COAL AND AIR PERMITTING PROCESS BEGINS	SGX/CO



Derived from network model - issue #3, sht sg 1, dated 10/09/92

- **filled bars show early starts & finishes**
- **open bars show late starts & finishes**

C. Steam generation system (boiler) (sgx) - other associated master systems include apx/ asx/ bmx/ cax/ ccx/cem/ chx/ cox/ ecx/ fgx/ fwx/ hrx/ ppx/ scx/ sax/ wsx/
   1. Construction actions - before the red line
      a) Hydo test satisfactorily complete
      b) Refractory cure partially complete
      c) chemical clean of boiler complete
      d) Chemical clean of piping systems complete
      e) Water systems checked & complete
      f) Instrumentation check complete
      g) Burner logic checked & complete
      h) Boiler logic checked & complete
      i) Natural gas systems checked & complete
      j) Coal system checked & complete
      k) Lime system checked & complete
      l) Inert systems checked & complete
      m) Electrical equipment function checked & ok
      n) Cold air flow test satisfactorily complete
      o) Train staff on all systems adequate to begin startup sgx
      p) Continuous emissions monitor systems complete
   2. Start up actions - after the red line
      a) √Power up dcs control systems. (cox/ apx/ ppx)
      b) √Power up MCC 41. (apx/ ppx)
      c) √Power up MCC 42. (apx/ ppx)
      d) √Power up MCC 43. (apx/ ppx)
      e) √Power up MCC 44. (apx/ ppx)
      f) √Power up MCC 45. (apx/ ppx)
      g) √Power up MCC 46. (apx/ ppx)
      h) √Line up and start HRX system from MCC 41 & 42. (hrx/ ecx/ wsx)
      i) √Start control air compressors from MCC 43 & 44, & control air drier from MCC 46. (cax/ ecx/ hrx)
      j) Line up valving on boiler feed water system. (fwx/ hrx)
      k) Select water source of hotwell, condensate returns, demineralized make up or open feedwater header cross tie (fwx/ hrx)
      l) Fill feed water system with water. (fwx/ ecx. hrx)
      m) Line up vents & drains on boiler. (sgx)
      n) Fill boiler to light off level with water. (fwx)
      o) Walk down boiler & close all boiler, bag house, breeching, & air duct doors. (sgx/ ccx)
      p) Check valving on natural gas systems. (sgx/ fgx)
      q) Start induced draft fans. (sgx/ ecx/ hrx)
      r) Start primary air fan. (sgx/ ecx/ hrx/ scx/ cox)
      s) Start secondary air fan. (sgx/ ecx/ hrx/ scx/ cox)
      t) Adjust furnace draft & air flow for boiler purge. (sgx/ cox)
      u) Check inert system ready to feed. (sgx/ bmx)
      v) Admit start up gas guns to service & check burner logic. (sgx/ fgx/ cox)
      w) Fire to control temperature to complete refractory cure to manufacturer's recommendations. (sgx/ fgx/ cox)
      x) Fire main gas guns as necessary. (sgx/ fgx/ cox)
      y) Admit inert bed material as necessary. (sgx/ bmx)
      z) Start fluorseal blowers & system. (sgx/ ecx)
      aa) Start up chemical feed systems and monitor. (sgx/ sax/ fwx)

ab) **At recommended temperature rise admit coal & limestone at minimum feed. (sgx/ fgx/ bmx/ chx)**
ac) **Continue admitting fuel & increase boiler loading. (sgx)**
ad) **Close vents & drains. (sgx)**
ae) **Pull fly ash as necessary (asx)**
af) **Pull bed material as necessary (asx)**
ag) **Fill coal bunkers (chx)**
ah) **Fill limestone silos (bmx)**
ai) **Start up cem system (cox)**
aj) **Put bag house into service (ccx/ cox/ sgx)**
ak) **Set up bag house & start hopper heaters (sgx/ ccx/ cox)**

	activity	major systems	early start	early finish	late start	late finish	days
1	SG001 - T/R TO BEGINNING OF STEAM GENERATION - SGX - START UP	SGX	6/1/93	6/1/93	6/1/93	6/1/93	0
2	SG004 - POWER UP MCC 41 - .5	SGX/AP/PP	6/1/93	6/1/93	6/1/93	6/1/93	0.5
3	SG005 - POWER UP MCC 42 - .5	SGX/AP/PP	6/1/93	6/1/93	6/1/93	6/1/93	0.5
4	SG006 - POWER UP MCC 43 - .5	SGX/AP/PP	6/1/93	6/1/93	6/2/93	6/2/93	0.5
5	SG007 - POWER UP MCC 44 - .5	SGX/AP/PP	6/1/93	6/1/93	6/2/93	6/2/93	0.5
6	SG009 - POWER UP MCC 46- .5	SGX/AP/PP	6/1/93	6/1/93	6/2/93	6/2/93	0.5
7	SG003 - POWER UP DCS CONTROL SYSTEMS FOR SGX - 1	SGX/CO/AP/PP	6/1/93	6/1/93	8/6/93	8/9/93	1
8	SG002 - LINE UP VALVING ON BOILER FEED WATER SYSTEM - .5	SGX/FW/HR	6/1/93	6/1/93	8/9/93	8/9/93	0.5
9	SG008 - POWER UP MCC 45 - .5	SGX/AP/PP	6/1/93	6/1/93	8/12/93	8/12/93	0.5
10	SG011 - LINE UP & START HRX SYSTEM FROM MCC'S 41 & 42 - 1	SGX/HR/EC/WS	6/1/93	6/2/93	6/1/93	6/2/93	1
11	SG013 - START CONTROL AIR COMPESSORS FROM MCC 43 & 44, & CONTROL AIR DRYER FROM MCC 46 - .5	SGX/CA/EC/HR	6/2/93	6/2/93	6/3/93	6/3/93	0.5
12	SG010 - LINE UP VENTS & DRAINS ON BOILER - .5	SGX	6/2/93	6/2/93	8/9/93	8/9/93	0.5
13	SG012 - WALK DOWN BOILER, BAG HSE, DUCTWK, OPEN GUILLOTINE DAMPERS, & CLOSE ALL DOORS - 1	SGX/CC	6/2/93	6/3/93	6/2/93	6/3/93	1
14	SG014 - FILL & PRESSURIZE FEED WATER SYSTEMS - 1	SGX/FW/EC/HR	6/2/93	6/3/93	8/10/93	8/10/93	1
15	SG017 - START UP INDUCED DRAFT FANS - .5	SGX/CO/EC/HR	6/3/93	6/3/93	6/3/93	6/3/93	0.5
16	SG015 - SELECT WATER SOURCE OF FWA, FWC, FWF & FILL BOILER TO LIGHT OFF LEVEL - 1	SGX/FW/HR	6/3/93	6/4/93	8/11/93	8/11/93	1
17	SG016 - SET BAG HOUSE FOR START UP, TURN ON HOPPER HEATERS - 1	SGX/CC	6/3/93	6/4/93	8/12/93	8/13/93	1
18	SG019 - START UP PRIMARY AIR FANS - .5	SGX/EC/HR/SC/CO	6/4/93	6/4/93	6/4/93	6/4/93	0.5
19	SG020 - START UP SECONDARY AIR FANS - .5	SGX/EC/HR/CS/CO	6/4/93	6/4/93	6/4/93	6/4/93	0.5
20	SG021 - PURGE BOILER - .5	SGX/CO	6/4/93	6/4/93	6/4/93	6/4/93	0.5

	activity	major systems	early start	early finish	late start	late finish	days
21	SG018 - START CHEMICAL FEED SYSTEMS & MONITOR - .5	SGX/SA/FW	6/4/93	6/4/93	8/12/93	8/12/93	0.5
22	SG025 - CHECK VALVING ON NATURAL GAS SYSTEM - .5	SGX/FG	6/7/93	6/7/93	6/7/93	6/7/93	0.5
23	SG022 - CHECK INERT SYSTEMS READY TO FEED - .5	SGX/BM/	6/7/93	6/7/93	6/24/93	6/24/93	0.5
24	SG024- CHECK COAL SYSTEMS READY TO FEED - .5	SGX/CH	6/7/93	6/7/93	8/12/93	8/12/93	0.5
25	SG026 - START UP CONTINUOUS EMISSIONS MONITORING SYSTEM - 2	SGX/CO	6/7/93	6/9/93	6/7/93	6/9/93	2
26	SG023 - CHECK LIMESTONE READY TO FEED - .5	SGX/BM	6/7/93	6/11/93	8/5/93	8/12/93	5
27	SG027 - ADMIT START UP GAS GUNS TO SERVICE & CHECK BURNER LOGIC - 2	SGX/FG/CO	6/9/93	6/11/93	6/9/93	6/11/93	2
28	SG026 - FIRE GAS TO CONTROL & COMP REFRACTORY CURE - 5	SGC/FG/CO	6/11/93	6/18/93	6/11/93	6/18/93	5
29	SG028 - CLOSE VENTS & DRAINS - .5	SGX	6/18/93	6/18/93	6/25/93	6/25/93	0.5
30	SG041 - TAMPELLA CHEMICAL CLEAN BOILER - 4	SGX	6/18/93	6/24/93	6/18/93	6/24/93	4
31	SG027 - ADMIT INERT BED MATERIAL AS NECESSARY - 1	SGX/BM	6/24/93	6/25/93	6/24/93	6/25/93	1
32	SG029 - START FLUORSEAL BLOWERS & SYSTEM - 1	SGX/EC	6/25/93	6/28/93	6/25/93	6/28/93	1
33	SG030 - FIRE MAIN GAS GUNS AS NECESSARY - 1	SGX/FG/CO	6/25/93	6/28/93	6/25/93	6/28/93	1
34	SG031 - STEAM BLOW MAIN STEAM PIPING SYSTEMS - 10		6/28/93	7/13/93	6/28/93	7/13/93	10
35	SG032 - SHUT DOWN & REMOVE STEAM BLOW PIPING - 10		7/13/93	7/27/93	7/13/93	7/27/93	10
36	SG033 - REPURGE BOILER - .5	SGX/CO	7/27/93	7/27/93	7/27/93	7/27/93	0.5
37	SG034 - RECHECK VALVING ON NATURAL GAS SYSTEM - .5	SGX/FG	7/28/93	7/28/93	7/28/93	7/28/93	0.5
38	SG035 - RECHECK INERT SYSTEMS READY TO FEED - .5	SGX/BM/	7/28/93	7/28/93	8/10/93	8/10/93	0.5
39	SG036 - RESTART UP CONTINUOUS EMISSIONS MONITORING SYSTEM - 2	SGX/CO	7/28/93	7/30/93	7/28/93	7/30/93	2
40	SG037 - READMIT START UP GAS GUNS TO SERVICE & CHECK BURNER LOGIC - 2	SGX/FG/CO	7/30/93	8/3/93	7/30/93	8/3/93	2

	activity	major systems	early start	early finish	late start	late finish	days
41	SG038 - REFIRE GAS TO CONTROL & COMP REFRACTORY CURE - 5	SGC/FG/CO	8/3/93	8/10/93	8/3/93	8/10/93	5
42	SG040 - RECLOSE VENTS & DRAINS - .5	SGX	8/10/93	8/10/93	8/11/93	8/11/93	0.5
43	SG039 - READMIT INERT BED MATERIAL AS NECESSARY - 1	SGX/BM	8/10/93	8/11/93	8/10/93	8/11/93	1
44	SG051 - RESTART FLUORSEAL BLOWERS & SYSTEM - 1	SGX/EC	8/11/93	8/12/93	8/11/93	8/12/93	1
45	SG052 - REFIRE MAIN GAS GUNS AS NECESSARY - 1	SGX/FG/CO	8/11/93	8/12/93	8/11/93	8/12/93	1
46	SG053 - FIRE COAL & LIMESTONE - 1	SGX/FG/BM/CH	8/12/93	8/13/93	8/12/93	8/13/93	1
47	SG054 - PUT BAG HOUSE IN SERVICE - .5	SGX	8/13/93	8/13/93	8/13/93	8/13/93	0.5
48	SG056 - PULL FLY ASH AS NECESSARY - .5	SGX/AS	8/16/93	8/16/93	8/17/93	8/17/93	0.5
49	SG055 - CONT(1) INCREASING BOILER LOADING - 2	SGX	8/16/93	8/17/93	8/16/93	8/17/93	2
50	SG057 - PULL BED MATERIAL AS NECESSARY - .5	SGX/AS	8/18/93	8/18/93	8/18/93	8/18/93	0.5
51	SG058 - AT THIS POINT BOILER IS STEAMING ON COAL AND AIR PERMITTING PROCESS BEGINS	SGX/CO	8/18/93	8/18/93	8/18/93	8/18/93	0

	abb	meaning	type	sort code	source	b&v des
1	a/c	Alberici/Clark	org		rjs	
2	ac	alternating current	tec	alter	rjs	
3	act	action	gen	actio	rjs	
4	acu	alternating current - second choice abb	tec	alter	rjs	
5	apa	ac power supply (120v/240v)	sys		b&v	.0401
6	apb	ac power supply (120v/208v)	sys		b&v	.0402
7	apc	ac power supply (480v)	sys		b&v	.0403
8	apd	ac power supply (4160v)	sys		b&v	.0404
9	aph	dc power supply	sys		b&v	.0408
10	api	essential service ac	sys		b&v	.0409
11	apj	essential service dc	sys		b&v	.0410
12	apx	auxiliary power supply - generic	sys	auxil	b&v	.0400
13	asf	combustion waste storage	sys		b&v	.0206
14	asg	ash collection	sys		b&v	.0207
15	asx	ash handling - generic	sys	ashha	b&v	.0200
16	b&v	Black & Veatch	org		rjs	
17	bai	Bailey Controls	org	baile	rjs	
18	bfw	boiler feed water	tec	boile	rjs	
19	bmd	limestone handling	sys		b&v	.1004
20	bme	inert bed material handling	sys		b&v	.1005
21	bmx	bulk materials (other than coal) - generic	sys	bulkm	b&v	.1000
22	brk	breaker?	equ	break	rjs	
23	bsa	generation building	sys		b&v	.0801
24	bsb	air quality control building	sys		b&v	.0802
25	bsh	circulating water	sys		b&v	.0808
26	bso	water treatment building	sys		b&v	.0815
27	bsx	buildings and structures - generic	sys	build	b&v	.0800
28	bva	Bruce Van Heest - B&V struct engr	nme	vanhe	rgi	
29	c/e	chemical/electrical building	tec	chemi	rjs	
30	caa	station air	sys		b&v	.1801

MSU PP4 start up meeting notes

XIV. **1:05:23 PM - Monday, November 23, 1992**

A. **Location - RJS office**

B. **Those attending**

1. **Ron McClintic - Technical Supervisor - MSU - in late am & pm**
2. **Ralph J. Stephenson - Consultant**

C. **Agenda for Monday, November 23, 1992**

1. **Review roles of Roy Gies & Ron McClintic in start up**
   a) In relation to responsibility –
   b) In relation to authority –
   c) In relation to MSU construction department
      (1) Jim Simons
      (2) Dick Wever
   d) In relation to MSU utilities department
      (1) Rick Johnson - electrical interfacing in respect to
         (a) Control Power Corporation
         (b) Between existing and PP4
   e) In relation to dfi contractors
      (1) Field operations assigned to Alberici Clark
         (a) Tampella
         (b) General Electric
         (c) Environmental Elements
         (d) Thermal Dynamics
      (2) Under direct owner control - Rick Johnson
         (a) Bailey Controls
         (b) Control Power Corporation - high voltage equipment
   f) In relation to non dfi primes
      (1) Alberici Clark
         (a) IMC Mechanical
      (2) Quality Electric

Ron & Roy are peers on start up w/ temp subordinate supervisor positions exchanged as needed to achieve objectives.

- Both answer to Bob Ellebrock
- Rick J works for Roy & Ron.
- Rick J will probably answer chiefly to Roy G.
- Where is he to come on to the team

2. **Identify methods of documenting start up classifications so the information is of max value in plant operations.**
   a) Black & Veatch designated
   b) dcs systems
   c) dfi overarching systems
3. **Review how we integrate the plant wide control installation, its start up, and its turn over for full operation.**
4. **Prepare preliminary Bailey control network models to set interfaces with main systems.**
   These may best be shown by adding the control activity interface into each major system network directly.
   a) Controls - cox & dcs
   b) Heat rejection system - hrx
   c) Combustion gas cleaning & exhaust (bag house) - ccx & cem

d) Steam generator - sgx
   May attempt to run generator from existing steam sources - boilers 1, 2 & 3.
   (1) Water controls
   (2) Combustion controls
   (3) Burner management controls
   (4) Steam conditioning controls
   (5) Other?

e) Turbine & generator - tgx

	abb	sort code	meaning	type	source	b&v des
1	a/c	alber	Alberici/Clark	org	rjs	
2	abb	abbre	Abbreviations	gen	rjs	
3	abo	ancho	Anchor bolts	sub	rjs	
4	ac	alter	alternating current	tec	rjs	
5	ac	alter	ac - alternating current ?	tec	rjs	
6	act	actio	action	gen	rjs	
7	acu	alter	alternating current - second choice abb	tec	rjs	
8	alm	alme	Almet, Inc.	org	rjs	
9	apa	acpow	ac power supply (120v/240v)	sys	b&v	.0401
10	apb	acpow	ac power supply (120v/208v)	sys	b&v	.0402
11	apc	acpow	ac power supply (480v)	sys	b&v	.0403
12	apd	acpow	ac power supply (4160v)	sys	b&v	.0404
13	aph	dcpow	dc power supply	sys	b&v	.0408
14	api	ashpi	Ash pit	sub	rjs	
15	api	essea	essential service ac	sys	b&v	.0409
16	apj	essed	essential service dc	sys	b&v	.0410
17	apx	auxil	auxiliary power supply - generic	sys	b&v	.0400
18	asf	combw	combustion waste storage	sys	b&v	.0206
19	asg	ashco	ash collection	sys	b&v	.0207
20	asx	ashha	ash handling - generic	sys	b&v	.0200
21	b&v	black	Black & Veatch	org	rjs	
22	bai	baile	Bailey Controls	org	rjs	
23	bfw	boile	boiler feed water	tec	rjs	
24	bkf	backf	Backfill	sub	jsi	
25	bmd	limes	limestone handling	sys	b&v	.1004
26	bme	inert	inert bed material handling	sys	b&v	.1005
27	bmx	bulkm	bulk materials (other than coal) - generic	sys	b&v	.1000
28	brk	break	breaker?	equ	rjs	
29	bsa	gener	generation building	sys	b&v	.0801
30	bsb	airqu	air quality control building	sys	b&v	.0802
31	bsh	circw	circulating water	sys	b&v	.0808
32	bso	water	water treatment building	sys	b&v	.0815
33	bsx	build	buildings and structures - generic	sys	b&v	.0800
34	bva	vanhe	Bruce Van Heest - B&V proj & struct engr	nme	rgi	
35	c/e	chemi	chemical/electrical building	tec	rjs	
36	caa	stati	station air	sys	b&v	.1801
37	cab	contr	control air	sys	b&v	.1802
38	cac	corre	corrective action	sub	jsi	
39	cac	sootb	soot blowing air	sys	b&v	.1803
40	cai	caiss	Caissons	sub	jsi	

	abb	sort code	meaning	type	source	b&v des
41	cax	compa	compressed air - generic	sys	b&v	.1800
42	ccb	parti	particulate removal	sys	b&v	.1402
43	cce	induc	induced draft	sys	b&v	.1405
44	ccx	combu	combustion gas cleaning and exhaust - generic	sys	b&v	.1400
45	cei	carle	Carl Eigenauer, MSU campus fire marshall	ind	jsi	
46	cem	conti	continuous emissions monitoring - see cog & cex	sys	rjs	
47	cex	conti	continuous emissions system - generic	sys	rjs	
48	cfa	consp	construction power	sys	b&v	.2201
49	cfb	consw	construction water	sys	b&v	.2202
50	cfd	conss	construction security	sys	b&v	.2204
51	cfe	consl	construction lighting	sys	b&v	.2205
52	cfi	consl	construction laydown and storage	sys	b&v	.2209
53	cfx	consf	construction facilities - generic	sys	b&v	.2200
54	cgc	chlor	chlorine storage	sys	b&v	.2003
55	cgx	compg	compressed gas storage - generic	sys	b&v	.2000
56	chc	inpla	in plant coal storage	sys	b&v	.1203
57	chd	coalh	coal handling	sys	b&v	.1204
58	chf	coald	coal dust control	sys	b&v	.1206
59	chx	coalh	coal handling - generic	sys	b&v	.1200
60	circ	circw	circulating water - 2nd choic abb	gen	rjs	
61	cma	planc	plant communication	sys	b&v	.1601
62	cmx	commu	communication - generic	sys	b&v	.1600
63	coa	planc	plant control	sys	b&v	.2401
64	coc	unitp	unit protection	sys	b&v	.2403
65	cog	conte	continuous emissions monitoring	sys	b&v	.2407
66	col	colum	column	tec	rjs	
67	cox	contr	control - generic	sys	b&v	.2400
68	css	tec	? Campus readout steam	tec	msu	
69	csx	csxtr	CSX Transportation	org	rjs	
70	ct	curre	current transformers	equ	rjs	
71	cto	cooli	cooling tower	equ	rjs	
72	cto	cooli	cooling tower	tec	rjs	
73	d&b	desig	Design & Build	org	rjs	
74	dafd	detai	detail, approve, fab & deliver	gen	rjs	
75	dafd	detai	detail, approve, fabricate & deliver	gen	rjs	
76	dba	ductb	Duct bank	sub	jsi	
77	dca	campb	David Campbell - B&V mech engr	nme	rgi	
78	dcl	clend	Don Clendenan - MSU shift first engineer	nme	rjs	
79	dcr	daily	Daily construction report	dty	jsi	
80	dcr	daily	Daily concrete report	sub	jsi	

	abb	sort code	meaning	type	source	b&v des
81	dcr	daily	Daily concrete report	dty	jsi	
82	dcs	distr	distributed control system	tec	rjs	
83	ddp	dated	Date document prepared	gen	jsi	
84	ddr	dater	Date document received	gen	jsi	
85	del	deane	Dean Ely - TPC project manager	nme	rjs	
86	demin	demin	demineralizer	equ	rjs	
87	dfi	design	design, furnish & install	gen	rjs	
88	dim	dimen	Dimension	sub	jsi	
89	din	docui	Document in	gen	jsi	
90	dma	dougm	Douglas MacDonald, MSU design coordinator	ind	rjs	
91	dmc	macdo	Douglas MacDonald - MSU mech engr	ind	rgi	
92	dmu	munro	Dave Monroe - A/C field suptd	ind	rgi	
93	dou	docuo	Document out	gen		
94	dpa	build	building drains and plumbing	sys	b&v	.2801
95	dpx	drain	drains & plumbing - generic	sys	b&v	.2800
96	dsa	sange	David Sanger - MSU construction inspector	nme	rjs	
97	dsp	donsp	Don Spruit - D&B estimator	ind	jsi	
98	dty	docut	document type	gen	rjs	
99	dwg	drawi	drawing	sub	jsi	
100	ecb	close	closed cycle cooling water	sys	b&v	.3202
101	ecx	equip	equipment cooling - generic	sys	b&v	.3200
102	eea	freez	freeze protection	sys	b&v	.3001
103	eeb	groun	grounding	sys	b&v	.3002
104	eec	racew	raceway	sys	b&v	.3003
105	eed	catho	cathodic protection	sys	b&v	.3004
106	eel	envir	Environmental Elements	org	rjs	
107	eex	elecg	electrical - generic	sys	b&v	.3000
108	ele	elect	electrical	sub	rjs	
109	elv	eleva	elevator	equ	rjs	
110	equ	equip	equipment	gen	rjs	
111	ess	essen	essential systems	tec	rjs	
112	fab	fabri	fabricate	gen	rjs	
113	fec	fuele	Fuel Economy	org	rjs	
114	ffb	fabri	fabric filter building	loc	rjs	
115	ffb	fabri	fabric filter building	tec	rjs	
116	fga	fuelg	fuel gas supply	sys	b&v	.3801
117	fgx	fuelg	fuel gas - generic	sys	b&v	.3800
118	fhy	fireh	fire hydrant	sub	rjs	
119	fms	forms	forms	sub	rjs	
120	fpr	firep	fire protection	sub	rjs	

	abb	sort code	meaning	type	source	b&v des
121	fpx	firep	fire protection - generic	sys	b&v	.3600
122	fwa	boile	boiler feed water	sys	b&v	.3401
123	fwc	conde	condensate	sys	b&v	.3403
124	fwe	cycle	cycle chemical feed	sys	b&v	.3405
125	fwf	cycle	cycle makeup and storage	sys	b&v	.3406
126	fwg	attem	attemporator spray water	sys	b&v	.3407
127	fwh	desup	desuperheater spray water	sys	b&v	.3408
128	fwx	feedw	feedwater - generic	sys	b&v	.3400
129	gbe	grade	Grade beam	sub	rjs	
130	gda	davis	Gil Davis - MSU shift first engineer	nme	rjs	
131	gec	gener	General Electric Corporation	org	rjs	
132	gen	genea	general abbreviation	typ	rjs	
133	gen	gener	General document type	gen	rjs	
134	gen	gener	generator	equ	rjs	
135	geo	geote	Geotechnical reports	sub/dty	rjs	
136	ghe	gashe	Gas heater	sub	rjs	
137	gpm	genep	general project manager - Alberici/Clark	org	rjs	
138	gro	groun	Grouding	sub	rjs	
139	gta	gened	generator bus duct	sys	b&v	.4201
140	gtc	genes	generator surge protection	sys	b&v	.4203
141	gtd	genen	generator neutral grounding	sys	b&v	.4204
142	gtr	gener	Generator	sub	rjs	
143	gtx	gener	generator terminal - generic	sys	b&v	.4200
144	hdr	circm	circulating water makeup	sys	b&v	.2604
145	hra	conde	condensing	sys	b&v	.2601
146	hrc	circw	circulating water	sys	b&v	.2603
147	hre	circc	circulating water chemical feed	sys	b&v	.2605
148	hrx	cycle	cycle heat rejection - generic	sys	b&v	.2600
149	idr	indif	Individual from	gen	rjs	
150	idt	indit	individual to	gen	rjs	
151	imc	indus	Industrial Mechanical Contractors	org	rjs	
152	imp	impac	Impact	sub	rjs	
153	ind	indiv	Individual	gen	rjs	
154	ind	vibra	vibration monitoring	sys	b&v	.4404
155	inx	infor	information - generic	sys	b&v	.4400
156	jhu	hubba	Jack Hubbard - MSU shift first engineer	nme	rjs	
157	jhu	hucul	John Hucul - A/C project manager	ind	rgi	
158	jka	kaman	John Kaman - B&V elect engr	ind	rgi	
159	jsc	schai	James Schaibly - D&B field superintendent	ind	rjs	
160	jsi	simon	James Simons - MSU const. rep	ind	rjs	

	abb	sort code	meaning	type	source	b&v des
161	kcl	clark	Kent Clark - United Excavators	ind	rjs	
162	kgr	green	Ken Green - MSU maint supvr util	ind	rgi	
163	lay	layou	Layout	sub	rjs	
164	loc	locat	location abbreviation	typ	rjs	
165	lta	geneb	generation building lighting	sys	b&v	.4601
166	ltr	airql	air quality control bldg lighting	sys	b&v	.4602
167	ltr	lette	Letter	dty	rjs	
168	ltx	light	lighting - generic	sys	b&v	.4600
169	man	manif	Manifest	sub/dty	rjs	
170	mcc	motor	motor control center	tec/equ	rjs	
171	mec	mecha	Mechanical	sub	rjs	
172	mem	memor	Memorandum	dty	rjs	
173	mfc	makef	make final connection	act	rjs	
174	min	marti	Martin, International	ind	rjs	
175	mkr	kroel	M. Kroell - TDT	ind	rjs	
176	mlt	memol	Memo letter	dty	rjs	
177	msu	michi	Michigan State University	org	rjs	
178	mtg	meeti	Meeting	sub	rjs	
179	mxd	mixed	mixed	tec	rjs	
180	n	north	north	gen	rjs	
181	ofe	owner	owner furnished equipment	gen	rjs	
182	ofr	orgaf	Organization from	gen	rjs	
183	ois	opera	Operator interface system	sys	rjs	
184	opis	opera	Operator interface system	sys	rjs	
185	org	orgaa	organization abbreviation	typ	rjs	
186	org	organ	Organization	gen	rjs	
187	oto	orgat	Organization to	gen	rjs	
188	pod	proce	Procedures	sub	rjs	
189	pcr	crock	Phil Crockett - D&B president	ind	rjs	
190	pdi	dimit	Phil Dimitri - B&V proj mgr	ind	rgi	
191	piv	posti	post indicator valve	equ	rjs	
192	pla	larse	Paul Larsen - SME senior associate	ind	rjs	
193	pma	chemc	chemical cleaning	sys	b&v	.4801
194	pmx	planm	plant maintenance - generic	sys	b&v	.4800
195	ppc	13.8 k	13.8 kv distribution system	sys	b&v	.5003
196	ppx	prima	primary power supply - generic	sys	b&v	.5000
197	prv	press	pressure relief valve	equ	rjs	
198	pst	plans	Plant start up	sys	rjs	
199	pth	thies	Peter Thies - TAM senior field rep	ind	rjs	
200	qel	quali	Quality Electric	org	rjs	

	abb	sort code	meaning	type	source	b&v des
201	que	quali	Quality Electric - second choice abbreviation	org	rjs	
202	rel	eller	Robert Ellerhorst - MSU director of power & water	ind	rjs	
203	rfi	reque	Request for information	dty	rjs	
204	rgi	giesr	Roy Gies - start up manager	nme	rjs	
205	rhi	hicks	Ron Hicks - B&V mechanical engineer	ind	rgi	
206	rjo	johns	Rick Johnson - MSU elect engr	ind	rgi	
207	rjs	steph	Ralph J. Stephenson - consultant	nme	rjs	
208	rle	leero	Robert Lee - MSU shift first engineer	ind	rjs	
209	rmc	mccli	Ron McClintic - MSU controls supervisor	ind	rgi	
210	rne	nestl	Robert Nestle - MSU architectural manager	ind	rjs	
211	roc	repor	Report of contact	dty	rjs	
212	rof	roofi	Roofing	sub	rjs	
213	rst	reste	Resteel	sub	rjs	
214	rwe	wever	Richard Wever - MSU construction superintendent	ind	rjs	
215	s	south	south	gen/tec	rjs	
216	saa	combg	comb. gases sampling & analysis	sys	b&v	.5201
217	sac	steam	steam cycle sampling & analysis	sys	b&v	.5203
218	sad	circw	circul. water sampling & analysis	sys	b&v	.5204
219	sae	circw	water supply sampling & analysis	sys	b&v	.5205
220	saf	plane	plant effluent sampling & analysis	sys	b&v	.5206
221	saf	safet	Safety	sub	rjs	
222	sax	sampl	sampling and analysis - generic	sys	b&v	.5200
223	sbm	submi	Submittals	sub	rjs	
224	sca	gensp	gen. bldg. space conditioning	sys	b&v	.5601
225	sce	circb	circ. water treatment bldg.	sys	b&v	.5605
226	sch	sched	Schedule	sub	rjs	
227	sco	subje	Subject codes	gen	rjs	
228	scx	space	space conditioning - generic	sys	b&v	.5600
229	sew	sewer	Sewer	sub	rjs	
230	sga	steam	steam generator	sys	b&v	.5801
231	sgb	comba	combustion air	sys	b&v	.5802
232	sge	ignit	igniter and auxiliary fuel	sys	b&v	.5805
233	sgf	boile	boiler vents and drains	sys	b&v	.5806
234	sgg	mains	main steam	sys	b&v	.5807
235	sgh	burne	burner controls	sys	b&v	.5808
236	sgi	sootb	soot blowing	sys	b&v	.5809
237	sgk	tempb	temporary blowout	sys	b&v	.5811
238	sgl	sncrs	sncr system	sys	b&v	.5812
239	sgx	steam	steam generation - generic	sys	b&v	.5800
240	shd	shopd	Shop drawings	sub/dty	rjs	

	abb	sort code	meaning	type	source	b&v des
241	sme	soils	Soils & Materials Engineers	org	org	
242	srd	servr	Service road'	sub	rjs	
243	sst	struc	Structural steel	sub	rjs	
244	sta	roads	roads and parking	sys	b&v	.5401
245	stf	gradi	grading, drainage, & landscaping	sys	b&v	.5406
246	stm	steam	steam	tec	rjs	
247	stup	start	start up - 2nd choice	gen	rjs	
248	stx	siteg	site - generic	sys	b&v	.5400
249	sup	start	start up	gen	rjs	
250	tcd	telep	Telephone conversation documentation	dty	rjs	
251	tdt	therm	Thermal Dynamic Towers	org	rjs	
252	tea	extrs	extraction steam	sys	b&v	.6001
253	tec	extrd	extraction drains	sys	b&v	.6003
254	tec	techn	technical abbreviation	typ	rjs	
255	ted	heatd	heater drains	sys	b&v	.6004
256	tef	heatv	heater vents & misc. drains	sys	b&v	.6006
257	tex	turbe	turbine extraction - generic	sys	b&v	.6000
258	tga	turbi	turbine	sys	b&v	.6201
259	tgb	genee	generator and excitation	sys	b&v	.6202
260	tgc	turbs	turbine seals and drains	sys	b&v	.6203
261	tgd	turbl	turbine lube oil	sys	b&v	.6204
262	tgf	turbc	turbine cntrl and instrumentation	sys	b&v	.6205
263	tgx	turbg	turbine generator - generic	sys	b&v	.6200
264	the	tempo	Temporary heat	sub	rjs	
265	tpc	tampe	Tampella Power Corporation	org	rjs	
266	trm	trans	Transmittal	dty	rjs	
267	turb	turbi	turbine	equ	rjs	
268	typ	typea	type abbreviation	typ	rjs	
269	uex	unite	United Excavators	org	rjs	
270	ups	unint	uninterruptable power source	sys	rjs	
271	vlv	valve	Valves	sub	rjs	
272	wes	westi	Westinghouse	org	rjs	
273	wes	westi	Westinghouse	org	rjs	
274	whp	weath	Weather protection	sub	rjs	
275	wkj	kjona	Wayne Kjonaas - Director of Utilities - Purdue Univ.	nme	rjs	
276	wpr	watep	Water problems	sub	rjs	
277	wsc	servw	service water	sys	b&v	.6603
278	wsx	water	water supply and storage - generic	sys	b&v	.6600
279	wwc	wastc	wastewater collection & treatment	sys	b&v	.6403
280	wwd	oilsp	oil spill prevention	sys	b&v	.6404

	abb	sort code	meaning	type	source	b&v des
281	wwx	waste	waste collection and treatment - generic	sys	b&v	.6400

A

Absolute	ABS
Accessory	ACCY
Accumulator	ACC
Acknowledge	ACK
Actual	ACT
After	AFT
After Cooling	AFT CLR
Air Circuit Breaker	ACB
Air Condition	AIR COND
Air Handling Unit	AHU
Air Heater	AH
Alarm	ALM
Alternate	ALT
Alternating Current	AC
Ambient	AMB
Ampere	AMP
Amplifier	AMPL
Analysis (Analyzer)	ANAL
Annunciator	ANN
Approximate	APPROX
Assembly	ASSY
Atomizing	ATOM
Attemperator	ATTEMP
Automatic	AUTO
Auxiliary	AUX
Average	AVG

B

Backup	BKUP
Balance	BAL
Barrel	BRRL
Basement	BSMT
Battery	BTRY
Bearing	BRG
Between	BETWN
Block	BLK
Blown	BLWN
Blowdown	BLWDN
Blower	BLWR
Boiler	BLR
Boiler Feed Pump	BFP
Booster	BOSTR
Bottle	BTL
Bottom	BTM
Breaker	BKR
British Thermal Unit	BTU
Building	BLDG
Burner	BRN
Bypass	BYP

C

Cabinet	CAB
Campus	CMPS
Capacitor	CAP
Cathode Ray Tube	CRT
Celsius	C
Center	CNTR
Charger	CHGR
Charging	CHG
Check	CHK
Chlorination	CHLOR
Circuit	CKT
Circuit Breaker	CKT BKR
Circulating Fluidized Bed	CFB
Circulating Water	CIRC WTR
Circulating Water Pump	CWP
Clear	CLER
Clockwise	CW
Closed	CLOSD
Coal Presence Detector	CPD
Collector	COLL
Column	COL
Combind	CMBD
Combustible	COMBL
Combustion	COMB
Command	CMD
Common	COM
Communication	COMM
Compartment	COMPT
Compressed	COMP
Compressor	CMPRSR
Computer	CMPTR
Condensate	CNDS
Condenser	CNDBR
Conditioner	CONDTN
Conductivity	CNDVTY
Configuration	CONFIG
Containment	CNTMT
Continue	CONT
Continuity	CNTNTY
Control	CNTL
Control Switch	CS
Converter	CONV
Conveyor	CNVR
Cooler	CLR
Cooling	CLG
Cooling Tower	CLG TWR
Cooling Water	CLG WTR
Counterclockwise	CCW

Critical	CRIT
Crusher	CRSHR
Cubic Feet Per Minute	CFM
Cubic Feet	CU FT
Cubic Inch	CU IN
Current-to-Pneumatic Converter	I/P
Cutout	CO
Cycle	CYC
Cyclone	CYCLN
Cylinder	CYL

D

Damper	DMPR
Deaerator	DA
Decelerate	DECEL
Degasifier	DEGSFR
Degree	DEG
Demineralizer	DI or DEMIN
Density	DENS
Desiccant	DESIC
Desuperheater	DESUPHTR
Desuperheating	DESUPHTG
Detector	DECT
Differential	DIFF
Differential Pressure	DP/DIFF PRESS
Direct Current	DC
Direction	DIR
Discharge	DISCH
Displacement	DISPL
Dissolved Oxygen	DO
Distribution	DISTR
Division	DIV
Down	DN
Downcomer	DNCMR
Drain	DRN
Drive	DRV

E

East	E
Eccentricity	ECC
Economizer	ECON
Effluent	EFFL
Electric	ELEC
Electric-to-Pneumatic Converter	I/P
Electrohydraulic Control	EHC
Element	ELEM
Elevator	ELEV
Emergency	EMER
Enclosure	ENCL
Entrance	ENTR
Equipment	EQPT
Essential	ESNTL
Evaporator	EVAP
Exchanger	EXCHG
Excitation	EXC
Exciter	EXCTR
Exhaust	EXH
Expansion	EXP
Extraction	EXTN

F

Fahrenheit	F
Failure	FAIL
Feeder	FDR
Feedwater	FW
Feet	FT
Feet Per Minute	FPM
Field	FLD
Filter	FLTR
Final	FNL
Finish	FNSH
Flame	FLM
Flexible	FLEX
Float	FLT
Flow	FLO
Fluidizing	FLGZNG
Fluroseal	FLURSL
Foot	FT
Foot-Pound	FT-LB
Forced Draft Fan	FD FAN
Forward	FWD
Freeze	FRZ
Frequency	FREQ
Fuel Oil	FO
Furnace	FURN
Fuse	FUS

G

Gallon	GAL
Gallon Per Hour	GPH
Gallon Per Minute	GPM
Generator	GEN
Gland	GLND
Ground	GND
Group	GRP

H	
Hand-Automatic	H/A
Handling	HDLG
Header	HDR
Heater	HTR
Heating	HTG
Heatin Ventilating and Air Conditioning	HVAC
Hertz	HZ
High	HI
High High	HIHI
High High High	HIHIHI
High Voltage	HV
Hoist	HST
Holding	HLDG
Hopper	HPR
Horizontal	HORZ
Horn	HRN
Horsepower	HP
Hour	HR
House	HSE
Hydraulic	HYD
Hydrogen	H2
Hydrogen Ion Concentration	PH

I	
Igniter	IGN
Impulse	IMP
Inboard	INBD
Inch	IN
Inches of Mercury	IN HG
Inches of Mercury Absolute	IN HGA
Inches of Water Gage	IN WG
Inches of Water Gage Absolute	IN WGA
Inches Per Second	IPS
Including	INC
Incoming	INCMG
Indicator	IND
Induced Draft	ID
Induced Draft Fan	ID FAN
Information	INFO
Initial	INIT
Injection	INJ
Inlet	INLT
Input	INPT
Input/Output	I/O
Install	INSTL
Instantaneous	INST
Instrument	INSTR
Intake	INTK
Intercommunication	INTERCOM
Interior	INTR
Interlock	INTLK
Intermidiate	INTMD
Inverter	INV
Isolation	ISOL

J	
Junction	JCT
Junction Box	JB

K	
Kelvin Degree	K
Keyboard	KYBD
Kidney	KDNY
Kilopound	KLB
Kilopound Per Hour	KLB-HR
Kilovar	KVAR
Kilovolt	KV
Kilovolt-Ampere	KVA
Kilowatt	KW
Kilowatt-Hour	KWh

L	
Lane	LN
Leakoff	LKOFF
Level	LVL
Level Switch	LS
Life	LFE
Limestone	LIMSTN
Limit	LIM
Liquid	LIQ
Load	LD
Load Center	LD CNTR
Local	LOC
Lockout Relay	LOR
Logic	LGC
Lower	LWR
Lubrication	LUB

M	
Main Steam	MN STM
Main Steam Stop Valve	MSV
Makeup	MKUP
Management	MGT
Manual	MAN
Master Fuel Trip	MFT

Master Trip Relay	MFT RLY
Material	MATL
Maximum	MAX
Measure	MEAS
Mechanical	MECH
Mega	M
Megavar	MVAR
Megavolt-Ampere	MVA
Megawatt	MW
Megawatt-Hour	MWH
Metal	MTL
Mezzanine	MEZZ
Micromhos	MMHOS
Milliampere	MA
Milligram Per Liter	MG/L
Million Gallons Per Day	MGD
Million Pounds Per Hour	KKLB-HR
Millivolts	MV
Minimum	MIN
Minute	MIN
Miscellaneous	MISC
Mixer	MXR
Mixing	MXG
Module	MDLE
Module Address	MADR
Monitor	MON
Motor	MTR
Motor Control Center	MCC
Motor Operated Valve	MOV
Multiplex	MUX

N

Negative	NEG
Neutral	NEUT
Normal	NORM
North	N
Number	NO

O

Open	OPN
Opened	OPEND
Operating	OPR
Outboard	OUTBD
Outlet	OUTLT
Output	OUTPT
Overcurrent	OC
Overflow	OVR FLO
Overload	OVLD
Overspeed	OVSPD

P

Pair	PR
Panel	PNL
Partition	PARTN
Parts Per Billion	PPB
Parts Per Million	PPM
Penthouse	PENTHSE
Phase	PHSE
Phosphate	PHOS
Pickup	PU
Plant	PLNT
Plenum	PLNM
Plugged	PLGD
Pneumatic	PNEU
Pneumatic-to-Electric Converter	P/I
Point	PT
Position	POSN
Position Transmiter	ZT
Positive	POS
Potential	POT
Pound	LB
Pounds Per Square Inch	PSI
Pounds Per Square Inch Absolute	PSIA
Pounds Per Square Inch Differential	PSID
Pounds Per Square Inch Gage	PSIG
Power	PWR
Preheater	PREHTR
Preliminary	PRELIM
Pressure	PRESS
Primary	PRI
Priming	PRM
Printer	PTR
Program	PROG
Protection	PROT
Proximity	PROX
Pump	PMP
Purging	PRNG
Purifier	PUR

Q

Quality	QUAL
Quandary	

R	
Raise	RSE
Reactive	RECTV
Received	RECVD
Receiver	RECVR
Receiving	RECVG
Recirculation	RECIRC
Reclaim	RCLM
Recorder	RCDR
Rectifier	RECT
Recycle	RECYC
Reducer	REDCR
Reference	REF
Relay	RLY
Relief Valve	RV
Remote	REMOT
Required	REQD
Reservior	RSVR
Resistance Temperature Detector	RTD
Return	RTN
Revolutions Per Minute	RPM
Room	RM
Rotary	RTRY
Running	RNG

S	
Safety	SFTY
Sample	SMPL
Sampling	SMPLG
Sand	SND
Saturate(d)	SAT
Scanner	SCANR
Science	SCI
Screen	SCRN
Secondary	SEC
Secondary Air Fan	SA FAN
Secondary Unit Substation	SUS
Section	SECT
Seperator	SEP
Sequence	SEQ
Serial	SER
Service	SERV
Servo	SRVO
Shaft	SHFT
Shaw	SHW
Silencer	SLNCR
Similar	SIMILAR
Slave Address	SLADR
Slurry	SLRY
Solenoid	SOLND
South	S
Specific Gravity	SP GR
Speed	SPD
Square	SQ
Stage	STG
Standard	STD
Standby	STNDBY
Startup	SU
Station	STA
Steam	STM
Storage	STOR
Strainer	STRNR
Substation	SUB
Suction	SUCT
Superheat	SUPHT
Superheater	SUPHTR
Surge	SURG
Switchgear	SWGR
Switchyard	SWYD
Synchronizing	SYNCH
Synchroscope	SYNSCP
System	SYS

T	
Tank	TNK
Temperature	TEMP
Tempering	TMPRG
Terminal	TERM
Thermocouple	TC
Thousand Pound Per Hour	KLB/HR
Throttle	THRTL
Thrust	THRST
Tower	TWR
Transfer	XFER
Transformer	XFRM
Transmitter	XMTR
Treatment	TRTMT
Trip & Throttle Valve	TTV
Tripped	TRIPD
Tripping	TRIPG
Turbine	TURB
Turbine Supervisory Instrumentation	TSI
Turning Gear	TRNGR

U	
Uncontrolled	UNCNTLD

Unit Auxiliary Transformer	UAT
Upper	UPR
Utility	UTIL

V

Vaccum	VAC
Valve	VLV
Vapor(izer)	VAP
Ventilation	VENT
Vertical	VERT
Vibration	VIB
Volt	VLTS
Volt-Ampere	VA
Volt-Ampere Reactive	VAR
Voltage Regulator	VLT REG

W

Water	WTR
Watt	W
Watt-Hour	WH
Weight	WT
West	W
Winding	WNDG
Winky-Blinky	WKY-BLKY

Y

Yard	YD
Year	YR

INSTRUMENTS
FUNCTION CODES

Chemistry	
Conductivity Element	CE
Differential Pressure	
Indicator	dPI
Switch Hi	dPSH
Transmitter	dPT
Flow	
Controller	FC
Element	FE
Indicator	FI
Meter	FM
Switch	FS
Transmitter	FT
Level	
Indicator	LI
Switch Hi	LSH
Switch Hi Hi	LSHH
Switch Low	LSL
Switch Low Low	LSLL
Transmitter	LT
Position	
Pressure	
Controller	PC
Indicator	PI
Switch Hi	PSH
Switch Hi Hi	PSHH
Switch Low	PSL
Switch Low Low	PSLL
Transmitter	PT
Temperature	
Element	TE
Controller	TC
Indicator	TI
Switch	TS
Transmitter	TT
Valves (Control)	
Flow	FCV
Level	LCV
Pressure	PRV
Relief	RV
Temperature	TCV

Nov 23 93

DURATIONS SHOWN ASSUME NO RECYCLING OR TRACKING OF TURNOVER PACKET IS REQUIRED.

Beginning of start up is the point where the start up manager receives the initial turnover card (this is the card to be given to Roy Gies by Jim Simons that signifies all construction contract materials and equipment making up the system have been put in place in accordance with the construction contract requirements.)

NOTE:
Begining of dcs control systems start up determined by contract date for completion of ?. See list of contract dates.

·Mechanical construction

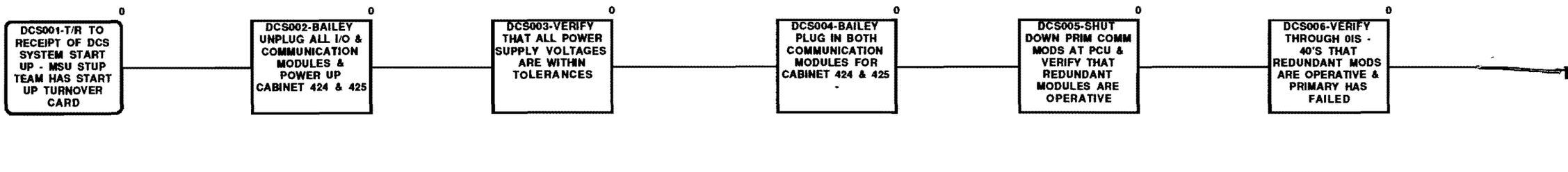
- **Closed cooling water system (HRX)**
- **Control air system (CAX)**
- **Controls (COX)**
- **House service air system (CAX)**
- **Soot blowing air system (CAX)**
- **Ash handling systems (ASX)**
- **Coal systems (CHX)**
- **Limestone systems (BMX)**
- **Inert bed systems (BMX)**
- **Natural gas systems (FGX)**
- **Sampling & analysis systems (SAX)**
- **Feed water systems (FWX)**
- **Mixed bed demineralizer (FWX)**
- **Building vents & drains (BSX)**
- **Boiler vents & drains (SGX)**

· Electrical construction

- **Primary power, 13.8 kv (PPX)**
- **High voltage systems, 4160 v (APX)**
- **Low voltage systems, 480 V (APX)**
- **Control systems, 120 v (COX)**
- **UPS systems, 120 v (APX)**
- **Direct current systems, 130 v (APX)**

Items to be installed or complete prior to beginning of start up operations for csx

- **dcs cabinet 424/425 set in position**
- **dcs cabinet 424/425 inputs & outputs terminated at both ends**
- **ups power available to cabinet**
- **cabinet tested to show no loops grounded to building steel**
- **dc ground terminated**
- **control room cables terminated to OIS - 40's**
- **communication loops identified & terminated**
- **OIS - 40's are operative for testing communications modules & graphic to configurations of each vendor's package (all construction)**



- DCS

- Software systems (COX)
- Hardware systems (COX)

- Controls

- Instrumentation piping & wiring (COX)

- Chemical

- Tanks, pumps, controls (COX, FWX, HRX)

- Boiler

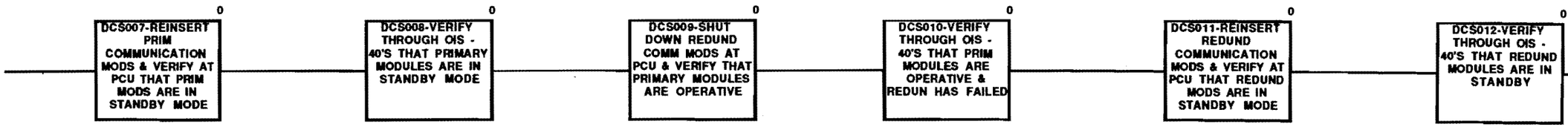
- Entire (SGX)

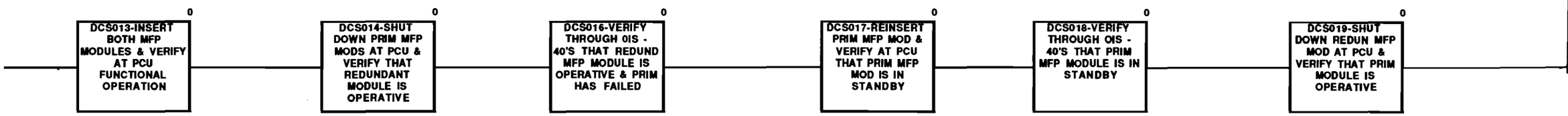
- Emissions

- Bag filter (CCX)
- ID fans (CCX)
- CEM system (COX)

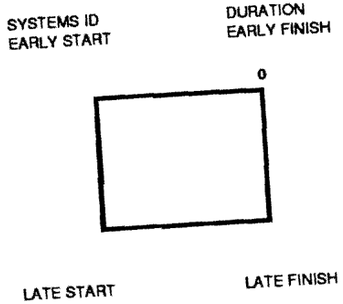
Major systems abbreviations from B & V design documents

apx - auxiliary power supply
asx - ash handling sys
bmx - bulk materials (other than coal) sys
bsx - buildings and structures
cax - compressed air
ccx - combustion gas cleaning and exhaust
cem - continuous emissions monitoring
cfx - construction facilities
cgx - compressed gas storage
chx - coal handling
cmx - communication
cox - controls
denox - urea (sncr) system
dpx - drains & plumbing
ecx - equipment cooling
eex - electrical
fgx - fuel gas
fpx - fire protection
fwx - feed water
gtx - generator terminal
hrx - cycle heat rejection
inx - information
ltx - lighting
pmx - plant maintenance
ppx - primary power supply
sax - sampling & analysis
scx - space conditioning
sgx steam generation
stx - site
tex - turbine extraction
tgx - turbine generator
wsx - water supply & storage
wwx - waste collection & treatment




0
DCS013-INSERT BOTH MFP MODULES & VERIFY AT PCU FUNCTIONAL OPERATION
0
DCS014-SHUT DOWN PRIM MFP MODS AT PCU & VERIFY THAT REDUNDANT MODULE IS OPERATIVE
0
DCS016-VERIFY THROUGH OIS - 40'S THAT REDUND MFP MODULE IS OPERATIVE & PRIM HAS FAILED
0
DCS017-REINSERT PRIM MFP MOD & VERIFY AT PCU THAT PRIM MFP MOD IS IN STANDBY
0
DCS018-VERIFY THROUGH OIS - 40'S THAT PRIM MFP MODULE IS IN STANDBY
0
DCS019-SHUT DOWN REDUN MFP MOD AT PCU & VERIFY THAT PRIM MODULE IS OPERATIVE

Note: in systems id, letter x indicates system master id



Activity Key

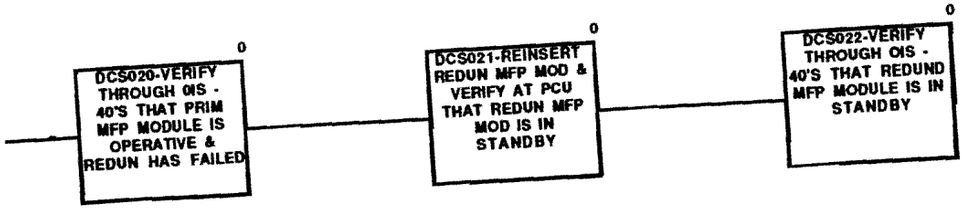
Reserved Activity Numbers

dcs041	dcs046
dcs042	dcs047
dcs043	dcs048
dcs044	dcs049
dcs045	dcs050

lan dcs001
han dcs

DCS START UP TEMPLATE

Issue #1, 2, 3 & 4 - not used
Issue #5 - November 23, 1992
i5 tgx stup - imw50% & stw60%lgl
disk 333



Network Model for T. B. Simon Power Plant Unit 4 Michigan State University East Lansing, Michigan

Robert Ellerhorst - Director of Utilities
Roy Gies - Start Up Manager
Ron McClintic -
Richard Wever - Construction Superintendent
Jim Simons - Construction Project Representative

Ralph J. Stephenson PE PC
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858
ph 517 772 2537

Sheet #dcs1

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
1	0.000	Plant #4 start up												
2	1.000	Ground cable tray										que		
3	2.000	Install cable tray										que		
4	3.000	Install instrument conduit to junction boxes										que		What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
5	4.000	Pull instrument wire from ? to ?										que		What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
6	5.000	Make instrument wiring final connections										que		What is included in this set of activities?
7	6.000	Install isolated instrument grounding										que		
8	7.000	Install lighting conduit from ? to ?										que		Does this include the Unistrut support grid?
9	8.000	Install 110 V power conduit from ? to ?										que		What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
10	9.000	Install lighting panels										que		Could start at different time than lighting conduit
11	10.000	Pull lighting wire from ? to ?										que		
12	11.000	Pull 110 v power wire from ? to ?										que		

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
13	12.000	Make final 110 v power connections										que		To what equipment?
14	13.000	Install light fixtures										que		TC up to start (on flip chart - what does this mean?)
15	14.000	Install Unistrut support system										que		
16	15.000	Install equipment power conduit										que		How does this differ from oen 8? - What are the various run segements by which the bulk conduit runs can be distinguished from the system conduit runs?
17	16.000	Pull equiment wire										que		Is a wiring plan needed for this activity?
18	17.000	Make final equipment power connections										que		
19	18.000	Prepare & submit bus duct location drawings										msu/bai		15 kv & 600 v ?
20	19.000	a/e review & approve bus duct location drawings										b&v		15 kv & 600 v ?
21	20.000	dafd (Detail, approve, fab & deliver) mcc's 41 & 42										msu/wes/bai/b&v		ofe - Owner furnished euipment - to begin shipping 08/28/92, will deliver one pair per week
22	21.000	dafd dcs cabinets 428 & 429										msu/bai/b&v		ofe - Owner furnished euipment
23	22.000	dafd 13.8 kv distribution switch gear										msu/cpc?/b&v		ofe - Owner furnished euipment
24	23.000	dafd mcc's 43 & 44 with dcs (distributed control system?) cabinets 431 & 432)										msu/wes/bai/b&v/		ofe - Ower furnished equipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
25	24.000	dafd mcc's 45 & 46 with dcs (distributed control system) cabinets 411 & 412										msu/wes/bai/b&v		ofe - Owner furnished euipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs
26	25.000	dafd free standing dcs cabinets										msu/bai/b&v		ofe
27	26.000	dafd 4160 v substation (transformers ?)										msu/wes/b&v	x	ofe
28	27.000	dafd 480 v substation (transformers ?)										msu/wes/b&v/	x	ofe
29	28.000	dafd ess 2-4 batteries										msu	x	ofe
30	29.000	dafd mcc 47										msu/		ofe
31	30.000	dafd mcc 48										msu/wes/b&v		ofe
32	31.000	dafd ess distribution panel										msu		ofe ?
33	32.000	dafd ess ac power panels										que		
34	33.000	dafd ess inverter										msu		ofe ?
35	34.000	dafd ess dc power panels										que		
36	35.000	dafd ess battery chargers (3)										msu/	x	ofe ?

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
37	36.000	Set mcc's 41 & 42						851'0" - col line E12	4APC-MCC-42			que/		ofe - Owner furnished euipment - to begin shipping 08/28/92, will deliver one pair per week
38	37.000	Set dcs cabinets 428 & 429										msu/bai/b&v		ofe - Owner furnished euipment
39	38.000	Set 13.8 kv distribution switch gear										msu/cpc?/b&v	x	ofe - Owner furnished euipment
40	39.000	Set mcc's 43 & 44 with dcs (distributed control system?) cabinets 431 & 432)						875' 0" col line - E14				que/	x	ofe - Ower furnished equipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs
41	40.000	Set mcc's 45 & 46 with dcs (distributed control system) cabinets 411 & 412						875'0" - col line B11				que/		ofe - Owner furnished euipment - Bailey attaches dcs cabinets to mcc's at their plant, tests the units, and delivers to site - Quality installs
42	41.000	Set free standing dcs cabinets										msu/bai/b&v		ofe
43	42.000	Set 4160 v substation (transformers ?)										msu/wes/b&v	x	ofe
44	43.000	Set 480 v substation (transformers ?)						861'4 1/2" - col line K12				que/	x	ofe
45	44.000	Set ess 2-4 batteries										msu	x	ofe
46	45.000	Set mcc 47	hrx/apc/					Cooling tower				que/		ofe - set with mcc 48
47	46.000	Set mcc 48	hrx/apc/					Cooling tower				que/		ofe - set with mcc 47
48	47.000	Set ess distribution panel										que/	x	ofe ?

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
49	48.000	Set ess ac power panels										que	x	
50	49.000	Set ess inverter										que/	x	ofe ?
51	50.000	Set ess dc power panels										que		
52	51.000	Set ess battery chargers (3)						890' 0" - col line K12				que/	x	ofe ?
53	52.000	dafd alternate source transformer										msu		ofe
54	53.000	Set alternate source transformer										que		
55	54.000	dafd lighting switchgear substation										que/b& v /		
56	55.000	Set lighting switchgear										que		
57	56.000	dafd lighting panels										que		
58	57.000	Pull main feed from cable vault to chemical electrical building										que		
59	58.000	Pull main feed to cooling tower				445						que		
60	59.000	Pull main feed in pp #4 from n end cable vault to s end pull box										que		

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
6 1	60.000	mfc to equipment as noted in 60.000 series from 4160 substation 41									4160 substation 41			
6 2	60.001	mfc to 1A equipment spare *(?)									4160 substation 41			
6 3	60.002	mfc to bfw pump 1A	sgx/	fwx		420/421/422		851'0" - col line D11	4FWAE-100501	4FWA-P-1A	4160 substation 41A	abc/tam?		Who's responsible for this action?
6 4	60.003	mfc to id fan 1A	sgx/	fwx		401/402/403		877'0" - col line AA12	4CCBE-100501	4CCB-FAN-1A	4160 substation 41A	abc/tam?		Who's responsible for this action?
6 5	60.004	mfc to pt (potential transformers) compt									4160 substation 41A			
6 6	60.005	mfc to pt (potential transformers) compt									4160 substation 41B			
6 7	60.006	mfc to id (induced draft) fan 1B	sgx/			420/421/422		877'0" - col line AA14	4CCBE-100502	4CCB-FAN-1B	4160 substation 41B	abc/tam ?		Who's responsible for this action?
6 8	60.007	mfc to ct (current transformer) compt									4160 substation 41A			
6 9	60.008	mfc to bfw pump 1B	sgx/	fwa		420/421/422		851'0" - col line D11	4FWAE-100502	45GA-P-1B	4160 substation 41B	abc/tam		Who's responsible for this action?
7 0	60.009	mfc to equipment spare (no connection to be made)*									4160 substation 41			No connection. Does't need to be made
7 1	60.010	mfc to spare*									4160 substation 41			
7 2	60.011	mfc to pa fan 1B	sgx/					930'9" - col line B13	4SGAE-100502	45GA-FAN-1B	4160 substation 41B	abc/tam ?		Who's responsible for this action?

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
73	60.012	mfc to ct (current transformer)trans compt									4160 substation 41B			
74	60.013	mfc to main bkr									4160 substation 41A			
75	60.014	mfc DELETED												
76	60.015	mfc to tie brk*									4160 substation 41			
77	60.016	mfc to main bkr								4SGA-FAN-1A	4160 substation 41B			
78	60.017	mfc to pa fan 1A	sgx/	cco/		408/409		930'9" - col line A13	4SGAL-100501		4160 substation 41	abc/tam		Who's responsible for this action?
79	60.018	mfc to spare*									4160 substation 41			
80	60.019	mfc to attemporator spray pump	sgx/	fwg/		417/418			4FWGE-100502	4FWG-P-1B	4160 substation 41B			
81	60.020	mfc to attemporator spray pump	sgx/	fwg/		417/418			4FWGE-100501	4FWG-P-1A	4160 substation 41A			
82	61.000	mfc to equipment as noted in 61.000 series from 480 v substation 41								4APC-SUS-41	480 v substation 41	que/		
83	61.001	mfc to instruments - same as 61.004*									480 v substation 41	tam/que		tam installs from instrument to a junction box. Quality installs from junction box to substation
84	61.002	mfc to battery charger #24C	apj/					890'0" - col line K12	CAPHE 100611	CAPH-CHGR-24C	480 v substation 41B			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
85	61.003	mfc to equipment spare*									480 v substation 41			
86	61.004	mfc tol instruments 2 ?- same as 61.001?*									480 v substation 41	tam/que		tam installs from instrument to a junction box. Quality installs from junction box to substation
87	61.005	mfc to equipment*									480 v substation 41			
88	61.006	mfc to mcc 41 - main breaker				428/429			4APCE-100601	4APC-MCC-41	480 v substation 41			
89	61.007	mfc to instruments 3 ?*									480 v substation 41	que/tam		tam installs from instrument to a junction box. Quality installs from junction box to substation
90	61.008	mfc to main bkr 1 - bus duct (600V)									480 v substation 41			
91	61.009	mfc blank 1*									480 v substation FMR 41A			
92	61.010	mfc to ltg sub							4APBE-100601	4APB-LSUB-41	480 v substation 41B			
93	61.011	mfc main breaker to mcc 48						Cooling tower	4APC-100608	4APC-MCC-48	480 v substation 41B	que/		
94	61.012	mfc spare*									480 v substation 41			
95	61.013	mfc main breaker to mcc 46						875'0" - col line B11	4APC-100654	4APC-MCC-4L	480 v substation 41B	msu/que		
96	61.014	mfc main breaker to mcc 44							4APC-100604	4APC-MCC-44	480 v substation 41B	que		

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
97	61.015	mfc main breaker to mcc 42						851'0" - col line E12	4APC-100602	4APC-MCC-42	480 v substation 41	que/		
98	61.016	mfc to tie breaker*									480 v substation 41			
99	61.017	mfc blank 2*									480 v substation 41			
100	61.018	mfc to fire pump / cntrl cab	fpx/					851'0" - col line E14	4FPU - 100609	4FPU-P-1	480 v substation 41A	que		
101	61.019	mfc to battery charger 24A	apj/					890' 0" - col line K12	CAPH-100610	CAPH-CHGR-24A	480 v substation #41B	que/	x	
102	61.020	mfc spare 3*									480 v substation 41			
103	61.021	mfc main breaker to mcc 43				431/		875'0" - col line E14	4APC-100603	4APC-MCC-43	480 v substation 41A	que/		
104	61.022	mfc main breaker to mcc 45				411/412		875'0" - col line B11	4APC-100651	4APC-MCC-45	480 v substation 41A	que/		
105	61.023	mfc main breaker to mcc 47	apc/hrx					chemical / electrical building	4APC-100607	4APC-MCC-47	480 v substation 41A	que/		
106	61.024	mfc to main bkr									480 v substation FMR 41B			
107	61.025	mfc blank 3*									480 v substation 41			
108	61.026	mfc to battery charger 24B	apj/					890' 0" - col line K12	CAPH	CAPH-CHGR-24B	480 v substation #2	que/	x	

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
109	62.000	mfc to equipment as noted in 62.000 series from substation 2									substation 2			
110	62.001	mfc to battery charger 24B	apj/					890' 0" - col line K12	CAPH-100601	CAPH-CHGR-24C	480V sub station #2	que/		
111	63.000	mfc to equipment as noted in 63.000 series from substation 6									substation 6	que/		
112	63.001	mfc from substation #6 to mcc 1A, 1B & 1C							CAPCE-100601		480V sub station #6	que/		
113	64.000	mfc to equipment as noted in 64.000 series from boiler / turbine mcc 41	hrx/sgx/tgx	fwa/							boiler / turbine mcc 41	que/		
114	64.001	mfc to bf pump lube oil pump 2A	sgx/	fwa/		420/421/422	428/431	7c	4FWAE 120101	2A 4FW A -P - 2A	boiler / turbine mcc 41			
115	64.002	mfc to turb lube oil vapor exhauster	tgx/			434/435/436	428/	5	4TGDE 120101	4TGD - EXH -1	boiler / turbine mcc 41			
116	64.003	mfc to turb gen main lube oil pum 1A	tgx/	tgd/		434/435/436/	428/	5	4TGDE 120102	1A 4TGD - P -1A	boiler / turbine mcc 41			
117	64.004	mfc to bed ash screw cooler feeder 3A	sgx/	asg/		405/406/	414/col	2a	4SGAE 120101	3A 4SGA - CLR - 3A	boiler / turbine mcc 41			
118	64.005	mfc to attemporator spray pump 1A	sgx/	fwg/		420/421/422/	411/405/408/417 /428/431	7c	?	1A 4FWG-P-1A	boiler / turbine mcc 41			
119	64.006	mfc to attemporator spray pump 1B	tgx/	fwg/		420/421/422/	411/405/408/417 /428/431	7c	4ECBE-120102	1B 4FWG-P-1B	boiler / turbine mcc 42			√check the oen for this equipment - it is a duplicate number.
120	64.007	mfc to stm seal inlet blk vlv	tgx/	tgc/		434/435/436	428/	5	4TGCE 120104	4TGC - BV - 0001	boiler / turbine mcc 41			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
121	64.008	mfc to turb ms drip leg	tgx/	tgc/		434/435/436	428/	5	4SGGE 120101	4SGG - MBV - 0012	boiler / turbine mcc 41			
122	64.009	mfc to close cycle cooling water pump	hrx/	ecb/		414/415/	428/417/	2c	4ECBE 120101	4ECB - P - 1A	boiler / turbine mcc 41			
123	64.010	mfc to attemp spray mxd air comp	sgx/	fwg/		405/406/	411/col/	2a	4FWAE- 120101	4FWG - CMP - 1	boiler / turbine mcc 41			
124	64.011	mfc to mxd bed demin recycle pump	sgx/	fwg/		405/406/	411/col/	2a	4FWGE 120104	4FWG - P - 2	boiler / turbine mcc 41			
125	64.012	mfc to turb css extn stm vlv	tgx/	tea/		434/435/436/	428/	5	4TEAE- 120101	4ETA - MBV - 0005	boiler / turbine mcc 41			
126	64.013	mfc to condenser hotwell pump	tgx/	fwc/		420/421/422/	405/408/411/417 /428/431/	7c	4FWCE- 120101	1A 4FWC - P - 1A	boiler / turbine mcc 41			
127	64.014	mfc to turb gen drain valve (hrx?)	tgx/	tgc/		434/435/436/	428/	5	4TGCE- 120101	1 4TGC - DR - 1	boiler / turbine mcc 41			
128	64.015	mfc to turb gen drain valve (hrx?)	tgx/	tgc/		434/435/436/	428/	5	4TGCE- 120102	2 4TGC - DR - 2	boiler / turbine mcc 41			
129	64.016	mfc to turb gen drain valve (hrx?)	tgx/	tgc/		434/435/436/	428/	5	4TGCE- 120103	3 4TGC - DR - 3	boiler / turbine mcc 41			
130	64.017	mfc to enc fluid pump	tgx/	tgf/		434/435/436/	428/	5	4TGFE- 120101	1A 4TGF - P - 1A	boiler / turbine mcc 41			
131	64.018	mfc to bldg htng condensate return pumps 1A & 1B	bsx/scx/	sca/		?	?		4SCAE- 120101	4SCA - P - 1A & 4SCA - P - 1B	boiler / turbine mcc 41			
132	64.019	mfc to boiler area 480 v pwr pnl 41	sgx/					851'0" - col line B.4-12	4APC- 120101	41 4APC - PPL -	boiler / turbine mcc 41	que		

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
133	64.020	mfc to attemp spray cross tie isol	sgx	fwg/		417/418/		7c	4FWAE-120103	4FWA - MBV - 0023	boiler / turbine mcc 41			
134	64.021	mfc to turb uncntrl extrn stm vlv	tgx/tex	tea/		434/435/436/	428/	5	4TEAE-120102	4TEA - MBV - 0001	boiler / turbine mcc 41			
135	64.022	mfc to turb extrn dripleg vlv 2	tgx/tex/	tec/		434/435/436/	428/	5	4TECE-120101	2 4TEC - MBV - 0002	boiler / turbine mcc 41			
136	64.023	mfc to turb extrn dripleg vlv	tgx/tex/	tec/		434/435/436/	428/	5	4TCEC-120102	8 4TEC-MBV- 0008	boiler / turbine mcc 41			
137	64.024	mfc incoming from 480 v sus bus							4APC-120101	41A 4APC-SUS-41	boiler / turbine mcc 41			
138	64.025	mfc to turb cnrl extn after blk vlv drip leg	tgx/	tec/		434/435/436/	428/	5	4TECE-120105	4TGC-DR-3	mcc 41			
139	65.000	mfc to equipment as noted in 65.000 series from boiler / turbine mcc 42	tgx/sbx/								boiler / turbine mcc 42	que/		√
140	65.001	mfc to bfw pump lube oil pump 2B	sgx/fwx/	fwa/					4FWAE-120102	2B 4FWA-P-2B	boiler / turbine mcc 42			√
141	65.002	mfc to turb gen aux lube oil pum 1B	tgx/	tgd/		434/435/436/	428/	5	4TGDE-120103	1B 4TGO-P-1B	boiler / turbine mcc 42			√
142	65.003	mfc to bed ash screw cooler feeder 3B	sgx/asx	asg/					4SGAE-120102	3B 4SGA-CLR-3B	boiler / turbine mcc 42			√
143	65.004	mfc to turb ms drip leg	tgx/	tgc/		434/435/436/	428/	5	4SGGE-120102	4SGG-MBV-0037	boiler / turbine mcc 42			√
144	65.005	mfc to closed cycle cooling water pump 1B	hrx/ecx/	ecb/		414/415/	417/428/	2c	4ECBE-120102	1B 4ECB-P-1B	boiler / turbine mcc 42			√

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
145	65.006	mfc to attemp spray pp lub oil pump	sgx/fwx/	fwg/					4FWGE-120105	4FWG-P-3A	boiler / turbine mcc 42			√
146	65.007	mfc to condenser hotwell pump 1B	tgx/fwx/	fwc/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4FWCE-120102	1B 4FWC-P-1B	boiler / turbine mcc 42			√
147	65.008	mfc to ehc fluid pump 1B	tgx/	tgf/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4TGFE-120102	1B 4TGF-P-1B	boiler / turbine mcc 42			√
148	65.009	mfc to bldg htng condensate rtn pumps 2A & 2B	bsx/scx/	sca/					4SCAE-120102	2A & 2B, 4SCA-P-2A, & 4SCAJ-P-2B	boiler / turbine mcc 42			√
149	65.010	mfc to attemp spray pp lube oil pump	sgx/fwx/	fwg/					4TWGE-120106	4FWG-P-3B	boiler / turbine mcc 42			√
150	65.011	mfc to incoming from 480 v sus bus 41B							4APC-SUS-41	41B 4APC-SUS-41	boiler / turbine mcc 42			√
151	65.012	mfc to turning gear	tgx/	tga/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4TGAE-120101	4TGA-TGR-1	boiler / turbine mcc 42			√
152	65.013	mfc to gland steam condenser blower	tgx/	tgc/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4TGCE-120105	4TGCJ-BLO-1	boiler / turbine mcc 42			√
153	65.014	mfc to service water booster pump cab (vfd)	hrx/wsx/	wsc/					CWSCE-120102	CWSC-VDR-1	boiler / turbine mcc 42			√
154	65.015	mfc to turb underfloor dry pipe air comp?	fpx/bsx						4FBUE-120101	4FPU-CMP-1	boiler / turbine mcc 42			√
155	65.016	mfc to main steam header drip leg lvl cntrl vlv	tgx/	tgc/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4SGGE-120103	4SGF-LCV-0013	boiler / turbine mcc 42			√
156	65.017	mfc to main steam header drip leg lvl cntrl vlv	tgx/	tgc/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4SGGE-120104	4SGF-LCV-0014	boiler / turbine mcc 42			√

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
157	65.018	mfc to turb css extn drip leg vlv 14	tgx/tex/	tec/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4TECE-120103	14 4TEC-MBV-0014	boiler / turbine mcc 42			√
158	65.019	mfc to turb css extn drip leg vlv 20	tgx/tex/	tec/		420/421/422/434/435/436	405/408/411/417/428/431/	7c	4TECE-120104	20 4TEC-MBV-0020	boiler / turbine mcc 42			√
159	65.020	mfc to cond outlet valve	hrx/	hrc/					4HRCE-120101	4HRC-MBV-16	boiler / turbine mcc 42			√
160	65.021	mfc to cond inlet valve	hrx/	hrc/					4HRCE-120102	4HRC-MBV-17	boiler / turbine mcc 42			√
161	65.022	mfc Deleted - 9/22/92												
162	65.023	mfc to boiler area 480 v pwr panel 42	apx/	apd/				851'0" - col line E12	4APC-100602	4APC-PPL-42	boiler / turbine mcc 42	que/		√
163	65.024	mfc to turb before stop vlv drip leg	tgx/	tgc/		420/421/422/434/435/436			4SGGE-120102	4SGG-MBV-0037	boiler / turbine mcc 42			
164	65.025	mfc to bfw pump lube oil pump 2B	sgx/fwa/	fwx/					4FWAE-120102	4FWAE-P-2B	boiler / turbine mcc 42			
165	66.000	mfc to equipment as noted in 66.000 series from boiler turbine mcc 43	tgx/sgx/bsx/								boiler / turbine mcc 43	que/		
166	66.001	mfc to coal conveyor drive system	sgx/chx/	chd/					4CHDE-120210	4CHD-BLT-1	boiler / turbine mcc 43			
167	66.002	mfc to coal handling tripper drive system	sgx/chx/	chd/					4CHDE-120211	4CHD-BLT-1	boiler / turbine mcc 43			
168	66.003	mfc to sand chute gate 1A	sgx/bmx/	bme/		420/421/422/	405/411/428/408/417/431/	7c	4BMEE-120201	1A 4BME-CHE-1A	boiler / turbine mcc 43			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
169	66.004	mfc to coal tripper fire protection air compressor	bsx/fpx	fpu/					4FPUE-120201	4FPU-CMP-2	boiler / turbine mcc 43			
170	66.005	mfc to control air compress 1A	cax/	cab/					4CABE-120201	1A 4CAB-CMP-1A	boiler / turbine mcc 43			
171	66.006	mfc to coal discharge gate 2A	sgx/chx/	chc/		720/721/722/	405/408/411/417 /428/431/	7c	4CHDE-120202	2A 4CHD-GAT-2A	boiler / turbine mcc 43			
172	66.007	mfc to coal discharge gate 2B	sgx/chx/	chc/		720/721/722/	405/408/411/417 /428/431/	7c	4CHDE-120203	2B 4CHD-GAT-2B	boiler / turbine mcc 43			
173	66.008	mfc to coal feed chute gate 3A	sgx/chx/	chc/		720/721/722/	405/408/411/417 /428/431/	7c	4CHDE-120206	3A 4CHD-GAT-3A	boiler / turbine mcc 43			
174	66.009	mfc to coal feed chute gate 3B	sgx/chx/	chc/		720/721/722/	405/408/411/417 /428/431/	7c	4CHDE-120207	3B 4CHD-GAT-3B	boiler / turbine mcc 43			
175	66.010	mfc Deleted - 9/22/92												
176	66.011	mfc to incoming from 480 v sus bus 41A	apx/						4APC-120201	41A 4APC-SUS-41	boiler / turbine mcc 43			
177	66.012	mfc to boiler area 480 v pwr pnl 43	apx/	apc/				875'0" - col line C.3 - 14	4APC 120201	43 4APC-PPL-43	boiler / turbine mcc 43	que/		
178	66.013	mfc to battery room air handling unit	bsx/scx/apx/	sca/apj/			??		4SCAE-120201	4SCA-AHU-1	boiler / turbine mcc 43			
179	67.000	mfc to equipment as noted in 67.000 series from boiler / turbine mcc 44	sgx/								boiler / turbine mcc 44	que/		
180	67.001	mfc to attemp spray blk vlv 4FWG -MBV-25	sgx/	fwg/					4FWGE 120201	4FWG -MBV-25	boiler / turbine mcc 44			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
181	67.002	mfc to incoming line from 480 v sus bus 41B							4APC-USU-41	41B 4APC-USU-41	boiler / turbine mcc 44			
182	67.003	mfc to coal discharge gate 2C	sgx/	cab/		720/721/722	405/408/411/417/428/431/	7c	4CHDE 120204	2C 4CHD-GAT-2C	boiler / turbine mcc 44			
183	67.004	mfc to coal discharge gate 2D	sgx/	cab/					4CH2E 120205	2D 4CHD-GAT-2D	boiler / turbine mcc 44			
184	67.005	mfc to coal feed chute gate 3C	sgx/	cab/		420/421/422/	405/408/411/417/428/431/	7c	4CHDE 120208	3C 4CHD-GAT-3C	boiler / turbine mcc 44			
185	67.006	mfc to coal feed chute gate 3D	sgx/	cab/		420/421/422/	405/408/411/417/428/431/	7c	4CHDE 120209	3D 4CHD-GAT-3D	boiler / turbine mcc 44			
186	67.008	mfc to sand rotary screw feeder 4BME-FDR-1	sgx/bmx/	bme/		420/421/422/	405/408/411/417/428/431/	7c	4BMEE 120203	4BME-FDR-1	boiler / turbine mcc 44			
187	67.009	mfc to control air compressor 1B	cax/	cab/		420/421/422/	405/408/411/417/428/431/	7c	4CABE 120202	1B 4CAB-CMP-1B	boiler / turbine mcc 44			
188	67.010	mfc to sand discharge gate	sgx/bmx/	bme/		420/421/422/	405/408/411/417/428/431/	7c	4BMEE 120204	4BME-GAT-1	boiler / turbine mcc 44			
189	67.011	mfc to sand chute gate 1B	sgx/bmx/	bme/		420/421/422/	405/408/411/417/428/431/	7c	4BMEE 120202	1B 4BME-CHE-1B	boiler / turbine mcc 44			
190	67.012	mfc to unit 4 elevator 4BSA-ELEV-2	bsx/						4BSAE 120203	4BSA-ELEV-2	boiler / turbine mcc 44			
191	67.013	mfc desc dryer cntrl panel	cax/	cab/		420/421/422/	405/408/411/417/428/431/	7c	4CABE 120201	4CAB-PNL-1	boiler / turbine mcc 46			
192	68.000	mfc to equipment as noted in 68.000 series from fabric filter mcc 45	ccx/sgx/								fabric filter mcc 45	que/		

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
193	68.001	mfc to urea bldg 480 v pwr pnl 45	sgx/ccx/	bsb/apc/		414/415/	411/417/420/428/	851'0" - urea bldg - 2c	4APC 120302	45 4APC-PPL-45	fabric filter mcc 45	que/		
194	68.002	mfc to fluoseal blower 1A	sgx/	sga/		414/415/	411/417/420/428/	2c	4SGAE 120301	1A 4SGA-BLO-1A	fabric filter mcc 45			
195	68.003	mfc to primary air fan 1A outlet damper	sgx/	sgb/		420/421/422/	405/408/411/417/428/431/	7c	4SGAE 120303	4SGA-DMPR-1A	fabric filter mcc 45			
196	68.004	mfc to secondary air fan 2A outlet damper	sgx/	sgb/		420/421/422/	405/408/411/417/428/431/	7c	4SGAE 120305	4SGA-DMPR-2A	fabric filter mcc 45			
197	68.005	mfc to secondary air fan 2A	sgx/	sgb/		408/409/	414	6	4SGAE 120307	2A 4SGA-FAN-2A	fabric filter mcc 45			
198	68.006	mfc to soot blower cont cab	sgx/	sgi/		408/409/	411/col	6	4SGIE 120301	4SGI-CAB-1	fabric filter mcc 45			
199	68.007	mfc to limestone rotary feed valve 2A	sgx/bmx/	bmd/		405/406/	411/col	2a	4BMDE 120303	2A 4BMD-FDR-2A	fabric filter mcc 45			
200	68.008	mfc to ash conditioner 4ASF-MIX-1	ccx/asx/	asg/		405/406/	411/col	2a	4ASFE 120302	4ASF-MIX-1	fabric filter mcc 45			
201	68.009	mfc to ash handling vacuum exhauster 1A	ccx/	asg/asf/		405/406/	411/col	2a	4ASGE 120301	1A 4ASG-EXH-1A	fabric filter mcc 45			
202	68.010	mfc to limestone discharge gate 1A	sgx/bmx/	bmd/		405/406/	411/col	2a	4BMDE 120301 ?	1A 4BMO-GAT-1A	fabric filter mcc 45			
203	68.011	mfc to limestone conveying sys blower 1A	sgx/bmx/	bmd/		405/406/	411/col	2a	4BMDE 120301 ?	1A 4BMD-BLO-1A	fabric filter mcc 45			
204	68.012	mfc to rev air gas fan 2A	ccx/			401/402/403/		1	4CCBE 120301	2A 4CCB-FAN-2A	fabric filter mcc 45			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
205	68.013	mfc to noxout sncr sys circ pump 1A	ccx/cem/			414/415/	411/417/420/428/	2c	4SGLE 102301	1A 4SGL-P-1A	fabric filer mcc 45			
206	68.014	mfc to noxout sncr sys water pump 3A	ccx/cem/	sgl/		414/415/	411/417/420/428/	2c	4SGLE 120301	3A 4SGL-P-3A	fabric filer mcc 45			
207	68.015	mfc to incoming line from 480 v sus bus 41A	ccx/						4APE 100651	41A 4APC-SUS-41	fabric filer mcc 45			
208	69.000	mfc to equipment as noted in 69.000 series from fabric filter mcc 46	ccx/sgx/								fabric filter mcc 46			
209	69.001	mfc to noxout sncr sys circ pump 1B	ccx/cem/	sgl/		414/415/	411/417/420/428/	2c	4SGLE 120302	1B 4SGL-P-1B	fabric filter mcc 46			
210	69.002	mfc to limestone rotary feed valve 2B	sgx/bmx/	bmd/		405/406/	411/col	2a	4BMDE 120304	2B 4BMD-FDR-2B	fabric filer mcc 46			
211	69.003	mfc to noxout sncr sys water pump 3B	ccx/cem/	sgl/		414/415/	411/417/420/428/	2c	4SGLE 120304	3B 4SGL-P-3B	fabric filter mcc 46			
212	69.004	mfc to incoming line from 480 v sus bus 41B	ccx/						4APCE 100653	41B 4APC-SUS-41	fabric filter mcc 46			
213	69.005	mfc to limestone discharge gate 1B	sgx/bmx/	bmd/		405/406/	411/col/	2a	4BMDE 120306	1B 4BMD-GAT-1B	fabric filter mcc 46			
214	69.006	mfc to limestone conveying sys blower 1B	sgx/bmx/	bmd/		405/406/	411/col/	2a	4BMDE 120302	1B 4BMD-BLD-1B	fabric filter mcc 46			
215	69.007	mfc to rev air bas fan 2B	ccx/			405/406/	411/col/	2a	4CCBE 120302	2B 4CCB-FAN-2B	fabric filter mcc 46			
216	69.008	mfc to ash silo fldzg air heater 4ASF-HTR-1	ccx/asx/	asg/					4ASFE 120303	4ASF-HTR-1	fabric filter mcc 46			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
217	69.009	mfc to ash unloading room vent fan 4SCA-FAN-1	ccx/asx/	asg/					4SCAE 120301	4SCA-FAN-1	fabric filter mcc 46			
218	69.010	mfc to primary air fan 1B outlet damper 4SGA-DMPR-1B	sgx/	sgb/		408/409/	414/	6	4SGAE 120304	4SGA-DMPR-1B	fabric filter mcc 46			
219	69.011	mfcto ash handling vacuum exhauster 1B	ccx/asx	asg/					4ASGE 120302	1B 4ASG-EXH-1B	fabric filter mcc 46			
220	69.012	mfc to secondary air fan 2B outlet damper	sgx/	sgb/		408/409/	414/	6	4SGAE 120302	4SGA-DMPR-2B	fabric filter mcc 46			
221	69.013	mfc to secondary air fan 2B	sgx/	sgb/		408/409/	414/	6	4SGAE 120308	2B 4SGA-FAN-2B	fabric filter mcc 46			
222	69.014	mfc to fabric filter 480 v hop htr cntrl pnl	ccx/			401/402/403/		1	4CCBE 120304	4CCB-CPL-1	fabric filter mcc 46			
223	69.015	mfc to fluoseal blowr 1B	sgx/	sgb/		408/409/	414	6	4SGAE 120302	1B 4SGA-BLO-1B	fabric filter mcc 46			
224	69.016	mfc to boiler area 480 v pwr pnl 44	ccx/					875'0" - col line E14	4APCE 120301	44 4APC-PPL-44	fabric filter mcc 46	que/		
225	69.017	mfc to unit 4 overhead equipment hoist	bsx/						4BSAE 120301	4BSA-HST-1	fabric filter mcc 46			
226	69.018	mfc to ash silo outlet valve	ccx/	asf/					4ASFE 120301	4AST-MOV-0005	fabric filter mcc 46			
227	69.019	mfc to rev. air gas fan 2B	ccx/			401/402/403/		1	4CCBE 120302	4CCB-FAN-2B	fabric filter mcc 46			
228	70.000	mfc to equipment as noted in 70.000 series from cooling tower mcc 47	hrx/								cooling tower mcc 47	que/		

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
229	70.001	mfc to cooling tower fan 1B	hrx/			445/	443/	10	4HRCE 120406	1B 4HRC-MFAN-1B	cooling tower mcc 47			
230	70.002	mfc to cooling tower 480 - 120/208 v ltng xfmr 47	hrx/		apb/	445/	443/	10	4APBE	47 4APB-LXF-47	cooling tower mcc 47	que		
231	70.003	mfc to cooling tower fan 1A	hrx/			445/	443/	10	4HRCE 120405	1A 4HRC-MFAN-1A	cooling tower mcc 47			
232	70.004	mfc to cooling tower bypass valve	hrx/			445/	443/	10	4HRCE 120413	4HRC-MBV-0014	cooling tower mcc 47			
233	70.005	mfc to circ water pump 1A	hrx/			445/	443/	10	4HRCE 120409	1A 4HRC-P-1A	cooling tower mcc 47			
234	70.006	mfc to circ water pump 1B	hrx/			445/	443/	10	4HRCE 120410	1B 4HRC-P-1B	cooling tower mcc 47			
235	70.007	mfc to incoming line from 480 v sus bus 41A	hrx/			445/	443/	10	4APCE 100607	41A 4APC-SUS -41	cooling tower mcc 47			
236	71.000	mfc to equipment as noted in 71.000 series from cooling tower mcc 48	hrx/						4APCE 100608		cooling tower mcc 48	que/		
237	71.001	mfc to circ water pump 1C	hrx/			445/	443/	10	4HRCE 120411	1C 4HRC-P-1C	cooling tower mcc 48			
238	71.002	mfc to circ water pump 1D	hrx/			445/	443/	10	4HRCE 120412	1D 4HRC-P-1D	cooling tower mcc 48			
239	71.003	mfc cooling tower 480 v ltng xfmr 48	hrx/			445/	443/	10	4APBE 120402	48 4APB-LXF-48	cooling tower mcc 48			
240	71.004	mfc to cooling tower fn 1D	hrx/			445/	443/	10	4HRCE 120408	1D 4HRC-MFAN-1D	cooling tower mcc 48			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
241	71.005	mfc to cooling tower fn 1C	hrx/			445/	443/	10	4HRCE 120407	1C 4HRC-MFAN-1C	cooling tower mcc 48			
242	71.006	mfc to electrical unit heaters	bsx/	bsh/bso/		445/	443/	10	4SCEE 120401	4SCE-EUHT-3, 2, 1	cooling tower mcc 48			
243	73.000	mfc to 15 kv switchgear												
244	74.000	mfc to 5 kv switchgear												
245	75.000	mfc to 600 v switchgear												
246	76.000	mfc to dcs 428, 429, 437, 432, 411 & 412 on mcc's										que/		
247	77.000	mfc to free standing dcs cabinets	cox/apx/	coa/api/										
248	78.000	mfc to high voltage transformers												
249	79.000	mfc to new ois at existing control room	cox/apx/	coa/api/										opis - operator interface system
250	80.000	Owner furnish dafd ois equiment	cox/apx/									msu		
251	81.000	Test all systems										all		To be defined with utilities operating staff of msu in conjunction with the installing contractors - see sect 16d of specifications
252	82.000	Test all equipment										all		To be defined with utilities operating staff of msu in conjunction with the installing contractors

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
253	84.000	mfc (make final connections) from lighting substation 41	apx/	apb/				861'4 1/2 col J, row 12		4APB-LSUB-41	lighting sub 41			
254	84.001	mfc to 120/208 v lighting panel 41	apx/	apb/					4APBE 160101	4APB-LPL-41	lighting sub 41			
255	84.002	mfc to 120/208 v lighting panel 43	apx/	apb/					4APBE 160103	4APB-LPL-43	lighting sub 41			
256	84.003	mfc to 120/208 v lighting panel 45	apx/	apb/					4APBE 160105	4APB-LPL-45	lighting sub 41			
257	84.004	mfc to 120/208 v power panel 41	apx/	apb/					4APBE 160111	4APB-PPL-41	lighting sub 41			
258	84.005	mfc to fab filter baghouse 120/208 v L. P. L. 41	apx/	apb/					4CCBE 160101	4CCB-LPL-41	lighting sub 41			
259	84.006	mfc to 120/208 v lighting panel 42	apx/	apb/					4APBE 160102	4APB-LPL-42	lighting sub 41			
260	84.007	mfc to 120/208 v lighting panel 44	apx/	apb/					4APBE 160104	4APB-LPL-44	lighting sub 41			
261	84.008	mfc to 120/208 v lighting panel 46	apx/	apb/					4APBE 160106	4APB-LPL-46	lighting sub 41			
262	84.009	mfc to 120/208 v power panel 42	apx/	apb/					4APBE 160112	4APB-PPL-42	lighting sub 41			
263	84.010	mfc to 120/208 v power panel 43	apx/	apb/					4APBE 160113	4APB-PPL-43	lighting sub 41			
264	84.011	mfc to ess 2 -4, 120/v alternate source isolation XFMER 24	apx/	apb/					CAPIE 160101	CAPI-XF-24	lighting sub 41			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
265	85.000	mfc from ess distribution panel 41A	apx/	apb/						4API-PPL-41A	ess dist panel 41			
266	85.001	mfc to mcc 41 & 42 dsc term pnl 428	apx/	apb/					4C0AE 160601	4API-PPL-41A	ess dist panel 41			
267	85.002	mfc to mcc 45 & 46 dsc term pnl 411	apx/	apb/					4COAE 160603	4API-PPL-41A	ess dist panel 41			
268	85.003	mfc to dsc node 401	apx/	api/					4COAE 160605	fab filter	ess dist panel 41			
269	85.004	mfc to dsc node 408	sgx/apx	api/					4COAE 160607	pa fans	ess dist panel 41			
270	85.005	mfc to dsc node 417	sgx/apx	api/					4COAE 160609	blr drum	ess dist panel 41			
271	85.006	mfc to dsc node 424	sgx/apx	api/					4COAE 160611	blr combust.	ess dist panel 41			
272	85.007	mfc to dsc node 438	hrx/apx/	api/hra/					4COAE 160613	condenser	ess dist panel 41			
273	85.008	mfc to dsc node 445	hrx/apx/	api/					4COAE 160615	cooling tower	ess dist panel 41			
274	85.009	mfc to mcc 43 & 44	apx/	api/					4COAE 160602	dsc term pnl 431 (equip?)	ess dist panel 41			
275	85.010	mfc to mcc 46 & 47	apx/	api/					4COAE 160604	dsc term pnl 443 (equip?)	ess dist panel 41			
276	85.011	mfc to dsc node 405	apx/	api/					4COAE 160606	ash	ess dist panel 41			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
277	85.012	mfc to dsc node 414	sgx/apx/	api/					4COAE 160608	blr pumps	ess dist panel 41			
278	85.013	mfc to dsc node 420	sgx/apx/	api/					4COAE 160610	bnr mngmnt	ess dist panel 41			
279	85.014	mfc to dsc node 434	apx/	api/					4COAE 160612	turbine	ess dist panel 41			
280	85.015	mfc to dsc node 440	apx/	api/					4COAE 160614	swgr	ess dist panel 41			
281	85.016	mfc to dsc sync. panel	apx/	api/					CC0AE 160601		ess dist panel 41			
282	85.017	mfc to dsc gateway panel	cox/apx/	api/					CC0AE 160602		ess dist panel 41			
283	86.000	mfc from ess power panel 41B	apx/					890'0"		4API-PPL-41B	ess dist panel 41 (or 21?)			what is the ess 120v ac dist panel 21 - 2API-PPL-21? What field or relation does it have to power panel #41B?
284	86.001	mfc to mcc 41 & 42 dcs term pnl 428	apx/	api/					4COAE 160621	4COA-TPL-0428	ess dist panel 41 (or 21?)			
285	86.002	mfc to mcc 45 & 46 dcs term pnl 411	apx/	api/					4COAE 160623	4COA-TPL-0411	ess dist panel 41 (or 21?)			
286	86.003	mfc to dcs node 401 term pnl (fab filter)	sgx/apx/	api/					4COAE 160625	4COA-TPL-0401	ess dist panel 41 (or 21?)			
287	86.004	mfc to dcs node 408 term pnl (pa fans)	sgx/apx/	api/					4COAE 160627	4COA-TPL-0408	ess dist panel 41 (or 21?)			
288	86.005	mfc to dcs node 424 term pnl (blr combust)	sgx/apx/	api/					4COAE 160631	4COA-TPL-0424	ess dist panel 41 (or 21?)			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
289	86.006	mfc to dsc node 438 term pnl (condenser)	hrx/apx	api/					4COAE 160633	4COA-TPL-0438	ess dist panel 41 (or 21?)			
290	86.007	mfc to dsc node 445 term pnl (unit 4 cooling tower)	hrx/apx	api/					4COAE 160635	4COA-TPL-0445	ess dist panel 41 (or 21?)			
291	86.008	mfc to mcc 43 & 44 dcs term pnl 431	apx/	api/					4COAE 160622	4COA-TPL-0431	ess dist panel 41 (or 21?)			
292	86.009	mfc to mcc 46 & 47 dcs term pnl 443	apx/	api/					4COAE 160624	4COA-TPL-0443	ess dist panel 41 (or 21?)			
293	86.010	mfc to dsc node 405 term pnl (-ash)	ccx/apx/	ags/api/					4COAE 160626	4COA-TPL-0405	ess dist panel 41 (or 21?)			
294	86.011	mfc to dsc mpde 414 term pnl (blr pumps)	sgx/apx/	fwa/					4COAE 160628	4COA-TPL-0414	ess dist panel 41 (or 21?)			
295	86.012	mfc to dcs node 420 term pnl (burner mngmnt)	sgx/apx/	sgh/api/					4COAE 160630	4COA-TPL-0420	ess dist panel 41 (or 21?)			
296	86.013	mfc to dsc node 434 term pnl (turbine)	apx/	tgf/api/					4COA3 160632	4COA-TPL-0434	ess dist panel 41 (or 21?)			
297	86.014	mfc to dsc node 440 term pnl (swgr)	apx/	apd/api/					4COA3 160634	4COA-TPL-0440	ess dist panel 41 (or 21?)			
298	86.015	mfc to dsc sync panel	ppx/apx/	api/					CCOAE 160603	CCOA-TPL-0606	ess dist panel 41 (or 21?)			
299	86.016	mfc to dsc gateway panel	apx/	api/					CCOAE 160604	CCOA-TPL-?	ess dist panel 41 (or 21?)			
300	87.000	mfc from ess panel 41c	apx/	apc/				battery room elev 890'0"	4APIE 130103	4API-PPL-41C	ess dist panel 41			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
301	87.001	mfc to boiler operator crt #1	sgx/apx/	api/					4COAT 160641	4COA-CRT-1	ess dist panel 41			
302	87.002	mfc to boiler operator crt #3	sgx/apx/	api/					4COAT 160643	4COA-CRT-3	ess dist panel 41			
303	87.003	mfc to boiler operator crt #5	sgx/apx/	api/					4COAT 160645	4COA-CRT-5	ess dist panel 41			
304	87.004	mfc to dsc local cont panel #2	apx/	api/					4COAE 160647	4COA-CPL-2	ess dist panel 41			
305	87.005	mfc to rcpt - dcs cont room printers	apx/	api/					4COAE 160648	?	ess dist panel 41			
306	87.006	mfc to cem computer	cem/apx/	api/sgl/					4COGE 16060	4COG-CPU-1	ess dist panel 41			
307	87.007	mfc to blr burner mgmt. cab.	sgx/apx	sgh/					4COAE 160649	4COA-CAB-1	ess dist panel 41			
308	87.008	mfc to boiler operator crt #2	sgx/apx	api/					4COAE 160642	4COA-CRT-2	ess dist panel 41			
309	87.009	mfc to boiler operator crt #1	sgx/apx	api/					4COAE 160644	4COA-CRT-4	ess dist panel 41			
310	87.010	mfc to dcs local control panel #1	apx/	api/					4COAE 160646	4COA-CPL-1	ess dist panel 41			
311	87.011	mfc to engineering work station	apx/	api/					CCOAE 160605	CCOA-CPU-1	ess dist panel 41			
312	87.012	mfc to cem analyzer	apx/	sgl/api/		401/402/403	411/co1/	1	4COGE 160602	4COG-ANZ-1	ess dist panel 41			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
313	87.013	mfc to fire protection panel	bsx/apx/	fpx/api/					4FPAE 160601	4FPA-CPL-1	ess dist panel 41			
314	87.014	mfc to unit 4 generator excitation	tgx/apx/	tgb/		434/435/436/	428	5	4TGBE 160601	COMPT 60	ess dist panel 41			
315	88.000	mfc from 120/208v power panel board 41 - boiler/turbine area	apx/	apb/				el 851'0" col 12, row E		4APB-PPL-41	power panel board 41			
316	88.001	mfc to phosphate solution tank mixer	sgx/fwx/apx./	fwe/apb/		420/421/422/	405/408/411/417/428/431/	7c	4FWEE 160501	4FWE-MIX-1	power panel board 41			
317	88.002	mfc to oxygen scavenger feed pump	fwx/	fwe/		420/421/422/	405/408/411/417/428/431/	7c	4FWEE 160506	4FWE-P-3	power panel board 41			
318	88.003	mfc to phosphate feed pump 1A	fwx/	fwe/		420/421/422/	405/408/411/417/428/431/	7c	4FWEE 160502	4FWE-P-1A	power panel board 41			
319	88.004	mfc to phosphate feed pump 1B	fwx/	fwe/		420/421/422/	405/408/411/417/428/431/	7c	4FWEE 160503	4FWE-P-1B	power panel board 41			
320	88.005	mfc to morpholine feed pump 2A	fwx/	fwe/		420/421/422/	405/408/411/417/428/431/	7c	4FWEE 160504	4FWE-P-2A	power panel board 41			
321	88.006	mfc to morpholine feed pump 2B	fwx/	fwe/		420/421/422/	405/408/411/417/428/431/	7c	4FWEE 160505	4FWE-P-2B	power panel board 41			
322	88.007	mfc to unit heaters 1 & 2	bsx/	bsa/tef/					4SCAE 160521	4SCA-UHT-01, 02	power panel board 41			
323	88.008	mfc to unit heaters 5, 6 & 7	bsx/	bsa/tef/					4SCAE 160522	4SCA-UHT-05, 06, 07	power panel board 41			
324	88.009	mfc to unit heaters 13, 14 & 15	bsx/	bsa/tef/					4SCAE 160521	4SCA-UHT-13, 14, 15	power panel board 41			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
325	88.010	mfc to unit heaters 16, 17 & 18	bsx/	bsa/tef/					4SCAE 160524	4SCA-UHT-16, 17, 18	power panel board 41			
326	88.011	mfc to turb/gen lub oil & ehc oil heaters	tgx/	tgf/tgd/		434/435/436/	428/	5	4TGDE 160501	4TGD-HT-1, 2	power panel board 41			
327	88.012	mfc to dsc local control panel 1	apx/	api/					4COAE 160501	4CDA-CPL-1	power panel board 41			
328	88.013	mfc to dsc local control panel 2	apx/	api/					4COAE 160502	4CDA-CPL-2	power panel board 41			
329	88.014	mfc to unit 4 generator space htrs.	tgx/	tgb/					4TGBE 160501	4TGB-JBX-???	power panel board 41			
330	88.015	mfc to unit 4 generator pmg compt light	tgx/	tgb/					4TGBE 160502	4-RECPT	power panel board 41			
331	89.000	mfc from 120/208 v power panel board 42 (?) - boiler turbine area	apx/							4APB-PPL-42	power panel board 42			
332	89.001	mfc to boiler bldg grav roof vents 1A - 1C, 1E - 1G & 1I - 1N	bsx/	bsa/					SCAE 160501	4SCA-PNL-01	power panel board 42			
333	89.002	mfc to combustion air biasing dmp 3A	sgx/	sgb/		420/421/422/	405/408/411/417 /428/431/	7c	4SCAE 160511	4SCA-MCD-3A	power panel board 42			
334	89.003	mfc to unit heaters 37, 38	bsx/	bsa/tef/					4SCAE 160510	4SCA-UHT-37, 38	power panel board 42			
335	89.004	mfc to unit heaters 34, 35, 363	bsx/	bsa/tef/					4SCAE 160505	4SCA-UHT-34, 35, 36	power panel board 42			
336	89.005	mfc to steam gen. drum site (sight?) glass backlights	sgx/	sga/					4SGAE 160501	4SCG-SG-1	power panel board 42			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
337	89.006	mfc to combustion air biasing dmp SB	sgx/	sga/		420/421/422/	405/408/411/417 /428/431/	7c	4SCAE 160512	4SCA-MCD-3B	power panel board 42			
338	89.007	mfc to coal grav wgh feeder 1A	sgx/	chd/		420/421/422/	405/408/411/417 /428/431/	7c	4CHDE 160501	4CHD-FDR-1A	power panel board 42			
339	89.008	mfc to coal grav wgh feeder 1B	sgx/	chd/		420/421/422/	405/408/411/417 /428/431/	7c	4CHDE 160502	4CHD-FDR-1B	power panel board 42			
340	89.009	mfc to coal grav wgh feeder 1C	sgx/	chd/		420/421/422/	405/408/411/417 /428/431/	7c	4CHDE 160503	4CHD-FDR-1C	power panel board 42			
341	89.010	mfc to coal grav wgh feeder 1D	sgx/	chd/		420/421/422/	405/408/411/417 /428/431/	7c	4CHDE 160504	4CHD-FDR-1D	power panel board 42			
342	90.000	mfc from 120/203 V power panel board 43 - boiler turbine area	apx/							4APB-PPL-43	power panel board 43			
343	90.001	mfc to turbine bldg. grav roof vent 2A & 2B	bsx/	bsa/					4SCAE 160502	4SCA-PNL-02	power panel board 43			
344	90.002	mfc to unit 4 chem sample panel	sgx/	sax/					4SCAE 160509	4SCA-PNL-03	power panel board 43			
345	90.003	mfc to limestone grav wgh feeder 1A	sgx/	bmx/bmd/		405/406	411/co1/	2a	4BMDE 160501	4MBD-FDR-1A	power panel board 43			
346	90.004	mfc to limestone grav wgh feeder 1B	sgx/	bmx/bmd/		405/406	411/co1/	2a	4BMDE 160502	4MBD-FDR-1B	power panel board 43			
347	90.005	mfc to unit heaters 19, 20, 21	bsx/	bsa/tef/					4SCAE 160525	4SCA-UNT-19, 20, 21	power panel board 43			
348	90.006	mfc to unit heaters 22, 23, 24	bsx/	bsa/tef/					4SCAE 160526	4SCA-UNT-22, 23, 24	power panel board 43			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
349	90.007	mfc to unit heaters 25, 26, 27	bsx/	bsa/tef/					4SCAE 160527	4SCA-UNT-25, 26, 27	power panel board 43			
350	90.008	mfc to unit heaters 28, 29	bsx/	bsa/tef/					4SCAE 160508	4SCA-UNT-28, 29	power panel board 43			
351	90.009	mfc to unit heaters 30, 31, 32	bsx/	bsa/tef/					4SCAE 160507	4SCA-UNT-30, 31, 32	power panel board 43			
352	90.010	mfc to battery room dmpr1	bsx/						4SCAE 160515	4SCA-MCD-1	power panel board 43			
353	90.011	mfc to unit heater 33	bsx/	bsa/tef/					4SCAE 160506	4SCA-UHT-33	power panel board 43			
354	90.012	mfc to battery room dmpr 2	bsx/	bsa/					4SCAE 160516	4SCA-MCD-2	power panel board 43			
355	91.000	mfc from 120/208 V power panel board 48 - cooling tower	hrx/	bso/						4APB-PPL-48	power panel board 48			
356	91.001	mfc to c. t. fire protection air compressor	bsx/fex/	mcs/	fpu/wsc/				4HRCE 160501	4HRC-JBX-751	power panel board 48			
357	91.002	mfc to 6" fire line & valving freeze prot.	bsx/hrx/	mcs/	fpu/wsc/				4APBE 160501	4HRC-HT-1	power panel board 48			
358	91.003	mfc to circ water bldg elect room prv-1	hrx/bsx/	bso/					4SCEE 160501	4SCE-PRV-1	power panel board 48			
359	91.004	mfc to circ water bldg chem room prv-2	hrx/	bso/					4SCEE 160502	4SCE-PRV-2	power panel board 48			
360	91.005	mfc to unit 1, 2 & 4 acid pumps - CHRE-P-3 & 4	hrx/	hre/		445	443	10	CHREE 160504	4AAA-JBX-068	power panel board 48			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
361	91.006	mfc to unit 1, 2 & 4 sludge pumps - CHRE-P-5A & 5B	hrx/	hre/		445	443	10	CHREE 160505	4AAA-JBX-065	power panel board 48			
362	91.007	mfc to unit 1, 2 & 4 chromate pumps	hrx/	hre/		445	443	10	CHREE 160501	4HRE-P-1 & 2	power panel board 48			
363	91.008	mfc to unit 1, 2 & 4 penetrant pumps	hrx/	hre/		445	443	10	CHREE 160502	4HRE-P-3 & 4	power panel board 48			
364	91.009	mfc to unit 1, 2 & 4 biocide pumps	hrx/	hre/		445	443	10	CHREE 160503	4HRE-P-5A & 5B	power panel board 48			
365	91.010	mfc to unit 1, 2 & 4 biocide pumps	hrx/	hre/		445	443	10	CHREE 160506	4CHRE-P-5A & 5B	power panel board 48			
366	92.000	mfc to mfc from 480 V panel board 41						el 851'0" col 12, row B.4		4APC-PPL-41	panel board 41			
367	92.001	mfc to welding recepts - elev 851'0"	bsx/					el 851'0"	4APC 161007		panel board 41			
368	92.002	mfc to welding recepts - elev 851'0"	bsx/						4APC 161008		panel board 41			
369	92.003	mfc to motor operated overhead doors 5 & 6	bsx/						4BSAE 161003	4BSA-DEN-1005 & 1006	panel board 41			
370	92.004	mfc to unit heaters 8 & 9	bsx/						4SCAE 161005	4SCA-UHT-08 & 09	panel board 41			
371	92.005	mfc to unit heaters 10, 11 & 12	bsx/						4SCAE 161006	4SCA-UHT-10, 11 & 12	panel board 41			
372	93.000	mfc from 480V panel board 42						el 851'0"		4APC-PPL-42	panel board 42			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
373	93.001	mfc to welding recepts	bsx/						4APCE 161006		panel board 42			
374	93.002	mfc to welding recepts	bsx/						4APCE 161004		panel board 42			
375	93.003	mfc to unit heater fans 3 & 4	bsx/						4SCAE 161004	4SCA-UHT-03 & 04	panel board 42			
376	93.004	mfc to ash pit sump pump control panel	bsx/sgx/	asg/					4DPAE 161001	4DPA-PNL-1	panel board 42			
377	93.005	mfc to motor operated overhead door 1 - turb/gen bay	bsx/						4BSAE 161001	4BSA-DEN-1001	panel board 42			
378	93.006	mfc to fire water system press. maint pump	fpx/	apc/					4FPUE 161001	4FPU-P-2	panel board 42			
379	94.000	mfc from 480 V panel board 43						el 875'0" col 14, row C.3		4APC-PPL-43	panel board 43			
380	94.001	mfc to welding recepts	bsx/						4APCE 161001		panel board 43			
381	94.002	mfc to welding recepts	bsx/						4APCE 161003		panel board 43			
382	94.003	mfc to welding recepts	bsx/						4APCE 161002		panel board 43			
383	94.004	mfc to id fan equipment hoist	bsx/						4BSAE 161005	4BSA-HST-5	panel board 43			
384	94.005	mfc to primary air/sec air fan hoist 2	bsx/						4BSAE 161005	4BSA-HST-2	panel board 43			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
385	94.006	mfc to fab filter area dcs enclosure roof ventilator	bsx/	sca/					4SCAE 161007	4SCA-PRV-3	panel board 43			
386	94.007	mfc to coal gravimetric feeder 1A	sgx/	chd/		420/421/422/	405/408/411/417 /428/431/	7c	4CHDE 161003	4CHD-FDR-1A	panel board 43			
387	94.008	mfc to coal gravimetric feeder 1B	sgx/	chd/		420/421/422/	405/408/411/417 /428/431/	7c	4CHDE 161004	4CHD-FDR-1B	panel board 43			
388	94.009	mfc to limestone system gravimetric feeder 1A	sgx/	bmd/		405/406/	411/co1/	2a	4BMDE 161001	4BMD-FDR-1A	panel board 43			
389	94.010	mfc to fabric filter dcs enclosure elec unit heater	apx/ccx/			405/406/	411/co1/	2a	4SCAE 161008	4SCA-EUHT-3	panel board 43			
390	95.000	mfc to mfc from 480 V panel board 44						el 875'0" col 14, row E		4APC-PPL-44	panel board 44			
391	95.001	mfc to welding recept.	bsx/						4APCE 161105		panel board 44			
392	95.002	mfc to coal tripper power & control cable reels	chx/sgx/	chd/					4CHDE 161110	4CHD-CR-1 & 2	panel board 44			
393	95.003	mfc to elevator room power roof ventilator	bsx/	bsa/					4SCAE 161102	4SCA-PRV-2	panel board 44			
394	95.004	mfc to coal bunker bin vent blower	bsx/	chd/					4CAFE 161101	4CHF-BLO-1	panel board 44			
395	95.005	mfc to coal tripper room power roof vent	sbx/	chd/					4SCAE 161101	4SCA-PRV-1	panel board 44			
396	95.006	cmfc to coal gravimetric feeder 1C	sgx/	chd/		420/421/422/	405/408/411/417 /428/430/	7c	4CHDE 161101	4CHD-FDR-1C	panel board 44			

	oen	activity or item	system level 2	system level 3	system level 4	dcs inputs	dcs outputs	location or pcu#	circuit #	equip #	power source	resp	on job	Remarks
397	95.007	mfc to coal gravimetric feeder 1D	sgx/	chd/		420/421/422/	405/408/411/417 /428/430/	7c	4CHDE 161102	4CHD-FDR-1D	panel board 44			
398	95.008	mfc to limestone gravimetric feeder 1B	sgx/	bmd/		405/406/	411/co1	2a	4BMDE 161101	4BMD-FDR-1B	panel board 44			
399	96.000	mfc from 480 V panel board 45				405/406/	411/co1	2a - el 851'0" urea bldg		4APC-PPL-45	panel board 45			
400	96.001	mfc to unit heaters	bsx/	bsa/					4SCAF 161104	4SCA-EUHT-1 & 2	panel board 45			
401	96.002	mfc to bag house upper enclosure vent fan 3	bsx/						4CCBE 161102	4CCB-FAN 3	panel board 45			
402	96.003	mfc to bag house upper enclosure vent fan 4	bsx/						4CCBE 161104	4CCB-FAN 4	panel board 45			
403	96.004	mfc to hopper enclosure vent fan control panel 2	bsx/						4CCBE 161101	4CCB-CPL-2	panel board 45			
404	96.005	mfc to urea metering pumps 2A & 2B	cem/	bsx/sgl/		414/415/	411/417/420/428 /	2c	4SGLE 161101	4SGL-P-2A & 2B	panel board 45			
405	96.006	mfc to fabric filter equip hoist 3	bsx/						4BSAE 161101	4BSA-HST-3	panel board 45			
406	96.007	mfc to hopper vibrator control panel	ccx/						4CCBE 161104	4CCB-PNL-1	panel board 45			
407	96.008	mfc to sncr tank heater	cem/	sgl/					4SGLE 161104	4SGL-HT-2	panel board 45			

(A) (B) (C) (D) (E) (F) (G) (H)

12/21/92

master mech construction data base from a/c for msu pp4

rgi sy #	system level 2	system level 3	discipline system	A/C tgt turnover date as of 09/14/92 (to be confirmed)	msu expctd stup date as of 11/11/92	√'ed dates ok - as of 11/11/92	A/C turnover update as of 12/15/92	msu expctd stup date as of 12/21/93	√'ed dates ok as of 12/21/92	contract date - interp - should be confirmed	A/C turnover update as of 12/16/92	msu expctd stup es date as of 12/21/92	√'ed dates ok as of 12/21/92	act #'s & late date	tam stup reqmts - early fin - as of 12/17/92	tam stup reqmts - late fin - as of 12/17/92	notes	b & v p&id #	oen
01	bsx/	dpa/	building drains & vents	11/27/92	11/27/93	√	11/27/92				1/22/93	2/22/93	√	sg 010 - 3/1/93			no contract date available - assume desired comp at 11/27/92	M2029	1.0
02	bsx/	wsc/	service water	11/27/92	11/27/93	√	1/22/93				3/12/93				1/4/93	1/25/93		M2012	2.0
03	bsx/	fpu/	fire protection	2/1/93	2/1/93	√	2/1/93			3/1/93							as of 12/16/93 rgi requested response from A/C	M2012	3.0
04	bsx/	tef/	heater vents & miscellaneous drains	11/27/92	11/27/93	√	12/24/92			7/23/93	2/6/93					5/3/93		M2016	4.0
05	tgx/	ted/	heater drains	11/27/92	3/8/93	√	12/24/92			7/23/93	2/28/93					5/3/93		M2016	5.0
06	bsx/	sca/	steam unit heaters & air handling unit	11/27/92	11/27/93	√	1/1/93				1/22/93						for partial use only - phase 1 - see also SCA phase 2 - insul only, no lagging okd 12/15/92	M2015	6.0
07	bsx/	cab/	control air	2/12/93	2/12/93	√	2/12/93			3/1/93	3/12/93				1/15/93	1/25/93		M2010	7.0
08	tgx/	hra/	condensate	3/5/93	3/8/93	√	3/5/93			7/23/93	3/15/93				3/15/93	5/3/93	see PMA systems	M2003	8.1
09	sgx/	hrc/fwc/	condensate	3/5/93	6/1/93	√	3/5/93			4/5/93	3/15/93	2/22/93	x	sg 002 - 2/26/93	3/15/93	5/3/93	see PMA systems	M2003	8.2
10	tgx/	hra/	condensate air extraction	3/5/93	3/8/93	√	3/5/93			7/23/93	2/15/93							M2003	9.0
11	tgx/	hra/fwc/	condensate	3/5/93	3/8/93	√	3/5/93			7/23/93	4/1/93				3/15/93	5/3/93		M2003	10.1

rgi sy #	system level 2	system level 3	discipline system	A/C tgt turnover date as of 09/14/92 (to be confirmed)	msu expctd stup date as of 11/11/92	√'ed dates ok - as of 11/11/92	A/C turnover update as of 12/15/92	msu expctd stup date as of 12/21/93	√'ed dates ok as of 12/21/92	contract date - interp - should be confirmed	A/C turnover update as of 12/16/92	msu expctd stup es date as of 12/21/92	√'ed dates ok as of 12/21/92	act #'s & late date	tam stup reqmts - early fin - as of 12/17/92	tam stup reqmts - late fin - as of 12/17/92	notes	b & v p&id #	oen
12	sgx/	hra/fwc/	condensate	3/5/93	6/1/93	√	3/5/93			4/5/93	4/1/93	2/22/93	x	sg 002 - 2/26/93	3/15/93	5/3/93		M2003	10.2
13	hrx/	hre/	circulating water chemical feed	1/8/93	3/4/93	√	2/8/93			8/23/93	2/8/93							M2005	11.0
14	sgx/	fwe/	cycle chemical feed	1/15/93	6/1/93	√	2/8/93			6/1/93	2/8/93	2/25/93	√	sg 018 - 3/3/93	4/1/93	6/1/93		M2005	12.0
15	hrx/	hrc/	circulating water	1/29/93	3/4/93	√	2/8/93			3/1/93	5/15/93							M2007	13.0
16	hrx/	ecb/	closed cycle cooling water	1/15/93	3/4/93	√	2/12/93			3/1/93	3/5/93				1/15/93	1/25/93		M2006	14.0
17	bsx/	caa/	station air	2/12/93	2/12/93	√	2/12/93			3/1/93	2/15/93				5/1/93	6/1/93		M2010	15.0
18	sgx/	pma/	chemical clean	1/29/93	6/1/93	√	1/29/93			4/5/93	4/15/93	3/23/93	x	sg 041 - 3/23/93	3/20/93	4/5/93	pre boiler chem clean - FWC, FWA & FWG - from 01/15/93 to 01/29/93	M2013	16.0
19	sgx/	fwg/	attemporator spray water	3/5/93	6/1/93	√	3/5/93			8/2/93	3/12/93	8/2/93	√	sg 061 - 8/2/93	6/1/93	7/2/93	see PMA systems - tam says stup can begin at 100% of maximum capacity rating (mcr)	M2028	17.0
20	sgx/	fwa/	feed water	3/5/93	6/1/93	√	3/5/93			4/5/93	3/12/93	2/22/93	x	sg 014 - 2/26/93	1/15/93	2/5/93	see PMA systems	M2002	18.0
21	tgx/	fwh/	desuperheater water	3/5/93	3/8/93	√	3/5/93			8/2/93	5/1/93				6/1/93	7/2/93		M2002	19.0
22	tgx/	fwf/	demineralized water	3/5/93	3/8/93	√	3/5/93			7/23/93	5/1/93				1/15/93	4/5/93		M2003	20.1

rgi sy #	system level 2	system level 3	discipline system	A/C tgt turnover date as of 09/14/92 (to be confirmed)	msu expctd stup date as of 11/11/92	√'ed dates ok - as of 11/11/92	A/C turnover update as of 12/15/92	msu expctd stup date as of 12/21/93	√'ed dates ok as of 12/21/92	contract date - interp - should be confirmed	A/C turnover update as of 12/16/92	msu expctd stup es date as of 12/21/92	√'ed dates ok as of 12/21/92	act #'s & late date	tam stup reqmts - early fin - as of 12/17/92	tam stup reqmts - late fin - as of 12/17/92	notes	b & v p&id #	oen
23	sgx/	fwf/	demineralized water	3/5/93	6/1/93	√	3/5/93			8/2/93	5/1/93	8/2/93	√	sg 061 - 8/2/93	1/15/93	4/5/93		M2003	20.2
24	tgx/	sac/	sampling & analysis	3/5/93	3/8/93	√	3/5/93			7/23/93	4/5/93				8/2/93	8/2/93		M2014	21.1
25	sgx/	sac/	sampling & analysis	3/5/93	6/1/93	√	3/5/93			5/3/93	4/5/93	2/25/93	x	sg 018 - 3/3/93	8/2/93	8/2/93		M2014	21.2
26	sgx/	sgf/	boiler drains & vents	4/9/93	6/1/93	√	4/9/93			4/5/93	2/15/93	2/22/93	√	sg 010 - 3/1/93	3/15/93	4/5/93		M2023	22.0
27	sgx/	sge/	natural gas	4/9/93	6/1/93	√	4/9/93			4/5/93					3/1/93	4/5/93	a/c says complete as of 12/15/92 (to be checked) - as of 12/16/93 rgi requested response from A/C	?	22.1
28	tgx/	sgg/	main steam	4/9/93	3/8/93	√? to be checked & revised as needed	4/9/93			4/5/93	4/26/93				5/1/93	6/1/93	from issue #5, sht sg1. Date set by activity SG032 at pm of 08/09/93	M2001	24.1
29	sgx/	sgg/	main steam	4/9/93	6/1/93	√	4/9/93			4/5/93	4/26/93	6/29/93	√	sg 033 - 7/9/93	5/1/93	6/1/93		M2001	24.2
30	tgx/	sgk/	steam blow piping	4/16/93	3/8/93	√?to be checked & revised as needed	4/16/93			4/5/93	4/26/93				5/1/93	6/1/93	from issue #5, sht sg1. Date set by activity SG031 at am of 07/12/93	M2025	25.1
31	sgx/	sgk/	steam blow piping	4/16/93	6/1/93	√	4/16/93			4/5/93	4/26/93	6/1/93	√	sg 031 - 6/1/93	5/1/93	6/1/93		M2025	25.2
32	tgx/	tec/	extraction traps & drains	4/16/93	3/8/93	√?to be checked & revised as needed	4/16/93			7/23/93	4/26/93				4/15/93	5/3/93	from issue #5, sht tg1. Date set by activity TG053 at am of 08/10/93	M2016	26.0
33	tgx/	tea/	extraction steam	4/16/93	3/8/93	√?to be checked & revised as needed	4/16/93			7/23/93	4/26/93				4/15/93	5/3/93	turbine ready to go. from issue #5, sht tg1. Date set by activity TG053 at am of 08/10/93	M2016	27.0

rgi say #	system level 2	system level 3	discipline system	A/C tgt turnover date as of 09/14/92 (to be confirmed)	msu expctd stup date as of 11/11/92	√'ed dates ok - as of 11/11/92	A/C turnover update as of 12/15/92	msu expctd stup date as of 12/21/93	√'ed dates ok as of 12/21/92	contract date - interp - should be confirmed	A/C turnover update as of 12/16/92	msu expctd stup es date as of 12/21/92	√'ed dates ok as of 12/21/92	act #'s & late date	tam stup reqmts - early fin - as of 12/17/92	tam stup reqmts - late fin - as of 12/17/92	notes	b & v p&id #	oen
34	bsx/	sca/	building space conditioning	4/30/93	4/30/93	√	4/30/93										for phase 2 - see other SCA for phase 1	M2015	28.0
35	sgx/	cac/	soot blower air	2/12/93	6/1/93	√	2/12/93			8/2/93	4/26/93	8/2/93	√	sg 055 - 8/2/93	6/2/93	6/2/93		M2010	29.0
36	sgx/	chd/	coal handling system	6/1/93	6/1/93	√	6/1/93			8/2/93					6/2/93	6/2/93	requires CHC - as of 12/16/93 rgi requested response from A/C	M?	30.0
37	sgx/	bmd/	limestone handling	6/1/93	6/1/93	√	6/1/93			8/2/93	6/1/93	3/10/93	√	sg 023 - 7/7/93	3/1/93	4/5/93		M2009	31.0
38	sgx/	bme/	sand handling (inert)	6/1/93	6/1/93	√	6/1/93			4/5/93	6/1/93	3/10/93	x	sg 022 - 5/25/93	3/1/93	4/5/93		?	32.0
39	sgx/	asg/	ash collection	6/1/93	6/1/93	√	6/1/93			8/2/93	6/1/93	4/5/93	x	sg 066 - 5/27/93	6/2/93	6/2/93		M2008	33.0
40	sgx/	asf/	combustion waste storage	6/1/93	6/1/93	√	6/1/93			8/2/93	6/1/93	4/5/93	x	sg 066 - 5/27/93	6/2/93	6/2/93		M2008	34.0
41	bsx/	pmc/	vacuum cleaning	6/1/93	6/1/93	√	6/1/93				6/1/93						bag house ready to come on line.	M4009	35.0