# PROJECT REPORT

## 500 kV MUZAFFAR GARH SUBSTATION (EPC TURN KEY PROJECT)

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**SEMESTER:** FALL - 2015, MS (PM) - III

**MS (PROJECT MANAGEMENT)**

**BAHRIA UNIVERSITY MUZAFFAR GARHCAMPUS**

**SUBMITTED TO:** MR. MUHAMMAD FAISAL SHAHZAD

**SUBMITION DATE:** January 17th, 2016

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CNEEC/LAHORE/HR/1159

January 5th, 2016

## CERTIFICATE

This witness statement is issued to the applicants for the fulfilment of their MS (Project Management) program requirements being carried out at Bahria University Lahore Campus (BULC).

It is witnessed that **Mr. USMAN ALI & Mr. Rashid Mahmood**, Enrollment: **03-298142-0038 & 03-298142-030** Class: **MSPM-III** Semester: **Fall 2015** have contacted / visited / frequently utilized our premises /participated in our real-time projects for implementing project management skills using Primavera P6 as a leading software tool.

Both, in case of participation in organization's project, have contributed fully / partially in the following project(s) and within the highlighted fields:

1. Planning.

2. Scheduling.

Both, in case of visiting/ frequently utilized premises, have been found skillful in applying Primavera P6 in the following highlighted fields (planning, scheduling, earned value analysis, performance monitoring, and report generation).

Additionally, it is noteworthy to mention that Mr. USMAN ALI & Rashid Mahmood demonstrated good ethical practices, enthusiastic approach to work, task convergence capabilities, professionalism while his stay / connection with this organization.

Certified By:

Verified By Trainer:

China National Electric Engineering Co., Ltd. and Sulzer 2 Electric Power Construction Corporation joint venture

Mr. Zhao Yao
Project Director

## ACKNOWLEDGEMENT

First of all I am very thankful to ALLAH who gives me strength and courage to complete this project. However, it would not have been possible without the kind support and help of many individuals and organization. I would like to extend my sincere thanks to all of them.

I am very grateful to Faculty of Bahria University for their guidance and constant supervision as well as for providing necessary information regarding the project & also for their support in completing the project.

I would like to express my gratitude towards my teacher "**Mr. Muhammad Faisal Shahzad**" for his kind co-operation and encouragement which help me in completion of this project.

I would like to express my special gratitude and thanks to CNEEC Pakistan Team specially **Mr. Hafiz Yasir Arfat and Mr. Ali Usman** for supporting me with their precious time.

My thanks and appreciations also go to my friends in developing the project and people who have willingly helped me out with their abilities.

**500 kV Muzaffar Garh Extension Project**

**China National Electric Engineering Company Limited**

**Department of Management Sciences**

**Bahria University Lahore, Pakistan**

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## A. Project Management:

Project management is the concept to initiate, plan, execute, monitor & control and close the wok of the team in order to gain certain goals and targets with in specific criteria.

### 1. Project:

Project is a temporary endeavor which will be performed in order to make a unique product with unique characteristics or results.

### 2. Management:

Management is a function which coordinates with the efforts of people to reach specific goals/objectives by using available resources in efficient and effective way.

### 3. Project Management Knowledge Areas and Process Groups:

There are 10 knowledge areas of the project management;

a) **Project Integration Management.**
b) **Project Scope Management.**
c) **Project Schedule Management.**
d) **Project Cost Management.**
e) **Project Quality Management.**
f) **Project Human Resource Management.**
g) **Project Communication Management.**
h) **Project Risk Management.**
i) **Project Procurement Management.**
j) **Project Stakeholder Management.**

There are 5 process groups in the project management;

a) **Initiate.**
b) **Plan.**
c) **Execute.**
d) **Monitor and Control.**
e) **Close.**

Project management is basically concerned with application and knowledge of the above mentioned knowledge areas and process groups using different tools and techniques to meet project requirements.

## 4. Project Scope Management:

Following steps are performed in project scope management;

1. Plan and document that how the scope of the project will be defined, authenticated and organized.
2. Collect requirements by managing stakeholder's needs and develop detailed description of the scope.
3. Decompose work into smaller components and create a Work Breakdown structure.
4. Validate and control scope in the Project Monitoring and controls process group.

## 5. Project Time Management:

Following steps are performed in project time management;

1. Plan and document that how the schedule of the project will be defined, managed execute and controlled.
2. By using decomposition technique, rolling wave planning and expert judgment, Work packages are break down into small activities (i.e. Define Activity) and we get activity list, activity attributes and Milestone.
3. In the next step, activities are sequenced using precedence diagraming method, dependency determination, leads and lags and prepare schedule network diagram.
4. After sequencing activities, resources like material, human resource, equipment of supplies are determined for each activity.
5. Activities duration will be estimated using analogous estimating, parametric estimating or three point estimating (Most likely, Optimistic and Pessimistic) tools and techniques.
6. In the last schedule is developed using tools and techniques (i.e. schedule network analysis, critical path method, critical chain method, resource optimization technique, leads & lags).

## 6. Project Cost Management:

Project cost management includes following steps;

1. Plan and document that how the cost of the project will be managed, expand and controlled.

2. In the next step cost will be estimated for each activity using analogous estimating, parametric estimating or three point estimating (Most likely, Optimistic and Pessimistic) tools and techniques.
3. After activity cost estimation budget will be developed and a base line will be originated.
4. Cost is monitored throughout the project using Earned Value Management, Forecasting, To-Complete performance Index (TCPI) tools & techniques to control the cost.

7. **Earned Value Management (EVM):**

   Earned Value Management (EVM) is a technique/method to access the project performance. In EVM, cost baseline (i.e. Develop Budget), schedule base line (i.e. Develop Schedule) and scope base baseline are integrated to make a performance base line. The performance base line helps the project manager to assess the performance of the project.

## B. Primavera P.6:

### 1. Enterprise Project Structure:

The EPS is the outsider's view of your company, showing your business nature. The EPS is laid out in a tree structure. A construction company may have an EPS tree with different nodes like: Development, for work on existing sites and Construction, for new sites. Enterprise Project Structure represents the structure of the organization's work/operation.

### a) EPS in Primavera:

- Choose Enterprise from menu bar, then Enterprise Project Structure.
- Click on the EPS name column where we want to add a new element.
- Click on the Add button.
- Type Name and ID of the EPS node & in resource Manager Field, select OBS element for new element
- Hierarchy can be changed by using arrow keys
- Close the EPS window, go to Enterprise then Projects and specify the project detail of budget, resources and dated.
-

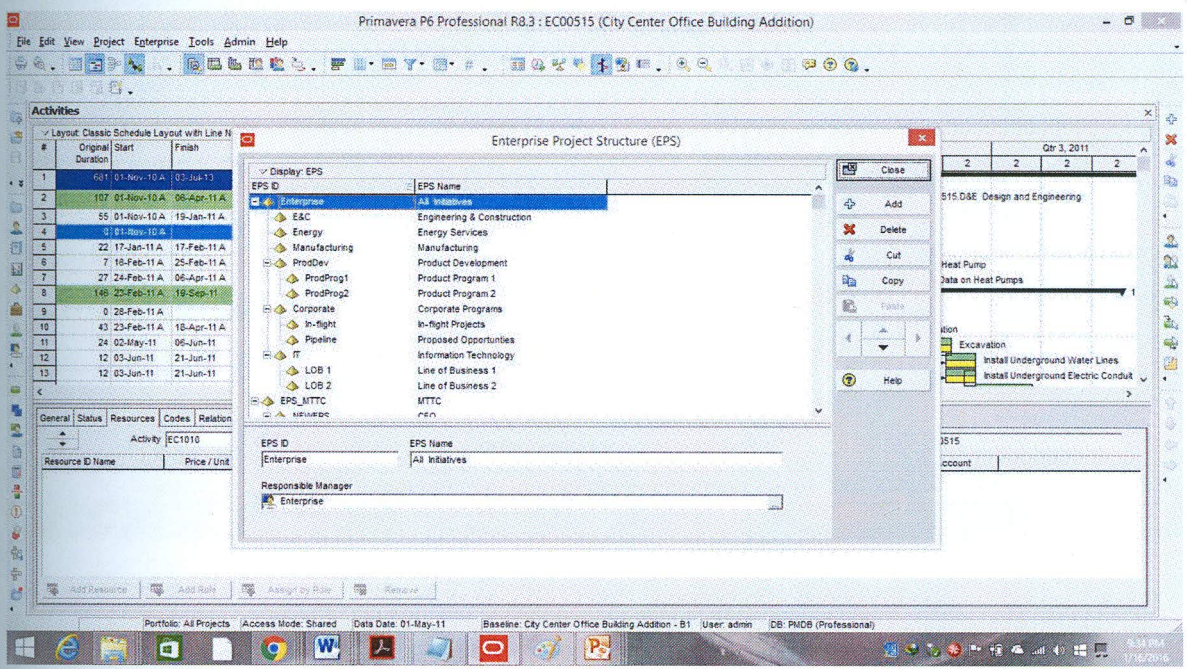


**Figure 2: Enterprise Project Structure**

## 2. Organization Breakdown Structure:

OBS is the hierarchical structure used to depict the organizations different positions on the software. The Organizational Break down Structure (OBS) defines how people within a company are organized and what rights and access they have within projects and more over what authority they have. OBS in primavera will be created as follows;

- Go to **Enterprise** from **Menu Bar** and select **OBS**.
- Using **Add button**, add **OBS** as organization structure.
- Enter the **name** of the **OBS**.
- Hierarchy of **OBS** can be changed by using arrow keys.
- Close the **OBS** window after adding OBS.

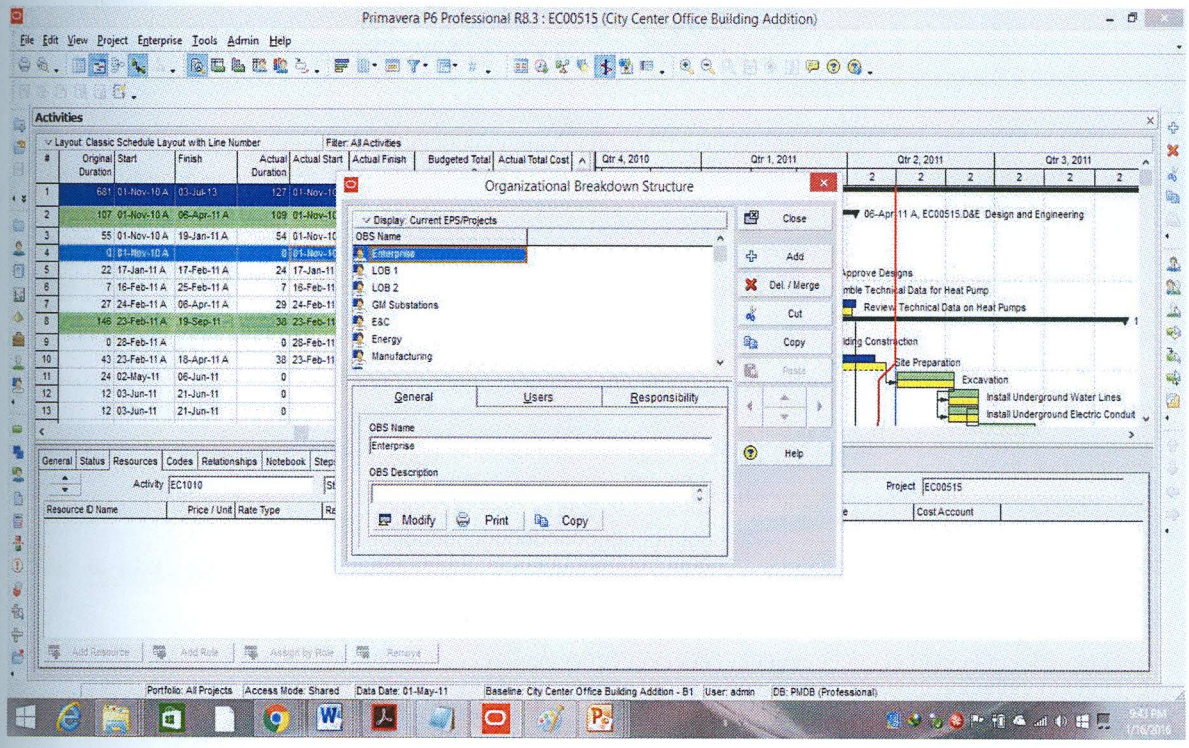



**Figure 3: Organization Breakdown Structure**

## 3. Activity Gantt Chart:

Gantt chart represents the progress and activities relationships on the timeline. Start and Finish date columns updated automatically when the position of the bars changed. You can customize the Gantt chart and highlight the activities. Following steps are performed during the configuration of the Gantt chart.

- On the **navigation bar** click EPS or activities.
- On the EPS page, select view menu and select **Gantt Chart**.

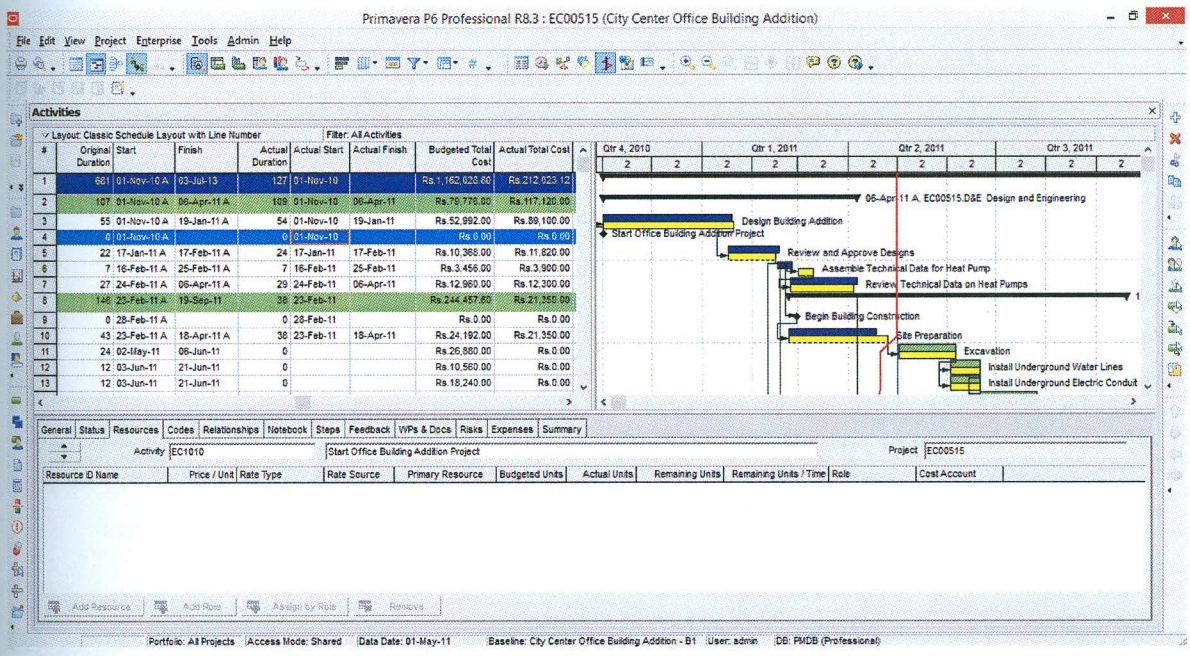



**Figure – 4: Gantt Chart**

## 4. Activity Network:

Activity network shows the WBS elements and project activities in the graphical interconnected boxes. Arrows between the activities shows the relationship between them. Milestones represented by Black diamond, green bar represents that the activity is still not started, half blue-green bar represent that the activity is in progress, blue bar represent that the activity is completed while the red bar represent that the activity is on

critical path. To view network diagram, click on the Activity Network on the navigation bar.

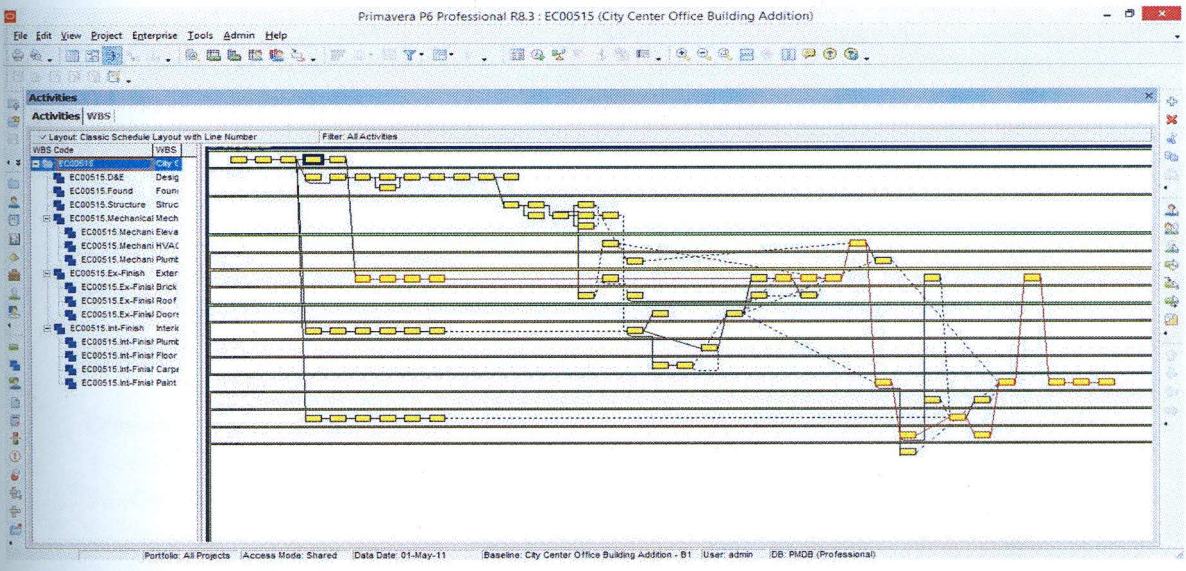



**Figure – 5: Activity Network Diagram**

## 5. Work Breakdown Structure:

A work breakdown structure is the division of work into different parts based on their specification and some other characteristics. WBS helps organizations to support the work and identify the structure of work in good manner. In Primavera P6, WBS can be created as follows;

- Select the **WBS** from the **Project** option on the **Tool bar**.
- Then select the **WBS table**.
- Finally **Add** the WBS of the project.

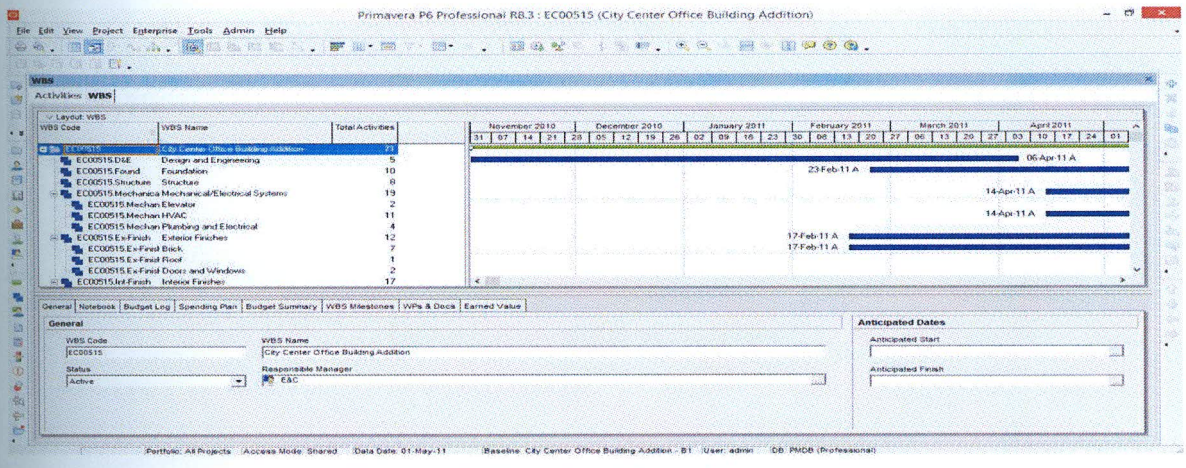



**Figure – 6: Work Breakdown Structure**

## 6. Baseline:

Baseline shows the statistical representation of the project plan. In order to measure the performance of the project baseline will be used as benchmark. Number of baseline can be created throughout the project. To establish a baseline activity for a specified time period at the expected level of performance against the current finding is used to perform the analysis. Project Management, chair accepted and approved plans and related documentation refers to them. The project baselines, generally, are approved by the project management team and project activities and those measurements are used to control.

**Creation of Baseline:**

1. Open the project in the EPS.
2. On the tool bar click on Project Option and then click on Maintain Baseline.
3. After maintaining base line click on the Assign Baseline in the Projects option on the tool bar.

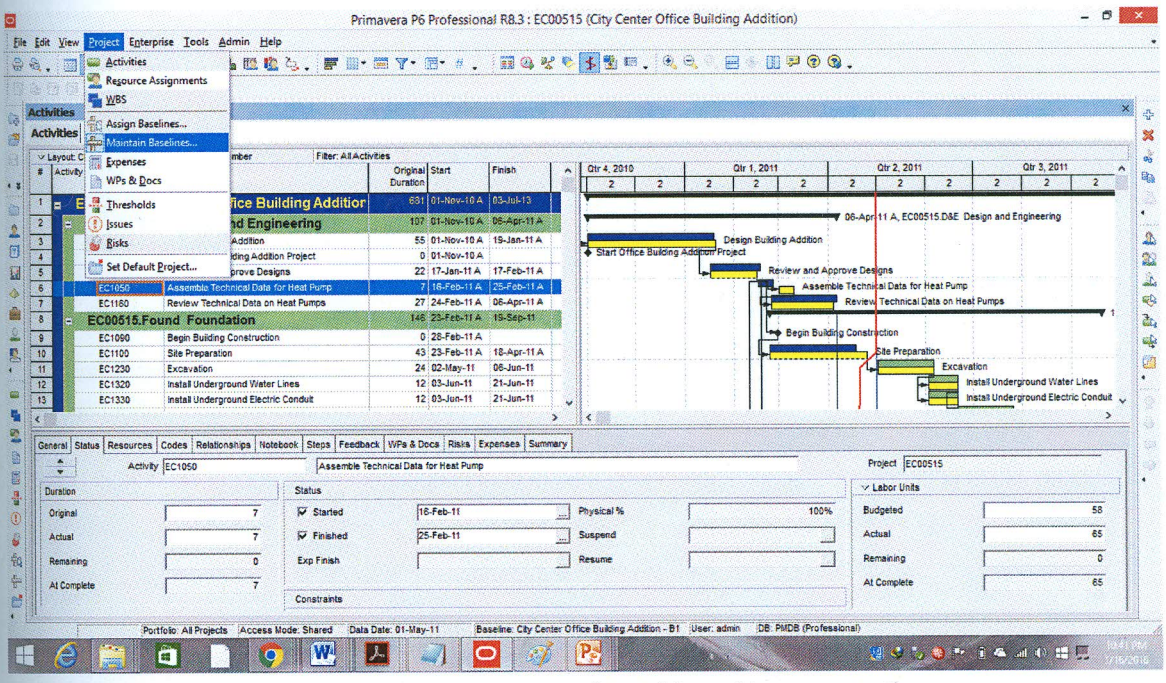



**Figure – 7: Creation of Base Line**

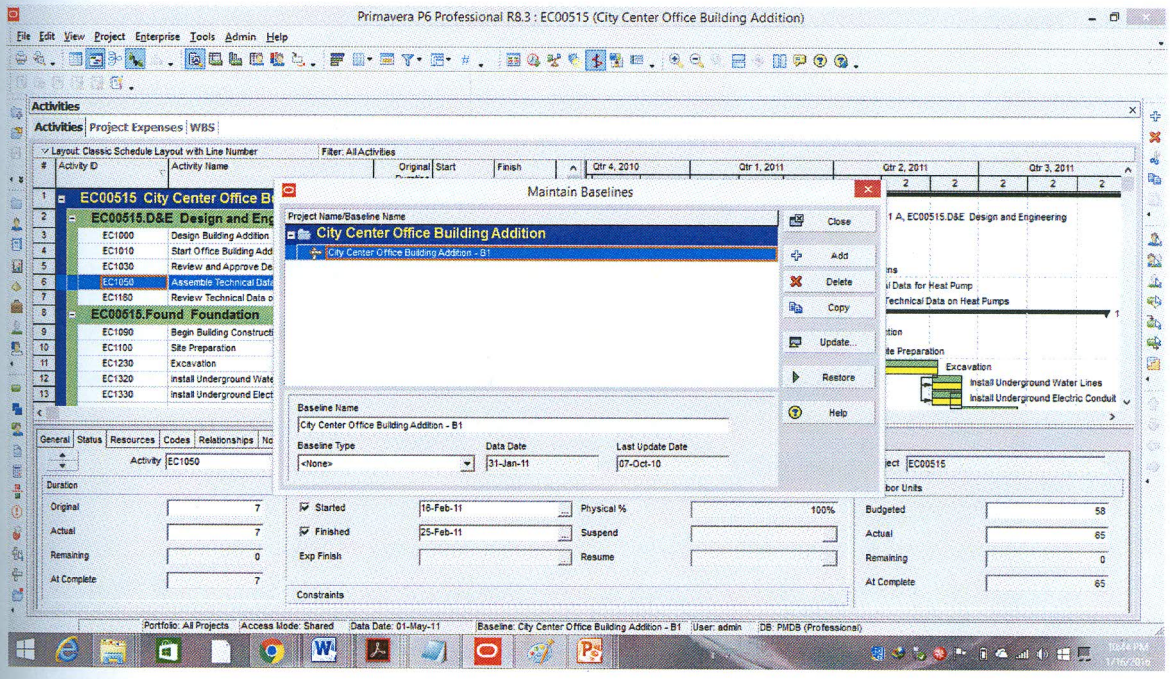



**Figure – 8: Maintain Base Line**

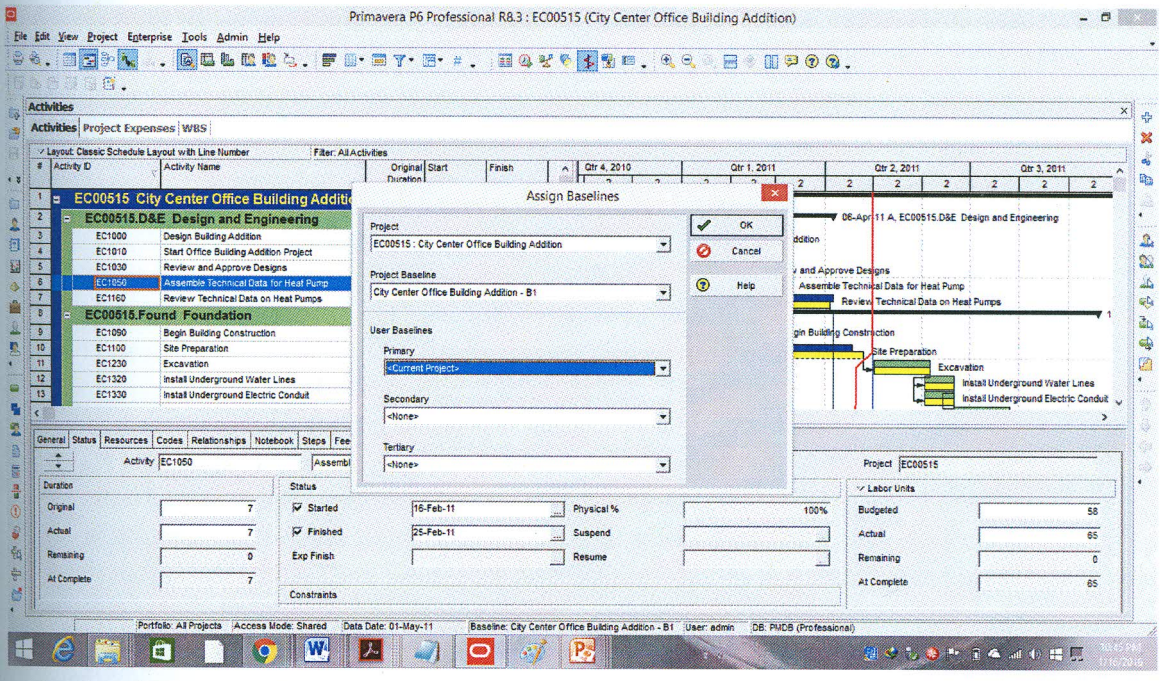



**Figure – 9: Assign Base Line**

## 7. Scheduling:

Schedule represents the order of the activities. In primavera P.6, run scheduler F9 on the navigation bar.

**Critical Path Method:**

Critical path is the longest path on the project and activities on the critical path are known as critical path activities. Critical path describes the project completion date and any activity on the critical path is delayed, the project will be delayed. Critical path method is time dominant while the critical chain method is the resource dominant technique. Critical Path method determines four dates of the activities i.e. Early start, Early Finish, Late Start and Late Finish. The difference between the early start and late start is zero then there is no slack for the activity and activity is known as critical activity that can't be delayed.

## 8. Roles:

Different people have different roles in the organization as well the work based on their capability. This division of work is called roles. People perform specific work, so according to their experience and skill, roles and responsibilities of the work are defined. If the roles are clearly defined then the project will be controlled easily and deliverables will be completed on time which is required by the customer. In Primavera roles can be assigned as follows;

- Click on **Enterprise** from tool bar, and then select **Roles**.
- Click **Add** button to add roles.
- Enter **Role ID** and **Role Name**.
- Hierarchy can be adjusted by using arrow keys.
- In description detail window, type description of **Role's Responsibility.**
- Click on **Prices Tab** to add price of each Role.
- Click on **Rate type field** to enter the **Rate**.
- Click on **Role Limits** tab to enter the **limit** of each role.
- Click **Add** to insert **unit/time** for the **role overtime.**
- In effective **date/time field**, double click and select date from calendar.
- In maximum **Units/Time field**, click and type maximum work units per time for each role.
- Close the window after **Assigning Roles.**

## 9. Resources:

One factor in economic or productive activity is to meet a need, or start an enterprise and to achieve the desired results. Three of the most basic resources of land, labor, and capital, energy and other resources, entrepreneurship, knowledge, skills, management, and includes the time. Resources include the personnel and equipment that perform work on activities across all projects. Resources are generally are used between activities and/or projects.

In the Project Management module, we can create a resource pool that reflects our organization's resource structure and supports the assignment of resources to activities. The PM module also enables us to distinguish between labor, material, and non-labor resources. Labor and non-labor resources are always time-based, and material resources, such as consumable items, use a unit of measure you can specify. We can create and assign resource calendars and define are source's roles, contact information, and time-varying prices.

### 9.1 Resources in Primavera P6:

a. First enable **New Resource Wizard** by clicking on Edit button from menu bar, select User Preferences access the "Assistance" tab & then check the box to enable the wizard.
b. Go to **Project option** from tool bar, and then select **Resource Assignments** or Select **Resources** from Directory bar.
c. Click **Add** button on the command bar.
d. Enter **Resource ID** and **Name**.
e. Specify the type of resource (**labor, non-labor, or material**)
f. Enter the **unit price, default units per day & maximum units per day** for the new resource
g. Enter the official telephone & email.
h. Assign **"Roles**" to the new resource. We can assign multiple roles, identify the proficiency of the resource when performing the role, and design ate the "**Primary Role**" for the resource
i. Select the resource calendar. We can choose from a list of existing calendars or we can create a new calendar.
j. Identify whether to "auto-compute actuals" for the resource.
k. Enter information for the Progress Reporter.

### 9.2 Primary Resources:

A primary resource is a document written during the time under study or in the physical object is created. These sources were present during an experiment or a period of time and the offer of a special event. Some types of primary sources include: Original documents, speeches, manuscripts, letters and interviews.

### 9.3 Resource Security:

Resource Security allows the administrator to restrict your resource access by assigning you to a node in the resource hierarchy. That node is your root node. Once assigned to a resource node, you have access only to your root node and all of its children. In the Resource Assignments window you still have access to current project resources even if they are outside your root node.

## 10. Earned Value Management:

### 1. Steps to Calculate Earned Value in Primavera

a. Add Activities, Tie Logic, Set Percent (%) complete to Physical.
b. Add Resource Assignments.
c. Maintain Baseline and Assign to Project.
d. Customize Columns for Analysis.
e. Update Physical Percent (%) complete.
f. Update Resource Actual units (Or Expenses).
g. Schedule Project, Advance Data Date.
h. Analyze Earned Value.

### 2. Planned Value

Planed value is budgets which require/assigned performing the work of project. We measure our performance against planed value.

**PV = %age work completion *BAC.**

### 3. Schedule variance

Calculate the project schedule variance .We can compare the project schedule with the planned schedule and calculate the schedule variance.

**SV= EV –PV**

### 4. Schedule performance index:

In **SPI** we check that ho much work completed on time and we also check the variance.

**SPI= EV/PV.**

If the answer is negative its mean we behind from the schedule, if answer is positive then we ahead from schedule. If the answer is one then we are on schedule.

5. **Cost variance**

We can calculate the project cost variance .We can compare the project cost with the planned cost and calculate the cost variance.

**CV= EV –AC**

6. **Cost performance index:**

In CPI we check that ho much work completed on time and we also check the variance.

**CPI= EV/AC**

If the answer is negative its mean we behind from the budget, if answer is positive then we ahead from budget. If the answer is one then we are under budget.

7. **Actual Cost Work Performed(ACWP):**

Actual Cost Work Performed (ACWP) is the actual total cost incurred on the activity as of the project data date. ACWP is the same as the Actual Total Cost.
**ACWP = Actual Labor Cost + Actual Non-Labor Cost + Actual Material Cost + Actual Expense Cost**

8. **Budget at Completion (BAC):**
This is always the Total cost from the Baseline, calculated using the Baseline Budgeted Values or Baseline At Completion values depending upon the 'Earned Value Calculation' setting (Admin, Admin Preferences, Earned Value). If the 'Earned Value Calculation' is set to 'Budgeted Values with Planned dates' or 'Budgeted Values with Current Dates'.

**BAC= BL Budgeted Labor Cost + BL Budgeted Non-Labor Cos t+ BL Budgeted Material Cost + BL Budgeted Expense Cost.**

If the 'Earned Value Calculation' is set to 'At Completion Values with Current Dates':

**BAC = BL at Completion Labor Cost + BL at Completion Non-Labor Cost + BL At Completion Material Cost + BL At Completion Expense Cost.**

9. **Earned Value Cost (BCWP or EV):**

Earned Value Cost (EV) is the portion of the budgeted total cost of the activity that is actually completed as of the project data date. Also known as the Budgeted Cost of Work Performed for the activity. Theme for computing the performance percent complete depends on the Earned Value technique selected for the activity's WBS.

**EV =BAC * Performance % Complete.**

**10. Estimate at Completion**

EAC is the estimated cost at completion for the activity.

**EAC = Actual Cost + ETC**

**11. Estimate to Complete (ETC)**

Estimate to Complete is the estimated cost left to complete on the activity. The calculation can be customized at the WBS level (On the 'Earned Value' tab in the WBS view).
**ETC=PF*(BAC–EV)**

**11. Tracking:**

The project involves tracking and measuring the results of pre-defined project milestones to achieve, is not confined to reporting the status of tasks and activities of the management of projects, refers to. Project tracking tasks related to the project, assignments, events and activities which automates the tracking software, it can refer to the project. Following step are used to define the tracking:

- Select the tracking from the side bar.
- Select the WBS level which you want to track.

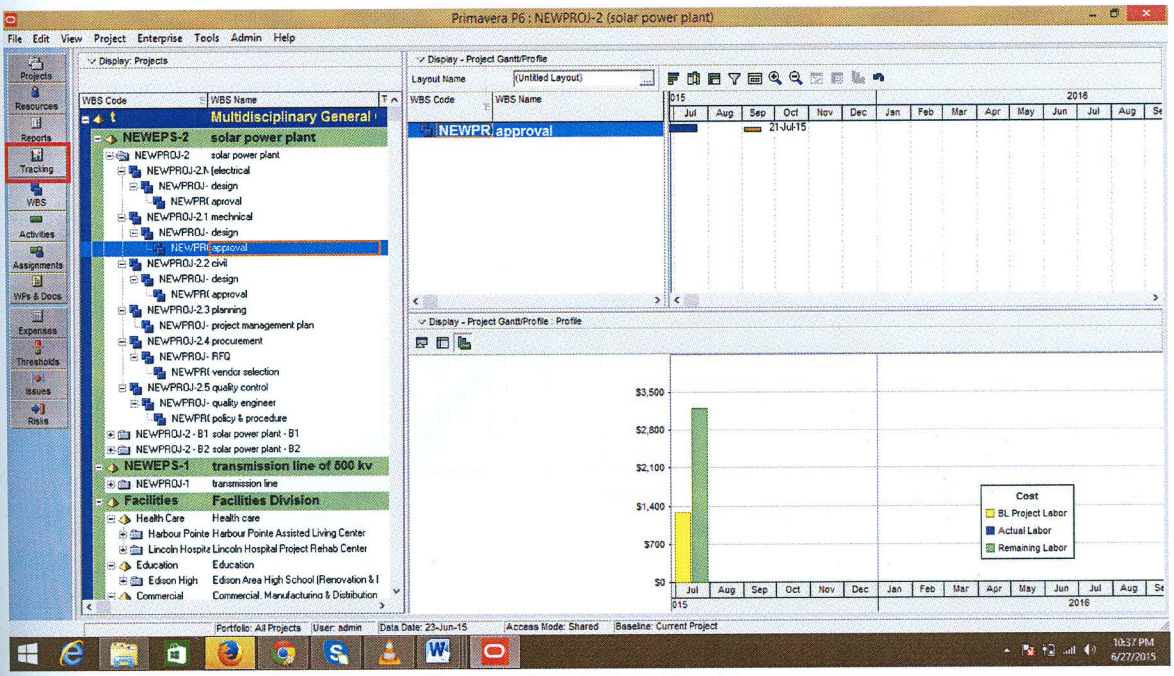


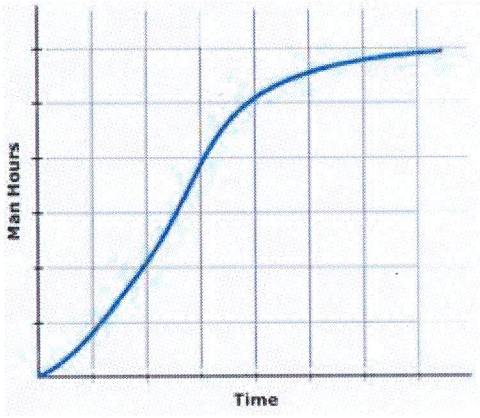

**Figure – 10: Project Tracking.**

## 12. S-Curve:

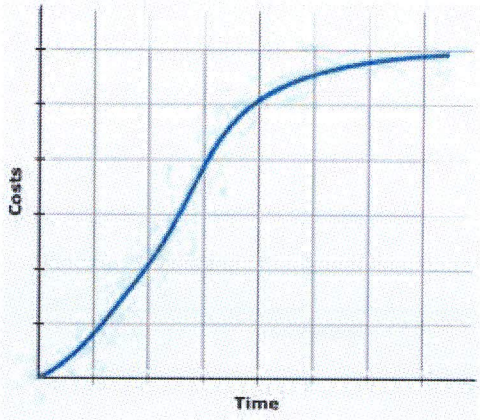
With the help of S curve we can check the progress of the project. We can calculate actual work, cost incurred and time. We can also measure the project schedule variance. It measures the actual schedule performance against planed schedule of the project. S-Curve is a display of cumulative costs, labor hours or other quantities plotted against time. A type of curve that shows the growth of a variable in terms of another variable, often expressed as unit of time.

### a. Types of S-Curve

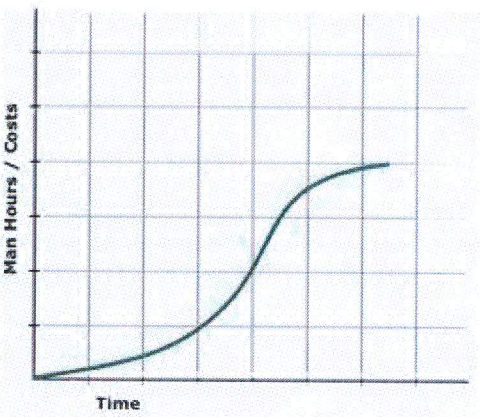
### 1. Man Hours versus Time S-curve



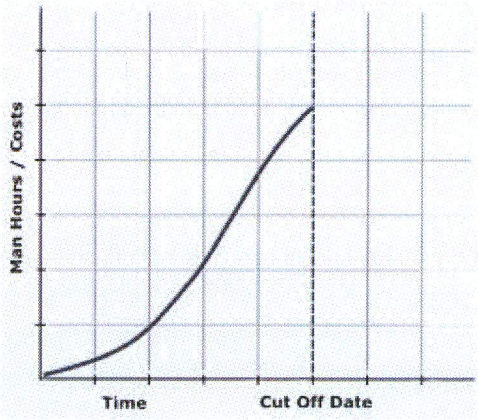
**2. Costs versus Time S-curve**



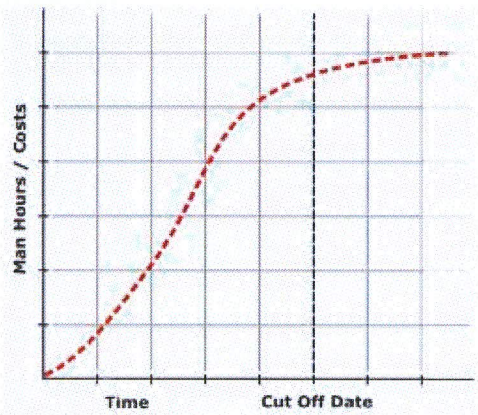

**3. Baseline S-Curve**




**4. Actual S-Curve**




**5. Target S-Curve**




**13. Risk:**

An investment opportunity than expected actual return will be different. Some or all of the investment risk, including the possibility of losing. Different versions of risk in general or a specific historical return an average of investment returns are measured by calculating the standard deviation is. A higher standard deviation indicates a high degree of risk. Following are steps to define the risk:

- Select the risk from the project.
- Add the risks of the project.
- Add the affected area and its types.
- Add the impact on the project

## Chapter # 2

1. **Project Management Techniques and Primavera P6 Tool Implementation on 500kV Muzaffar Garh Extension Project:**

2. **CNEEC INTRODUCTION:**

   China National Electric Engineering Company (CNEEC) formerly called China National Electric Corporation is a professional international engineering company. The government of China granted the certification of National High-Tech Enterprise. China National Electric Engineering also listed in the top 225 International contractors by ENR, USA.

   CNEEC provides one stop solution of in Engineering Services of consultation, construction and operation especially in the field of EPC contracting (Supply of Equipment, engineering design, project management and supervision, installation and commissioning, technical services, power plant maintenance and operation and personal tannings.)

3. **CNEEC Vision:**

   Brightening and warming the world, clearing and purifying the nature.

4. **CNEEC Mission:**

   Change for better.

5. **CNEEC Market Distribution:**

   CNEEC business covers more than sixty countries and region in Asia, America, Europe Africa and Oceania.

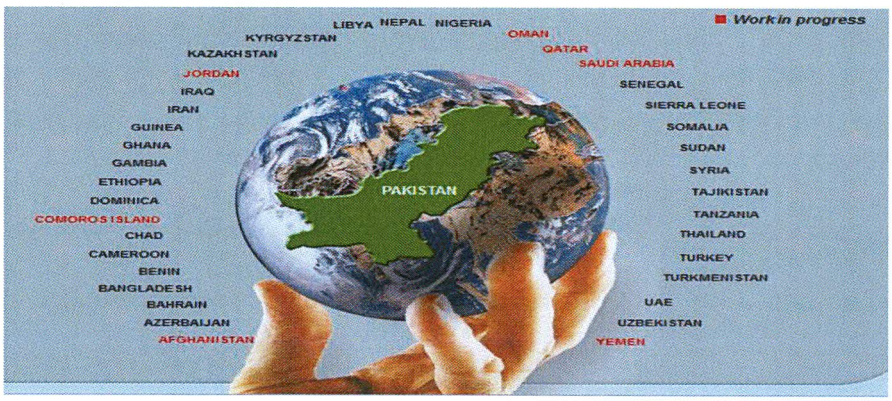



**Figure – 11 : Market Distribution**

## CNEEC BUSINESS ACTIVITIES

### 6. Energy:

Energy is the important factor for the survival of human and development which improves the development of economy. CNEEC achieved great success and accumulated abundant experience in the field of thermal power generation, hydraulic power generation, power transmission and transformation, clean energy and integrated energy solution.

### 6.1 Thermal Power Generation

CNEEC has constructed more than 300 Thermal Power Plants including conventional thermal power plant, gas steam combined cycle power plant, integrated drying gasification combined cycle power, industrial self-power plants, co-generation power plants, gangue power plants, waste heater power plants and geothermal power plants. Following are the great achievements of CNNEC in the field of the Thermal Power Plant:

1. **1900 MW Combined Cycle Power Plant, SABAH, Malaysia.**
2. **SP1 to SP9 Power Projects in Sudan.**
3. **4x150 MW Coal Fired Power Plant Morupule, Botswana.**
4. **Rehabilitation and Enhancement of Super critical Thermal Power Plant, 7x300 MW, Azerbaijan.**

### 6.2 Hydraulic Power Generation

CNNEC has completed successfully completed number of domestic hydraulic power plant including the world most famous Three Gorges Dam as well as more than in over 20 countries which have won the customer trusts by outstanding performance and reliable quality. Following are the great achievements of CNNEC in the field of the Hydraulic Power Plant:

1. **32x700 MW Three-Gorges Hydro Power Project, China.**
2. **AKHANGARAN Hydro Power Project in Uzbekistan.**
3. **ADIJUZEL 2x31 MW Hydro Plant in Turkey.**

## 6.3 Power Transmission and Transformation:

CNEEC has undertaken diversified EPC Project of Power Transmission and Transformation in the field of electricity industry, metallurgy, fossil oil, chemical Industry, coal harbor and public utilities. Following are the great achievements of CNNEC in the field of the Power Transmission and Transformation:

1. **KACHMAZZ 330 kV Transmission and Transformation Project in Azerbaijan.**
2. **110 kV Power Grid Enhancement Project.**
3. **230 kV Transmission and Transformation Project, Chittagong, Bangladesh.**
4. **XIZHIMEN 220 kV GIS Substation Project, Beijing, China.**

## 6.4 Clean Energy and Integrated Energy Solution:

CNEEC actively developing projects of new energy and providing integrated energy solutions for the purpose of energy utility and saving, emission reduction and environmental improvement. CNEEC use to apply advance technologies in its project, it has accumulated abundant experience and presented its advantages especially in the field of natural gas, coal bed methane, blast furnace gas combined cycle power generation, bio mass power, marsh gas power, waste to energy power and cement kiln waste heat power. Following are the great achievements of CNNEC in the field of the Clean Energy:

1. **SHIE 120 MW Coal-Bed Meahne Power Plant, SHANXI Province China, the world largest Coal-Bed Methane Power Plant.**
2. **Weigang 50 MW Blast Furnace Gas Power Plant.**
3. **TPI PL 2x18 MW Cement Kiln Waste Heat Power Plant.**
4. **CHAFF FUELED Power Plan Thailand, a breakthrough in Bio Mass Energy.**

## 6.5 Environmental Protection:

CNEEC is pursuing its mission of Cleaning and Purifying which disclose it's another business of environmental protection. It is very experienced in terms of flu gas desulphurization, denitration, degusting, sewage disposal, waste disposal, gas-fired heat supply etc. It is devoted in environmental protection of project site and life quality improvement with

reasonable return. Following are the great achievements of CNNEC in the field of the Environmental Protection:

1. **Sewage Disposal and ESP of Thermal Power Plants Indonesia.**
2. **Desulphurization of Thermal Power Plant, Philippines.**
3. **120,000 T/D Waste Water Treatments, China.**
4. **Heat Supply Plant, China. Awarded with Gold Medal of state outstanding design.**

## 6.6 Municipal Utilities and Buildings:

CNEEC actively taking part in the projects of municipal utilities and building by providing professional services of EPC contracting, equipment supply, engineering design, consultation, construction supervision and project management. Following are the great achievements of CNNEC in the field of the Municipal Utilities and Buildings:

1. **China World Trade Center, Phase 3, the highest building in Beijing, China.**
2. **Chow Tai Fook Marina Center, Beijing, China.**
3. **Lanzhou Water Supply Extension Project, China.**
4. **International Convention Center China.**
5. 

## 7.Other Business:

1. **Mining.**
2. **Transportation.**
3. **Factory Construction.**
4. **International Trading.**
5. **Scientific Research and Development.**

## 8. CNEEC PAKISTAN:

CNEEC, China is encompassed 18 number of engineering departments and twenty number of overseas representative offices. CNEEC Pakistan is subsidiary of CNEEC China, working in the field of Power Transmission and Transformation with abundant experience in EPC contracting. CNEEC Pak comprised of experienced team of Engineers and Designers for Civil, Electrical and Mechanical work.

## 9. CNEEC Pak Business:

Keeping the Vision and Mission of CNEEC China, CNEEC Pak working in the field of Energy i.e. Power Transmission and Transformation. Following are the achievements of the CNEEC Pak in the field of energy:

1. 500 kV Ghazi Barotha Substation Extension, Ghazi Barotha.
2. 500/220/132 kV Dera Ghazi Khan Substation, Dera Ghazi Khan.
3. 500/220 kV Muzaffar GarhSubsation, Lahore.
4. 202 km 500 kV Transmission Line 3rd Circuit form Jamshoro to Moro.
5. 100 MW Quaid.e.Azam Solar Park (132 kV Substation), Bahawal Pur.
6. 500kV Switching Station, Moro.

## 10. Major Services:

CNEEC Pak provides the following services to its customers:

- **EPC Contracting.**
- **Engineering, Design and Consultation.**
- **Project Management and Supervision.**
- **Complete supply of Electrical and Mechanical Equipment.**
- **Performance Testing of Power Plants.**
- **Operational, Maintenance and Personnel Tanning of Power Plant.**
- **International Trading.**
- **Scientific Research and Development.**

## 11. 500kV Muzaffargarh Extension Work

### 11.1 Project Charter:

| Project Charter | | | |
|---|---|---|---|
| **Part - 1 General Information** | | | |
| **(1) Title** | **500 KV Muzaffar Garh Substation** | | |
| **(2) Project Manager** | **(3) Authority Level** | **(4) Project Sponsor** | **(5) Project Client** |
| Hafiz Yasir Arfat | Full Decision and Spending Authority | Asian Development Bank (ADB) | National Transmission and Despatch Company (NTDC) |
| **(6) Project Description / Deliverable** | The Scope of works includes Design, manufacturing, insurance to site, delivery to Wharf port Karachi, Transportation to substation site, proper storage at site, erection, testing and commissioning of substation equipment and civil works. The substation shall consist of Four (4) 500 kV bays Four (4) 220kV bays. The 500 kV and 220 kV bays are arranged in breaker and a half scheme. The 500 kV Sahiwal-Muzaffar Garh and Gatti-Muzaffar Garh transmission lines will be tapped at this substations through an In and Out arrangement. The following 220kV transmission lines will be tapped in the 220 kV switchyard through and In and Out arrangements:<br><br>1. D.G.khan and Muzaffar Garh 220kV S/C Transmission Line.<br><br>Two 3x250 MVA, 525/231/23 kV auto-transformer banks to inter-connect 500 kV and 220 kV switchyard along with allied equipment such as 500kV Circuit Breakers, 500kV Disconnectors, 420kV Surge Arresters etc. and 220 kV equipment and one 12/20 MVA 220/11.5 kV Power Transformer to fed the auxiliaries, should be installed under this Contract.<br><br>The civil works required for all the above mentioned work including Control House Building and Mechanical Services Building are also included in the scope of work under this contract. | | |
| **(8) Objectives** | This project is the strategic expansion plan of the utility system of NTDC. With the completion of this project the NTDC system will be able to form the In Out arrangement of the following substations in case of black out of the electric supply: 1. 500 kV Muzaffar Garh Sheikhupura, 2. 500 kV Sahiwal, 500 kV Ghakkar, 220 kV Wapda Town Lahore, 220 KV Ghazi Road, Muzaffar | | |

| | |
|---|---|
| | Garhand 220 KV New Kot Lakhpat Lahore. |
| **(9) Location** | The Muzaffar Garh 500/220 kV substation will be built in the city of Muzaffar Garh, Punjab province of Pakistan. The substation is located near 1350MW Thermal Power Plant 4Km on Kot-Adu road, Muzaffar Garh. |
| **(10) Pre-Assigned Resources** | Ali Usman. Skilled Team Leader with 5 years of experience in the field of Substations EPC Project.<br>Fareed Maqsood. Project Planner with Deep Knowledge of Primavera P6. |

**(11) Stakeholders**

| Name | Title | Organization |
|---|---|---|
| Usamu | CEO | ADB |
| Ishaq Khan | Chief Engineer | NTDC, Pakistan |
| Shabbir Sadiq | Project Manager | NESPAK, Pakistan |
| Zhou | Design Engineer Sub Con. | NWEPDI, China |
| Muhammad Imran | Chief Engineer | Pyramid Consultant, Pakistan |

**(12) Milestone Summary and Schedule**

| Description | Date |
|---|---|
| Site Handing Over | 13/05/2015 |
| Energization/Commissioning (PAC/TOC) | 21/09/2016 |

| | |
|---|---|
| **(13) Budget** | FCC= J¥ 2,164,460,601.<br>LCC= PKR 1,154,964,643 (including provisional sums PKR 500,000,000).<br>Contingency Reserves: 15% of FCC.<br>Management Reserves: 10 % of FCC. |

**(14) Assumptions and Constraints**

(1) Project has to be completed must before 23rd September, 2016.
(2) Budget should remain within the threshold limits of contingencies.
(3) English Language will be used as the official written communication.

| | |
|---|---|
| **(16) High Level Risk** | 1. Because there may be delay in the production of the equipment and shipment to the site the subject duration can be changed.<br>2. Deprecation of Japanese Yen should not exceed 5%, otherwise claim will be made on the same. |

**Business Information**

| | |
|---|---|
| **(17) Terms and Conditions** | 1. Payments Should be done with within 30 days from the date of receipt of invoice.<br>2. Defects Liability period of the equipment should be 2 years.<br>3. Arbitration method will be used in case of any dispute resolution. |
| **(18) Business Case** | On completion of the project with great success rate, CNEEC will be able to capture the 50% market of Power Transmission and Transformation at 500 kV level for the next 10 years. |
| **(19) Stakeholders** | 1. Usmau: Assistant Manager at ADB, the funding agency want to complete |

| | |
|---|---|
| **Expectations** | the Project with in the given time frame and within the approved budget.<br>2. Client: A quality project should be delivered within the approved Budget and Time baseline. |
| **(20) Project Acceptance / Success Criteria** | 1. Project Acceptance or Success Criteria is as follows:<br>i. 10 % Value variance in schedule.<br>Ii. 10 % Value variance in Approved Budget. |
| **(21) Meetings** | Progress Review Meetings will be held on monthly basis.<br>Monthly Progress Report will be submitted before 5th of every month which also include the lesson learned. |

Signature: **Project Client**

Name : _____

Roll: _____

Date: _____

**Signature: Project Contractor**

Name : _____

Roll: _____

Date: _____

## Gantt Chart 500kV Muzaffar Garh Substation Extension:

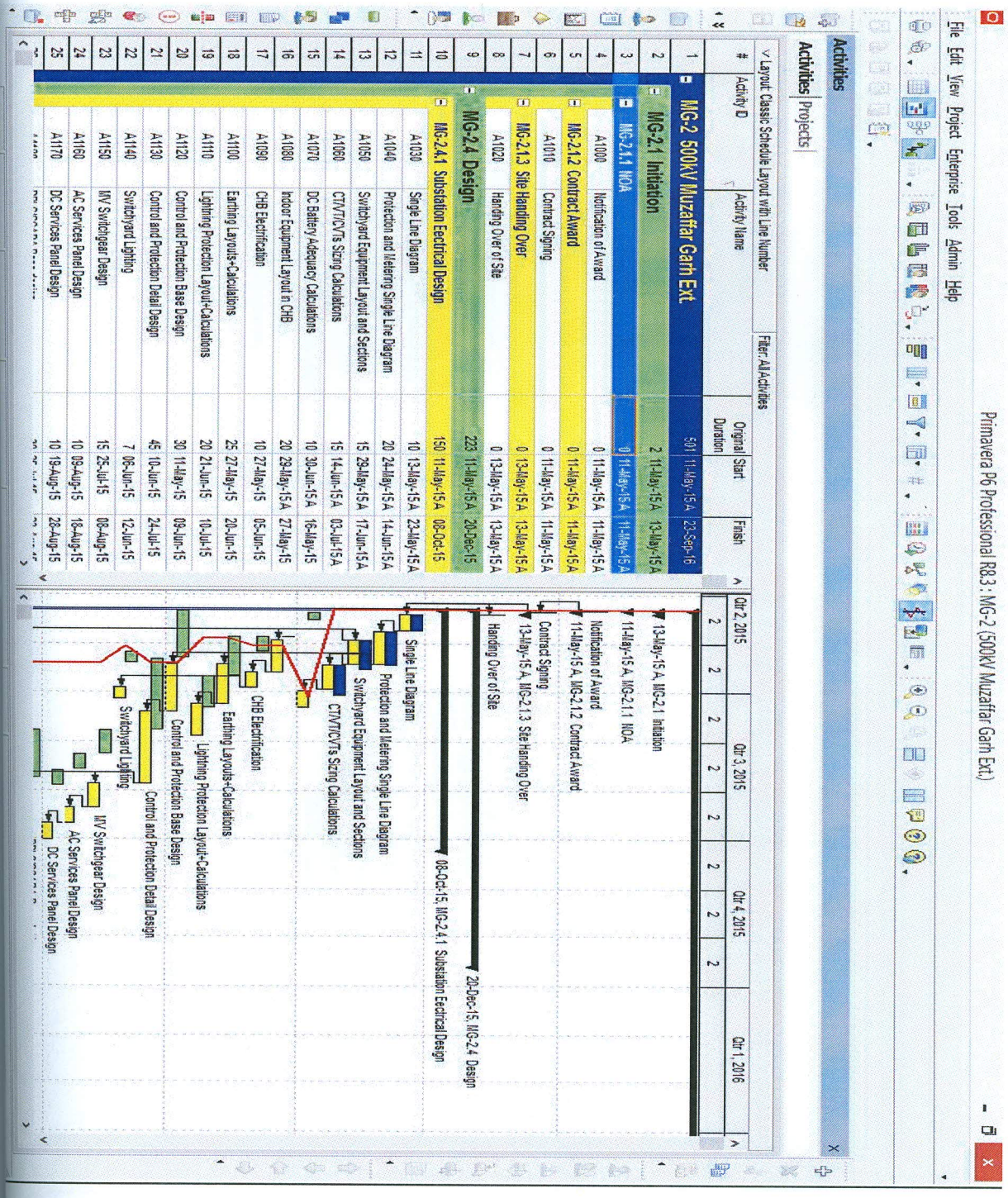



**Figure – 12: Activity Gantt Chart**

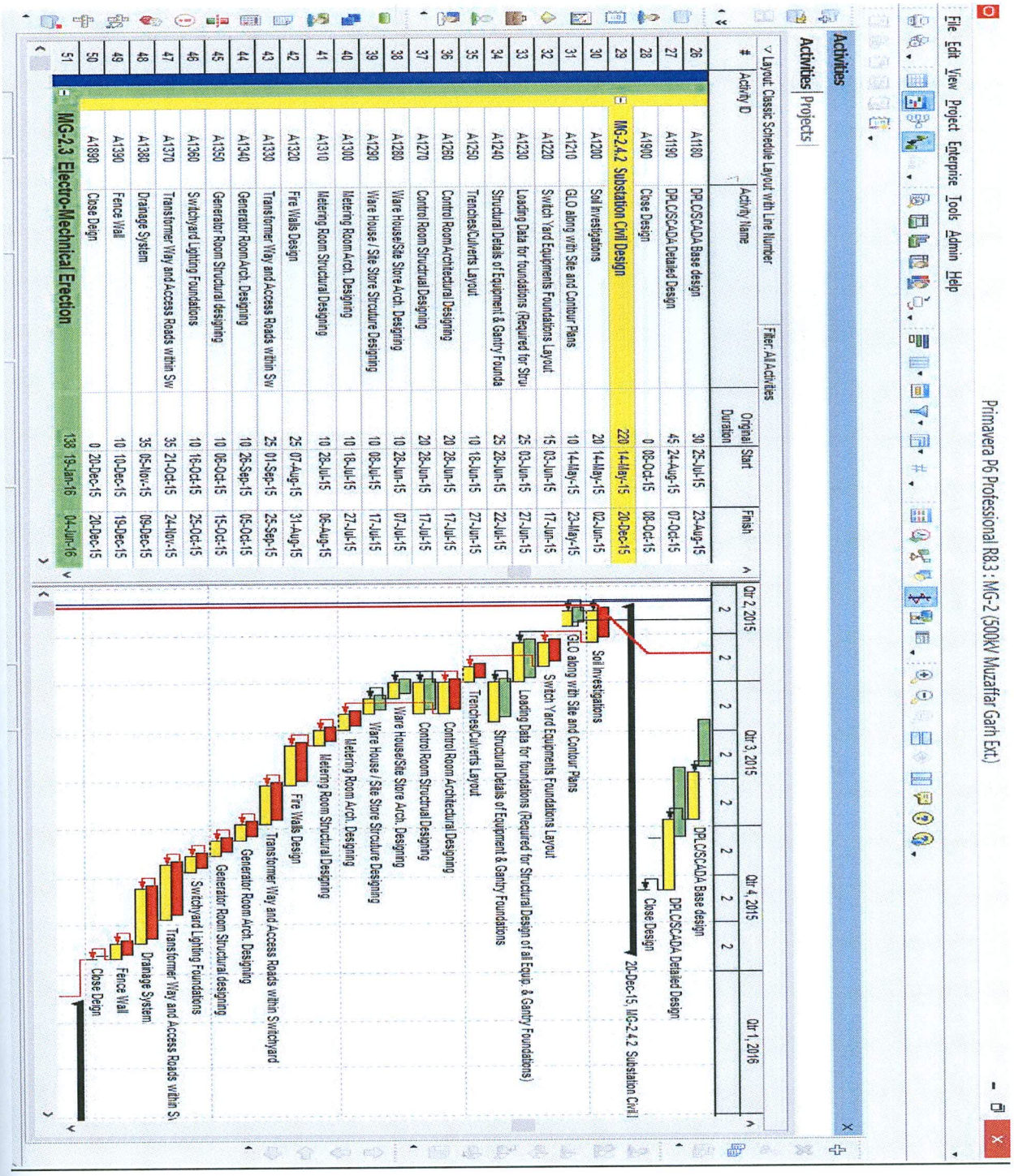



Figure – 12.1: Activity Gantt Chart


**Figure – 12.2: Activity Gantt Chart**

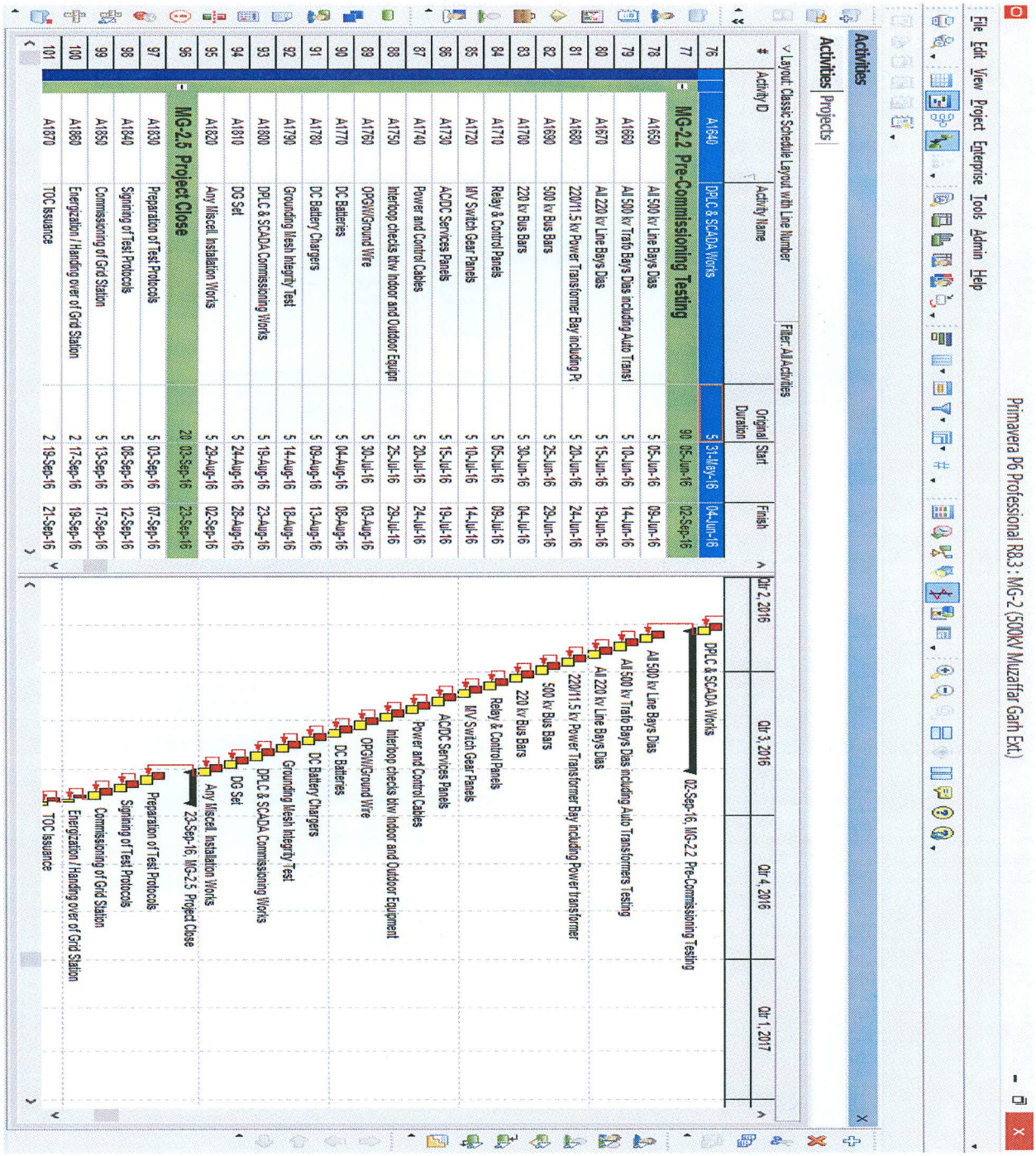



**Figure – 12.3: Activity Gantt Chart**

## Work Breakdown Structure:

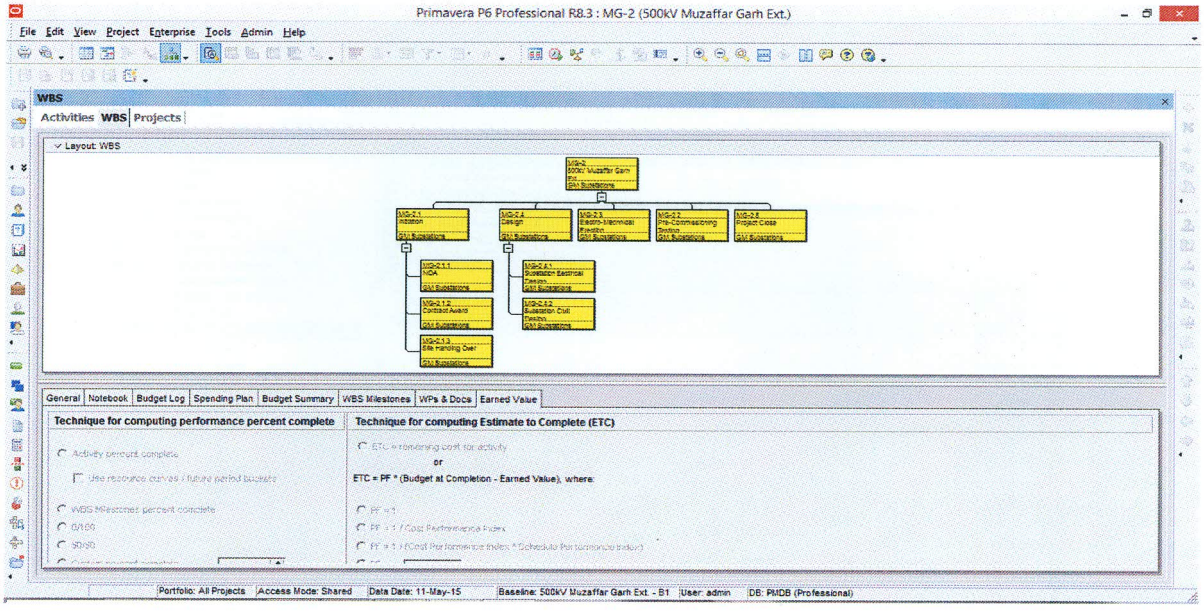



Figure – 13: Work Breakdown Structure

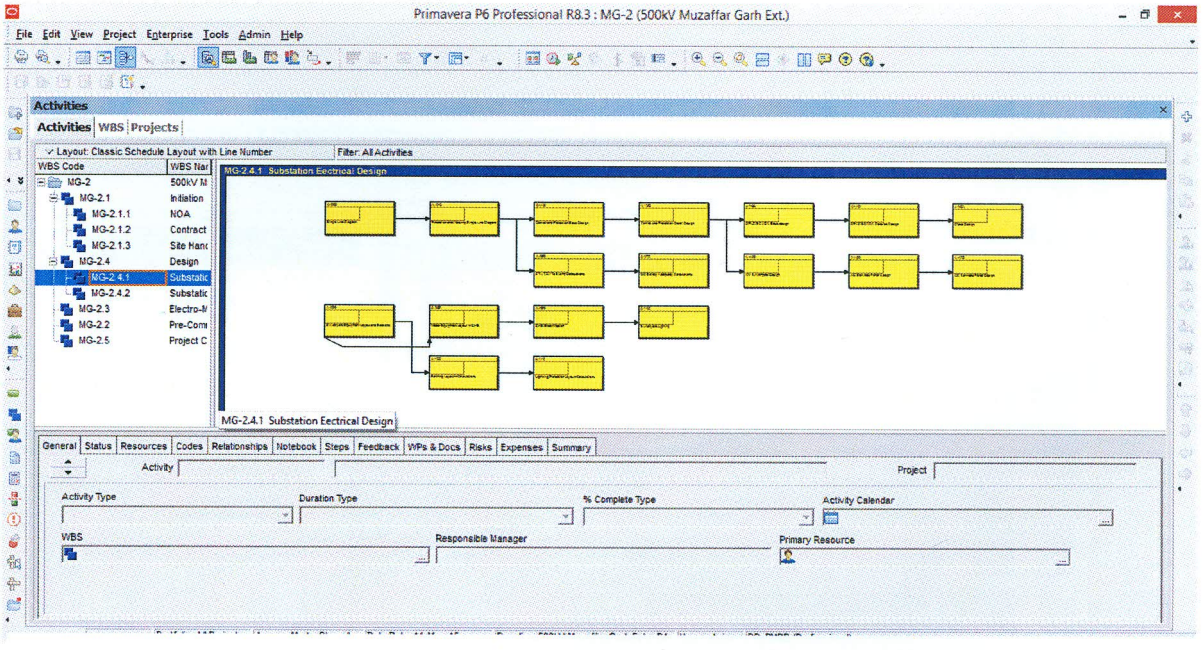



Figure – 14: Work Breakdown Structure Network Diagram

## Earned Value Curves:

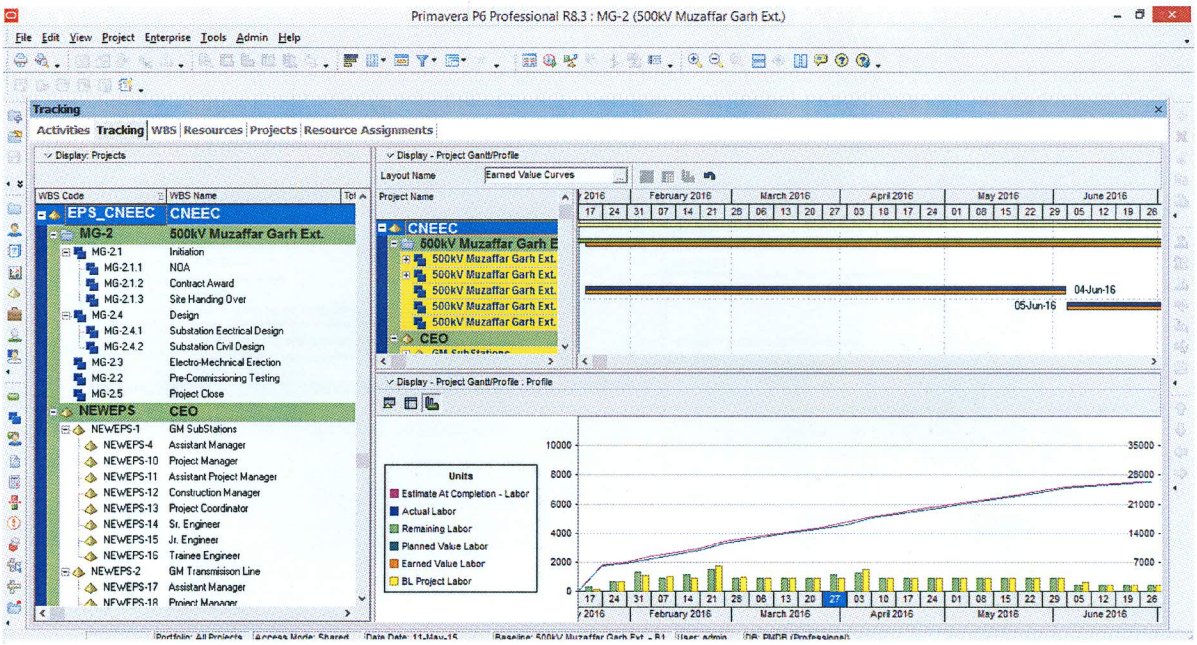



Figure – 15: EVM Curve

## Resource Allocation:

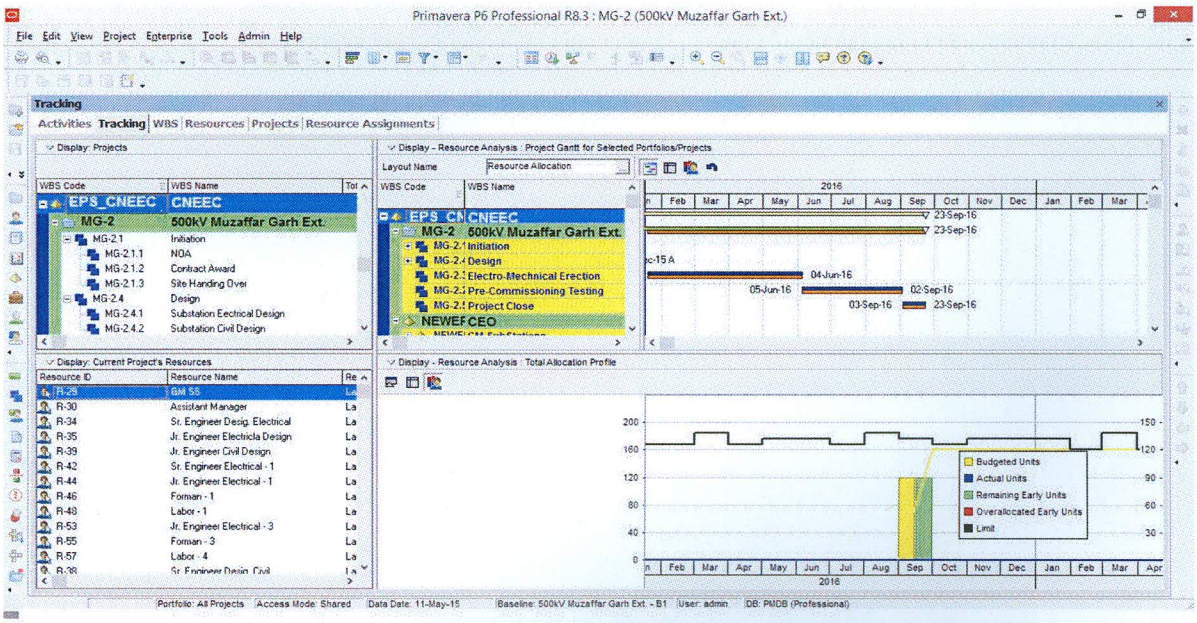



Figure – 16: Resource Allocation

## Activity Usage Profile:

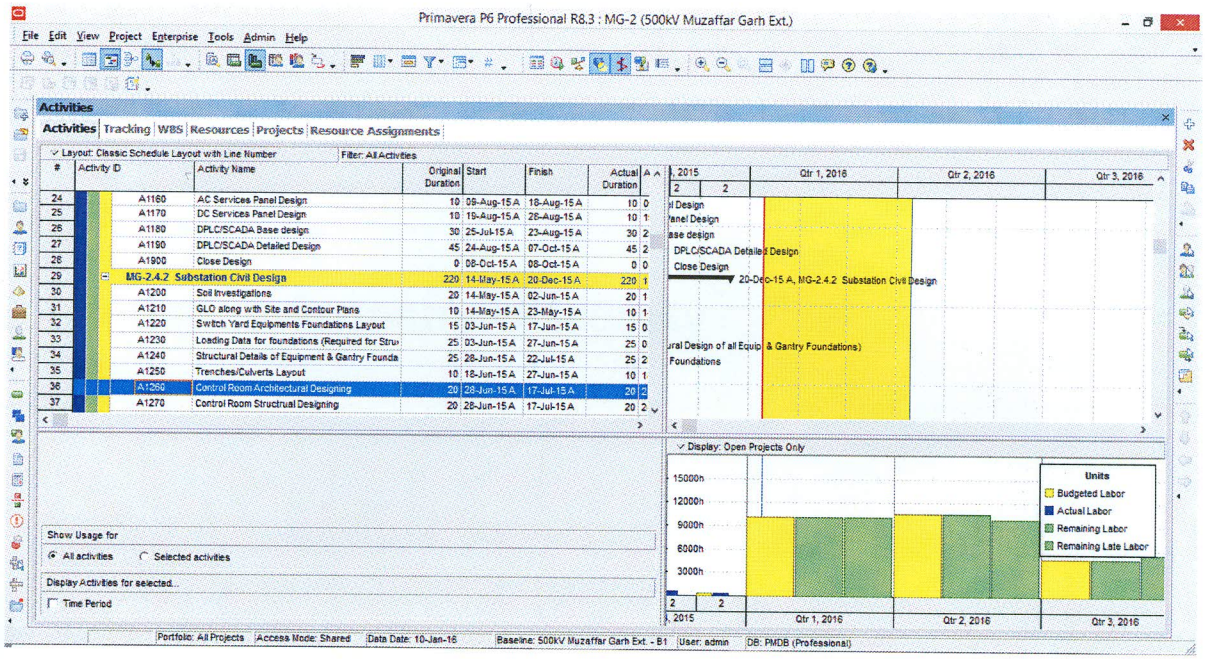



**Figure – 17: Activity Usage Profile**

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