

Delay Analysis

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ABSTRACT

Delay analysis : It is critical part of project controls. It is used to identify and quantify the cause of delay so that corrective action can be taken to mitigate the impact of the delay and ensure that the project is completed on time

There are many different factors that can contribute to delay in project .These include :



Scope Change:

Changes to the project scope can often delay as they require additional time and resources to implement



Resource constrain :

Lack of availability of resources ,such as labor material or equipment can also lead to delay



Scheduling

errors : Errors in the Project Schedule can also lead to delay as they can result in activities being started



External factor:

External factors such as weather strikes or regulatory changes can also lead to delay



DEFINATION



Delay analysis is the process of determining how the project schedule was impacted by one or more events that occurred during the project, as well as the causes and responsibility for those events. It is an important tool for project managers to use to identify and mitigate delays, and to protect their interests in the event of a dispute.

There are a number of different delay analysis techniques that can be used, depending on the specific circumstances of the project



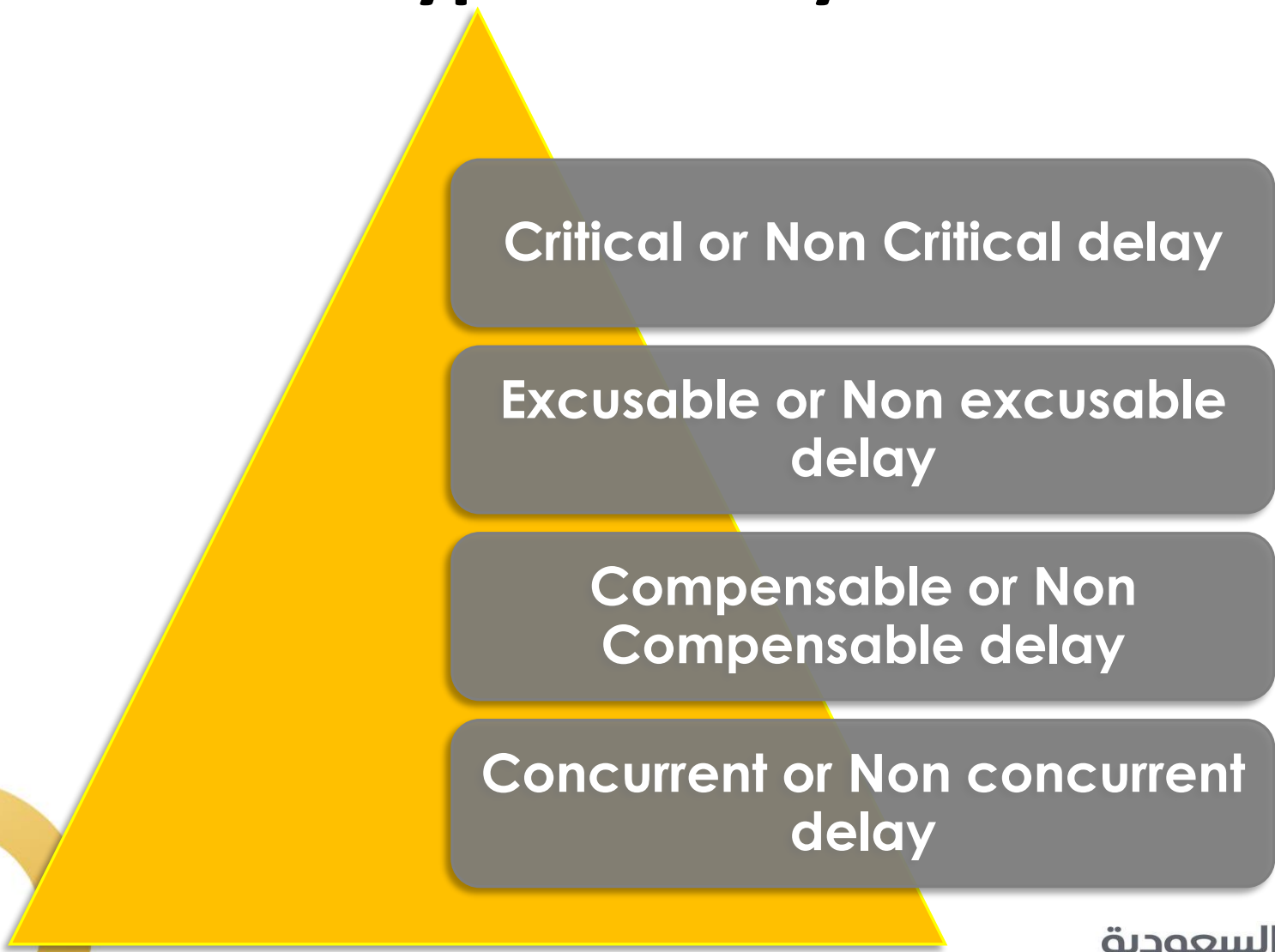
GENRAL TYPES OF DELAY

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General Type of delay



Critical or Non Critical delay

Excusable or Non excusable
delay

Compensable or Non
Compensable delay

Concurrent or Non concurrent
delay



General Type of delay

Critical delay : Delay that effect the project Completion or in some cases a milestone date

Non Critical delay : Delay that does not affect the project Completion or in some cases a milestone date



General Type of delay

Excusable delay: Delay that is due to unforeseeable event beyond the contractor or subcontractor control

Non excusable delay : Delay are event that are within the contractor or subcontractor control or that are foreseeable

General Type of delay

Compensable delay: Delay where the contractor is entitled to a time extension and additional compensation

Non Compensable delay : Delay where the contractor is not entitled to a time extension and additional compensation though it is an excusable delay

General Type of delay

Concurrent delay: Two or more separate delays to the critical path that occur at the same time

Non excusable delay :Two or more separate delays to the critical path that does not occur at the same time.

DELAY ANALYSIS TECHNIQUE

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Delay Analysis Technique

Delay Analysis

Schedule based
analysis

Non-schedule
based analysis:

Prospective
TIA

Retrospective
TIA

Window
analysis

Analysis
based on
dollar

S-curve

As planned
vs As Build
analysis

Impact As
Planned
Analysis

Collapsed
As Build
Analysis

But for
Analysis

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Prospective TIA (Time Impact Analysis) : Forecasting future delay

This technique is used to predict the potential impact of future events on a Project's Schedule .Its specially helpful in proactive management ,Allowing to identify and address potential delay before they occur .Owner and Contractor will agree to an estimated value of work prior to the work being performed

When to use it :

When there major changes in project scope or design.

When encountering unforeseen circumstances like material shortage or weather delay

Merit :

Improve Project Planning one can proactively adjust the schedule and resource allocation to mitigate delay. Reduce the risk of cost overrun

Demerit :

This Technique can only be used if the delay event is well known in advance before starting the activity

As Planned Vs as built Analysis:

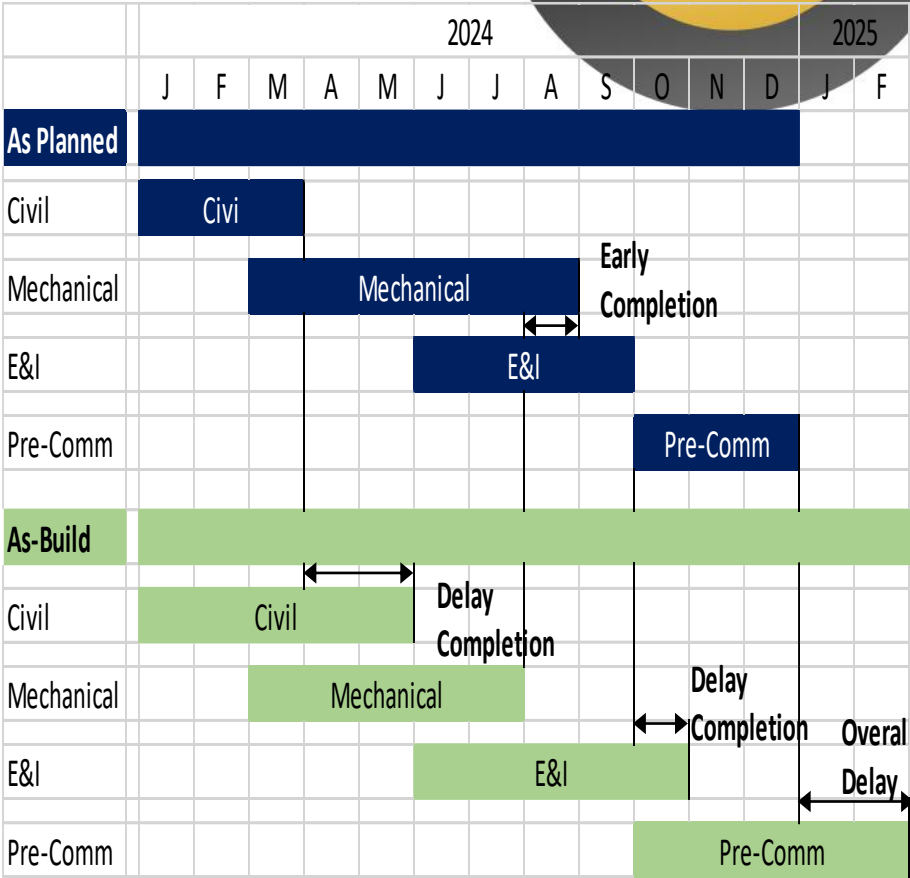
In this technique, the analyst compare the As-Planned (baseline Schedule) to the As-Built (Updated Schedule) to find out the reasons for the Project’s late completion. This analysis is usually performed at a high level or WBS level of project Schedule .Basically it compares “ What happen to what was suppose to happen”

Merit :

It is easy to understand and present as it does not get down to more details

Demerit :

This analysis may identify noncritical path delays as delays for which the Contractor would be entitled to a time extension. If the Project is executed in different sequence than planned, this technique will not be able to properly identify and measure the delays. This approach lacks the ability to identify and address concurrent delays



Impacted As-Planned Analysis:

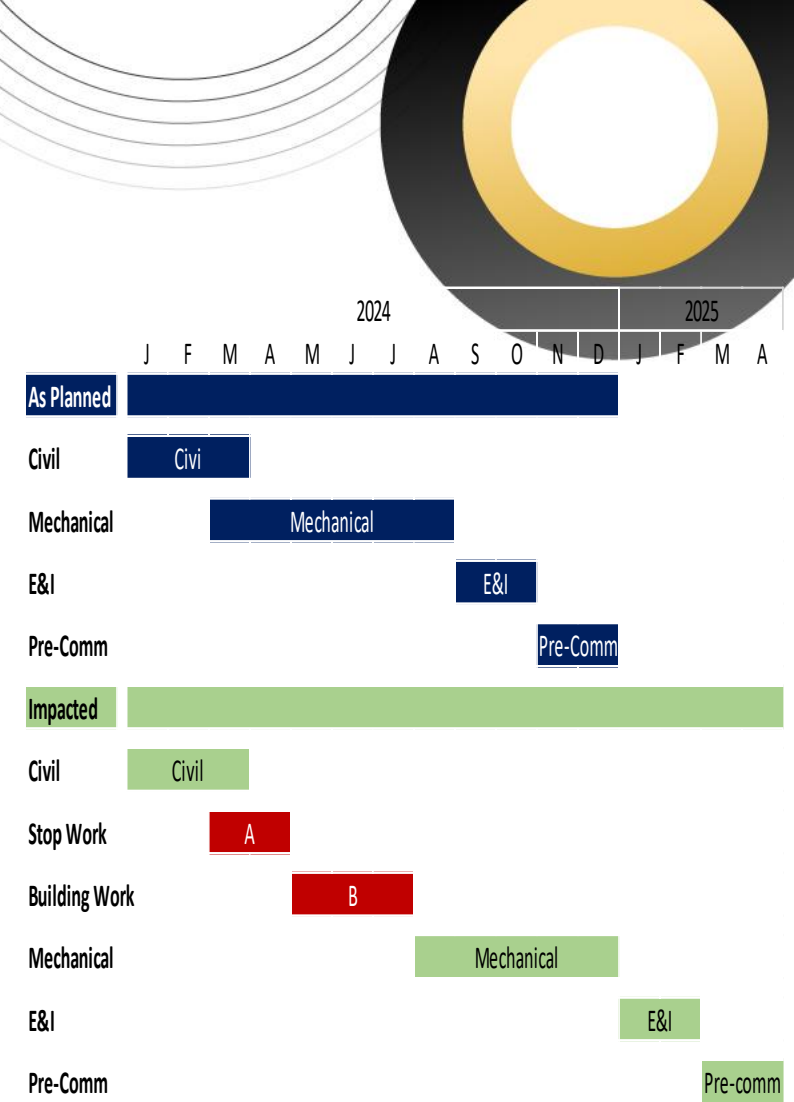
In this technique a fragnet will be developed for each delay event and will be inserted in to the baseline schedule and the schedule will be re-run. This Schedule is Impacted As-Planned Schedule .Its Project finish date will be compared with the Project finish date of As-Planned Schedule (Baseline). The difference in Project finish dates is the delay measured as a result of delay fragnets inserted in to the schedule.

Merit :

It is easy to understand and present as it does not get down to more details

Demerit :

This analysis considered that the project is executed as per baseline schedule except for the delay fragnets inserted. In reality, there may be various change in sequence of activities & shifts in Critical path. Mostly, the analyst will only insert the delay caused by opposition party . So the outcome of this technique will be inherently biased against the opposition party



But For Analysis:

In this technique the Analyst insert the Owner's delays in to the Original Project schedule and then argue that "but for" these delays, he could have finished the work much sooner. The difference between the actual completion date and the "but for" schedule is then the measure of the delays caused by the Owner.

Collapsed As Built Analysis:

It is nothing but a reverse of Impacted As-Planned Analysis. In this method the analyst will subtract (removes) activities from the as built schedule which represent delays or change and activities which have impacted the project schedule. Then the difference in days between the as-built and the collapsed as-built end dates is considered to be the delay caused by the specific activities that were removed This approach is commonly being considered as unreliable and erroneous

Window Analysis :

In this technique, the analyst chooses to analyze delays in Isolated time periods or "windows" during the project.

Windows analysis involves two major steps. They are selection of time period or window and selection of delay analysis technique



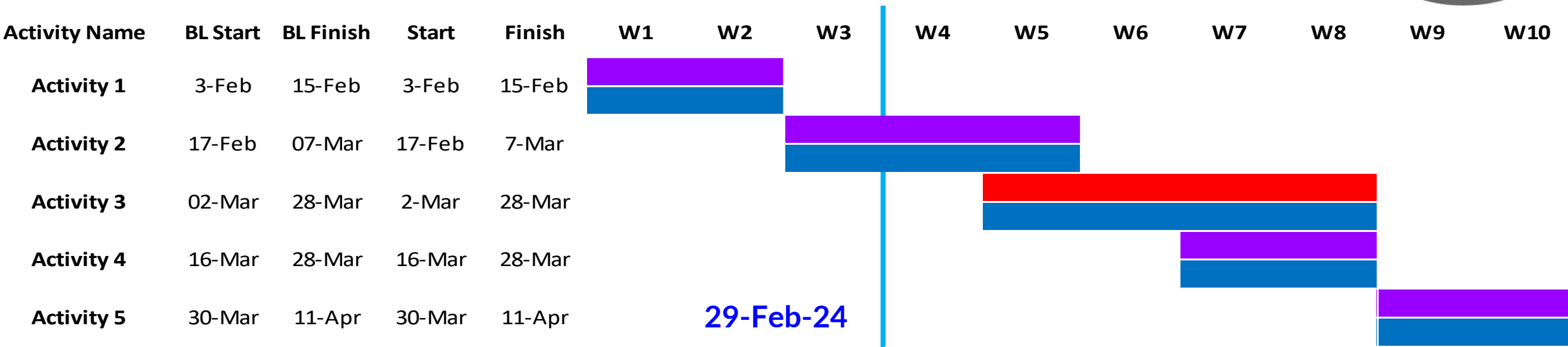
Steps for Prospective TIA Technique

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1. Identify the effective date by which, the added or changed work will be made part of the Contract
2. Identify the last available updated schedule closer to the effective date of added or changed work

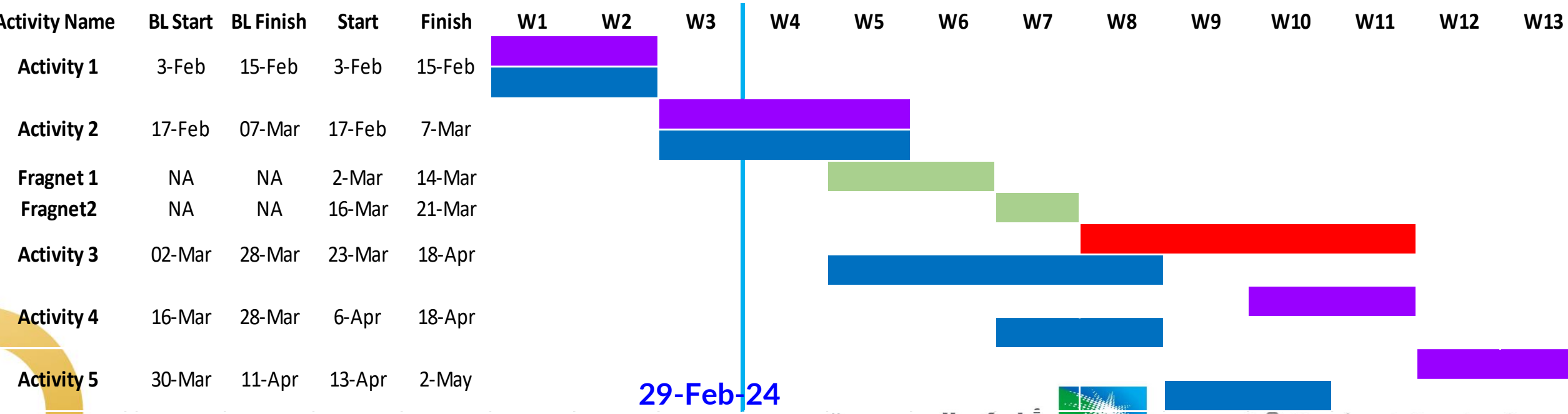


3. Developed fragnet for the added or changed work .Get the Owner’s review and approval of fragnet logic and duration may undergo negotiation during approval



4.Insert the approved fragnet in to the copy of the schedule discussed here in Step No. 2.
Insertion of Fragnet also involves agreement of both the parties with regard to how the fragnet activities are linked to the existing activities in the schedule

5. Finally, rerun the fragnet inserted schedule to get the revised forecast completion date. It shall be compared with the forecast completion date of the schedule before inserting the fragnet. The difference in forecast completion date is the delay resulting from the insertion of fragnet



Steps for Retrospective TIA Technique

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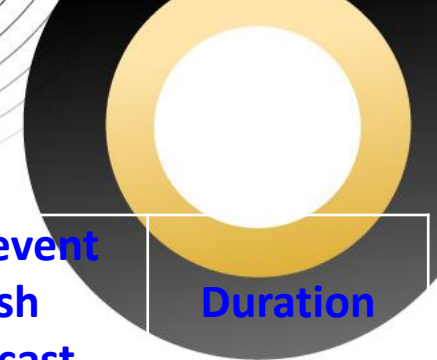


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1. List down all the delay events which impacted the Mechanical completion
2. Identify the effective date and duration of these delay events .

Sr No	Delay Event	Event description	Delay event start	Delay event Finish /Forecast	Duration
1	DE-01	Delay due to late issuance of LUP and NTP for temporary laydown yard & Temporary office Facilities	30-Dec-20	16-Mar-21	63
2	DE-02	Excavation for foundation on hold due to mismatch between plant coordinates and IFC drawings	06-Jan-21	30-Jan-21	24
3	DE-03	Delay in achievement of early demolition milestone due to delay in shutdown	12-Feb-21	20-Mar-21	36
4	DE-04	Delay in completion of civil foundations in early demolition area due to DE02, design conflicts and Permit by Operations	18-Mar-21	25-Mar-21	7
5	DE-05	Delay in civil foundations in NAPD corridor - design concerns raised by proponent and NAPD	9-Apr-21	14-Apr-21	5
6	DE-06	Delay in completion of Ignition Skid foundation - Coordinates mismatch	11-Apr-21	17-Apr-21	6
7	DE-07	Excavation on hold for Flare area foundations - pending for resolution of H2S detection	16-May-21	28-May-21	12

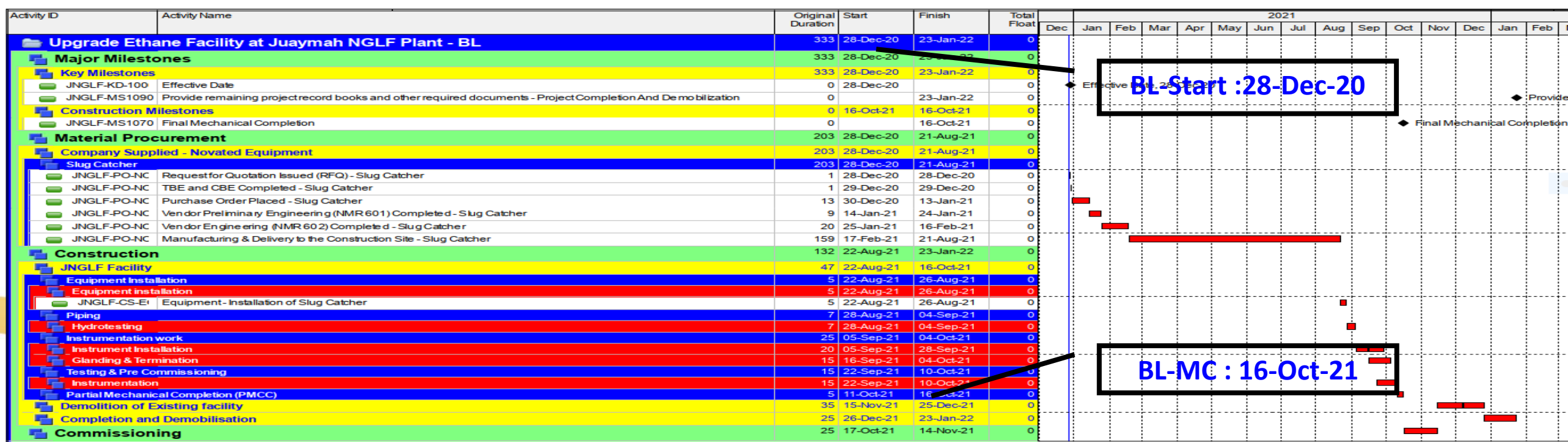




3. Calculate the Impact on Mechanical Completion by each delay event one by one.

Sr No	Delay Event	Event description	Delay event start	Delay event Finish /Forecast	Duration
1	DE-01	Delay due to late issuance of LUP and NTP for temporary laydown yard & Temporary office Facilities	30-Dec-20	16-Mar-21	63

4. Identify the updated Program (Schedule) with data date just prior to the start of the delay event.



5. Develop Fragnet for the delay event .get the Owner’s review and approval of fragnet logic and duration

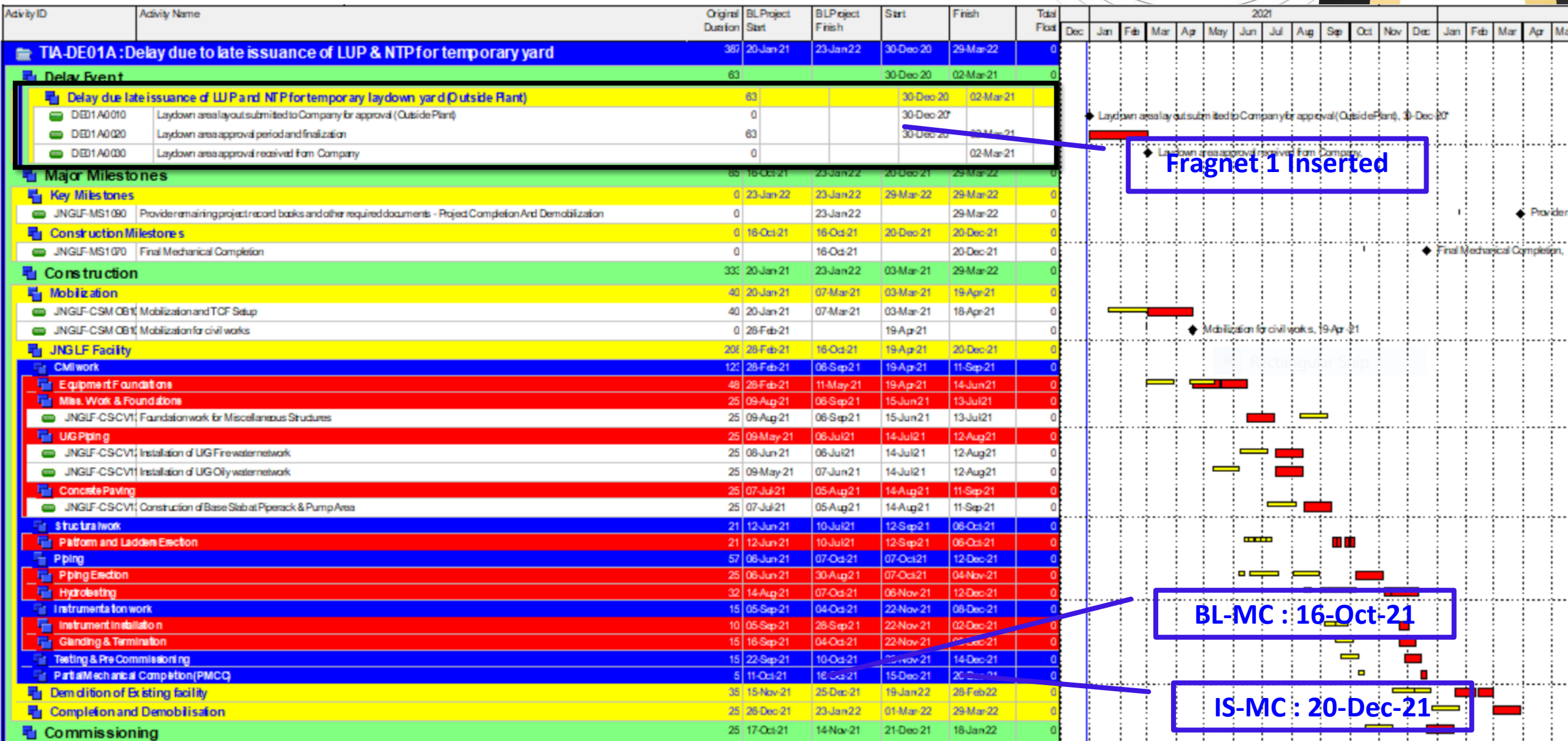
Activity ID	Activity Name	Original Duration	Start	Finish	
TIA-DE01A : Delay due to late issuance of LUP & NTP for temporary yard					
Delay Event		63	30-Dec-20	02-Mar-21	
Delay due late issuance of LUP and NTP for temporary laydown yard (Outside Plant)		63	30-Dec-20	02-Mar-21	
DE01A-0010	Laydown area layout submitted to Company for approval (Outside Plant)	0	30-Dec-20*		◆ Laydown area layout submitted to Company for approval (Outs
DE01A-0020	Laydown area approval period and finalization	63	30-Dec-20	02-Mar-21	
DE01A-0030	Laydown area approval received from Company	0		02-Mar-21	◆ Laydown area approval received from Company.

6.Insert the approved fragnet in to the copy of the updated schedule discussed here in step No 4. Insertion of fragnet also involves agreement of both the parties with regard to how the fragnet activities are linked to the existing activities in the schedule.

7. Finally after inserting the fragnet and rerunning the schedule it is observed that the final Mechanical completion is shifted from 16-Oct-21 to 20-Dec-21 making an impact of 65 calendar days

Activity ID	Activity Description	BL Completion Update	TIA-DE01A Completion Date	Variance (days)
JNGLF-MS1070	Final Mechanical Completion	16-Oct-21	20-Dec-21	65 Days



Sr No	Delay Event	Event description	Mechanical Completion before TIA	Schedule Reference for TIA	Mechanical Completion after TIA-DE	Impacted Days
1	DE-01	Delay due to late issuance of LUP and NTP for temporary laydown yard & Temporary office Facilities	16-Oct-21	28-Dec-20	20-Dec-21	65 days
2	DE-02	Excavation for foundation on hold due to mismatch between plant coordinates and IFC drawings	20-Dec-21	28-Jan-21	25-Jan-22	36 days
3	DE-03	Delay in achievement of early demolition milestone due to delay in shutdown	21-Dec-21	25-Feb-21	3-Feb-22	44 days
4	DE-04	Delay in completion of civil foundations in early demolition area due to DE02, design conflicts and Permit by Operations	16-Feb-22	25-Mar-21	27-Feb-22	11 days
5	DE-05	Delay in civil foundations in NAPD corridor - design concerns raised by proponent and NAPD	24-Jan-22	29-Apr-21	4-Apr-22	11 days
6	DE-06	Delay in completion of Ignition Skid foundation - Coordinates mismatch	26-Apr-22	29-Apr-21	18-Apr-22	12 days
7	DE-07	Excavation on hold for Flare area foundations - pending for resolution of H2S detection	28-Apr-22	27-May-21	15-May-22	17 days

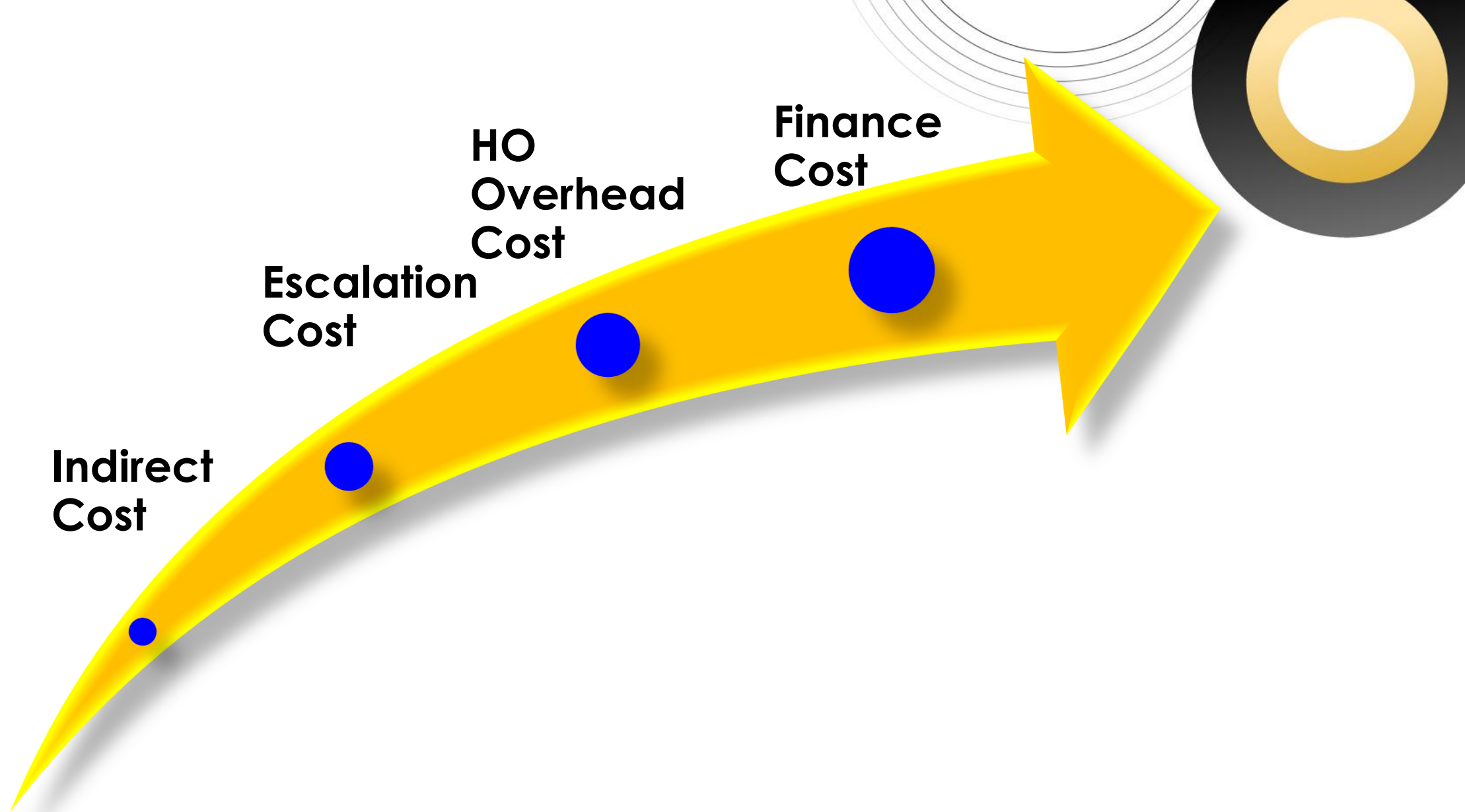
8. Total delay is the summation of the delays of all the individual delay events i.e 196 days

Cost of Delay

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● Indirect Cost

Indirect Manpower :

key Staff(Project Manager, RCM
Construction Manager,, Project Control
Team, HSE, QA/QC, Admin, etc)

P&M :

Additional M/C Month for extended
stay after original MC date

Vehicle Conveyance :

Staff and workmen Vehicle conveyance

Operational & Maintenance Cost :

Food, Accommodation, Power,
Insurance etc.

Escalation
Cost

HO
Overhead
Cost

Finance
Cost

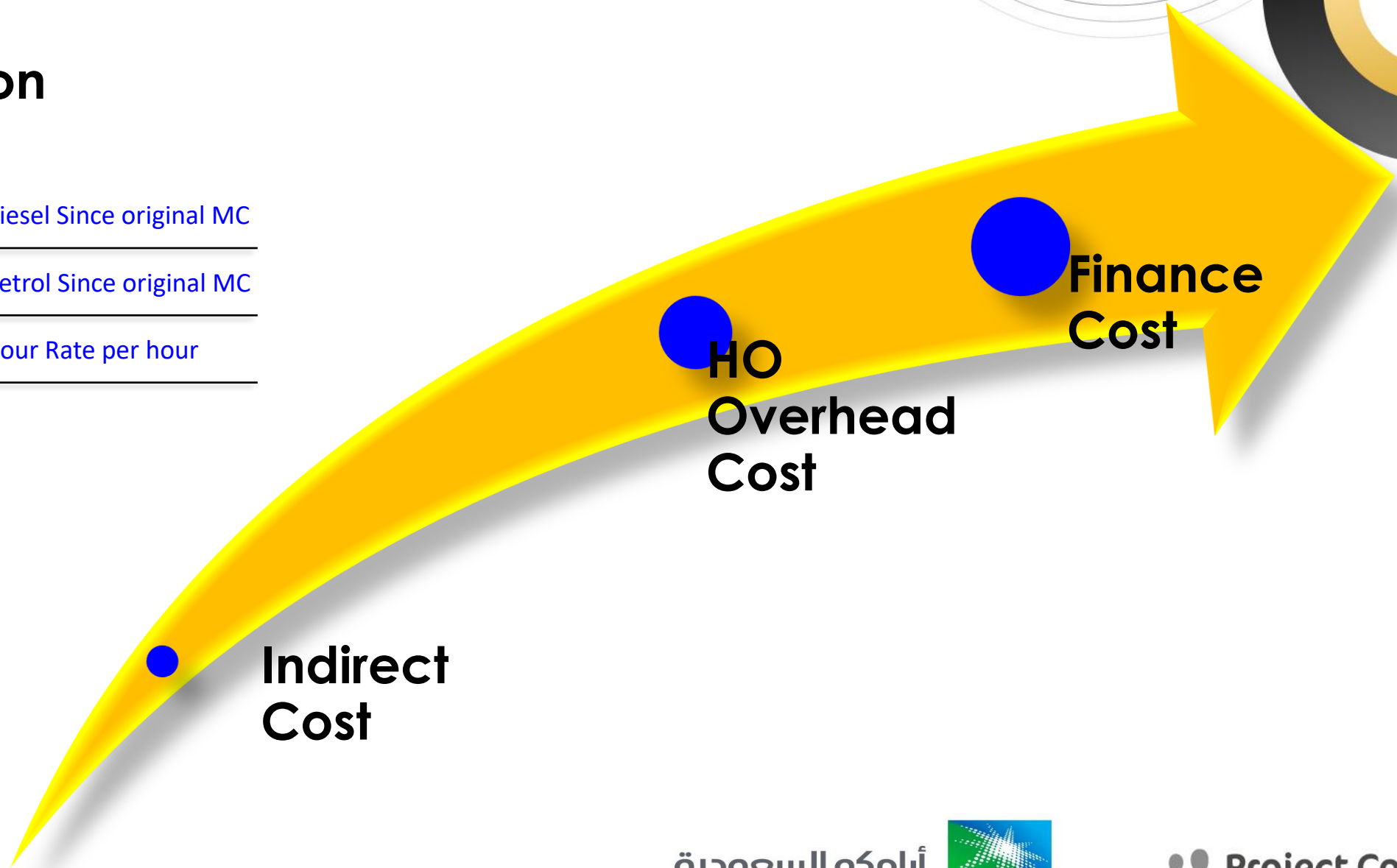


● Escalation Cost

Rate Escalation of diesel Since original MC

Rate Escalation of Petrol Since original MC

Escalation in Man-hour Rate per hour



Indirect Cost

HO Overhead Cost

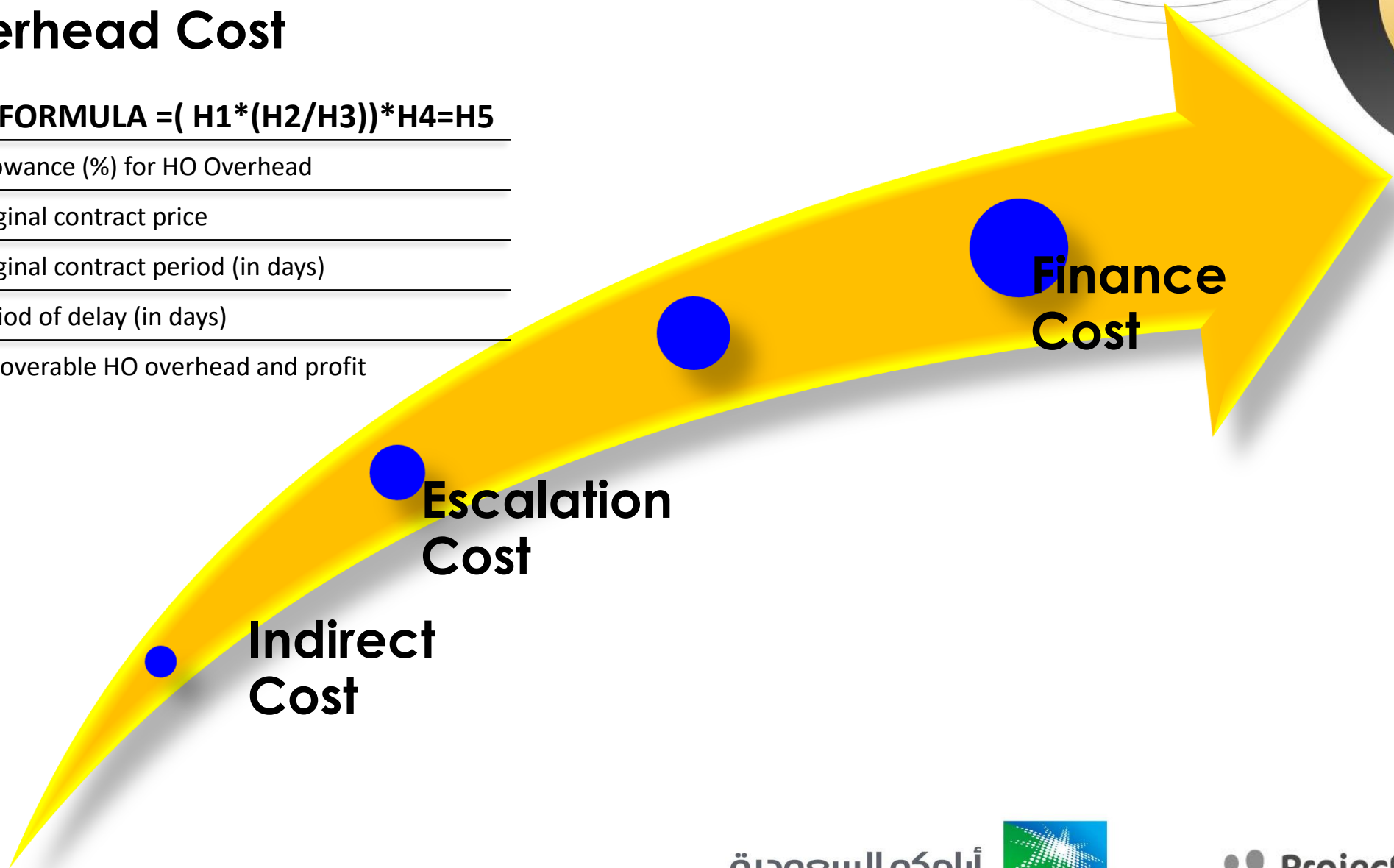
Finance Cost



HO Overhead Cost

HUDSON FORMULA $= (H1 * (H2/H3)) * H4 = H5$

H1	Allowance (%) for HO Overhead
H2	Original contract price
H3	Original contract period (in days)
H4	Period of delay (in days)
H5	Recoverable HO overhead and profit





Finance Cost

$$E = (A * C * D) / 365$$

- A** Rate of interest
- B** Contract Value
- C** Value of Retention
 - Retention Release as per Contract
 - Expected Retention Release
- D** Delay in Days
- E** Cost of Arranging Funds for Delayed Period





THANK YOU

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