STMI Forum

Plan of Actions & Milestones, (POA&M),
A Proven Road-Map Toward Effective SD and TA Preparation, A Success Story.

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AGENDA

- Introduction, Shutdowns & AM system.
- Strategizing and building values in SD and TA through step by step POA&M
- Planning SD & TA preparation phases with POA&M
- Managing risks in SD & TA
- Lean Shutdown Management
- Planning for logistics and support activities

SHUTDOWNS & ASSET MANAGEMENT SYSTEM

Asset Management Revolution

ISO 55001:2014, Asset Management, Management System Was Released in January, 2014

It itemizes 24 clauses specifying 71 'shall statements' for an Asset Management System.

"**A complete strategic enterprise wide system and activities"**

Asset Management

"Coordinated activities of an organisation to realise value from assets"

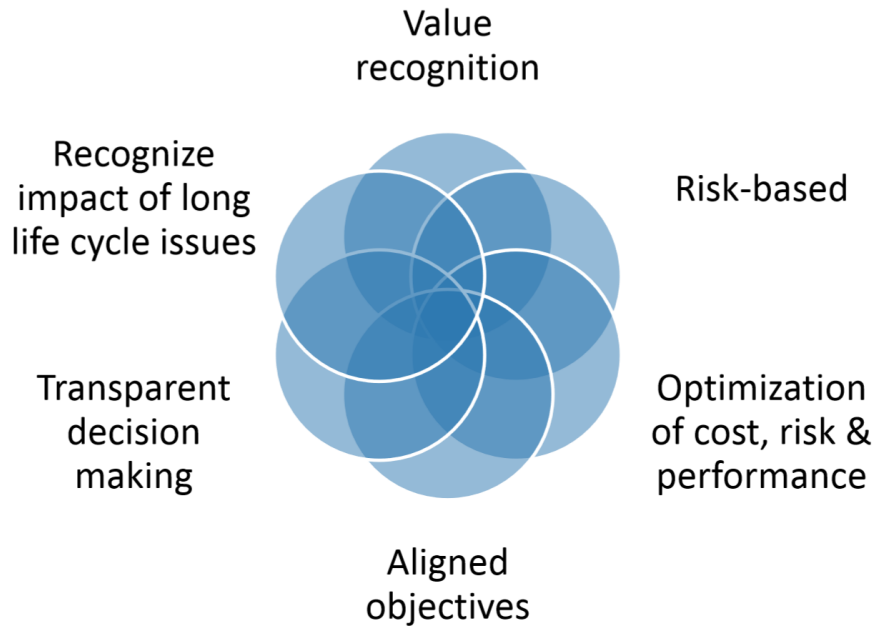
Asset

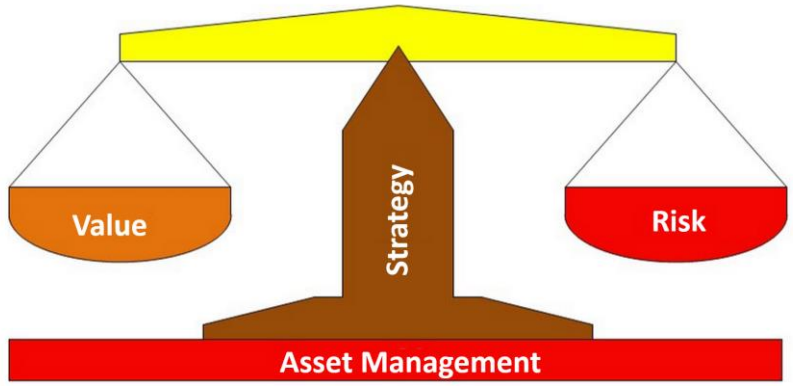
"Something that has potential or actual value to an organisation"

SHUTDOWNS & ASSET MANAGEMENT SYSTEM

Key Principles of ISO 55001

- Value to Organization & its Stakeholders
- Alignment and Strategic Planning
- Leadership and Workplace Culture
- Assurance of Fulfillment





SHUTDOWNS & ASSET MANAGEMENT SYSTEM

How do Turnarounds Fit into Asset Management?

Extracting the needed VALUE to organization and stakeholders

SHUTDOWNS & ASSET MANAGEMENT SYSTEM

- F1 Racing Pit Stop, a Case of SD Management Perfection :

Formula 1 is a highly competitive environment.

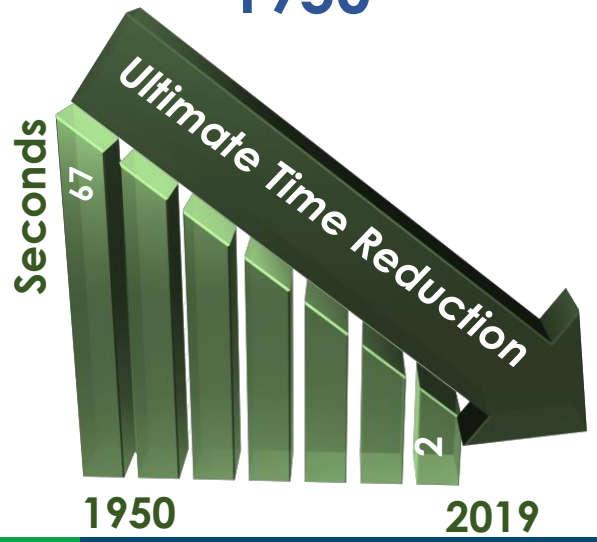
Teams quickly realized that pit stops were the critical moment of the race that could decide vital positions and, ultimately, the win or defeat.

SHUTDOWNS & ASSET MANAGEMENT SYSTEM

- F1 Racing Pit Stop, a Case of SD Management Perfection :

1950

2019



Perfection in SD & TA Management

SHUTDOWNS & ASSET MANAGEMENT SYSTEM

- Behind perfection earlier scene:

Management & Leadership

Preparedness

Training & Skills

Technology & Tools

What about our Shutdowns & Turnarounds?

- Over 90% of Turnarounds Failed to Meet Company's Business & Turnaround Goals.
- 80% of Turnarounds Experienced Cost Overruns of 10-40%.
- Half of the Turnarounds Suffered From Schedule Slippages.
- Almost 90% of Turnarounds Reported Work scope Growth of 10-50%.
- Most Turnarounds Were Impacted by Shortages of Qualified Staff and Crafts.
- 3 out of 4 Times the Schedules Were abandoned in the First Week of Turnaround.
- 90% of Post-Turnaround Reports Recommendations are Never Implemented

Ref.: IDC TECHNOLOGIES, Practical Shutdown and Turnaround Management for Engineers and Managers.

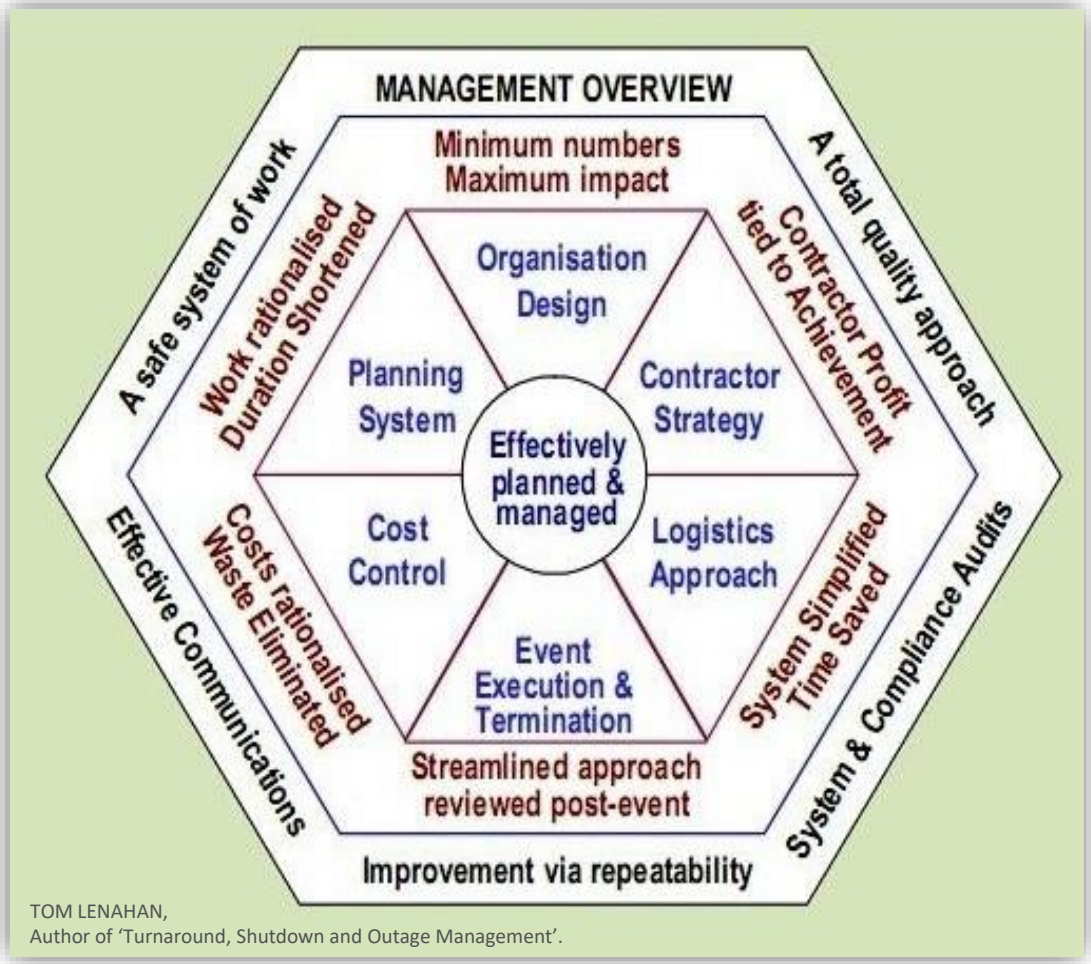
WHY DO TURNAROUNDS FAIL?

- Failure to start early enough
- Failure to treat as projects
- Ineffective planning effort
- Failure to assign professional management team
- Failure to control scope

Ref.: IDC TECHNOLOGIES, Practical Shutdown and Turnaround Management for Engineers and Managers.

WHAT IS NEEDED TO BE DONE?

Tom Lenahan Turnaround Model of Excellence (All in One)



TOM LENAHAN,
Author of 'Turnaround, Shutdown and Outage Management'.

Reference: TOM LENAHAN,
Author of 'Turnaround, Shutdown and Outage Management'.

Outline Model of Excellence for Turnarounds

SAFE SYSTEM OF WORK	MANAGEMENT OVERVIEW	TOTAL QUALITY APPROACH
Objectives - Safe systems - Assessment Compliance - Monitoring	Constantly test strategic Turnaround strategy	Standards - Quality Assurance - Quality control Compliance - Monitoring

ORGANISATION	PLANNING	CONTRACTS	COST	LOGISTICS	EXECUTION	TERMINATION
Steering Group Strategy	Planning Philosophy	Contract Policy	Pricing framework	Logistics Approach	Management Control	Start -up Control
Event Manager	Project Definition	Contractor Commitment	Ballpark Estimate	Procurement	Briefing Program	Critical activities
Designed organisation	Work scope definition	Critical Contract Elements	Estimate Refinement	Infrastructure	Human factors	Plant Start-up routine
Planning & preparation team	Worklist Control	Subcontractor policy	Contract Pricing	Supply Control	Planned Daily Routines	Plant Start-up
Process Team Input	Detailed Planning	Incentive schemes		Organising Bulkwork	Plant Shut-down	Monitor plant performance
Technical Team Input	Schedule Optimisation	Contractor Mobilisation	Cost control Process	Offsite Services	Scheduled Work	Post mortem de-brief
Resource Levels	Pre-shutdown Work	Performance Monitoring	Monitoring (during event)	Cranes & Transport	Emergent Work	Close out meeting
Client/ Contractor Integration	Schedule Updating Criteria	Contractor Demobilisation	Closing-out Accounts	Site demobilisation	Equipment hand-back	Action to improve
Risk Management	Risk Management	Risk Management	Risk Management	Risk Management	Risk Management	Preparing for Next event

COMMUNICATION STRATEGY	IMPROVEMENT VIA REPEATABILITY	AUDIT PROGRAMME
Policy - Activities - Spread	Capture, record and Re-use best practice	Audit: Strategy Preparation Execution

WHAT IS NEEDED TO BE DONE?

All of us know what is needed to be done

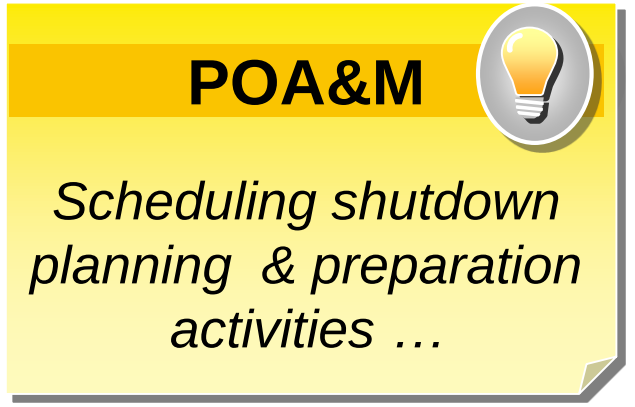
But we need to plan for them to be done

We need planned & controlled focus on turnaround prep

WHAT IS NEEDED TO BE DONE?

Overall Plan of Actions & Milestones (POA&M)

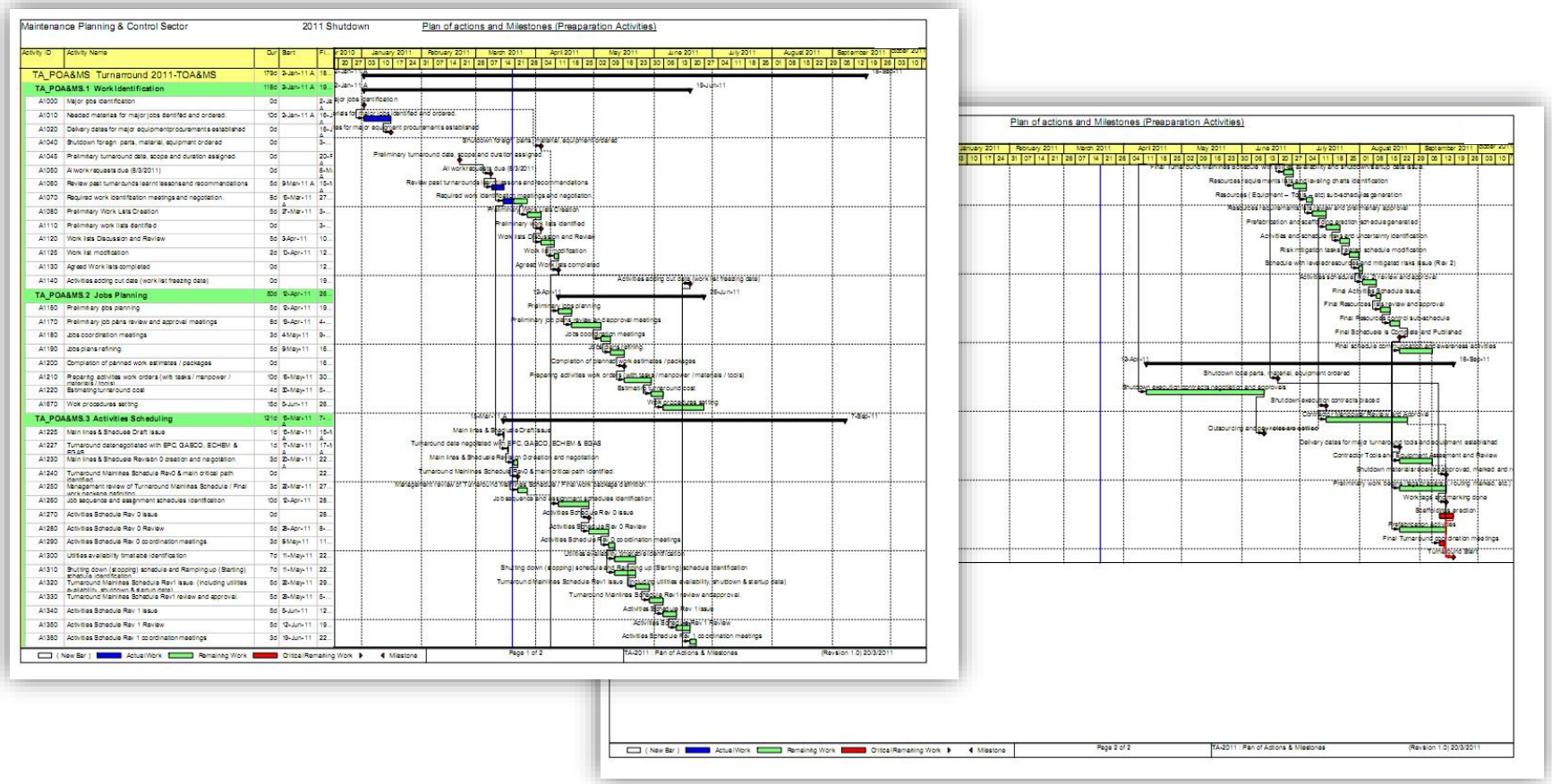
A schedule frames out main preparation activities and important dates.



Kevin Duffy, Strategies to optimize shutdowns, turnarounds and outages.

WHAT IS NEEDED TO BE DONE?

Overall Plan of Actions & Milestones (POA&M)



WHAT IS NEEDED TO BE DONE?

Overall Plan of Actions & Milestones (POA&M)

Example Contents:

- Review last shutdown lessons learnt and recommendations *(Activity)*
- Preparation of job list *(Activity)*
- Preliminary job list meeting/coordination *(Activity)*
- Activity list freezing date *(Milestone)*
- Preparation of Planned Jobs Package *(Activity)*
- Developing Shutdown Mainlines Schedule *(Activity)*
- Mainlines Schedule communicated and approved *(Milestone)*
- Developing Detailed Turnaround Schedules *(Activity)*

THE POLL

Login to : SLI.DO

Event #: STMI

Poll Q1: SLI.DO Event # STMI

1. Do you use Plan of Actions & Milestones in your preparation for shutdown and turnaround?

   A. Yes, with a formal schedule for all preparation activities

   B. Yes, but not formal and not in a documented and controlled way

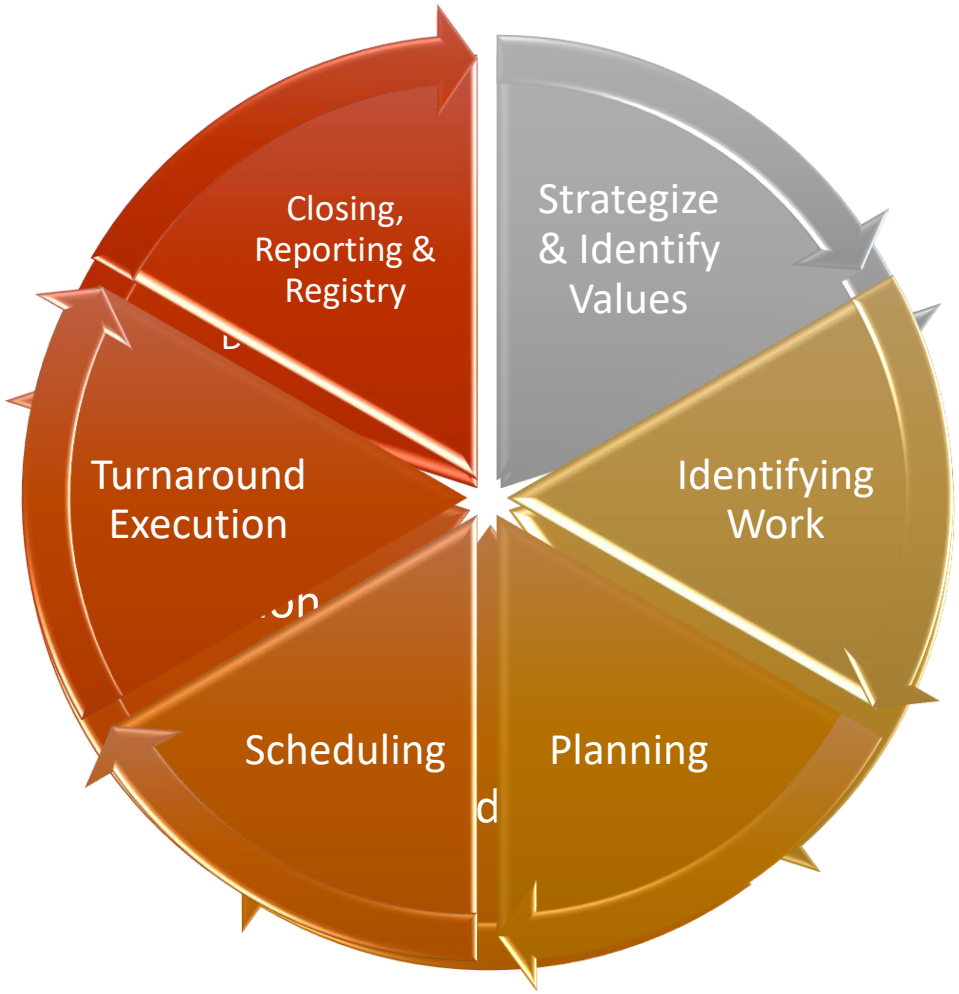
   C. No, we just prepare our SD & TA trying to do the best for it.

   D. I don’t know.

   E. I am a service provider or vendor.

MAIN TURNAROUND PHASES

Strategizing Turnarounds & Shutdowns



Initiation Phases

- Teams Formation
- Turnaround Strategy
- Turnaround Scoping
- Planning for the Plan (Plan of Actions & Milestones)

Preparation Phases

- Work List Details
- Work Planning & Scheduling
- Procurement & Contracting

Execution & Closing

- Pre-Shutdown Activities
- Shutdown Execution
- Commissioning &Start-Up
- Evaluation & Closing

STRATEGIZING AND RECOGNIZING VALUES

Turnaround Goals & Objectives

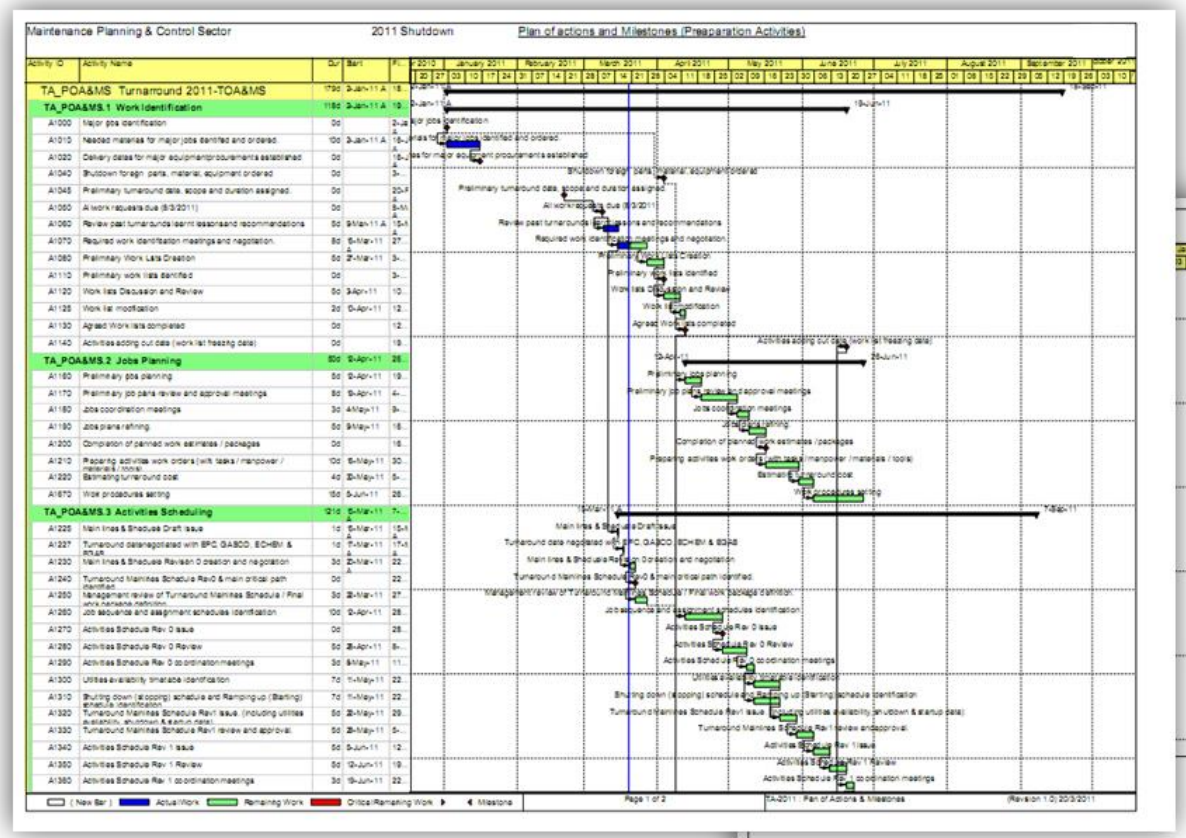
Safety

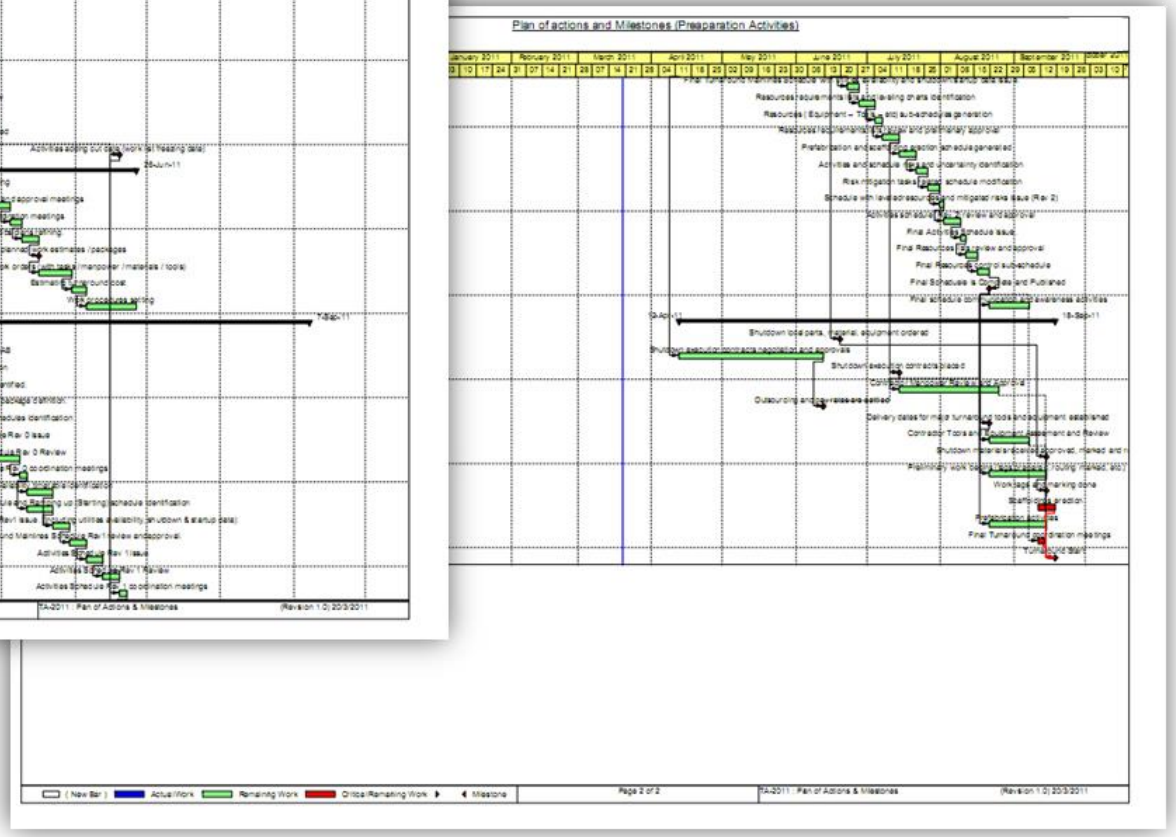
Performance | Time | Cost

PLAN OF ACTIONS & MILESTONES - (POA&M)

POA&M

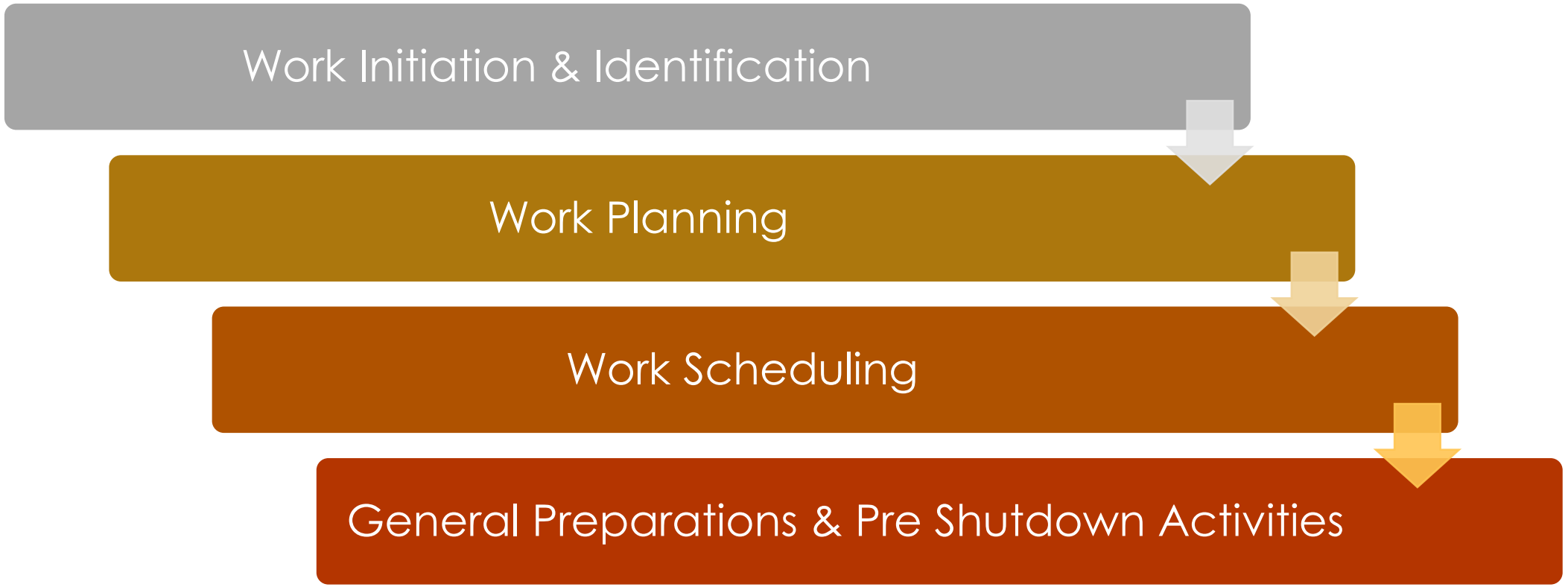
Scheduling shutdown planning & preparation activities …





PLAN OF ACTIONS & MILESTONES - (POA&M)

- Overall Plan of Actions & Milestones (POA&M) Breakdown Structure

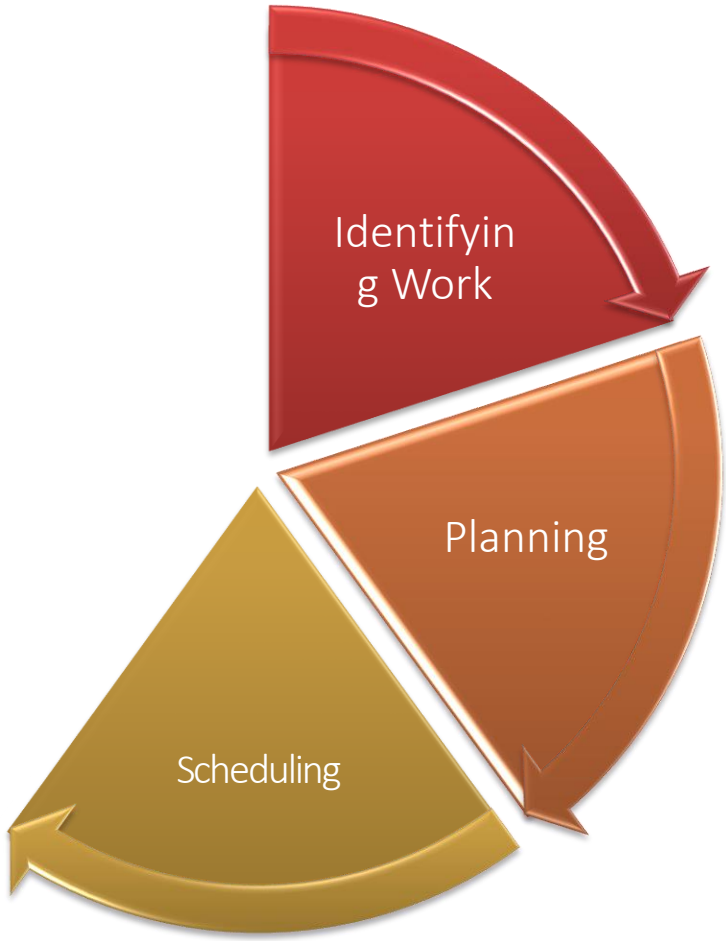


PLAN OF ACTIONS & MILESTONES - (POA&M)

- Overall Plan of Actions & Milestones (POA&M) Enables Effective Preparation

Effective Preparation

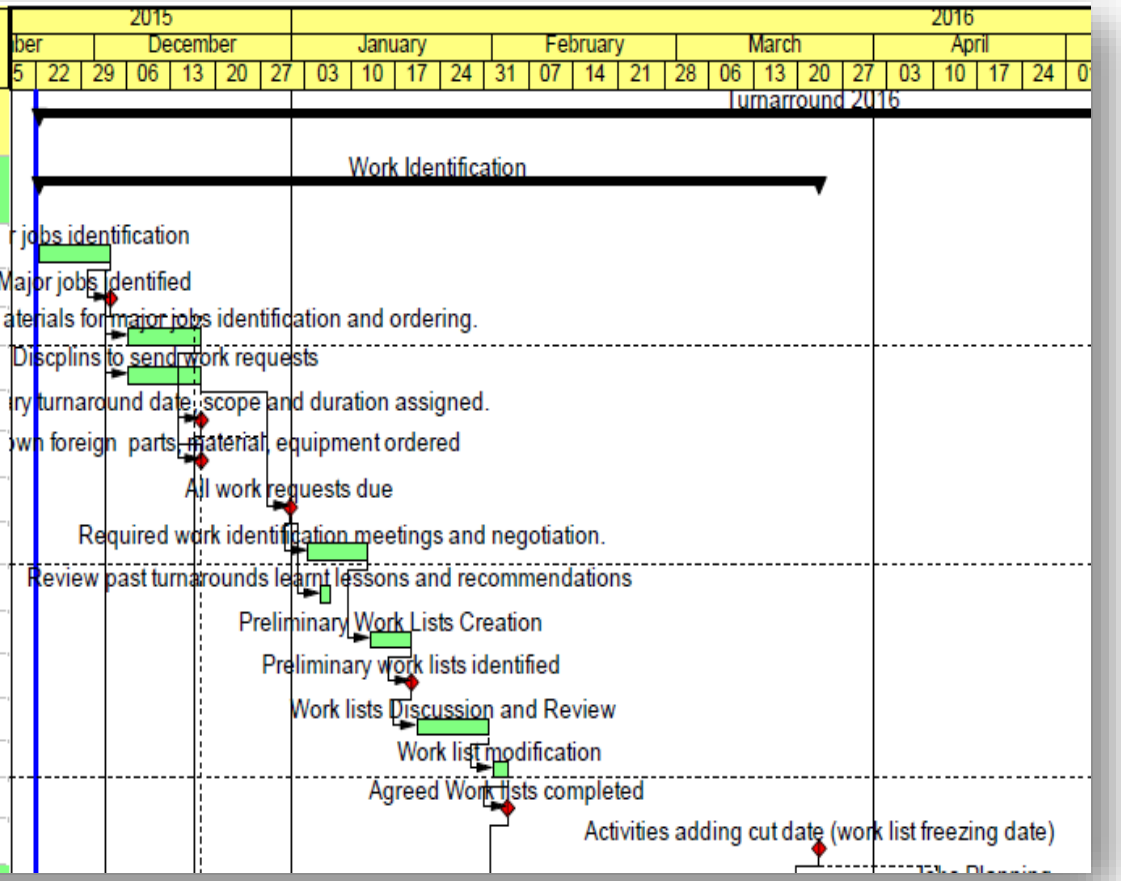
- Work identification
- Effective Planning
- Effective Scheduling
- Managing risks and uncertainty
- Lean Shutdown Management
- Managing and Preparing Logistics
- Procurement &Contracting
- Pre Shutdown Activities



PLAN OF ACTIONS & MILESTONES - (POA&M)

- Work Identification WBS

Activity ID	Activity Name	OD	Start	Finish
Turnaround				
Work Identification				
A1000	Major jobs identification	10d	22-Nov-1	03-Dec-1
A1005	Major jobs identified	0d		03-Dec-1
A1010	Needed materials for major jobs identification and ordering.	10d	06-Dec-1	17-Dec-1
A1047	Discplins to send work requests	10d	06-Dec-1	17-Dec-1
A1045	Preliminary turnaround date, scope and duration assigned.	0d		17-Dec-1
A1040	Shutdown foreign parts, material, equipment ordered	0d		17-Dec-1
A1050	All work requests due	0d		31-Dec-1
A1070	Required work identification meetings and negotiation.	8d	03-Jan-1	12-Jan-1
A1060	Review past turnarounds learnt lessons and recommenda	2d	05-Jan-1	06-Jan-1
A1080	Preliminary Work Lists Creation	5d	13-Jan-1	19-Jan-1
A1110	Preliminary work lists identified	0d		19-Jan-1
A1120	Work lists Discussion and Review	8d	20-Jan-1	31-Jan-1
A1125	Work list modification	3d	01-Feb-1	03-Feb-1
A1130	Agreed Work lists completed	0d		03-Feb-1
A1140	Activities adding cut date (work list freezing date)	0d		23-Mar-1



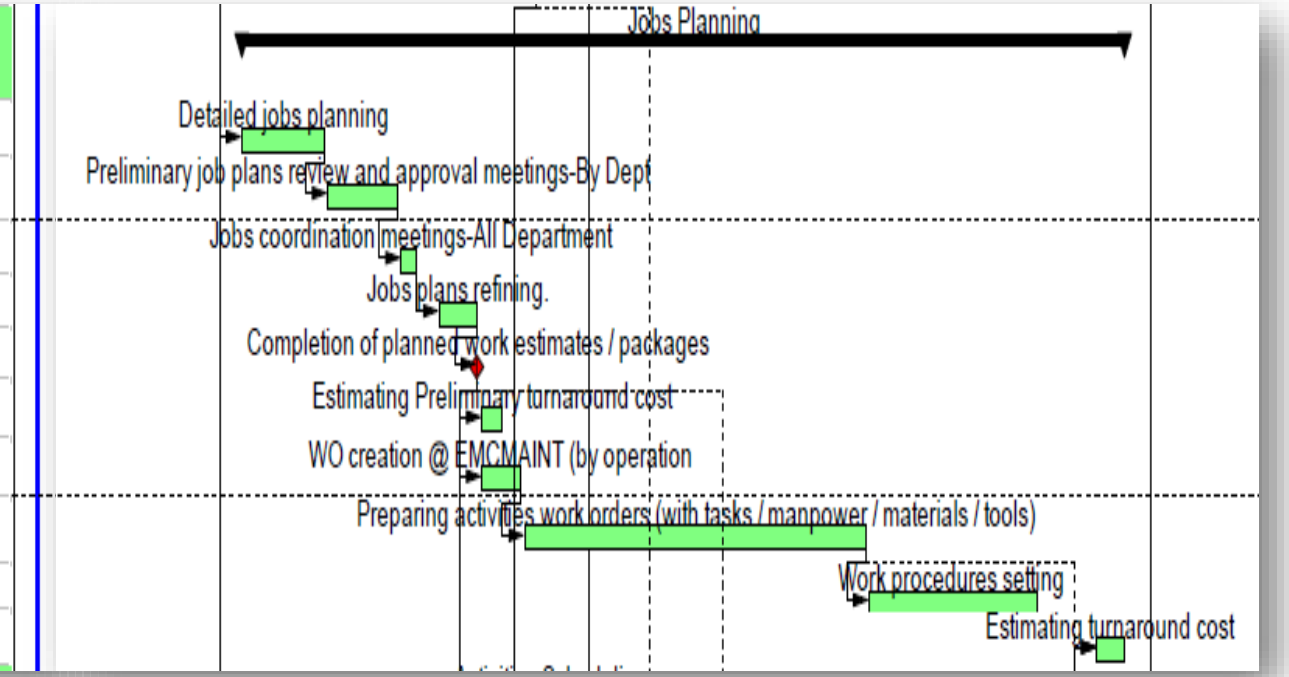
POA&M - Work Identification:

- Identifying work is crucial – Pitfall examples
  - “Jump in mind” work – Executing non scheduled jobs
  - Neglected/Forgotten Work
    - Thoroughly identify and include all needed jobs
  - Included unnecessary work
    - Clear shutdown activity list from jobs not requiring a shutdown.
  - Define and limit shutdown scope
  - Define all constrains
  - Identify and include start-up related activities

PLAN OF ACTIONS & MILESTONES - (POA&M)

- Work Planning WBS

Jobs Planning				
A1165	Detailed jobs planning	10d	04-Feb-1	17-Feb-1
A1170	Preliminary job plans review and approval meetings-By De	8d	18-Feb-1	29-Feb-1
A1180	Jobs coordination meetings-All Department	3d	01-Mar-1	03-Mar-1
A1190	Jobs plans refining.	5d	07-Mar-1	13-Mar-1
A1200	Completion of planned work estimates / packages	0d		13-Mar-1
A1220	Estimating Preliminary turnaround cost	4d	14-Mar-1	17-Mar-1
A1205	WO creation @ EMCMAINT (by operation	5d	14-Mar-1	20-Mar-1
A1210	Preparing activities work orders (with tasks / manpower / r	40d	21-Mar-1	15-May-1
A1670	Work procedures setting	20d	16-May-1	12-Jun-1
A1690	Estimating turnaround cost	3d	22-Jun-1	26-Jun-1



POA&M - WORK PLANNING:

Success is planning dependant

- Good work estimation support turnaround success

- (Materials -Time – Tools
  Manpower – Machines, Etc.)

  Plan should reflect:

  - All safety considerations
  - Quality & Inspection considerations
    (ex: X-Ray for welding)

- Develop CMMS work orders for every job
  (prepare and generate just before execution)

Parkinson's Law

Work expands to fill allowed time…

Good Estimation

+

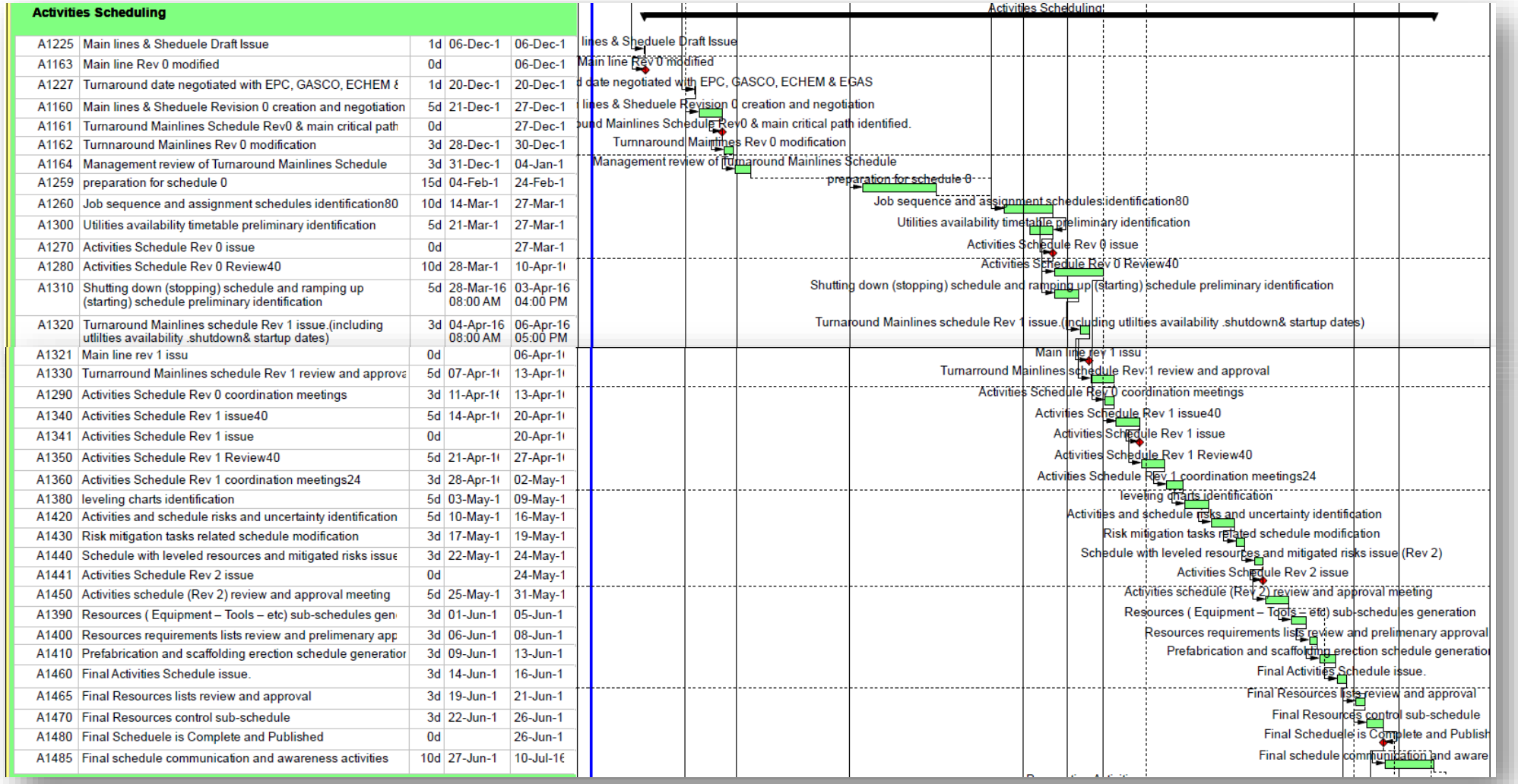
Effective Scheduling

=

EXPECTED SUCCESS

PLAN OF ACTIONS & MILESTONES - (POA&M)

- Work Scheduling WBS



Activities Scheduling				
A1225	Main lines & Sheduele Draft Issue	1d	06-Dec-1	06-Dec-1
A1163	Main line Rev 0 modified	0d		06-Dec-1
A1227	Turnaround date negotiated with EPC, GASCO, ECHEM &	1d	20-Dec-1	20-Dec-1
A1160	Main lines & Sheduele Revision 0 creation and negotiation	5d	21-Dec-1	27-Dec-1
A1161	Turnaround Mainlines Schedule Rev0 & main critical path	0d		27-Dec-1
A1162	Turnnaround Mainlines Rev 0 modification	3d	28-Dec-1	30-Dec-1
A1164	Management review of Turnaround Mainlines Schedule	3d	31-Dec-1	04-Jan-1
A1259	preparation for schedule 0	15d	04-Feb-1	24-Feb-1
A1260	Job sequence and assignment schedules identification80	10d	14-Mar-1	27-Mar-1
A1300	Utilities availability timetable preliminary identification	5d	21-Mar-1	27-Mar-1
A1270	Activities Schedule Rev 0 issue	0d		27-Mar-1
A1280	Activities Schedule Rev 0 Review40	10d	28-Mar-1	10-Apr-1
A1310	Shutting down (stopping) schedule and ramping up (starting) schedule preliminary identification	5d	28-Mar-16 08:00 AM	03-Apr-16 04:00 PM
A1320	Turnaround Mainlines schedule Rev 1 issue.(including utlilties availability .shutdown& startup dates)	3d	04-Apr-16 08:00 AM	06-Apr-16 05:00 PM
A1321	Main line rev 1 issu	0d		06-Apr-1
A1330	Turnarround Mainlines schedule Rev 1 review and approva	5d	07-Apr-1	13-Apr-1
A1290	Activities Schedule Rev 0 coordination meetings	3d	11-Apr-1	13-Apr-1
A1340	Activities Schedule Rev 1 issue40	5d	14-Apr-1	20-Apr-1
A1341	Activities Schedule Rev 1 issue	0d		20-Apr-1
A1350	Activities Schedule Rev 1 Review40	5d	21-Apr-1	27-Apr-1
A1360	Activities Schedule Rev 1 coordination meetings24	3d	28-Apr-1	02-May-1
A1380	leveling charts identification	5d	03-May-1	09-May-1
A1420	Activities and schedule risks and uncertainty identification	5d	10-May-1	16-May-1
A1430	Risk mitigation tasks related schedule modification	3d	17-May-1	19-May-1
A1440	Schedule with leveled resources and mitigated risks issue	3d	22-May-1	24-May-1
A1441	Activities Schedule Rev 2 issue	0d		24-May-1
A1450	Activities schedule (Rev 2) review and approval meeting	5d	25-May-1	31-May-1
A1390	Resources (Equipment – Tools – etc) sub-schedules gen	3d	01-Jun-1	05-Jun-1
A1400	Resources requirements lists review and prelimenary app	3d	06-Jun-1	08-Jun-1
A1410	Prefabrication and scaffolding erection schedule generatio	3d	09-Jun-1	13-Jun-1
A1460	Final Activities Schedule issue.	3d	14-Jun-1	16-Jun-1
A1465	Final Resources lists review and approval	3d	19-Jun-1	21-Jun-1
A1470	Final Resources control sub-schedule	3d	22-Jun-1	26-Jun-1
A1480	Final Scheduele is Complete and Published	0d		26-Jun-1
A1485	Final schedule communication and awareness activities	10d	27-Jun-1	10-Jul-1

POA&M - WORK SCHEDULING:

Developing Shutdown Schedules

- Shutdown/Turnaround Detailed Activities Schedule

A schedule contains all activities with resources and relation to each other.

- Schedule Parts

Turning Down Schedule

• Stopping – Venting - Purging

Execution Schedule

• Repairs – Maintenance – Modifications – Changes & Replacements

Operating Schedule

• Purging – Preparations – Starting up

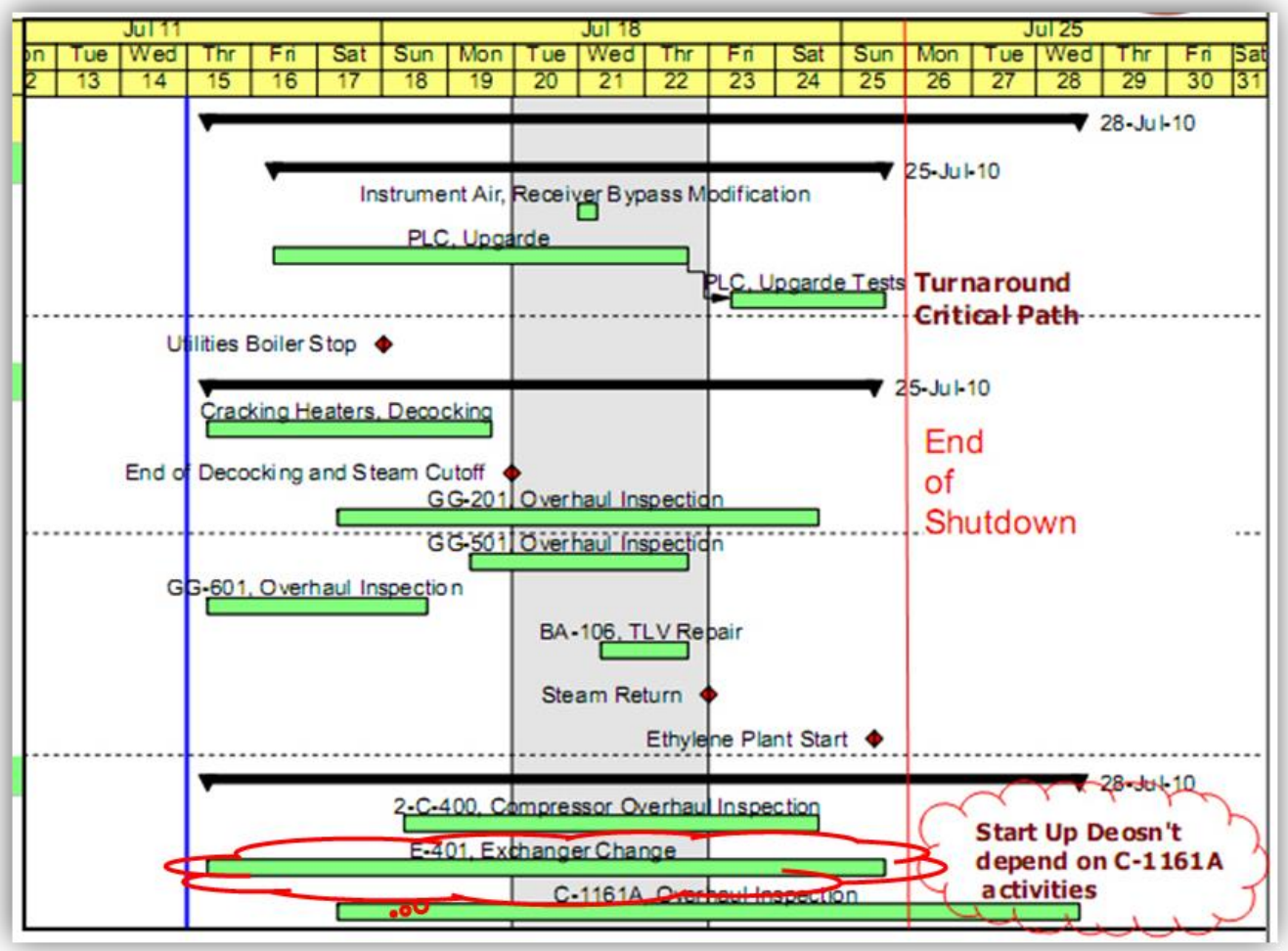
Overall Schedule

Include all schedules in one schedule
(Connect – Relate – Filter)…

Use project management software – (Primavera / MS Project)
Training facilitates correct usage

WORK SCHEDULING:

Working with Critical Path *(Longest path to finish schedule)*



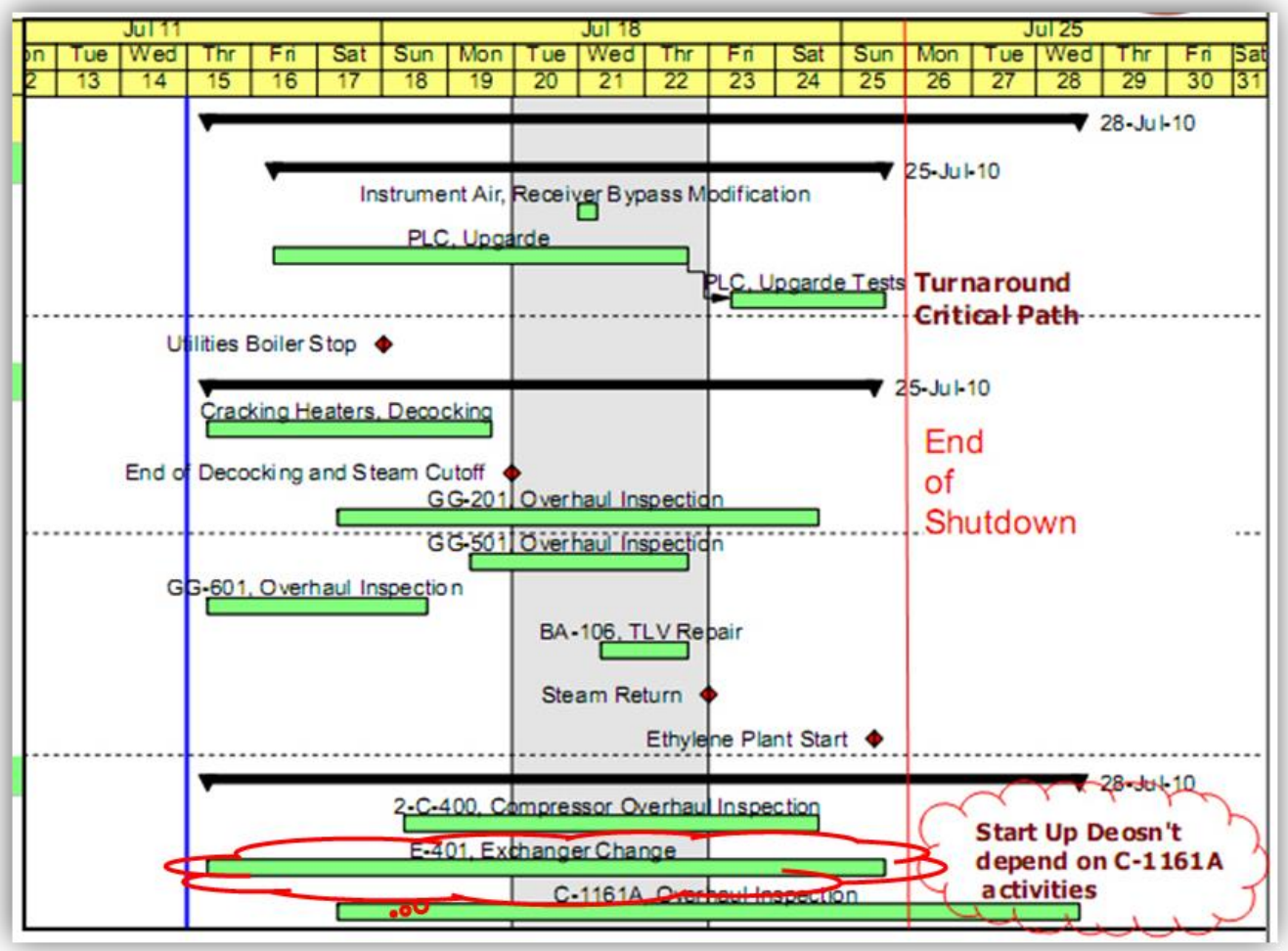
Reducing Critical Path Duration Reduces Shutdown Period

Considerations

- *One or two critical paths at most*
- *Leave a margin behind it*

WORK SCHEDULING:

Working with Critical Path *(Longest path to finish schedule)*



Split into components &steps

Perform activities in parallel

Increase work time/manpower

Use technology

WORK SCHEDULING:

- Working with Critical Path *(Longest path to finish schedule)*

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WORK SCHEDULING:

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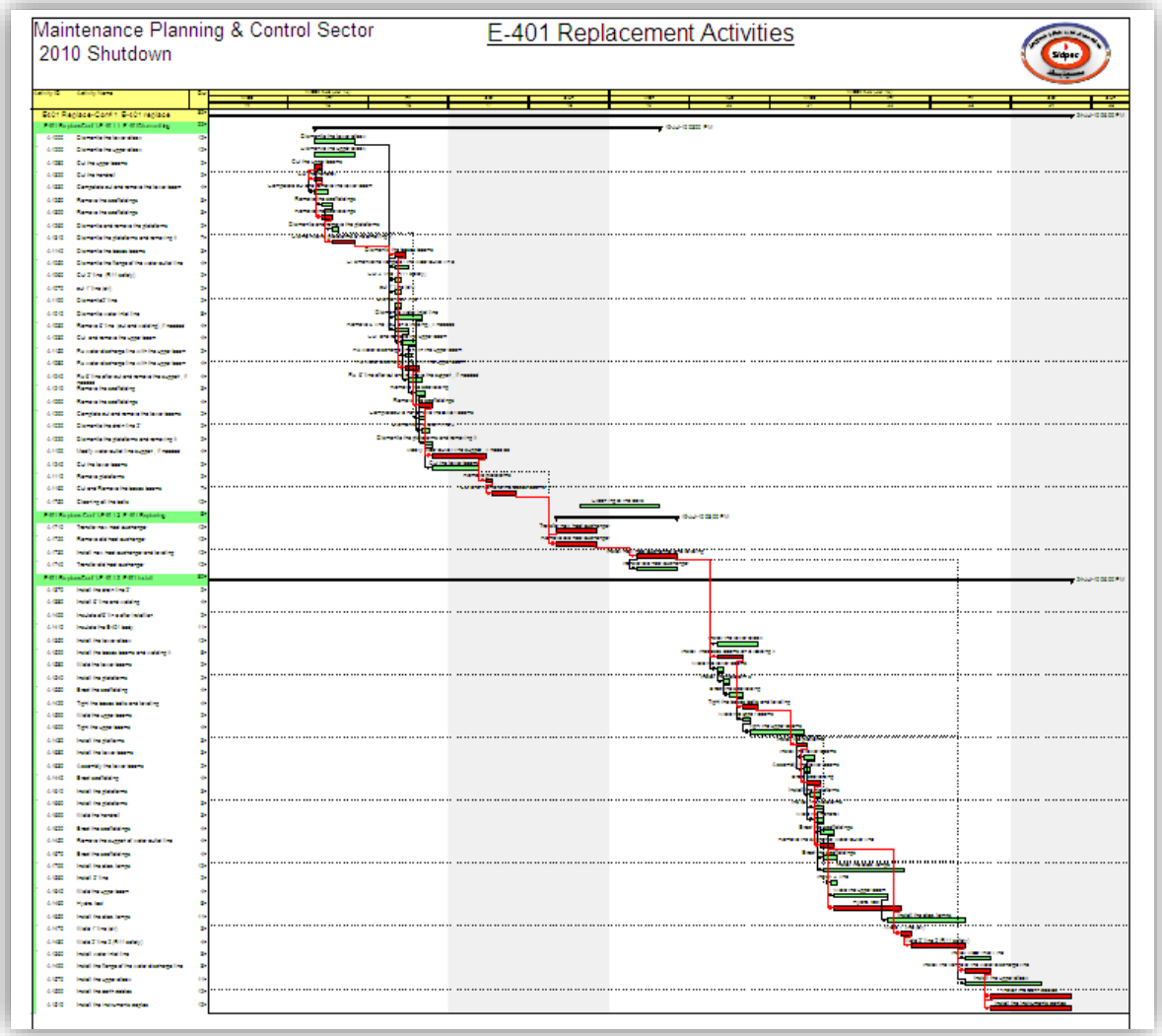

Split into components &steps

Perform activities in parallel

Increase work time/manpower

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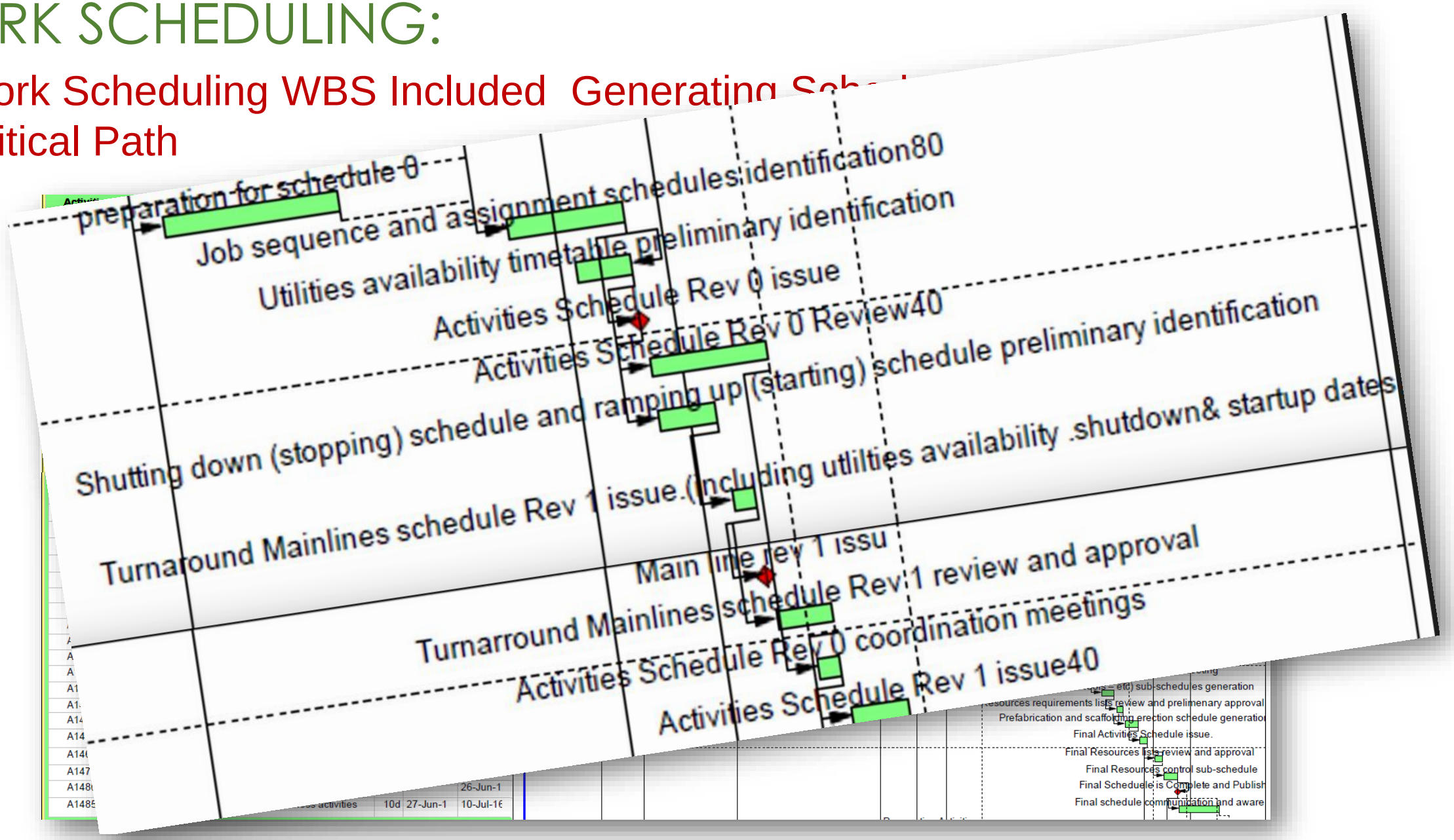
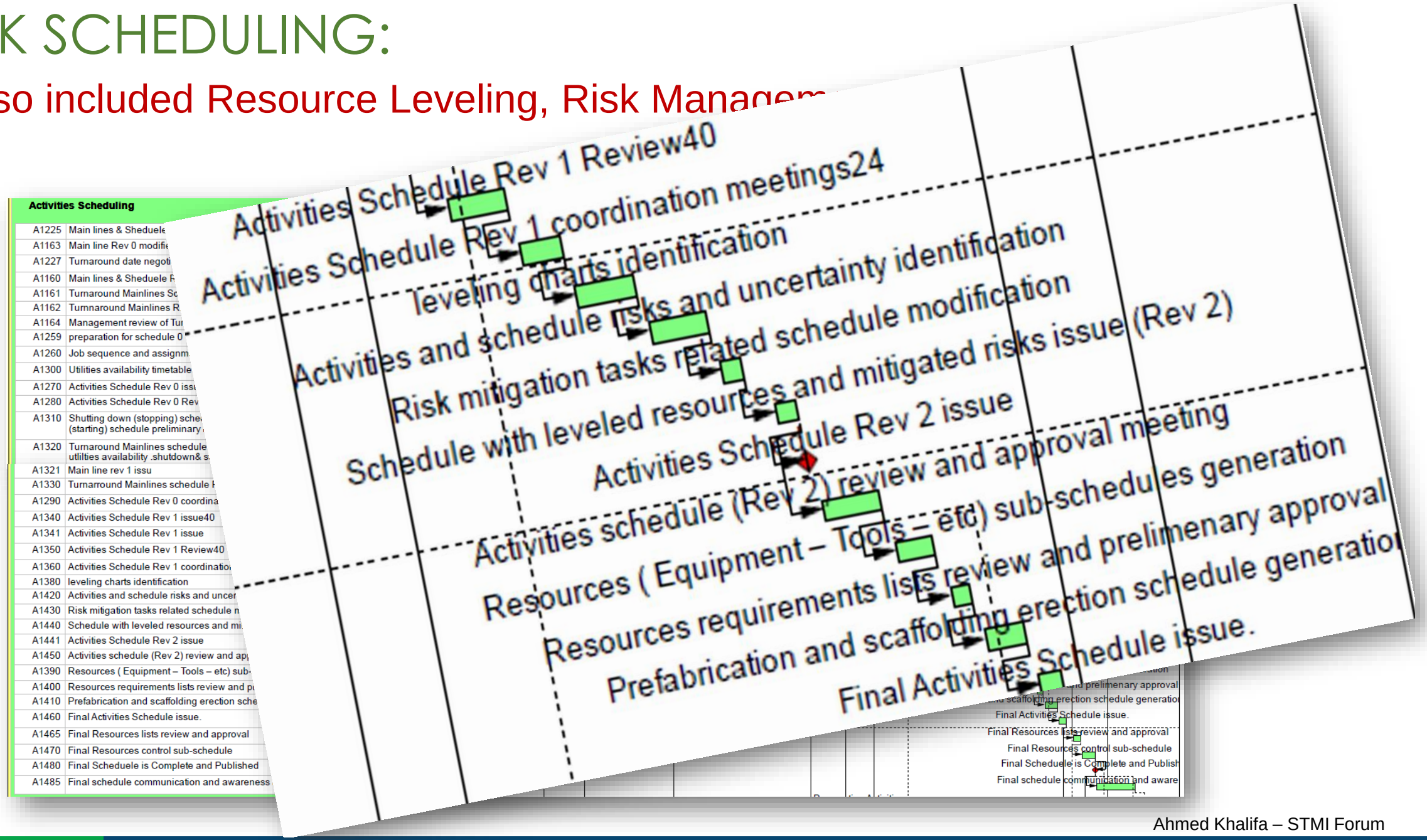
WORK SCHEDULING:

Work Scheduling WBS Included Generating Sch...
Critical Path



WORK SCHEDULING:

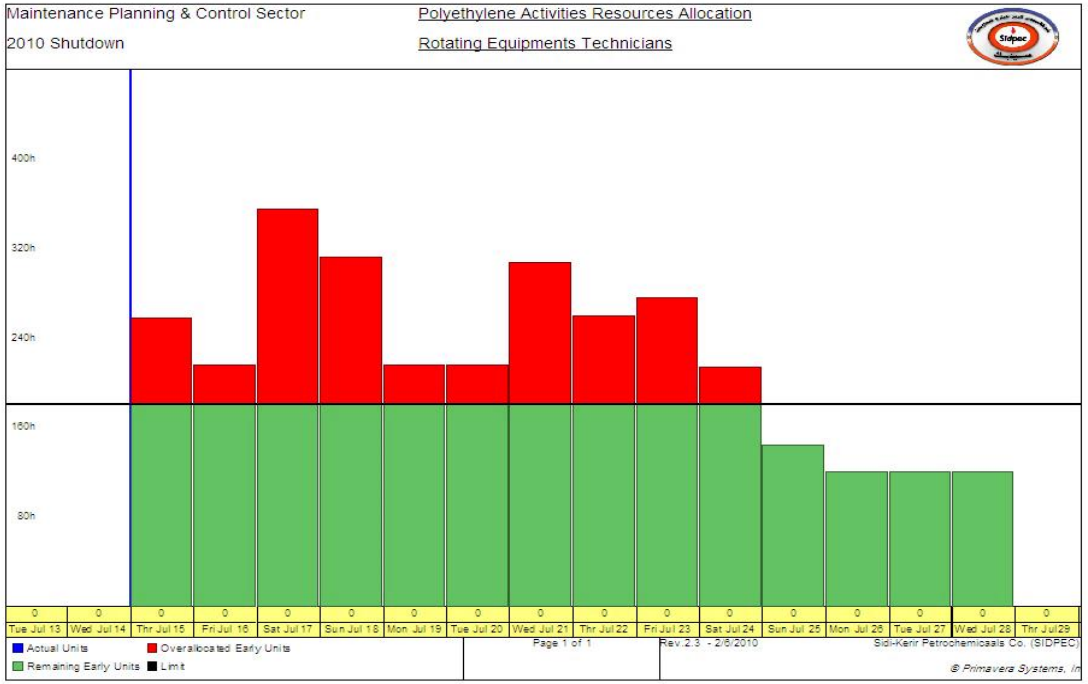
It Also included Resource Leveling, Risk Manage



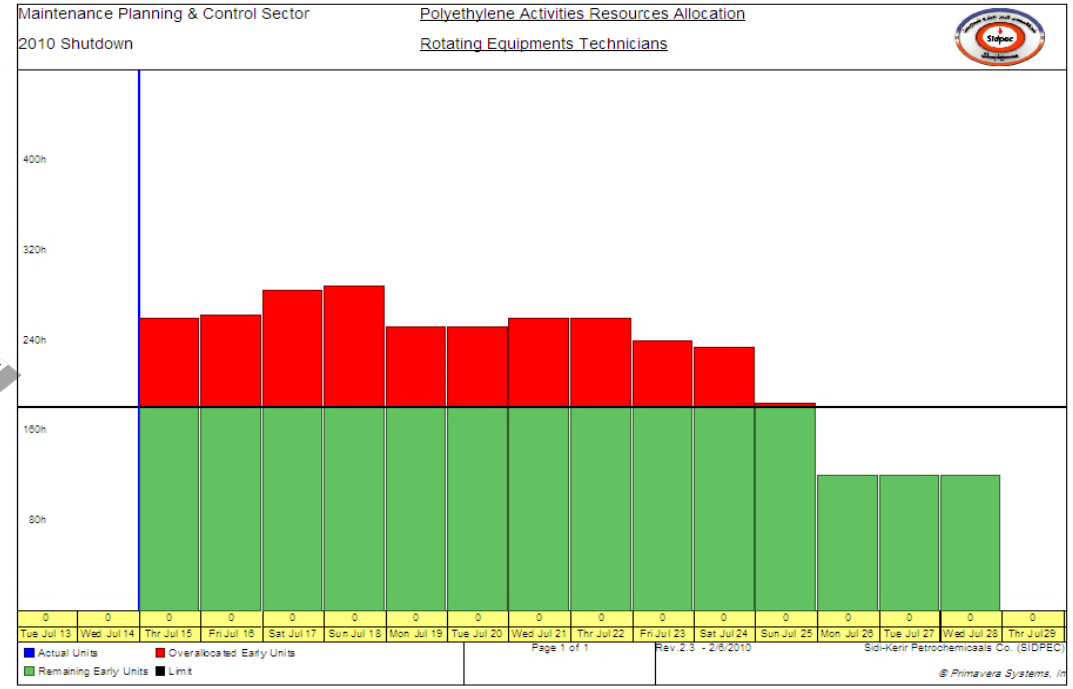
WORK SCHEDULING:

Identification, Mapping & Leveling Resources & Workload

- Rearranging activities inside schedule to level assignments
  - Increase utilization
  - Decrease needed external labor



Assignments Without Resource Leveling



Assignments After Resource Leveling

TURNAROUND SCHEDULING PHASE

Logistics and Support work Schedules

(Site) Logistics involves organising the reception, storage and distribution of the materials, equipment, services, facilities and utilities required for the TA.

The objective of logistics is to ensure that the right thing is in the right place at the right time.

Many companies do not plan their logistic as well as they plan the technical aspects of the work-scope

Poor logistics is the most common reason for Turnarounds overrunning their durations.

TURNAROUND SCHEDULING PHASE

Logistics and Support work Schedules

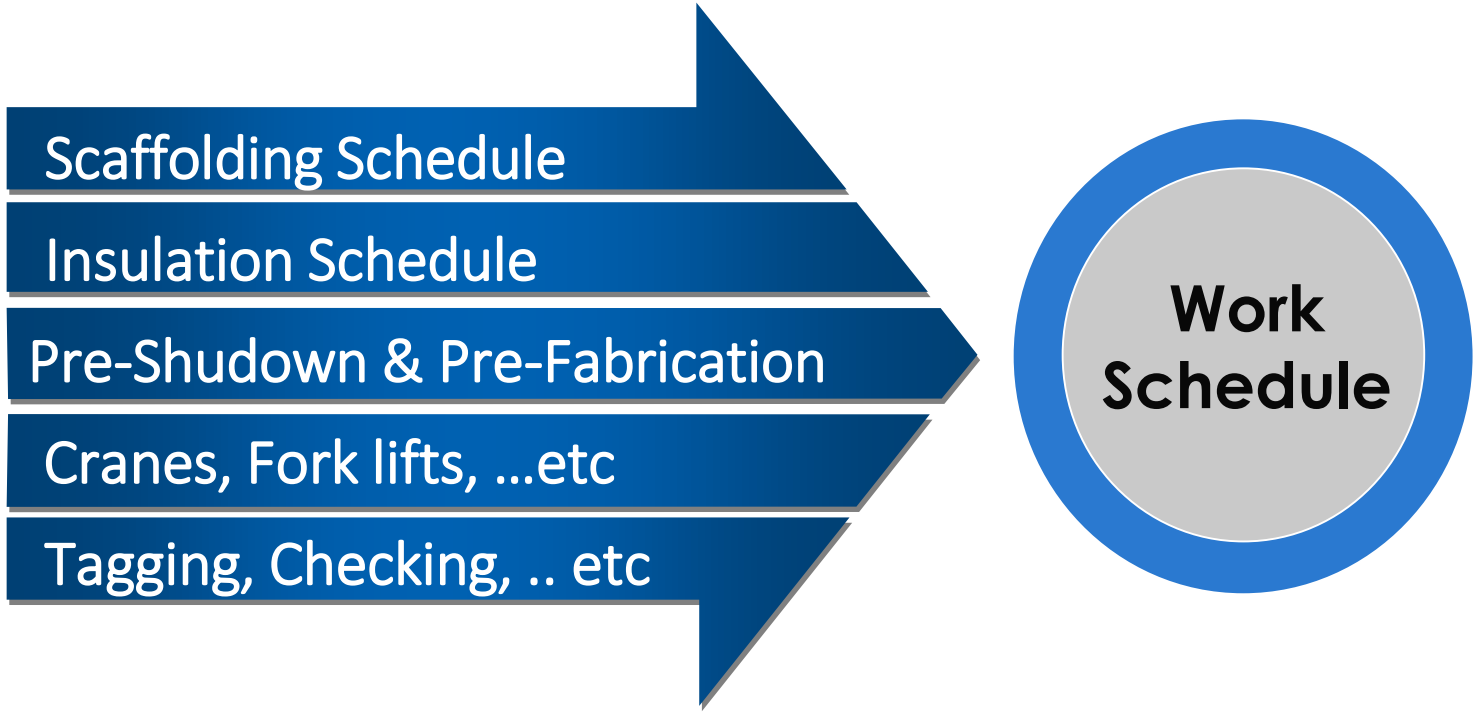
Example Logistics Services

- Site Planning & Sequencing
- Temporary Storage Management
- Internal site transportation
- Food and Catering Services
- On-Site Medical Services
- Water & Waste Water Services
- Temporary Power & HVAC Equipment
- Staff Management & Administration
- Security, Entry & Exit Management
- Break Location and Sanitary Services
- Temporary Fire Fighting Equipment
- ….Etc.

TURNAROUND SCHEDULING PHASE

Logistics and Support work Schedules

- Generally, prepared after work schedule is generated
- To guarantee that the right thing will be in the right place in the right time

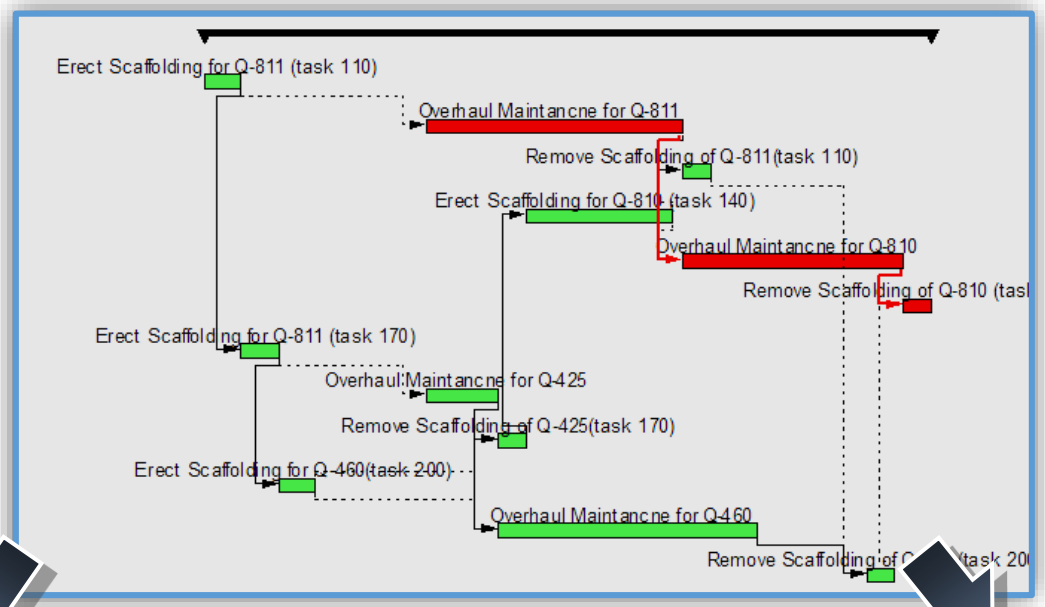


- Include as detailed schedules in the work schedule

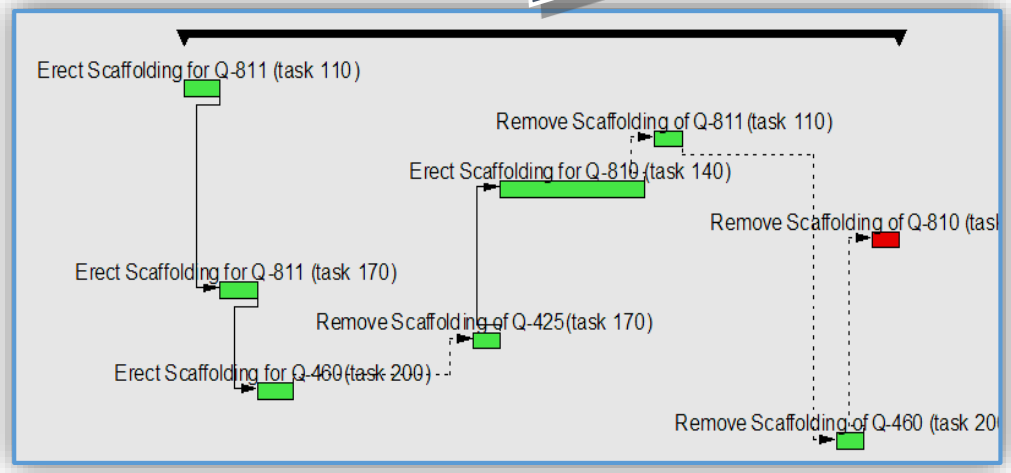
TURNAROUND SCHEDULING PHASE

Logistics and Support work Schedules

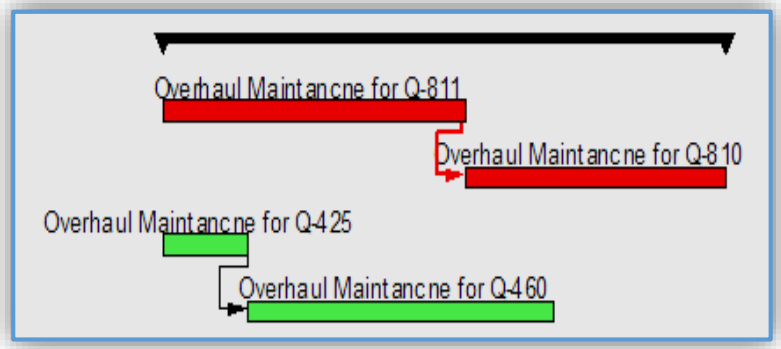
Overall Schedule.



Scaffolding Schedule.



Activities Schedule.

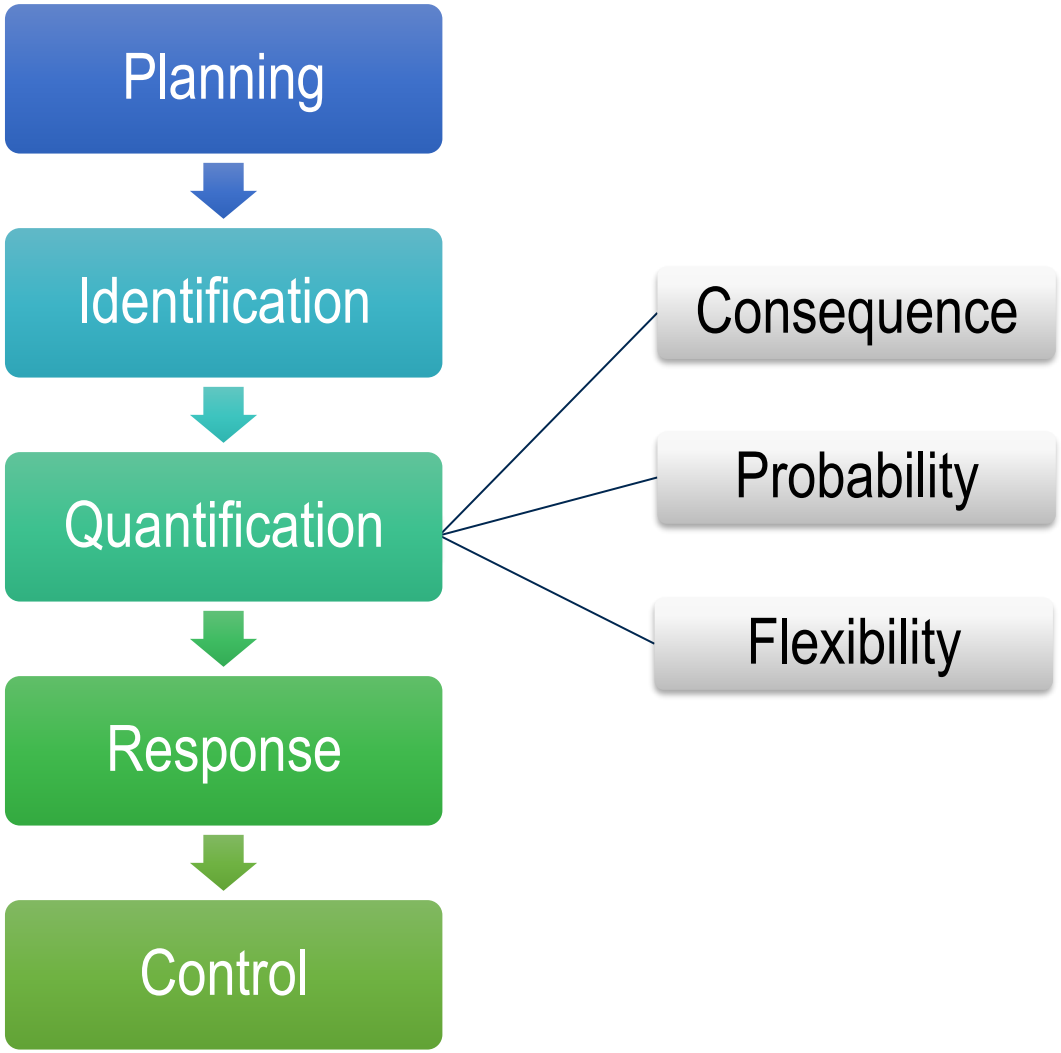


TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- Example Shutdown Risk Sources
  - **Weather** - affecting activities exposed to bad weather.
  - **Materials/ Spares-** unavailability, defected or infant mortality.
  - **Equipment/Tools** - breakdown, unavailability, idle waiting time, etc.
  - **Manpower** - under staffing / unavailability, under skilled, etc.
  - **Productivity** - a slowing down due to fatigue, etc.
  - **Complexity** – high technicalities jobs, equipment age, etc

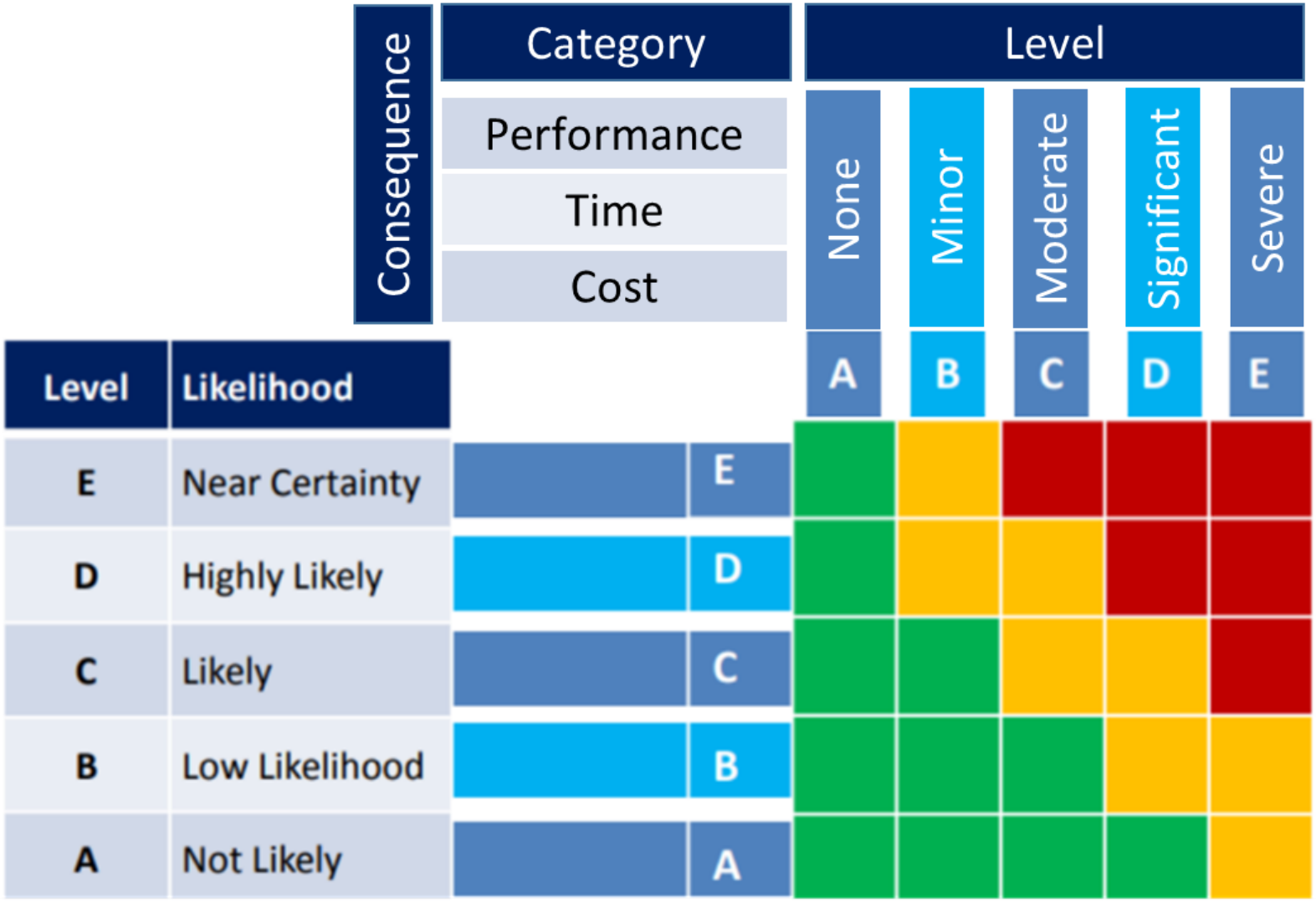
TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- Risk Management Process



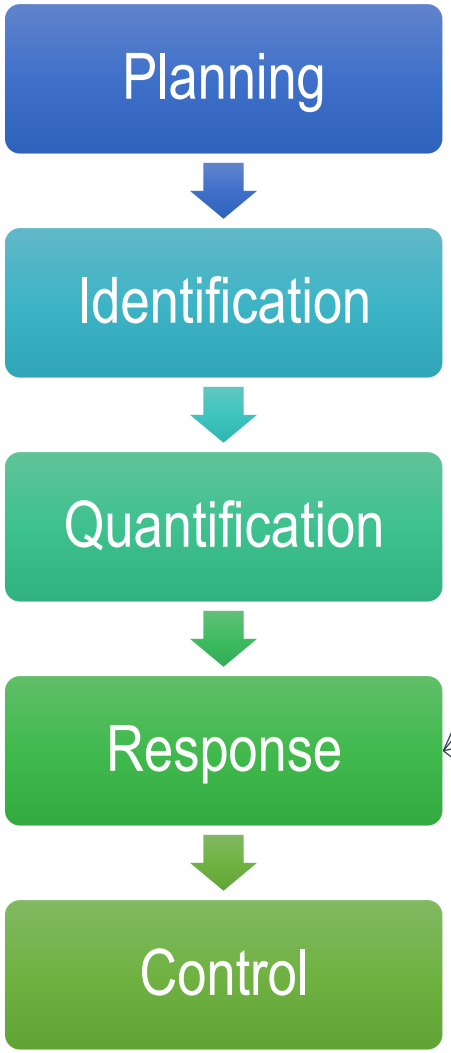
TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- Risk Quantification Matrix



TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- Risk Management Process



Avoidance

- Eliminate the possibility of occurrence

Mitigation

- Reduce the effect of the occurrence

Acceptance

- Live with the consequences of occurrence

Transference

- Transferring ownership of the risk factor

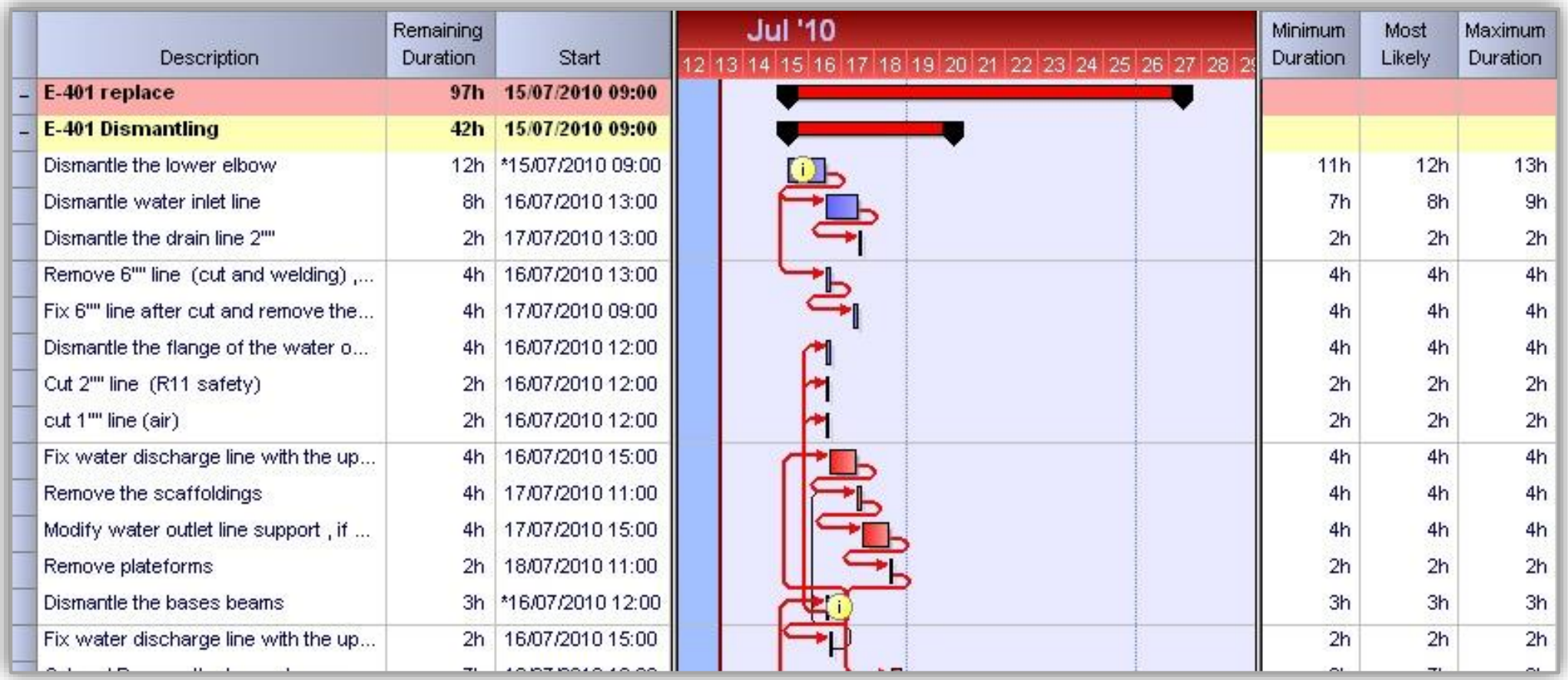
Poll Q2: SLI.DO Event # STMI

2. Do you do formal planned risk management (and not safety related) in your preparation for shutdown and turnaround?

   A. Yes, with a formal and planned process for all shutdown activities.
   B. Yes but not planned assessment and for some selected work. we had trials, some successful and other times we hardly find time to do so.
   C. No, we just consider some known risks for our activities from our experience.
   D. No, we only make safety risk assessment & JSA or we don't do risk assessment
   E. I don't know.
   F. I am a service provider or vendor

TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- PERT Analysis:
  - Probabilistic durations leads to expected finish dates and enable risk calculation :



Description	Remaining Duration	Start	Minimum Duration	Most Likely	Maximum Duration
E-401 replace	**97h**	**15/07/2010 09:00**			
E-401 Dismantling	**42h**	**15/07/2010 09:00**			
Dismantle the lower elbow	12h	*15/07/2010 09:00	11h	12h	13h
Dismantle water inlet line	8h	16/07/2010 13:00	7h	8h	9h
Dismantle the drain line 2""	2h	17/07/2010 13:00	2h	2h	2h
Remove 6"" line (cut and welding) ,...	4h	16/07/2010 13:00	4h	4h	4h
Fix 6"" line after cut and remove the...	4h	17/07/2010 09:00	4h	4h	4h
Dismantle the flange of the water o...	4h	16/07/2010 12:00	4h	4h	4h
Cut 2"" line (R11 safety)	2h	16/07/2010 12:00	2h	2h	2h
cut 1"" line (air)	2h	16/07/2010 12:00	2h	2h	2h
Fix water discharge line with the up...	4h	16/07/2010 15:00	4h	4h	4h
Remove the scaffoldings	4h	17/07/2010 11:00	4h	4h	4h
Modify water outlet line support , if ...	4h	17/07/2010 15:00	4h	4h	4h
Remove plateforms	2h	18/07/2010 11:00	2h	2h	2h
Dismantle the bases beams	3h	*16/07/2010 12:00	3h	3h	3h
Fix water discharge line with the up...	2h	16/07/2010 15:00	2h	2h	2h

Expected Time = (Optimistic + 4×Most Likely + Pessimistic) / 6

TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- Using Risk Analysis Programs:

Risk			Pre-Mitigation (Data Date = 12 Oct 05)					Mitigation			Post-mitigation				
ID	T/O	Title	Probability	Schedule	C...	Safety	Score	Response	Title	Total Cost	Probability	Schedule	C...	Safety	Sco
RISK4	T	Key resource unavailable	H	L	L	VH	56	Reduce	Change res...	$300,000	VL	L	L	N	1
RISK3	T	Contract Delay	H	M	L	H	28	Reduce	Change for...	$500,000	L	M	L	N	6
RISK10	O	Reuse previous design work	H	N	H	N	28	Enhance		$0	H	N	H	N	28
RISK5	T	Delivery overrun	M	H	N	N	20	Reduce	Source alter...	$50,000	L	L	N	N	3
RISK9	T	Design changes	H	M	M	N	14	Reduce		$0	H	M	M	N	14
RISK1	T	Poor understanding and detail ...	L	H	M	VL	12	Reduce	Introduce p...	$10,000	VL	L	L	N	1
RISK7	T	Rework required for assembly ...	M	M	M	L	10	Reduce	Check man...	$200,000	N	M	M	N	0
RISK2	T	System failure	VL	VH	VH	VH	8	Reduce	Improve ini...	$750,000	N	VH	VH	N	0
RISK8	T	Testing fails	L	L	L	N	3	Reduce		$0	L	L	L	N	3
RISK6	T	Fabrication contractor goes bust	N	M	M	M	0	Reduce		$0	N	M	M	M	0

Risk Details | Code Fields | Mitigation | Waterfall Chart | Notes | Risk History

ID: RISK4

Title: Key resource unavailable

RBS: R.1.3

Cause: Due to other project commitments.

Description: Key resources may be unavailable.

Effect: Delay could occur on completion of key activities.

Threat / Opportunity: Threat

Manageability:

Owner: DP

Status: Open

Exposure (Entered): $0

Start Date: 07 Jan 06

End Date: 01 Jan 08

Pre-mitigated position:

Probability	H	(50% to 70%)
Schedule	L	(10 to 20)
Cost	L	($10,000 to $50,000)
Safety	VH	(Failure to meet ac...

Score: 56

Overall Impact: VH

Post-mitigated position:

Probability	VL	(Up to 10%)
Schedule	L	(10 to 20)
Cost	L	($10,000 to $50,000)
Safety	N	(Negligible)

Score: 1

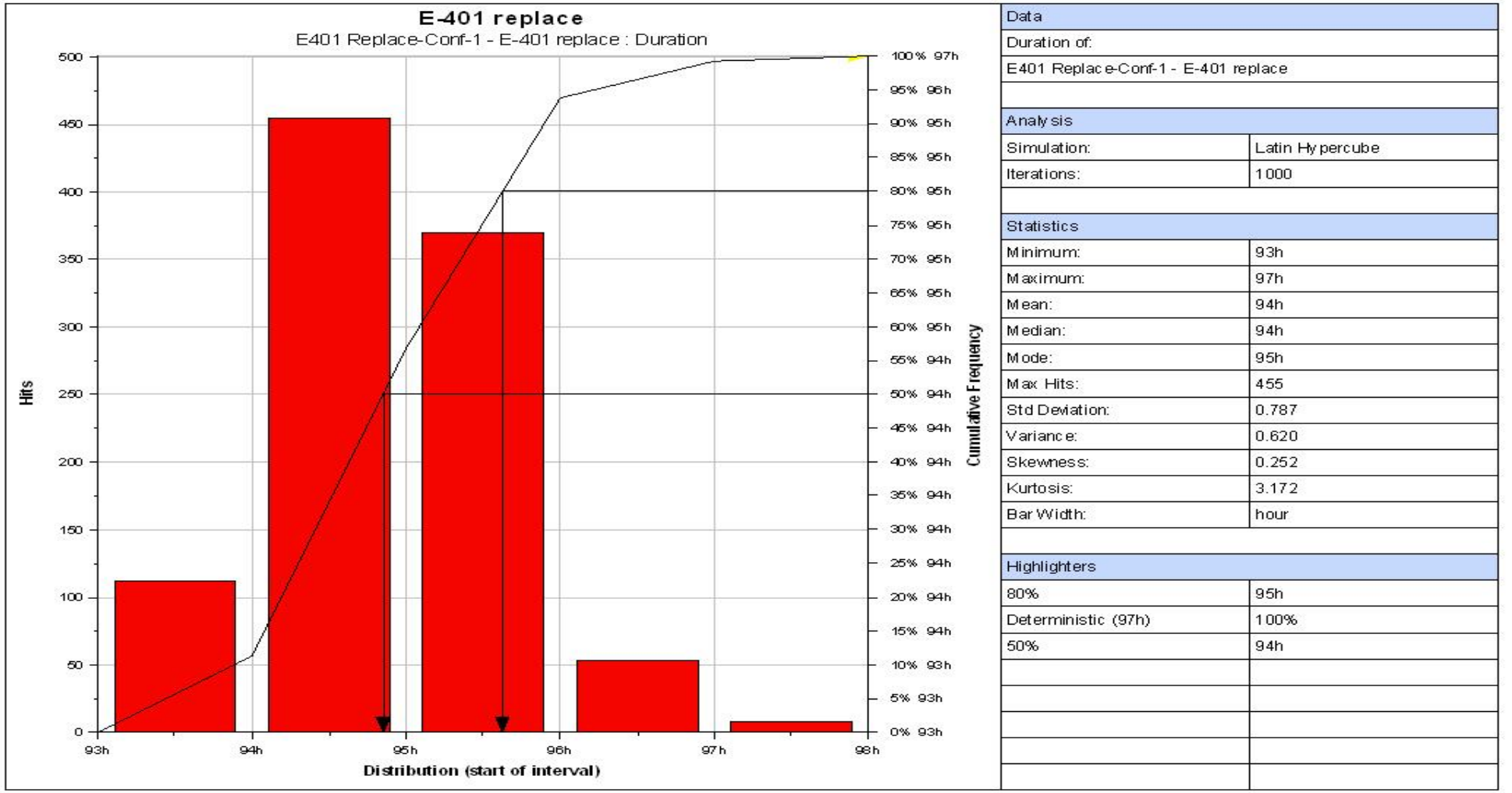
Overall Impact: L

Quantified Risk

Show in Quantitative

TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

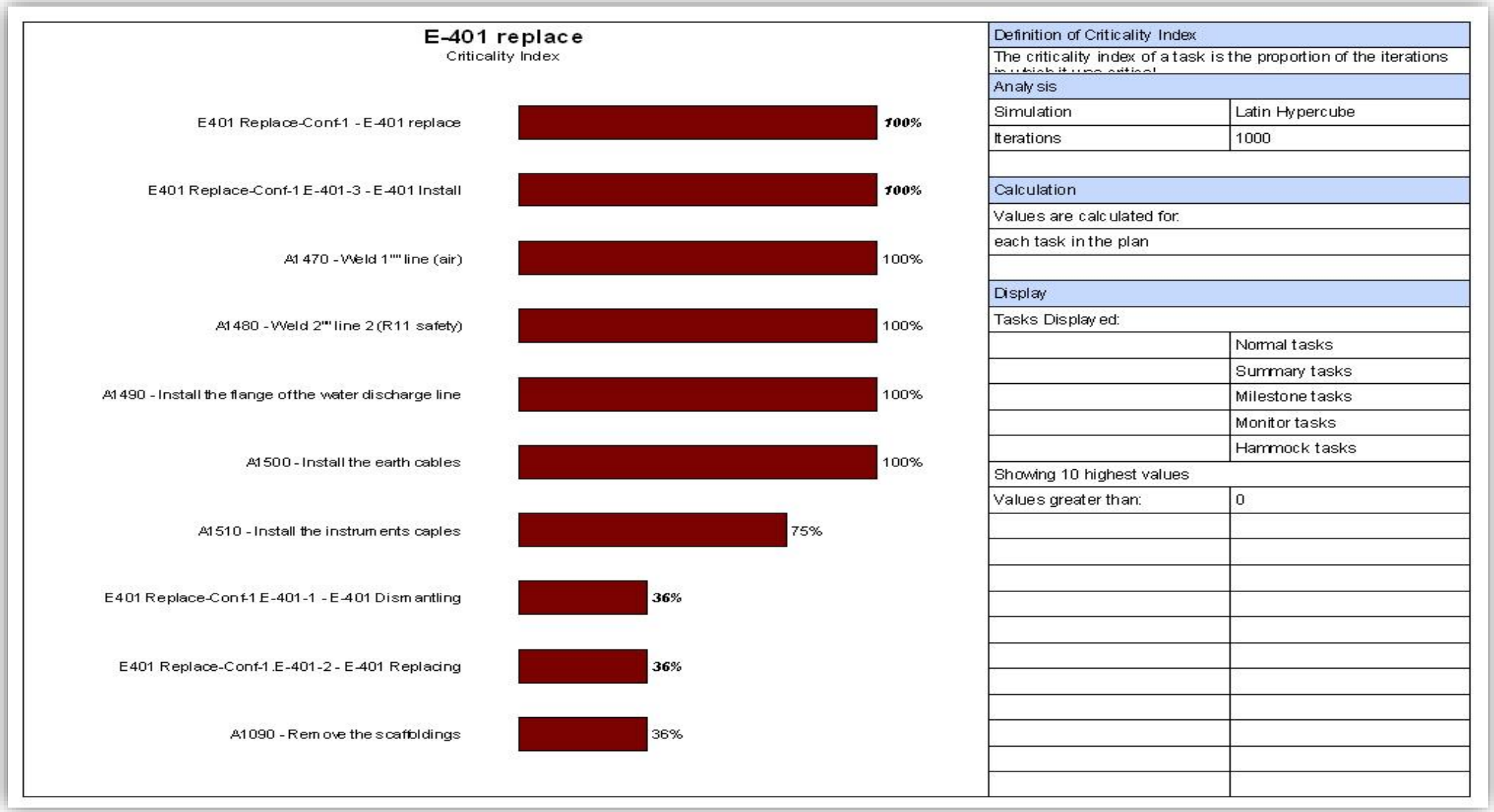
- Using Risk Analysis Programs:



Data	
Duration of:	
E401 Replace-Conf-1 - E-401 replace	
Analysis	
Simulation:	Latin Hypercube
Iterations:	1000
Statistics	
Minimum:	93h
Maximum:	97h
Mean:	94h
Median:	94h
Mode:	95h
Max Hits:	455
Std Deviation:	0.787
Variance:	0.620
Skewness:	0.252
Kurtosis:	3.172
Bar Width:	hour
Highlighters	
80%	95h
Deterministic (97h)	100%
50%	94h

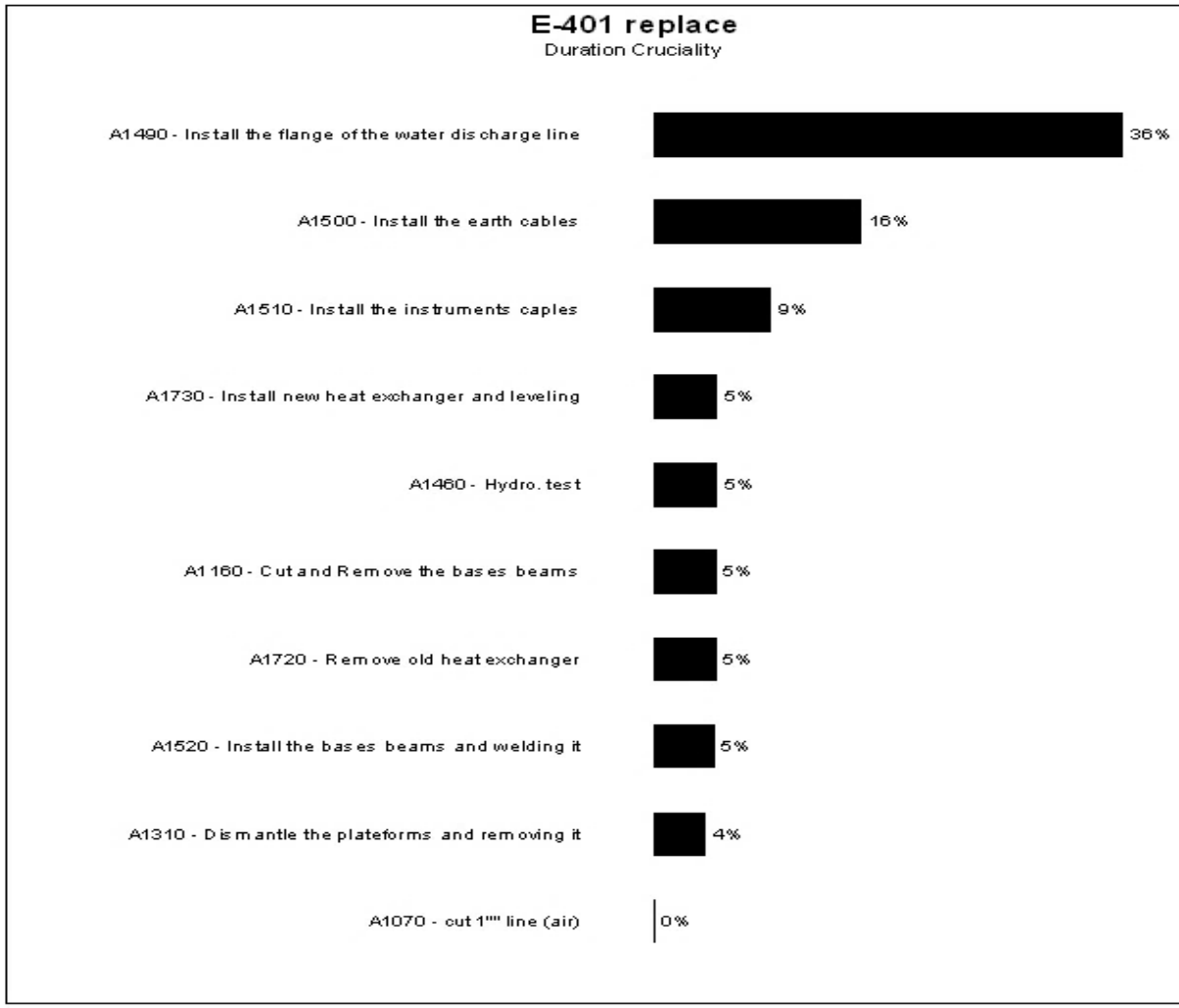
TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- Using Risk Analysis Programs:



TURNAROUND RISK AND UNCERTAINTY MANAGEMENT

- Using Risk Analysis Programs:



Definition of Duration Cruciality	
The cruciality of a task is calculated by multiplying its duration	
Analysis	
Simulation	Latin Hypercube
Iterations	1000
Sensitivity calculation	
Correlation between:	
Duration of Entire Plan	
And:	
Duration of each task in the plan	
Using: Pearson's product moment.	
Display	
Normal tasks only	
Showing 10 highest values	
Values greater than:	0

Lean Shutdown Management

What is Lean

Lean (Meaning) : Free from unwanted substances

- Preserving value with less work (Doing more with less)
- To minimize the non-value adding activities

Principles :

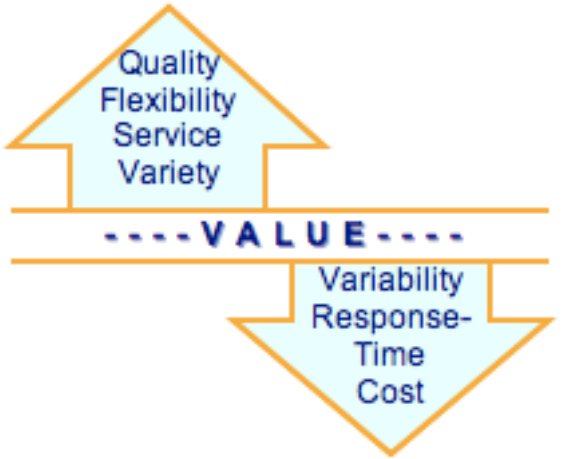
- Create Flow (one piece flow)
- Eliminate Waste
- Optimize resources
- Continuous Improvement
- Teaming

Lean Muscle

Lean Shutdown Management

Lean Tools

- Eliminating 7 Deadly Wastes (MUDA)
- Value Stream Mapping
- 5 S Process
- Pull system (Kanban)
- Mistake Proofing (Poka Yoke)
- Takt Time
- Quality at source (Jidoka)
- ……etc.



Poll Q3: SLI.DO Event # STMI

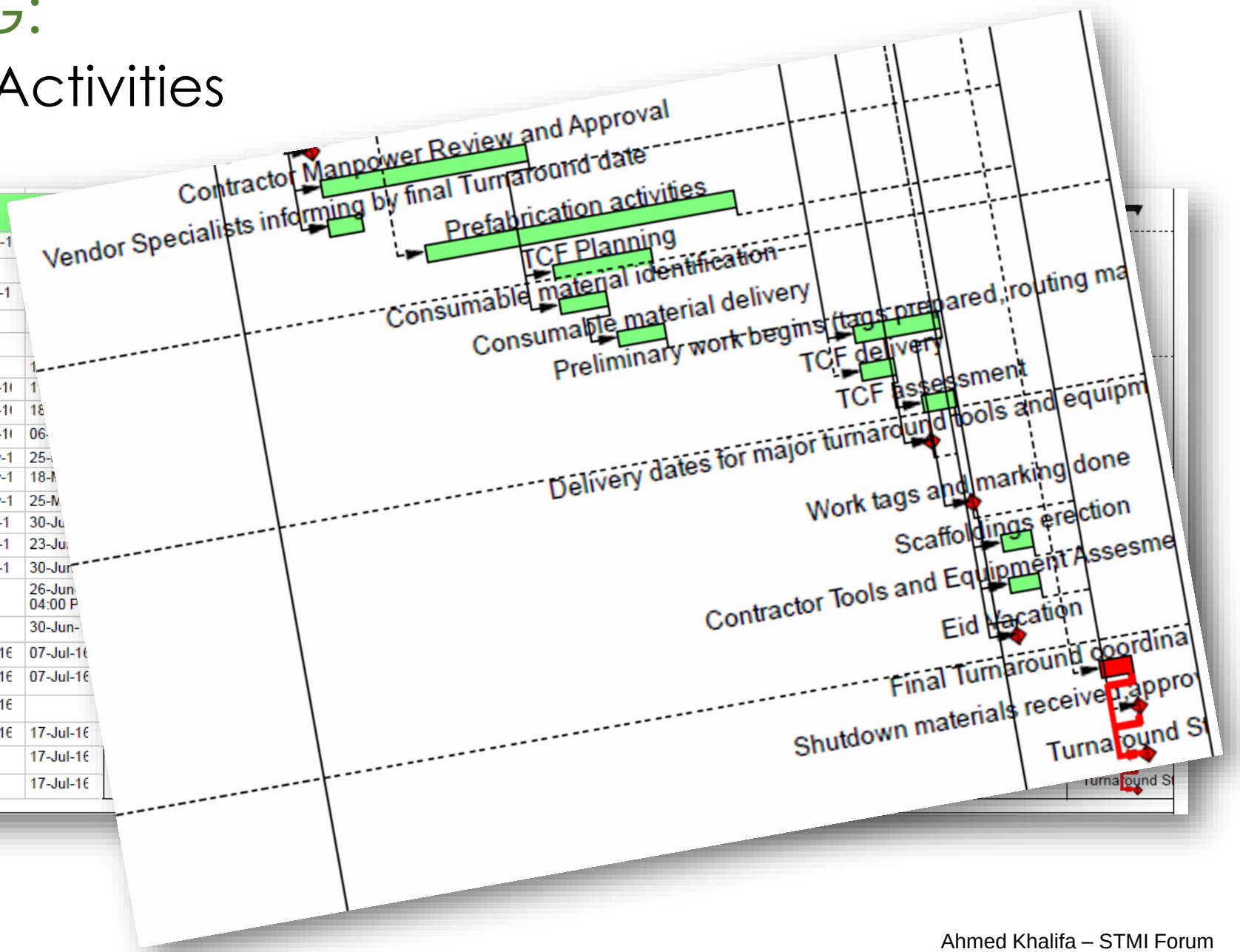
3. Do you do use lean shutdown management tools & techniques in preparation for shutdown and turnaround?

   A. Yes, with a formal and planned process for all shutdown activities.
   B. Yes, we had trials to remove waste, some successful and other times we hardly find time to complete this study before SD.
   C. No, we don't use lean shutdown management tools and don't know them.
   D. I don't know.
   E. I am a service provider or vendor.

WORK SCHEDULING:

General Preparation Activities

	Preparation Activities			
A1497	Vendor Specialists contacting and inquiring	20d	21-Dec-1	
A1507	Vendor specialist contacting	0d		
A1495	Shutdown execution contracts negotiation and approvals	50d	04-Feb-1	
A1490	Shutdown local parts, material, equipment ordered	0d		
A1500	Shutdown execution contracts placed	0d		
A1496	Outsourcing and pay rates are settled	0d		1
A1505	Contractor Manpower Review and Approval	20d	14-Apr-1(	1
A1498	Vendor Specialists informing by final Turnaround date	3d	14-Apr-1(	18
A1570	Prefabrication activities	30d	26-Apr-1(	06-
A1700	TCF Planning	10d	12-May-1	25-
A1740	Consumable material identification	5d	12-May-1	18-M
A1750	Consumable material delivery	5d	19-May-1	25-M
A1540	Preliminary work begins (tags prepared, routing marked, (	10d	19-Jun-1	30-Ju
A1710	TCF delivery	5d	19-Jun-1	23-Ju
A1720	TCF assessment	5d	26-Jun-1	30-Jun
A1520	Delivery dates for major turnaround tools and equipment established	0d		26-Jun- 04:00 P
A1550	Work tags and marking done	0d		30-Jun-
A1560	Scaffoldings erection	5d	03-Jul-16	07-Jul-16
A1525	Contractor Tools and Equipment Assesment and Review	5d	03-Jul-16	07-Jul-16
A1580	Eid Vacation	0d	03-Jul-16	
A1630	Final Turnaround coordination meetings	3d	13-Jul-16	17-Jul-16
A1530	Shutdown materials received,approved, marked and rese	0d		17-Jul-16
A1680	Turnaround Start	0d		17-Jul-16



CONCLUSION

- Managing shutdowns and turnarounds is an integral part of the contemporary Asset Management System.
- We need to build strategy and identify output values in SD and TA
- Attaining these values can only be achieved by focusing on planning and management of turnaround planning and preparation
- We know what is needed to be done but we need to plan for them to be done.
- POA&M provides planned & controlled focus on turnaround preparation.
- It can enable some missing areas like managing risks in SD & TA, Lean Shutdown Management and successful planning for logistics and support activities.

Thank You!