ROSKA

Design | Build | Operate

Turnarounds, Shutdowns & Outages (STO's)
An Overview for Stakeholders

Wapiti Area Synergy Partnership (WASP) - May 14, 2024

Roska DBO Inc.

“We are Operations People with process equipment, technically-backed and ready-to-go, including Production Testing that meets facility standards”

Ron Bettin

- Management Consultant
- 7 Facility Start-ups
- ~12 Turnarounds
- 4 Company Start-ups
- Canada, US, Ecuador & UK
- Worked in GP Area for several companies

Many Stakeholders

Government & Regulators

Management

Internal Corporate Groups

STO PROJECT

Public & Landowners

Workers

Suppliers & Contractors

Turnarounds, Shutdowns & Outages (STOs)

Turnarounds, Shutdowns & Outages (STOs) are planned pauses in production to perform inspections, maintenance and project work that can not be performed with the equipment in operation. STOs are scheduled at regular intervals from one to six years depending on the type, size and complexity of the facility.

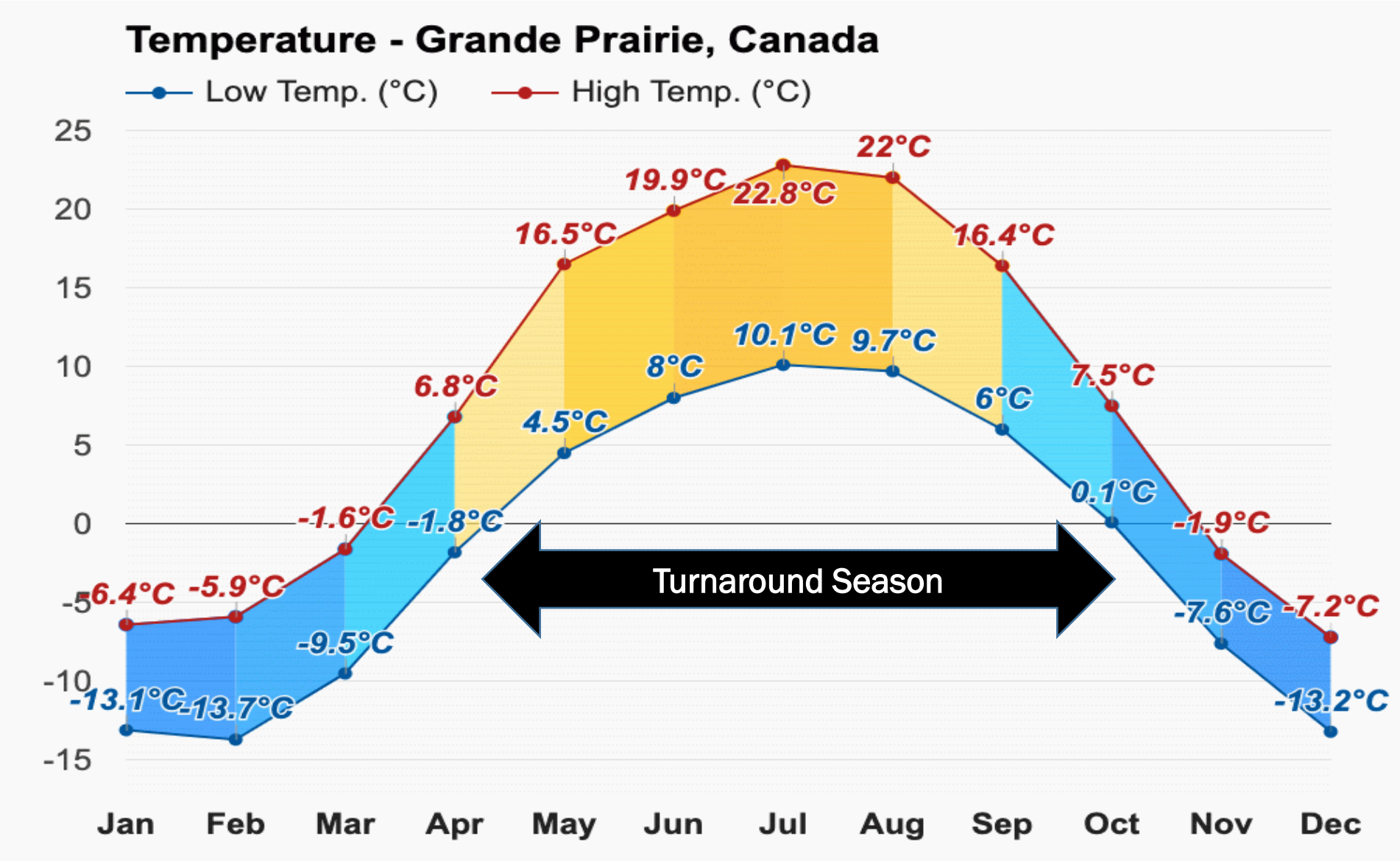
Turnarounds, Shutdowns & Outages (STOs)

Shutdown:
A planned event where an operating unit or piece of equipment is shutdown to perform work

Turnaround:
A planned event that requires a plant, or an entire portion of a plant to go completely offline for maintenance, inspection, compliance or project work

Outage:
Generally, an unplanned event that and involves a partial or complete stoppage of an operating plant or unit

When Do STOs Occur?



STO Durations

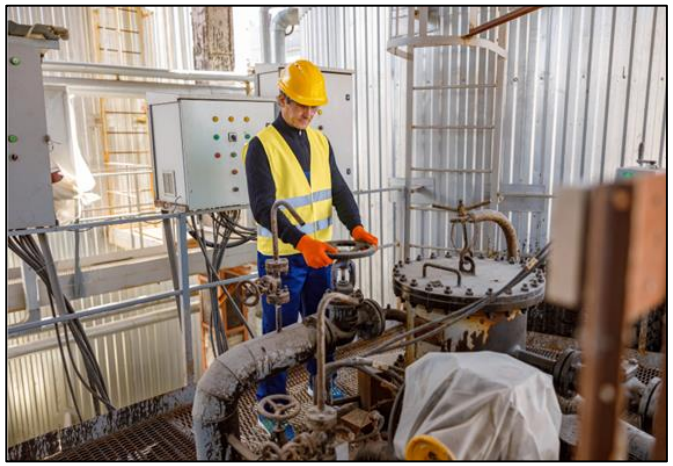
Compressor Site
~1 to 7 days

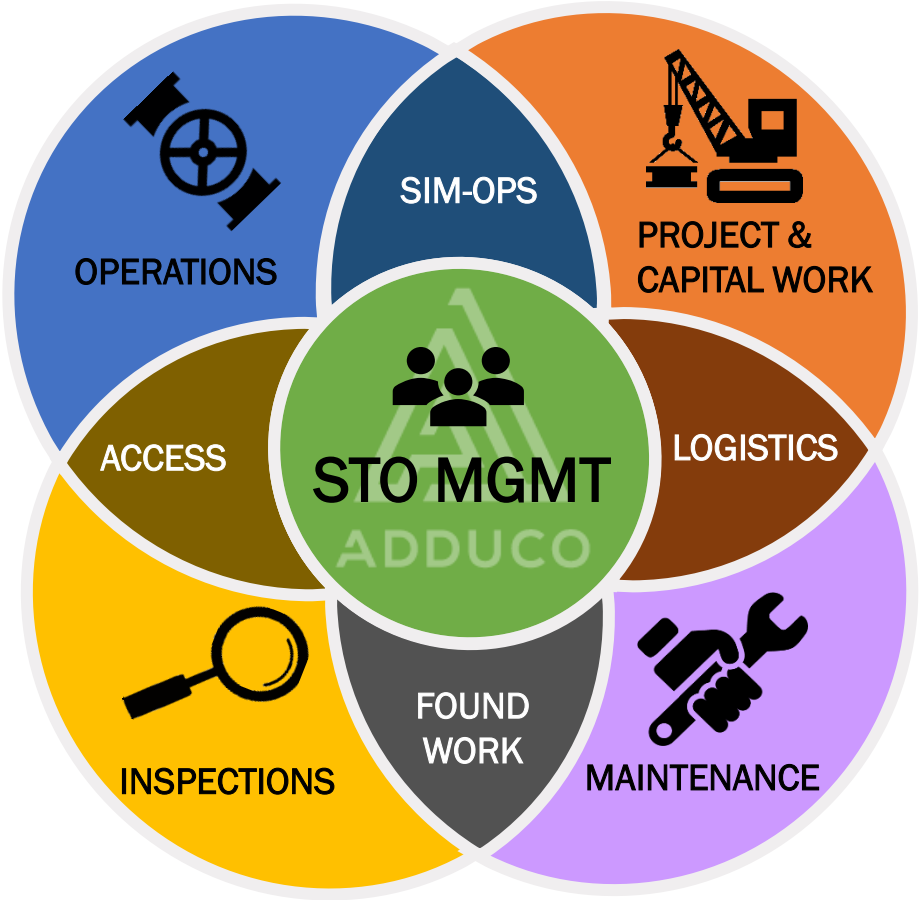
Sour Gas Processing Plant
~7 to 28 days

Oil Battery
~1 to 14 days

Refinery
~21 to 56 days

What happens during an STO?

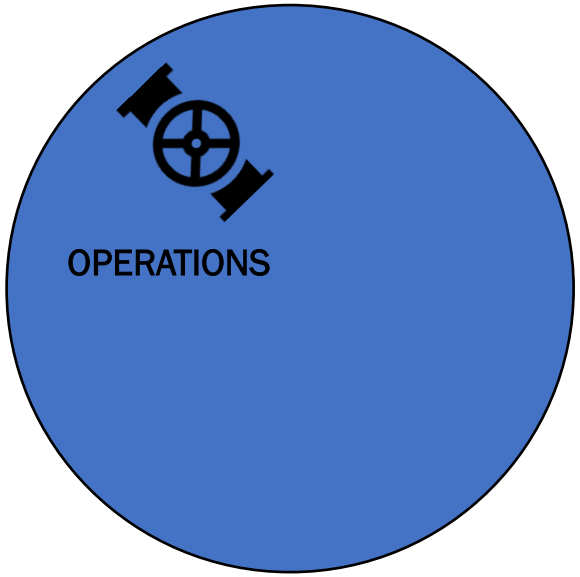




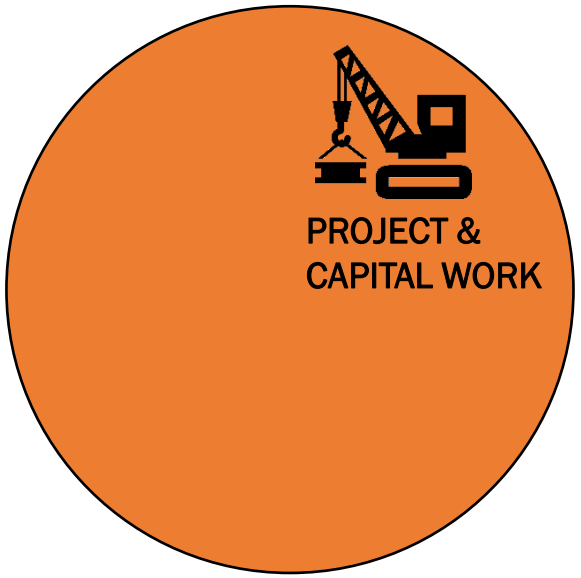
Operations Activities

OPERATIONS

- Stop production
- Methodically shutdown the facility
- Depressure & decontaminate
- Prepare equipment for safe work
- Lock-out-tag-out (LOTO)
- Issue safe work permits
- Re-commission
- Start-up production



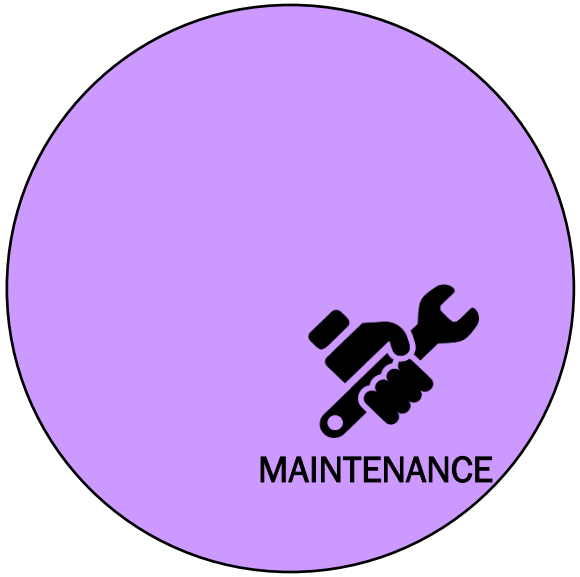
Project Work



PROJECT & CAPITAL WORK

- Project work that requires an outage to complete:
  - new equipment
  - major replacements
  - expansions
  - piping tie-ins
- Management of Change (MOC) projects that require an outage
- Project work requires:
  - Skilled labor
  - Equipment & tools
  - Materials
- Quality Assurance (e.g. x-rays)

Maintenance Work



MAINTENANCE

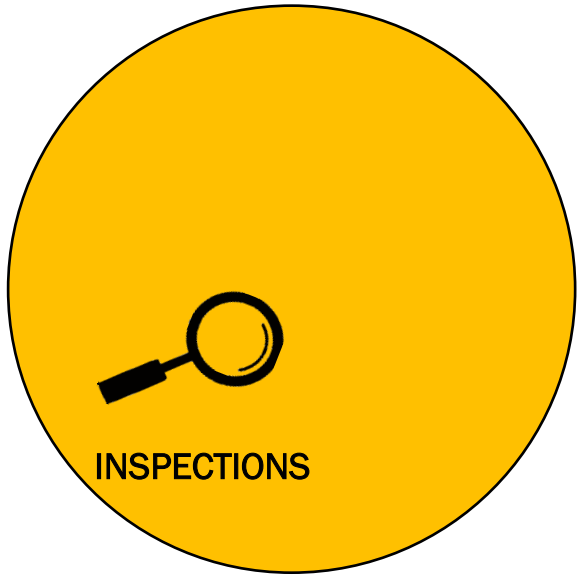
- Repairs & maintenance that require an outage
  - Cleaning
  - Equipment checks
  - Function testing
  - Electrical work
  - Controls system work
- Found work repairs
- Maintenance work requires:
  - Skilled labor
  - Equipment & tools
  - Materials

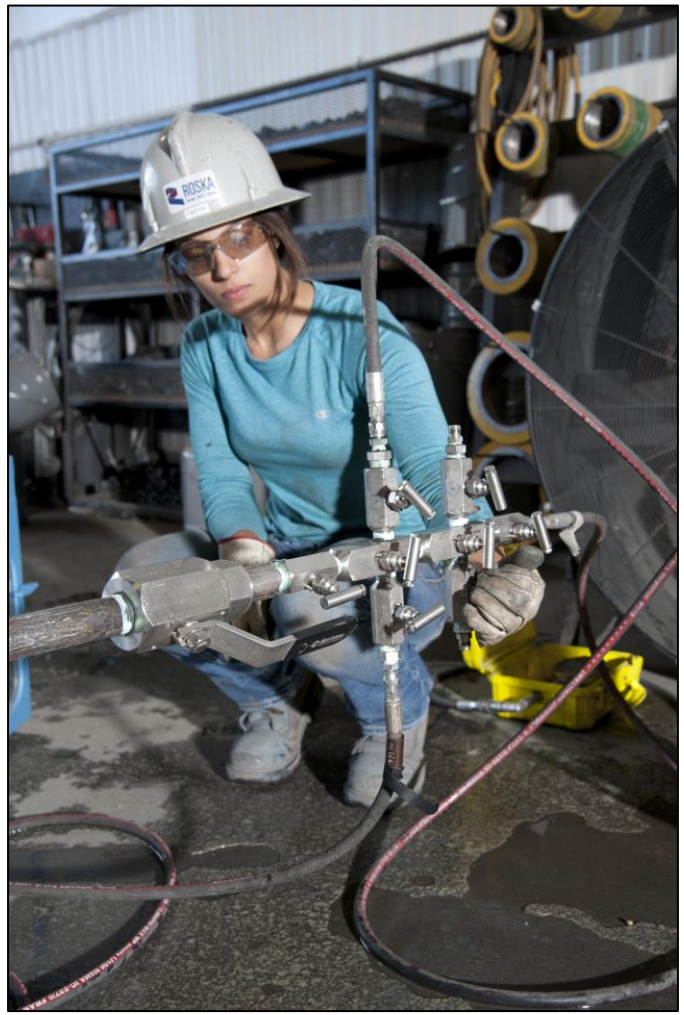
Ron Bettin

Inspections - Process Vessel, Piping & Equipment

INSPECTIONS

- Regulatory inspections
- Integrity inspections
- Operations inspections
- Internal design inspections
- Report “found work”
- Provide direction for Quality Assurance (QA) and Quality Control (QC)
- Inspection work requires:
  - Qualified inspectors
  - Specialized equipment & tools





Simultaneous Operations

SIM-OPS

SIMULTANEOUS OPERATIONS

- Simultaneous operations (SIMOPs), occurs during a turnaround when work activities are carried out in the same vicinity of operations activities.
  - During shut-down & start-up
  - Adjacent to operating systems that remain running
  - Electrical and utility systems that are not shut-down
- Hazard analysis and controls are required to ensure that these activities do not create an unacceptable level of risk when conducted at the same time.

Access to Equipment

ACCESS

ACCESS TO EQUIPMENT

- Access to equipment requires preparation and coordination to be completed safely and effectively.
- Some activities that require additional hazard analysis and controls are:
  - Confined space entry
  - Working at heights
  - Working on, or around, “live” equipment or systems

Found Work

FOUND WORK

- "Found work" is generally identified during the turnaround event from inspection. Although "found work" can be anticipated, the extent of repairs or replacement is unknown until the equipment is shut down.
- Typical found work includes:
  - Corrosion or erosion damage
  - Vessel internal damages to trays or packing
  - Internal coating damage
  - Demister pad damage
  - Baffle and diverter damage

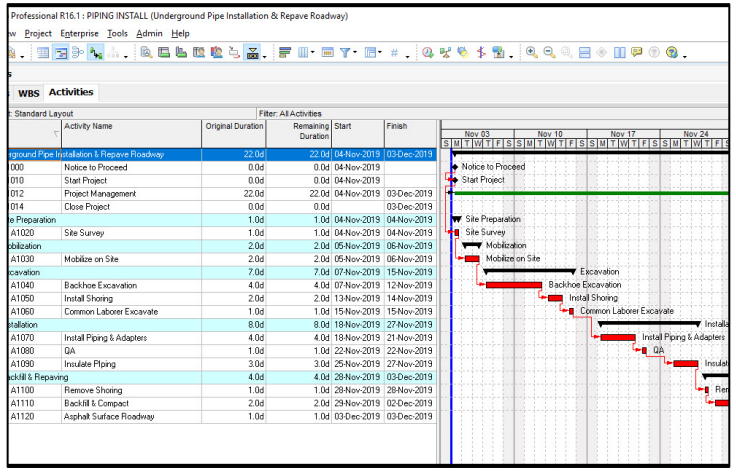
Turnaround Logistics

LOGISTICS

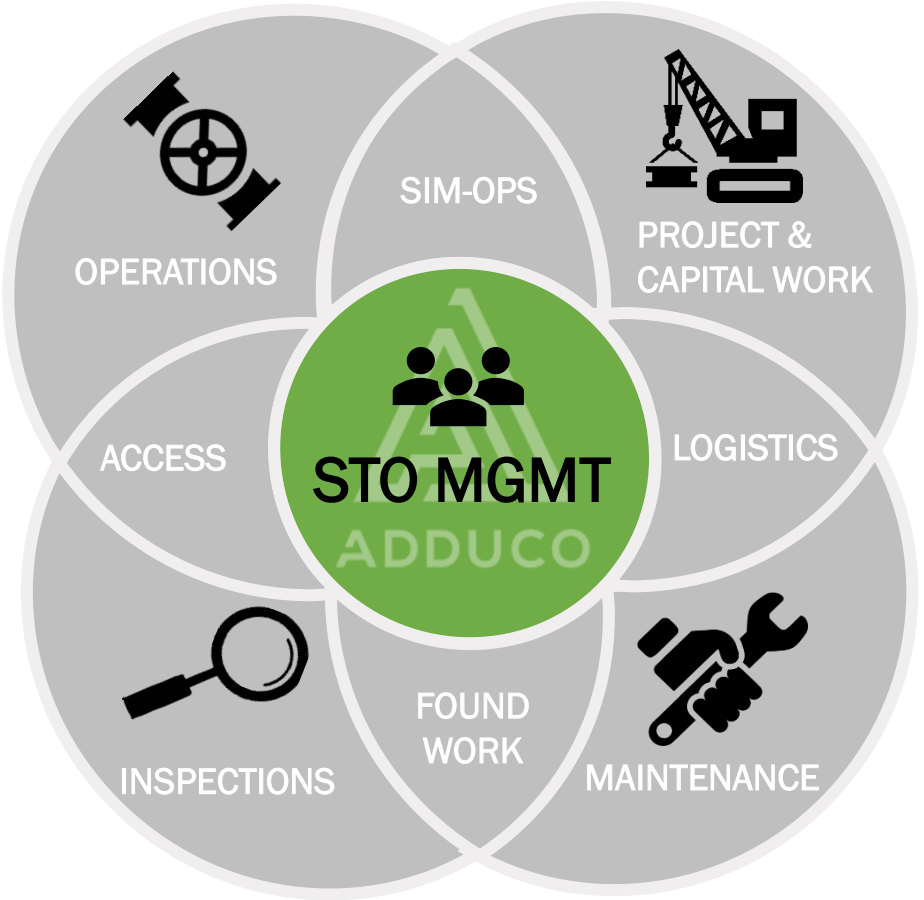
- With limited room and many workers on a site during a turnaround event logistics are important to control:
  - Temporary office and lunch trailers
  - Traffic flow
  - Site access control
  - Security
  - Lay-down areas
  - Equipment wash areas
  - Waste bin areas
- In the event of an emergency, it is important the all workers have the ability to move to a safe location

LOGISTICS

STO Project Management

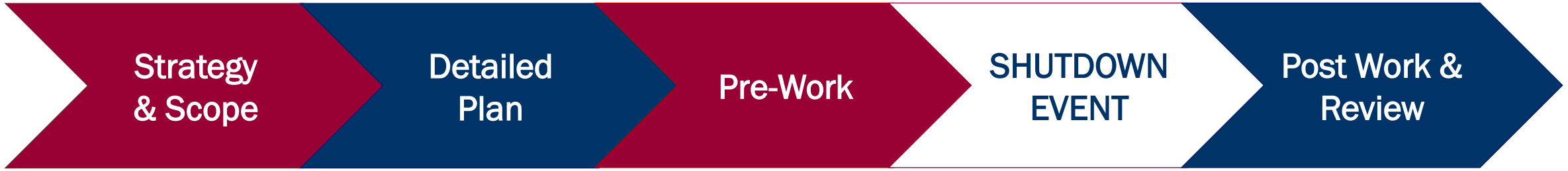


- STO's are complex.
- Effective Project Management is imperative to their success



- Coordination and support is required with all stakeholders
- Leadership support is essential

TYPICAL SHUTDOWN STAGE GATES



- ❑ Strategic plans & goals
- ❑ Define milestones
- ❑ Define scope
- ❑ Assign key resources

- ❑ Detailed work plans
- ❑ Write procedures
- ❑ Secure materials & services
- ❑ Detailed budgets

- ❑ Issue schedules
- ❑ Prepare work packages
- ❑ Equipment & materials staged
- ❑ Kick-offs

- ❑ Shutdown
- ❑ Equipment preparation
- ❑ Inspections
- ❑ Maint. work
- ❑ Capital work
- ❑ Commission & start-up
- ❑ Reporting

- ❑ Punch lists
- ❑ Post event work
- ❑ Equipment demob
- ❑ Evaluations & lookbacks
- ❑ Baseline next event

As a neighbour, what can you expect?

Flaring during shutdown & startup

Photo Source: www.cbc.com

Noise from equipment & activities

Photo Source: MEC Mechanical

Additional Traffic

24 Hour Worksite

Photo Source: Sterling Crane

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Shutdown, Turnaround & Outage Checklist

Strategy & Scope

- ❑ Project roles & responsibilities
- ❑ Assign project leads
- ❑ Steering Team
- ❑ Goals and outcomes
- ❑ Define milestones
- ❑ Review previous learnings
- ❑ Preliminary budget
- ❑ Cost control plan
- ❑ Reporting plan
- ❑ Define KPI's
- ❑ Communications plan
- ❑ Inspection list
- ❑ Mechanical list
- ❑ E&I list
- ❑ Capital project list
- ❑ MOC list
- ❑ Risk register
- ❑ Scope review
- ❑ Scope freeze
- ❑ Contract service strategy
- ❑ Identify long-leads

Detailed Plan

- ❑ Create detailed job work packages
- ❑ Create MOC packages
- ❑ Scope change process
- ❑ Project schedule
- ❑ Project budget
- ❑ Issue contracts
- ❑ Shut-down & decontamination procedures
- ❑ Start-up procedures
- ❑ LOTO plan
- ❑ Blinding plan
- ❑ Vessel entry plan
- ❑ Materials plan
- ❑ Traffic plan
- ❑ Lifting plan
- ❑ QC plan
- ❑ Order materials
- ❑ Logistics plan
- ❑ Rentals arranged
- ❑ Safety plan
- ❑ Medic & first aid plan
- ❑ Accommodation & transport plan
- ❑ Found work process
- ❑ Readiness review

Pre- Work

- ❑ Issue execution job plans
- ❑ Issue final schedule
- ❑ QC audits
- ❑ Contractor site walk-throughs
- ❑ Hazard assessments
- ❑ Services ordered
- ❑ Additional operators on-site
- ❑ Materials staged
- ❑ Lay-down area set-up
- ❑ Temp tanks & piping in place
- ❑ Temp power in place
- ❑ Scaffolds in place
- ❑ Temporary Offices & Lunch Rooms in place
- ❑ Insulation removed
- ❑ Notifications
- ❑ Control budget in place
- ❑ Cost reporting in place
- ❑ Review of project critical path
- ❑ Mobilize lifting equipment
- ❑ Rentals on site
- ❑ Safety/spill equip. in place
- ❑ Kick-off meetings
- ❑ Accommodations & transport in place
- ❑ Orientations
- ❑ Medic & first aid in place

SHUTDOWN

- ❑ Operations shut-down
- ❑ Site traffic control
- ❑ Ops permitting
- ❑ LOTO control
- ❑ Blinding control
- ❑ Job work package completions
- ❑ Inspections
- ❑ Vessel entry & closure control
- ❑ PSV travel sheets
- ❑ Daily progress meetings
- ❑ Daily schedules & critical path issued
- ❑ Daily time-tickets
- ❑ Found work decisions
- ❑ Hand-overs to operations
- ❑ Pre-start-up safety review (PSSR)
- ❑ Ops commission & start-up
- ❑ Startup notifications

Post Work & Review

- ❑ Job work package punch lists
- ❑ Equipment demob
- ❑ Materials return
- ❑ Scaffolds removed
- ❑ Insulation replaced
- ❑ Site clean-up
- ❑ Final project walk-through
- ❑ Job plan actuals documented
- ❑ Actual schedule documented
- ❑ Update all project files
- ❑ Update databases
- ❑ Contractor evaluations
- ❑ Post-project lessons learned
- ❑ Create "next shut-down" work list
- ❑ Post-project report
- ❑ Archive project files and documents

QUESTIONS?

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