

IAM
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People, processes, and technology:
Cameco's efforts to improve how physical assets are managed
at its mining operations

Jean-Pierre (J.P.) Pascoli, P.Eng, CMRP, MMP, CAMA, CSAM



Director, Asset Management & Reliability
Operational Excellence Group
Cameco Corporation



President
PEMAC Asset Management
Association of Canada

About the Presenter

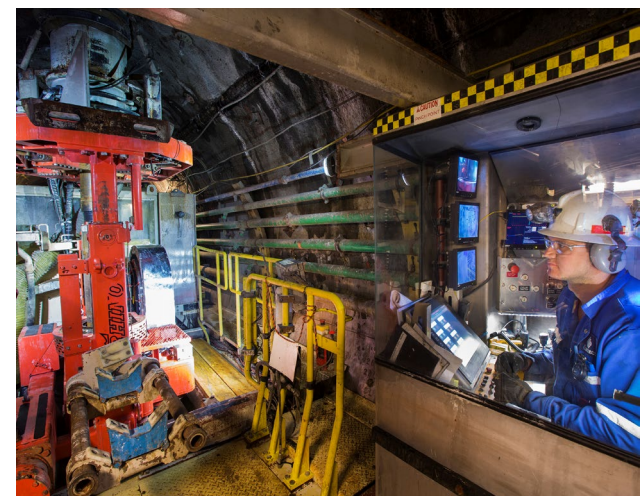


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Director, Asset & Management & Reliability
Operational Excellence Group
Cameco Corporation
Saskatoon, Saskatchewan, CANADA

- Professional engineer with over 30 years of industry experience
- Degree in mechanical engineering from Queen's University in Canada
- Certificate in physical asset management from the University of Toronto in Canada
- Certified maintenance and reliability professional (CMRP) with the Society for Maintenance & Reliability Professionals (SMRP)
- Certified asset management assessor (CAMA) through World Partners in Asset Management (WPiAM)
- Accredited maintenance management professional (MMP) and a certified senior principle in asset management (CSAM) with PEMAC Asset Management Association of Canada (PEMAC)
- President, PEMAC Asset Management Association of Canada
- Treasurer, Global Forum on Maintenance & Asset Management (GFMAM)



- **C**anadian **M**ining and **E**nergy **C**orporation
- Uranium mining, milling, refining, conversion and fuel manufacturing services
- Production facilities in Canada, USA, & Kazakhstan
- Regulated by the Canadian Nuclear Safety Commission (CNSC) and U.S. Nuclear Regulatory Commission (NRC)



← Cameco Canadian Operations



Mining & Milling
Key Lake
Cigar Lake
McArthur River
Rabbit Lake



Saskatoon
(Headquarters)

Fuel Processing
Blind River
Port Hope (2)
Cobourg



Physical Assets at Cameco



Processing Equipment



Buildings



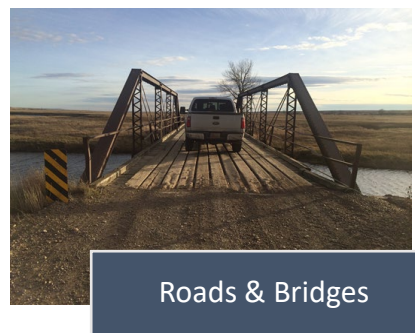
Heavy Mobile Equipment



Hoisting & Rigging Equipment



Vehicles



Roads & Bridges



Electrical Transformers



Elect. Distribution Equipment



Pressure Vessels



Utility Equipment



Buried Infrastructure



Piping Systems



Operational Asset Management

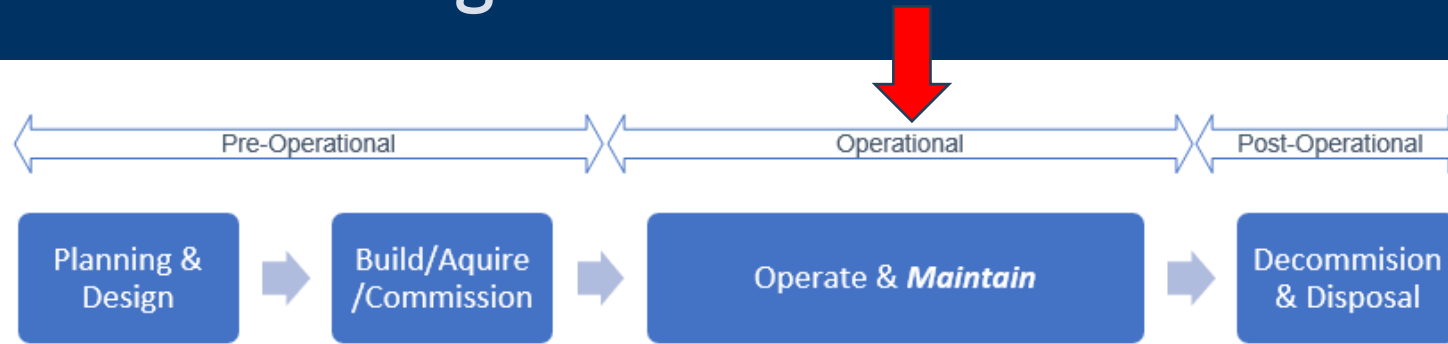


Figure 1 - Major Asset Life Cycle Stages in Physical Asset Management

*Life-Cycle of Physical Assets
GFMAM Maintenance Framework, Second Edition*

An Anatomy of Asset Management

Version 3 December 2015

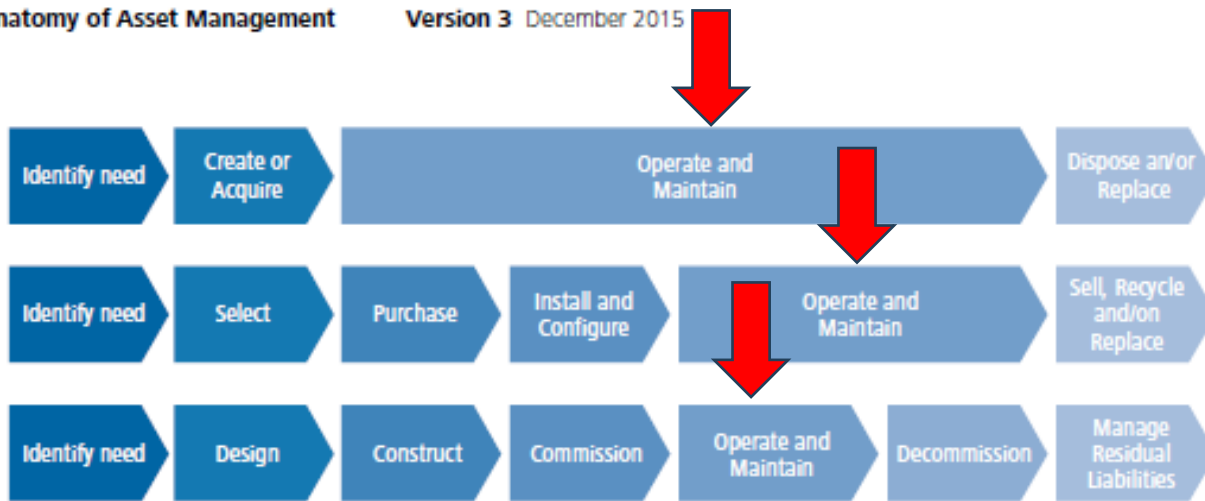
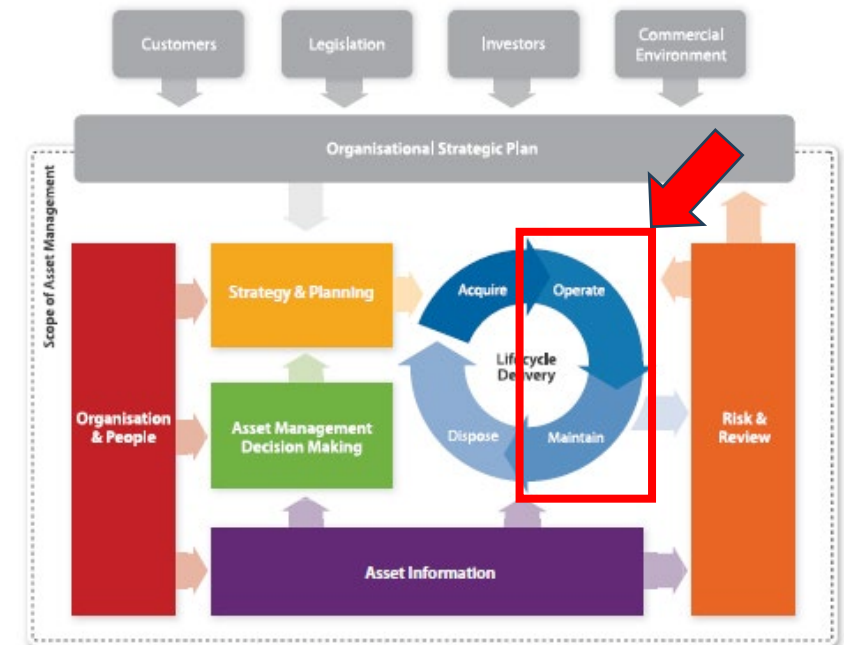


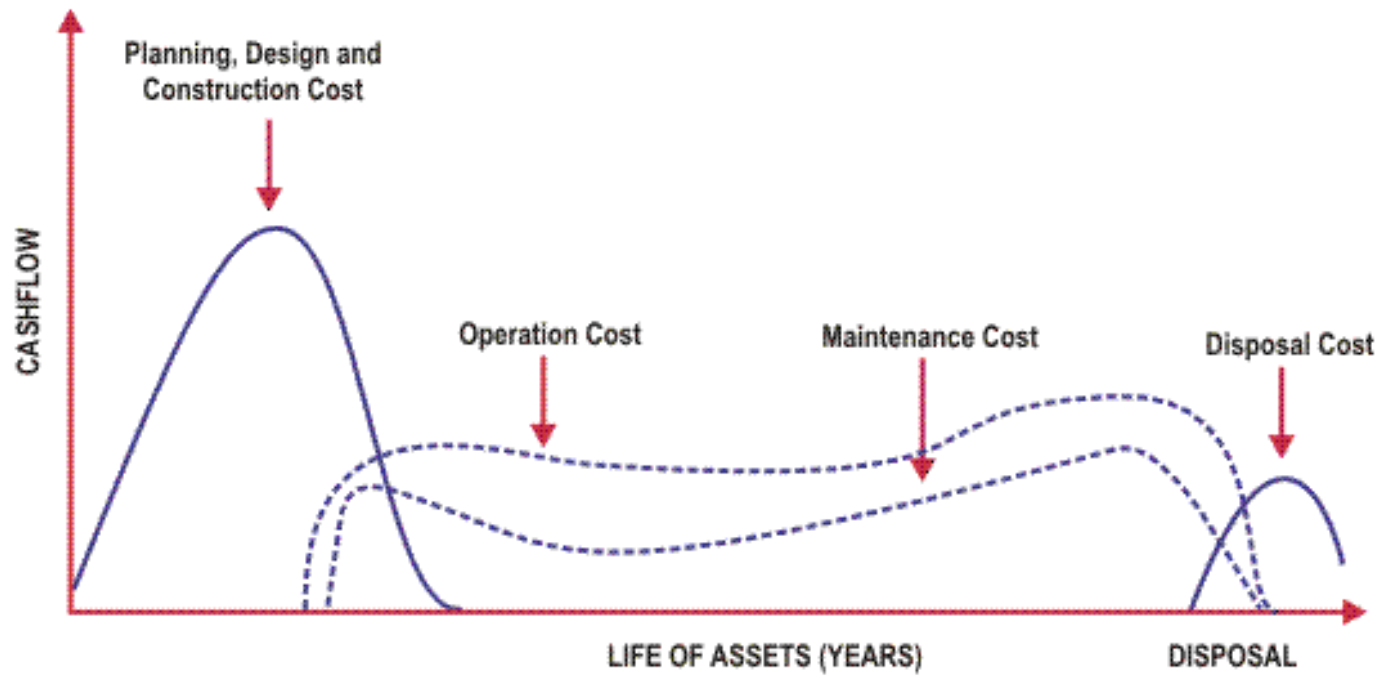
Figure 2: Examples of variations in the description of asset life cycle stages



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LCC impact of Operations and Maintenance



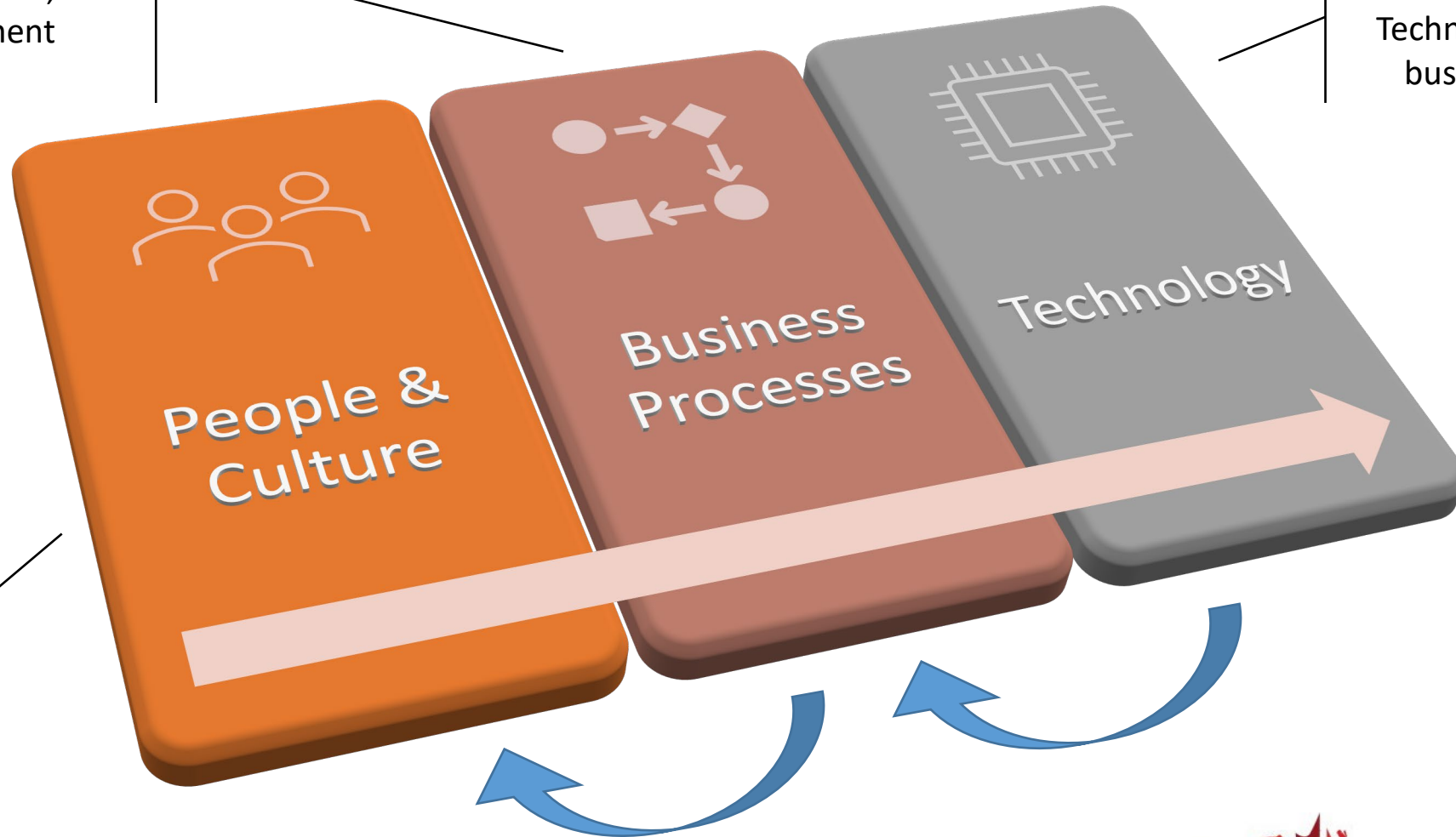
Life-Cycle Costs of Physical Assets
GFMAM Maintenance Framework, Second Edition



Operational Asset Management: Improvement Lenses

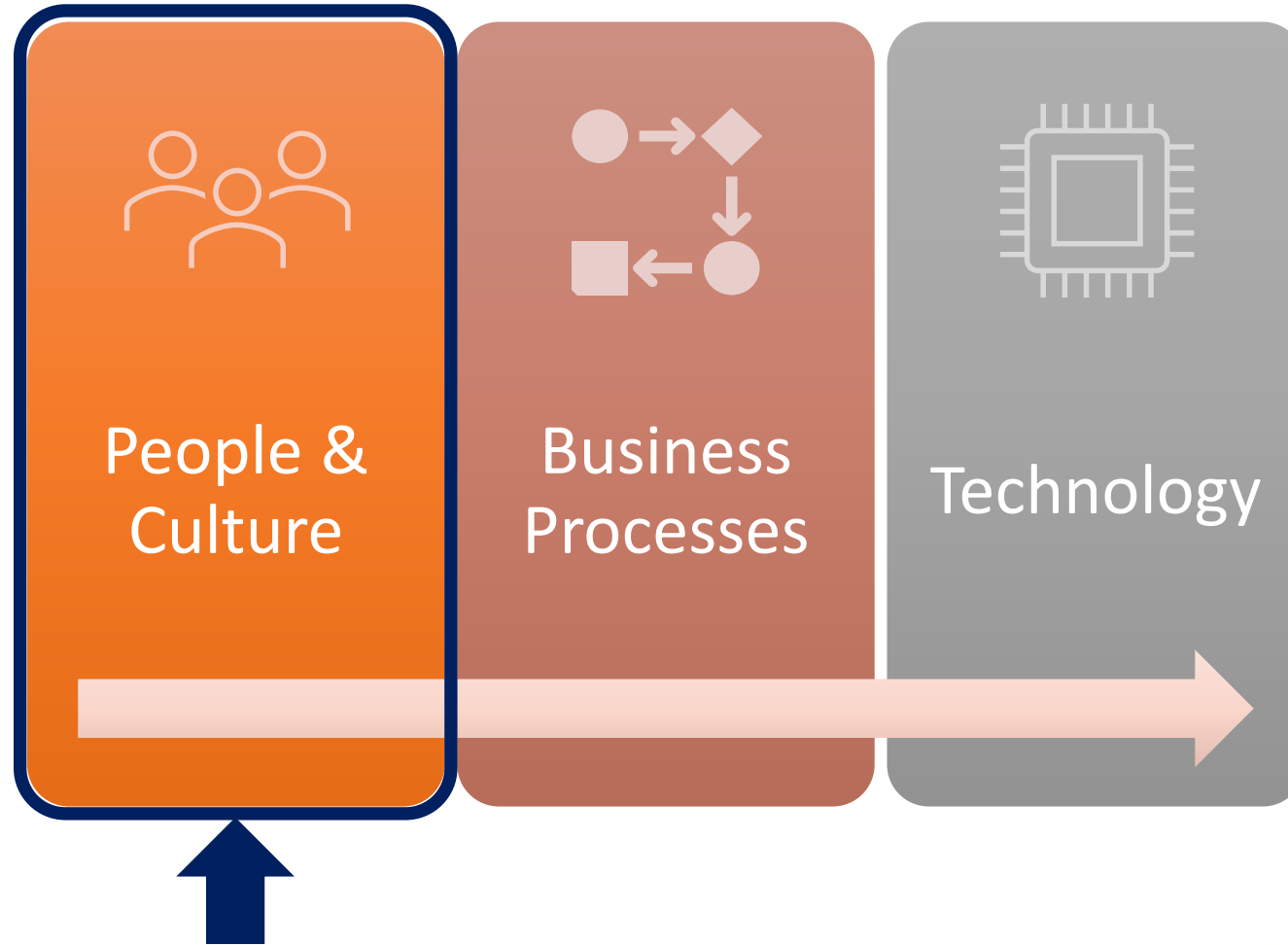
Processes supporting asset operation and maintenance; Process-Based Management methodology

Technology supporting business processes



Education; roles & responsibilities; communities of practice; change management; reliability culture







- People form an organization's culture
- Culture inertia \propto # of people
- Many people required operate and maintain assets (equipment) in industrial operations
- Culture will impact operational asset management activities, success
- Training & education will help form a positive culture
- Cultures of (Operational) Excellence:
 - Safety Culture
 - Quality Culture
 - Reliability Culture
- **Operational Excellence cannot be achieved without consideration for people and culture!**

“

Culture eats strategy
for breakfast,
operational excellence
for lunch, and
everything else for
dinner

Peter Drucker

”





Reliability

is not just a maintenance issue
...but a **culture**



- Cameco's Operational Reliability program
 - Develop and educate on asset-related business processes that affect operational reliability
 - Measure performance, establish accountability
 - Develop a *reliability* culture
 - Proper asset operation
 - Precision/quality work
 - Process adherence
 - Collective accountability
 - Data-driven decisions
 - Continuous improvement...
 - Develop Communities of Practice
 - Leverage change management



Building a Reliability Culture



**Building a “Reliability”
Culture:
Teaching reliability
fundamentals to site
leaders at Cameco**





Ownership. It shows.

Take pride in your equipment to improve reliability.



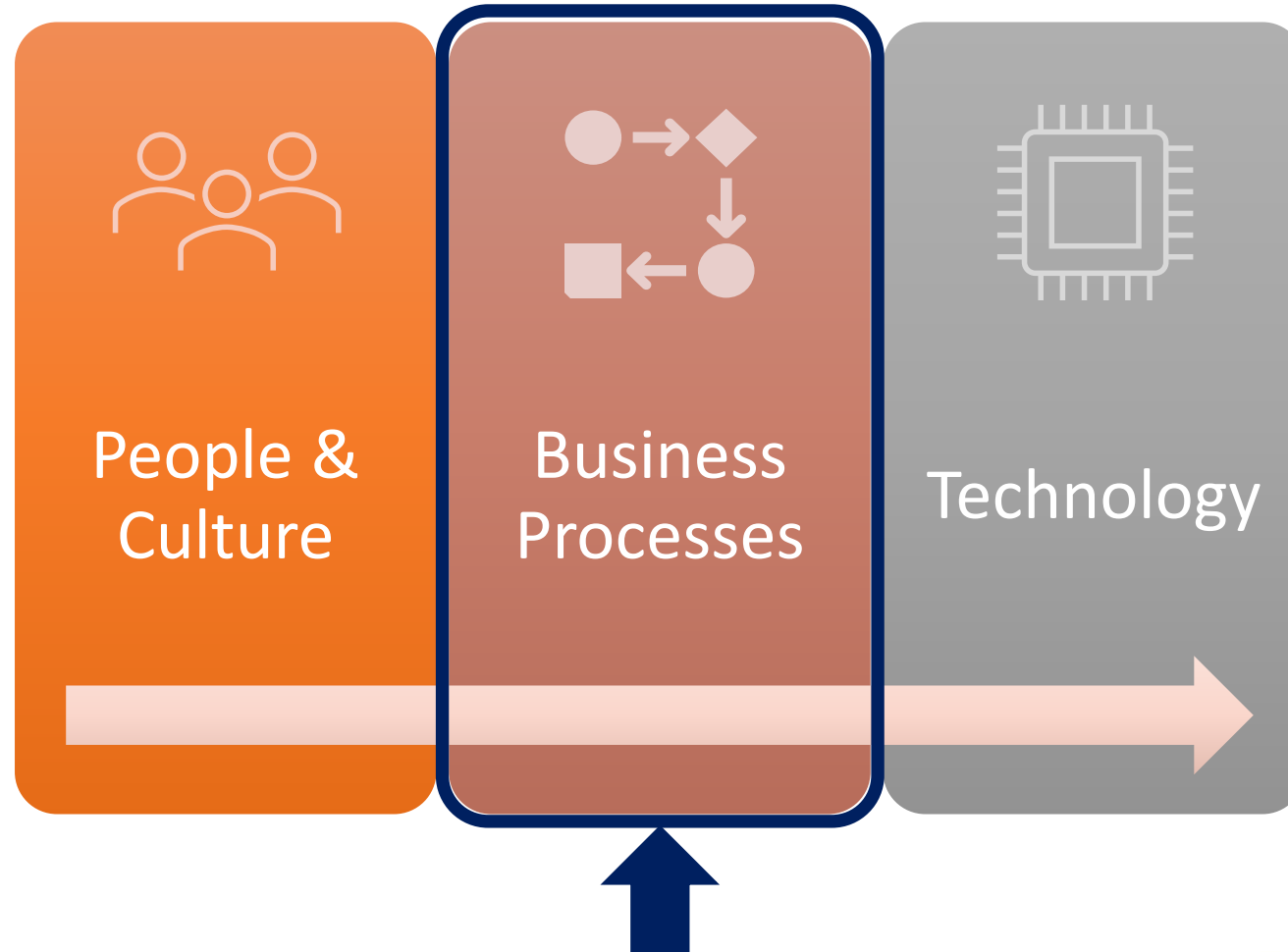
Work Smarter, Not Harder
RIGHT PEOPLE | RIGHT PLACE | RIGHT TIME | RIGHT EQUIPMENT



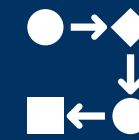
*Poster from
Operational
Reliability
Change
Management
communication
campaign*



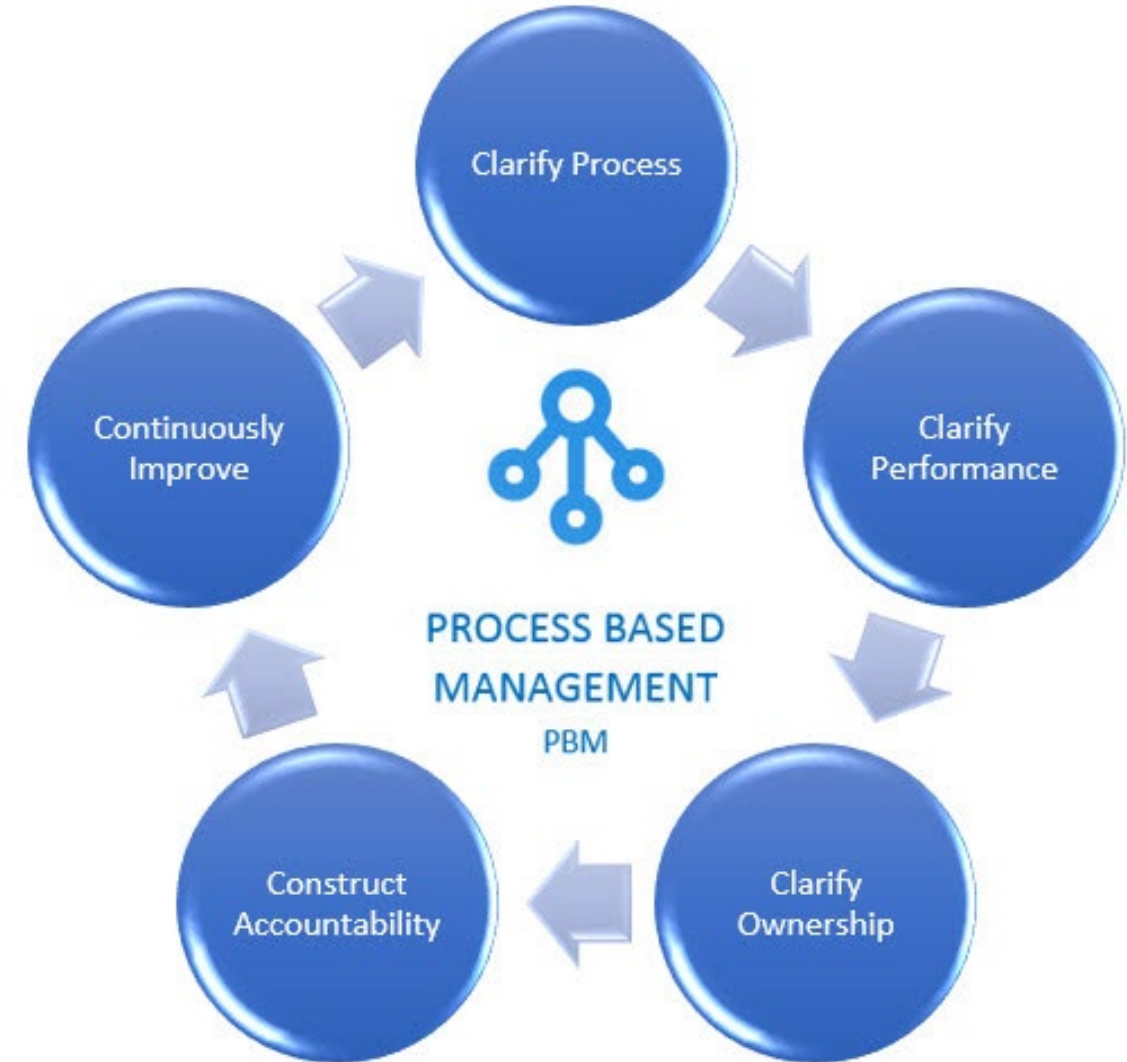
Operational Asset Management: Improvement Lenses



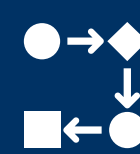
Process Based Management (PBM)



- PBM methodology: every activity is linked to a business process
- PBM key elements:
 - Process defined in maps/flowcharts
 - Defined singular process owner
 - Defined roles, responsibilities, accountabilities
 - Defined performance measures
 - Con
- Operational asset management processes using PBM:
 - [Asset Maintenance] Work Management
 - [MRO] Materials Management
 - Reliability Management
 - Operations Management (specific to asset reliability)



Business Process Management Resources



Cameco Process Based Management - Home

PROCESS BASED MANAGEMENT (PBM) - PROCESS LIBRARY

Use this process library to access all of the available process related material including the **process map** that outlines the steps of the process, how and where the process is measured, and how the process is linked to other processes. Click on any of the blue highlighted process steps to access **single step instructions** (SSI's) and other related documents specific to that step. Use the library on the left of each process page to access the related material through links to **MDS documents**. Each process page pulls together all of the relevant **MDS documentation** into one central location. Use the **process binder** document to review specific and standardized information related to the process. Also available on each process page is the contact information for the **process owner**, the person within Cameco who owns the process and process performance. Launch an email or skype conversation with the process owner directly from the process page to ask for more information on the process or suggest process improvements.

Cameco Processes

Expand All | Collapse All

- ☑ Cameco Enterprise Process Model
- ☑ Process Based Management
- Add New Document Set

Click on the icons or process names below to access the associated process page or use the menu on the left.



Work Identification

Work Planning

Work Scheduling

Work Execution

Work Close Out

Urgent Work Preparation

Material Master Data Governance (MDG)

Material Requirements Planning (MRP)

Reserve/Requisition Material

Material Purchasing

Material Receiving

Inventory Management

- Material Refurbishment
- Material Cycle Counting
- Material Maintenance
- Material Return

Material Order Fulfillment

Unrequired Material Disposition

Asset Reliability Strategy Development

Asset Reliability Strategy Execution

Asset Health/Failure Monitoring & Review

Loss Identification & Elimination

PM Optimization

Management of Change

Quick Links

Operational Performance Dashboard

KPI Data Extract Information(Date and Time, formula and notes)

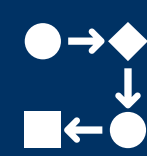
MDS - Operational Excellence

MDS - Supply Chain Management

MDS - SHEQ

CMS - Cameco Management System





Cameco Process Based Management

Back to all processes

Work Management

Process ID: PA-MA-WM
Process Owner: John Wettlaufer
Process KPI:
Parent Process: Maintain Assets

[View All Properties](#)
[Edit Properties](#)

[New](#) [Upload](#) [Sync](#) [Share](#)

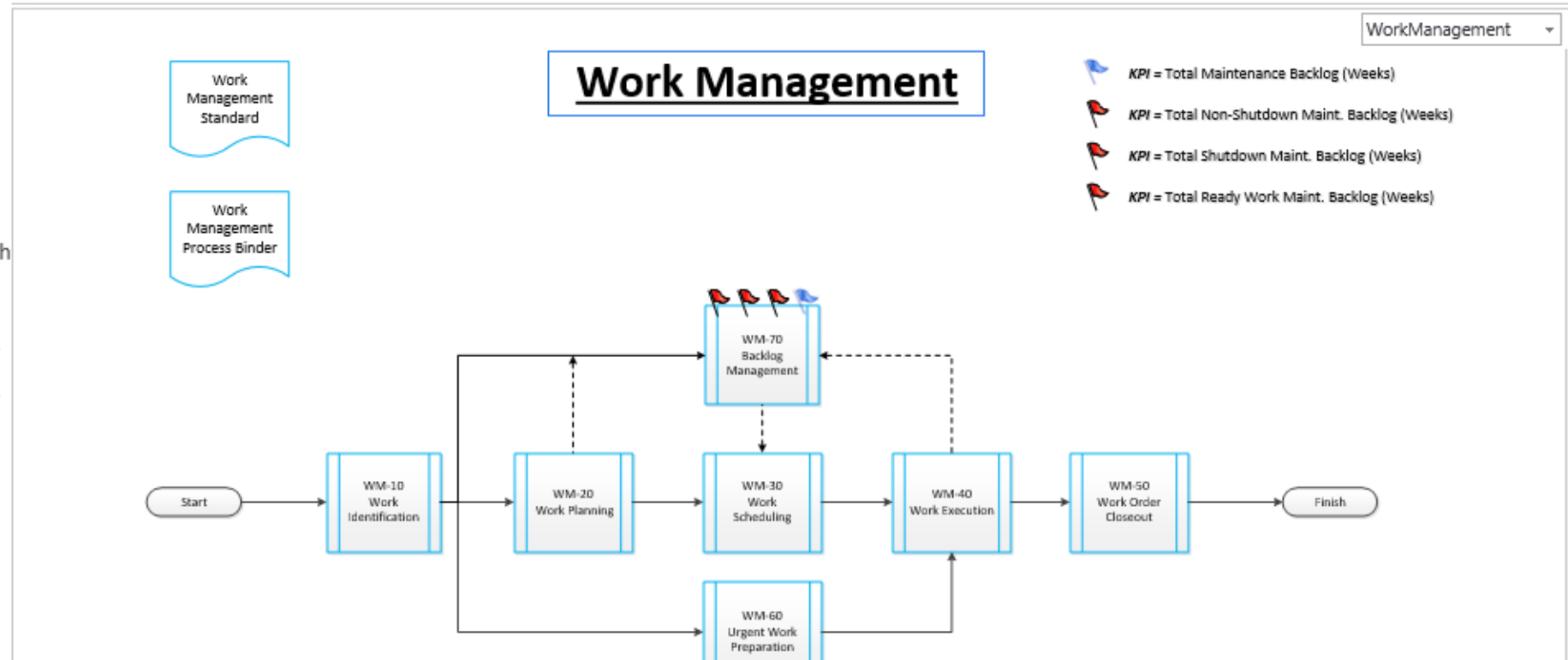
Find a file

✓	📄	Name	...
	📄	Sigga Brizzo Mobile EAM app installation	...
	📄	Sigga Brizzo Mobile EAM Daily Sync of Data	...
	📄	Sigga Brizzo Mobile Log-in Information	...

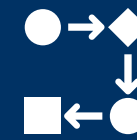
Work Management

Work Management is the high level process that ensures well-planned, properly scheduled, effectively communicated jobs to accomplish work efficiently, and at the lowest possible cost. This process is part of Asset Management and Reliability Excellence. It interacts with all business process that use assets to produce uranium fuel. It is most significantly impacted by the reliability and material management processes. These processes are owned by the Manager of Work Management Processes and are measured by a suite of KPI's. No one measure will effectively measure the process, the Cameco Operational Excellence KPI dashboard reflects the overall health of the process. The scope of work management starts with the identification, prioritizing, planning, scheduling, executing and the closure of the work order. A path for the planning and executing of unplanned (urgent) work is also included in this process.

PBM Interactive Process Map

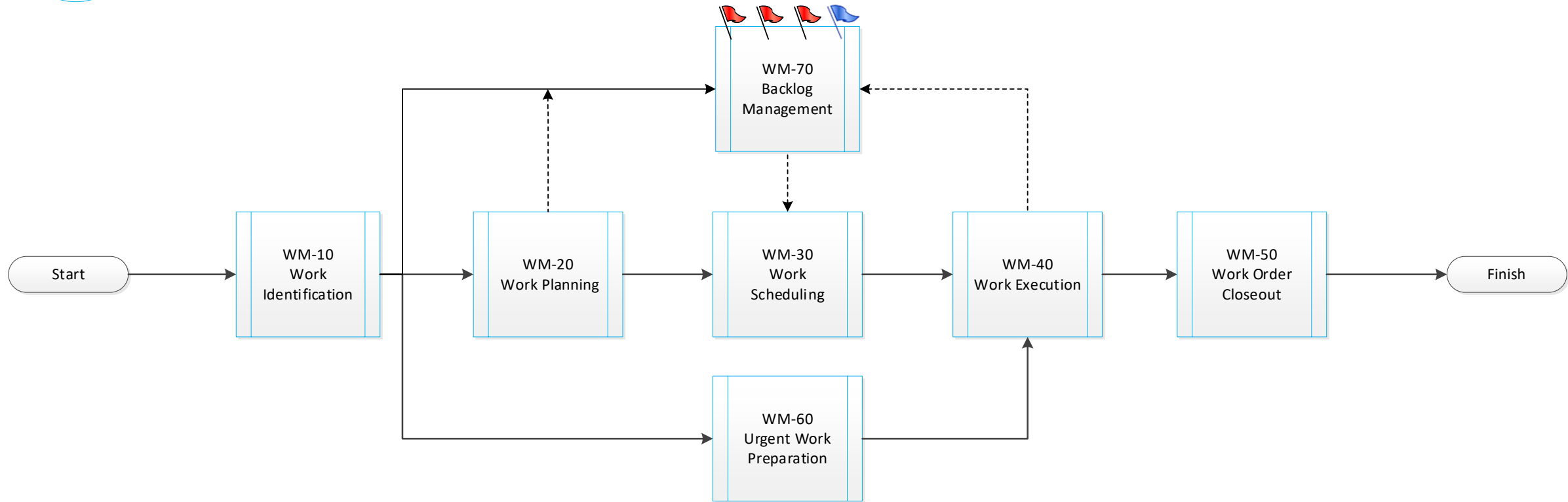


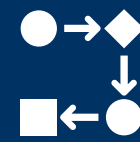
Business Process Management Resources



Work Management Process Binder

- KPI = Total Shutdown Maint. Backlog (Weeks)**
- KPI = Total Ready Work Maint. Backlog (Weeks)**





Cameco Process Based Management

Back to all processes

Work Management

Process ID: PA-MA-WM
Process Owner: John Wettlaufer
Process KPI: Maintain Assets
Parent Process: Maintain Assets

[View All Properties](#)
[Edit Properties](#)

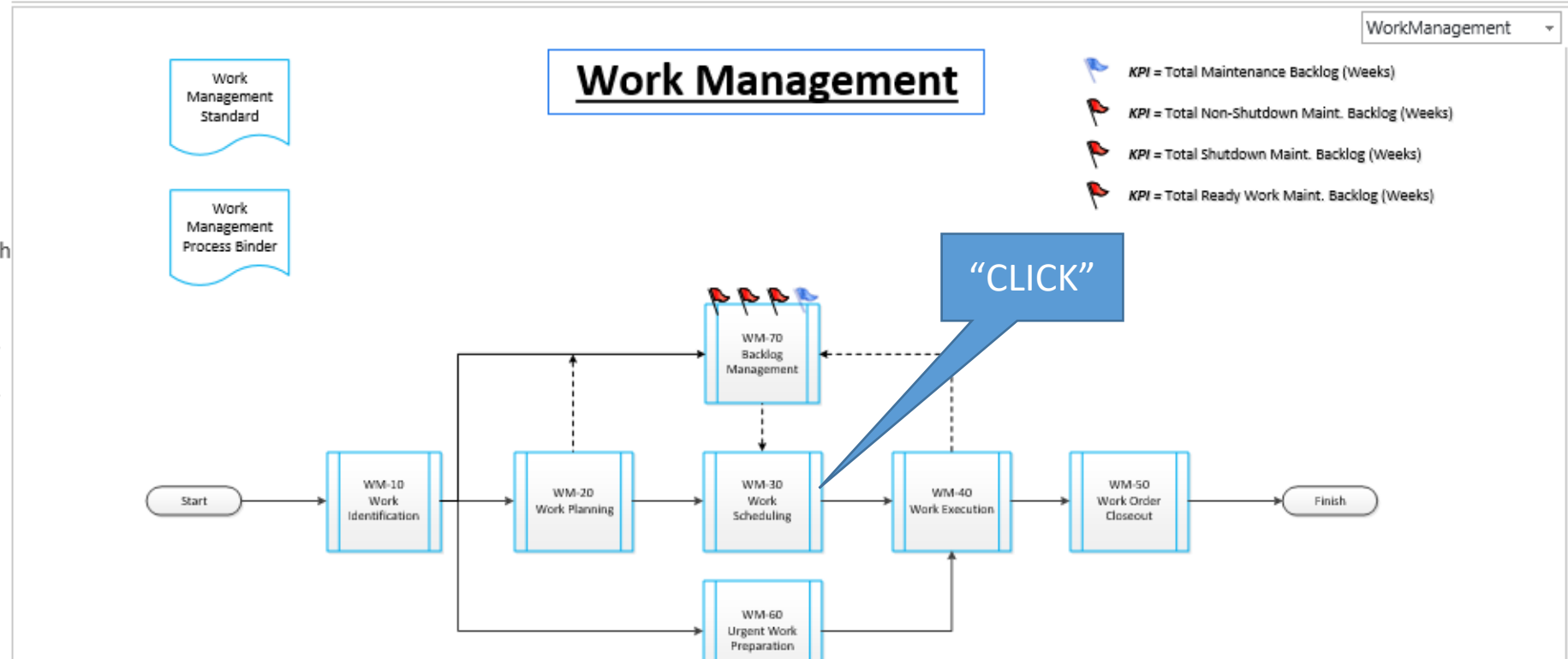
[New](#) [Upload](#) [Sync](#) [Share](#)

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	📄	Sigga Brizzo Mobile EAM app installation	...
	📄	Sigga Brizzo Mobile EAM Daily Sync of Data	...
	📄	Sigga Brizzo Mobile Log-in Information	...

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PBM Interactive Process Map



[Back to all processes](#)

Work Scheduling

Work Scheduling
 Process ID: PA-WM-WS
 Process Owner: John Wettlaufer
 Process KPI: Loaded Schedule Compliance
 Parent Process: Work Management

[View All Properties](#)
[Edit Properties](#)

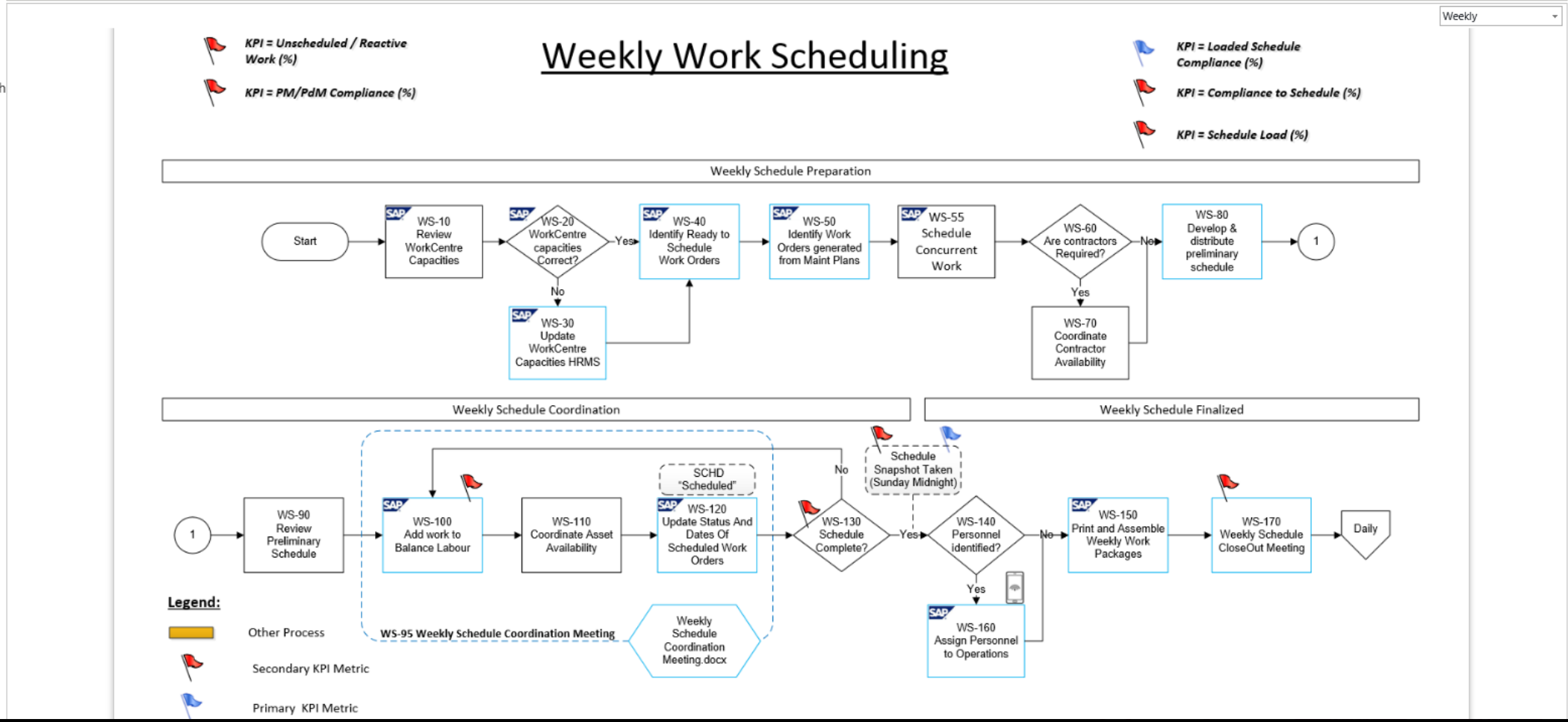
New Upload Sync Share

Find a file

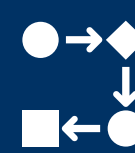
- Name**
- Work Scheduling Process Awareness ...
- Work Scheduling Process Binder ...
- Work Scheduling Process Flow ...
- WS-100 Add Work to Balance Labour in Weekly Schedule ...
- WS-120 Update Status And Dates Of Scheduled Work Orders ...
- WS-150 Print and Assemble Weekly Work Packages ...
- WS-160 Pull Ready Work and Assign Labor ...
- WS-170 Weekly Schedule Close Out Meeting ...
- WS-180 Identify Work for Next Day ...
- WS-220 Update Header Status and Operation Dates ...

Scheduling work is an important component of work management. Done properly, it ensures that the maintenance resources are efficiently deployed to address the highest priority needs of the business. It is a balancing act between availability and make-up of trade resources and the selection of work from a site's backlog of planned and ready-to-schedule work. The objective is to choose the work that is to be done (taking into consideration resource availability), coordinate resources, and to commit to getting the work done by a specific date. A joint prioritization of the work required is of utmost importance, and a commitment between equipment owner (operations who understand the need), maintenance (who understand the logistics), and other support departments (Eng., Safety, Radiation, Warehouse). As such they all need to be involved in the development of the weekly schedule. This process applies to weekly Maintenance work and activities, both maintenance and non-maintenance related, at all of Cameco's Canadian operations, whether performed by internal or external resources. It is designed specifically for Maintenance trades but, at a site's discretion, may be extended, in part or in whole, to other work groups. While the principles herein can be useful, this process as defined does not necessarily apply to scheduling annual shutdowns/turnarounds or any large maintenance event that is greater than 1 week in duration.

PBM Interactive Process Map



Business Process Management Resources



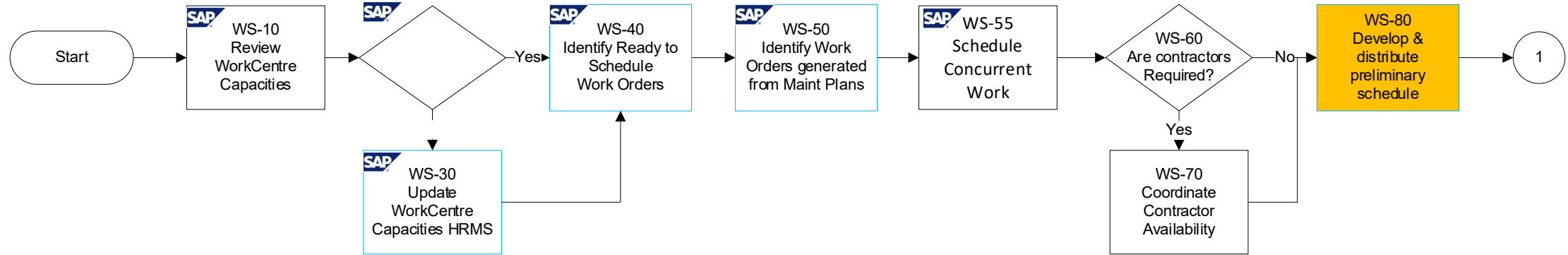
KPI = *Unscheduled / Reactive Work (%)*

KPI = *Compliance to Schedule (%)*

KPI = *PM/PdM Compliance (%)*

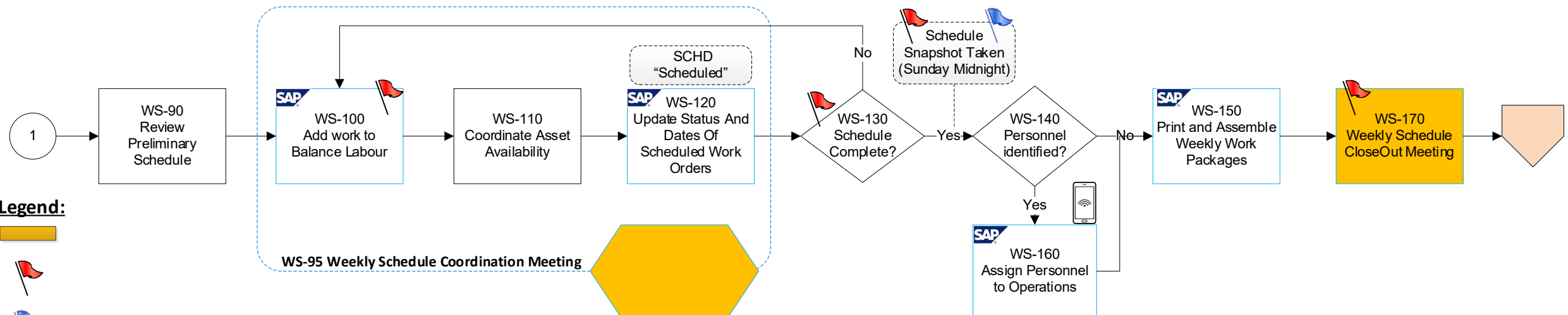
KPI = *Schedule Load (%)*

Weekly Schedule Preparation



Weekly Schedule Coordination

Weekly Schedule Finalized

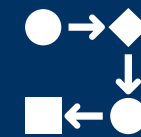


Legend:



Primary KPI Metric

Measuring Performance of Processes



Operational Performance Dashboard

Manage Physical Assets

Manage Supply Chain

Manage Health and Safety

Design Assets

Operate Assets

Maintain Assets

Decommission Assets

All Sites

Rolling 52 weeks Year to date 2022 week:35

Process Metrics COLLAPSE ALL

64.3

Program Assessment Score (%)

Non-Asset/Project Mat'ls & Services (\$) 5,661

RELIABILITY MANAGEMENT

Reliability Engineering

Uptime/Availability (%) 84.1
Proactive Work (%) 58.1

WORK MANAGEMENT

Total Maint. Backlog (weeks) 7.8

Work Identification

Notification Quality (%) 77.0
Postponed Notifications (%) 1.85
Notification Backlog (#) 1,441

Work Planning

Planning Variance Index (%) 22.5
Unplanned Backlog (%) 22.4
Planned Work (%) 91.4

Work Scheduling

Loaded Schedule Compliance (%) 63.8
Schedule Compliance (%) 75.5
Schedule Load (%) 84.6
PM/PdM Compliance (%) 62.8
Unscheduled / Reactive Work (%) 49.1

Work Execution

Core Return Compliance (%) 65.7
Execution Overdue (%) 34.5
Maintenance Overtime (%) 5.6
Percent Work Delays (%) 0.5
Work Status Returned (%) 3.0

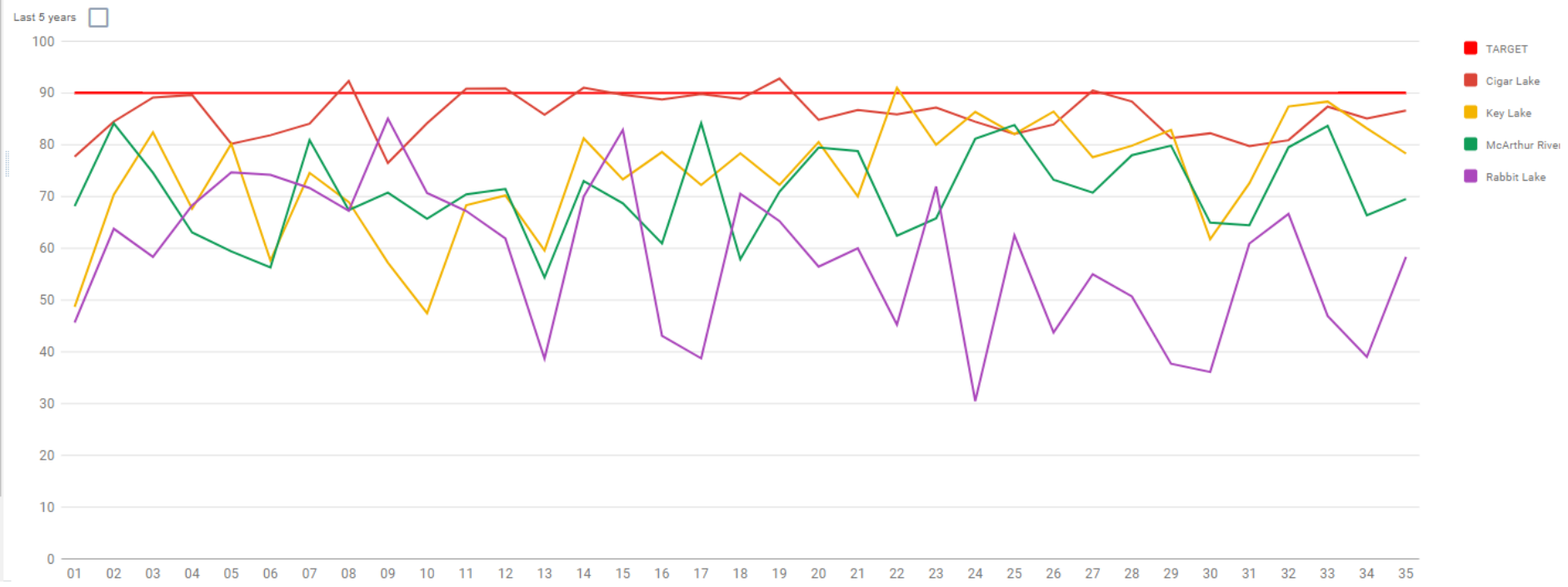
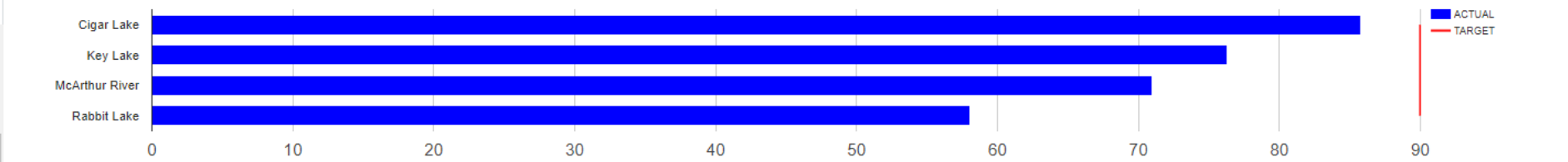
Urgent Work

Emergency/Urgent Work (%) 11.2

Schedule Compliance (%)

** Mining Div.

[DETAILED REPORT](#) [DEFINITION](#)



Measuring Performance of Processes

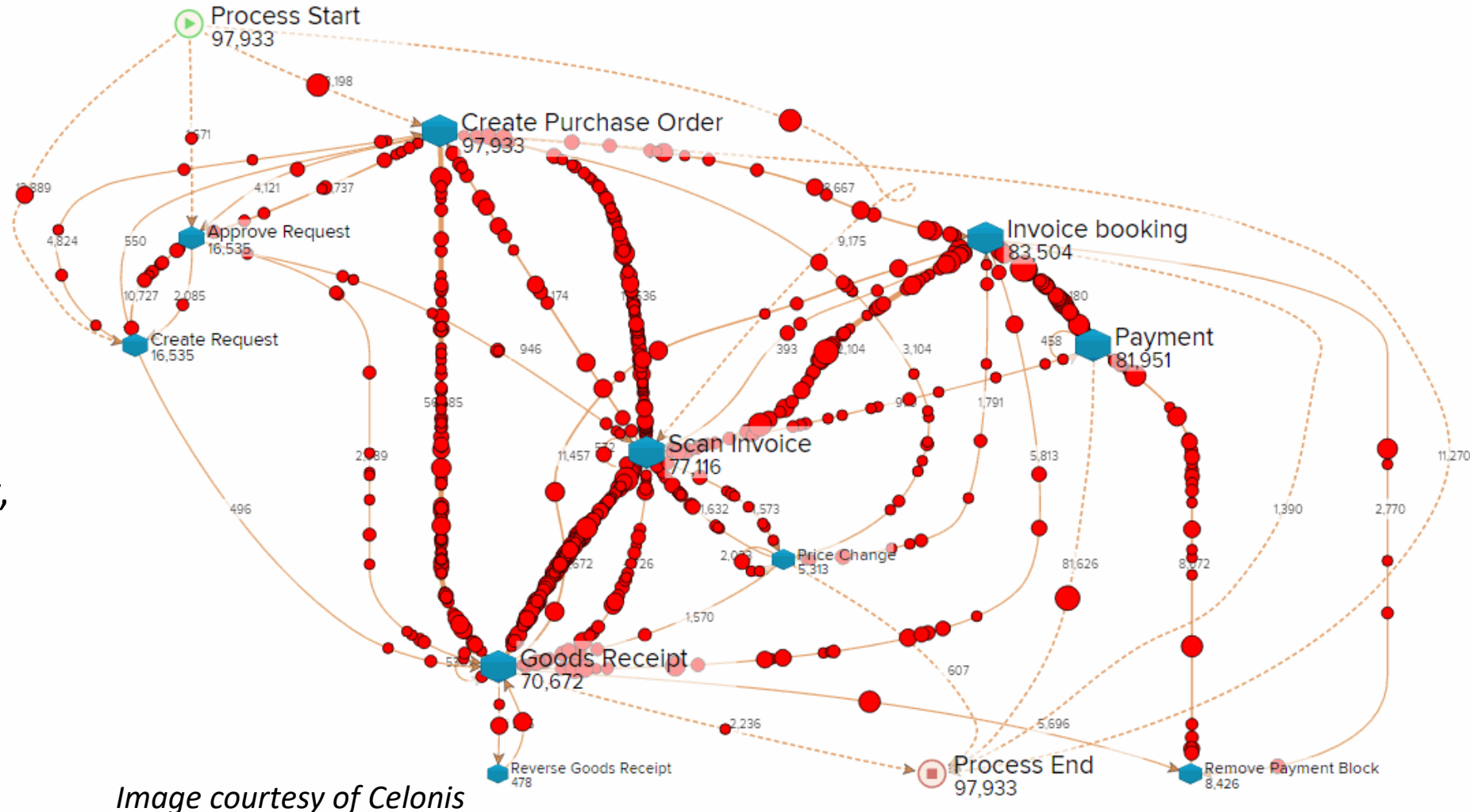
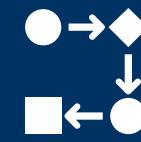
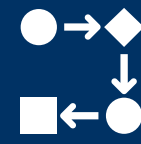


Image courtesy of Celonis

Application of *Business Process Mining* technology, made possible by business process mapping





Roadmap to reliability.

Operational Reliability provides a road map for success. Trust the processes to get you where you need to go.

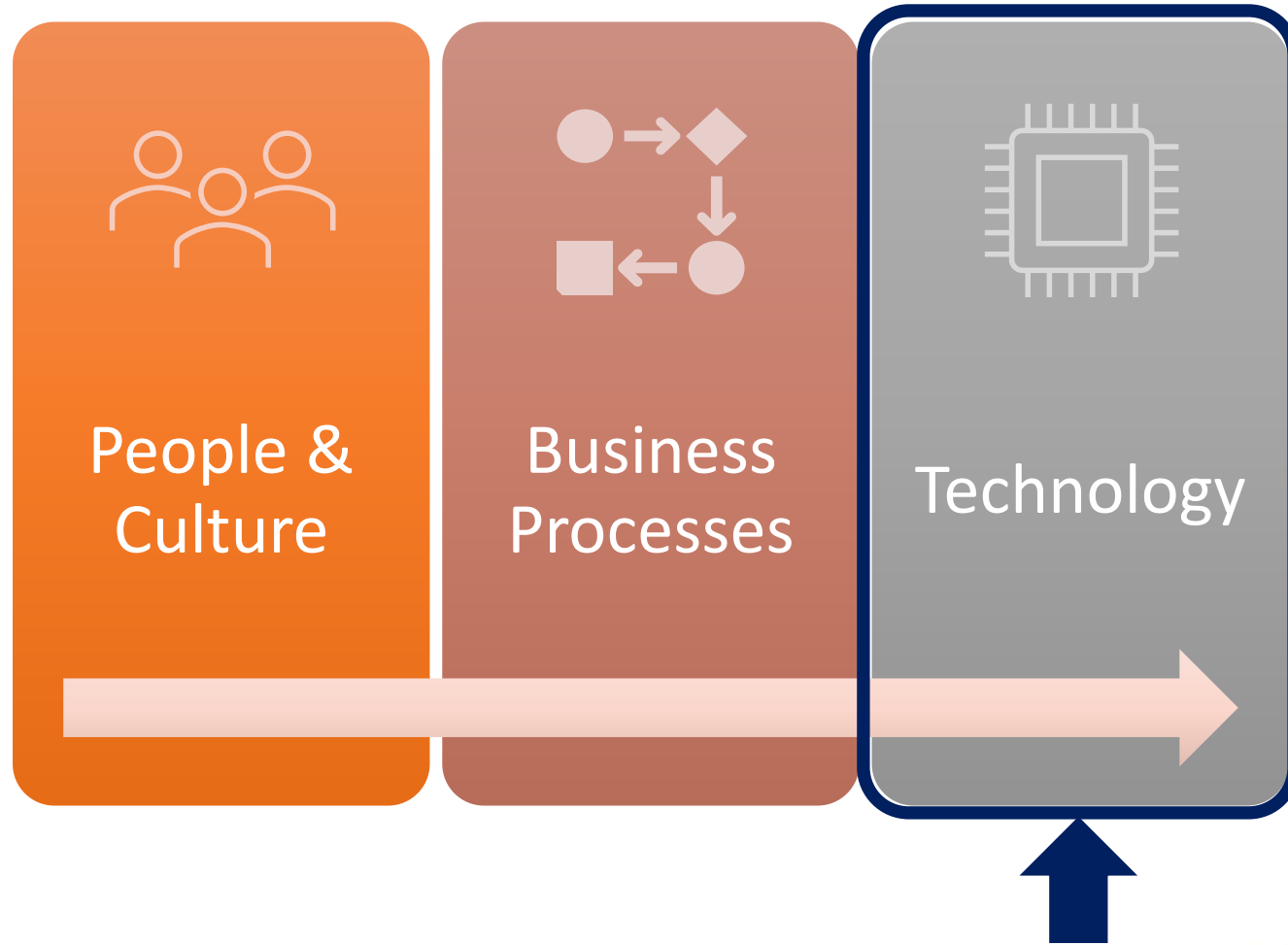


Poster from Operational Reliability Change Management communication campaign

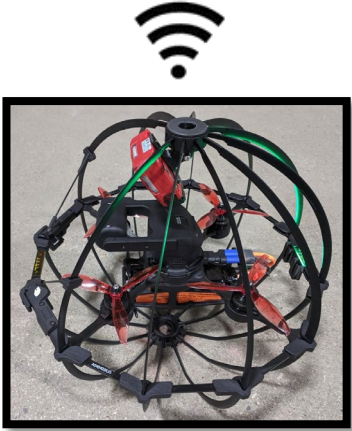
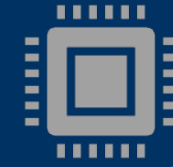
Work Smarter, Not Harder
RIGHT PEOPLE | RIGHT PLACE | RIGHT TIME | RIGHT EQUIPMENT









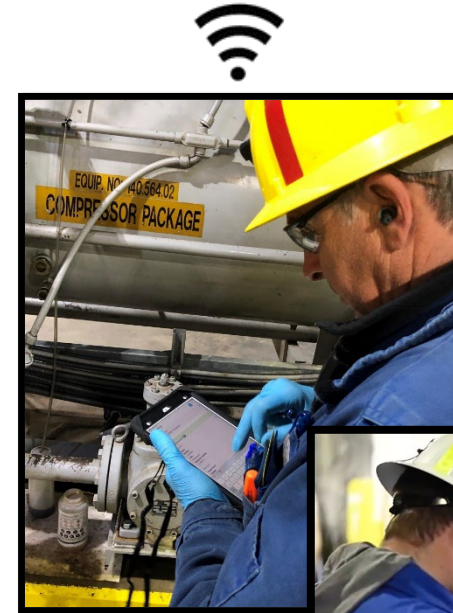
Operational Asset Management: Improvement Lenses




Technologies in play to support Asset Maintenance



-  Mobility / Connected Worker
-  Drones (UAVs)
-  IIoT Devices (wireless sensors)
-  AI / Machine Learning
-  Optical Labels (QR codes)
-  Telematics

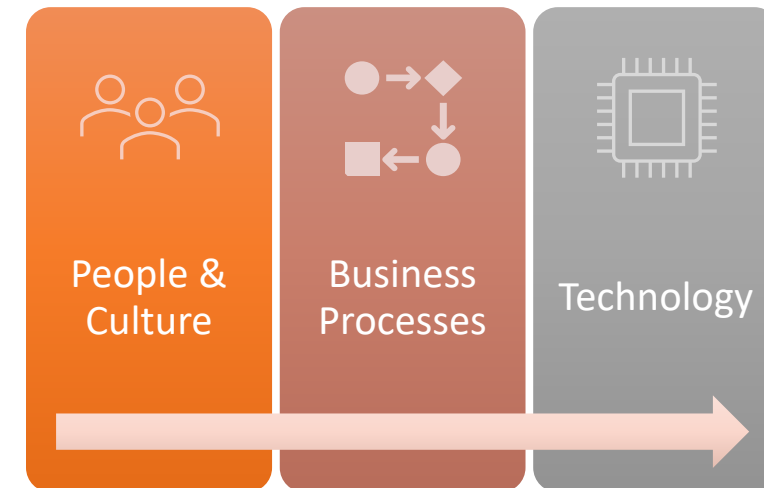


- Part of Operational Excellence business unit 
- Mission Statement:
 - Ensure physical assets at our operations reliably fulfill business needs at the lowest possible cost
- Key Responsibilities
 - Drive standardization of AM&R activities at Cameco's operations
 - Implement AM&R business processes and drive improvement
 - Deliver specialized asset reliability services
 - Reliability Engineering, Asset Health Monitoring, Asset Information Management
 - Development & maintenance of technical standards
- Key Accountabilities
 - Business process performance (process owners)
 - Maintenance strategy effectiveness
 - Asset information availability and master data quality

EXCELLENCE



- Three lens through which one must look through to improve how operational assets are management
 - ➔ People, Processes, and Technology
- Improvements *can* happen by focusing on people and processes alone...but never on technology alone
- For people, aim for more than trained and competent – develop a ‘reliability’ culture
- For business processes, apply PBM methodology
- For new technology, ensure success by
 - Having business process defined first
 - Applying organizational change management
- For multi-plant organizations, consider a Center of Excellence to drive consistency and expedite improvements





END / Q & A

Thank You

Jean-Pierre (J.P.) Pascoli, P.Eng, CMRP, MMP, CAMA, CSAM



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