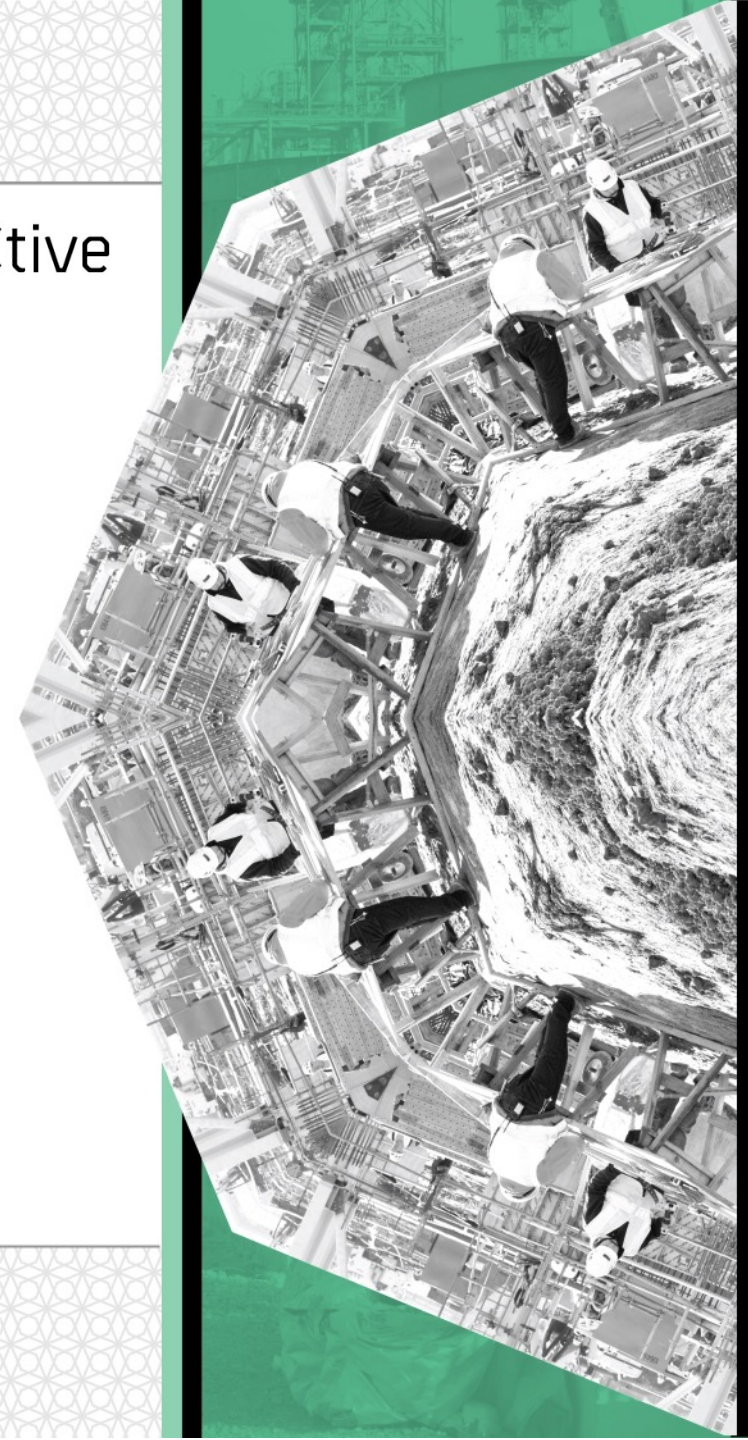


PerspECCtive

Modernizing Construction - From Construction to Production

How supply chains and project delivery are changing to leverage the
benefits of industrialization and digitization



Modernizing Construction - From Construction to Production

Facilitator



Willie LeFever

Senior Vice-President
**Performance
Contractors Inc.**

Panel



Todd Zabelle

Founder & CEO
**Strategic Project
Solutions, Inc.**



Keith Magowan

Unit Leader, Central
Subsea
BP



Jim Craig

Senior Advisor
Engineering Management
Chevron



Introduction

Willie LeFever

Modernizing Construction - From Construction to Production



Workers building cars in a factory, 1930s.



From That to This:


Other Industries Have
Perfected Modern Production.
So, When Will Construction?

Construction Users Roundtable (CURT) "The Voice 2019"

Modern Production Thinking

Examples (BP & Chevron)

Beyond Modern Production



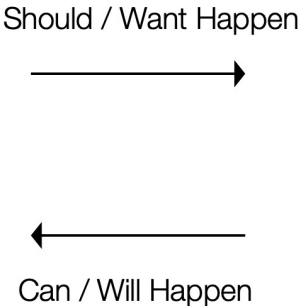
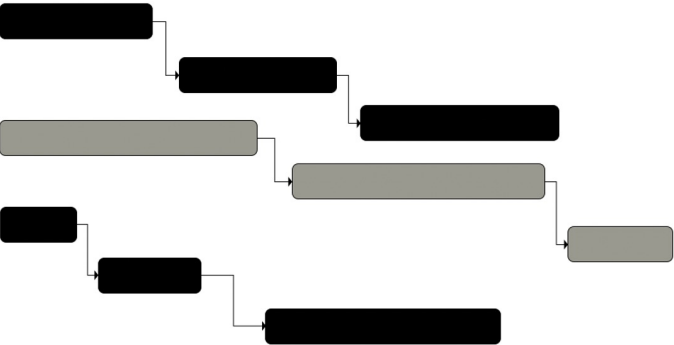
Modern Production Thinking

Todd R. Zabelle

Modernizing Construction - From Construction to Production

Modern Production?

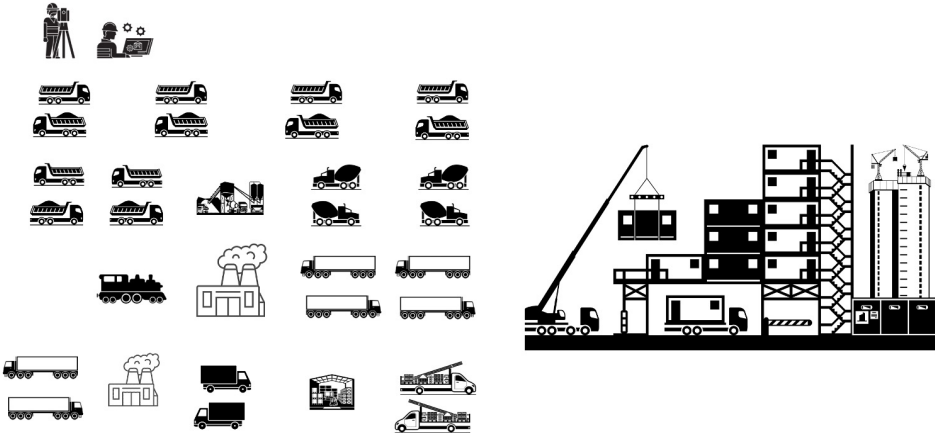
Demand (Schedule)



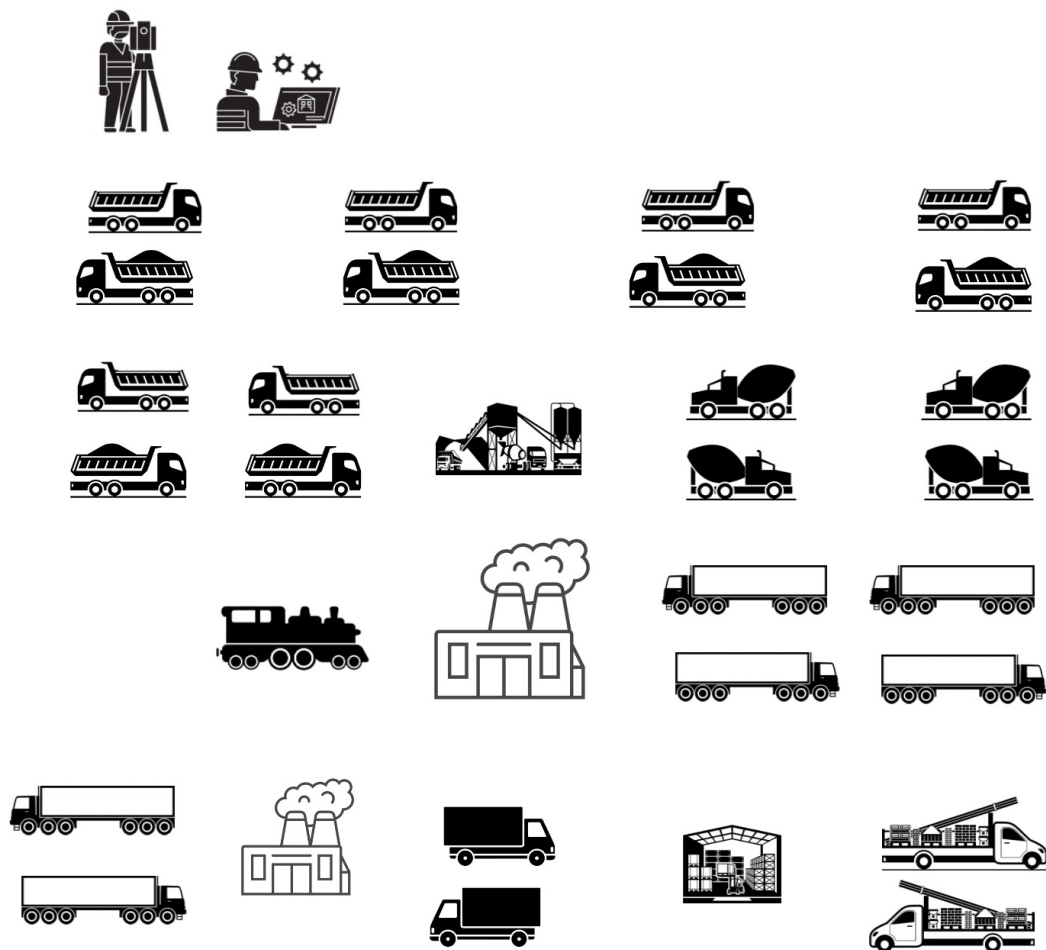
Dates

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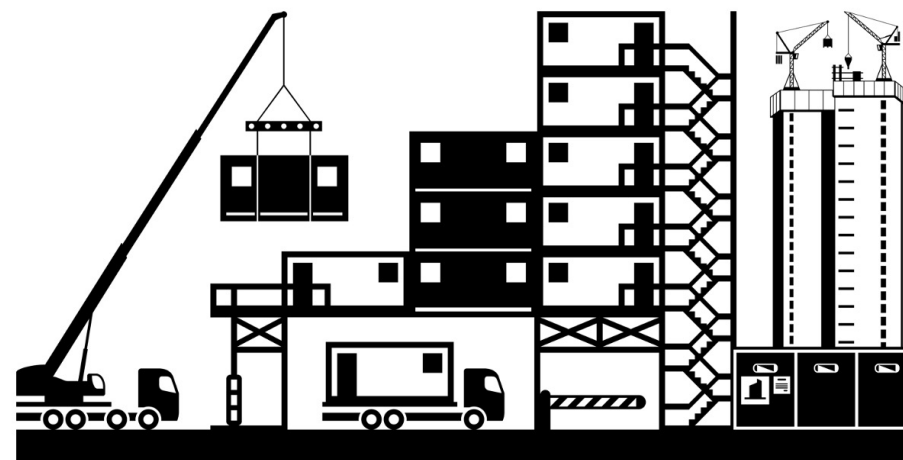
Supply (Production System)



Rates



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4 Verbs

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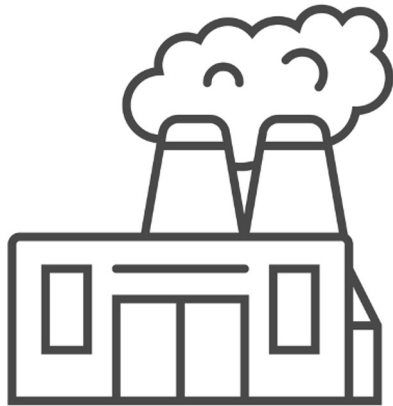
5 Levers

3 Curves

4 Verbs



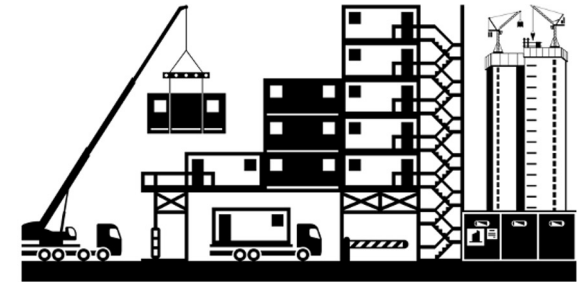
Design



Make



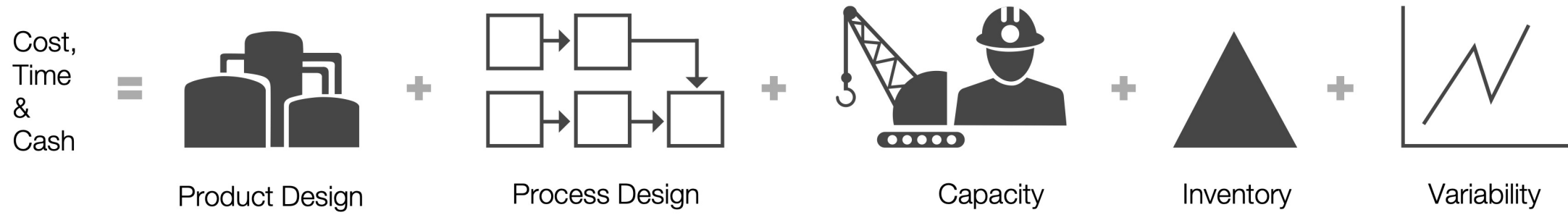
Transport



Build

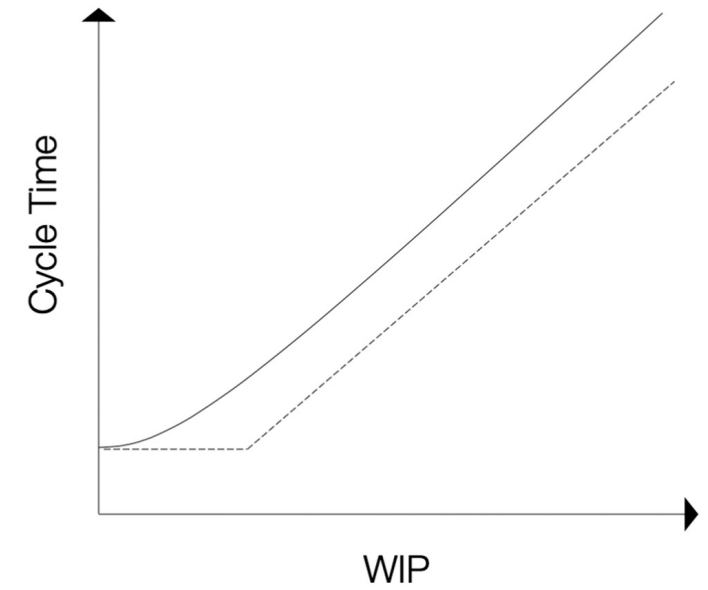
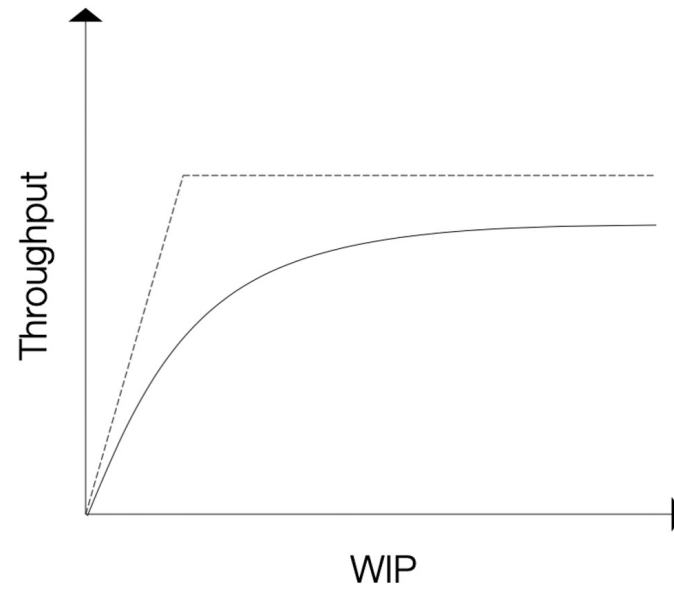
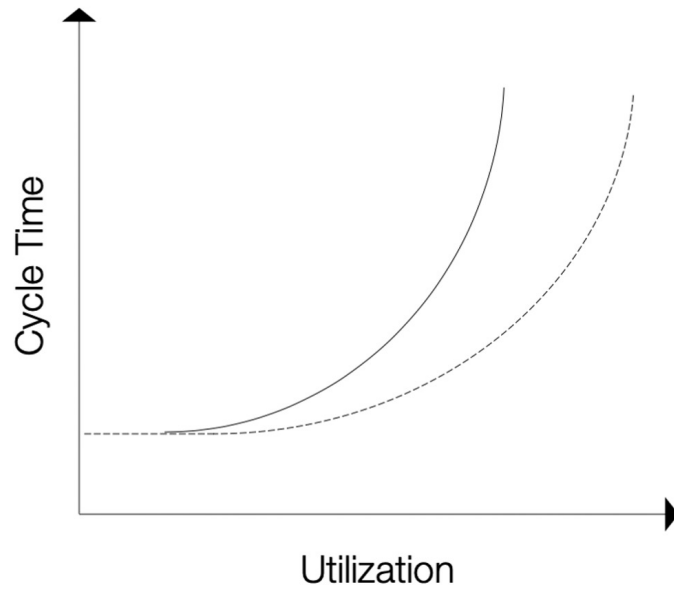
Copyright Project Production Institute

5 Levers



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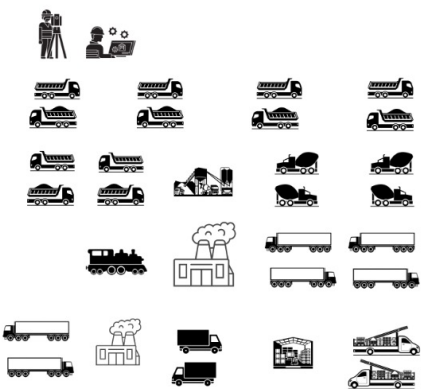
3 Curves



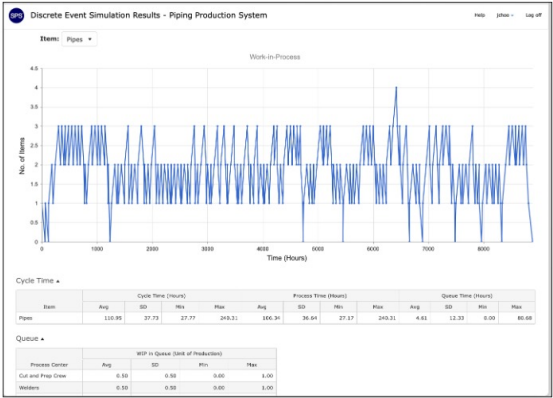
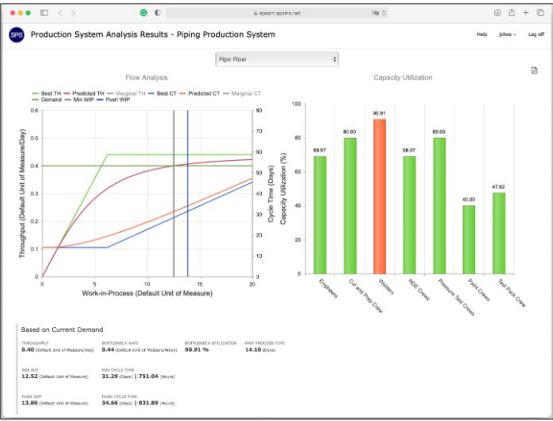
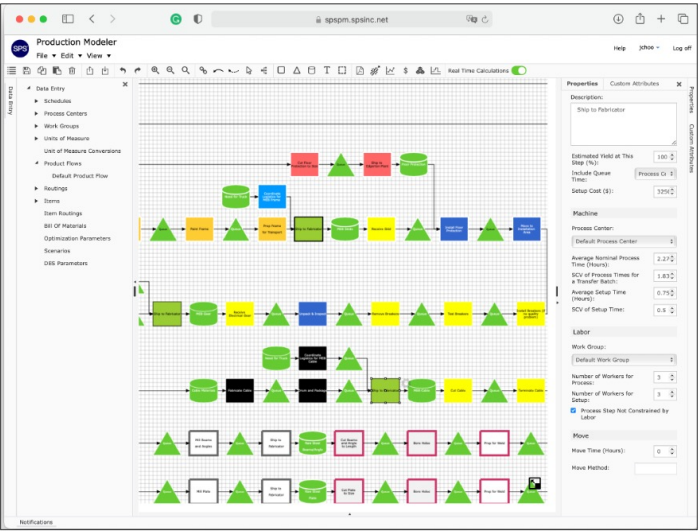
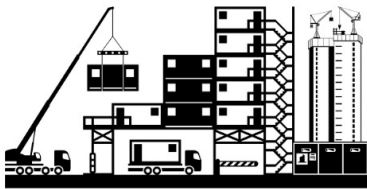
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Work-in-Process = Time!

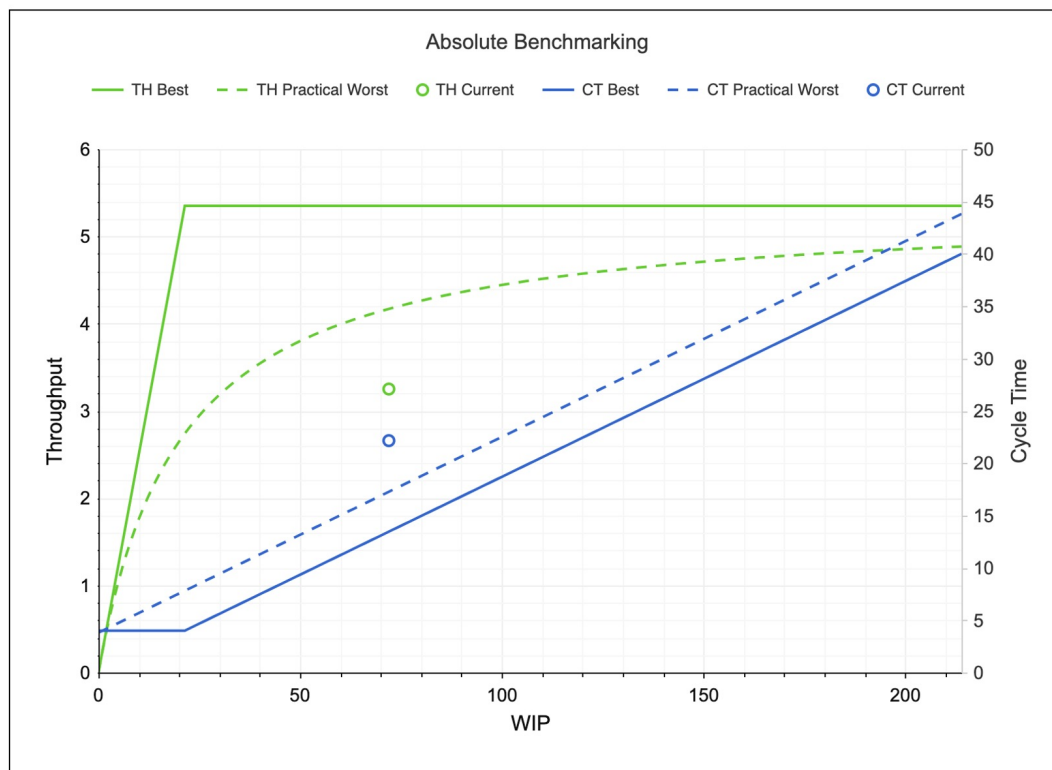
Production System Digital Twin



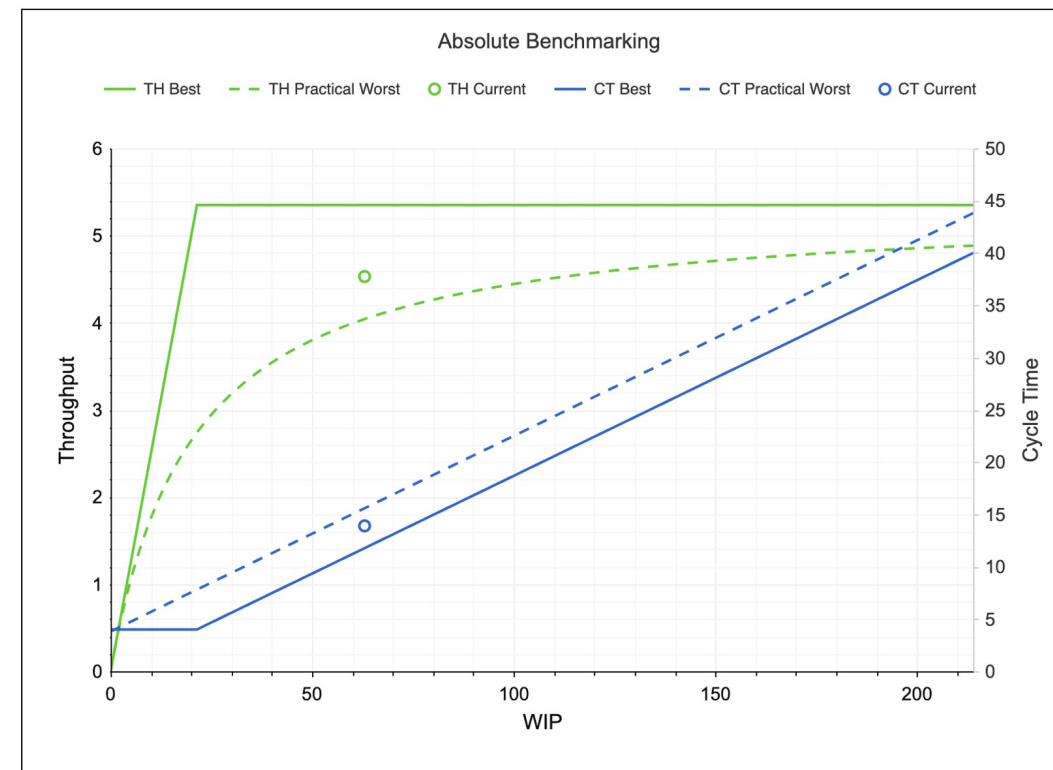
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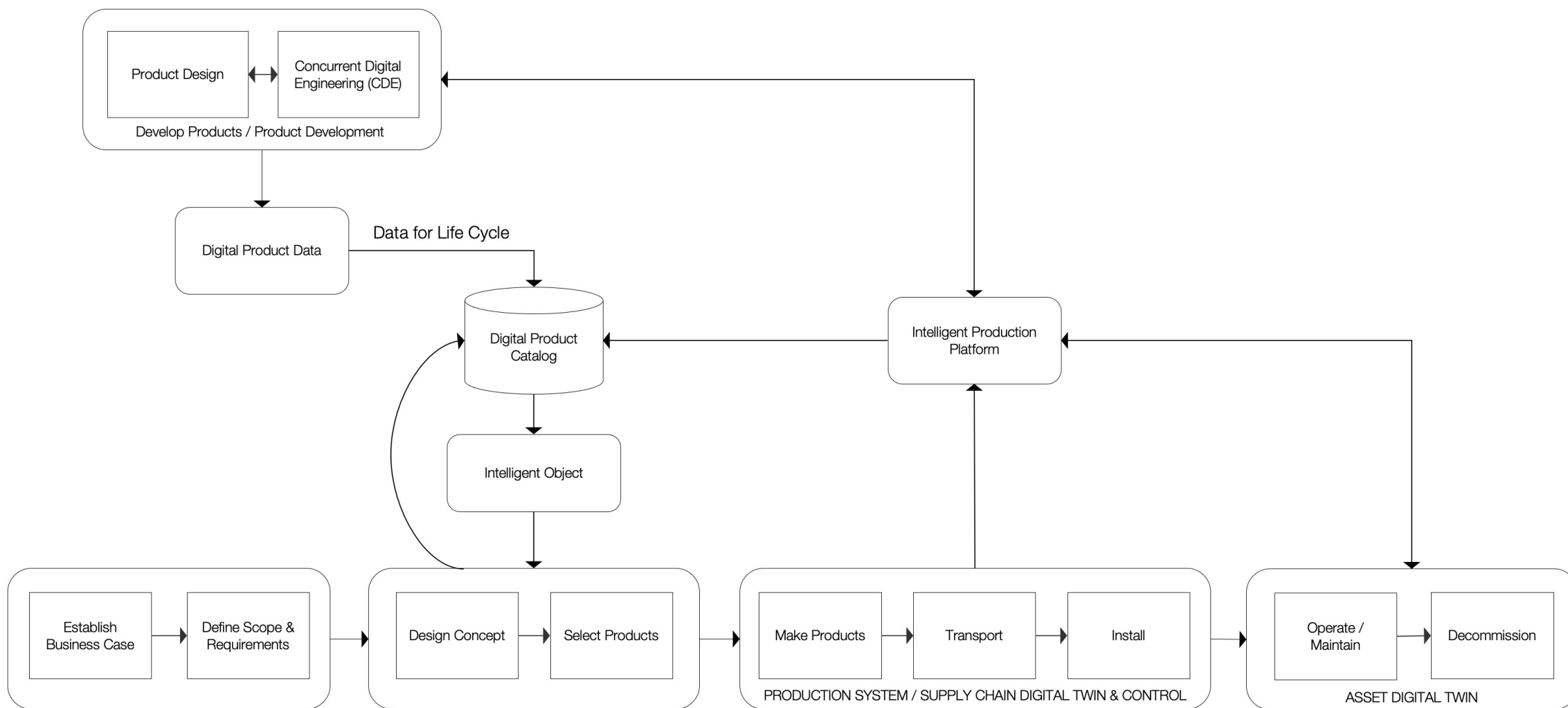


Current State



Optimal Frontier

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Productization

Keith Magowan - BP

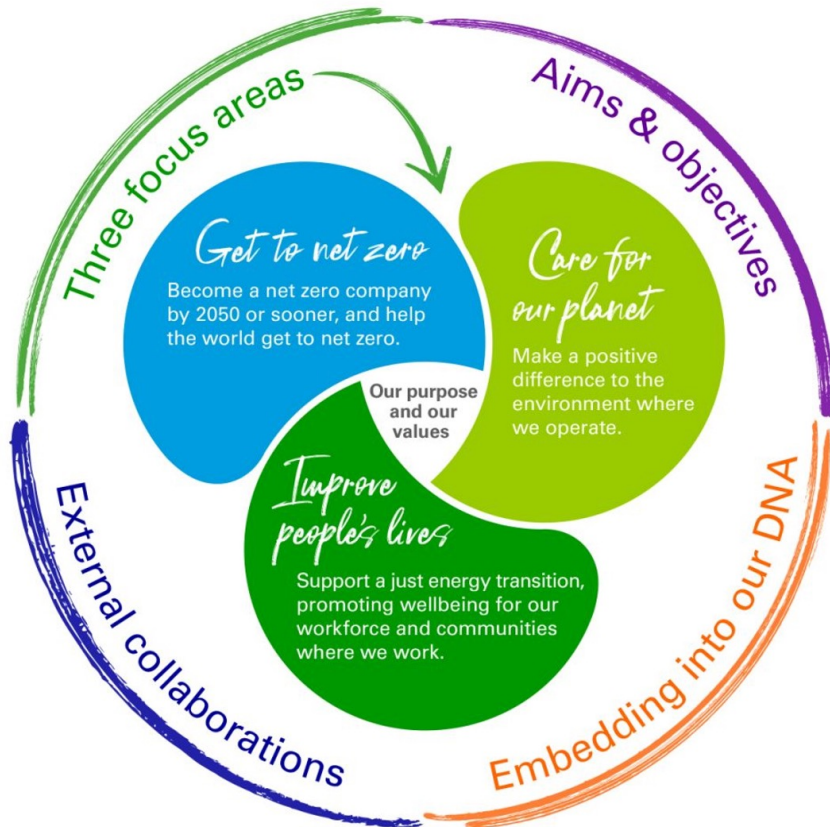
Modernizing Construction - From Construction to Production

Will Subsea be the next Blockbuster?



P&O

Energy Transition - From IOC to IEC



bp Sustainability Frame

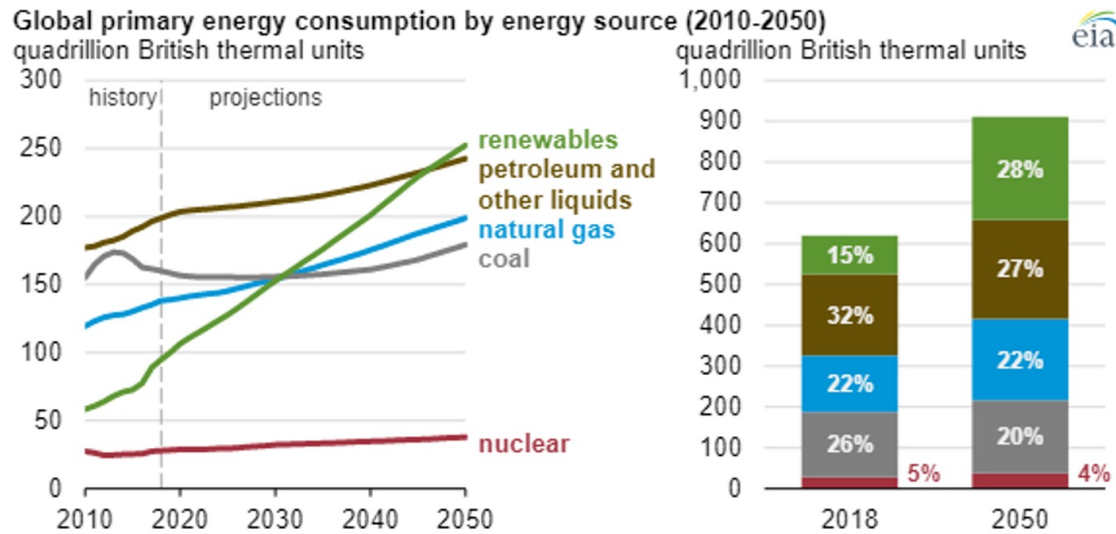
The **Energy Transition is real** and being driven by societal pressure to protect our planet

Spend x10 the capital in renewables by 2030

Reduce daily production by 40% by 2030 with Net Zero Carbon by 2050 ambition

Numerous governments making climate and emission reduction commitments

What does this mean for O&G?



What is the role of O&G in the Energy Transition?

Widely recognized that O&G will continue to be a major part of the world's energy portfolio in 2050

Oil and gas production will help bp fund the energy transition

What does this mean for Subsea Projects?

If subsea projects do not radically transform, subsea will quickly become uncompetitive and will rapidly become the Blockbuster of the oil and gas industry



Subsea Vision

20% reduction in Total Cost of Ownership

Subsea production system reliability >98%

Build contracts that align business goals

Improve Return on Investment

50% reduction in schedule for Define/Execute phase of subsea projects

Forecasting Accuracy

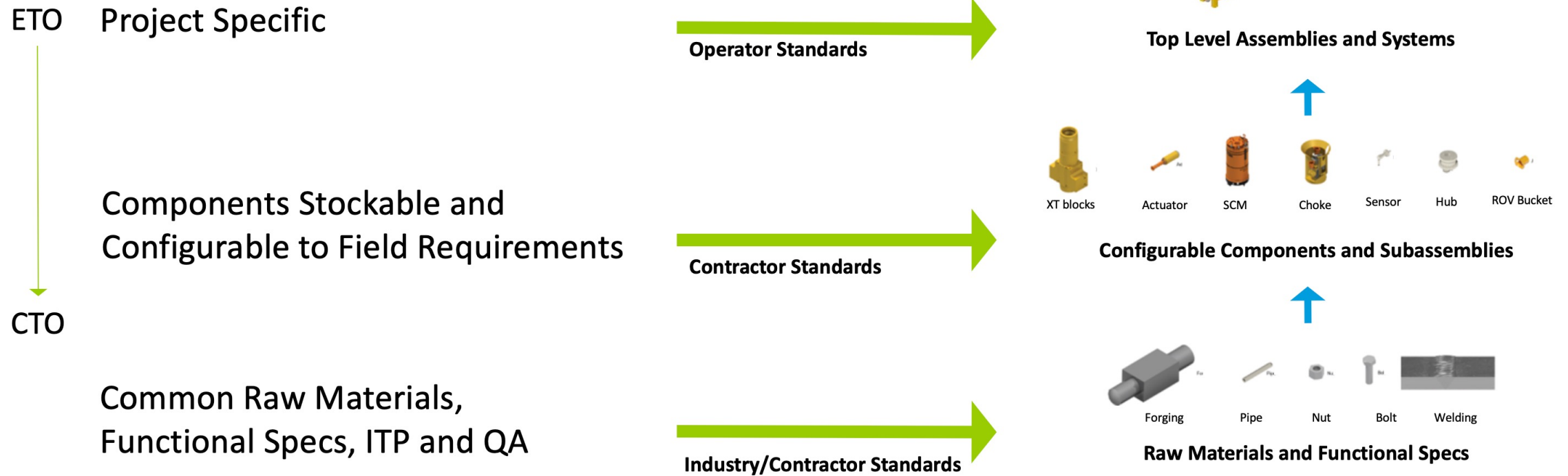
Cost accuracy within +/-2% for subsea projects minimizing time capital is employed before returns are realized

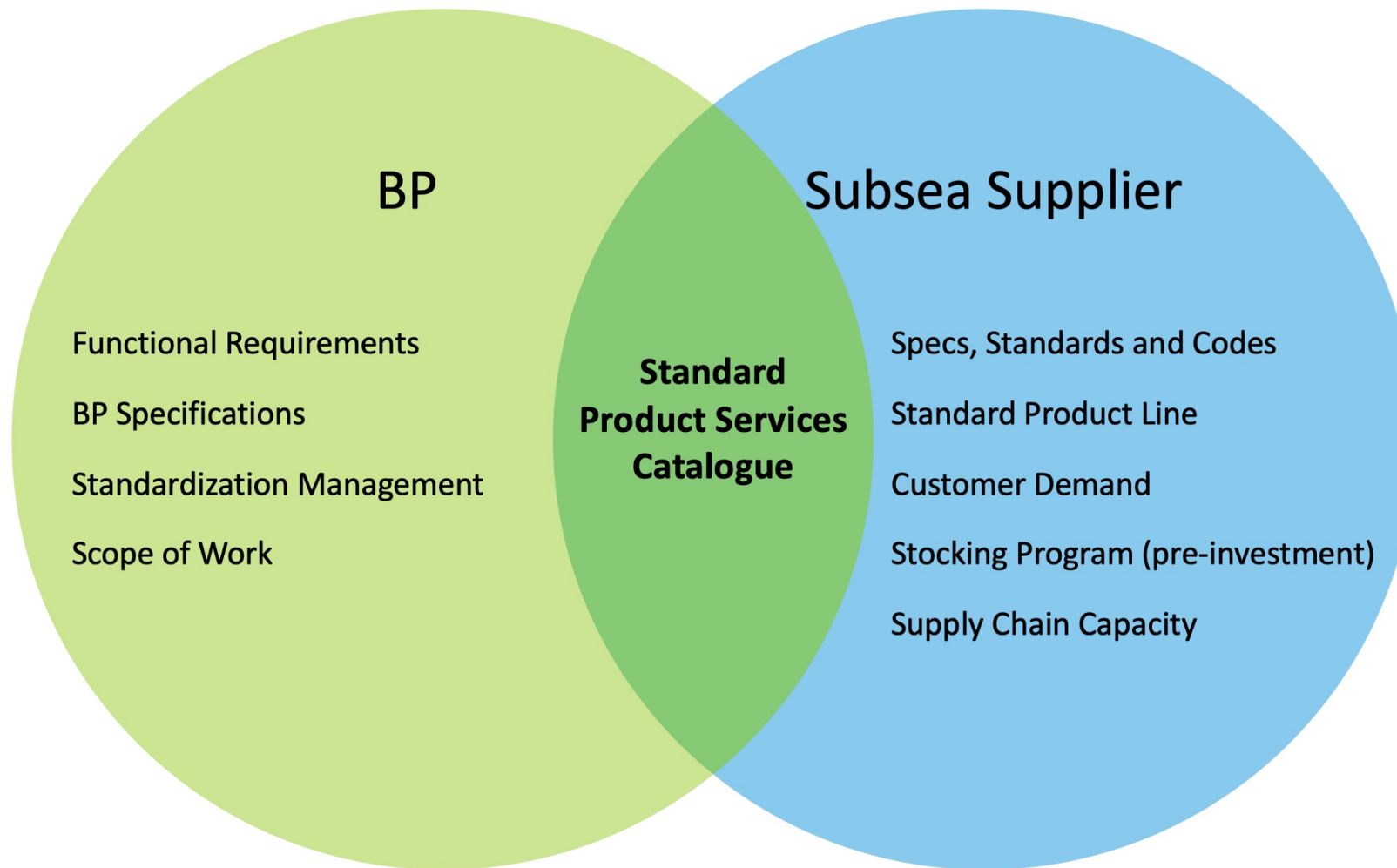


Productization

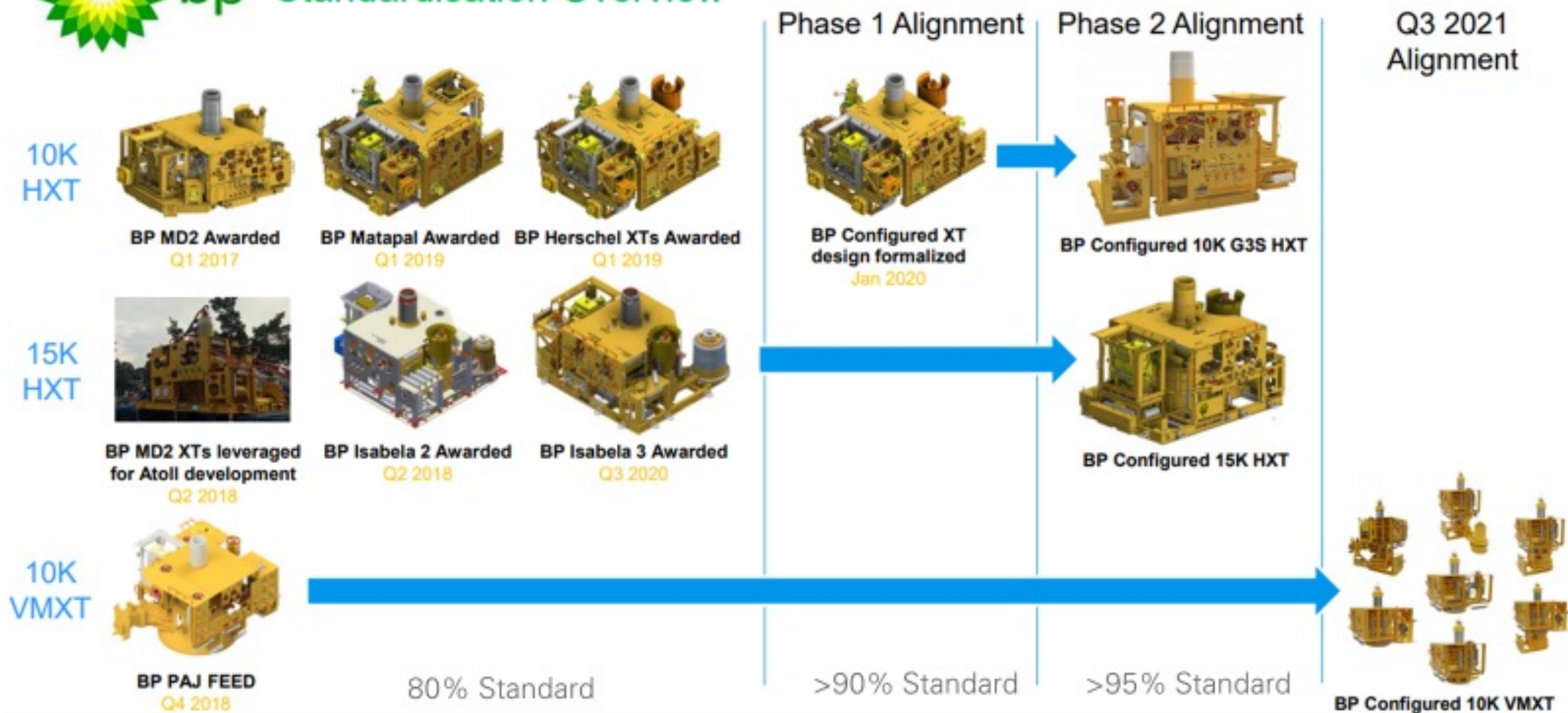
From ETO to CTO

P&O





bp Standardisation Overview



6

OneSubsea
A Schlumberger Company

Schlumberger



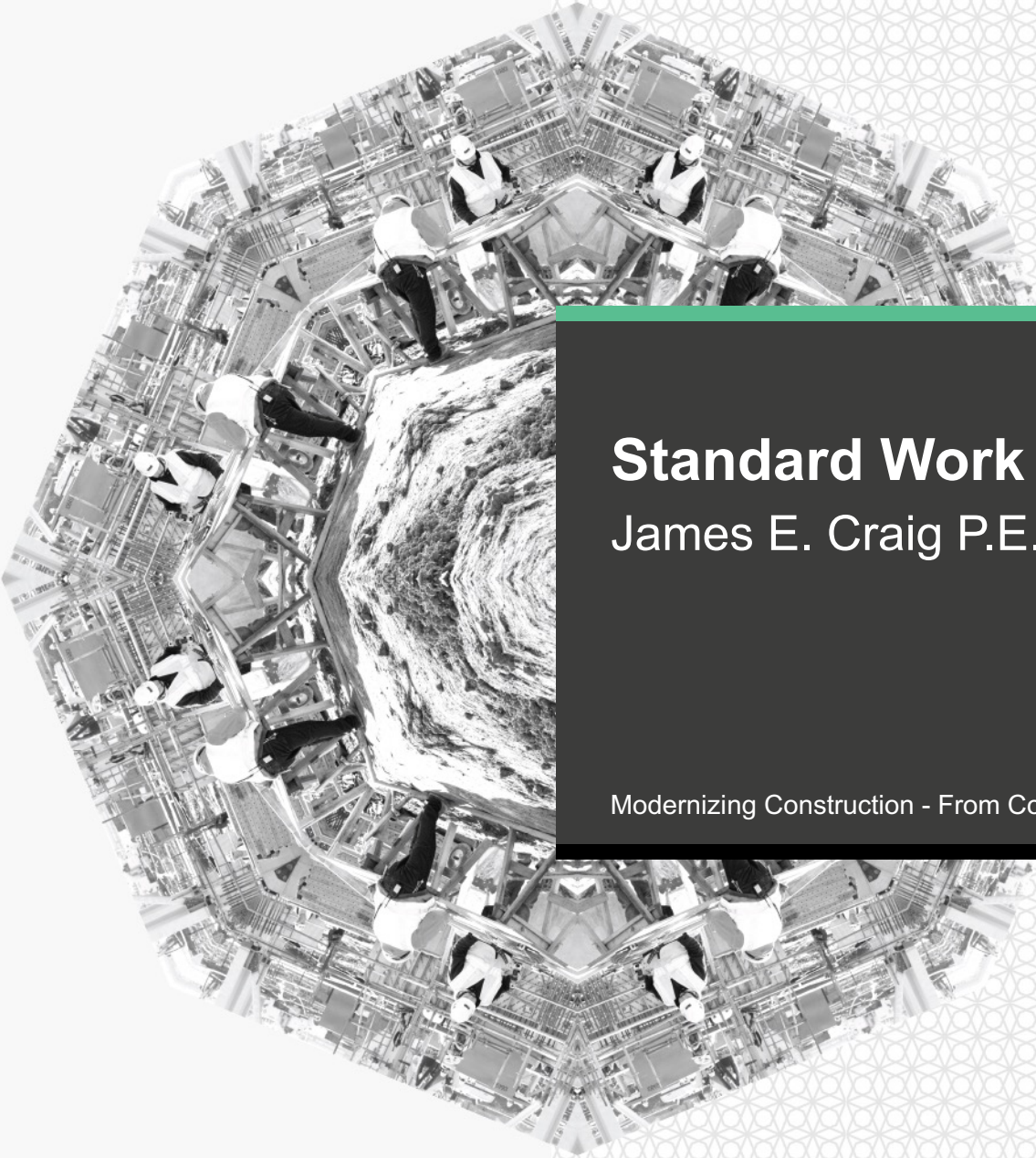
Blockers

Mindset - not how we have done it previously!

Timely technology forecasting and development

Funding

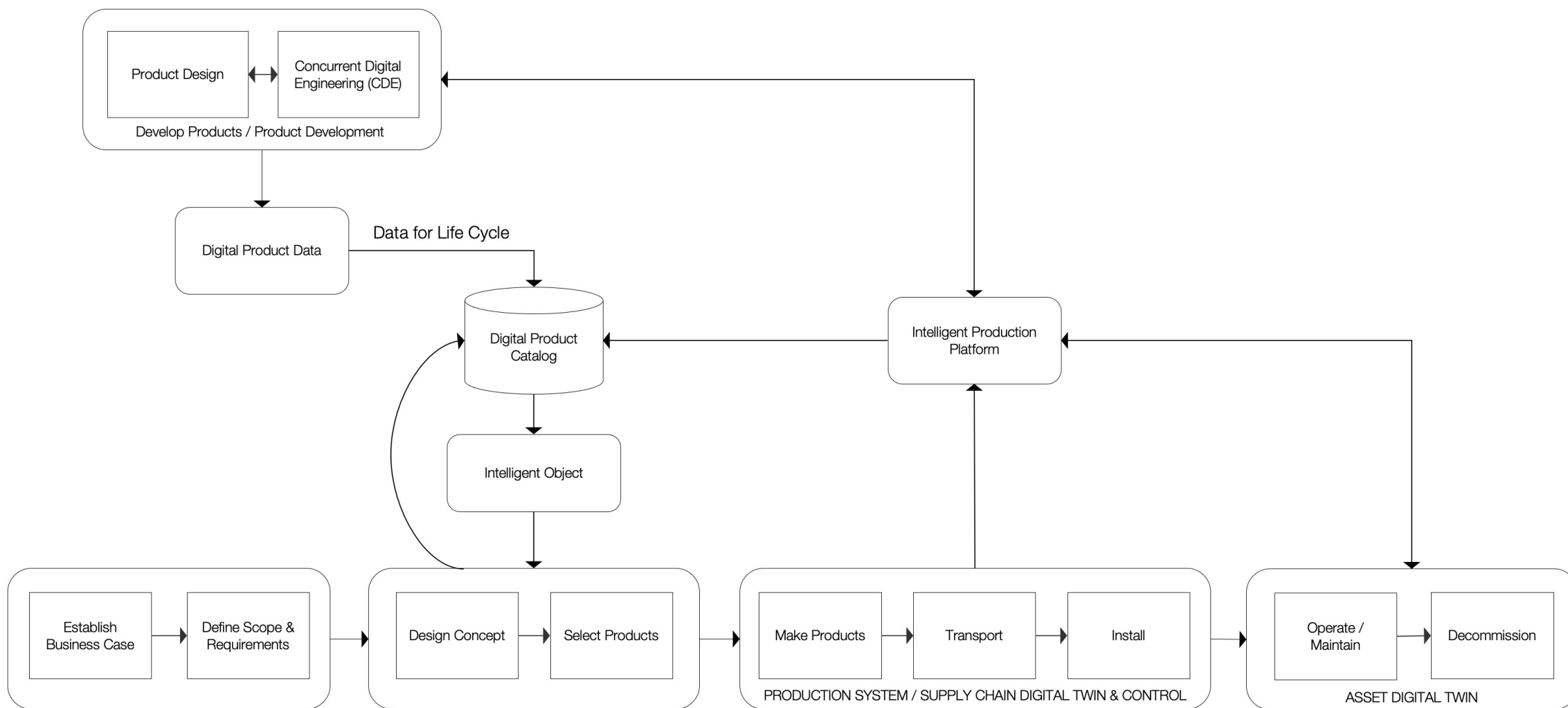
P&O



Standard Work

James E. Craig P.E.

Modernizing Construction - From Construction to Production



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Library (BoP) of >2,000 Standard Work Processes and Growing!

Edit Standard Process

Edit Existing Standard Process:

Create a New Standard Process

Selected Standard Process

ID: 1857

Name: KSU Cutover - 690V Power Cab

Put Process On Line BP History View

Details for selected Task

New Attach Point New Constraint Task

ID	Description
37677	Pull New Power and Control cable from new RP 1
37685	Identify location of feeder on switchboard at SS
37686	Lockout/Tagout Equipment @ sub-station Best C
37689	Test Power and Control cable for voltage with M
37690	Disconnect or Cut Power and Control cable from cable (per one cable) Worst Case Scenario - 60
37687	Ground Cable
37684	Identify Equipment in the field to make sure that
37683	Lockout/Tagout Equipment @ Plant HDA Station
37678	Test Power and Control cable for voltage with M
37682	Disconnect cable wires from terminal block and i
37690	Measure time from LV Switchboard Side) for Pow
37680	Dress and insulate Power cable ends at Switchc
37688	Remove ground and insulate Power cable end at
37679	Splice cable to make sure Power cable is not live
38649	Removal of cable ties and (sheats from existing p
38649	Removal of cable ties and (sheats from existing p
37691	Pull existing Power cable to splice point Duration
37690	Pull existing Control cable to splice point or JB (
37675	Perform Insulation Resistance (IR) Test on new i
37692	Splice old and new Power cable using splice kit i
37697	Terminate or Splice (optional) old and new Cont

Edit Standard Process

Off-Line: (1857) KSU Cutover - 690V Power Cable and Control Cable - Meta Level

Sort By Name

Filter...

Expand All Collapse All

- Off-Line: (1862) GS_Pt_MC_TOD
- (1863) CNST_Control_&Power_3GP_Main_Instrument_Cable
- (1864) CNST_Control_&Power_3GP_Main_Lighting_and_Power_Distribution_Cables
- (1865) CNST_Control_&Power_IV_and_Control_Cables
- (1866) CNST_Control_&Power_Control_and_Protection_cables
- (1868) CNST_Control_&Power_3GP_Main_HFT_Control_and_Protection_cables
- (1869) CNST_Control_&Power_3GP_Main_Termination_IV_and_Control_cables
- (1871) Pipe Spool Installation
- (1872) CNST_Control_&Power_3GP_Main_10kV_Cable_Termination
- (1873) CNST_Control_&Power_3GP_Main_GTG_110kV_Cable_Termination
- (1874) CNST_Control_&Power_3GP_Main_GTG_Cable_Termination_Link_Box
- (1875) CNST_Control_&Power_Utility_Installation_Grounding_Cable_Termination_Link_Box
- (1878) CNST_Control_&Power_Utility_Cable_Termination_Transformer
- (1879) CNST_Control_&Power_3GP_Utility_Installation_Auxiliary_Cables_between_Transformers
- (1880) CNST_Control_&Power_3GP_Utility_Installation_Bus_Duct
- Off-Line: (1881) Bio-treatment Monitoring - Weekly 2nd Round
- Off-Line: (1882) Bio-treatment Monitoring - Monthly with no itay
- Off-Line: (1883) Bio-treatment Monitoring (Weekly Round 1 and 2)
- (1887) CNST_Control_&Power_3GP_Utility_Installation_Cable_Rack
- (1888) CNST_Control_&Power_3GP_Utility_General_Painting
- Off-Line: (1898) Copy of MCBU Bio-Remediation Sampling Phase
- Off-Line: (1911) CNST-3GP MCBU: Cable installation (Meta LVL)
- (1918) Bioretment monitoring V2
- (1919) Preassemble and Install Ext. Tertiary Steel
- (1920) Install Extract Grilles and Diffusers
- (1922) Install HVAC Duct Spools Test Points
- (1923) Paint Floor Under Equipment
- Off-Line: (1924) Install Piping Penetration Frame
- (1926) Install Gas Extinguishing Piping System
- (1927) Paint of Gas Extinguishing Piping System Weld Joints
- (1938) 52-CR-9801 Install Cable trays (modified by YKAO 06/02/21)

Created At: 10/6/2020 2:11:39 PM

System

cess, it must be off-line.

Export to Excel Edit Using Network Manager

Test	Permit	Task	PO	Joint	Identified	Prod	Succ	Docs
No	No	Type	ID					
							37685	No
							37677 37686	No
							37685 37689	No
							37686 37681	No
							37689 37687	No
							37681 37684	No
							37687 37683	No
							37684 37678	No
							37683 37682	No
							37678 37690	No
							37682 37680	No
							37690 37688	No
							37690 38649	No
							38643	
							37688 38649	No
							38643	
							37679 37691	No
							37679 37696	No
							38643 37675	No
							38640 37675	No
							37691 37692	No
							37696 37697	No
							37675 37686	No
							37675 37666	No

[illegible]

Show: LRM Forecast LRM Logic Forecast Logic

1 2 3 4

37677 Pull New Power and Control cable from new RP to Splicing Point

37685 Identify position of feeder on switchboard at substation Best Case Scenario - 15 min Worst Case Scenario - 30 min

37686 Lockout/Tagout Equipment @ sub-station Best Case Scenario - 15 min Worst Case Scenario - 30 min

37689 Test Power and Control Cable with Multimeter

37691 Disconnect or Cut Power and Control cable from Switchboard (MCCB) Dress Best Case Scenario - 10 min for small cable (per one cable) Worst Case Scenario - 30 min

37687 Ground Cable

37684 Identify Equipment in the field to make sure that Power cable is de-energized at Load

37683 Lockout/Tagout Equipment @ Plant/HOA Station Best Case Scenario - 15 min Worst Case Scenario - 30 min

37678 Test Power and Control cable for voltage with Multimeter

37682 Disconnect cable wires from terminal block and insulate cable ends. Reinstall cover Best Case Scenario - 15 min Worst Case Scenario - 60 min

37690 Megger test (From LV Switchboard Side) for Power cable integrity IR and PI

37680 Dress and Insulate Power cable ends at Switchboard side Best Case Scenario - 5 min Worst Case Scenario - 30 min

37689 Remove ground and insulate Power cable end at Substation

37679 Strip cable to make sure your Power cable is not live (de-energized) WORST CASE

38643 Removal of cable ties and cleats from existing control power cable from old RP to tie-in point Base Case Scenario - 2 H Worst case - 2.5 H

38640 Removal of cable ties and cleats from existing control power cable from old RP to tie-in point Base Case Scenario - 1.5 H Worst Case Scenario - 1.5 H

37691 Pull Existing Power cable to splice point Duration depends on cable size and length

37686 Pull Existing Control cable to splice point or DB (Optional)

37675 Perform Insulation Resistance (OI) test on New Power and Control cables

37693 Seal Old and New Power cable using splice kit instructions

37687 Terminate or Splice (optional) old and new Control cable

37666 Visually inspect and Megger Test Power and Control Cable

37664 Assemble and Crimp Lug at switchgear

37661 Connect Cable to Switchboard

37693 Perform Continuity Test by Multi meter or Megger Test

37695 Check and verify protection settings at new RP

37694 Complete Motor Test on Motor (check rotor rotation (for motor only))

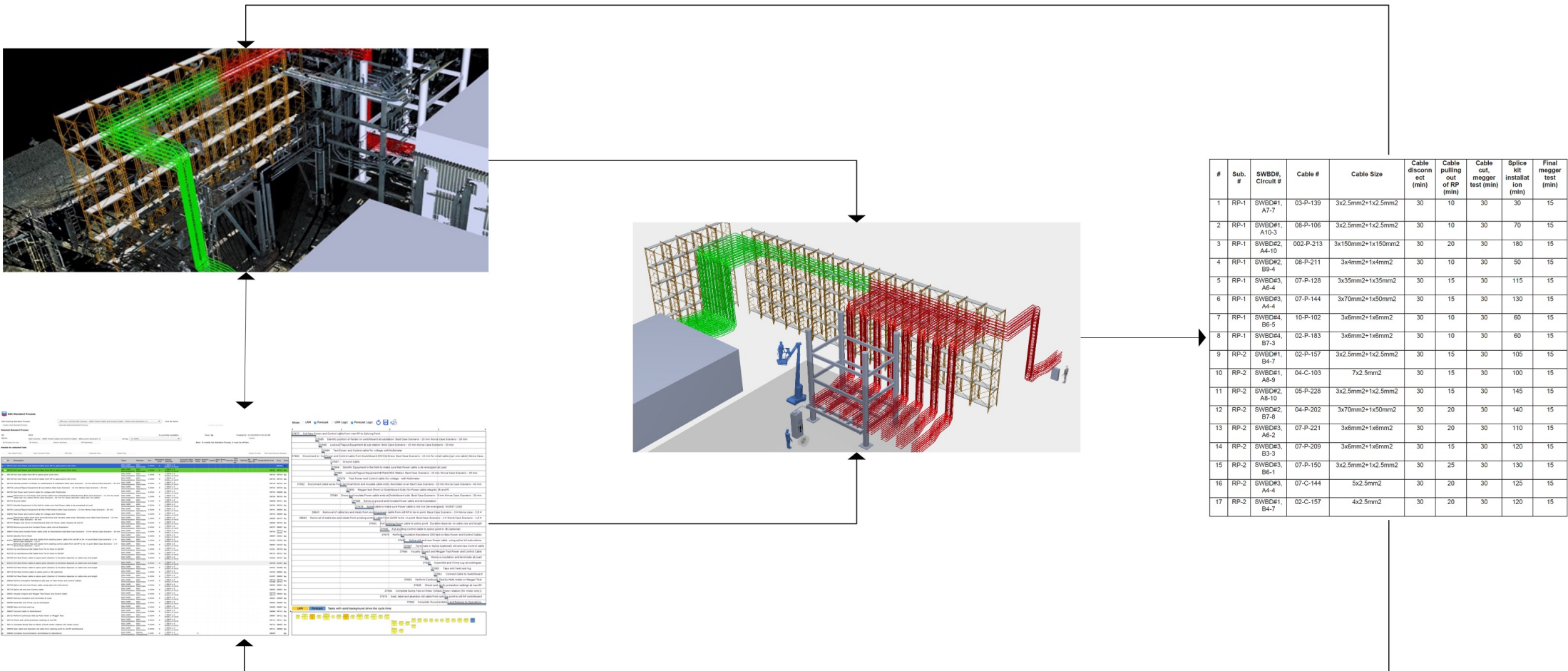
37676 Seal, label and abandon old cable from splice point to old RP switchboard

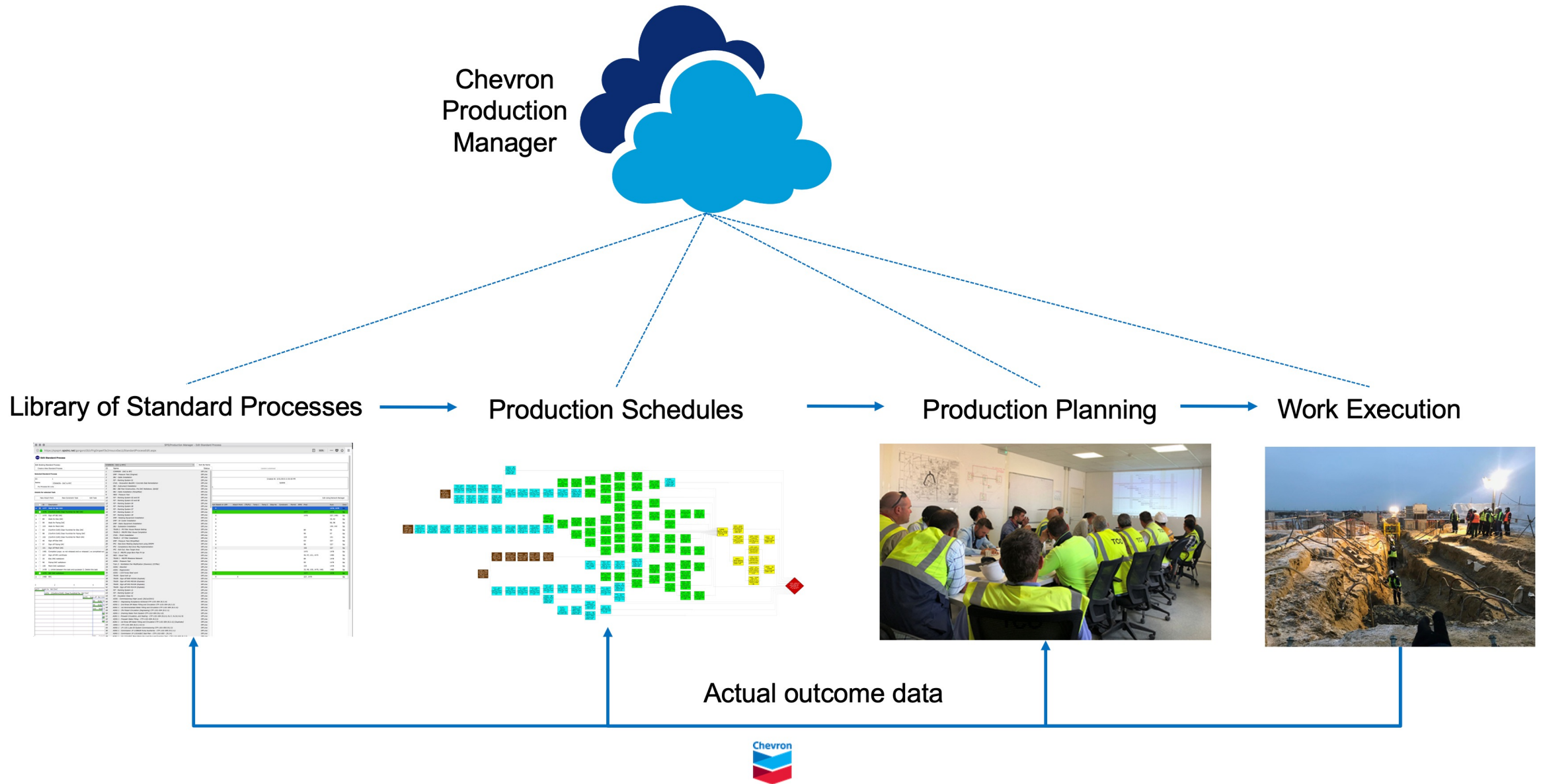
37660 Complete Documentation and Release to Operations

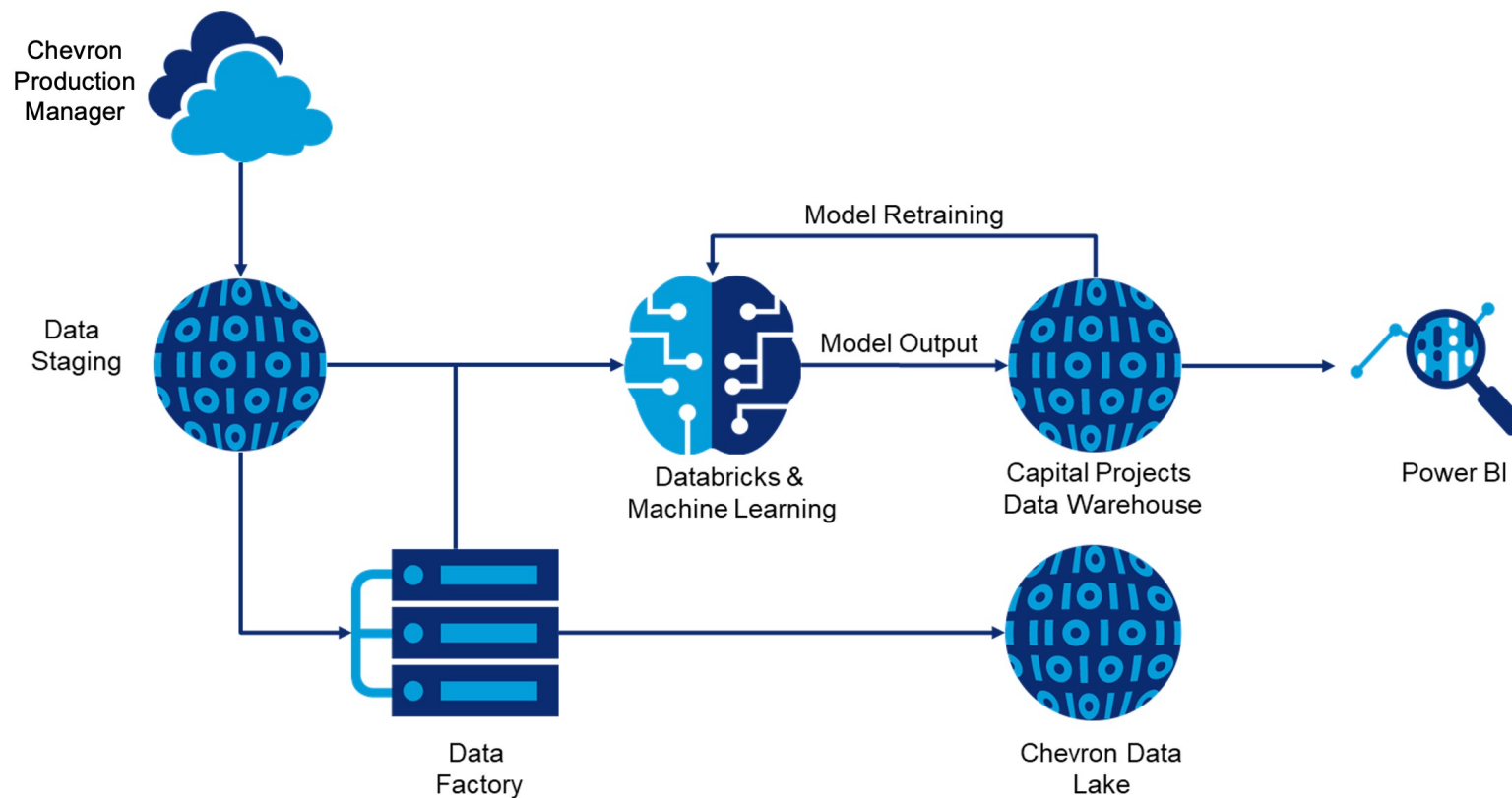
LRM Forecast Tasks with solid background drive the cycle time



Simultaneous Design of Product & Process







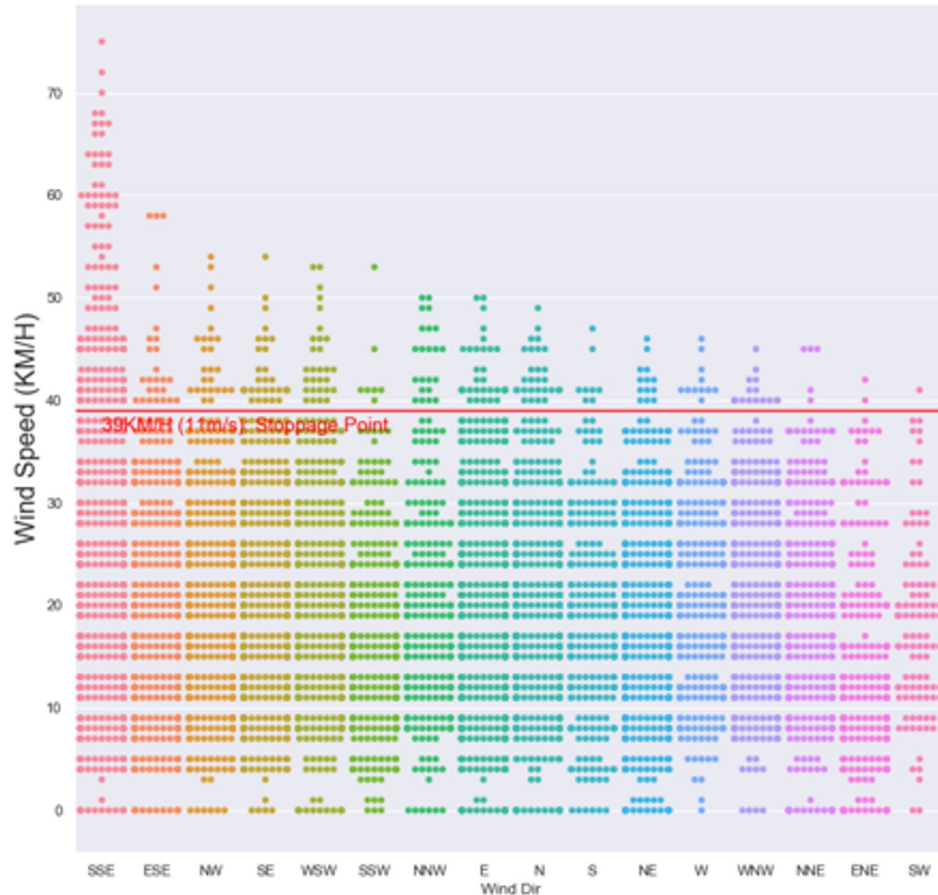
We own the data

Execution performance data is now digitally curated and ingested into the Chevron data lake four times daily

Data Lake keeps growing

- 350,000 tasks - 10,000,000 hours - 32,000 reasons tasks were not completed





Current Artificial Intelligence application

Weather Impact: Identifies the potential impact of wind to planned construction tasks in next 24hrs based on historical and forecast data

Task Completion Forecast: Predict early/ on-time/ late using an extreme gradient boosting algorithm

Dewatering Truck Optimization: Allocates capacity, identifies optimal timing, routing and sequence over multiple geographic locations





Planned Artificial Intelligence application

Automated Analytics Correlation: Identify relationships between analytics that we are not yet aware exist

Benchmarking, estimating and scheduling norms utilizing machine learning

And what's in the basement – What we can't talk about!

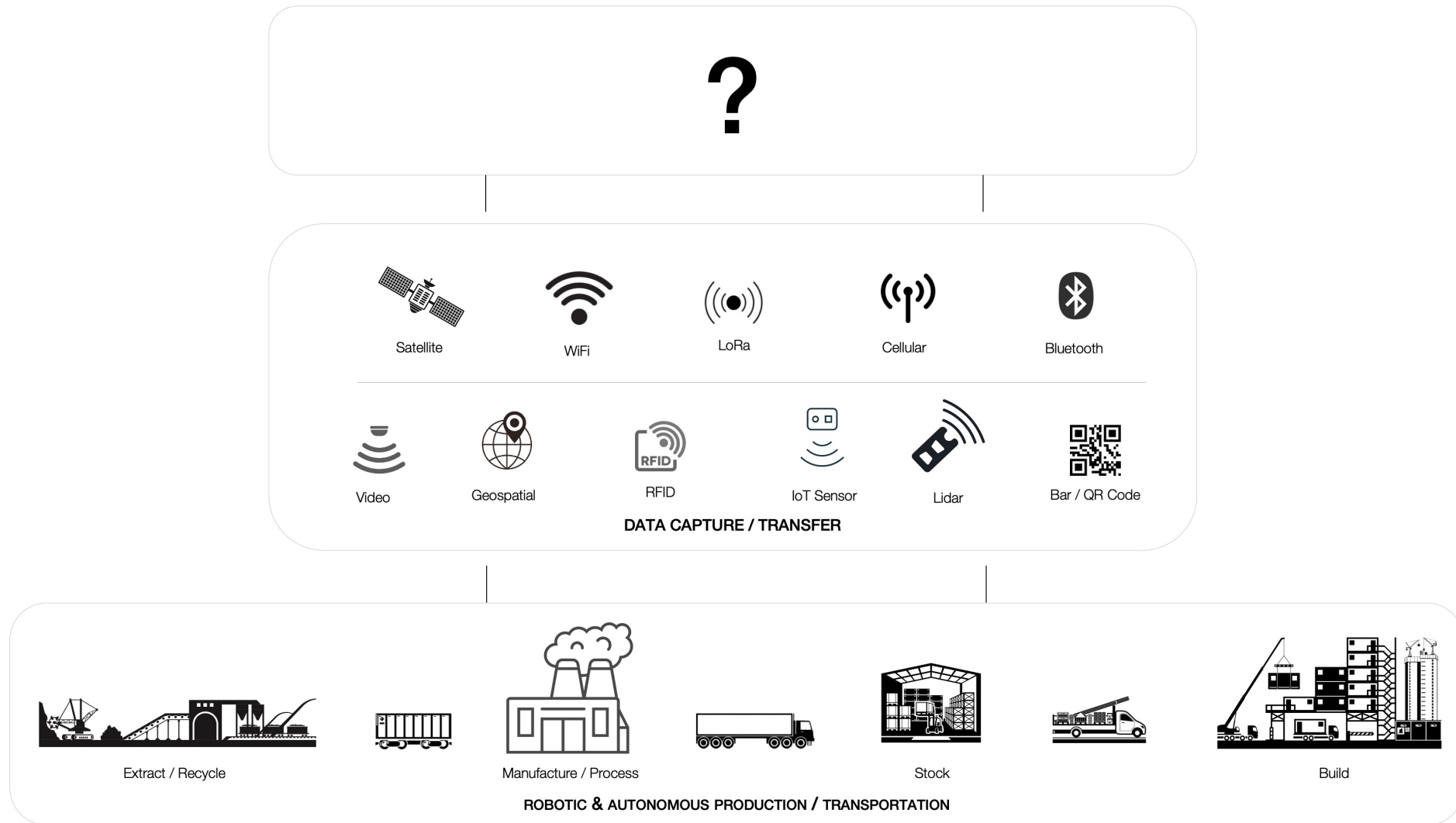





Beyond Modern Production

Todd R. Zabelle

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Panel Discussion

Willie LeFever

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