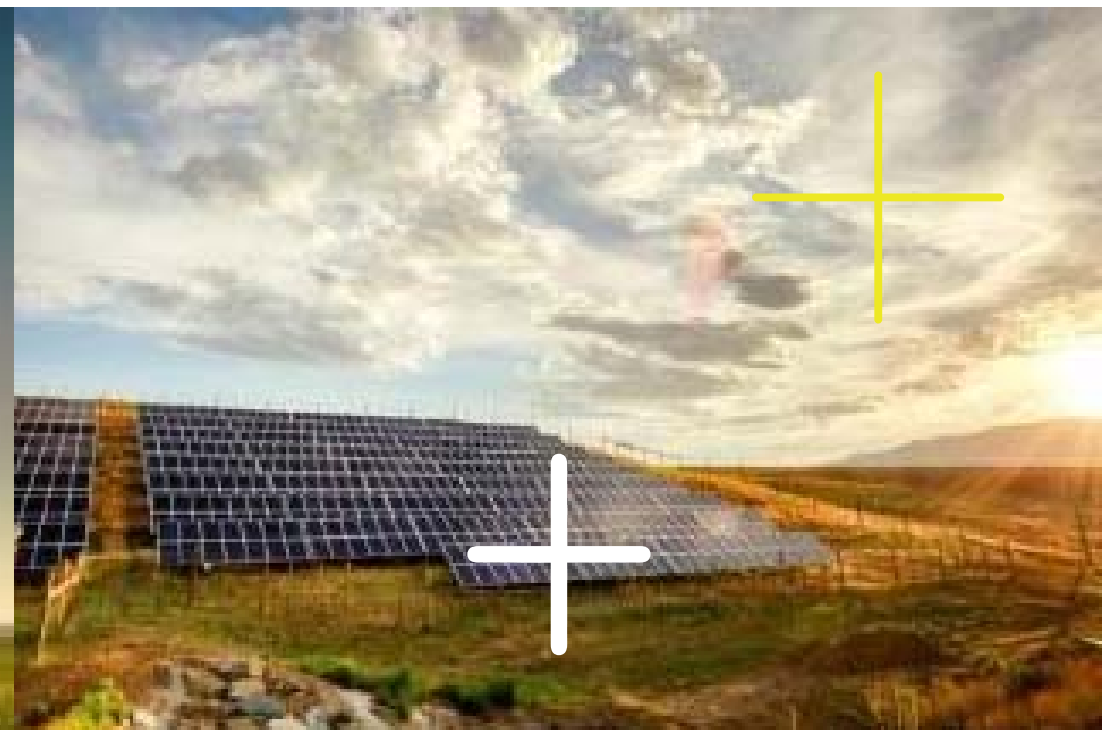




# Hydro-Power Digitalization



Aug 27, 2018

**HATCH**

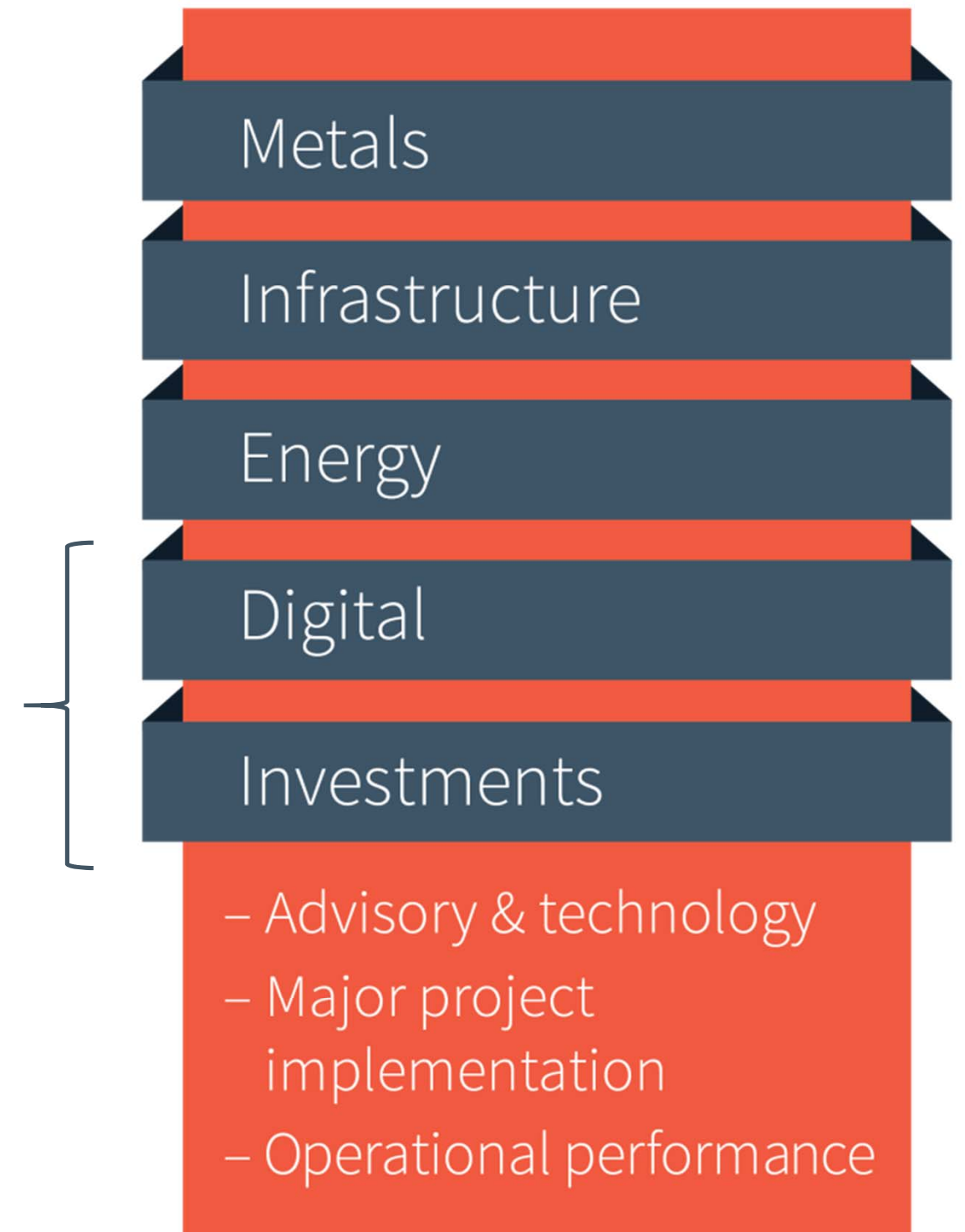
# Agenda

- Introduction
- Safety Share
- Digitalization Trends
- Hatch's Methodology



# Who is Hatch

- Employee-owned; partners who think like owners
- We are well known for our engineering, and have deep roots in technology development and innovation.
- Projects in more than 150 countries
- >9,000 professionals worldwide
- >US\$35 billion of projects under management



# Global Operations





Hatch is active in the industry and works on projects in both public and private markets.



Shikwamkwa Replacement Dam, Ontario, Canada



Oxec Hydroelectric Project, Guatemala



Red Rock Falls GS, Ontario, Canada



Kpong GS Rehabilitation Project, Ghana



Chaudière Vertical Flip, Ontario, Canada



Lower Mattagami River Project, Ontario, Canada



# Energy Clients

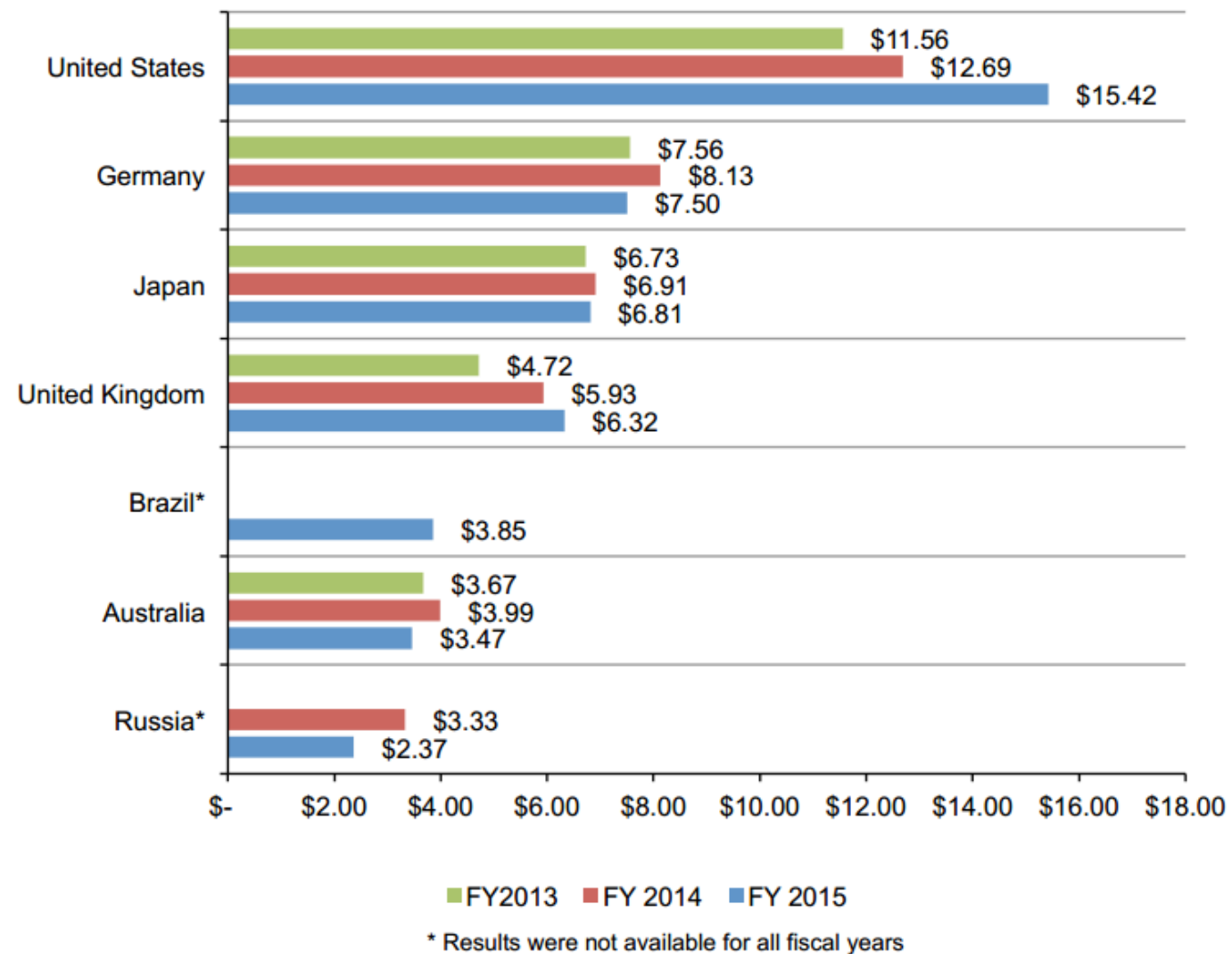




Safety Share

# Safety – Cybersecurity

**Figure 1. Total cost of cyber crime in seven countries**  
Cost expressed in US dollars (000,000), n = 252 separate companies



People are the weakest link when it comes to cyber security, which is why psychological manipulation of cyber attack victims is so common.







# Digital Trends

# What is Driving Digitalization?

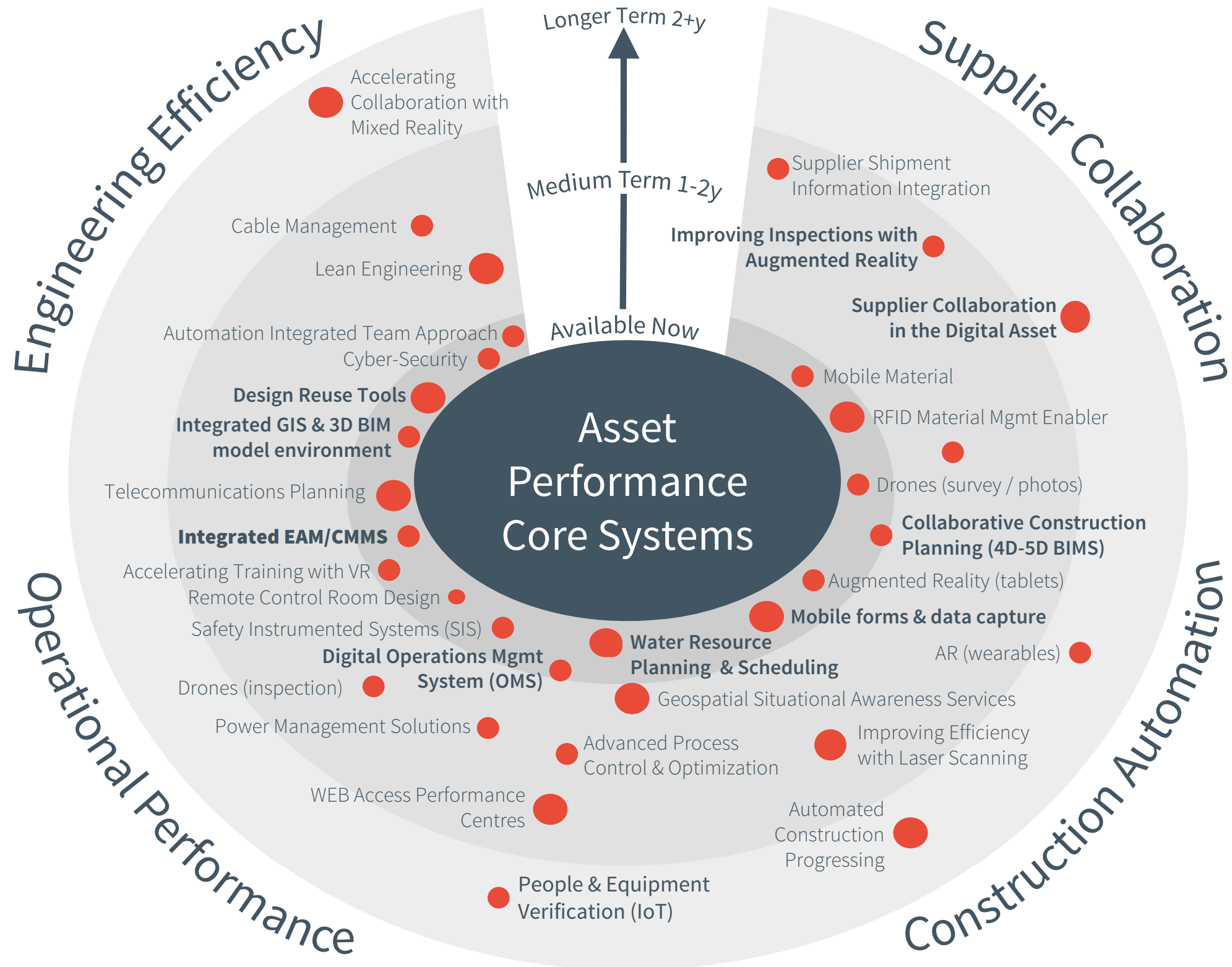
- Mitigation of Operational Risk while improving; Reliability, Efficiency, Availability and Costs

*“Simply put - Decisions need to be made based on near real time and historical data trends with data analysis supporting the understanding of risks associated with required options due to financial, resource & regulatory constraints”*

- Expanding Asset Base as Utilities diversify and Integrate

*“Hydro-Power must become an integrated part of an asset portfolio. This requires digital tools to manage centralized control aspects, and the enormous data sets required to deliver the improvements. It requires **Asset Performance Management** tools”.*

# Digital Innovation Horizon



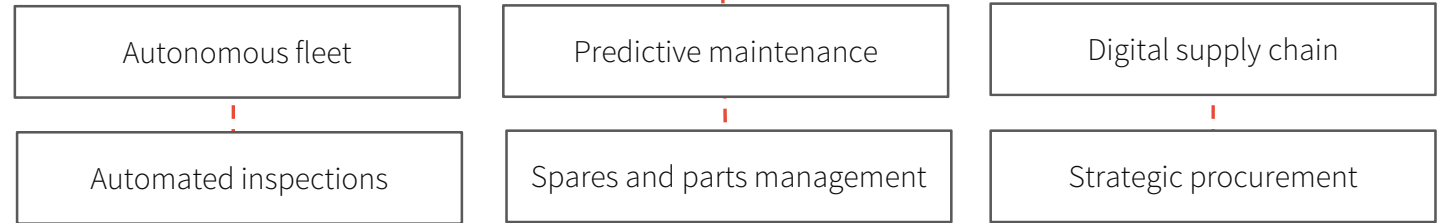


BUSINESS MODELS

Service Providers, OEMs, Third parties

Joint-Venture Partners, Clients, Communities

As required based on value enablement roadmap

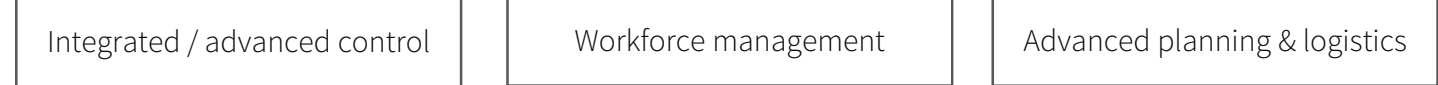


Collaboration

Transparency

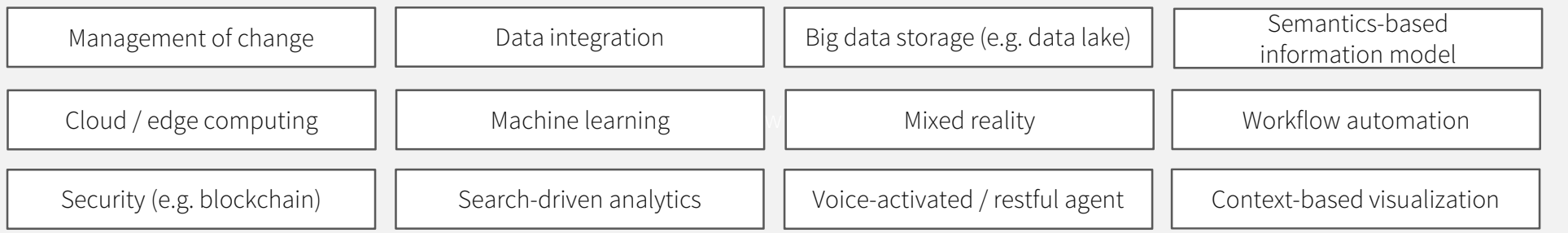
OPERATING MODELS

Situational awareness



Integration

Technology foundations

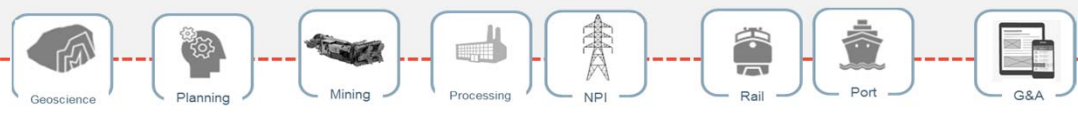
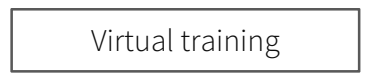


Connected worker  
Onsite operations (~75% workforce)



Operations centers  
Offsite operations (~25% workforce)

New hires, orientation, onboarding



Hatch as a Service Platform with Digital twins



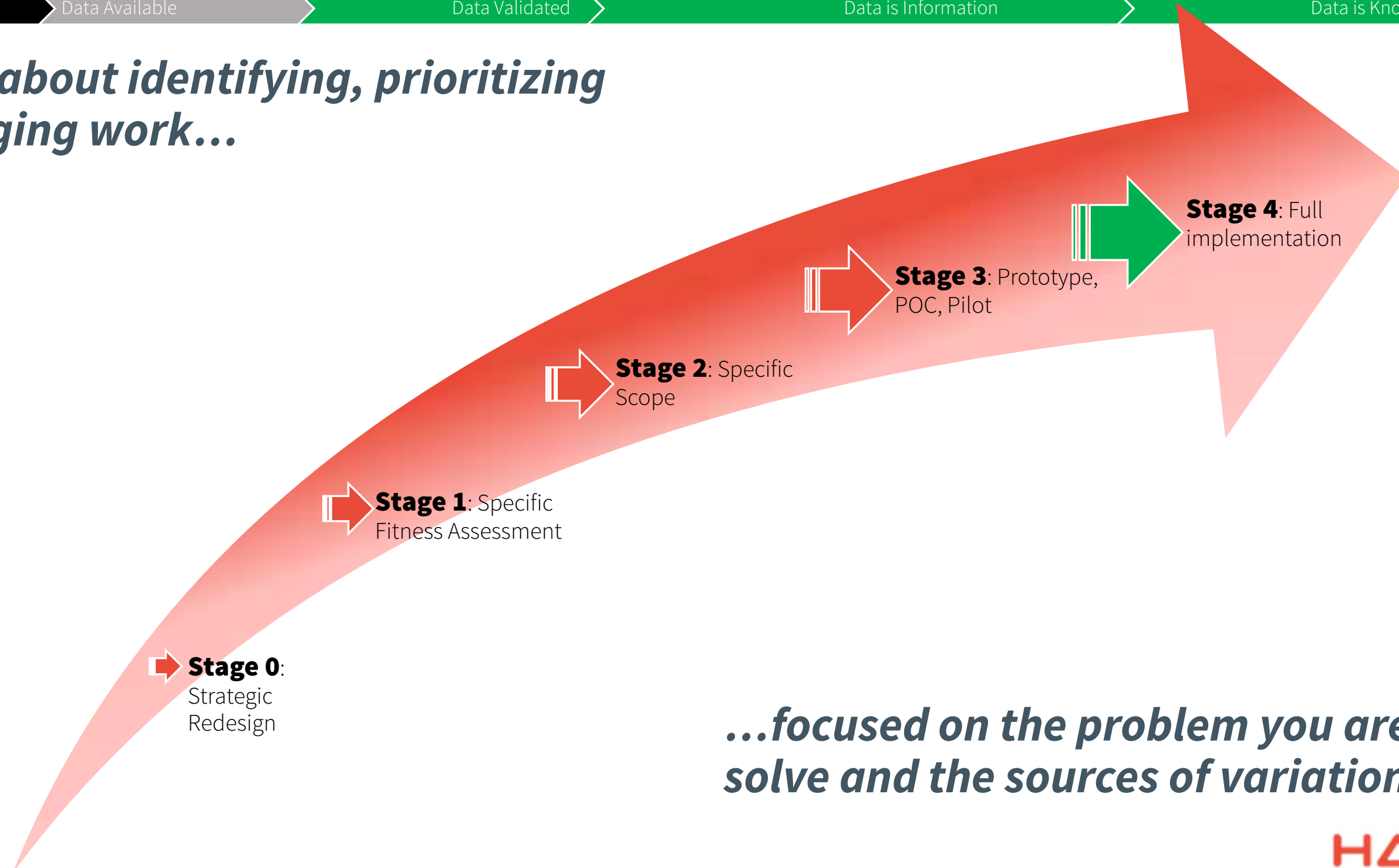


# Hatch's Methodology

# Roadmap – transforming data from “unseen” to “knowledge”



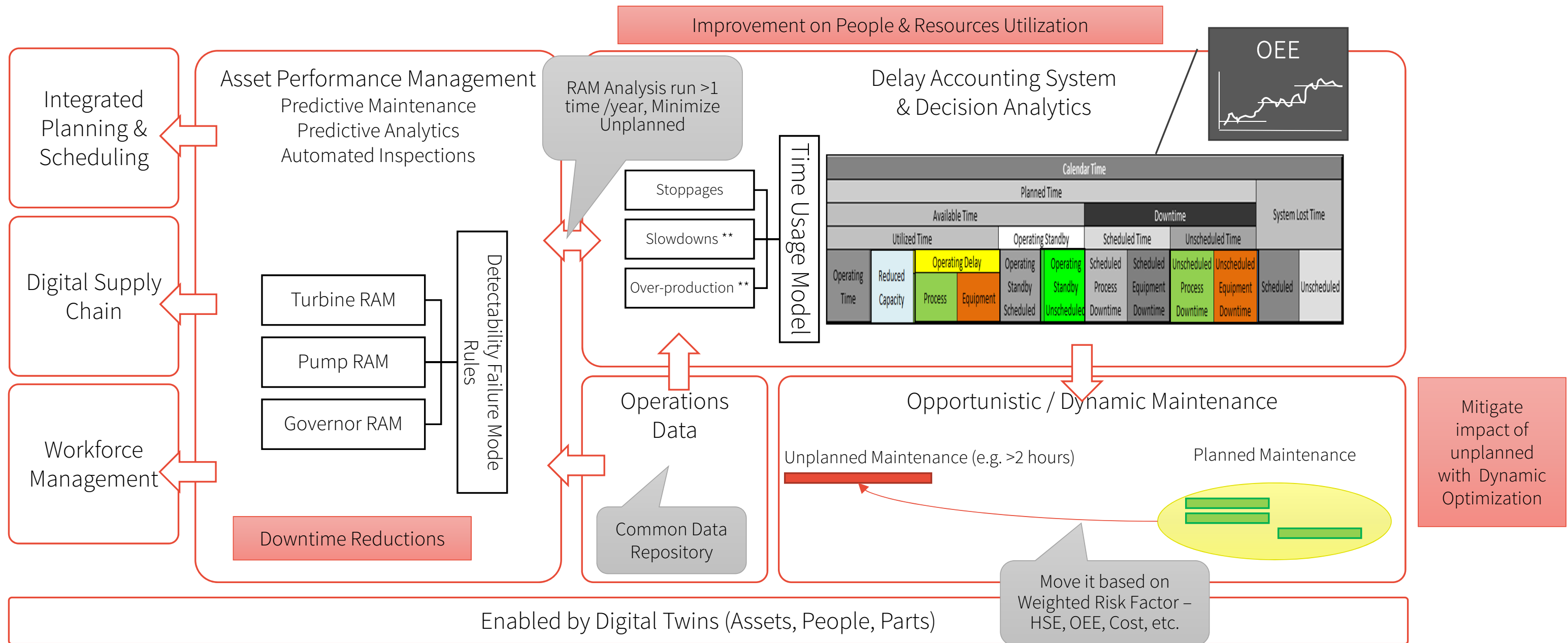
*Its always about identifying, prioritizing and managing work...*



*...focused on the problem you are trying to solve and the sources of variation...*

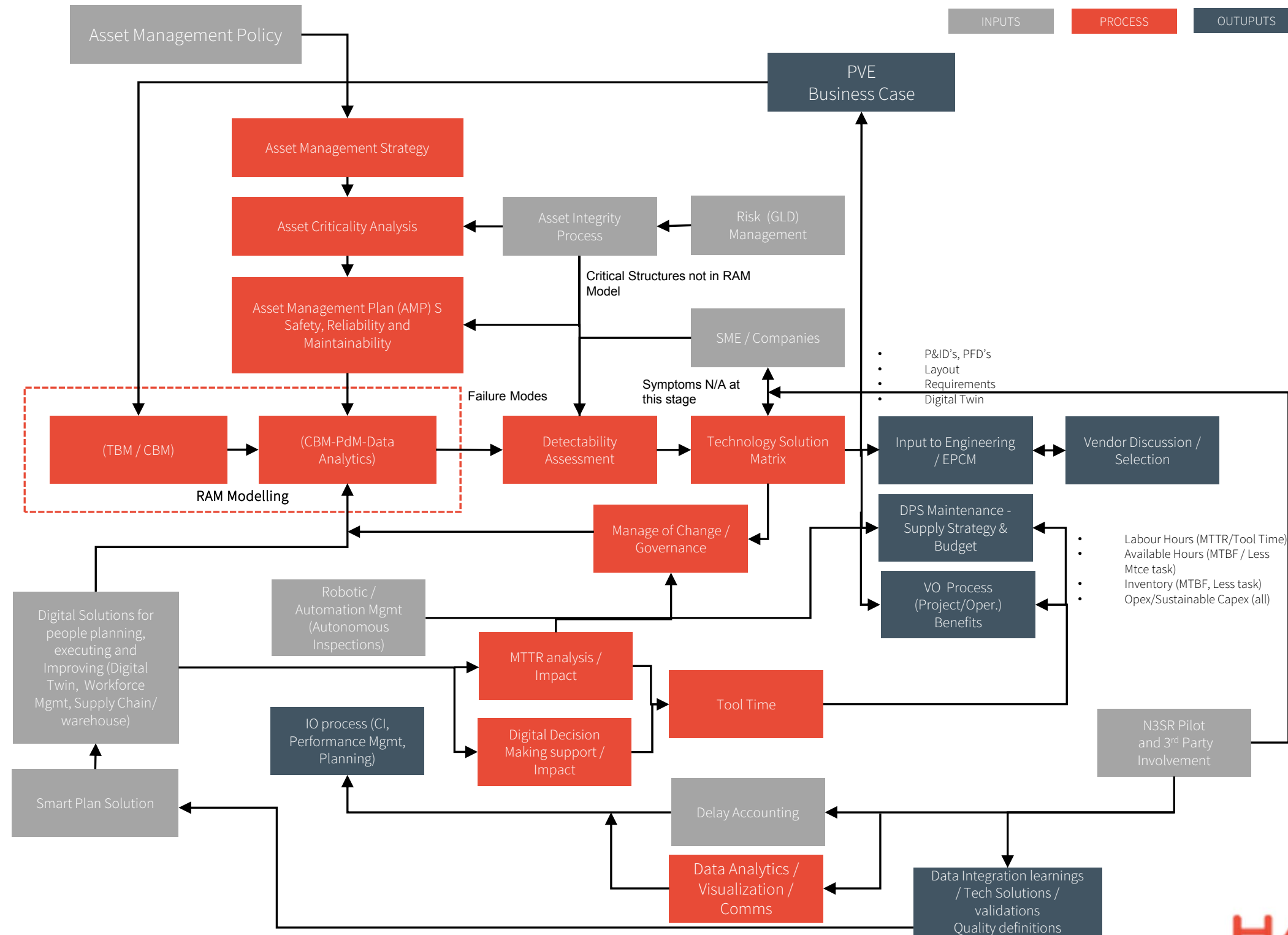


# Digital Asset Performance Management



# Digital Asset Performance Management

ISO 55000 Framework





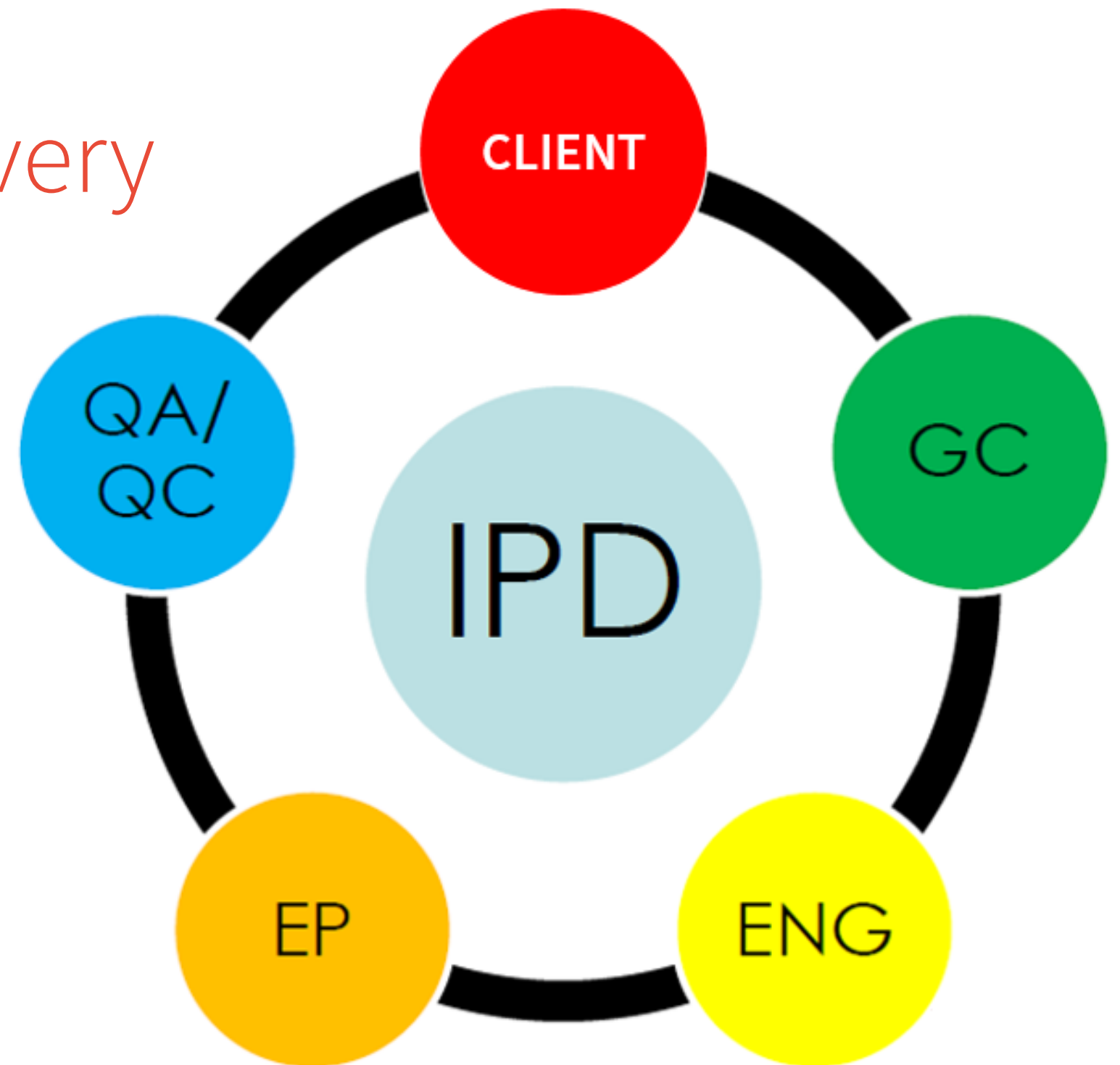
# Hatch's Delivery Methodology



# IPD

## Integrated Project Delivery

- Collaborative approach
- Multi-party contract arrangement
- Program Team consists of (5) primary Stakeholders
- Open and transparent environment



# What Does IPD Promote?

1. Early participation of all key stakeholders.
2. Processes that are outcome-driven and decisions that are not made solely on a first cost basis.
3. Communications throughout the project that is clear, concise, open, transparent, and based on trust.
4. Designers that fully understand the ramifications of their decisions at the time the decisions are made.
5. Value-based risk and reward that is appropriately balanced among all team members over the life of a project.

# What are the Benefits of IPD?

1. Strengthens project team's understanding of the owner's desired outcomes.
2. Allows constructors to contribute their expertise in construction techniques early in design process, which improves quality and financial performance during construction phase.
3. Allows Engineers to benefit from early contribution of constructors' expertise during design phase for accurate budget estimates and pre-construction resolution of design- related issues.
4. Certainty of cost and schedule.

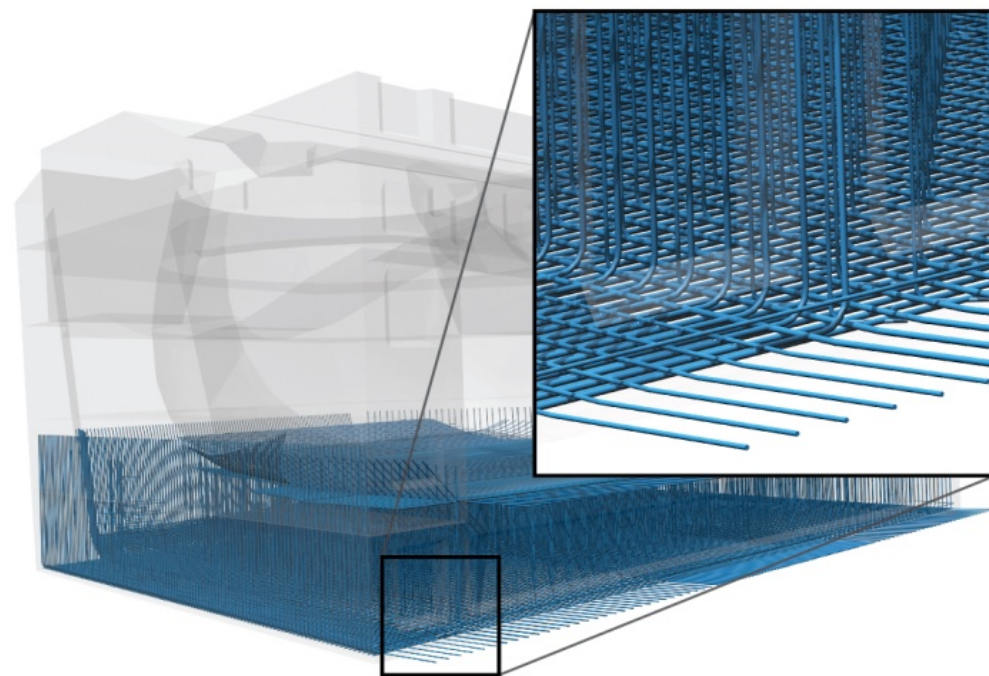




# Case Studies

# 3D-7D BIM (Building Information Modeling)

- The Keeyask Project, a 700 MW hydro dam located at the head of Stephens Lake in Manitoba, Canada
- This project presented an opportunity for Hatch to use our 3D rebar modelling capabilities, and imbedded 4D Scheduling & 5D Costing information.



Draft tube base slab rebar



- Electronically generated BAR schedule for direct import into automated production system including complex shape definitions.
- The use of tablets and other mobile technologies on site allowing for digital information to fabricators and contractors.

# Real world example 1: Sensor Disruption



Analog Gauge  
Inaccurate, manual  
inspections

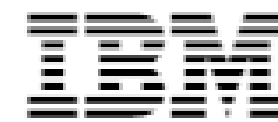


Pressure Transmitter  
\$\$\$ to own, install



Movus FitMachine

- Cost effective, easy to install (magnet mount)
- Senses vibration, temperature and noise
- Wireless, battery powered
- Advanced machine-learning analytics
- “Virtual sensor” analytics:  
Audio → bearings, RPM (motor load, no prime), slurry abrasion



*IIoT Experts!*

Source: <http://www.movus.com.au>



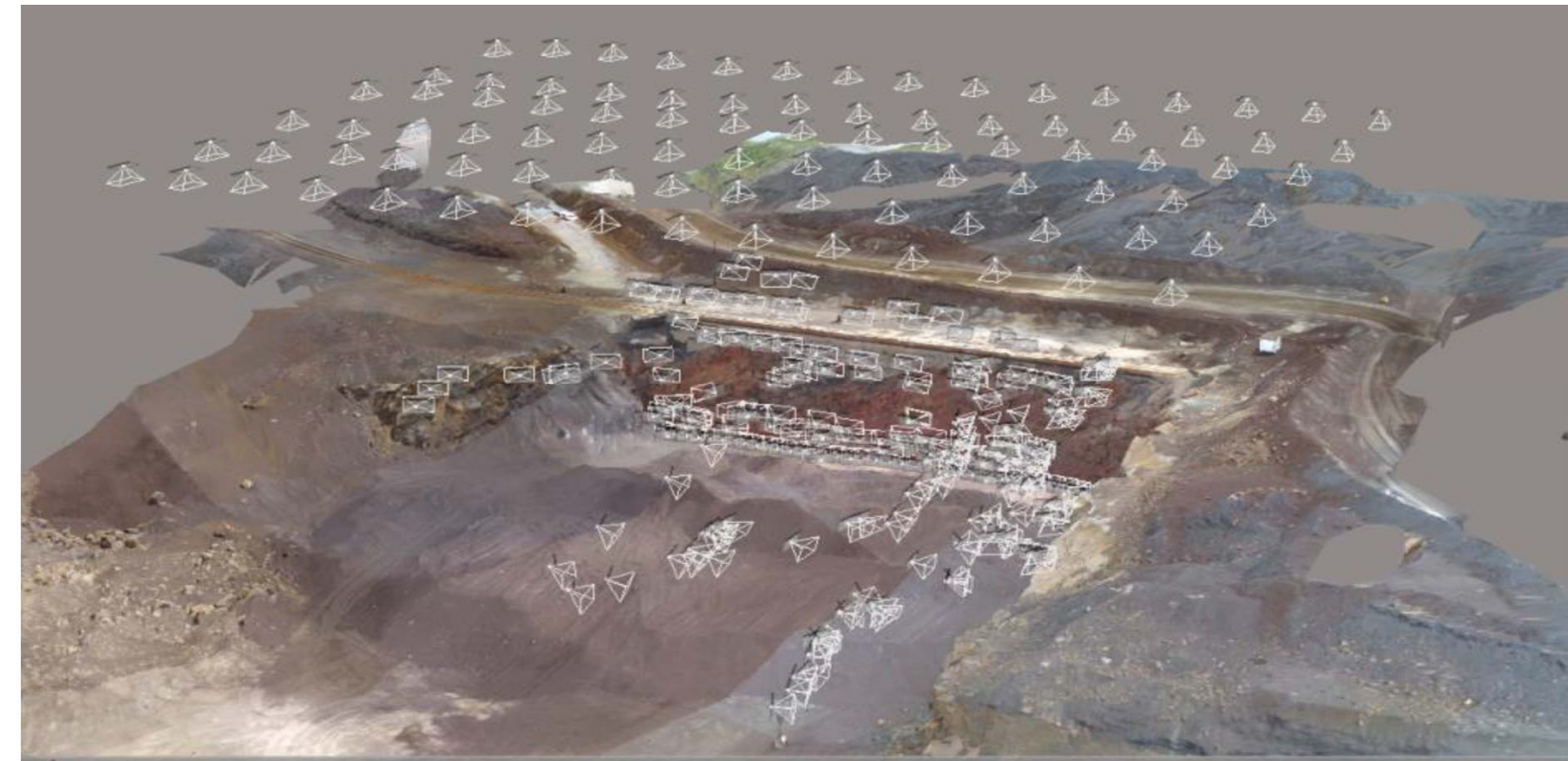
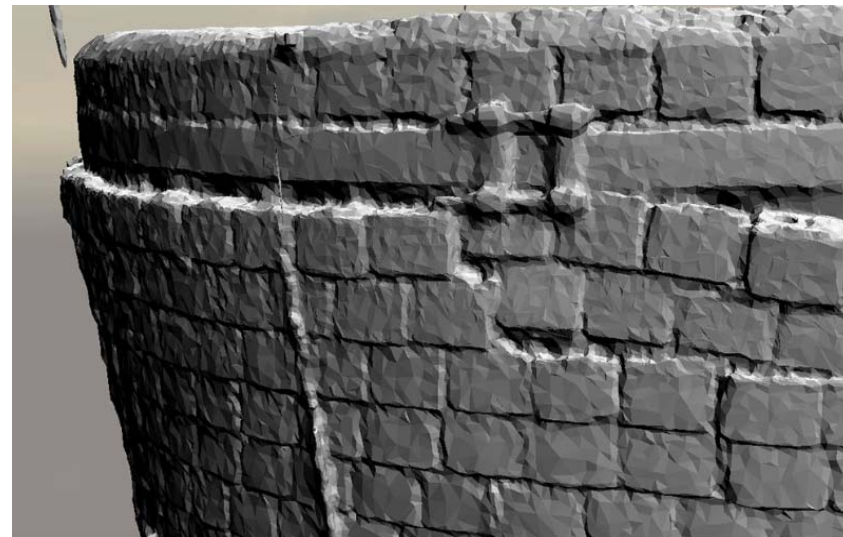


# Drone Technology



➤ UAV Reservoir Water Sampling

➤ High definition for detailed condition analysis



➤ 3D photogrammetry created using UAV aerial footage for Reservoir Rock Face Integrity



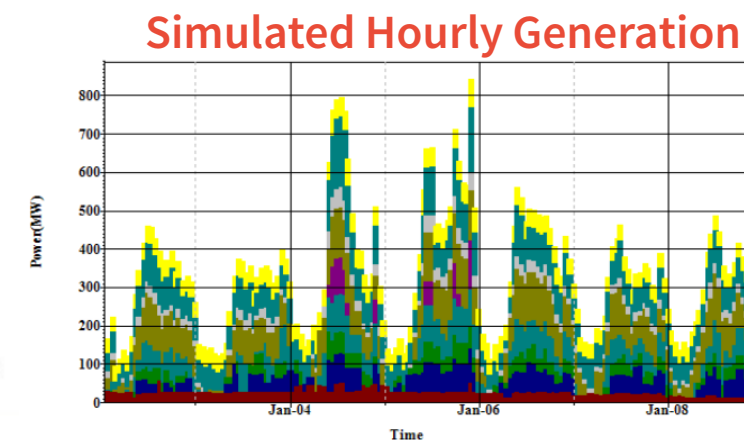
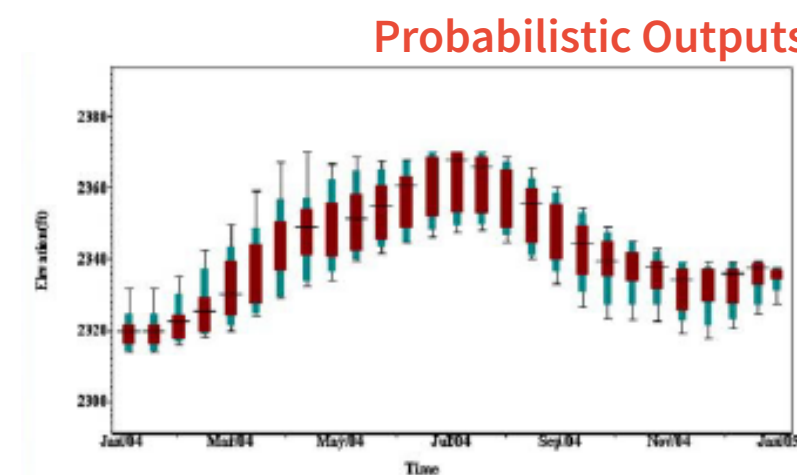
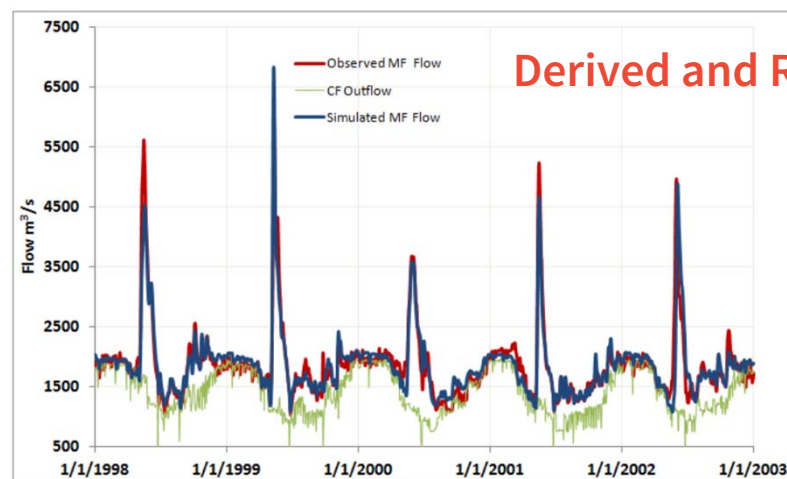
# Power and Water Optimization

- Vista DSS™ is regarded by many as the world's premiere power and water resources decision support tool and was deployed for NYPA including:
  - Integration of multiple generation modes (multiple types of renewable and non-renewable sources)
  - Incorporation of water management constraints in deciding the best dispatching strategy
  - Generation and pumped storage assets
  - Operational optimization guided by any energy prices and/or by load demands
  - Adjusts for inflow uncertainty
  - Accounts for risk-based longer-term asset management



**NYPA St. Lawrence Power Project**

The solution is used every day by the operators in the plant's control room to schedule generation, or to respond to flow changes'.

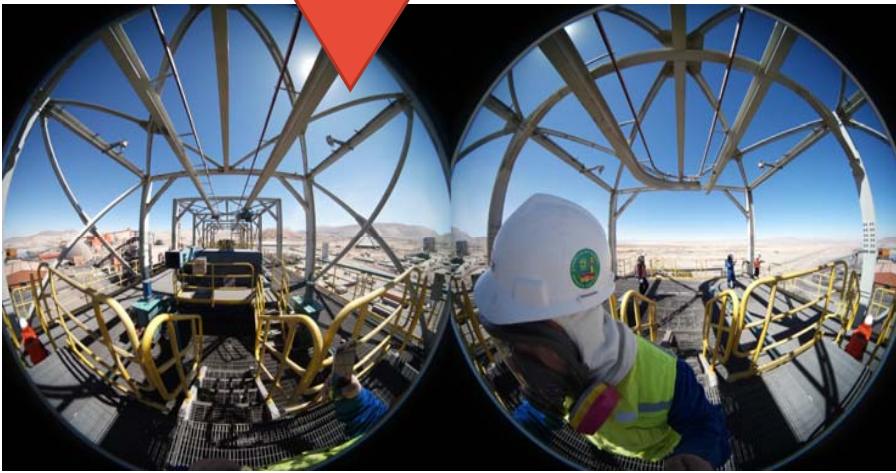




# Augmented / Virtual Reality from a Remote Operations Center



3<sup>rd</sup> Party Virtual Visits



Field Support



Remote Operations



For more information please contact:

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