

BUILDING A NEW PARADIGM: COMMISSIONING IN THE 21ST CENTURY

Craig Paul Omundsen, B.E., MIAM, CRL

This past January, the Minister of Infrastructure announced the 2021 Ontario Community Infrastructure Fund – a \$200-million investment to help communities build and repair roads, bridges, water, and wastewater infrastructure. These infrastructure investments will be key to the health of our communities and the protection of our economy, spurring growth and jobs throughout the development, construction, and operations sectors.

Most of this will go towards architectural and engineering services through the design, construction, and commissioning of retrofitted and new facilities. It is a welcome and much needed endeavor.

Yet, we need to ask ourselves, are we investing enough time and money into the commissioning phase to ensure our capital expenditure (CAPEX) will be managed responsibly and will be financially sustainable?

To ensure responsible stewardship during the operations and maintenance (O&M) of recently commissioned facilities, our clients' operators and maintenance staff require our industry's commitment and support. This support should be more than the supply of health and safety equipment, and physical tools. Support in the 21st century includes both physical and digital tools, from frameworks, policies, and processes to digital solutions that facilitate risk-based, structured decision-making.

This is not just best practice engineering; it is about delivering a new paradigm, one where commissioning a plant is not just turning over the keys after we have met the owner's requirements. It is about delivering a service that outlives the traditional facility life cycle thanks to incorporating the right client enterprise solutions.

■ OPERATIONAL AND ASSET MANAGEMENT READINESS

Operational readiness ensures that O&M teams are prepared for the additional responsibility of new infrastructure. Traditionally, when a Project Management Office (PMO) engages an operational

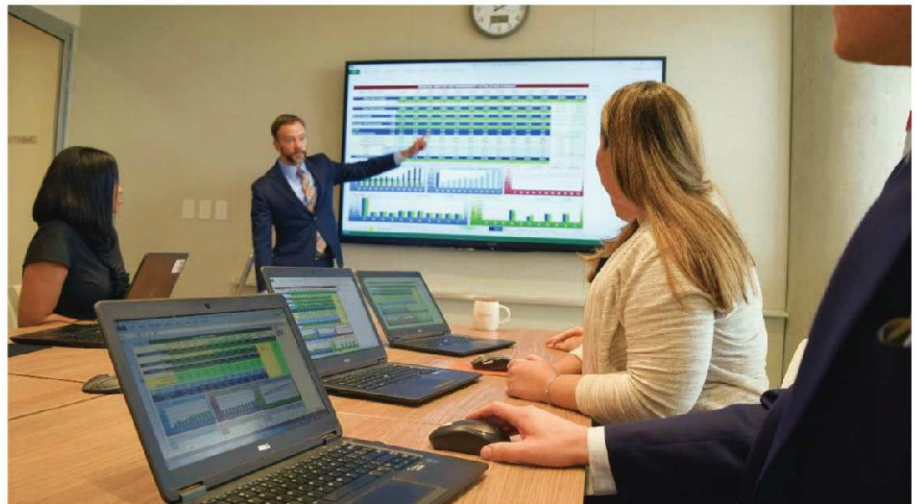


FIGURE 1 – Interconnected teams drive the best solutions for infrastructure resilience, asset sustainability, and minimizing TOTEX.



FIGURE 2 – Final commissioning walk throughs should no longer be the end of the asset management journey.

readiness team, the focus is on equipment test results for operability, training, and submittals for Original Equipment Manufacturer (OEM) manuals, customized O&M and safety manuals, as-built drawings, warranty certificates, and associated closeout documents.

When combined with asset management fundamentals, the traditional view of operational readiness evolves into a more inclusive process of operational and asset management readiness.

At Stantec, we incorporate the principals of operational readiness and asset management readiness to develop specialized staff who focus on:

- the efficiency of near-term operational readiness from construction to operations; and,
- maximizing long-term return on investment (ROI) by implementing asset management fundamentals through infrastructure design, construction, and commissioning.

Within a PMO, operational readiness teams work closely with a utility's O&M department. The PMO asset management teams collaborate with both the O&M department and capital planning department.

These teams collaborate to:

- Identify opportunities for predictive analytics to optimize maintenance and asset renewal;
- Update asset management policies, objectives, and the strategic asset management plan;
- Develop asset management plans for the new infrastructure; and,
- Calculate and optimize O&M budget forecast estimates.

This group also pinpoints future renewal decision-making strategies through the lens of multi-objective decision analysis, asset risk management, criticality assessment, life-cycle costing, and prioritization. An additional layer of post-warranty maintenance strategies is identified, including predictive analytics, condition-based maintenance, proactive maintenance optimization, and the new infrastructure's maintenance for reliability programs.

Operational readiness teams typically focus on day one and the efficiency of near-term operational readiness from construction to operations. During the commissioning phase the PMO asset management team advocates for the long-term management of assets to reduce the infrastructure's total expenditure (TOTEX), while achieving customer levels of service through asset performance; and, managing asset-risk at an acceptable level for utility leaders. The PMO asset management team concentrates on infrastructure resilience, asset sustainability, and minimizing TOTEX. This is key.

A significant percentage of TOTEX centers around two lifecycle phases: 1) within operational expenditure (OPEX) and 2) the requirement for asset renewal (replacement or refurbishment) under CAPEX. These costs rise when post-warranty maintenance is not optimized, and asset renewal remains unmonitored. Let us consider each separately.

■ OPTIMIZED MAINTENANCE FOR RELIABILITY

Case studies by the American Water Works Association (AWWA) and the US Department of Energy conclude that development of optimized proactive maintenance programs, using modern reliability-centered maintenance

fundamentals with predictive analysis technologies, result in a reduction in maintenance OPEX of between 20 to 30%.

Throughout the design, construction, and commissioning phases, there is time to develop the maintenance program for equipment after its warranty period is over. There is also time to install sensors for predictive analytics, time to be proactive, and budget to support these efforts.

As a rule, maintenance outlined within OEM Manuals is required to be implemented during the equipment warranty period. However, OEM manuals do not consider functional failure within an operating context. For this, an optimized proactive maintenance program should be implemented to consider predictive, preventive, and run-to-failure maintenance strategies within the specific operating environment.

The selection of predictive analytics hardware and software technology for proactive maintenance and reliability is best considered alongside operational solutions for automated fault detection and diagnostics (AFDD), and predictive technology for asset refurbishment and replacement.

Deciding upon specific digital solutions is best conducted within the larger context of digital transformation and asset management processes. This begins in the design and construction phases and is finalized during the commissioning of facilities.

A utility's digital transformation is a journey, not a one-off-process. This type of undertaking is an inter-departmental decision that brings together IT, operations, maintenance, and (although not at first evident) capital planning departments. Let's consider why.

■ MONITORING FOR ASSET RENEWAL

The latest Canadian Infrastructure Report Card (2019), produced by The Federation of Canadian Municipalities (FCM) and seven partner organizations, examined the state of Canada's public infrastructure. Among the key findings, 30% of water infrastructure is in fair, poor, or very poor condition. Those of us in the know understand this to be a strong indicator that infrastructure is not being renewed at an optimal time –

admittedly, not always an easy feat – and it is likely that customers' levels of service have been compromised.

To determine the optimal time for asset renewal, the capital planning department requires monitoring data. To capture and analyze valid data, an investment is required. The time to make the capital investment in both hardware and software and develop asset management processes which manage the data analysis is during the design and construction phase. Monitoring to optimize capital renewal – where software is installed, hardware is correctly placed, and the IT network is connected – begins when the infrastructure is healthy, and the asset management processes can be tweaked. Commissioning of facilities with trained operators ready to use, inspect, and analyze function, will ensure the fruits of this labor are realized.

■ THE UTILITY OF THE FUTURE

When viewing your enterprise as a whole, digital transformation and asset management solutions should be utilized together for maintenance optimization, reliability assurance, renewal forecasting, and TOTEX minimization. As projects include this complexity, this will not only improve and extend the life of our commissioned facilities, but also save utilities, and most importantly rate payers, money in the long run.

Asset management has evolved. When it comes to capital investment programs, utilities can no longer operate with a business-as-usual mindset. To realize the full value of an investment, a digital transformation is required, and risk-based, structured decision-making through an asset management lens must be the new norm.

■ ABOUT THE AUTHOR

Craig Omundsen, based out of Stantec's Ontario office, helps utilities realize significant economic and social benefit through resilient, sustainable, and affordable infrastructure. Craig has an exceptional international track record of successfully leading asset management programs and solutions for digital transformation as well as facilitating structured decision-making and infrastructure prioritization processes, and performing risk-based infrastructure renewal and capital planning. You can reach him at craig.omundsen@stantec.com. ♦