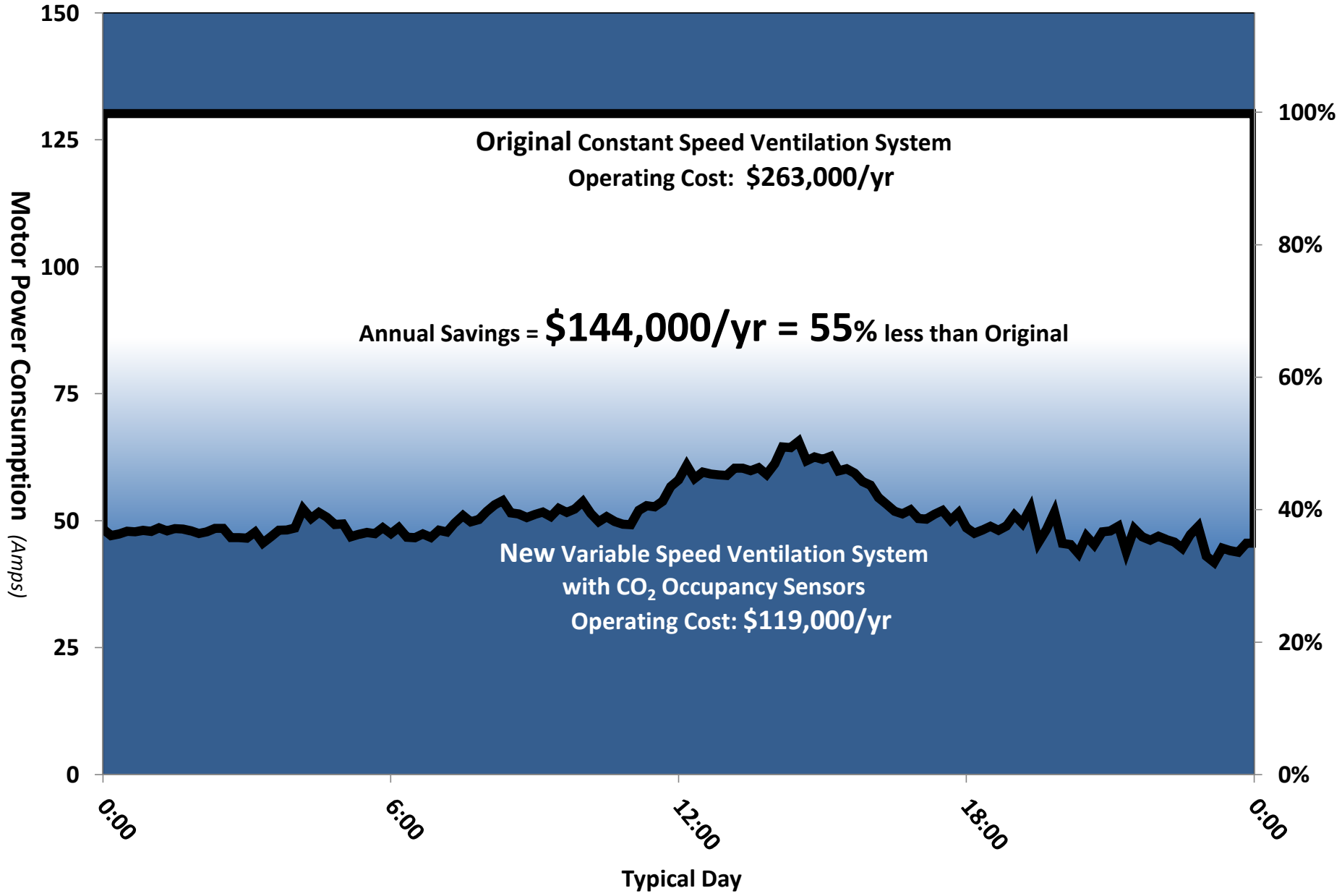
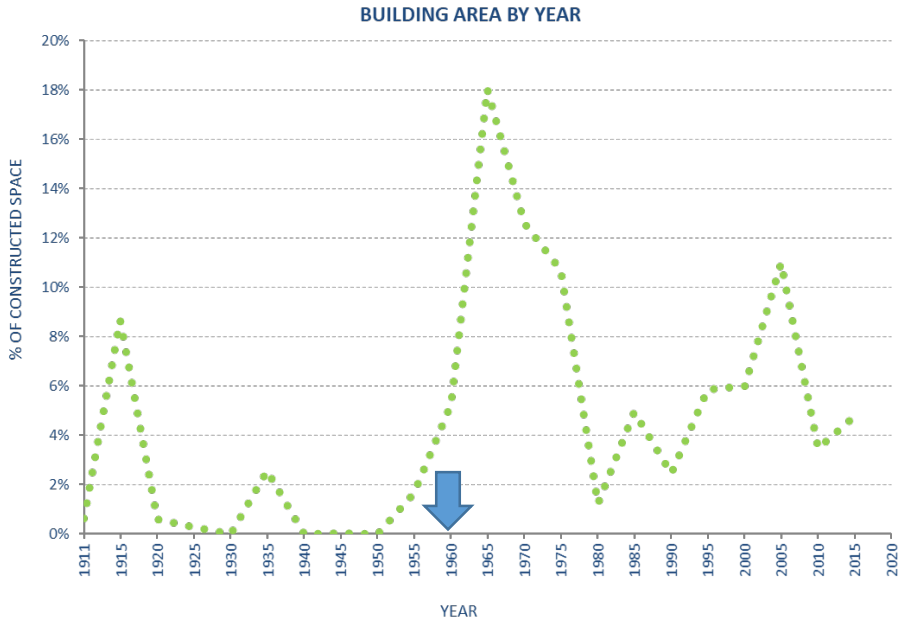
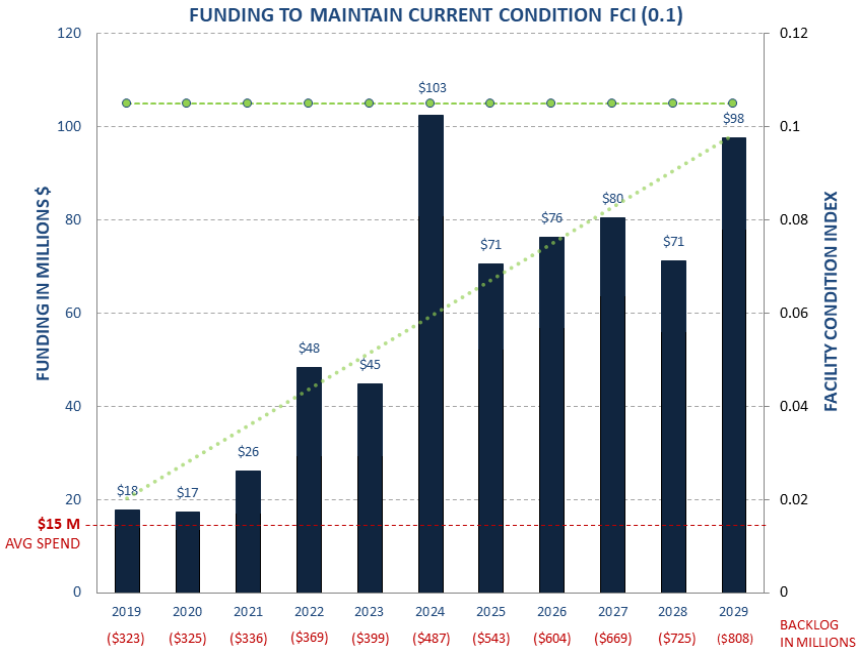
Energy Savings Comparison

Engineering 3 Supply Fan (150 hp motor)



Capital Renewal at Fort Garry Campus



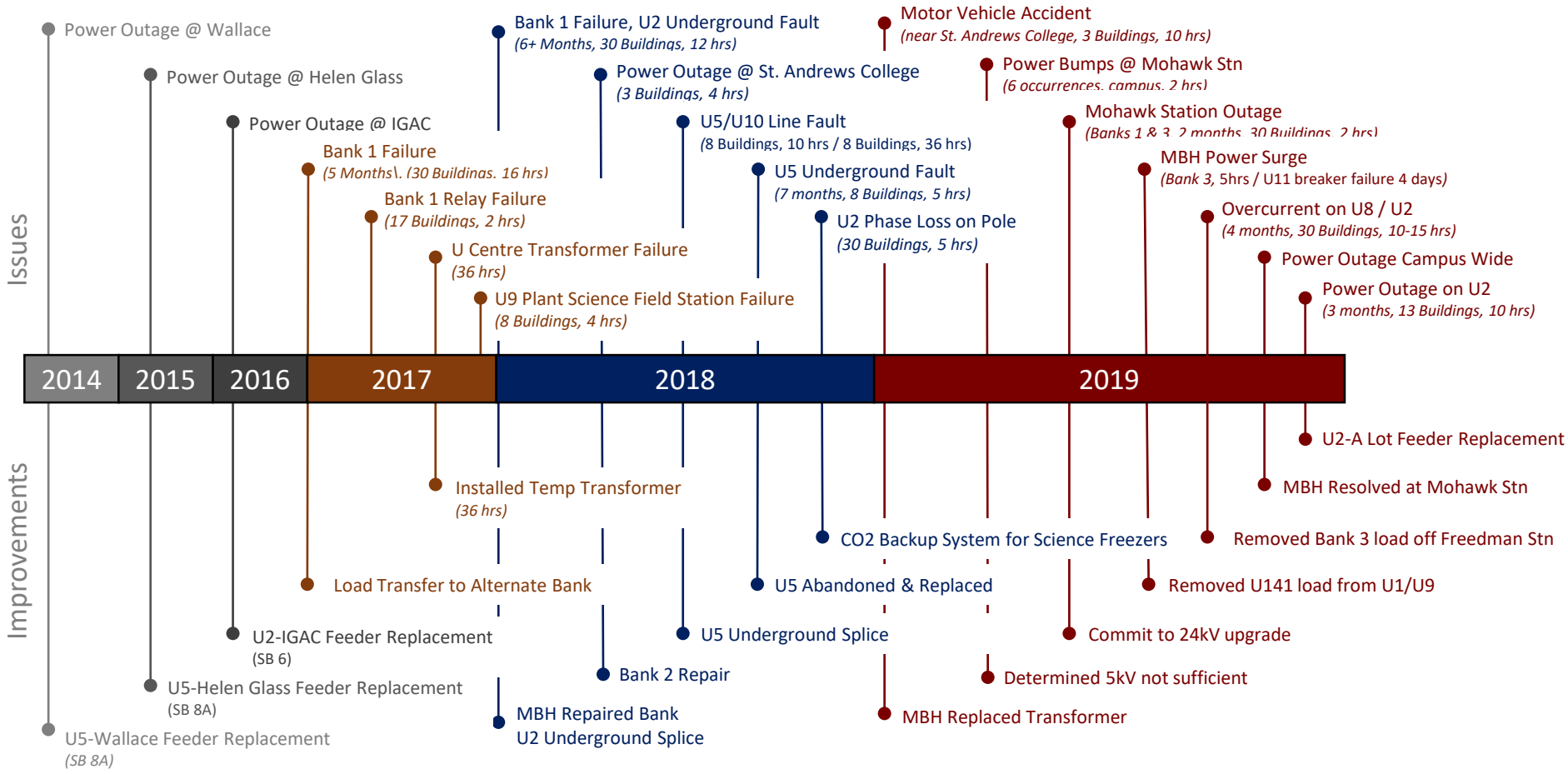


Power Re-Servicing at Fort Garry Campus

BACKGROUND

- The existing Manitoba Hydro Fort Garry Substation was built in 1960 and is at its end-of-life
- There are two 24 kV Manitoba Hydro feeders that deliver power to the three banks that service the Campus. The voltage is reduced to 5 kV and distributed to the Fort Garry Campus.
- Thirteen 5 kV feeders around University of Manitoba.
- Two 1960 feeders are PCB oil-insulated, lead-line, asbestos wrapped conductors.
- Five 1960 feeders are on overhead poles and failing.
- Manitoba Hydro feeders have exceeded 50% of the designed load, so no longer provide redundancy.
- Most campus feeders have exceeded 50% redundancy.
- This project is the highest priority for the Capital Renewal Plan and represents significant risk to campus operations

History of Power Outages



Status Update

- Signed a **letter of intent** with Manitoba Hydro committing to invest significant resources to project
- Hired an **Owner's Advocate** to provide subject matter expertise
- Formulating a **concept plan** for the campus-wide 24kV distribution ring architecture
- Conducted an **Emergency Power Study** for the Faculty of Science to prioritize needs and develop recommendations
- Filled vacant **Electrical Shop Manager** position to bolster University team expertise.
    - Electrical Shop Manager is implementing a transformer and distribution cable maintenance program
- Installing **temporary clamp-on power meters** to develop Campus feeder load profiles for each of the existing 13 feeders
- Manitoba Hydro will upgrade **University Station switchgear** by Summer 2021 to improve the reliability and extend station life

Design Overview

- New code requirements made upgrading the 5 kV system untenable
  - New feeder cables became four times larger than the original cables they replaced!
  - It was impossible to re-use the existing underground concrete cable duct banks.
- **Conceptual design is underway** to replace the 60-year old obsolete University Substation
- The University will migrate to a **24 kV power supply that will encircle the campus**
- It will use **readily available components** identical to Manitoba Hydro standards
- Tap into the ring at **multiple delivery points** – each **point of delivery (POD)** will serve one section of the campus
- There will be two 24 kV feeders into every POD providing **100% redundancy** to significantly increase **resiliency**
- **Detailed Design & Construction Drawings** of the first two POD installations will commence **Summer 2020**:

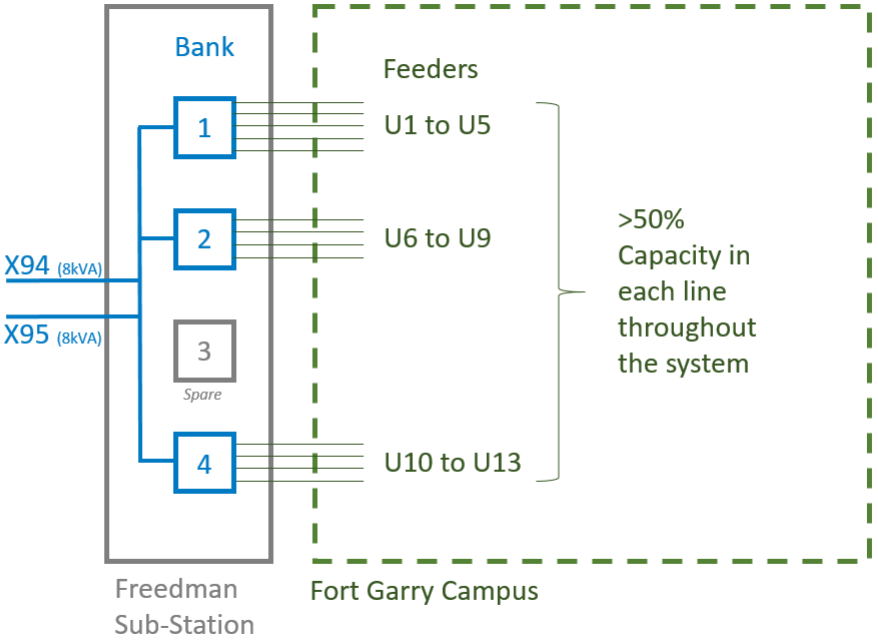
Current State (5 kV)

– 60 Year Old Obsolete Equipment

- Currently two primary feeders (X94, X95)
- > 50% Capacity in feeders with long distances (voltage drop) across campus

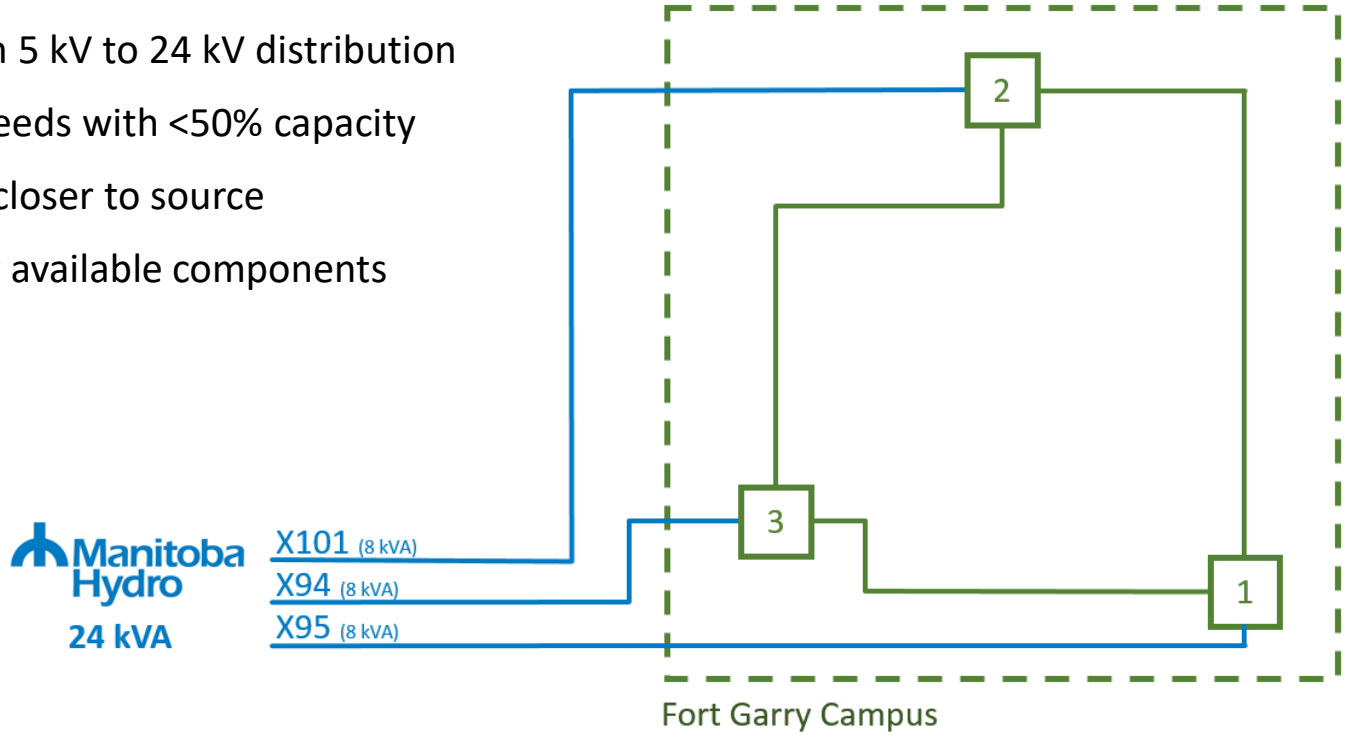
Manitoba Hydro

16 kVA



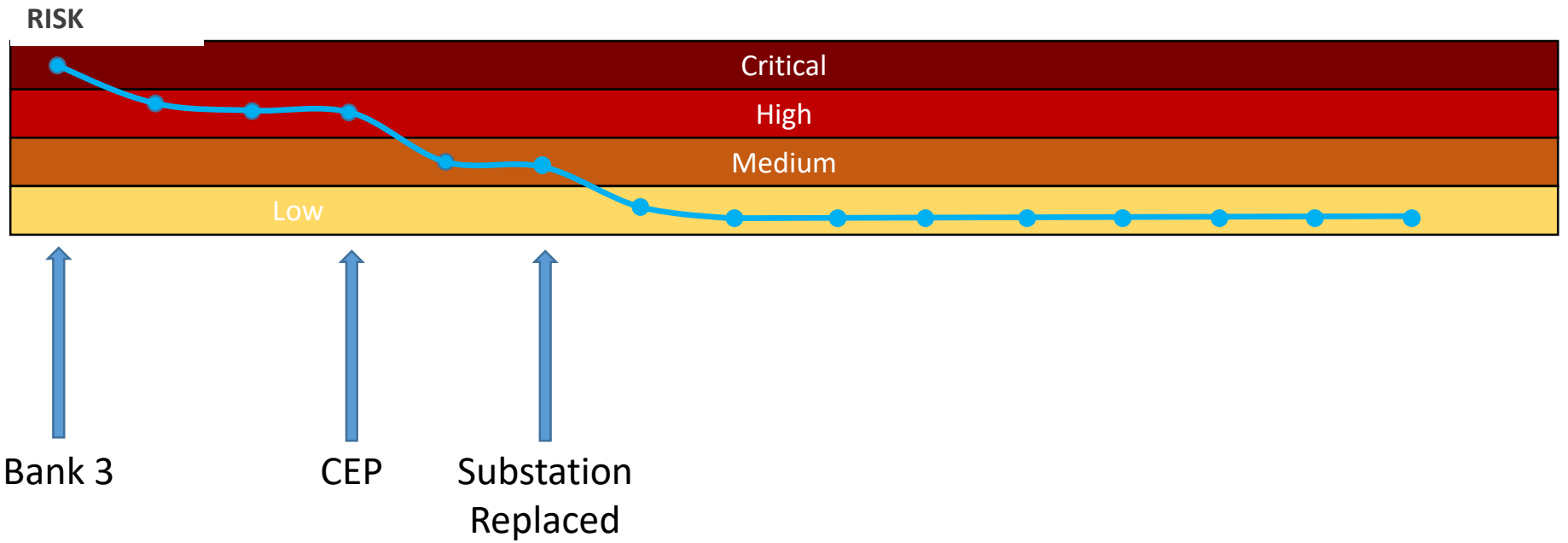
Future State (24 kV)

- Migrate from 5 kV to 24 kV distribution
- 3 incoming feeds with <50% capacity
- Move PODs closer to source
- More readily available components



Schedule

	5 Year Plan					5-10 Year Plan	10-15 Year Plan
	Planning		POD 1	POD 2	POD 3	Building Distribution Upgrades	Distribution Completion
2019	2020	2021	2022	2023	2024	2025 - 2029	2030 - 2035
	$1M	$1M	$5-10M	$5-10M	$5-10M	$25M	$25M



POD 1

- **POD 1** will serve the Central Energy Plant. It will reduce the maximum load on the existing substation by 40%
- POD 1 has been included in our Investing in Canada Infrastructure Program (ICIP) submission for 40% federal funding
- The ICIP program targeted projects with GHG reductions

- **The Hydro Re-servicing Project is anticipated to be in the order of $80m over 15 years**
- **We will have more accurate cost estimates and schedules as we move through the design and planning phase over the next year**
- **This project is one of the many growing renewal issues facing our campuses**

ICIP Application Summary

Updated September 13, 2021 mf

Brief Project Description

Upgrades to the Central Energy Plant and the campus-wide district heating and cooling systems will significantly reduce GHG emissions at the Fort Garry campus.

The Central Energy Plant is the beating heart of the University that provides district heating and cooling to all campus facilities. The Max Bell Centre is the campus recreational hub used year-round by the University and surrounding community.

CEP upgrades include a high efficiency natural gas boiler, condensing heat recovery for all natural gas-fired boilers, an electric boiler, a variable speed chiller, and additional electrical supply capacity. MBC measures include six high efficiency air-handling units and an efficient ice plant.

Green Infrastructure Stream (GIS) – Fort Garry District Energy Upgrades

Project Cost: $36.1M *Annual GHG emissions Reduction: 12.2k tonnes CO_2eq/year*
UM Cost: $21.7M *Federal Government ICIP Incentive: $14.4M*

This project seeks to replace aging and inefficient district heating and cooling infrastructure with new energy efficient and resilient equipment.

- **Climate Change Mitigation (GIS-CCM)**
  - **Increased Energy Efficient Buildings**

    - 1 - Boiler Replacement - Install a new energy efficient natural gas-fired boiler in the Central Energy Plant to increase combustion efficiency and improve the reliability of the campus-wide district heating system. The new boiler will be capable of burning renewable landfill gas.

    - 2 - Boiler Heat Recovery - Upgrade the heat recovery system to extract latent energy from the boiler exhaust gases and maximize combustion efficiency of the district heating system. Distribute the recovered energy throughout the campus using existing district heat recovery piping.

    - 3 - New Electric Boiler - Install the first electric boiler (2.5, 6, or 9 MW) in the CEP to produce heat using an alternate fuel source - renewable green hydroelectricity, maximize boiler efficiency, move towards carbon neutrality, and completely eliminate GHG emissions related to district heating.

    - 4 - Chiller Replacement - Replace the oldest chiller in the Central Energy Plant to improve operating efficiency, upgrade aging infrastructure, and increase reliability.

    - 5 - New Power Supply - Install a new power supply for the Central Energy Plant to deliver additional power for the new boiler and replacement chiller. This project provides for one new decentralized distribution centre located at the Central Energy Plant. Distributing power from multiple decentralized locations reduces the vulnerability of having one central location. It improves resilience and disaster mitigation. Relocate overhead feeders running along the Red River riverfront underground and well away from the eroding riverbank. Provide interconnections between electrical power distribution centres for additional redundancy.

    - 6 - Max Bell HVAC Upgrades - Expand the campus district heating system to serve Max Bell Centre. Install six new air-handling units to increase operating efficiency from 60% to over 90% and increase resiliency. Install carbon dioxide sensors to monitor occupancy and minimize energy waste. Provide excellent indoor air quality and suitable space temperatures when space is being used and shut off ventilation to unoccupied areas.

    - 7 - Max Bell Ice Plant Replacement - Install an energy efficient and reliable ice plant. Recover waste heat from ice plant and distribute it throughout the campus using the existing district heat recovery piping.