Manitoba Hydro
2015 General Rate Application

PLANNING & OPERATIONS PANEL

Darren Rainkie – Vice-President, Finance & Regulatory
David Cormie - Division Manager, Power Sales & Operations
Terry Miles - Division Manager, Power Planning
Sandy Bauerlein - Corporate Controller
Dave Bowen - Manager, Keeyask Project
Rob Elder - Division Manager, BPIII Project
Michel Morin, Manager, Distribution Asset Maintenance
Nick Read - Manager, Generation Maintenance Engineering
Dr. David Swatek - Manager, System Planning (Transmission)

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Water Conditions
and
Export Markets & Sales Update

David Cormie - Division Manager, Power Sales & Operations

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Water Conditions

- Recent precipitation has been below average
- Storage is favourable
- Water supply is a key uncertainty affecting Extra Provincial Revenues, Fuel and Power Purchases & Water Rentals in the mid-term
- MH's rate strategy addresses this uncertainty over the long-term

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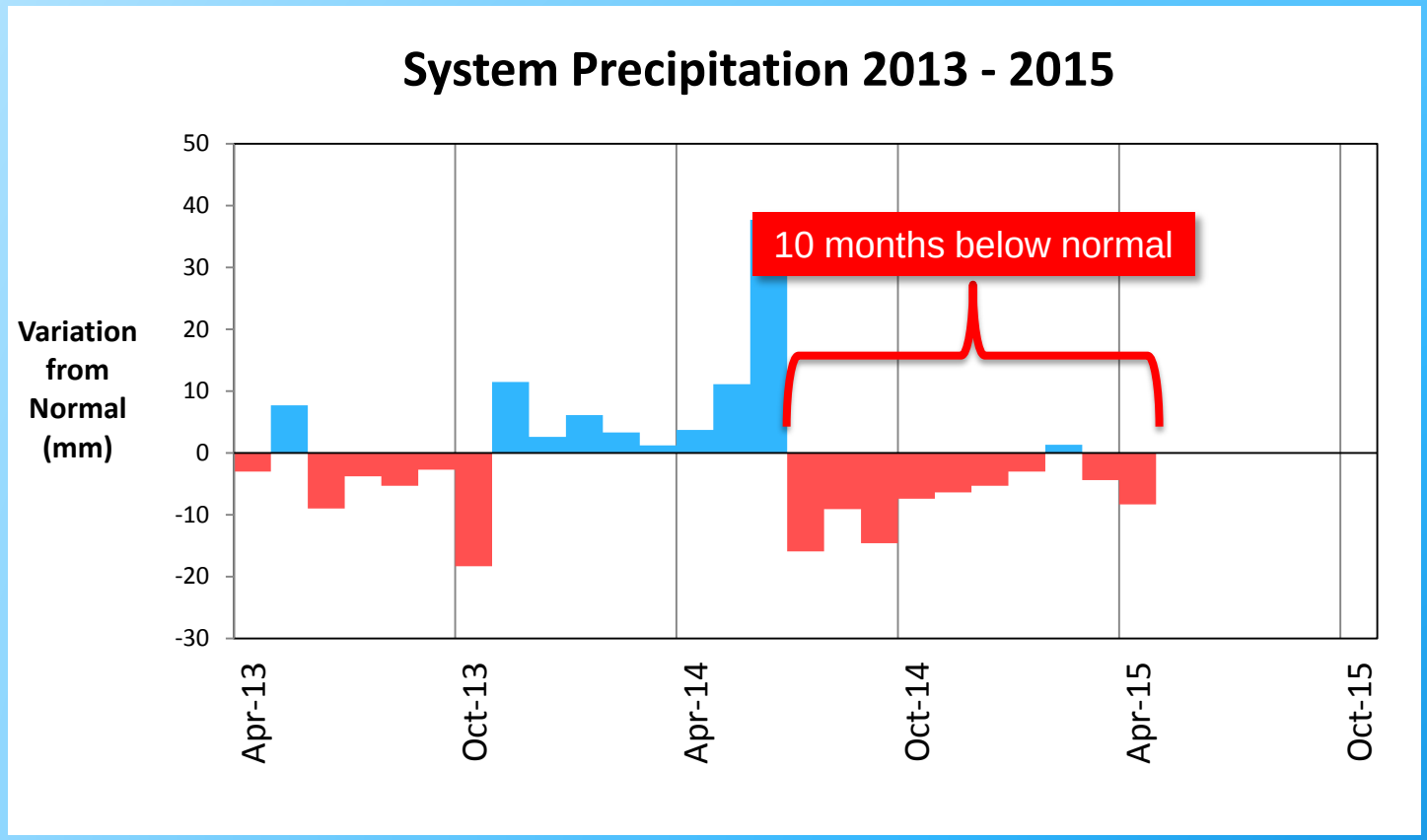
Water Conditions – precipitation has been below normal since July 2014



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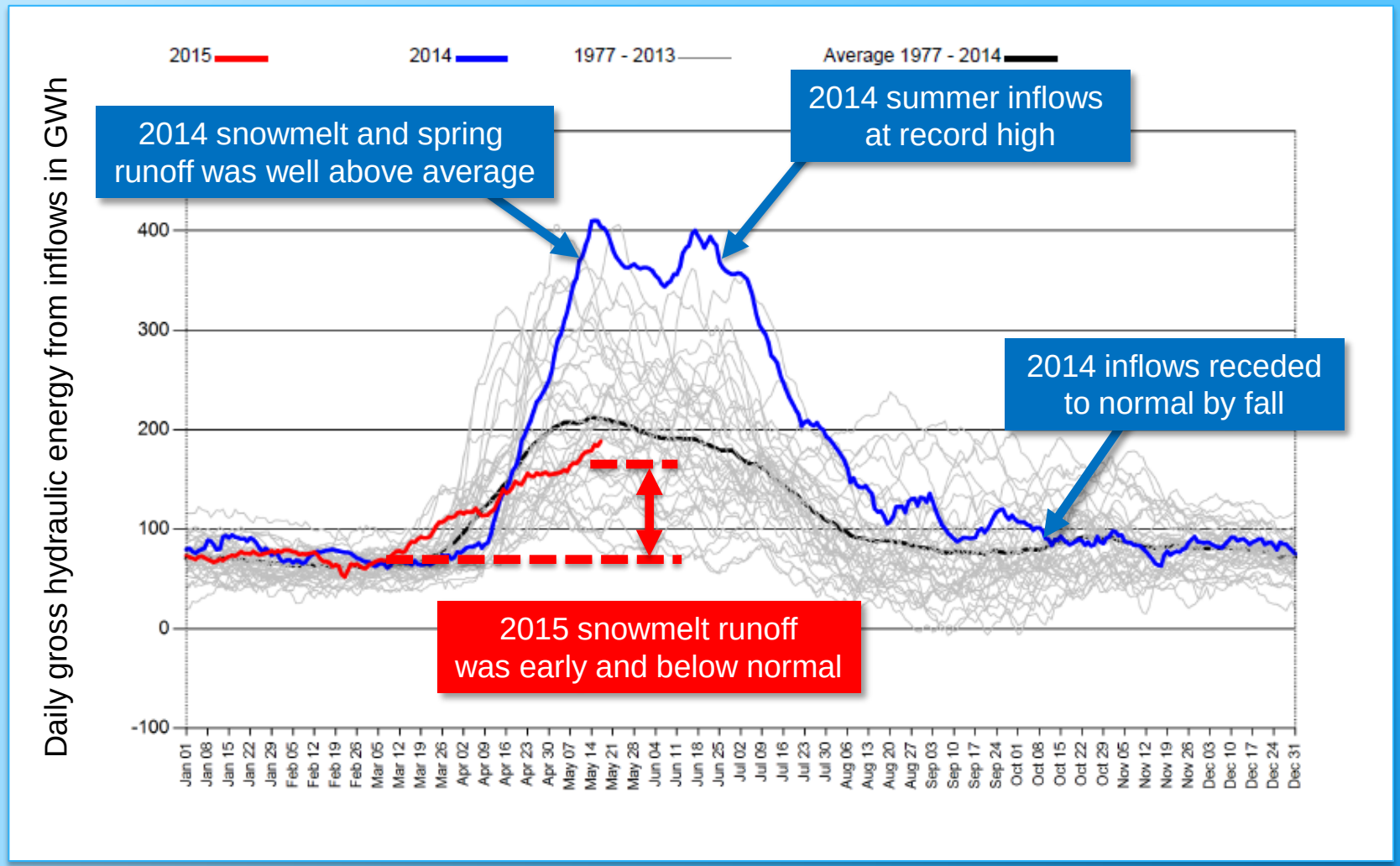
Water Inflows – below normal runoff in 2015, a sharp contrast to 2014



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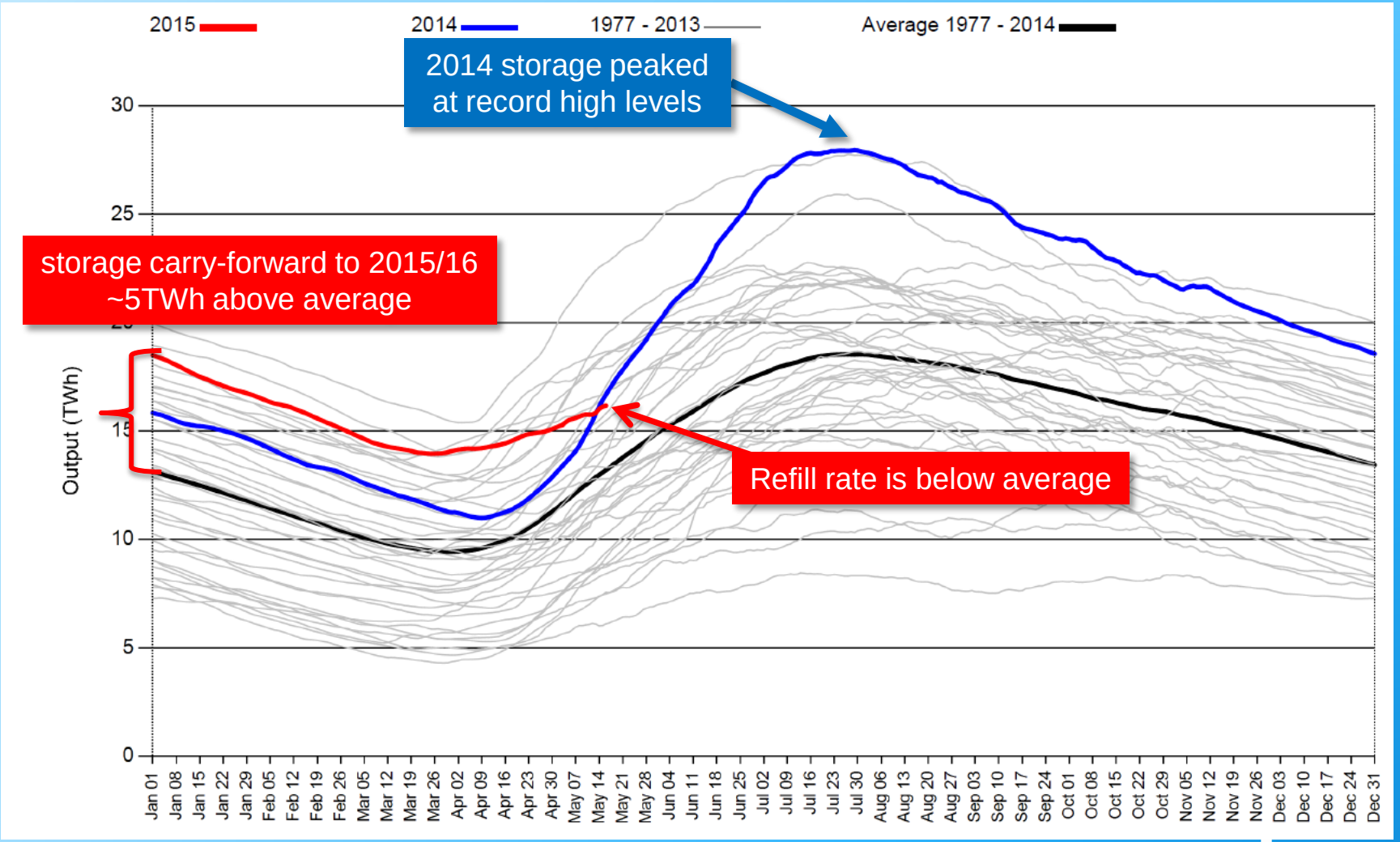
Reservoir Storage – energy reserves are above average but refill rate is below average



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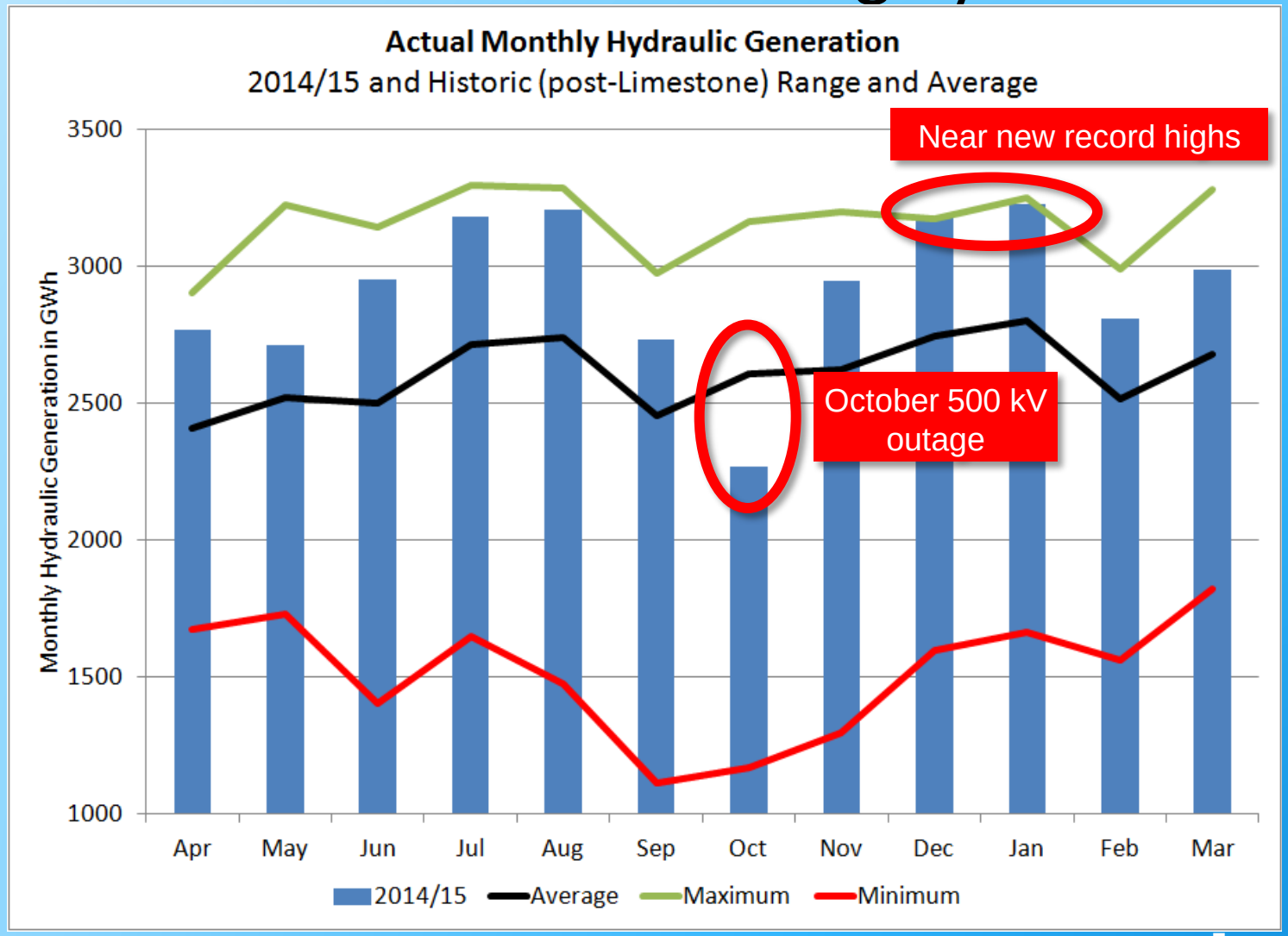
Hydraulic Generation – 2014/15 was another above average year



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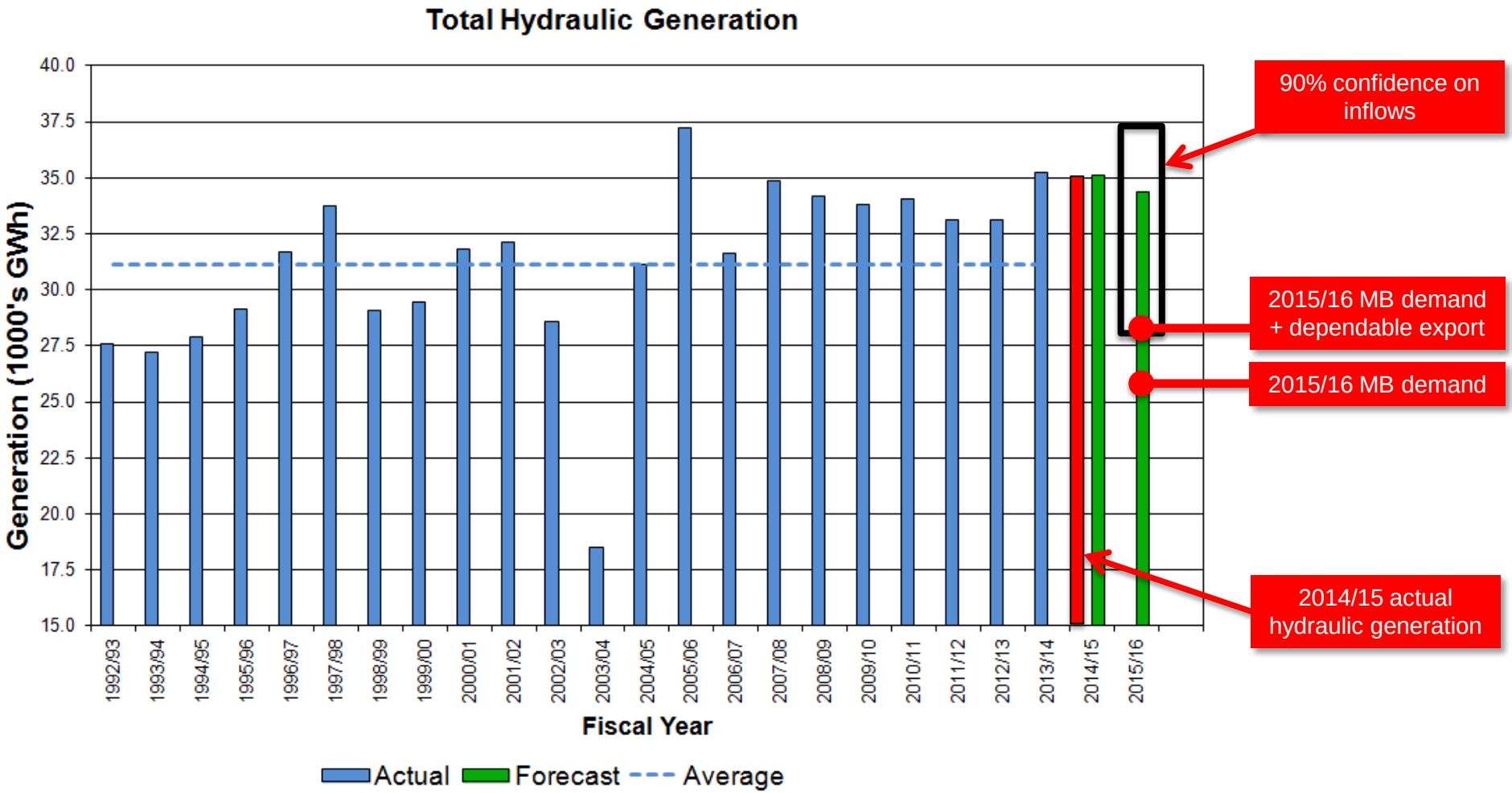
Hydraulic Generation – 11 years of average or higher generation, however future is uncertain



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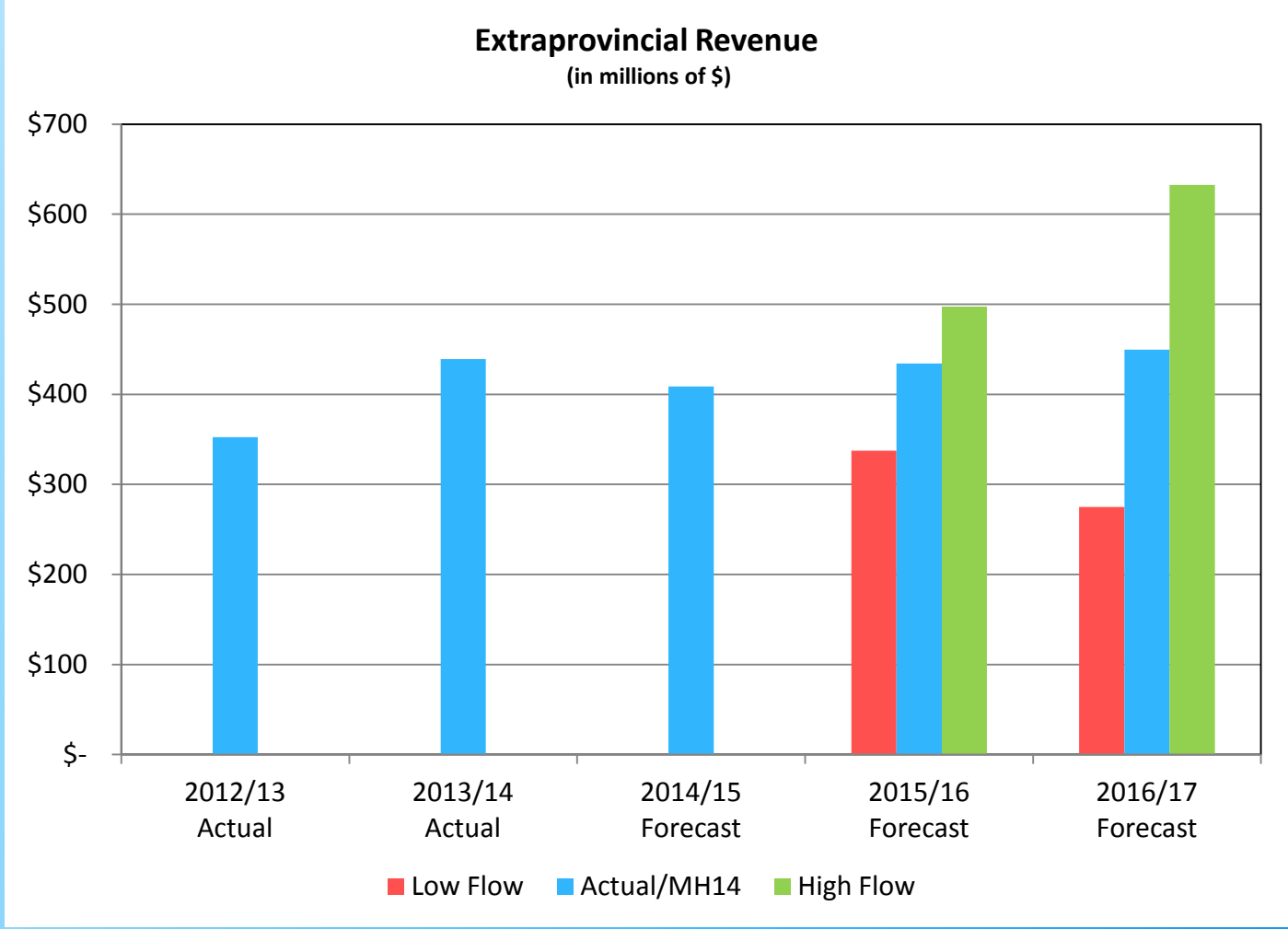
Extra-provincial Revenue – significant uncertainty in 2015/16 and later years



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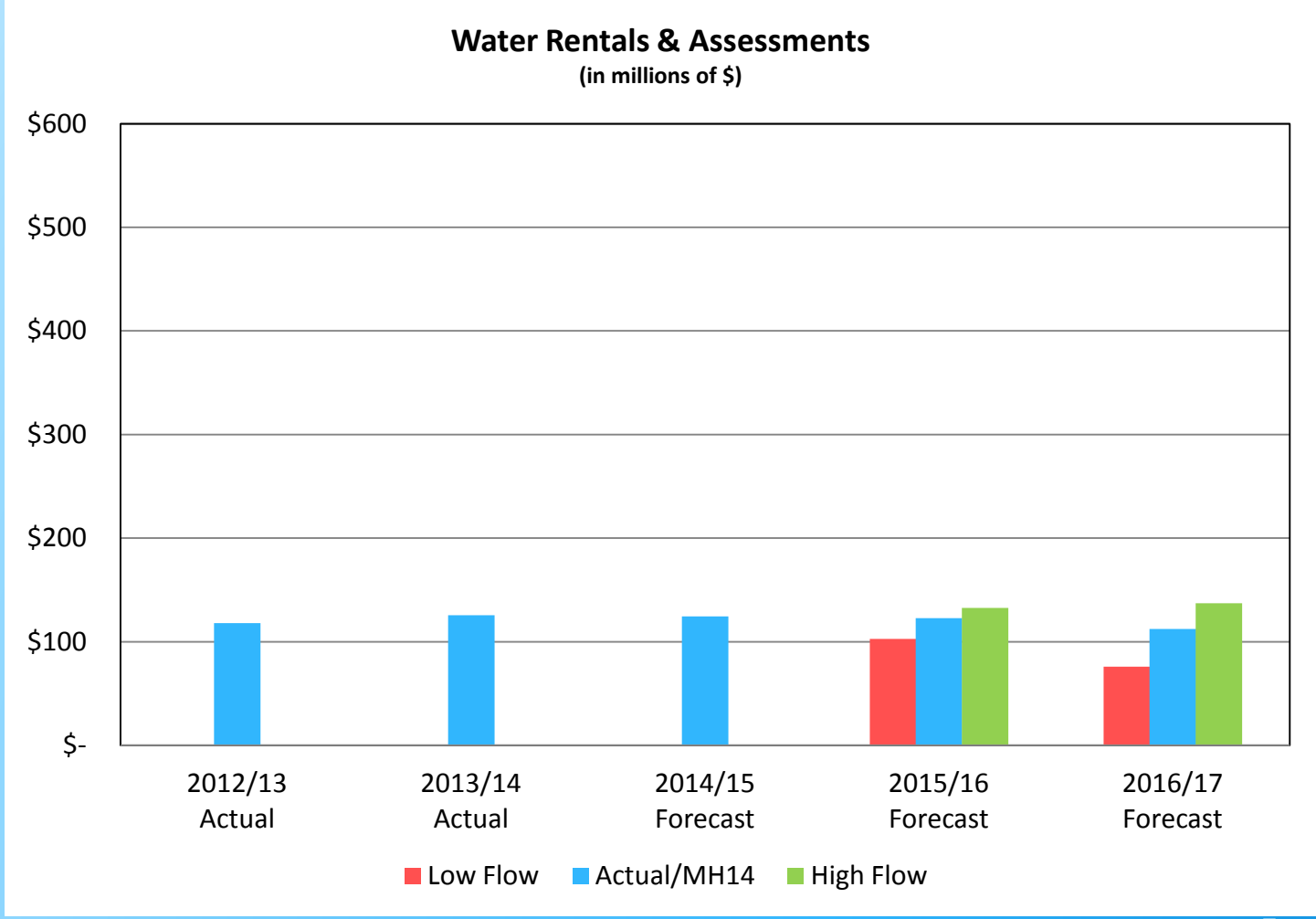
Water Rentals and Assessments – Uncertain, highly dependent on water supply



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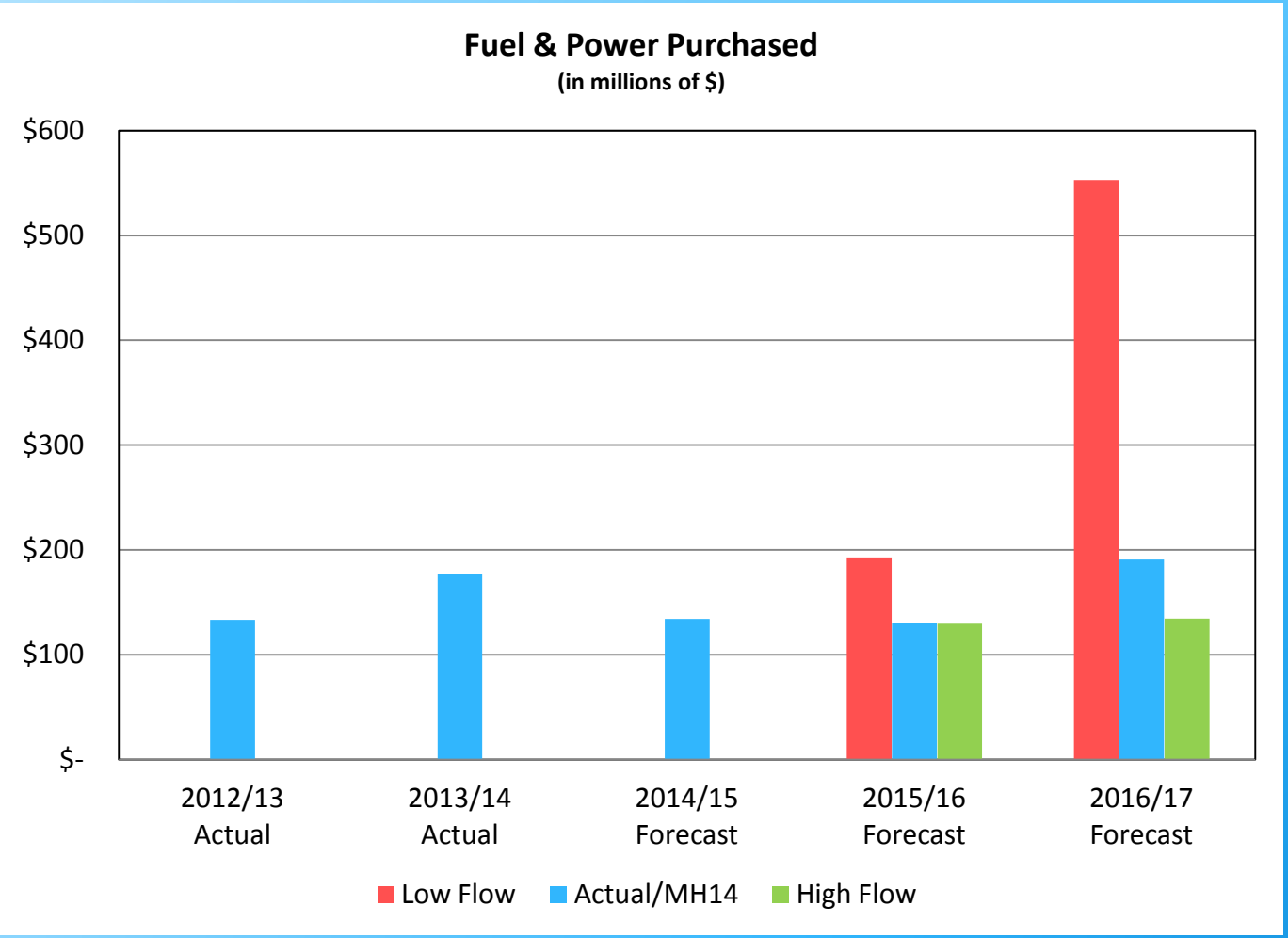
Fuel and Power Purchases – Uncertain primarily dependent on water supply



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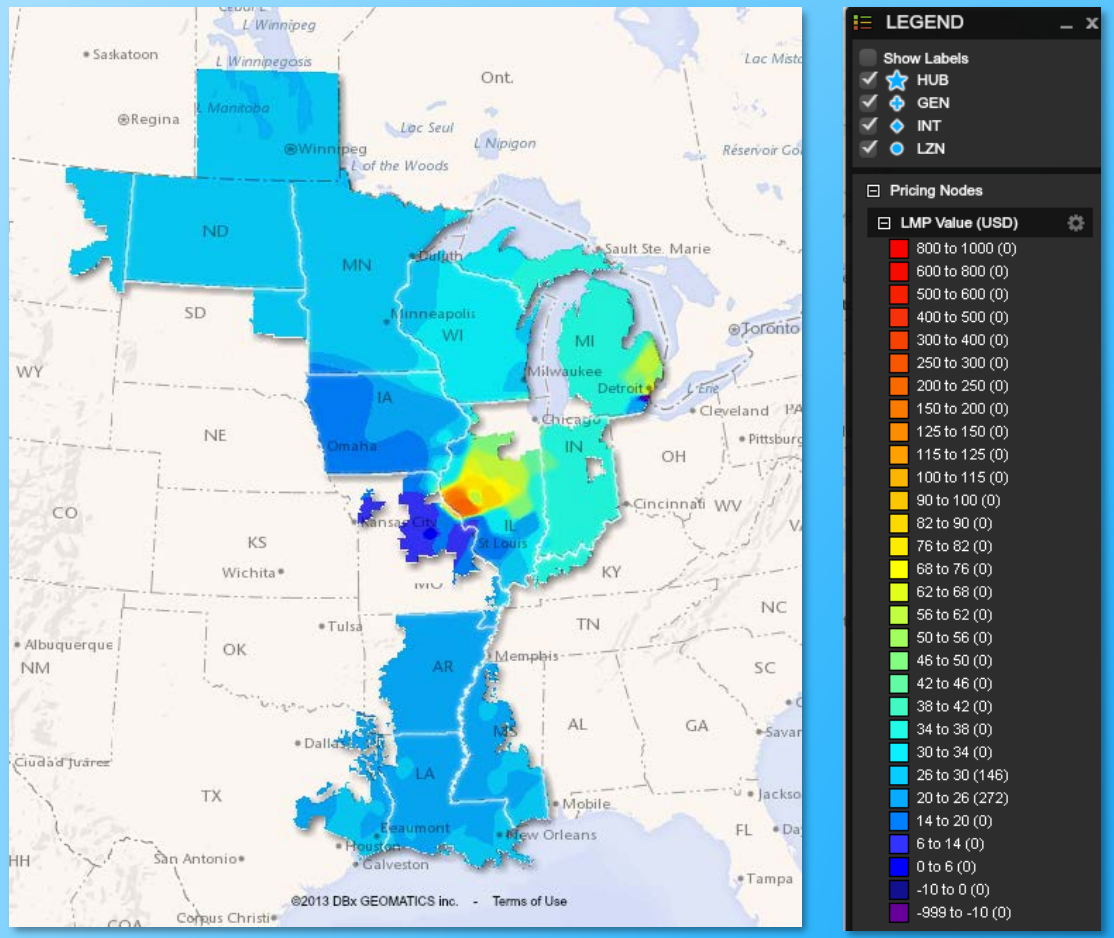
Net Export Revenues and Generation Costs – Largest Uncertainty in Early Years of IFF

- Water supply impact (low flow to high flow)
  - 2015/16 (-$180M to +$74M)
  - 2016/17 (-$500M to +$215M)
- Other uncertainties in mid-term
  - MISO market prices
  - Weather effects on load
  - Forced generation and transmission outages

Export Market and Sales Activity



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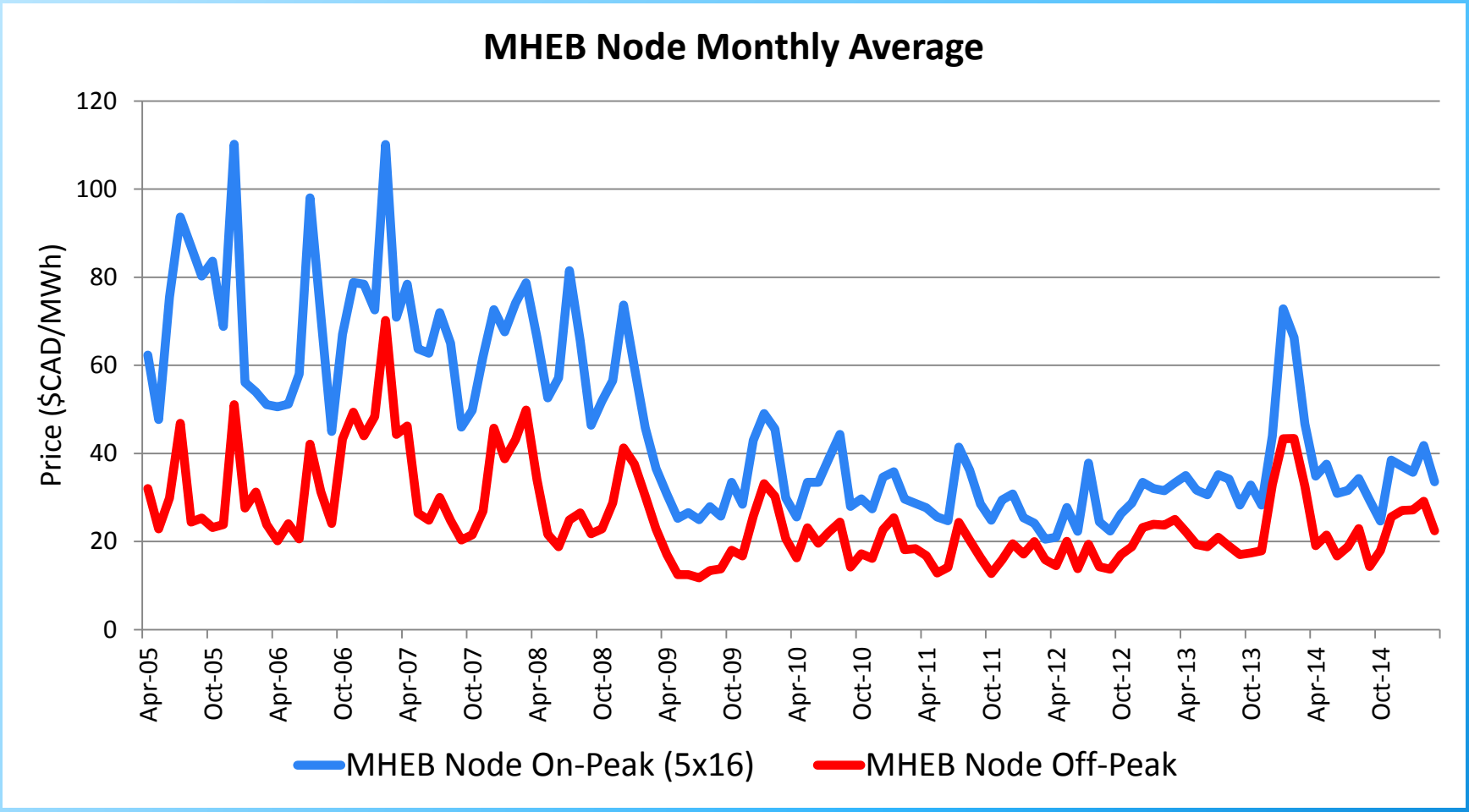
Exports – Opportunity prices remain under pressure



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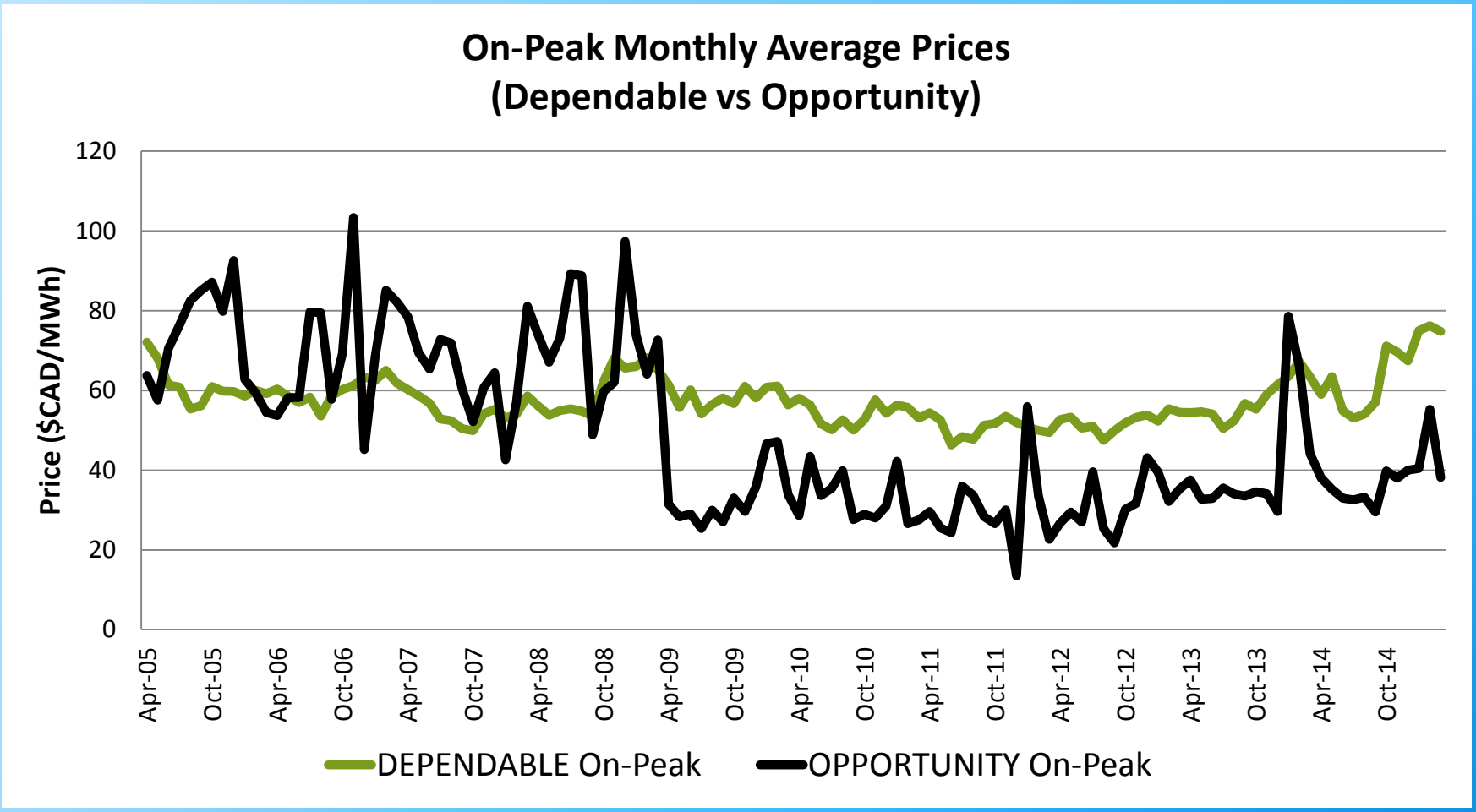
Dependable Exports – Firm contracts provide stable and predictable revenue stream



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SaskPower - 6 year sale

- 25 MW, 7d × 16hr, year around
- Capacity and Dependable Energy
- November 1, 2015 to May 31, 2022
- Serve uranium mining load in northern SK
- Attractive pricing

- Ongoing discussions on other long term opportunities

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Progress on Great Northern Transmission Line

- GNTL is the US leg of the proposed 500 kV transmission line to Minnesota
  - 883 MW of firm export capability
  - 698 MW of firm import capability
  - 2017 construction commencement, 2020 in-service date
- July 2014, MH and Minnesota Power agreed to construct the GNTL
  - 133 MW Energy Sales Agreement
  - 2014 Energy Exchange Agreement
- May 2015, Minnesota Public Utility Commission approved Agreements
  - Issued MP a Certificate of Need for the GNTL
- Remaining approvals
  - Route Permit, Presidential Permit, Wetlands Permit

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Resource Planning and Supply & Demand Overview

Terry Miles - Division Manager, Power Planning

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Major New Infrastructure

- Keeyask 2019/20
- New 500 kV US interconnection 2020/21
- BiPole III 2018/19
- IFF 14 assumes Conawapa suspended

Existing Generating System Assets

- Existing generation assets are maintained and operate at historical reliability levels through forecast period
- Brandon Unit 5 (coal) available until December 31, 2019
- Pointe du Bois operates until 2039/40

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Need for New Resources Beyond Keeyask G.S.

- 2014 Manitoba load forecast
  - The 2014 energy and winter peak capacity forecast higher than 2013 out to the 2032/33 timeframe.
- 2014 DSM assumptions 2028/29 timeframe
  - 2,797 GWh reduction in annual energy consumption
  - 582 MW reduction in winter peak load
- Persistent deficits beyond 2037/38

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Export Revenue Projections

- 2014 Electricity Export price projections
  - Over 20 year IFF period export price projections down 7% in comparison with 2013 projections
  - Export pricing assumptions do not contain any value for CO2 through 2019/20
- Factors such as continued development of renewables and higher than expected natural gas production putting downward pressure on long-term electricity export prices
- Release of EPA final rule in summer 2015
  - Longer term impact on generation mix, carbon emissions, export prices

CAPITAL INVESTMENT

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Keeyask Project

Dave Bowen, Project Manager
Keeyask Project

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Keeyask Project

- Estimated cost = $6.5 B
- Date approved = July 2014
- Construction start = July 16, 2014
- First Unit In Service Date = November 2019
- Partnership between Manitoba Hydro and the four Keeyask Cree Nations
- Consists of:
  - Keeyask Generating Station
  - Keeyask Infrastructure
  - Keeyask Generation Outlet Transmission

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Keeyask Current Progress

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Upcoming over the next year

- Efforts focused to support May 2016 first concrete
- Complete Spillway Cofferdam
- Rock excavation – Intake/Powerhouse ongoing and start spillway excavation
- Continue South Access Road construction
- Continue Main Camp Expansion
- Continue G.O.T. line Construction

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Bipole III Reliability Project

Rob Elder, Division Manager,
Bipole III Project

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Bipole III Project

- Environmental Act Licence Received August 14, 2013
- Construction started September 2013
- Budget = $4.65 B/ July 2018 ISD
- Consists of:
  - Keewatinohk Converter Station
    - 80 Km North East of Gillam Manitoba
  - Keewatinohk Construction Camp
    - 600 man construction camp
  - HVDC Transmission Line
    - ~1400 km transmission line
  - Riel Converter Station
    - Rural Municipality of Springfield
  - 2 Ground Electrodes

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Bipole III Control Budget

- Bipole III Control Budget of $4.65B established September 2014
- Process to establish Control Budget started April 2014.
- Key drivers for revised Control Budget:
  - HVDC bids received & technology selected (June 2014)
  - Signing of Keewatinohk AC Switchyard Contract (June 2014)
  - Completion of 1st major winter construction season

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Bipole III Progress

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Bipole III Progress

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Upcoming over the next year

- KCS/RCS HVDC mfg. & construction
- KCS Switchyard mfg. & construction
- KCS/RCS Auxiliary building construction
- RCS Synchronous Condenser design
- Transmission Line Construction:
  - Complete existing clearing/foundation work
  - Complete collector line work
  - Award/execute remaining foundation contracts
  - Award/execute transmission line construction contracts.

Sustaining Capital Investment and Prioritization Framework

Generation, Transmission, Distribution

Nick Read - Manager, Generation Maintenance Engineering
Dr. David Swatek - Manager, System Planning (Transmission)
Michel Morin, Manager, Distribution Asset Maintenance
Sandy Bauerlein – Corporate Controller

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Manitoba Hydro Needs to Re-Invest in Assets

- Aging assets and capacity are the largest contributors to the decline in reliability performance
- Existing reinvestment rates are not adequate to replace assets before end of life or to meet load growth
- Increased capital investment is now required

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Required investment in Canada's electricity system 2011-2030

Source: Conference Board of Canada

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Background

- Majority of system components were installed between the **1910's - 1970's**

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Current Status

- Past installations are coming due for replacement; examples:
  - Transformers
  - Generators
  - HVDC Valve Groups
  - Wood poles
  - Cables

- Although installed decades apart, these assets are reaching end of life at the same time

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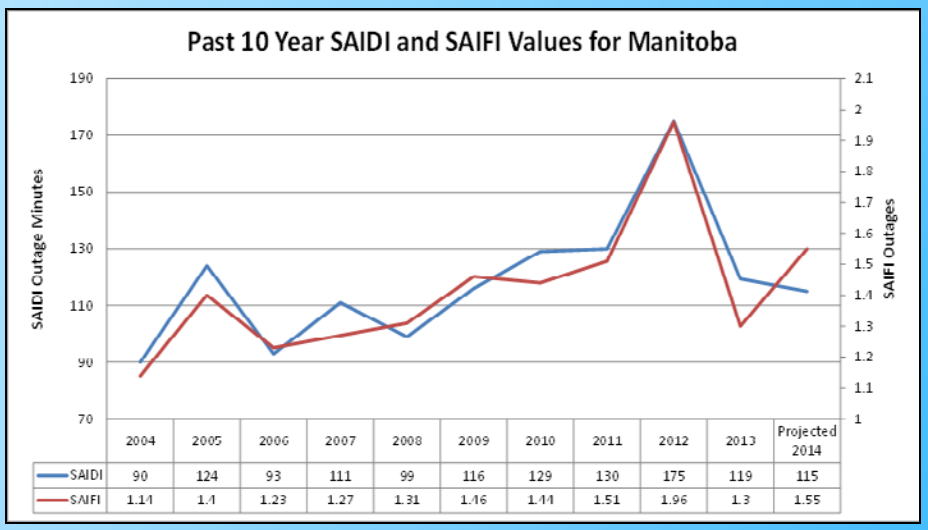
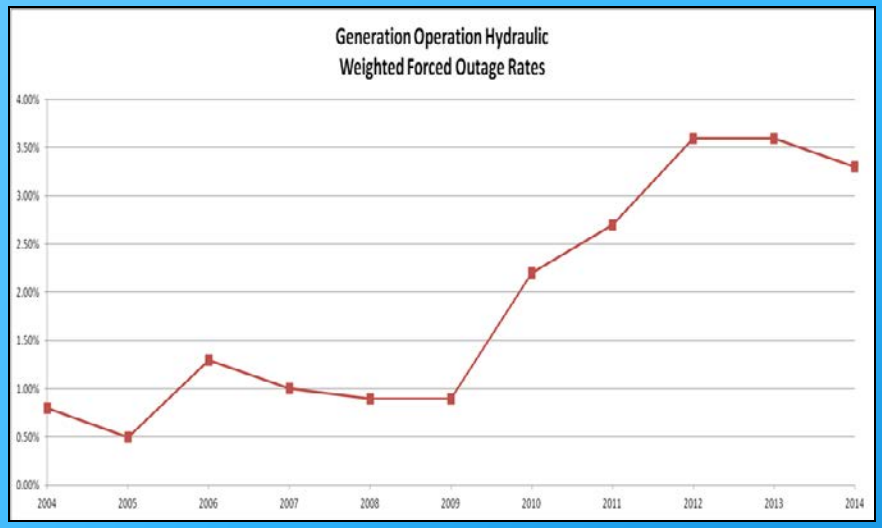
Rate Increases Needed to Maintain Reliable Service for Manitoba Hydro Customers

SAIDI and SAIFI Indicators



Hydraulic Generation Forced Outage Rates



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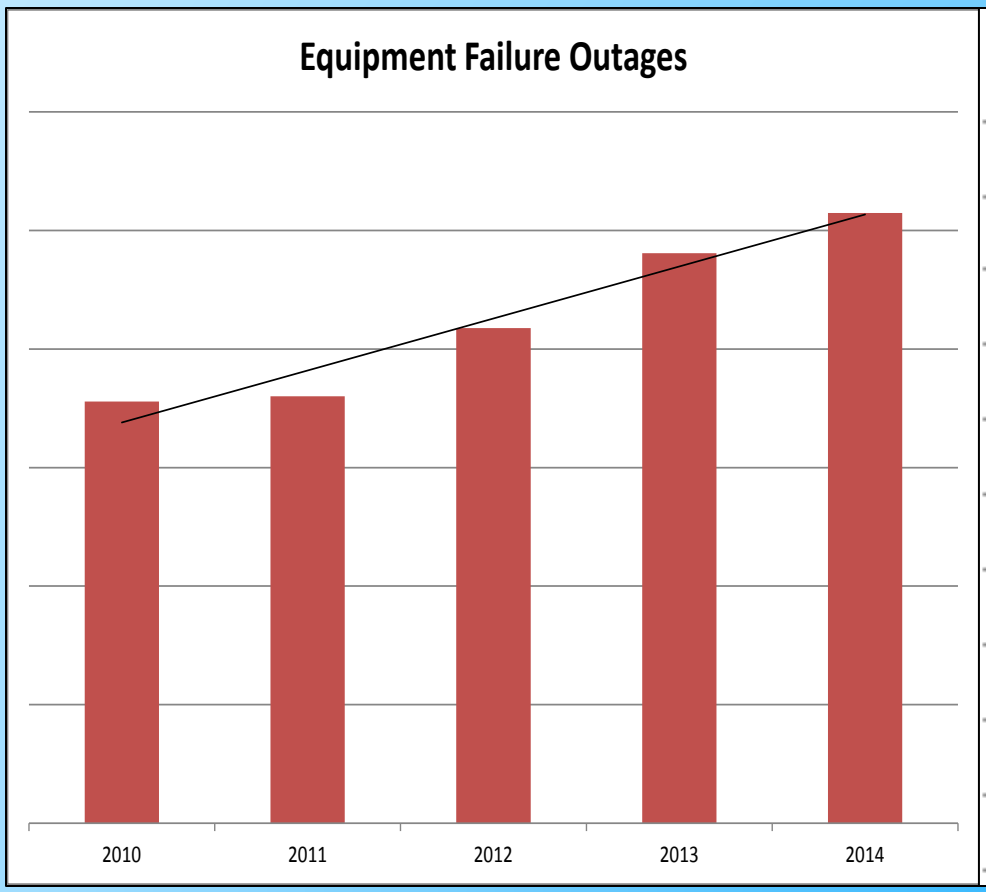
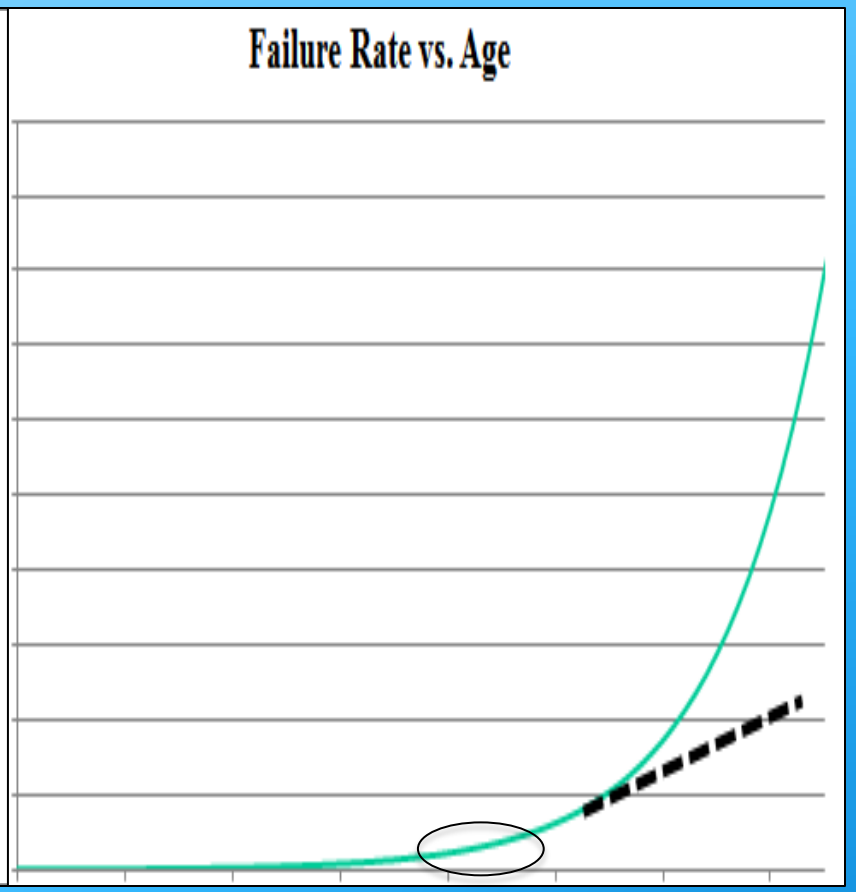
Equipment Failures are Increasing





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Aging Infrastructure

- The Asset Condition Report was developed to help illustrate the impacts of Aging Infrastructure
- Manitoba Hydro does not replace assets based solely on age
- Assets are replaced on risk and/ or economics
- Age in conjunction with current assessment data is used for long term planning
- Manitoba Hydro's prudent asset management strategies have allowed many assets to remain in-service well beyond industry norms

Asset Replacement
Generation

Asset Type	Life Expectancy (years)	Turnover (years)
Generators	60	117
Hydraulic Turbines	90 - 100	84
Exciters	50 - 90	117
Governors	20 - 125	50
Breakers	60 - 65	129
Transformers	40 - 70	150

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Examples of Generation Assets in Very Poor Condition

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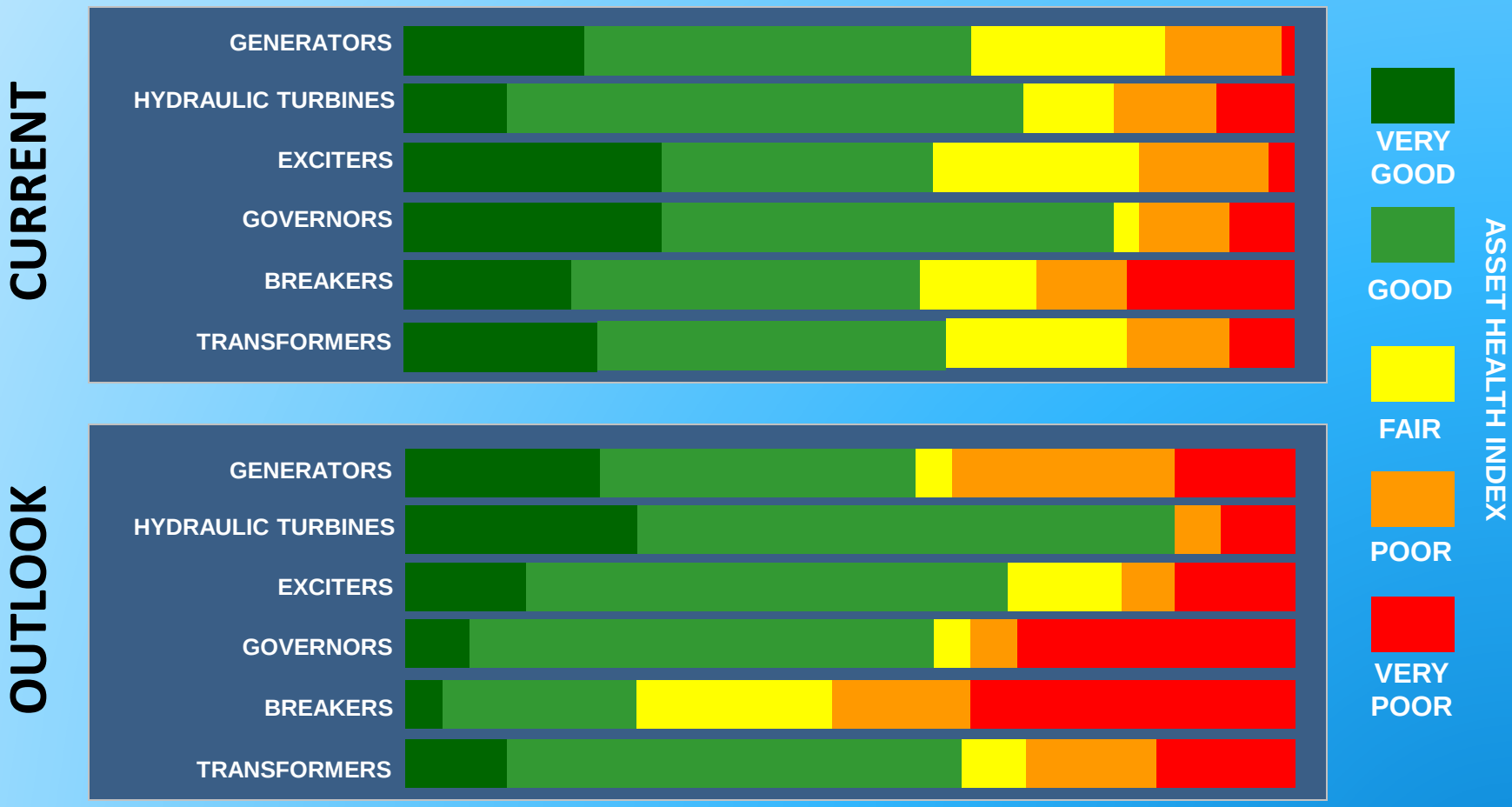
Generation - 20 Year Outlook

Generation Current and Outlook



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Asset Replacement
Transmission

Asset Type	Life Expectancy (years)	Turnover (years)
Transmission Breakers	60 – 65	149
HVDC Breakers	60 – 65	58
Transmission Transformers	40 – 70	152
HVDC Transformers	40 – 70	70
Transmission Structures	85	285
Transmission Wood Poles	75	255
Transmission Overhead Conductor	85	410
HVDC Converter Transformers	40 – 50	73
HVDC Valve Group	25	48
HVDC Synchronous Condensers	65	65
HVDC Shunt Reactors	35	55
HVDC Smoothing Reactors	25	30

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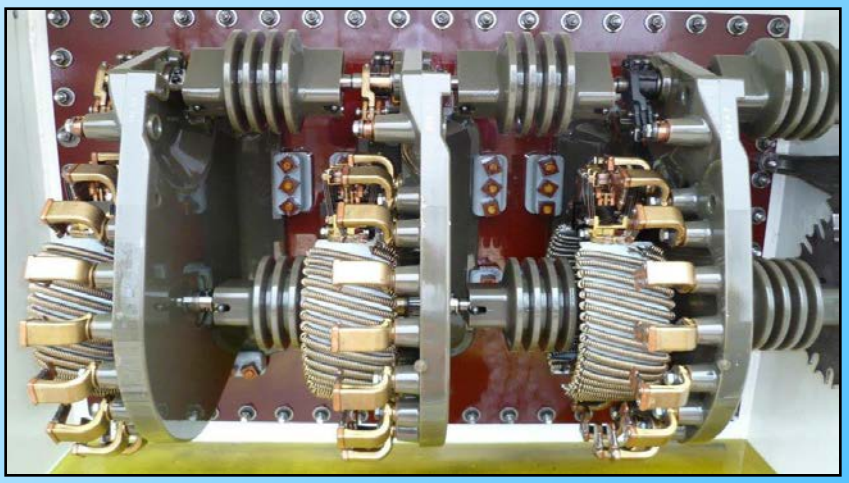
Examples of Transmission Assets in Very Poor Condition



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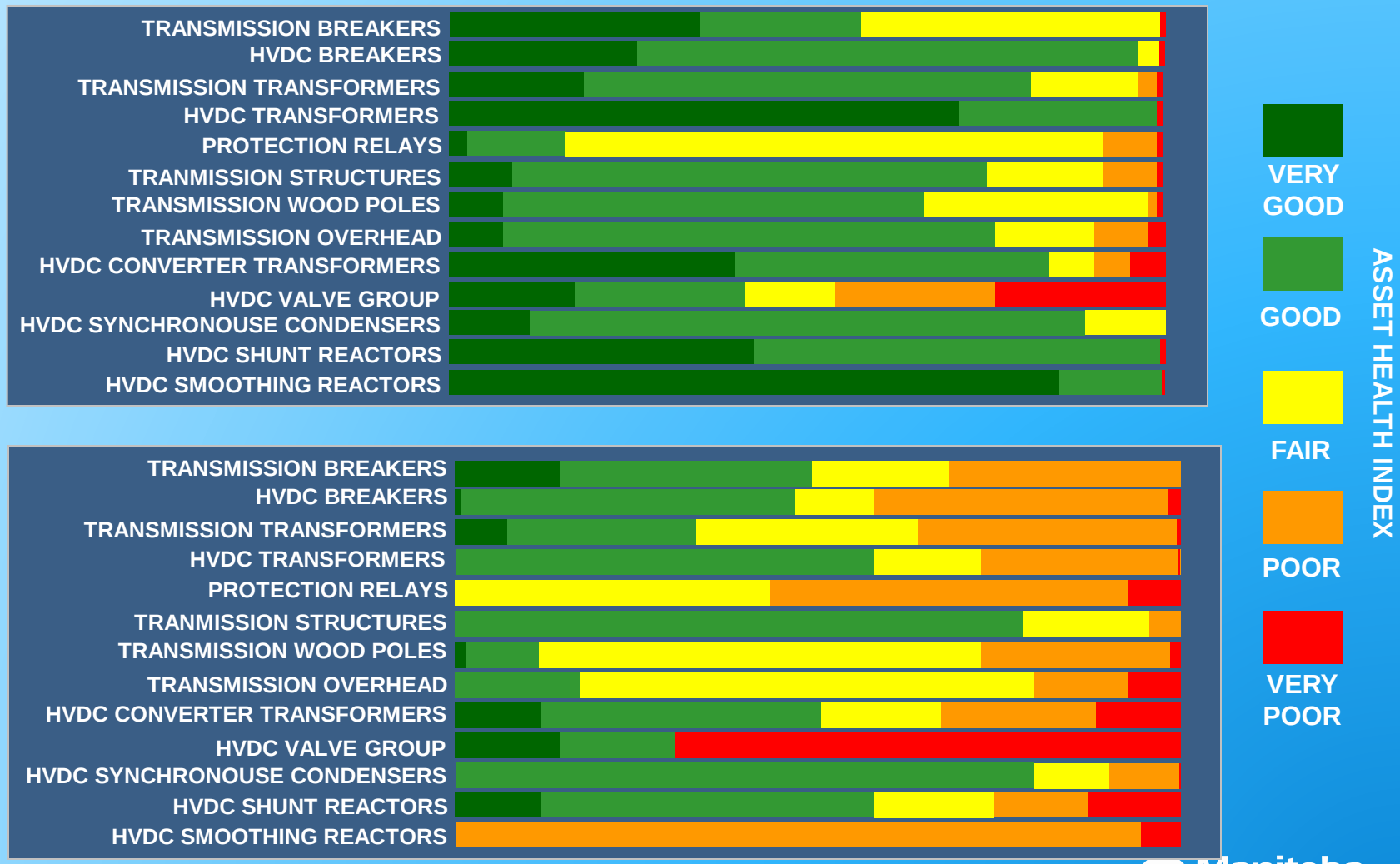
Transmission - 20 Year Outlook

Transmission Current and Outlook



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Asset Replacement

Distribution

Asset Type	Life Expectancy (years)	Turnover (years)
Station Breakers	60 – 65	180
Station Transformers	40 – 70	370
Underground Cables	30 – 70	328
Manholes	80	500
Ductlines	100	378
Padmount Transformers	50	70
Wood Poles	70	200
Overhead Conductors	100	200
Overhead Transformers	75	70
Street Lights	50 – 70	100

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Examples of Distribution Assets in Very Poor Condition

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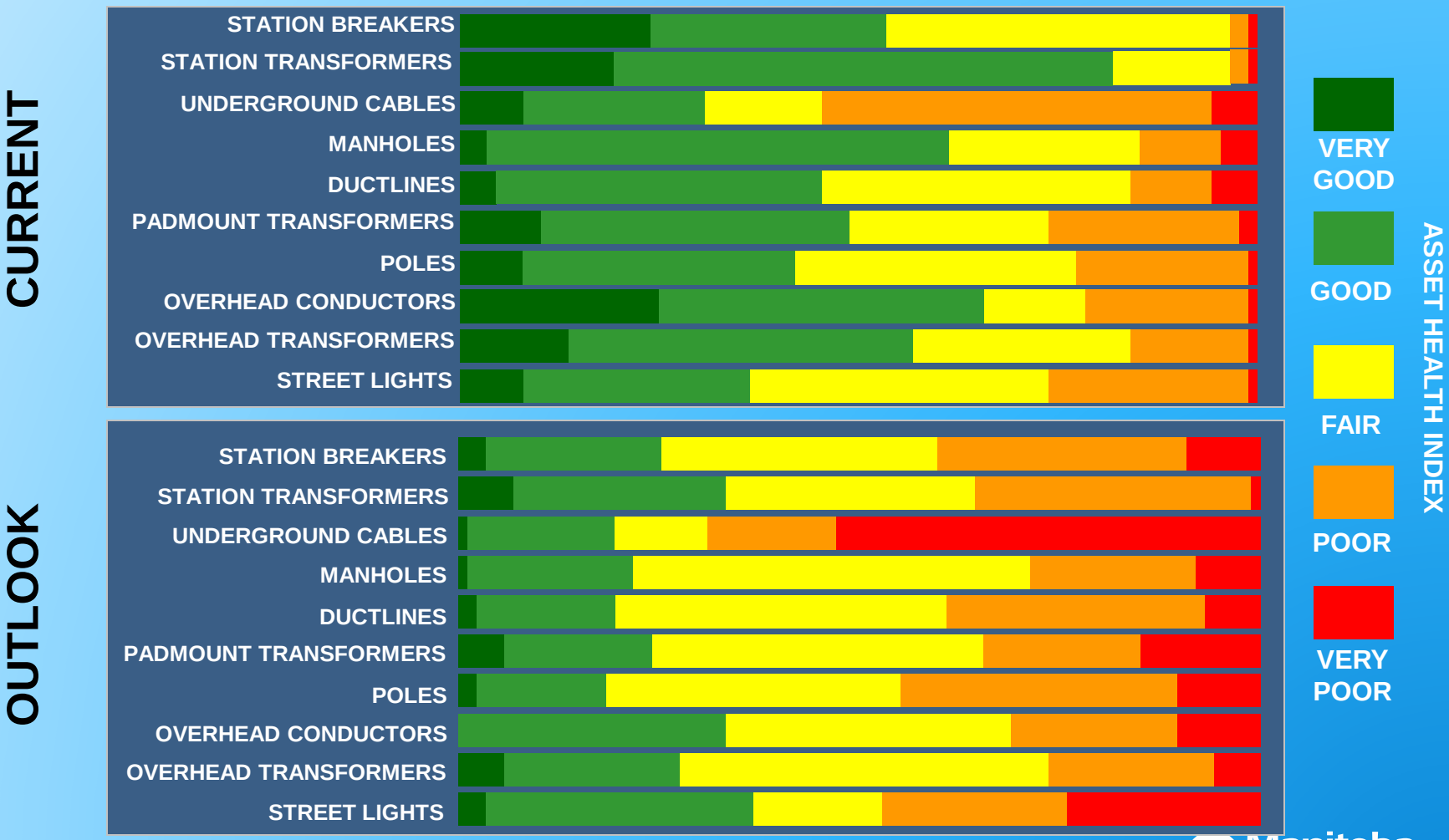
Distribution - 20 Year Outlook

Distribution Current and Outlook



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Potential Outcome

Large population of assets in Poor and Very Poor condition will result in:

- Reduction in reliability
- Reduced revenues
- Increased safety risks to public and staff
- Backlog will overwhelm resources
- Increased maintenance costs
- Increased emergency cost and consequential damages

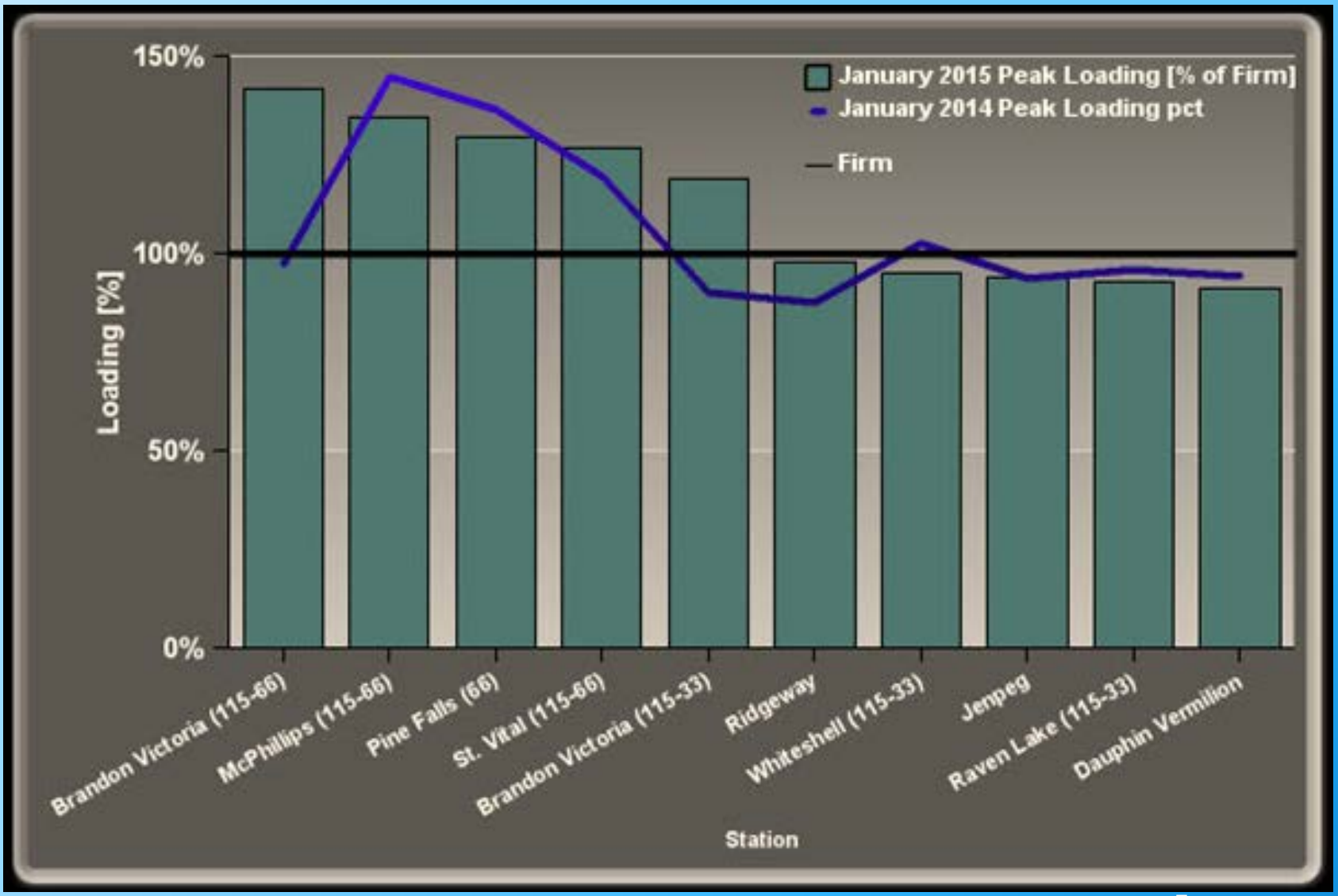
System Capacity Limits are being Exceeded

- **Transmission and Distribution:**
  - Province wide issue
  - Continued economic growth requires more electrical capacity for business and industry
  - Greater number of residential starts per year
  - Increased consumption per household
  - Peak demand is continually growing

Transmission Capacity

- **Firm capacity**
  - "N – 1"
  - Load growth erodes firm capacity
- **Capacity constraints are limiting growth**
  - Lake Winnipeg East
  - Steinbach
  - Morden/ Winkler
  - Winnipeg
  - Brandon

Most Heavily Loaded Transmission Stations



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Transmission Capacity

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Substations

King St. Station built in 1915 (Top left)

Watt St. Station built in 1953 (Bottom right)

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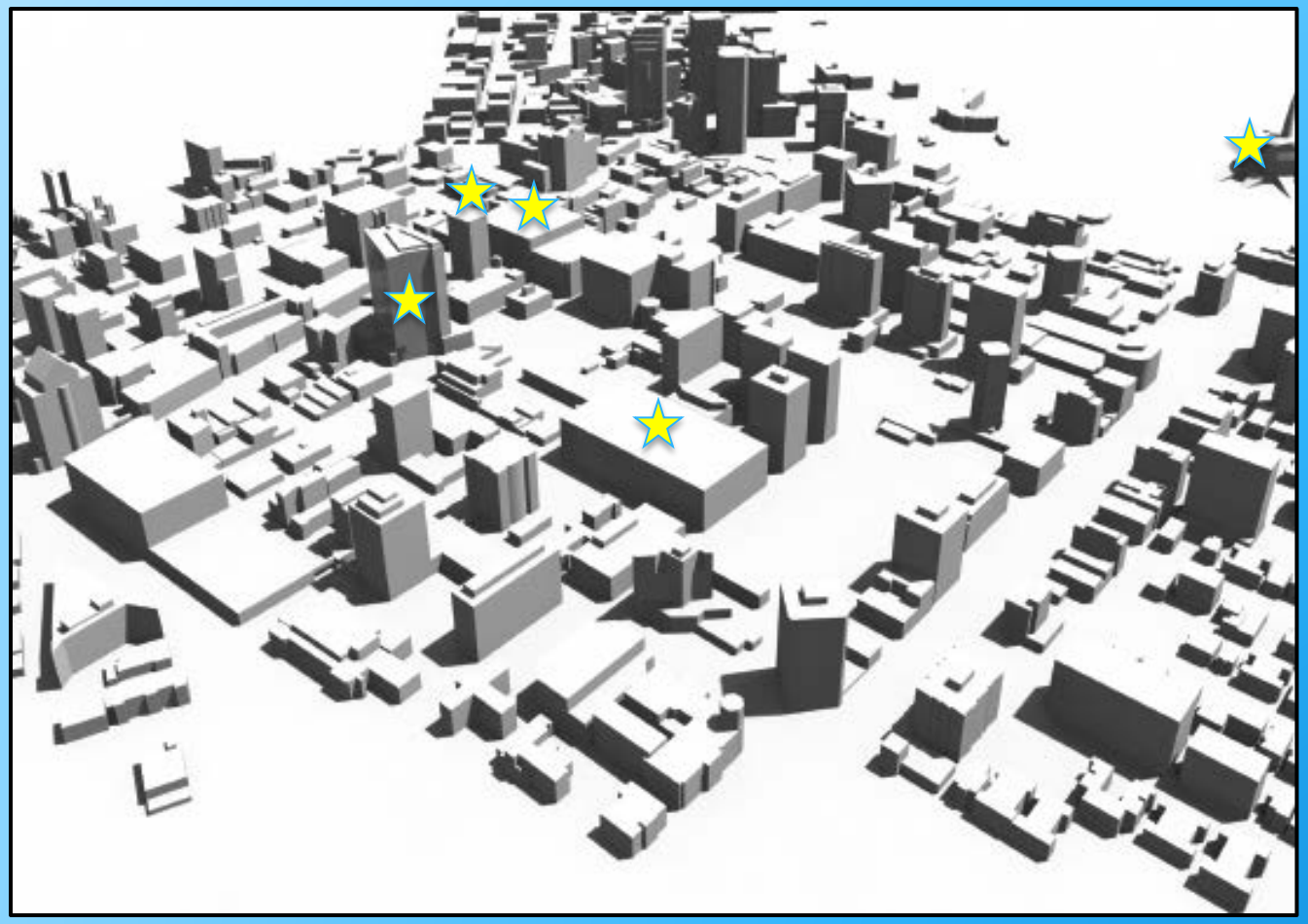
Current Downtown Winnipeg



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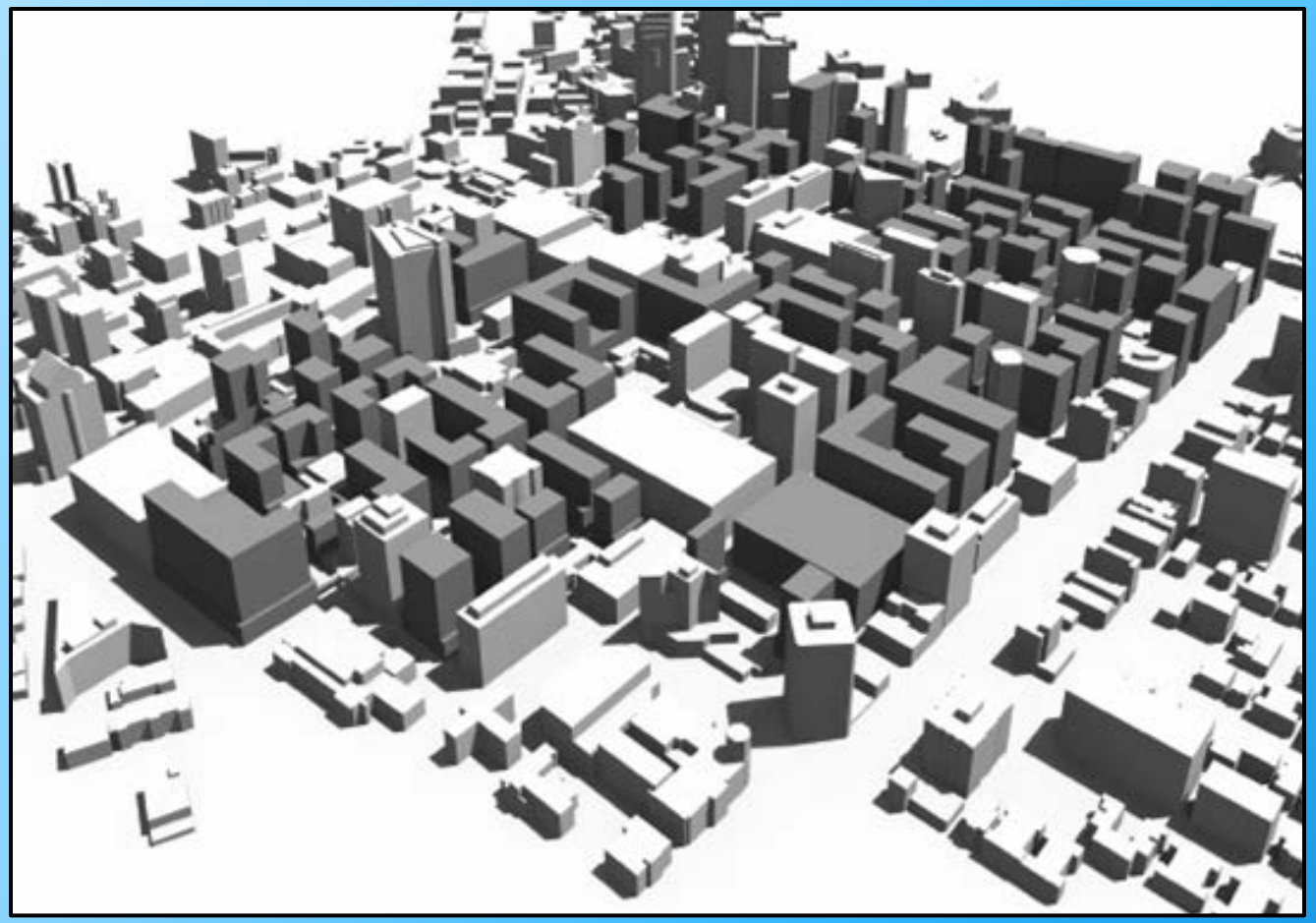
Load in Winnipeg is Exceeding Capacity



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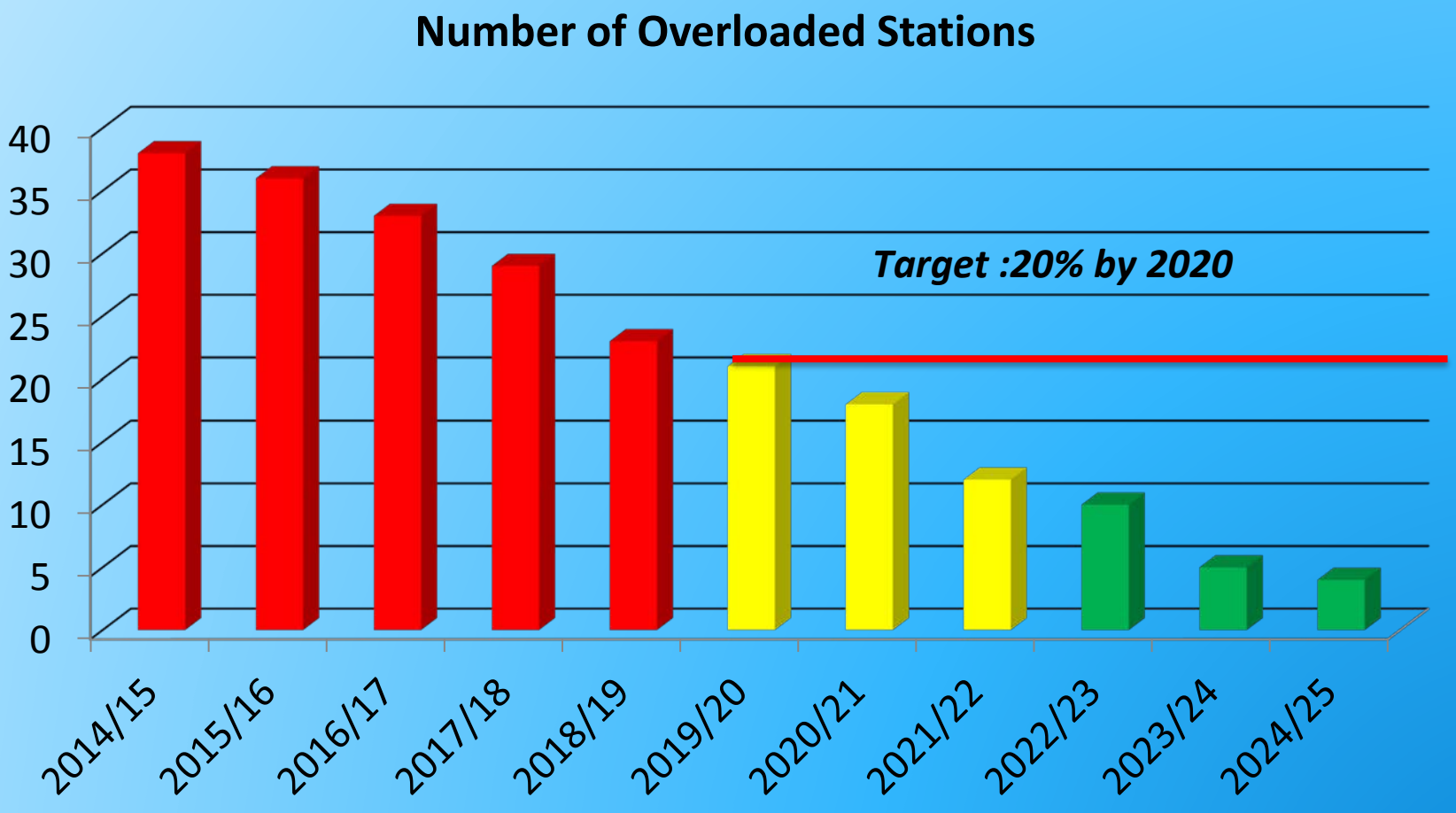
Overloaded Stations in Winnipeg



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Investment is Important for Public Safety

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Investment is Important for Public Safety

- Video Clips:
  - Manhole explosion footage
  - Transformer bank explosion footage

Summary

- Aging assets and capacity are the largest contributors to the decline in reliability performance
- Existing reinvestment rates are not adequate to replace assets before end of life or to meet load growth
- Increased capital investment is now required

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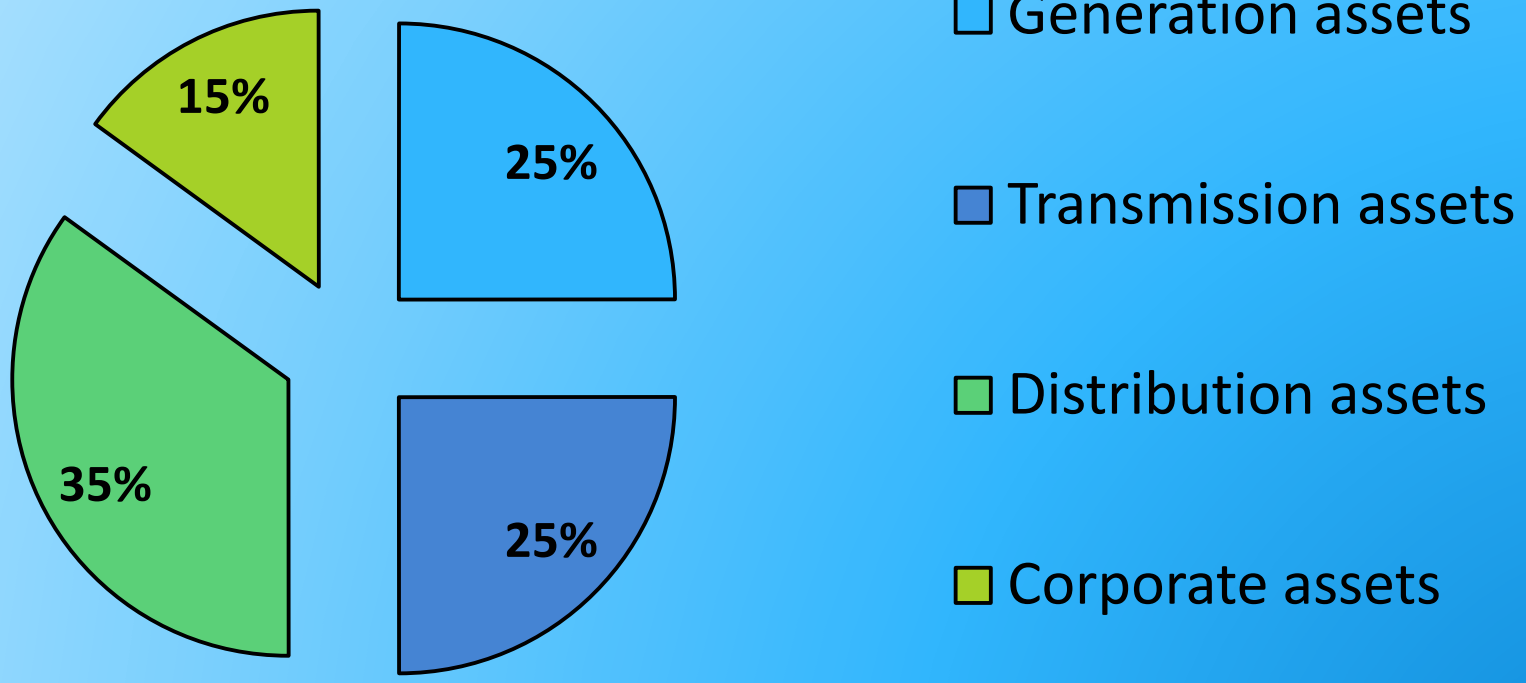
Sustaining Capital Investments

- $5.7 billion over the next ten years
- Asset portfolio allocation:



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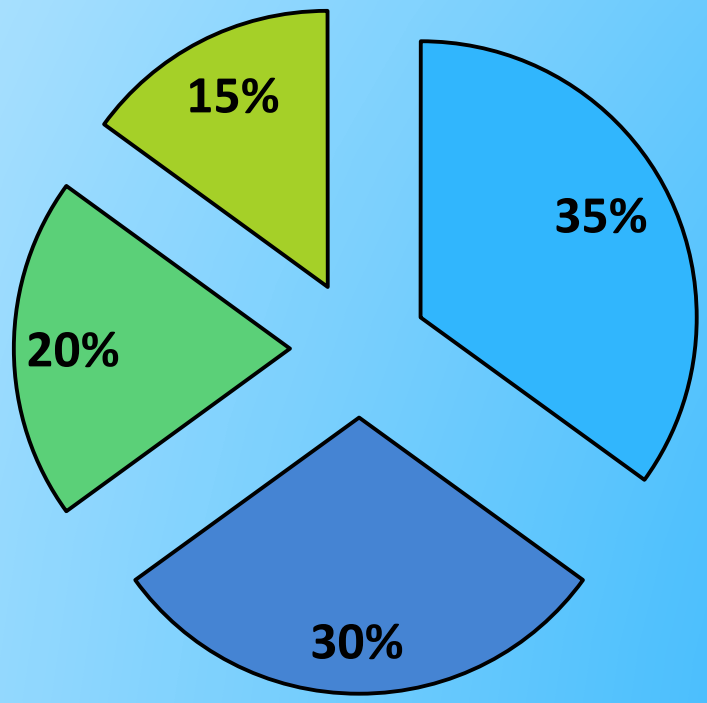
Sustaining Capital Investments: Generation

- $1.3 billion over the next ten years
- Asset portfolio allocation:



- Replacement of key drive-train assets
- Wpg River generation plant overhauls
- Mitigation of environmental and safety risks
- Restoration of smaller generation assets

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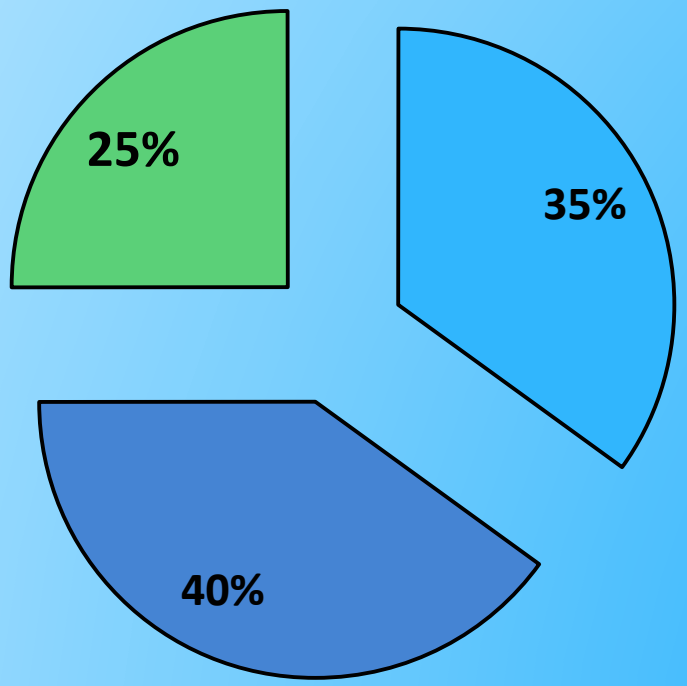
Sustaining Capital Investments: Transmission

- $1.3 billion over the next ten years
- Asset portfolio allocation:



- High Voltage Direct Current sustainment
- Transmission system capacity
- Transmission system sustainment

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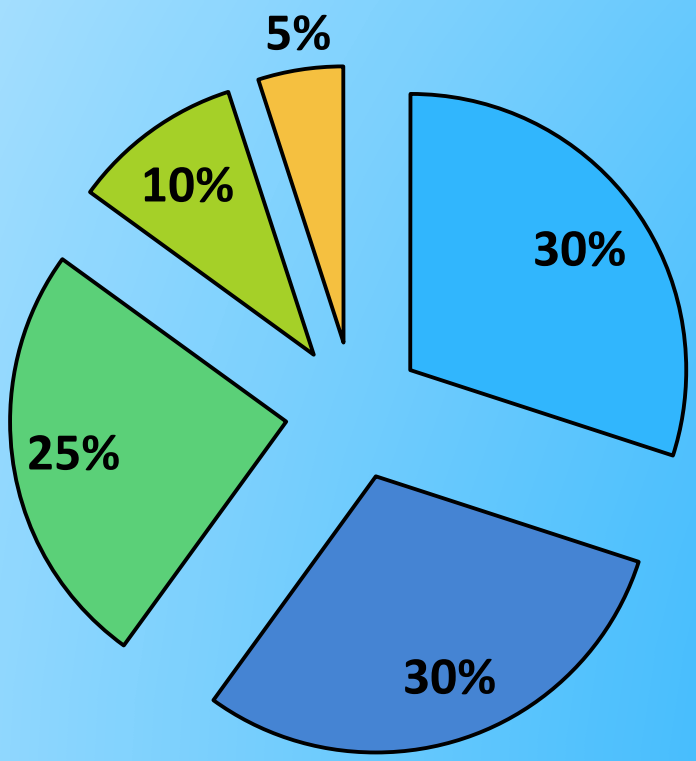
Sustaining Capital Investments: Distribution

- $2.2 billion over the next ten years
- Asset portfolio allocation:



- Distribution system capacity requirements
- Aging distribution infrastructure
- Supporting new customer growth
- Rural station and feeder development
- Distribution technology modernization

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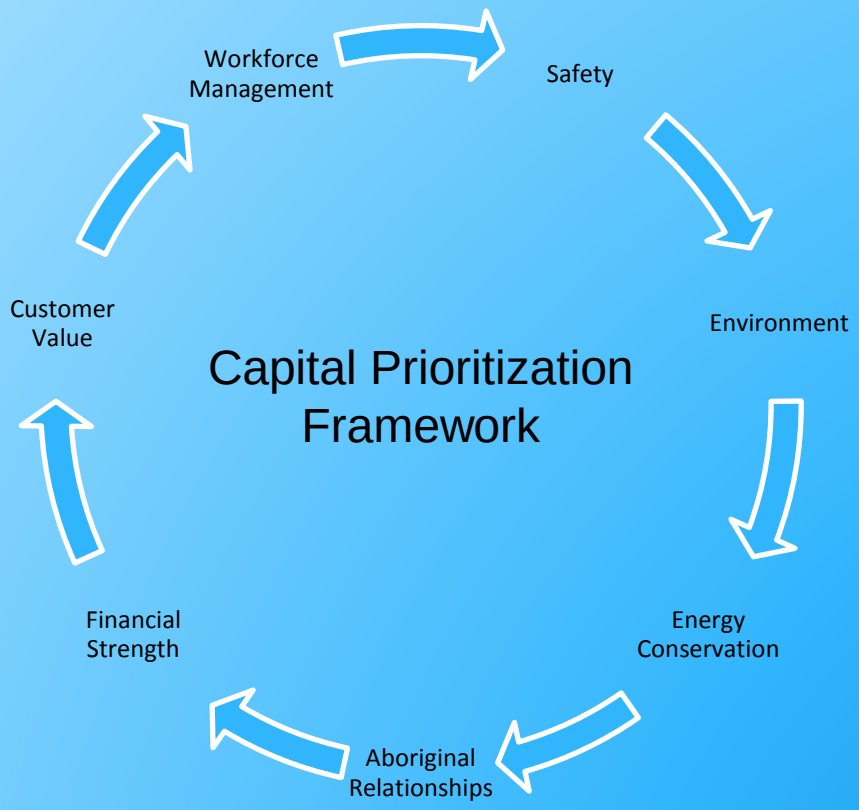
Capital Investment Prioritization



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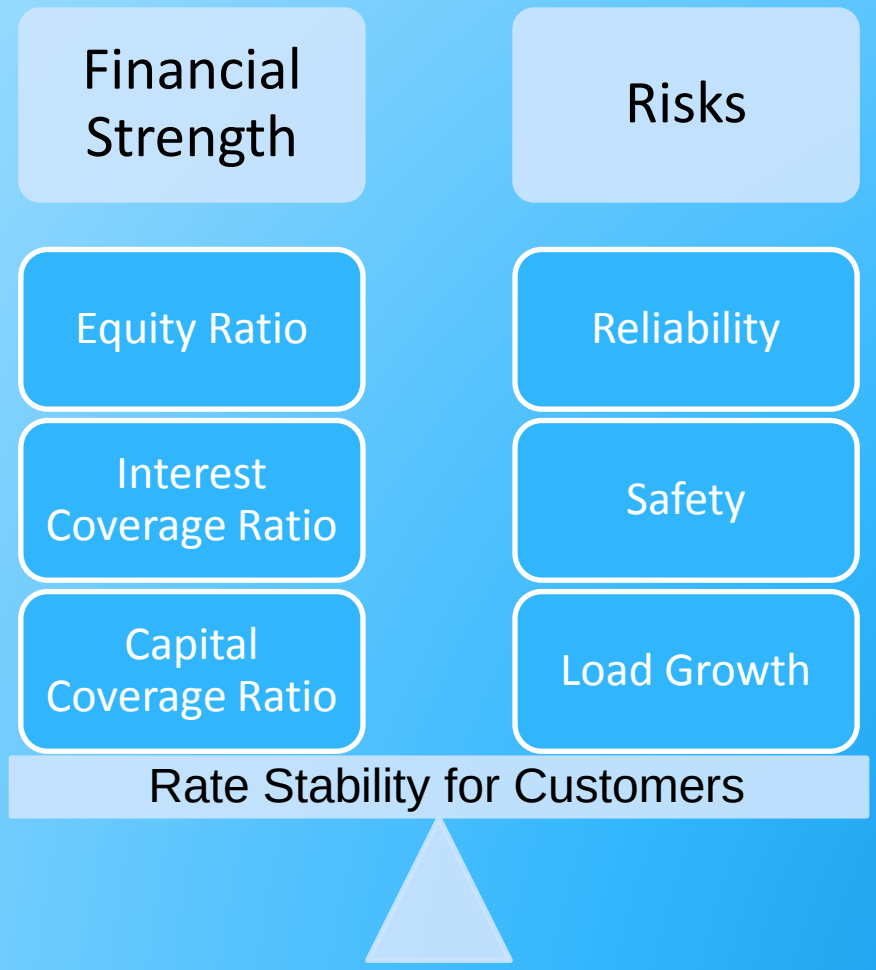
Balance Financial Strength and Risks



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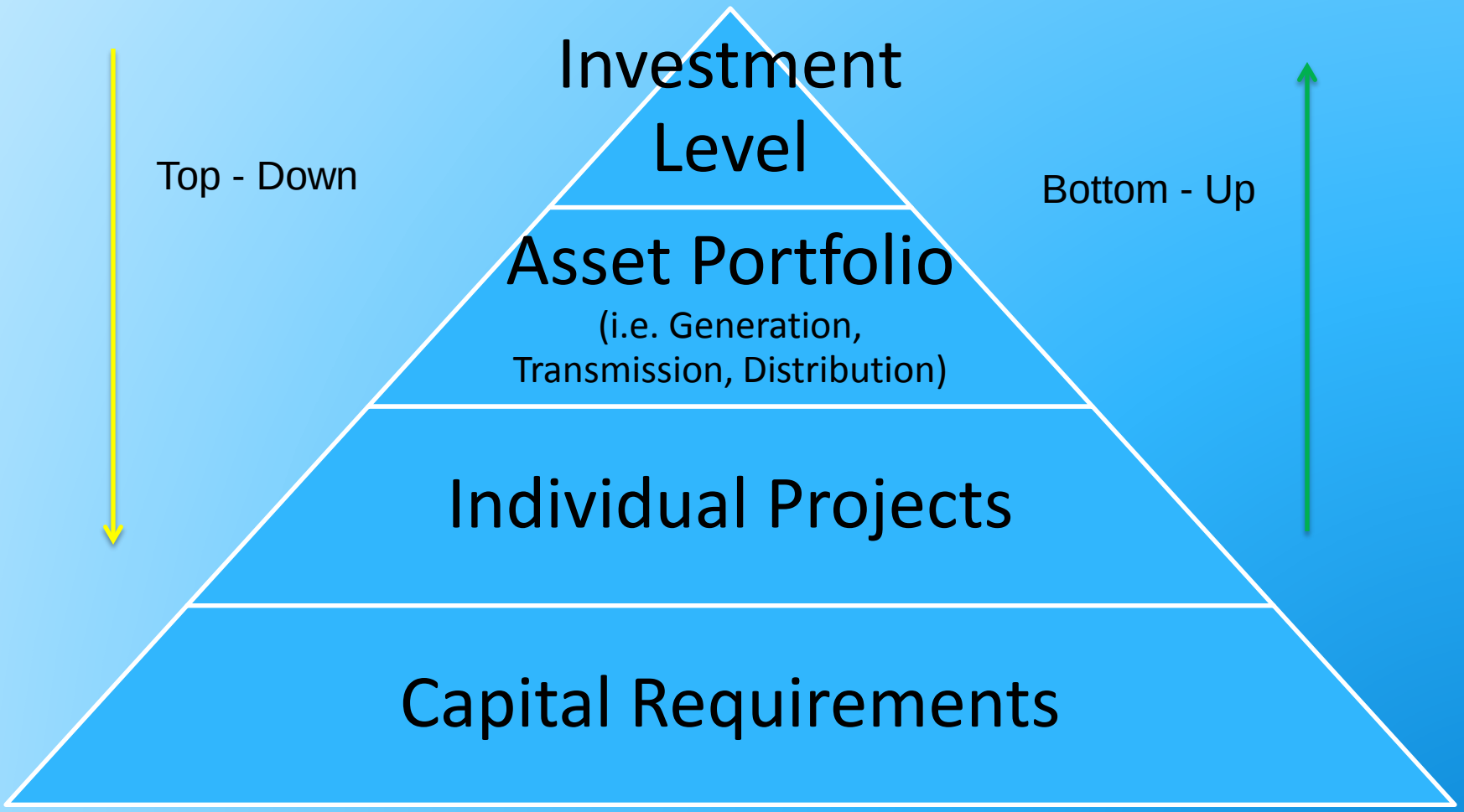
Levels of Capital Prioritization



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Why a Portfolio Approach

- Comparing apples, oranges and pears
- Differences
  - Risk factors
  - Number of assets
  - Geographic disbursement
  - How assets are operated and maintained
- Mandate to connect new customers
- Requirement to provide reliable service

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Capital Prioritization Framework Advantages

- Maximizes value
  - Considers long-term planning objectives
  - While addressing short term challenges
- Flexible to accommodate unexpected risks
- Addresses changing priorities and reallocate $
- Collaborative and a continuous process
- Aligns organizational structures with asset groups

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THANK YOU

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