

# University Energy Management: Intelligent Financing

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Sustainable Laboratories Regional Workshop

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# UAlberta Context

- Public university, est. 1908
- 15,000 staff and faculty
- 38,000 students
- 5 mostly urban campuses
  - 1,748,479 m<sup>2</sup> gross area

24% Office  
& Classroom

11% Phys.  
Ed & Misc.

47% Science  
& Lab

10%  
Residences

10% Parking

- Committed to sustainability



Old Arts Building



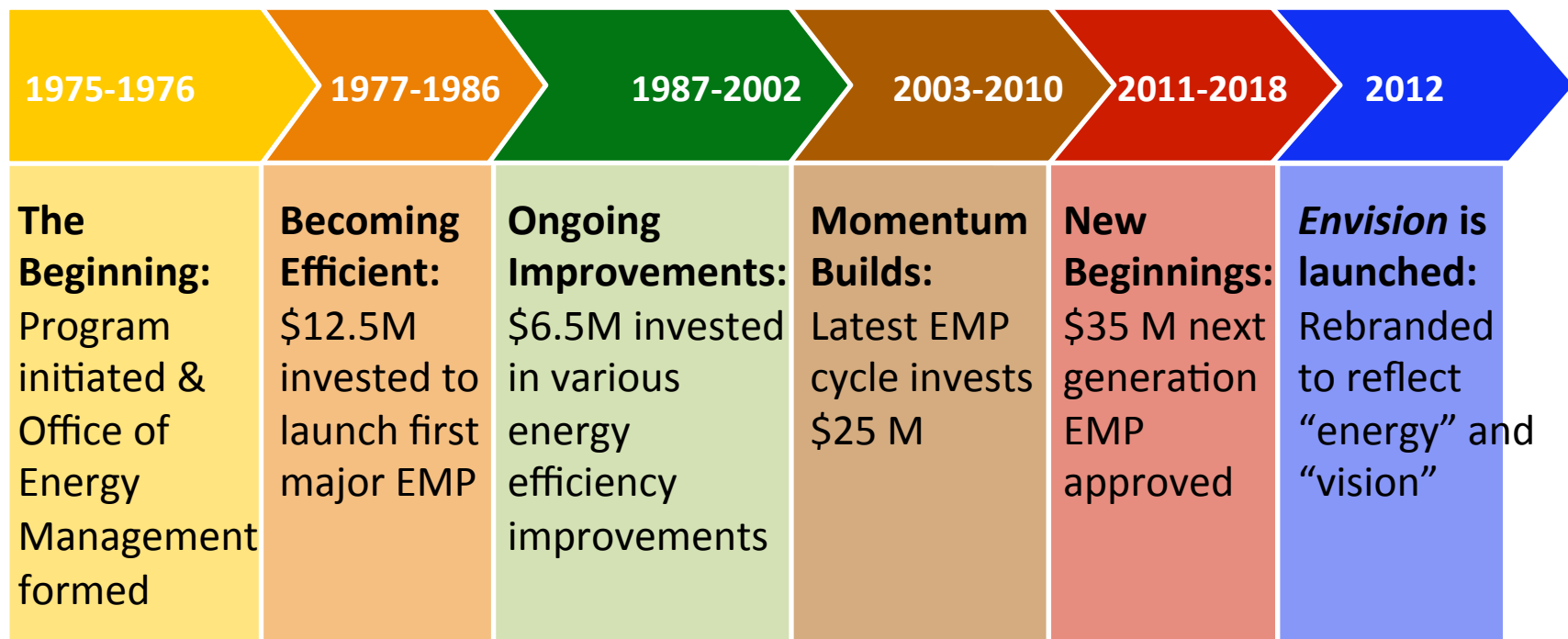
# Sustainability Indicators, Reporting, Certifications



- ✦ Sustainability Commitment & Guiding Principles
- ✦ Academic Plan & Sustainability companion document
- ✦ Comprehensive Institutional Plan
- ✦ Sustainability Plan
- ✦ GHG Inventory/Reduction Plan
- ✦ Energy Reduction Plan (2011-2017)

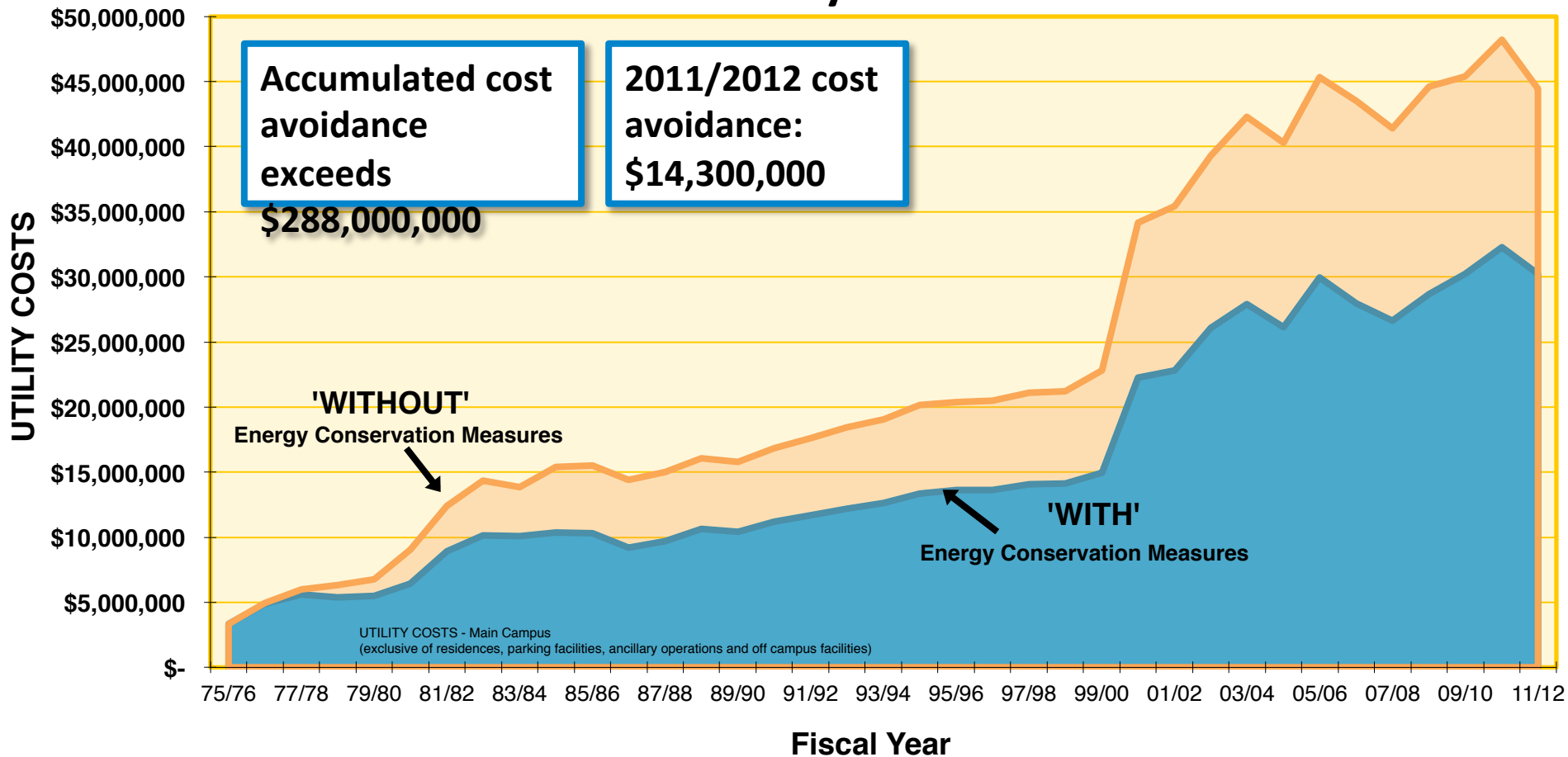


# Long Term Investment in Energy Management



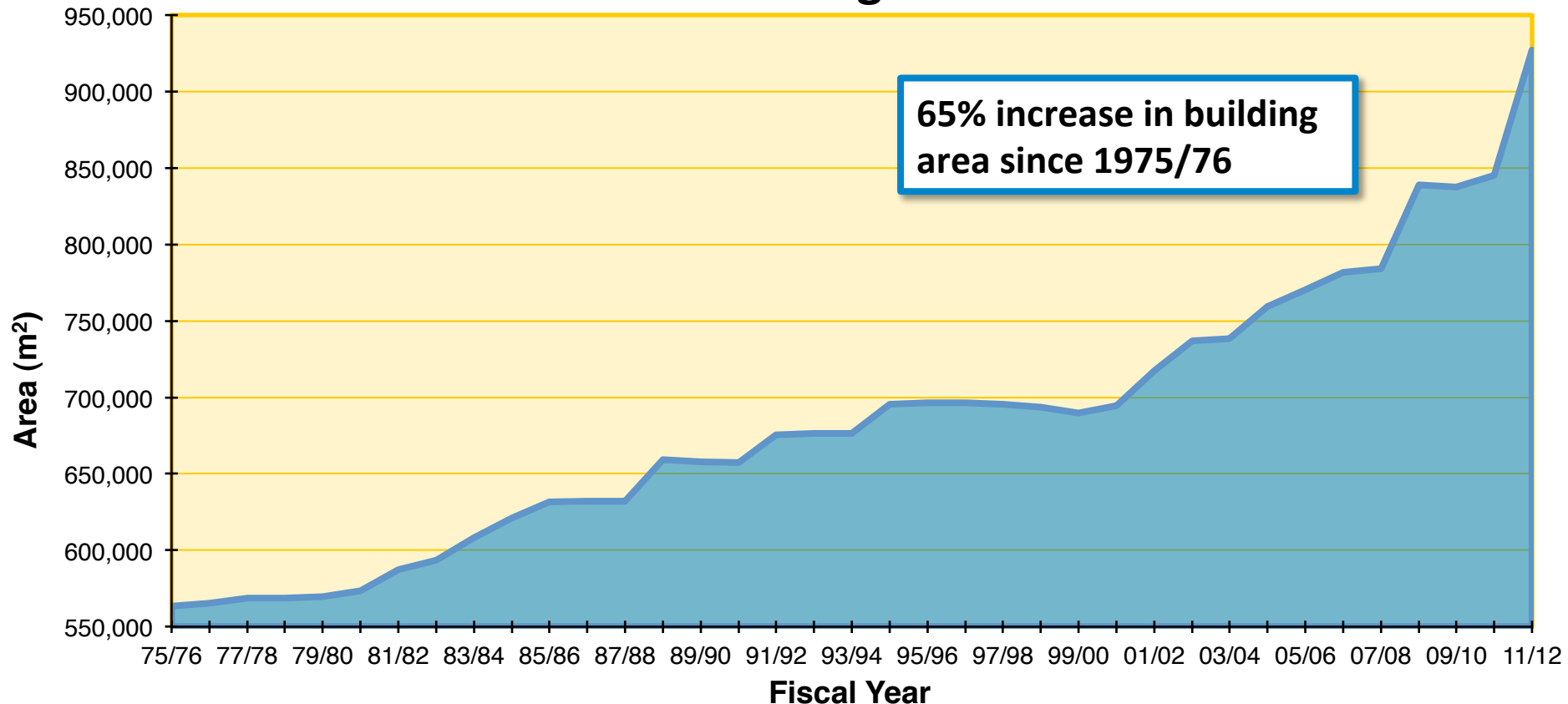
# Significant Savings Drive Continuous Improvements

## Utility Costs



# Significant Savings Drive Continuous Improvements

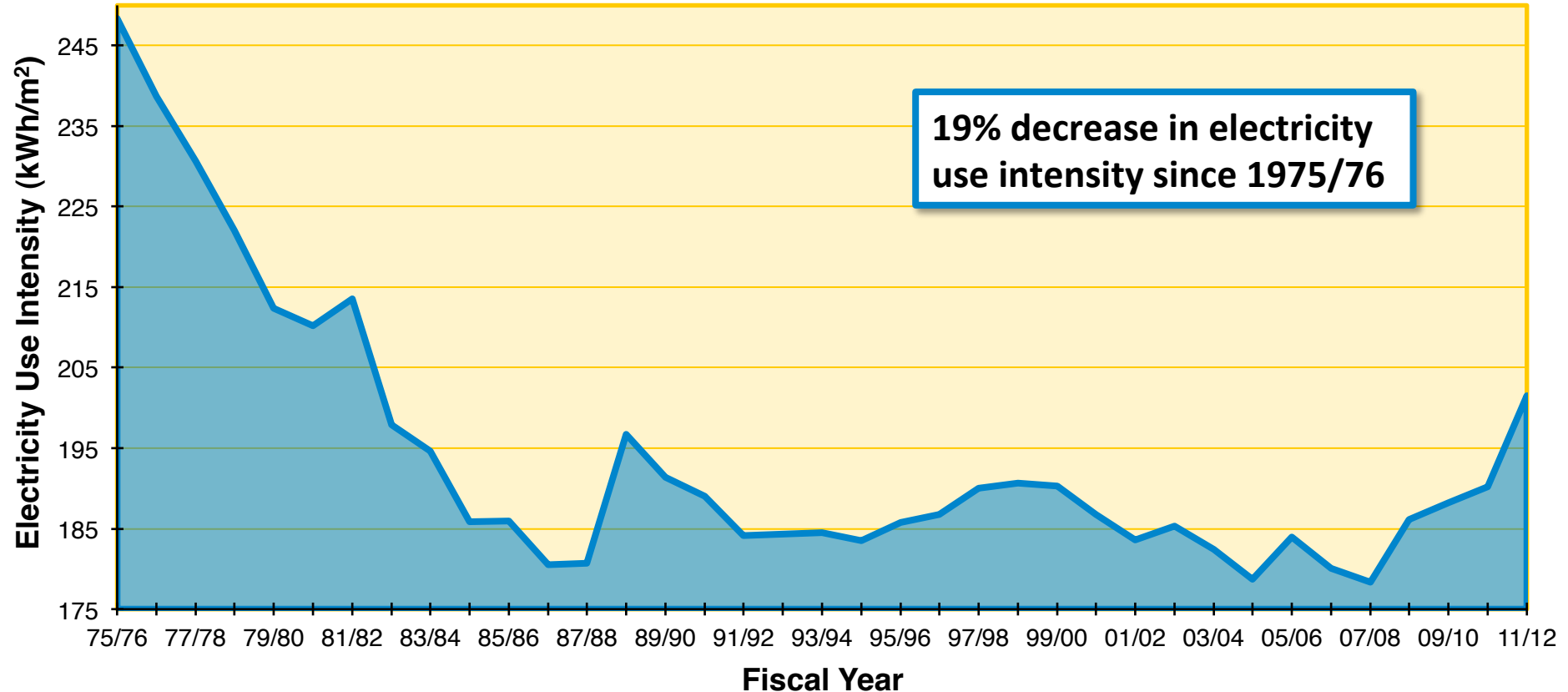
## Building Area



*Note: excludes residences, parking, ancillaries, and off campus*

# Significant Savings Drive Continuous Improvements

## Electricity Use Intensity

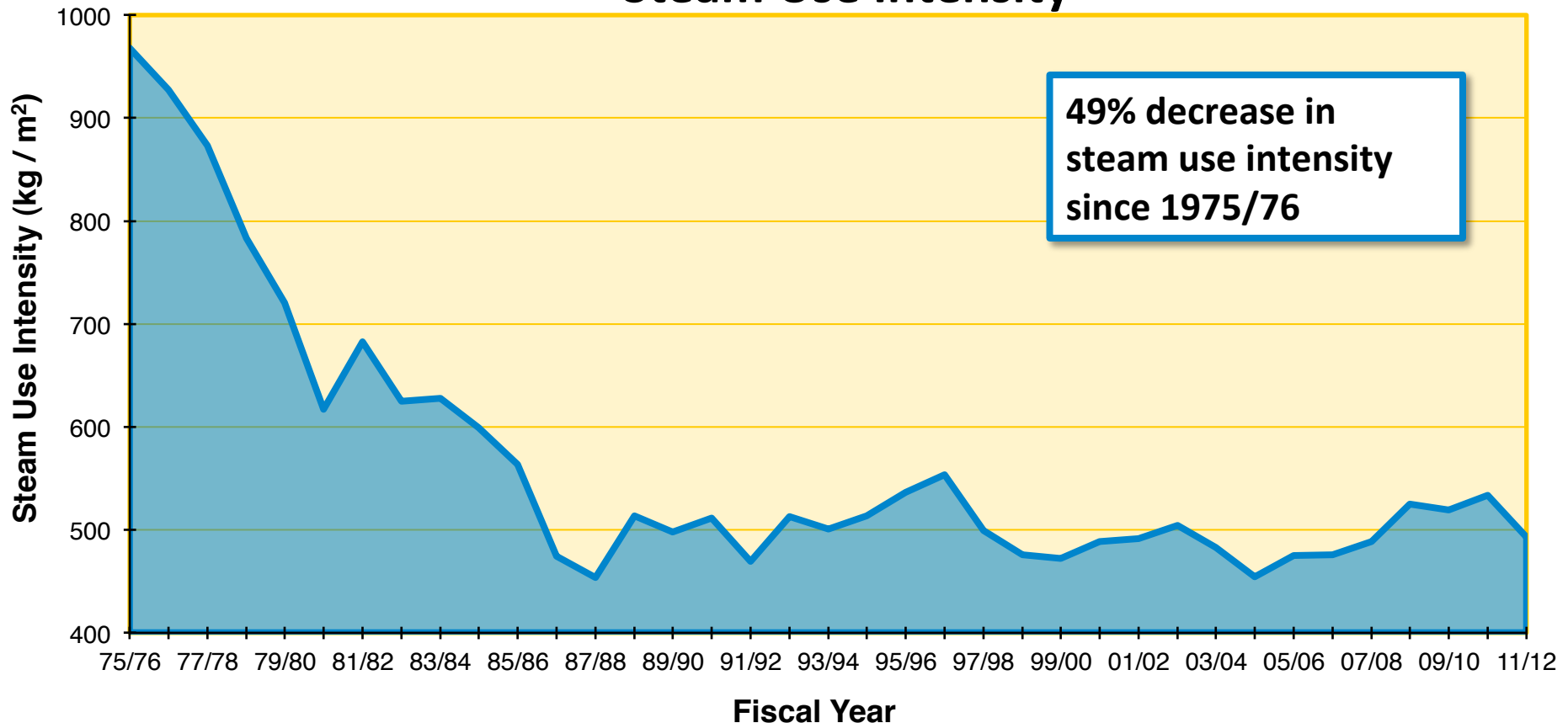


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# Significant Savings Drive Continuous Improvements

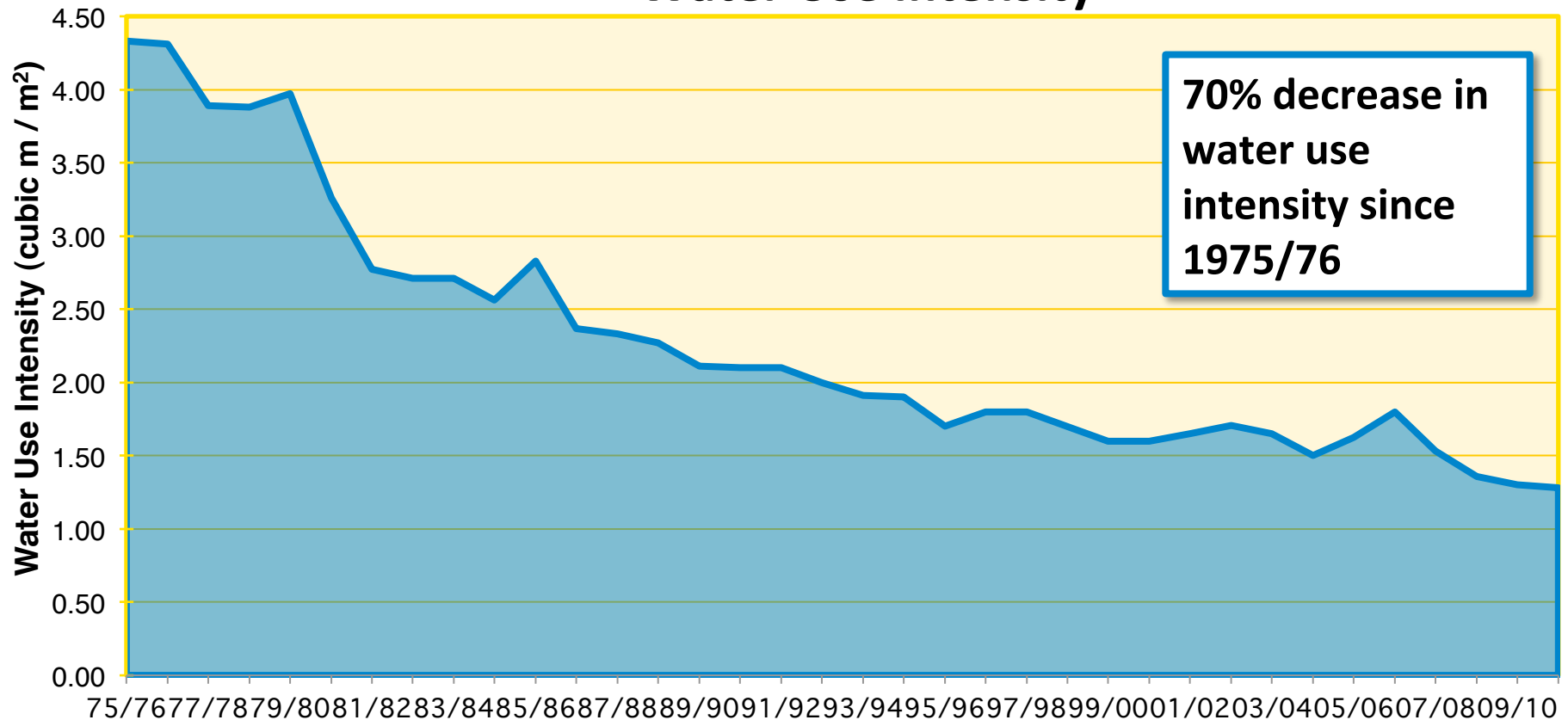
## Steam Use Intensity



*Note: excludes residences, parking, ancillaries, and off campus*

# Significant Savings Drive Continuous Improvements

## Water Use Intensity



*Note: excludes residences, parking, ancillaries, and off campus*

# Envision - Typical Implementation Measures

- Lighting system upgrades and retrofits
- Fan system upgrades
- HVAC upgrades and efficiency improvements
- Re-commissioning and system optimization
- Fume hood replacements and controls upgrades
- High efficiency motor replacements
- Waste heat recovery systems
- Variable speed drive installations
- Controls systems modifications and upgrades
- Automation of building room controls
- Piping and equipment insulation
- Building envelope sealing and upgrades
- Micro-steam turbines



## *Envision* - Additional Focus Areas

- water conservation
- infrastructure renewal and energy reduction synergies
- energy reduction for Ancillary Services
- renewable energy
- education and awareness
- dashboards
- energy analytics
- laboratory demand control ventilation







## Significant Savings Drive Continuous Improvements

- **GHG reduction to date:**
  - 2 million metric tonnes
- **7-year, \$25 Million program final year**
  - Anticipated savings per year:
    - \$3.5 Million per year
    - 27,000 tonnes of GHGs
- **Next generation: 7-year, \$35 Million**
  - Anticipated savings: \$3.8 Million per year
  - GHG reduction: 30,000 tonnes per year

Lighting Retrofit – Rutherford Library

# Contribution from District Energy System

- One of the five largest DES in North America
- Heating and cooling for the Greater Campus Area
- Cogeneration since 1994
  - On the order of \$5 Million and 50,000 tonnes CO<sub>2</sub> emissions prevented each year
- Free cooling of chillers in winter
- Thermal Energy Storage System
- Turbine Generator #3



Cooling Plant on Campus



## GHG Impact of programs

- Total impact of cogeneration, peaking unit and 7-year energy management program:
  - 40% reduction in GHG emissions compared to business as usual
- Additional 15% impact by 7-year next generation *Envision* program



- ✚ Next generation:
  - 7-year, \$35 Million
  - ✚ ACFA borrowing \$5M/year
  - ✚ Payback within 15 years
  - ✚ IRR: 10%
  - ✚ NPV: \$21.3 Million
  - ✚ Anticipated savings: \$3.8 Million per year
- ✚ Other financial benefits



# Excess Savings Fund Campus Sustainability Initiatives

EMP Excess  
Savings

Sale of GHG  
Credits

Other funding  
sources

Additional  
Projects &  
Campus  
Sustainability  
Initiatives



Renewable Energy Installs



Additional Energy  
Savings Projects



# Renewable and Alternative Energy

- **Solar PV Projects Completed (~26 kW)**
  - Medical Isotope and Cyclotron Facility (MICF) (old Balmoral curling rink)
- **Solar PV Projects in Progress (~390 kW)**
  - Camrose Performing Arts Centre (CPAC)
  - R. E. Phillips Building
  - CMEB
  - ECERF/ETLC
  - Innovation Centre for Engineering (ICE)
  - Physical Activity and Wellness (PAW) Centre
- **Microturbines (250 kW)**
  - Li Ka Shing
- **Solar PV Projects in Development**
  - Agriculture/Forestry Building Greenhouse
  - Universiade Pavilion (Butterdome)



PAW Centre Rendering (c/o Group 2 Architecture)

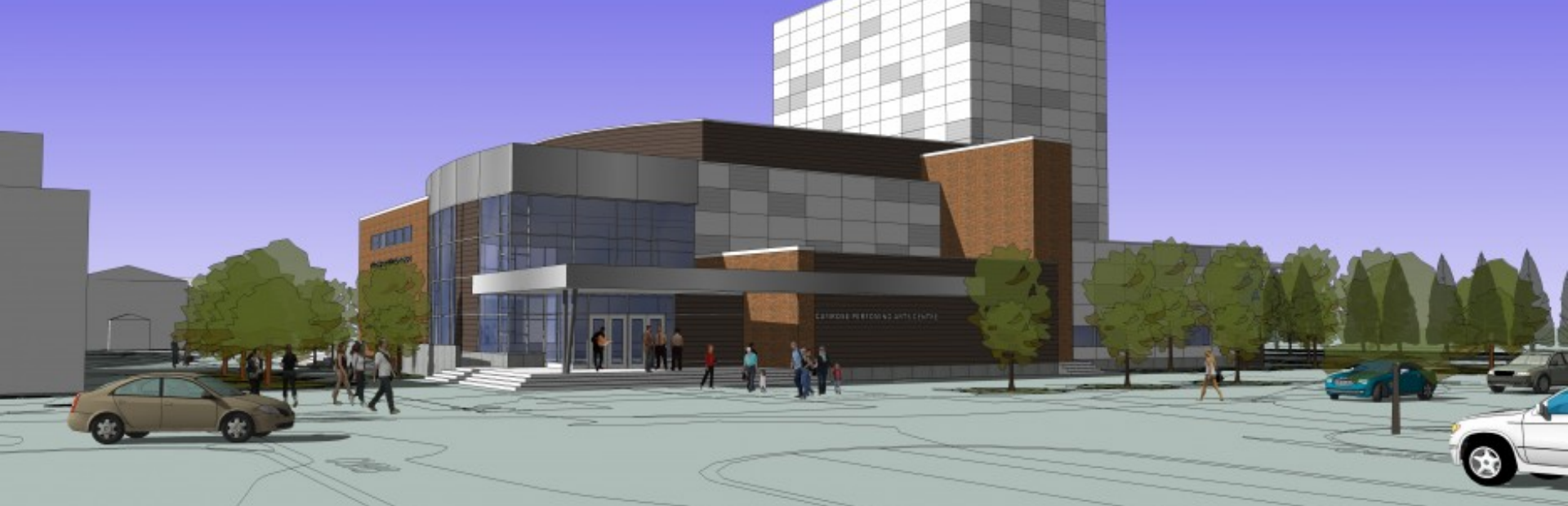




**Conversion of Balmoral Curling Club to  
Medical Isotope and Cyclotron Facility (26 kW)**







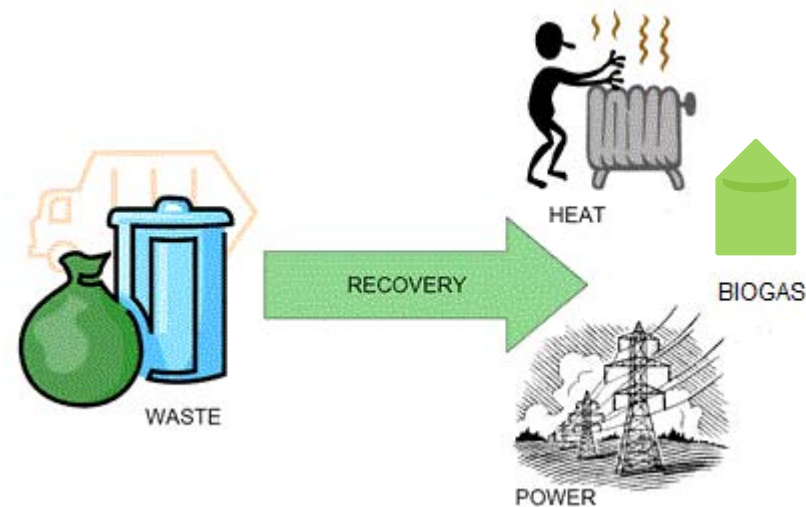
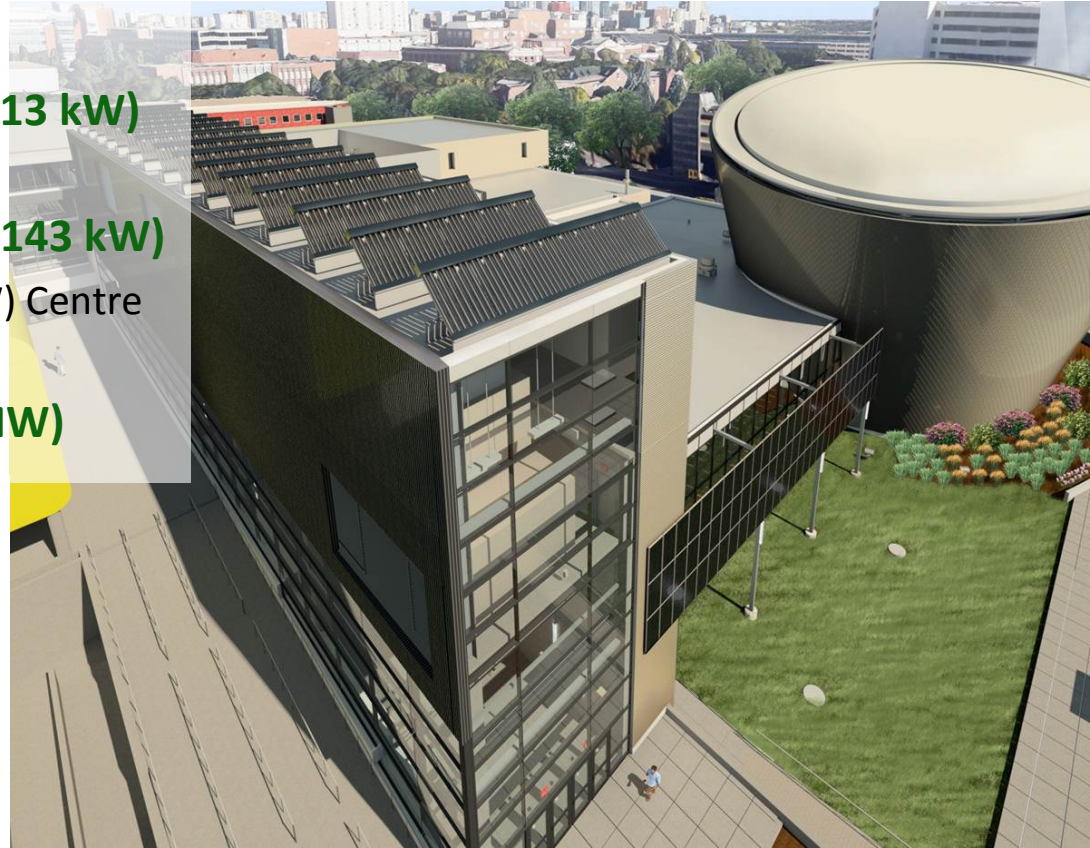
**Camrose Performing Arts Centre**  
**Largest Building-Integrated Solar PV (BIPV) Installation in Canada (122 kW)**





# Renewable and Alternative Energy

- **Solar Thermal Projects Completed (~13 kW)**
  - Augustana
- **Solar Thermal Projects in Progress (~143 kW)**
  - Physical Activity and Wellness (PAW) Centre
  - Augustana system expansion
- **Waste to Energy Partnership (~1.6 MW)**



# Benefits of Intelligent Financing

- Reduced operating, maintenance, and utility costs
- Improved lighting quality and space conditions
- Infrastructure renewal to address deferred maintenance
- Significant environmental benefits
- Helps fund sustainability initiatives
- Demonstrated action on sustainability, energy and GHG reduction plans
- Strategic alignment with City, Provincial, and Federal goals to mitigate greenhouse gas emissions



# Thank You

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**ENVision**  
INTELLIGENT ENERGY REDUCTION