GUIDING PRINCIPLES

• ENERGY EFFICIENCY
• RELIABILITY
• UTILITY COST SAVINGS
• FUTURE CAPACITY
• CONSISTENT WITH CAMPUS PLANS
  • LONG RANGE DEVELOPMENT PLAN
  • HISTORIC PLAN
• BEST VALUE FOR THE CITIZENS OF WYOMING
CRITICAL ISSUES AT HAND

• MEETING NEEDS OF THE NEAR TERM FUTURE BUILDINGS
  ▪ ENGINEERING EDUCATION AND RESEARCH BUILDING (HW/ CW)
  ▪ SCIENCE INITIATIVE (HW/ CW)
  ▪ HIGH BAY RESEARCH FACILITY (ST/ CW)

• MEET LONG TERM CAMPUS HEATING AND COOLING NEEDS
  ▪ LRDP/ UMP ESTIMATE 1-3% GROWTH PER YEAR
  ▪ EXCEEDING CURRENT CAPACITY
  ▪ EFFICIENT EQUIPMENT OPERATION
  ▪ SECURING LONG TERM HEATING FUEL SOURCES (COAL/ GAS)

• AGING INFRASTRUCTURE
OVERALL PROCESS

✓ ANALYSIS OF FUTURE HEATING AND COOLING LOAD GROWTH
✓ DETERMINATION OF EXISTING CEP AND CAMPUS INFRASTRUCTURE CONDITION
✓ DETERMINE PLAUSIBLE CONCEPTS TO FULFILL GOALS
✓ DEVELOP OVERALL WORK SCOPE S AND PROJECT COSTS
✓ PERFORM COMPARATIVE ECONOMIC ANALYSIS

TO DATE:

☐ IMPLEMENT SELECTED STRATEGY (DESIGN AND CONSTRUCTION)
CEP BOILER EQUIPMENT

• SURVEY OF EXISTING EQUIPMENT CONDITION
  • FINDINGS:
    ✓ WELL MAINTAINED
    ✓ GREAT CONDITION FOR BEING 36 YEARS OLD
    ✓ UW NOT IMPACTED BY THE EPA’S CLEAN POWER PLAN
CAMPUS HEATING ANALYSIS

- HEATING DEMAND HAS REACHED 85% OF DESIGN CAPACITY
- QUALITY COAL SUPPLY IS UNRELIABLE
- SIGNIFICANT LOSSES WITHIN WEST CAMPUS DISTRIBUTION SYSTEM
  - ~12% OF DESIGN CAPACITY
  - ~$700K/YEAR LOSS
- UNDERGROUND TUNNEL SYSTEM DETERIORATING
- URGENCY TO ADDRESS
HEATING ANALYSIS

MEETING FUTURE HEATING CAPACITY

CAMPUS HEATING LOAD

Plot Area

Natural Gas Capacity

Required Design Capacity

Coal Capacity

Load Projections
CHILLED WATER ANALYSIS

MEETING FUTURE CHILLED WATER CAPACITY

CHILLED WATER LOADS

- Installed CHW Capacity
- CHW Load
- Actual Metered CHW Load
THERMAL ENERGY STORAGE

- THERMAL ENERGY STORAGE (TES) OPTION
  - ADDITION OF A THERMAL ENERGY STORAGE TANK AND PUMPS
  - OFF PEAK LOAD SHEDDING

EXISTING AVERAGE CHILLED WATER LOAD BY MONTH
CONCEPT SELECTION

RECOMMENDATIONS FOR THE UNIVERSITY

• RETROFIT COAL BOILERS TO ACCEPT A WIDER VARIETY OF COAL SUPPLY (UNDERTHROW)

• TRANSITION TO A HIGHLY EFFICIENT HOT WATER SYSTEM WITH STEAM BACKUP

• WEST CAMPUS HEATING/COOLING PLANT (NORTH OF THE AGRICULTURE BUILDING)

• IMPLEMENTATION OF A CHILLED WATER THERMAL ENERGY STORAGE (TES) SYSTEM

• REMOVAL OF POOR SECTIONS OF STEAM PIPING/TUNNEL
NEW WEST CAMPUS PLANT

WEST CAMPUS HEATING/COOLING PLANT. A GREAT POTENTIAL FOR STUDENT INTERACTION AND LEARNING

- CLOSE PROXIMITY TO ENGINEERING FACILITIES

- CAN IMPLEMENT A LARGE DASHBOARD WITH REAL-TIME OPERATION DATA

- WINDOW WALL FOR VIEWING PURPOSES

- STUDENT TOURS
PROPOSED SOLUTION
PROPOSED SOLUTION
PROPOSED SOLUTION
BASE BUILDINGS:

- SCIENCE INITIATIVE
- ENZI S.T.E.M.
- EERB
- ANTHROPOLOGY
- ENGINEERING ADDITION & PETROLEUM WING
- AG C ADDITION
**FINANCIAL SUMMARY - 6 BUILDINGS**  
(ENZI, ENGINEERING, ANTHROPOLOGY, AGRICULTURE, EERB, SCIENCE INITIATIVE)

- **Boiler Stoker Retrofit** $1.2M  
- **West Campus Plant (Structure w/ Gen)** $8.2M  
- **New West Campus Hotwater Equipment** $4.2M  
- **West Campus TES Equipment** $4.9M  
- **Tunnel Repair/ Decommissioning** $2.1M  
- **Hotwater System Site Improvements** $6.0M  
- **Private Gasline Feasibility Study** $0.25M

**Total Project Cost Current**  
(INCLUDES 20% CONTINGENCY)  
= $26.7M

**Escalation 2017 (4%)** $27.9M  
**Escalation 2018 (4%)** $29.0M  
**Escalation 2019 (4%)** $30.1M

**Total Project Cost Projected (Midpt)**  
(INCLUDES 20% CONTINGENCY)  
= $30.1M

**Note:** These are conceptual, rough order of magnitude costs with minimal design work having been completed.
24 ADDITIONAL BUILDINGS:

- EIC
- BERRY
- EARTH SCIENCES
- OLD GEOLOGY (partial)
- PHARMACY
- HEALTH SCIENCES
- CLASSROOM
- AVEN NELSON
- CONSERVATORY
- PHYSICAL SCIENCES
- BIO SCIENCES
- GEO SURVEY
- HALF ACRE
- STUDENT UNION (partial)
- BUSINESS(2)
- ILLC (3)
- ROSS
- KNIGHT HALL (partial)
- HOYT
- STUDENT HEALTH
- ED ANNEX
## FINANCIAL SUMMARY - 30 BUILDINGS

**Boiler Stoker Retrofit**  
$1.2M

**West Campus Plant (Structure w/ Gen)**  
$8.2M

**New West Campus Hot Water Equipment**  
$5.6M

**West Campus TES Equipment**  
$4.9M

**Tunnel Repair/ Decommissioning**  
$4.5M

**Hot Water System Site Improvements**  
$13.6M

**Private Gasline Feasibility Study**  
$0.25M

**Total Project Cost Current** (includes 20% contingency)  
$38.1M

**Escalation 2017 (4%)**  
$39.6M

**Escalation 2018 (4%)**  
$41.2M

**Escalation 2019 (4%)**  
$42.9M

**Total Project Cost Projected (Midpt)** (includes 20% contingency)  
$42.9M

**Note:** These are conceptual rough order of magnitude costs with minimal design work having been completed.
## Moving Forward

### What is Needed to Move Forward?

- **Concept Confirmation**
- **University/Board of Trustees Backing**
- **Project Funding**

### Anticipated Project Schedule

- **Need to Move Quickly**

### Proposed Project Phasing and Preliminary Schedule

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<th>Item</th>
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<tr>
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<td>Year 1</td>
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<td>Jan-20</td>
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<tr>
<td>Complete Design/Permitting</td>
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