**SUSTAINING LONG-TERM ENERGY SAVINGS FOR A MAJOR TEXAS STATE AGENCY PERFORMANCE CONTRACTING INITIATIVE**

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Background

- 10 mental health & 13 mental retardation facilities with 24 hour-7 days a week care:
  - Over 1,300 buildings with 10 million ft$^2$
  - Current replacement value $\approx$ $1.6$ billion

- Special needs of clients
  - Specially designed to serve those with mental illness and mental retardation
  - One maximum security unit. One facility to address needs of youth
  - Aging population

- Buildings built
  - 25% constructed prior to 1951
  - 50% constructed prior to 1976
Background

- Over $15 million in energy projects over 9 years through SECO’s LoanSTAR
  - Included lighting, air-conditioning/heating, motors, energy management control systems
- Consulting services provided
  - Owner’s representative
  - Commissioning work
  - Technical expertise
Main Facilities

Phase I Sites
- Austin State Hosp (ASH), Austin State School (AUS), Kerrville State Hosp (KSH), San Antonio State Hosp (SAH), San Antonio State School (SAS)

Phase II Sites
- Abilene State School (ABS), Lubbock State School (LSS), San Angelo State School (SGS), El Paso State Center (ESC), Big Spring State Hosp (BSH)

Phase III Sites
- Denton State School (DSS), Mexia State School (MSS), Waco Center for Youth (WCY), North Texas State Hosp Vernon (NTSH-V), North Texas State Hosp Wichita Falls (NTSH-W)
Main Facilities

➤ Phase IV Sites
  - Brenham State School (BRS), Corpus Christi State School (CCS), Richmond State School (RSS)

➤ Phase V Sites
  - Lufkin State School (LFS), Rusk State Hosp (RSH), Terrell State Hosp (TSH),

➤ Phase VI Sites
  - Laundry Sites (ABS, NTSH-W, RSS, MSS - 4 sites)

➤ Phase VII Sites
  - San Antonio State Hosp (SAH), San Antonio State School (SAS), Texas Center for Infectious Diseases (TCID)
Challenges

➢ Funding
  - 12% Statewide budget cut
  - Efficiency mandates
  - Funding for repair/replacement reduced from $72 million to $35 million

➢ Liabilities
  - Deferred repairs/replacement: >$250 million

➢ Organizational
  - Geographic – HHSC covers Texas
  - O&M Staffing
  - Utilities - regulated/unregulated,
    - 7 electricity,
    - 7 natural gas
Solution

- **Energy Savings Performance Contract (ESPC)**
  - 10 year straight line payback
  - Includes O&M and M&V

- **Procurement Process**
  - Request for Qualifications
  - Detailed selection process

- **Contract Development**
  - Detailed utility audit contract
  - Implementation contract
  - Each phase carefully reviewed
The Plan

- Contractor Selection
- Preliminary Utility Audits
  - Site visits
  - Collect utility data
  - Collect deferred repair/replacement data
    - Over 10,000 repair/replacement needs have been evaluated
    - Three categories of deficiencies
- Develop Strategic Plan
  - Divide 23 sites into seven phases
  - Identify agency-wide renovations
  - Identify agency-wide standards
The Plan (continued)

➤ Detailed Audit
  - Texas A&M’s Energy Systems Lab is providing expertise

➤ Financing
  - Financing by the Texas Public Finance Authority
  - Additional funding from the Texas LoanSTAR Program

➤ Approvals
  - Reviewed by 3rd party engineer
  - Approved by State Energy Conservation Office

➤ Implementation
Implementation

- **Phase I**
  - 5 Sites – 100% Complete
  - Cost - $13.9 million
  - Savings - $1.5 million

- **Phase II**
  - 5 Sites – 100% Complete
  - Cost - $11.5 million
  - Savings - $1.2 million

- **Phase III**
  - 5 Sites – 100% Complete
  - Cost - $13.1 million
  - Savings - $1.4 million
Implementation

Phase IV
- 3 Sites – 75% complete
- Cost - $11.4 million
- Savings - $ 1.2 million

Phase V
- 3 sites – 40% complete
- Cost - $12.1 million
- Savings - $ 1.3 million

Phase VI
- 4 Sites – 100% Complete
- Cost - $5.2 million
- Savings - $0.57 million
Implementation

Phase VII
- 3 Sites – 50% complete
- Cost - $7.4 million
- Savings - $0.81 million
Detailed M&V

Measurement and Verification for Each Phase
- Option A used for whole campus water project
- Option B used for continuous batch washers
- Option C used for whole campus metering

M&V costs averaging 5%
- 10 to 30% of the savings decrease over time
- 15 year guarantee period
- Without M&V, large amount of savings may not materialize
Detailed M&V

📍 O&M Includes
- Regular on-site assistance
- Periodic training
- Operations and Maintenance consultation (24-7)
- O&M costs under 5%

Agency and ESCO Developed M&V
- On-going communication
- Worked together to achieve best possible result
- Independently verified baseline models
- Developed metrics to perform spot checks
Cumulative Savings

Total Dollar Savings to Date: $6,436,620
Total Guarantee to Date: $6,953,925

Unit Savings
kWh: 24,458,791
kW: 35,209
CCF: 23,901,539

Environmental Impact
Tons of CO2: 161,753
Cars for a Year: 32,351
Acres of Trees: 43,997
Model Comparisons

- **Performance Contractor Model**
  - Degree-day method incorporating variable-based degree-day

- **Comparison Model**
  - ASHRAE’s Inverse Model Toolkit
  - Change point regression model
2 Parameter Linear Regression

Energy Systems Laboratory

ASH [kWh/day] vs. Tdb [°F]

Proceedings of the Fifteen and a Half Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, TX, December 17-18, 2007
3 Parameter Change Point

Energy Systems Laboratory

ASH [kWh/day]

Tdb [°F]

Proceedings of the Fifteen and a Half Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, TX, December 17-18, 2007
4 Parameter Change Point

Energy Systems Laboratory

ASH [kWh/day] vs Tdb [°F]

Proceedings of the Fifteen and a Half Symposium on Improving Building Systems in Hot and Humid Climates, San Antonio, TX, December 17-18, 2007
## 1st Year Model Summary

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<th>Vendor Calculation</th>
<th>Agency Calculations</th>
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<td>Savings</td>
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<td>% Deviation</td>
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# 2nd Year Model Summary

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Summary

- HHSC is a large state agency with significant challenges to maintain facilities.
- HHSC chose ESPC as the solution to rebuild the facility infrastructure and achieve energy efficiency.
- M&V Plan requires measured performance and independent verification.
- This structure provides savings and measurement based assurance that the savings will continue.