NASA Utility Metering

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Metering 101 Session

Agenda

Under the Hood: Operations and Maintenance

- Mission, Vision, and Goals
- Infrastructure Overview
- Utility Metering & Information Systems Study
- Lessons Learned
- Conclusion

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Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Mission:
To pioneer the future in space exploration, scientific discovery, and aeronautics research.

Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Vision directed by
"A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration"

Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Strategic Goal 1: Fly the Shuttle as safely as possible until its retirement, not later than 2010.

Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Strategic Goal 2: Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration.

Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Strategic Goal 3: Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.

Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Strategic Goal 4:
Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.

Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Strategic Goal 5: Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.

Mission, Vision, and Goals

Under the Hood: Operations and Maintenance

Strategic Goal 6: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.

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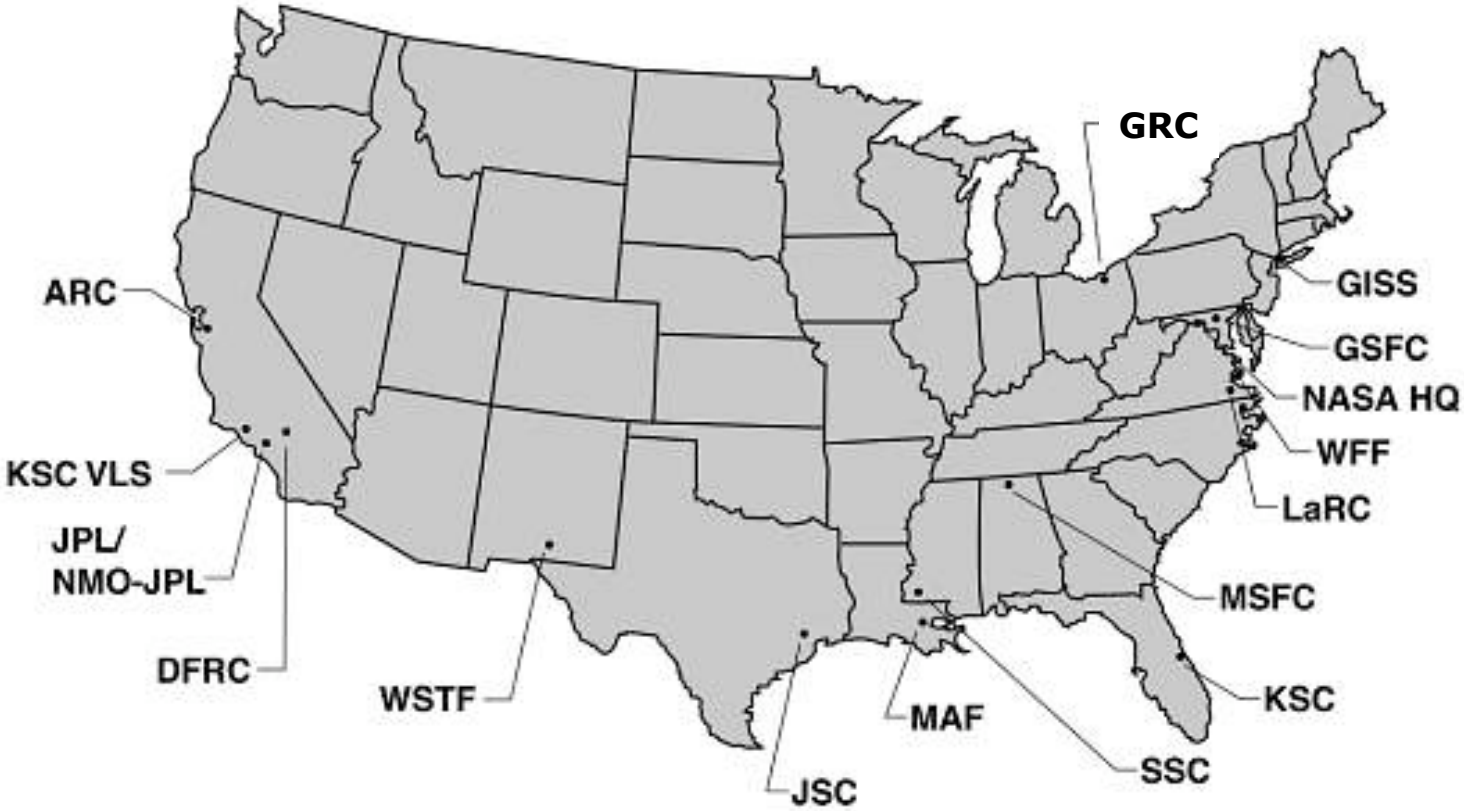
Infrastructure Overview

Under the Hood: Operations and Maintenance

- NASA installations map



Infrastructure Overview

Under the Hood: Operations and Maintenance

- Roughly 40 million square feet

Infrastructure Overview

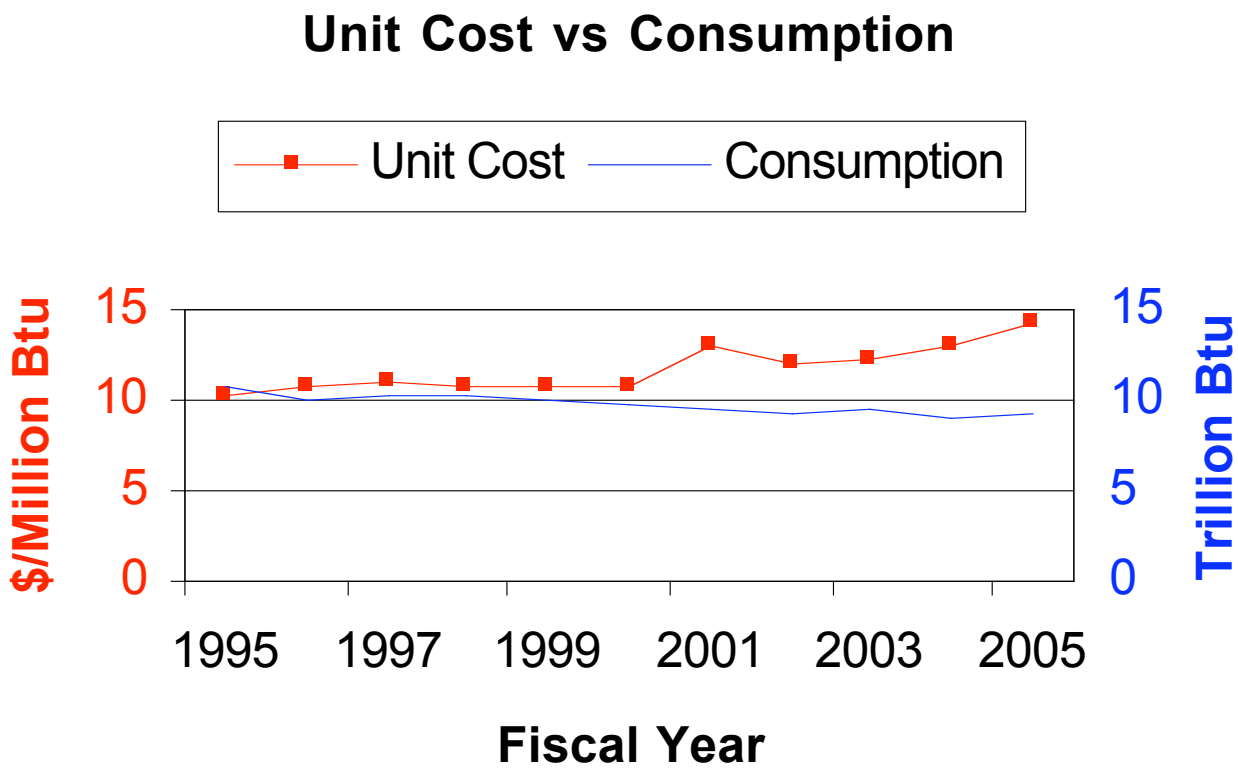
Under the Hood: Operations and Maintenance

- Office of Infrastructure & Administration (I&A) Goals
  - Reduce institutional risk to mission.
  - Assure resources and assets available to enable Vision.
  - Eliminate future risk to mission through sustainable practices.

Infrastructure Overview

Under the Hood: Operations and Maintenance

- $130M energy cost in FY 2005
- Trend: Buying less, spending more
  - Use down 14%; unit costs up 38%



Infrastructure Overview

Under the Hood: Operations and Maintenance

- Risk: Rising energy unit costs continue eroding mission funding.
- Mitigation efforts:
  - Perform mission O&M considering efficiency and cost
  - Construct/renovate with life-cycle in mind
  - Buy/generate utilities wisely

Infrastructure Overview

Under the Hood: Operations and Maintenance

- Submitted electricity metering project for FY 2008 funding
  - Strategic Institutional Investment competition for projects with returns
  - Created rough order of magnitude parametric estimate
    - Meters, installation, networks, software
  - Justified on potential cost benefit to mission and EPAct 2005 requirement

Infrastructure Overview

Under the Hood: Operations and Maintenance

- Conducted training at NASA environmental/energy workshop
  - Walt Disney World Resort's control, metering, and information systems
    - Energy Management System control
      - Building Tune Ups
    - Energy Information System monitoring
      - Utility Reporting System
    - Employee participation

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Meter/Information Study

Under the Hood: Operations and Maintenance

- Driver: Reduce utility costs to mission and meet EPAct 2005 requirements
- Currently mixed bag of metering coverage and information flow
- HQ contracted for study
  - Where are we?
  - Where do we want to be?
  - Project plan & cost estimate?

Meter/Information Study

Under the Hood: Operations and Maintenance

- Six objectives
  - Assess NASA's existing capabilities
    - Scope: Energy utilities/fuels & potable water
    - Electronic survey to gather baseline data consistent with DOE metering guidance reporting requirements

Meter/Information Study

Under the Hood: Operations and Maintenance

FY	Standard Meters		Advanced Meters	
	Cumulative # of Buildings Metered	Cumulative % of Electric Metered	Cumulative # of Buildings Metered	Cumulative % of Electric Metered
2007			not	reported
2008				
2009				
2010				
2011				
2012				

Meter/Information Study

Under the Hood: Operations and Maintenance

- Six objectives (continued)
  - Document leading examples from NASA sites with robust systems
    - Site visits to 3 of 15
  - Define an appropriate minimum standard capability for all sites
  - Estimate investment required to improve systems to new standard

Meter/Information Study

Under the Hood: Operations and Maintenance

- Six objectives (continued)
  - Draft phased plan for upgrade project
    - Identify major procurements and implementation steps
  - Draft policy language to begin/ maintain alignment with new standard

Meter/Information Study

Under the Hood: Operations and Maintenance

- Survey tool
  - Support contractor created custom spreadsheet for each site:
    - Historical pricing
    - Network and information system
    - Each utility/fuel by building
      - Key aspects for reporting and cost estimate
      - Filtered real property database building list
  - Headquarters tasked field locations
  - Contractor compiled results

Meter/Information Study

Under the Hood: Operations and Maintenance

- Survey tool (continued)
  - View of General table

General

Building ID Number	Building Ft^2	Networked? Y / N	Ft to nearest Network
G-100	800		
G-201	17,409		

Meter/Information Study

Under the Hood: Operations and Maintenance

- Survey tool (continued)
  - View of Information System table

Hardware?
Software?
Input Means? (modem,twisted,web,wireless,etc.)
Input Frequency? (15min,hrly,etc.)
What data is stored?
How long is it stored?
Are reports generated?
Who receives the reports?
How is output used to reduce energy consumption?
Future planned IS network design direction & schedule

Meter/Information Study

Under the Hood: Operations and Maintenance

- Survey tool (continued)
  - View of Electrical table

			Electrical			
Meter? Y / N / NA	Standard (S) Advanced (A)?	Meter ID	Volts Feed	Amps Feed	Phase Feed	Practicable? Y / N

  - Other system tables included:
    - Pipe Size”
    - Input Pressure psi

Meter/Information Study

Under the Hood: Operations and Maintenance

- Survey challenges
  - Incomplete responses
  - Inconsistent responses
- Emphasized electricity and made assumptions for cost estimate
  - Networked? Distance to nearest?
  - Metered? Advanced vs standard?
  - 3 phase vs 1?

Meter/Information Study

Under the Hood: Operations and Maintenance

- Electricity "answers"
  - Count of buildings metered vs not
  - KWh/yr advanced vs standard vs not
    - Found messy mix of advanced metering on distribution vs building level
  - Types of networks
  - Cost estimate
    - Advanced meters
    - Networking

Meter/Information Study

Under the Hood: Operations and Maintenance

- Site visits
  - Glenn Research Center, Johnson Space Center, Kennedy Space Center
  - Mix of open vs proprietary systems
  - Mix of current and obsolete hardware
  - Historical metering capability focused on reliability of mission utilities
    - Typically not building level
    - Monitoring/control systems used for operations and trouble shooting
    - Minimal use for conservation trending

Meter/Information Study

Under the Hood: Operations and Maintenance

- Next steps
  - Resolve electricity counting for EPAct
  - Resolve electricity data for estimate
  - Sanity check estimate
  - Develop/submit metering plan
  - Resolve non-electricity systems missing data
  - Complete study

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Lessons Learned

Under the Hood: Operations and Maintenance

- Plan how to count
- Start counting soon
- Begin with information reporting end in mind
- Communicate energy risk to mission
- Request funding--we got FY 2006!

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Conclusion

Under the Hood: Operations and Maintenance

- No rocket science needed--
  just common sense team effort
- Welcome questions/suggestions

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