

Kennedy Space Center (KSC) Energy Program

By:

Jenni Hill, PE, LEED AP

KSC Energy Manager

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For:

Society of American Military Engineers

Space Coast Post

Speaker - Jenni Hill



- ◆ Serves as Energy and Water Conservation Program Lead at NASA's Kennedy Space Center (KSC).
- ◆ Designated Energy Manager at KSC in January of 2020.
- ◆ Over 15 years of diverse work experience in facility and civil water resources design, construction management, environmental & energy management and compliance.
- ◆ Received her Bachelor of Science in Environmental Engineering from the University of Florida. Go gators!

Celebrate Energy Awareness Month with NASA's Energy and Water Management Program!



Agenda

- ◆ About Kennedy
- ◆ About Kennedy's Energy Program
- ◆ Energy Projects
 - Energy and Water Efficiency
 - Renewable energy
 - Resilience

ABOUT KENNEDY

Kennedy Space Center



ABOUT KENNEDY'S ENERGY PROGRAM



Energy Program Vision

Our vision is to secure America's future in space with an energy and water efficient and resilient multi-user spaceport.



Power Team

- ◆ Energy and Water Conservation Program
 - Program Lead, KSC Energy Manager
 - Energy and Water Specialist
- ◆ BOSS Energy Management Office
 - Certified Energy Manager (CEM) & support
- ◆ Energy and Water Working Groups
 - Local to KSC
 - Made up of Center operations and maintenance personnel, engineering, support contractors, neighbors, utility
- ◆ Energy Efficiency Panel
 - Agency-wide
 - Made up of Headquarters and Center energy managers/personnel and energy program support

Customers, Neighbors and Partners

- ◆ You! - U.S. Taxpayers
- ◆ NASA Agency
- ◆ KSC
 - Institutional Services
 - Operations and Maintenance (O&M)
 - Programs
 - International Space Station
 - Exploration Ground Systems
 - Launch Services Program
 - More...
- ◆ Cape Canaveral Space Force
- ◆ Commercial Industry Partners
 - Florida Power and Light (FPL)



Energy Program

- ◆ Department of Energy (DOE) 50001 Ready (based on ISO 50001)
- ◆ Identify energy and water conservation opportunities
 - Facility Comprehensive Evaluations (energy audits)
 - Re/retro-commissioning
 - Operations and Maintenance observations/needs
- ◆ Collect utility cost and consumption historical data
- ◆ Report consumption data in NASA Headquarters and Portfolio Manager
- ◆ Develop energy efficiency and renewable energy projects
- ◆ Seek and manage several funding programs
 - Performance Contracts
 - Appropriated funds, grants, rebates, etc..
- ◆ Advisor for KSC energy and water policy
- ◆ Promote and advocate for energy and water efficiency, renewable energy generation and increased utility resiliency

Goals of the Program

- ◆ Public Law and Executive Orders (EO)
 - Energy Independence and Security Act (EISA) of 2007
 - Executive Orders
- ◆ NASA's Procedural Requirements (NPR) and Plans
 - NPR 8570.1B NASA Energy Management Program
 - Kennedy (K)NPR 8500.1 KSC Environmental Requirements
 - Sustainability Plans
- ◆ Program Goals
 - Energy Efficiency/Resiliency
 - Clean and Renewable Energy
 - Water Use Efficiency and Management
 - Energy Performance Contracts

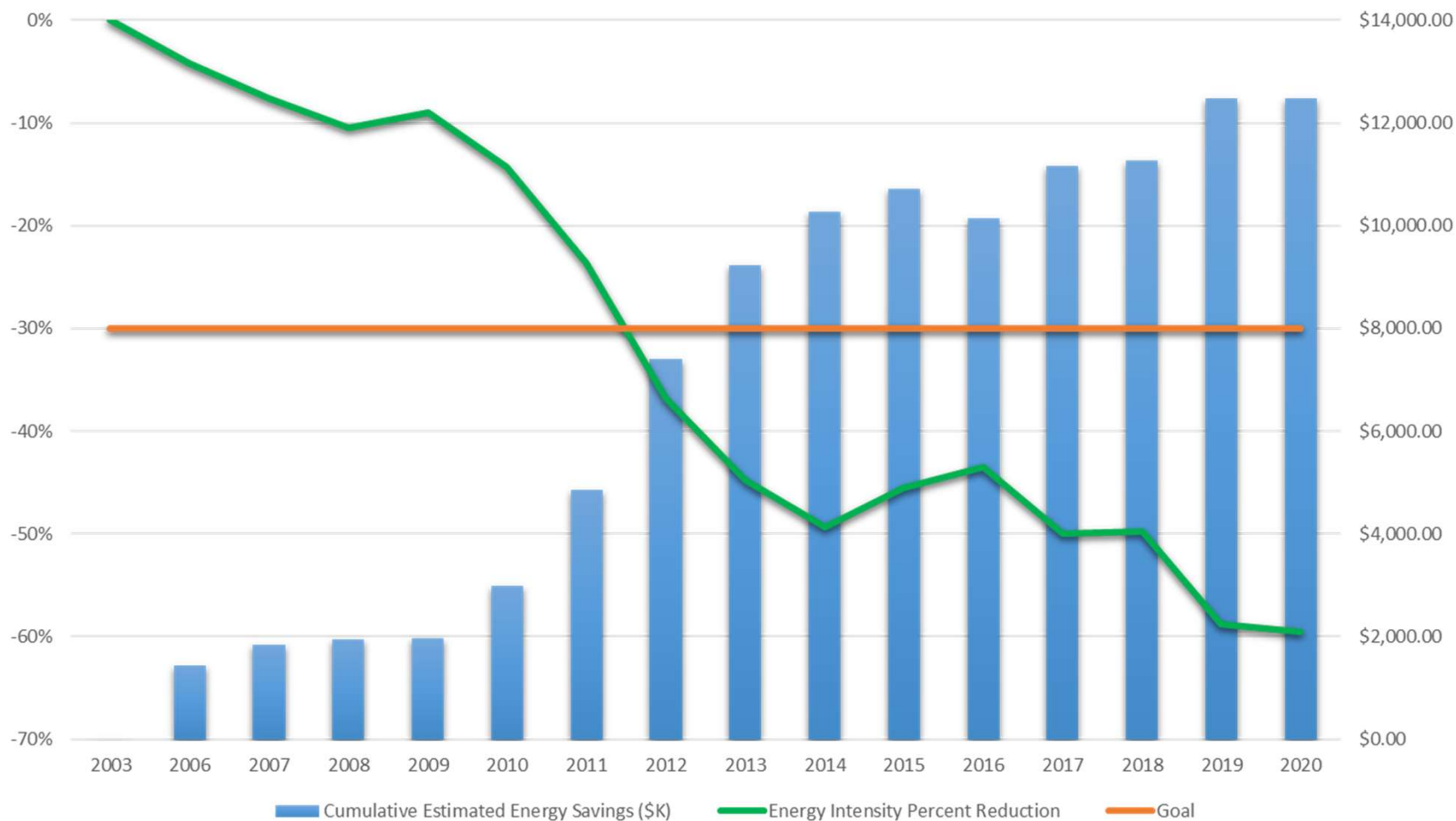
Benefits of the Program

- ◆ Assist Center with utility (electric, natural gas and water) and O&M long-term cost reductions
- ◆ Provide trending of utility cost and consumption data
 - Forecasting utility consumption and costs
 - Identify variances to be further investigated by the O&M technical community
- ◆ Assist the Center and Agency in meeting Agency/Center Sustainability goals:
 - Greenhouse Gas (GHG) Emissions Reduction
 - Clean and Renewable Energy
 - Water Use Efficiency and Management
 - Energy Performance Contracts
 - Sustainable Buildings (Energy Conservation)



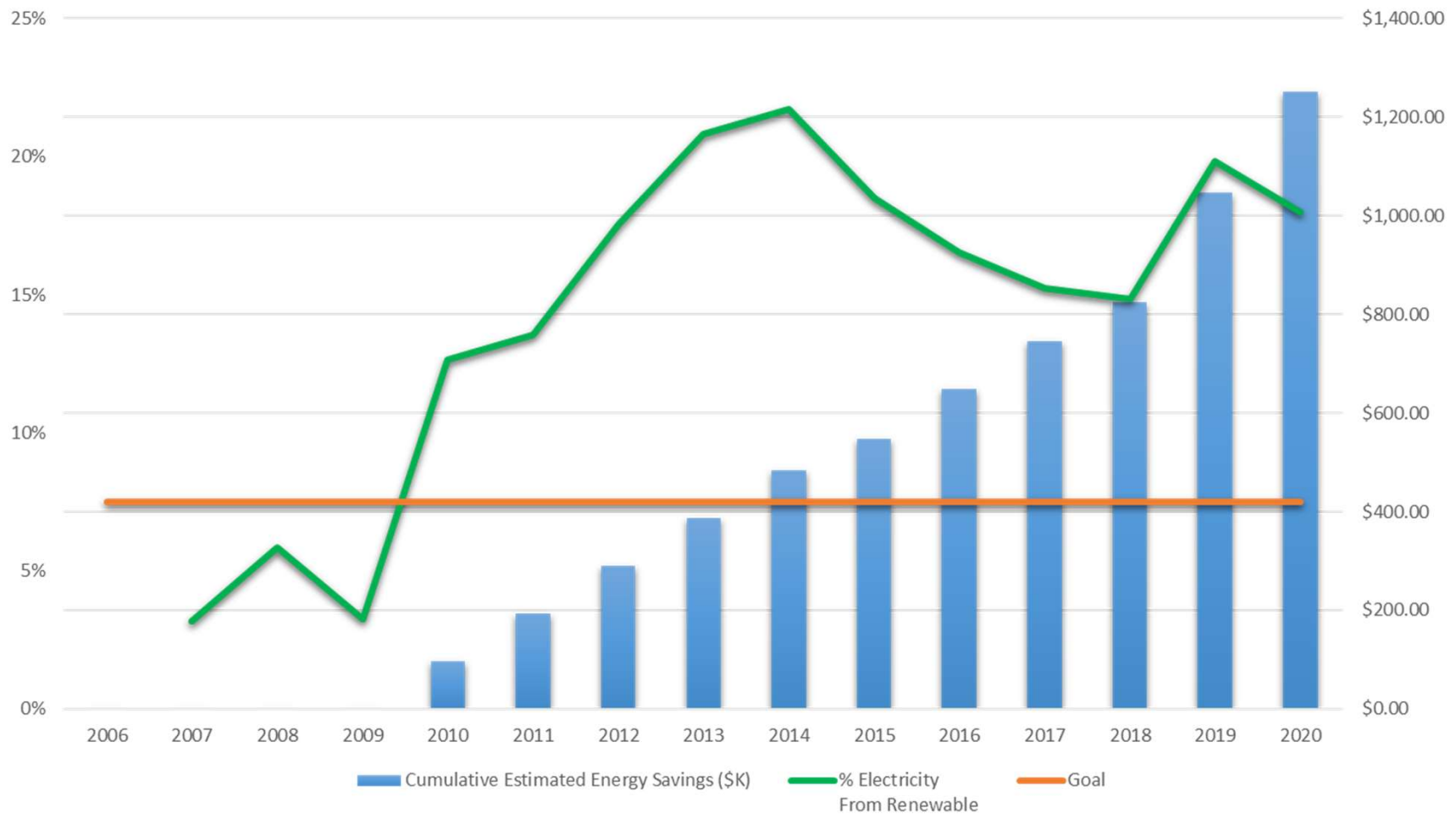
Energy Reduction

Energy Consumption Reductions and Estimated Savings



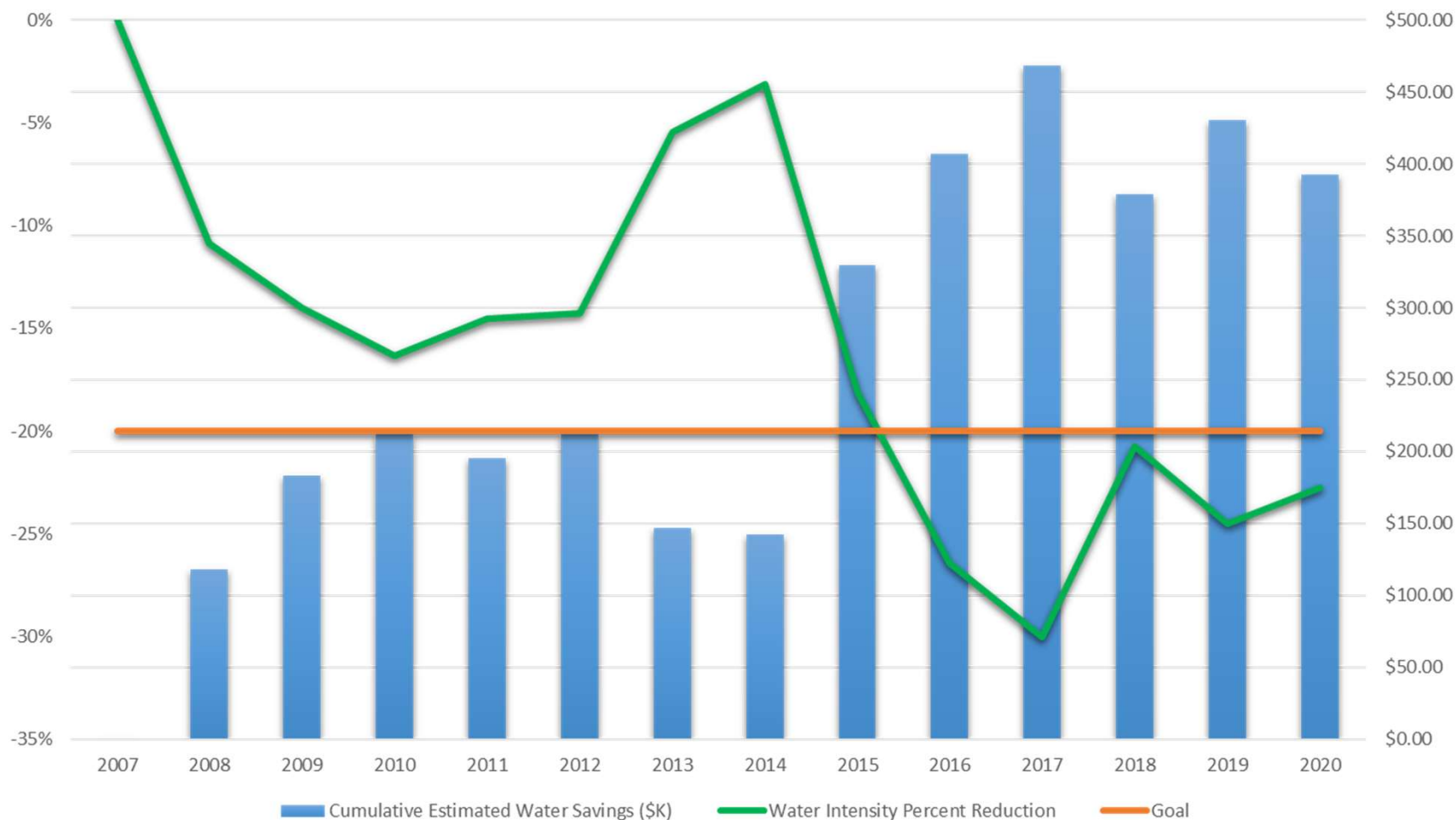
Renewable Energy

Renewable Energy and Estimated Savings



Water Management

Water Consumption Reductions and Estimated Savings



Energy Projects

ENERGY AND WATER EFFICIENCY

Energy and Water Efficiency

- ◆ Execute energy efficiency and renewable energy projects
 - Issue projects call and define scope of energy project(s)
 - Bundle energy and water conservation measures
 - Determine funding path
 - Performance Contracting, appropriated funds, grants, rebates
- ◆ Perform energy project follow-up
 - Measurement and Verification
- ◆ Commissioning and Re/Retro- Commissioning

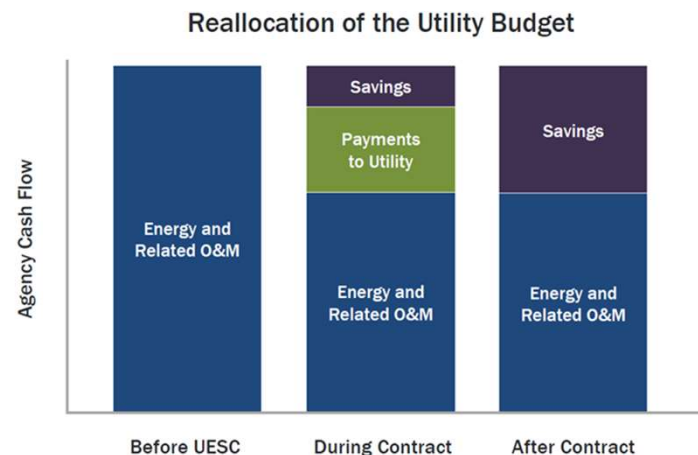
Utility Energy Services Contract

- ◆ What is a Utility Energy Services Contract (UESC)?
 - A performance contract that allows utilities to provide Federal customers with energy and water efficiency improvements and demand-reduction services
- ◆ Authorization
 - Energy Policy Act of 1992
 - Federal customers are authorized and encouraged to participate in utility programs generally available to non-federal customers
 - May accept utility financial incentives, goods, and services generally available to non-federal customers
 - Are encouraged to enter into negotiations with utilities to design cost effective programs to address unique needs of federal customers
- ◆ Goals/Benefits
 - Reduce energy and water intensity
 - Lower utility bills, proactive replacement and modernization of equipment

Utility Energy Services Contract

♦ Advantages

- Can finance energy and water conservation project(s) up to 25 years
 - Project payments come from “avoided energy/maintenance costs”
- Utility is established and familiar with the center’s energy needs
- It’s a partnership that is mutually beneficial
 - Reducing energy consumption reduces the need for new energy generation
- The utility refines the project scope by conducting assessments and designs
- DOE available for support throughout process



Utility Energy Services Contract

- ◆ UESC Overall Process/Schedule
 - ✓ Acquisition Planning
 - ✓ Preliminary Assessment
 - ✓ Feasibility Study (Investment Grade Audit)
 - Design/Implementation
 - Post Acceptance Performance
- ◆ Past performance contract were for a single project or one type of energy conservation measure
- ◆ KSC has established an internal process for continuous implementation of bundled conservation measures
 - Master checklist
 - Gantt schedule
 - Lessons learned
 - Stakeholder lists
 - Started process in 2018 with UESC Phase 1

UESC Phase 1

◆ Scope of Work, 34+ facilities/locations

- Lighting (high bay, low bay, office, wall packs, exterior street/parking)
- Mechanical (air handling units, chillers, controls, boilers)
- 2 MW Solar
- Water Fixtures
- Transformers



Installed Cost (\$)	Total Utility and Maintenance Savings (\$/yr)	Payback (yrs)
\$18.4M	\$1.4M	~12

Energy projects

RENEWABLE ENERGY

Renewable Energy

♦ Main source is solar

- Self-generated
- Hosted

♦ Types

- Ground mounted
- Roof top
- Awnings/Canopy

♦ Site examples

- Propellants North, 84 Kilo-Watt (KW) (2010)
- Electrical Maintenance Facility, 125 KW (2019)
- Central Campus, 1.87 MW (2019)



Electrical Maintenance Facility



Propellants North



Central Campus

Renewable Energy

◆ Space Coast Next Generation Solar Center

- 10 MW solar plant built 2010 at KSC through public-private partnership with NASA and FPL
- FPL built and maintains a separate 1 MW solar power facility at KSC as part of this partnership.
- A 30-year enhanced use lease (EUL) agreement.



Space Coast Next Generation Solar Center

◆ Future

- 2 MW ground mounted (UESC)
- Further assessing roof top and canopy



1MW FPL In-Kind

Discovery Solar Energy Center

◆ Goals

- Previous Executive Order 13693 required 30% renewables by 2025
- NASA seeking industrial interest and commercial partners and released a Notice of Availability (NOA) for Future Land Use at Kennedy
- FPL goal was to install more than 10 million solar panels throughout the state of Florida

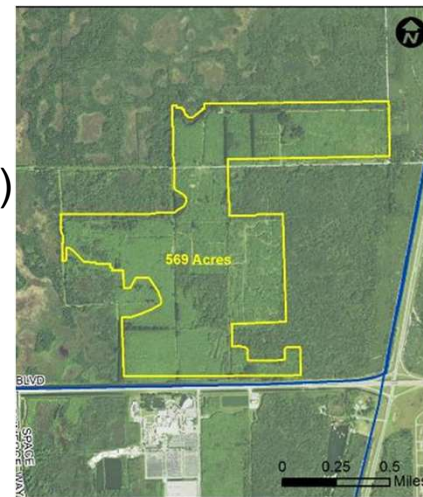
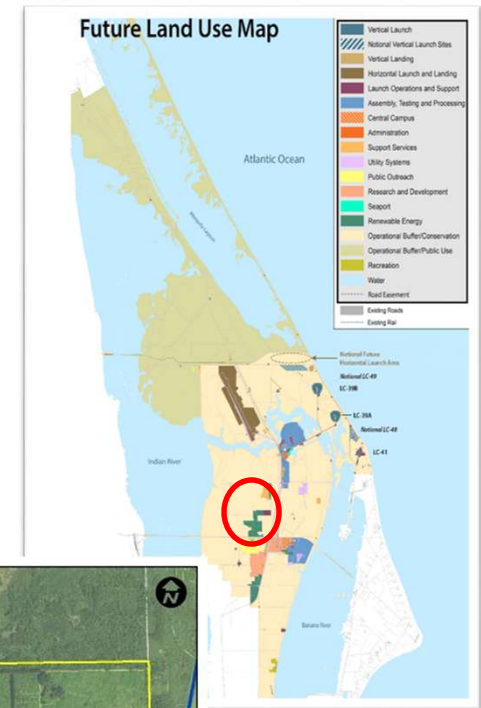
◆ Partnership Agreement Options

- In-Kind solar sites
- Cash considerations

◆ Technical Evaluation of Proposal

- National Renewable Energy Laboratory (NREL)
- Utility rate structure analysis
- Stennis workshop

◆ Environmental and Archaeological Assessments



Discovery Solar Energy Center

◆ Site Details

- ◆ Solar site capable of producing approximately 74.5 MW of clean energy
- ◆ 491 acres located north of Visitor Center

◆ Partnership Agreement with FPL

- 32 year Enhanced Use Lease, cash consideration

◆ Construction

- Construction approval
- Drawing approval
- Land Clearing/Burning
- Laydown Yard
- Distribution line utility boring
- Commissioning

◆ Schedule

- Start: March 2020
- Completion: June 2021



Image courtesy of Florida Power and Light

Energy projects

RESILIENCE

Energy & Water Resiliency

- ◆ Unanticipated catastrophic events can have major impacts on mission critical systems and infrastructure
- ◆ KSC enhances resiliency through planning, assessments and project implementation
- ◆ Currently have an Inter-Agency Agreement with NREL to perform the Resiliency Assessment and Systems Analysis
- ◆ NREL assessing...
 - Center documents, policies, procedures
 - Critical Infrastructure and Mission Essential Functions
 - Hazards, vulnerabilities and threats
- ◆ NREL producing...
 - Resilience Assessment identifying risk mitigation strategies, ultimately an action plan to increase resilience at KSC



Thermal Energy Storage

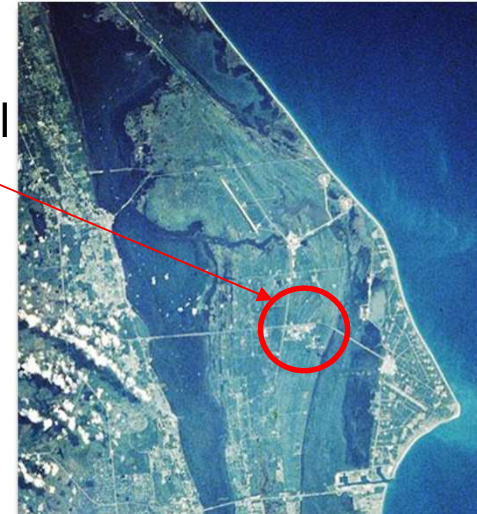
◆ Industrial Area Chiller Plant

- Chilled water and dry compressed air 24 hours a day/7 days a week to mission critical facilities

◆ Needs

- Modernize aging infrastructure
- More efficient system
 - Reduce operation and maintenance costs
 - Reduce energy use
- Increase reliability and resilience
 - Plant outages
 - Low maintenance
- Utility incentive - rebate

KSC
Industrial
Area



Industrial Area Chiller Plant

Thermal Energy Storage Tank

- ◆ 91 foot high, 78 foot diameter concrete stratified chilled water thermal energy storage tank system
- ◆ 10 inch diameter diffuser pipes
- ◆ Concrete base and dome
- ◆ 26 gauge steel diaphragm tank with exterior shotcrete and external 4" thick thermal insulation board, exterior finish



Construction



Interior Bottom Diffuser

Interior Top Diffuser



Tank Being Wrapped

Tank Being Insulated



Closing and Questions



Contact Information



Jennifer Hill, PE, LEED AP
NASA KSC Energy Manager
Jennifer.m.hill@nasa.gov

BACKUP SLIDES