U.S. General Services Administration

DER Projects in the Federal Sector

U.S. GSA Case Studies

presented by
Kinga Porst Hydras

Deep Energy Retrofit Case Studies

- Wayne Aspinall Federal Building
- GSA National Deep Energy Retrofit Program (NDER)
  - New Carrollton Federal Building
  - Almeric Christian Federal Building

Wayne Aspinall Federal Building History

Designed by Office of Supervising Architect - James A. Wetmore in 1915

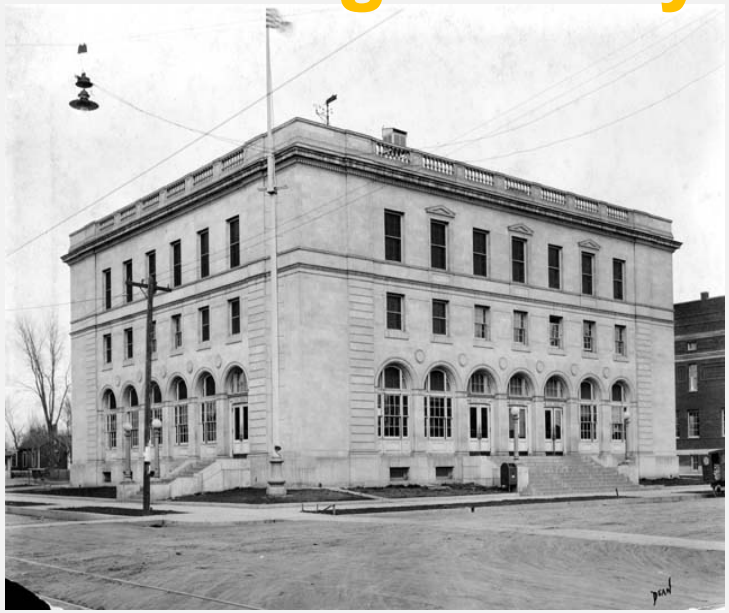
Third floor addition in 1916

Original construction completed in 1918 @ $250K

1938 Expansion @ $216K

Named after Congressman Wayne N. Aspinall in 1972

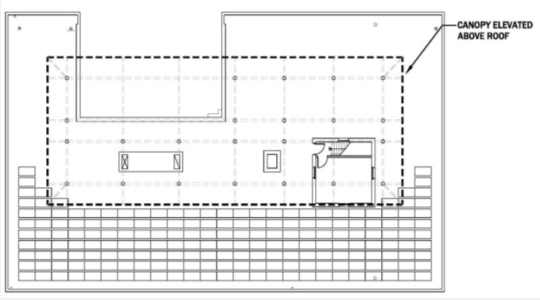
Listed on the National Register of Historic Places in 1980



Recovery Act Case Study

- Net-zero energy target
- Platinum LEED rating goal
- Historic Building
- 123 kW PV array to produce 170,000 kWh a year (greater than 50% of the building's historical annual electricity use)
- Ground source heat pumps
- ECMs: lighting control and monitoring, demand controlled ventilation, plug load management measures, thermally improved building envelope.
- Building physics analysis used

CO, Grand Junction Wayne N. Aspinall Federal Building & US Courthouse



Wayne Aspinall Federal Building Renovation

- Variable refrigerant flow heating and cooling (air-cooled)
- Demand controlled ventilation using multi-parameter system
- 0.6 W/sf avg. lighting power density
- Interior storm window with solar film
- Dedicated outdoor air system with heat recovery & indirect evaporative cooling
- Daylighting / occupancy controls
- Wireless sensors
- Energy sub-metering
- Integrated building automation system
- R-30 cool roof
- Solar thermal service hot water

Beck/Westlake Reed Leskosky

Utilizing Historic Resources

Interior Preservation

Source: WRL Design

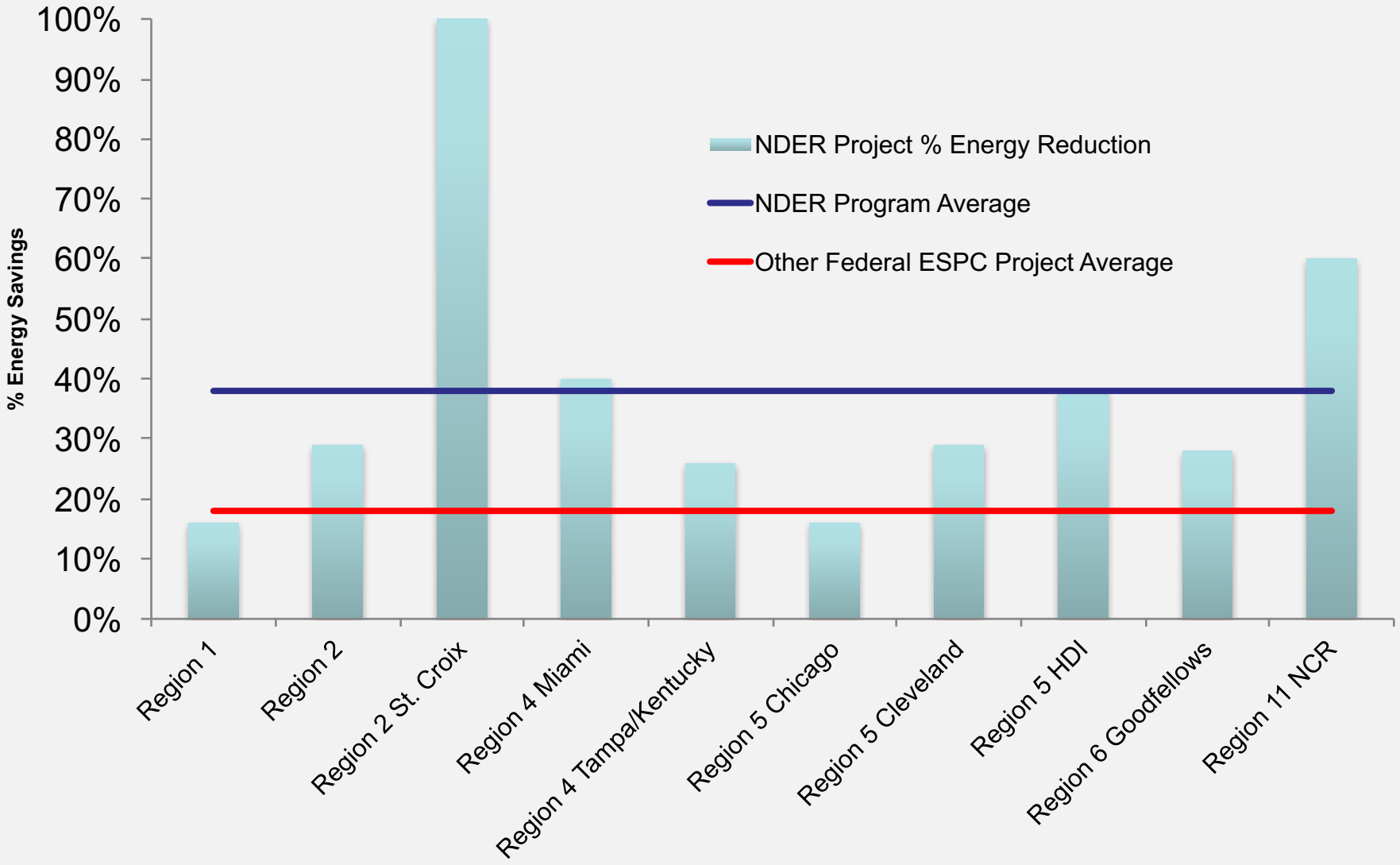
Project History

- Original Scope
  - $12-15 M project cost, 42,000 gsf
  - HVAC Life-Cycle Cost Analysis
    - 4-pipe FCU
    - WSHP
    - Air-source VRF
  - LEED Silver, 30% below ASHRAE 90.1-2007

National Deep Energy Retrofit NDER

- 23 facilities
- 10 Task orders awarded in 2014
- 14.7 million square feet
- 38% average energy reduction
- $172 million implementation cost
- $10.6 million annual savings
- 365 billion Btus annual energy
- Goals:
  - Retrofit plans that move a building towards net zero energy consumption
  - Use of innovative technologies
  - Use of renewable energy technologies
  - Unstated objective: achieve deep(er) energy savings than in past projects reduction

NDER Round 1 Results



The NDER Keys to Success

- ✓ **Aggressive Goals:** Emphasis on deep retrofits in the notice of opportunity
- ✓ **Clean Sheet** and **Integrative Design:** Design charrettes studied integrative design theory and reinforced the need for ESCOs to dig deeper (and propose ECMs with longer simple paybacks) than past projects
- ✓ **Support System:** Program Management Office provided central source of information for GSA regional managers

- The keys to successful deep ESPC projects are **well-understood** and **achievable** strategies
- **Communication**, deliberate **goal setting**, and **holistic design** are key to deep ESPCs
- Deep ESPCs are a **responsible investment** of taxpayer money
- Investing in efficiency today prepares our buildings to become **resilient grid assets** and supports goals like **net-zero energy**

New Carrollton Federal Building

New Carrollton Federal Building

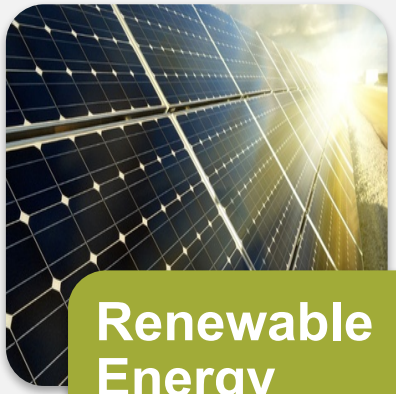
$44 M ESPC - Ameresco
60% reduction of total energy
54% water reduction
$2,839,770 annual energy savings
Over 20,000 tons of annual GHG emissions reduction

- 1.1M SF
- Completed in 1994, consists of three nine-story office towers connected by “public level” on the ground floor
- Occupancy is approximately 5,000
- All electric heating & cooling
- Initial EUI of 115

Project Highlights

Integrated ECMs

- Lighting & Advanced Controls - 15% energy reduction
- Chiller System Optimization - 7% reduction
- Building Controls - 30% reduction
- Other improvement measures - 9% reduction
- Infrastructure measures - 1% reduction



Renewable Energy

- Solar Thermal & PV System
- Geothermal Field

Economics

- $45 M Project Implementation Costs
- 22-Year Performance Period
- $4 M Rebates

- 11,000 LED lighting fixtures
- new control systems
- geothermal well field
- two new high efficiency chillers and one new chiller-heater
- 808kW solar canopy
- 67kW carport structure
- solar thermal heating
- new rain gardens

Almeric Christian Federal Building
First Net Zero ESPC

- GSA Region 2
- Schneider Electric selected in 2012, through NDER, to implement ESPC
- TO awarded September, 2013
- Construction completed September, 2014
- Project parameters
  - $6.4 million investment
  - $0.5 million/year guaranteed savings
  - 19 year finance term

Key Facts

Building Characteristics:

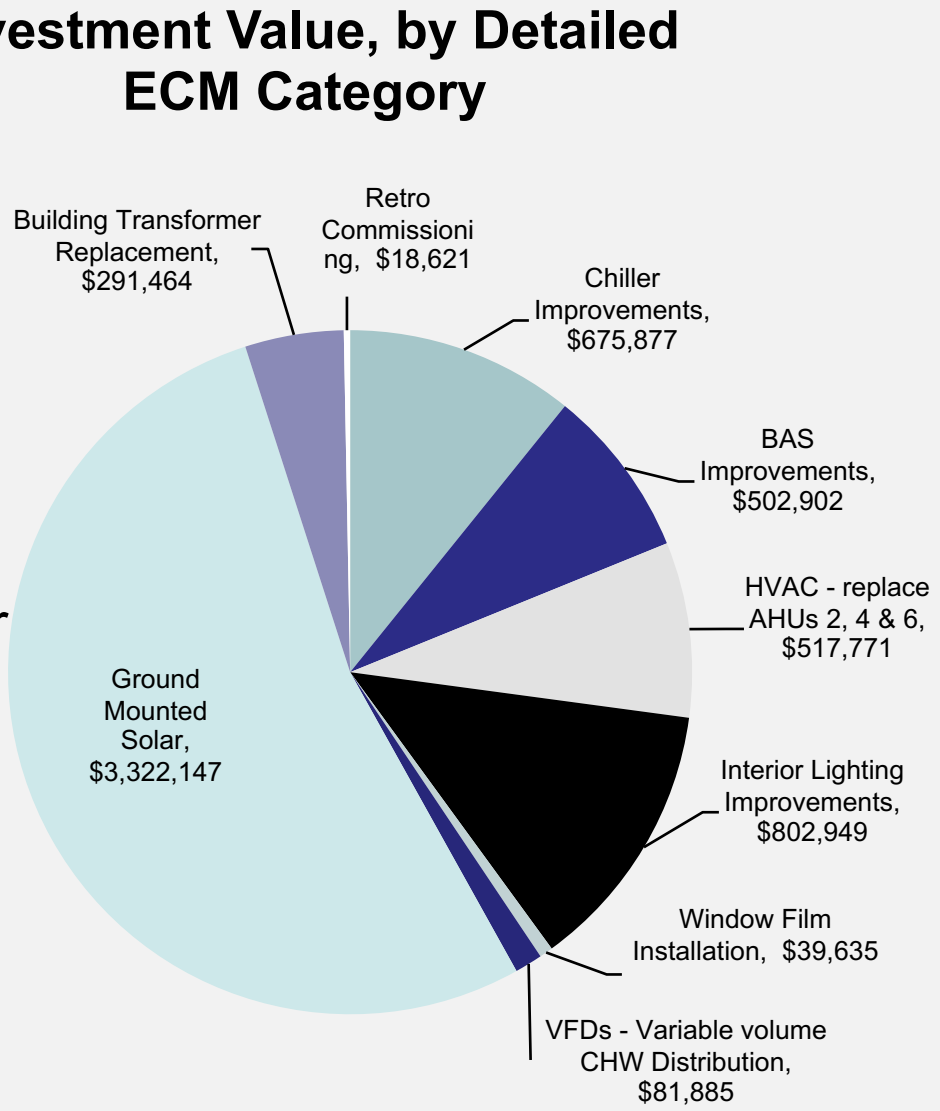
- **Location:** St. Croix, Virgin Islands
- **Floor Area:** 57,872 ft^2
- **Original Construction:** 1989
- **Tenant:** Federal Courts
- **Baseline EUI:** 57 $kBtu/ft^2$
- **Local Utility Rate:** $0.52/kWh

Project Details:

- **Project Duration:** Approx. 24 months, 12 each for development & construction
- **Investment Value:** $6.4 million
- **Projected Energy Reduction:** 100%
- **Projected Savings:** $500,000/year
- **Contract Term:** 19 years

Technical Specifications

- Key ECMs
  - Building Automation System
  - Lighting upgrades
  - Chiller and AHU upgrades
- Renewables
  - 462 kW ground-mounted solar
- M&V
  - Option B: PV system
  - Option C: all other ECMs



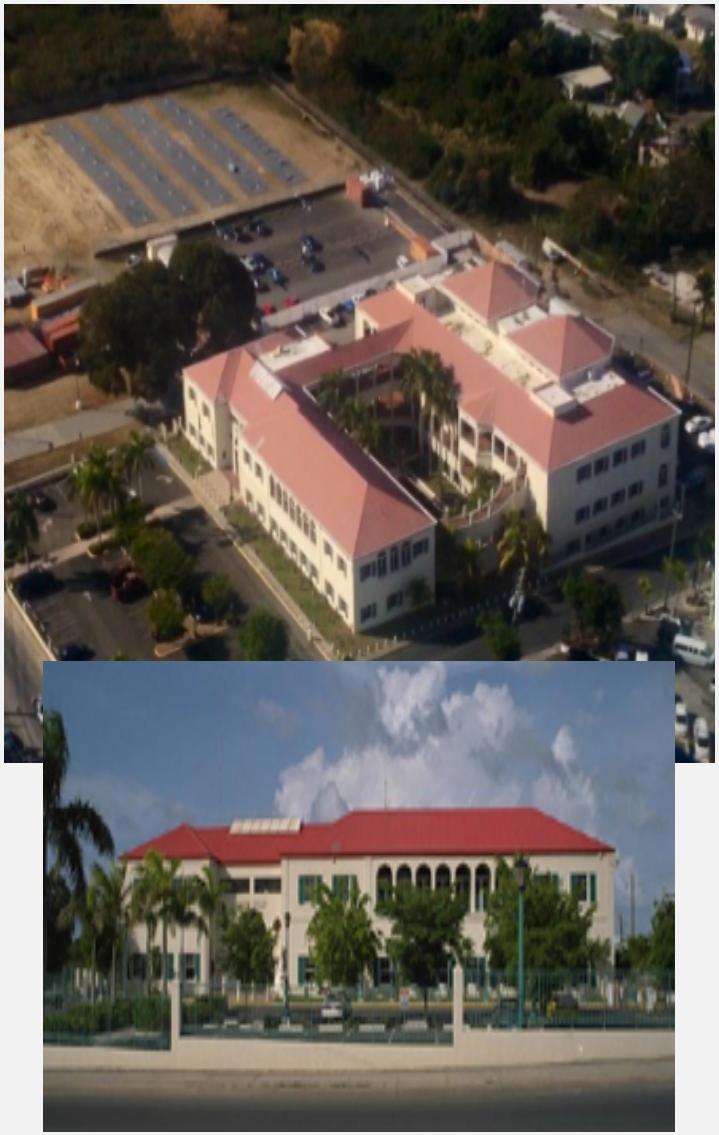
Scope

- 670kW PV system
- New Chillers
- New substation
- New air handling units
- New building automation system (BAS)
- Lighting upgrade
- Window film

Benefits of the ESPC

- 100% reduction in grid supplied electricity
- Stable utility rates
- Improved lighting and comfort conditions for the tenants
- New equipment reduces O&M expense
- Risk of substation failure is eliminated

Keys to Success



- Well-structured communication plan
- Building tenant buy-in
  - Proactively addressed tenant concerns
- Consideration of unique project characteristics
  - Utility rates
  - Security requirements
- Information collection and dissemination processes could be improved
  - More existing asset data needed
  - Standardized central location for all project information

Resources

GSA Office of Federal High Performance Green Buildings
www.gsa.gov/hpgb
ESPC Charrette Reports and Case Studies
www.rmi.org/gsaretrofits
ORNL report Energy Savings from GSA's National
Deep Energy Retrofit Program
http://www.gsa.gov/portal/mediaId/198447/fileName/NDEREnergySavingsReport5.action
Wayne Aspinall FB
http://www.gsa.gov/portal/content/121123
http://www.hpbmagazine.org/Case-Studies/Wayne-N-Aspinall-Federal-Building-and-US-Courthouse-Grand-Junction-CO/


GSA