CDC High-Performance Sustainable Buildings Master Planning

A holistic approach and lessons learned.

Federal Environmental Symposium Energy and Water Efficiency Webinar

2/17/21

New CDC Parkway Infrastructure Improvements

Roybal Campus: New East Parking Deck

Chamblee Campus Master Plan

Agenda

- Overview
- Pittsburgh Energy Savings Performance Contracts (ESPC) Case Study: Creative Funding
- Lawrenceville Building B Case Study: Merging Efforts
- Controls Study Case Study: Unintended Outcomes
- Other Project and Efforts
- Open Discussion

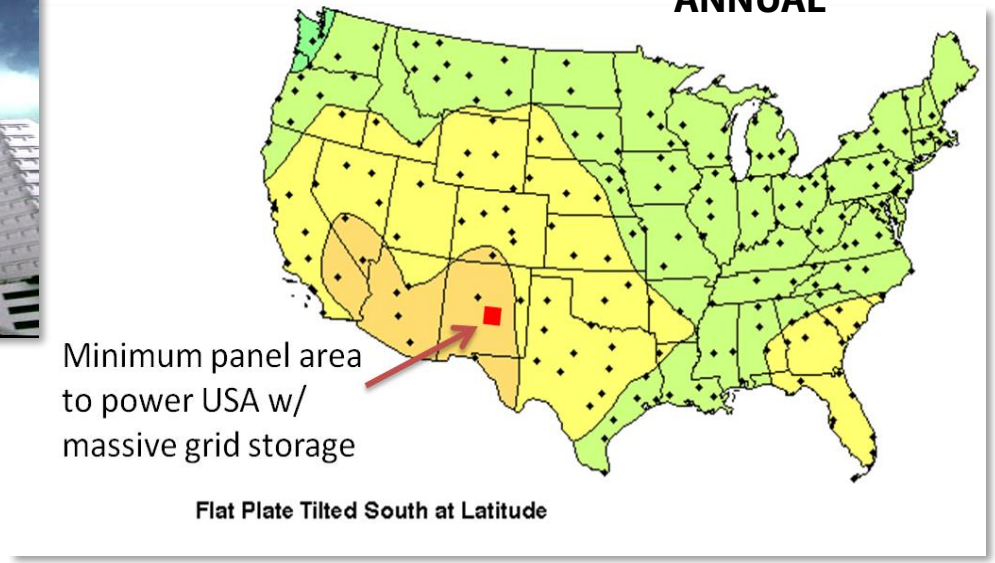
What is Sustainability?

- Sustainability is a buzzword, can mean many things
- “Old-school” mentality

What is Sustainability?

- Sustainability is a buzzword, can mean many things
- “Forward-vision” mentality

Average Daily Solar Radiation Per Month



What is Holistic?

- Holistic is a buzzword, can mean many things:
  - Integrated project team
  - Collaborative management culture
  - Whole greater than sum of parts
  - Taking a wide/long view

ho·lis·tic
/hōˈlistik/

adjective

PHILOSOPHY
characterized by comprehension of the parts of something as intimately interconnected and explicable only by reference to the whole.

- MEDICINE
  characterized by the treatment of the whole person, taking into account mental and social factors, rather than just the symptoms of a disease.

Challenges and Barriers to Success

- Unfunded mandates.
- Funding sources and procurement limitations (Color of Money).
- Is initiative for high-performance facilities empowered?
- Buy-in across traditional division lines.
- Tribal tendencies and internal “camps”.

CDC's Position in High Performance Buildings

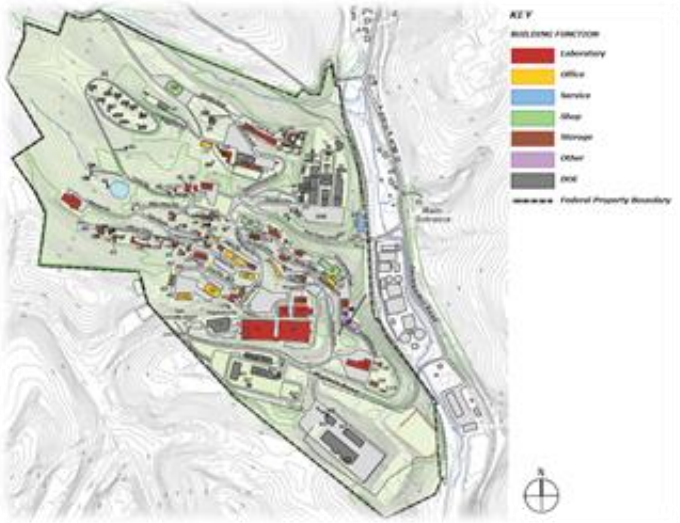
- CDC sustainable projects strive to meet three goals: support for the public health mission, reasonable financial return on investment, and positive sustainability and/or environmental Impact.
- High-performance facility characteristics integrated within CDC design and construction standards. Evolves with industry in order to maintain a "leading-edge" position.
- Sustainability is a key factor and leading initiative for CDC when developing long-term strategic plans.
- High performance facilities - part of CDC's master plan for its campuses.
- New initiatives evaluated on an ongoing basis across the entire portfolio for a more holistic approach.
- Over 29% of CDC's current inventory (by GSF) meet Guiding Principles Compliance and LEED certification – almost double the current mandated target of 15%.

LEED Certified Buildings

- GOLD – Chamblee Buildings 106, 107, 110, and Roybal 24.
- GOLD – Commercial Interiors: Ft. Collins Building 401
- SILVER – Roybal Building 21 and Lawrenceville Building B

Alternate Funding Sources: CDC/NIOSH PITTSBURGH
Energy Savings Performance Contract (ESPC)

- Sprawling campus with dated and deteriorating infrastructure.
- High energy and water demand based on mission critical work.



Site plan

Steam plant

CDC/NIOSH PITTSBURGH: Overview of Scope

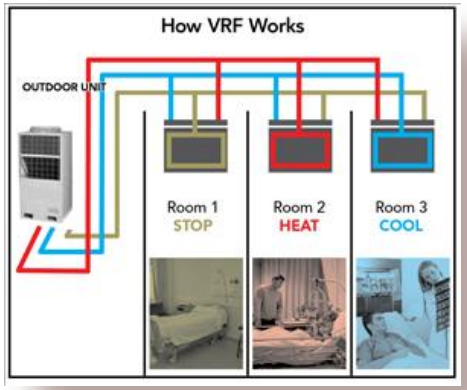
- Boiler decentralization.
- LED lighting.
- Plumbing improvements.
- Building decommissioning.
- Solar carport and charging station.

ECM Number	ECM Description	Energy MBtu	Water K Gal	Year 1 Cost Savings ($)	Benefits
ECM.01.01	Boiler Decentralization	53,046	3,126	528,216 Energy 46,662 Water 582,661 O&M	Provides a solution to the need to replace the existing end of life central steam plant and distribution system, includes campus wide smart meters. Additionally a campus wide Building Automation System network backbone will be installed.
ECM.05.01	Lighting Improvements	4,778	-	131,548 Energy	Redesigns lighting layouts, and adds LEDs in poorly lit, hard to access high bay research areas.
ECM.11.01	Solar Photovoltaic Carport with Electric Vehicle Charging Capability	20	-	335 Energy	Adds a renewable charging source for the campuses new electric vehicle fleet, which will reduce CDC's purchased electricity and demonstrate to its staff and visitors NIOSH's dedication to energy reduction.
ECM.13.01	Plumbing Improvements	-	618	9,217 Water	Helps the HHS/CDC/NIOSH address the aggressive water conservation goals.
ECM.16.01	Building Decommissioning	339		11,323 Energy	Accelerates the building demolition process, freeing up space.

*Year 1 Cost Savings and O&M Savings reflect two years of escalation from baseline savings.

CDC/NIOSH PITTSBURGH: Boiler Decentralization

Proposed Equipment	Quantity	Manufacturer	Model No.
Steam Boiler	5	Cleaver Brooks	CFH
Hot Water Boiler	1	Camus Hydronics	DRNH-1400
Hot Water Boiler	2	Camus Hydronics	DMNH-0601
Hot Water Boiler	1	Camus Hydronics	DMNH-0391
Variable Refrigerant Flow	2	Samsung	DVM-AM144FX
20-Ton Packaged Ground-Mounted Unit	1	Carrier	48TCED25AFM5-0F0A0
4-Ton Packaged Roof-Mounted Unit	2	Carrier	WeatherMaker 48TC Series
3-Ton Packaged Ground-Mounted Unit	5	Carrier	48TCEA04A2M5-0A0A0
70-Ton Air Handling Unit	1	Carrier	48P4D070611023369V
Gas Radiant Tube Heating System	41	Ambirad	VPLUS Series
Electric Meters	27	Schneider Electric	Square D PowerLogic Enercept
Natural Gas Meters	4	Elster American Meter	AC-250,
Natural Gas Meters	9	Romet	RM Imperial Series
Natural Gas Meters	3	Elster American Meter	AL-425
Natural Gas Meters	5	Elster American Meter	AC-630



Boiler Plant

CDC/NIOSH PITTSBURGH: Boiler Decentralization

Steam piping

Steam piping

CDC/NIOSH PITTSBURGH: Boiler Decentralization

Utility plant

Utility plant

CDC/NIOSH PITTSBURGH: CDC/NIOSH PITTSBURGH: Lighting Improvements

Lab space

High-bay lab

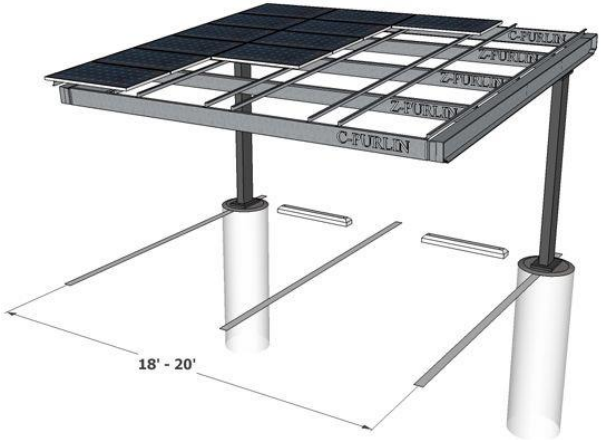
Lighting scope

Building Number	Area (Gross Sqft)	Building Number, Cont.	Area (Gross Sqft), Cont.
1	15,818	114	1,447
3	19,786	116	1,209
4	7,704	117	3,138
6	1,776	118	1,536
7	1,241	140	22,970
13	8,680	141	
14	2,439	142	1,000
15	914	143	13,527
18	257	144	13,764
19	21,980	145	6,385
019A	1,482	148	4,085
20	12,774	149	726
25	720	150	3,199
29	5,712	151	56,267
30	1,611	152	63,623
35	625	153	10,349
37	4,514	154	7,828
38	26,503	155	23,286
39	182	156	24,234
40	9,110	161	487
44	5,016	162	3,282
50	600	166	13,204
62	57,543	170	3,758
101	1,973	171	3,623
102	433	172	4,027
103	4,041	211	423
104	707	400	1,415
106	574	401	1,415
108	3,648	402	1,415
113	600	403	1,415

CDC/NIOSH PITTSBURGH: Solar Photovoltaic Carport w/Charging Station

- Feeds energy back into building/campus grid
- Cover provides incentive for electric vehicles.

Charging station



CDC/NIOSH PITTSBURGH: Plumbing Improvements

Proposed Equipment	Quantity	Manufacturer	Model No.
Aerator	19	Omni	Laminar Flow Model L-200 Series 0.5-GPM Aerator
Aerator	25	Omni	Laminar Flow Model A-200 Series 1.0-GPM Aerator
Automatic Flush Valves	141	Sloan	Optima Plus SFSM GEM2
Faucet	83	Zurn	Z81104-XL-3M 0.5 GPM
Shower Head	8	Install a 1.5 GPM Shower Head	Install a 1.5-GPM Shower Head
Urinals	39	Sloan	St7009-A china
Water Closet (WC)	102	Sloan	St-2009-A 1.28-GPF Floor-Mounted Flush Valve Toilet with an Elongated Open Front Seat

CDC/NIOSH PITTSBURGH: Building Decommissioning

Aging facilities

Break area

Decommissioned buildings

6			25	30	35
39		101	102	103	104
106	108	113	114	115	117
118	142	149	150 Storage Only	161	162
211	T145	T400	T401	T402	T403

CDC/NIOSH PITTSBURGH: Schedule/Budget Summary

- 2-Year Overall construction schedule for all. Energy Conservation Measure (ECMs).
- $14.5M In implemented improvements costs.
- $24M in overall project cost including financing over 14-year payback period.
- $25.3M In guaranteed savings by ESPC contractor.

Table 4-1: Summarized Year 1 Costs and Savings

ECM No.	ECM Name	Implementation Price ($)	Energy and Water Cost Savings ($)	O&M Cost Savings ($)	Total Year 1 Savings ($)
	Project Development		0	0	0
ECM.01.01	Boiler Decentralization		574,878	582,661	1,157,539
ECM.05.01	Lighting Improvements		131,548	0	131,548
ECM.11.01	Solar Photovoltaic Carport with Electric Vehicle Charging Capability		335	0	335
ECM.13.01	Plumbing Improvements		9,217	0	9,217
ECM.16.01	Building Decommissioning		11,323	0	11,323
	TOTALS	14,453,112	727,301	582,661	1,309,962

Note: Savings are based on utility rates escalated to the date of project acceptance.

CDC/NIOSH PITTSBURGH: Project Challenges/Keys to Success

- Accurate and thorough Critical Path Method (CPM) scheduling with critical path, float, and all logic ties appropriately identified and maintained.
- Expediting resolution when unknowns or unanticipated conditions arise.
- Smooth electronic project management system.

Next Steps, Additional Opportunities

- Gaining comfort level and considering a portfolio wide comprehensive energy and water “masterplan” using the ESPC program.

Lawrenceville Building B Case Study: Merging Efforts

- Building B is located on CDC's Lawrenceville campus in a semi-rural setting, surrounded by pastures and open spaces.
- Since the 1960's the site has been home to animal and other types of research to support CDC's public health mission.
- The site and project timing afforded the CDC team a unique opportunity for the confluence of several efforts.

Site images

Lawrenceville Building B: Overview

As part of its sustainable building management strategy, CDC performed building assessments of all its owned buildings from 2009 through 2011. The assessment included Energy Conserving Measures or "ECMs". Some of these ECM's were executed via the Building B repair project. Some features include:

- Low Volatile Organic Compound (VOC) and recycled materials.
- Creative re-use of furnishings slated for the landfill.
- Cost saving vs. traditional construction and procurement.
- Diversion of over 93% of construction waste from landfills.
- Integrated project team.

Figure 20: Lawrenceville Campus Building B Design/Build Team (l-r): Steve Klim, Craig Belflower, Gregory Langham, Judy Asher, Fatema Sadiq, Steven Battenfield, Art Lingler, Bill Dryden, and Angela Wagner.

Integrated project team

Lab space

Lawrenceville Building B: Sustainable Features

Earning LEED certification for a building constructed in 1963 is no small feat. Some other highlights include:

- The team replaced all utilities with new electrical, HVAC, and plumbing infrastructure to meet LEED requirements.
- Upgrades also served as a CDC pilot project for LED ambient and task lighting in laboratory spaces.
- EV Charging Stations were installed.
- Upgraded insulation, cool roof coating, renewable electricity, as well as new boilers, air handling units, chillers, and repurposed furniture from the Chamblee campus to Building B.

Figure 21: Mike Stepp, Lawrenceville Campus building manager with Bill Dryden, project manager near an Electric Charging Station.

Project images

Lawrenceville Building B: Sustainable Features - Campus UESC

- CDC awarded a Utility Energy Service Contract (UESC) project to Atlanta Gas Light/Southern Company that includes an on-site ground mount solar PV array that offsets 100% of the Building B energy consumption.
- Represents CDC milestone - first project designed to be an Energy Net Zero facility – years ahead of required targets and goals.
- Other UESC ECMs include campus-wide LED lighting, condensate water recovery, and improvements to existing well water equipment.
- These efforts along with independent funding sources and program drivers were coordinated and blended for mutual benefit.

Solar array

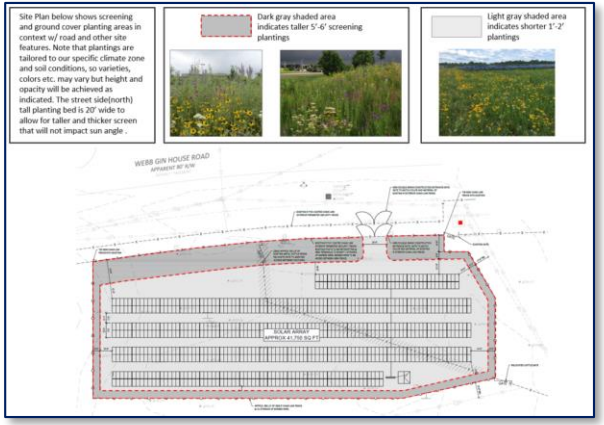
Lawrenceville Building B: Project Challenges

Anytime you swing a hammer or put a shovel in the dirt there are challenges.

Some included:

- Program logistics/facility shutdowns.
- Rigorous safety standards.
- Funding source constraints.
- LEED Documentation requirements.
- Interpretation of mandates.
- Public optics.
- Environmental/historical requirements.
- Multiple contractors.
- Compliance with masterplan.
- One year energy data tracking.

Solar array



Project images

Lawrenceville Building B: Summary/By the Numbers

Building B

- 8,800 SF renovated area (27,900 total).
- Over 260,348 KWH or $54,000 in estimated annual energy (offset).
- 58% water use reduction.

Lawrenceville Ground Mount Solar

- 249 KW array size.
- 376,900 KWH estimated annual energy production.
- $2.25/KW approximate installed cost.

Project images

Atlanta Campuses: UESC (Utility Energy Service Contract)

Phase I Scope

- **Roybal B18**
  Steam sub-metering
- **Roybal B19**
  PV 120kW
- **Roybal B20**
  Steam and chilled water sub-metering
  LED
- **Roybal B21**
  LED
  Lighting controls
- **Roybal B30 (South Deck)**
  LED
- **Chamblee B106**
  PV 120kW
- **Chamblee B110**
  Steam sub-metering
- **Chamblee B161 Deck**
  LED
- **Lawrenceville Bldg A**
  LED
- **Lawrenceville Bldg C**
  LED
  Well Water Makeup
- **Lawrenceville Site**
  PV 249kW

Phase I Budget

- $6.6M (with financing)
- $500K+ annual utility savings
- 11-year payback

Solar array

Atlanta Campuses: UESC (Utility Energy Service Contract)

Proposed Phase II Scope

PHASE 2 ECMs - Pricing Cost Breakdown

	Site Building	Project ($) Cost
Central Utility Plants (CUP)		
ECM P2.02 Clg Tower VFDs	10	$275,357
Office/Lab Buildings		
ECM 5.01 Lighting Improvements	16, 32 Parking Deck	$878,347
ECM 5.01 Lighting Improvements	45	$173,020
ECM 5.01 Lighting Improvements	101,102,103,106,107	$4,315,096
ECM 5.03 Lighting Controls	16	$420,233
ECM 5.03 Lighting Controls	103	$379,229
ECM 17.01 Re-Commissioning Base Case	16	$458,178
ECM 17.01 Re-Commissioning Base Case	101	$229,611
ECM 17.01 Re-Commissioning Base Case	102	$134,088
ECM 18.01 Submetering - Steam and CHW	17,21,101,102	$312,610
ECM 13.05 - Condensate Recovery	17,18,23	$1,465,515
TOTAL		**$9,041,284**

- **Pricing does not include financing fees**

Potential Phase II Budget

- **~$12 M (with financing)**
- **~$800K annual utility savings**
- **13-year payback**

Solar array

Current Projects

- Roybal Campus Improvements almost complete:
  - Includes rooftop PV providing 100% Energy offset for new East Parking Deck.
  - Targeting CDC's First LEED Parksmart certification.
  - Sustainable components were integrated into campus wide scope.

Parking deck

Main entry

Parking deck

Current Projects: San Juan Campus

Infrastructure improvements create resiliency and in response to sustain continued campus operations during extreme conditions due to emergent natural events.

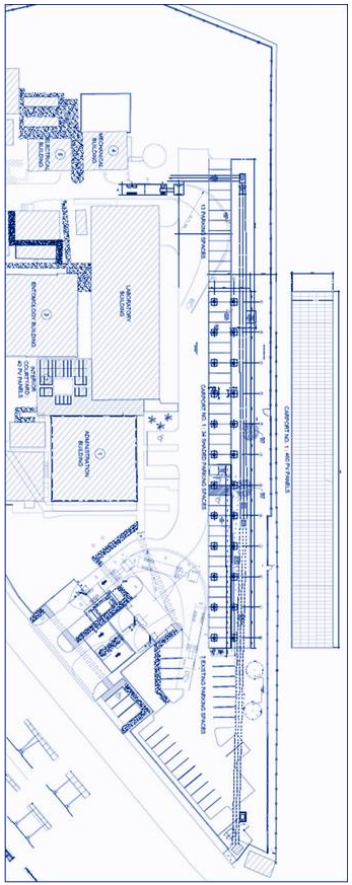
- **Electrical System Infrastructure Improvements**

Upgrade transformer, switchgear, and emergency standby generators. Redundant emergency standby generators will supply power to the campus electrical loads for approximately 20 days without the need of maintenance downtime.

- **Photovoltaic (PV) Array**

PV System in Parking Area along with Battery Backup. Roof mounted and cantilever over parking and connected to a 112kW battery backup system. Fully cantilevered 200kW (DC) photovoltaic canopy system with battery backup for the campus most critical loads for 24 hours.

San Juan images



San Juan site plan

Future Projects: Chamblee Campus

- Chamblee Campus office building project includes high performance office tower and parking deck expansion. Project has recently been awarded.
- CDC Wide Campus Masterplans include:
    - Energy Net Zero Buildings
    - Chilled water storage
    - Expanded ground mounted PV
    - Innovative water re-use
    - Environmentally-friendly groundwater management

Master plan images

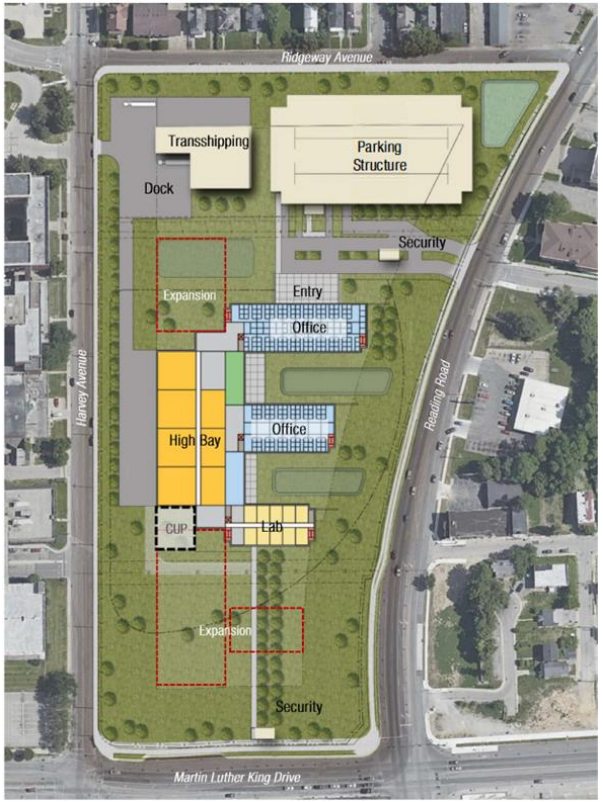
Future Projects: Cincinnati Campus

- Construction of new facility will consolidate three NIOSH Cincinnati campuses (Taft, Taft North and Hamilton) into one new location. Urban infill site selection will rehabilitate existing “brown field” conditions.

- Existing Cincinnati Campus with multiple aging facilities nearing the end of useful life. Consolidation anticipated to reduce annual operating cost by 37 percent.

- Construction is schedule to be complete Spring 2024.

- Targeting Guiding Principle Compliant and LEED certified components.



Cincinnati masterplan

Open Discussion

- There are no “Dummy” questions

For more information, contact CDC
1-800-CDC-INFO (232-4636)
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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.