NVESD

Fort Belvoir

300 Area Compound Energy Plan

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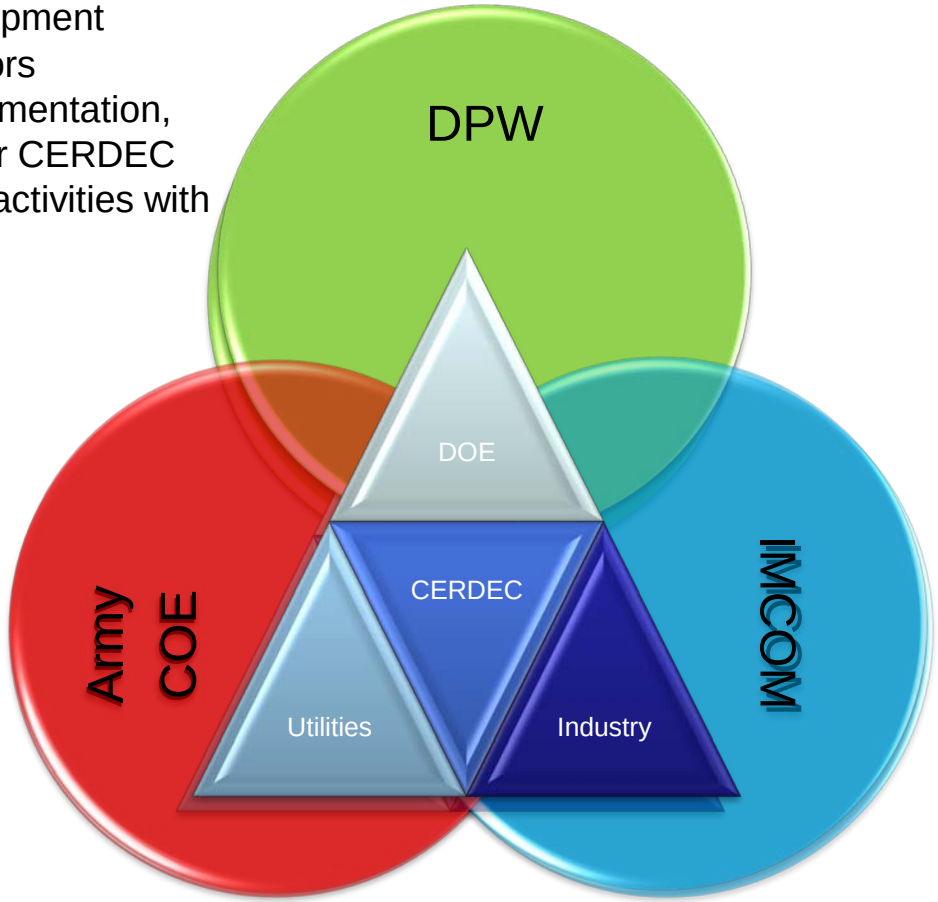
ENERGY SAVINGS FOR THE FUTURE
ENTERPRISE POWER INFRASTRUCTURE MODERNIZATION CHARTER

The Communications, Electronic Research Development Engineering Center, Night Vision Electronic Sensors Directorate, is responsible for the research, experimentation, testing of energy security and savings solutions for CERDEC installations. CERDEC NVESD will coordinate all activities with the following key stakeholders

- Department of Energy (DOE)
- National Renewable Energy Laboratory (NREL)
- Sandia National Laboratory; FEMP
- Oak Ridge National Laboratory
- C2, Power Generation Branch
- IMCOM
- Ft. Belvoir DPW
- The University of Virginia Engineering department
- Program Manager for Mobile Electric Power
- Aberdeen Proving Ground DPW
- Dominion
- Washington Gas
- PEPCO
- GE
- Johnson Controls



CERDEC NVESD will transition useful technologies to Installation Management Command as needed and requested. The main goal of the group is to assure energy security at CERDEC laboratories and assist correlated installations in meeting Department of the Army energy goals.

Proposed Path Forward

Phase I – Bldg 357

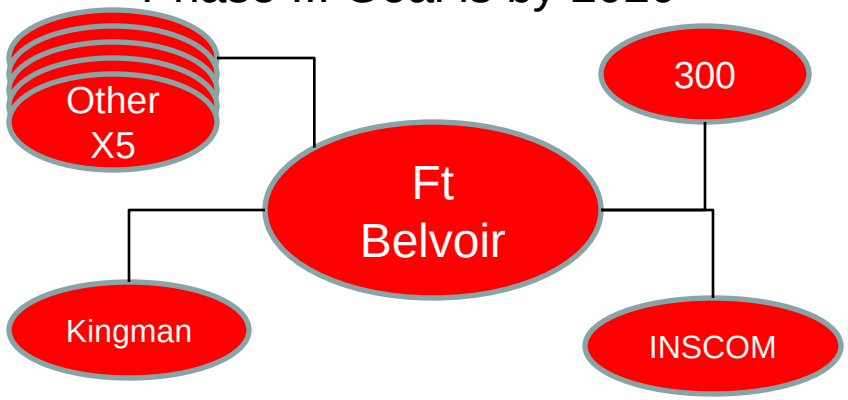
- 1 mw primary power & 800 kw backup power
- Incorporates thermal waste to act as heat source & AC source
- Upgrades aging infrastructure; will correct all facility power issues & safety concerns
- Reduces Carbon Footprint by 50% or >
- Clean primary power for 24/7 operation
- Provides backup power to buildings 307, 309 & 305 for designated areas, Labs, Conf Rooms & sensitive test chambers/rooms
- Provides Proof of Principle study for building 332 Power Plant Conversion for Phase II

Fueled by Natural Gas and Biomass

Phase II – 300 Area Compound

- Place 4-6 one mw Micro Turbines at 332: build an Energy Island/Smart Grid Node for the 300 Area
- COOP
- Provides clean primary power for 24/7 operation
- Provides 300 Area with 4-7 mw of power, current peak is 4-5 mw
- Reduces 300 Area Carbon Footprint by 50% or >
- Integrates Renewable Power & Renewable Fuels
- Provides Fort Belvoir with 12-15% Percent of its operational power
- Post total peak of approximately 40 mw, mean 28-30 mw
- Power can be redirected during peak load times
- Proof of Principle for IMCOM & Army test bed

Phase III Goal is by 2020



Generate 80% organic power, provides energy security and conservation

Year	FY 10	FY 11 PH I	FY 13 PH II
($k)	0	3.000	27.000

Cost estimates are based on DOE and Industry discussions through EWG for the 300 Area Compound at Ft Belvoir including Phases I & II

Project Summary

	Carbon Footprint Reduction	Energy Security	Renewable Fuel	Monitoring and Controls	New Technology Renewable Energy
Phase I *1.8 mw* *6 buildings* *Micro Grid*	50% from tri-generation alone; energy efficiency analysis plus monitoring and controls should create an additional 15% reduction	Primary and backup on site	Technology driven based on supply in close proximity to site	Monitor all consumption. Use for comparative analysis, energy efficiency analysis (test-fix-test)	Acting as test bed for new technologies, such as: bipolar ionization (IAQ), advanced AC (Liquid Desiccant), solar PV, hydro kinetics, peak shaving, flywheel/clutch, etc… No cost to Fort Belvoir
Phase II *4-6 mw* *46 buildings* *Smart Grid Node*	50% from tri-generation alone	Primary and backup on site		Develop process for reduced life cycle energy costs. (test-fix-test) Integration with grid	Implement multiple technologies. Continue to support private sector commercial-scale testing. Share lessons learned for facility and field applications with DOD agencies, other
Phase III 8 10-mw Smart Grid Nodes	Substantial carbon footprint reduction possible if using local renewable fuels	On-site fuel source, 2020 80% compliant (EO13423)	Biogas from Lorton, VA WWTP, gasification of post, and local biomass, etc…		Continue to test and implement new technologies

Background

NVESD/DPW/DOE

- Explored primary power Micro Turbines/Tri-generation

Micro Turbines provide primary power and the thermal waste can be recuperated through heating and cool air processes

DPW sought and received $2.7M stimulus funds for energy projects in the 300 Area Compound (Decommission of central boiler and decentralization of boilers)

Proposed renting Belvoir roof tops to Dominion for PV energy

- Thermal imaging of electrical circuitry

Detection and prevention of electrical problems before incidents, or outages occur

NVESD electrical staff now using thermal sensors for evaluation of internal building power lines, circuit breakers, wire connections—reduces manpower for troubleshooting by 80%

- Installed bipolar ionization devices throughout many 300 Area buildings

Lowered energy costs, improved employee attendance, and reduced illness. Study found reduction of intake air can still provide clean air yet reduce the amount of energy required by air handlers.

300 Area Compound

Terrain dependent is a driving factor in Micro Grid design
Central Boiler Plant converted to Prime Power Plant

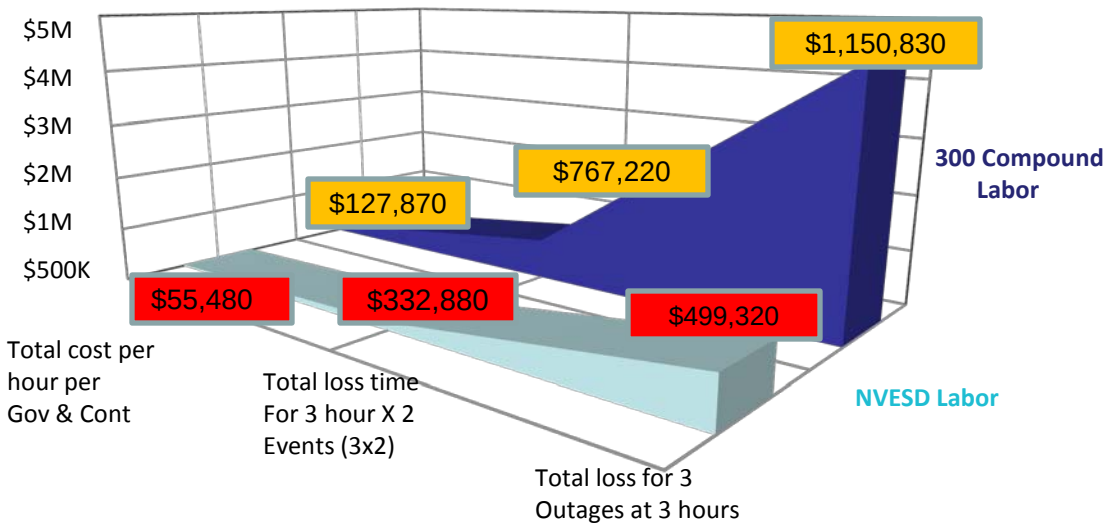
Energy Security, Carbon Footprint Reduction, and Savings Can Co-exist

	Total Annual Energy Cost for 300 Area	CO2 emissions (tons per year)	% On-site Generation
Current	$5,199,421	42,377	0%
ESM Phase 1	$4,799,421	35,875	25%
ESM Phase 2	$2,699,421	27,545	100%
Energy Efficiency (Monitoring and Controls)	$2,294,508	23,414	118%
Renewable Energy	$2,294,508	Zero CO2 emissions	118%, Fuel supply on-site

Total Annual Savings $ 2.9 Million

Power Outages Have Direct Cost Impact in 300 Area

Year to date the Government will lose estimated $2,128,950 each year in labor costs for nine hours of power outages: (Based on historical data outage data 43 hours = $10,171,560.00)



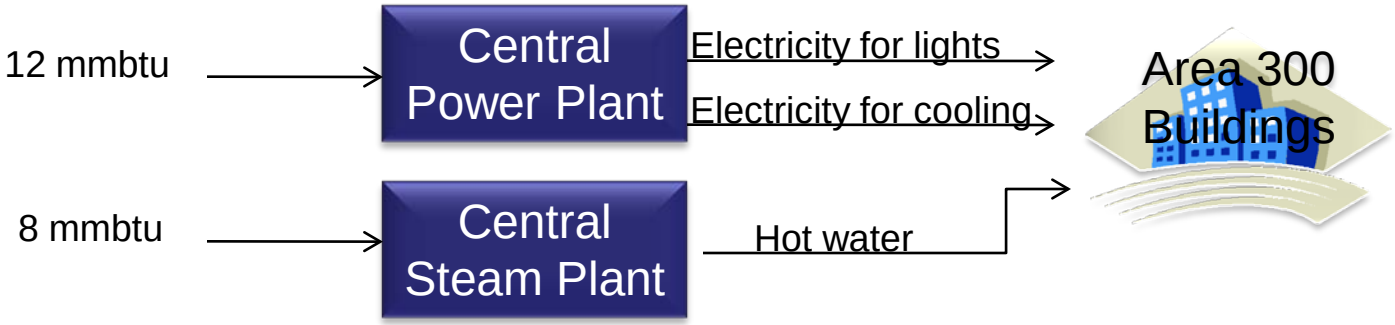
Assumes that employees come back to work after the outage

- Combines government and contractor daily rates
- Includes the loss of visitors coming to conduct business with 300 area compound partners

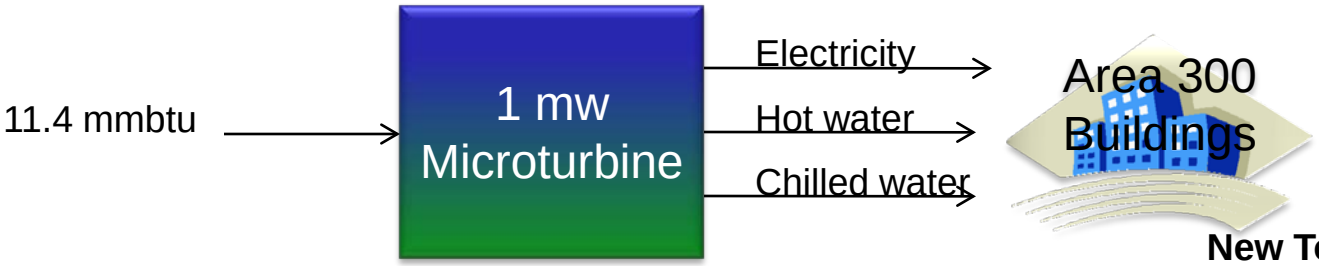
Note: This metric does not address anytime being made up

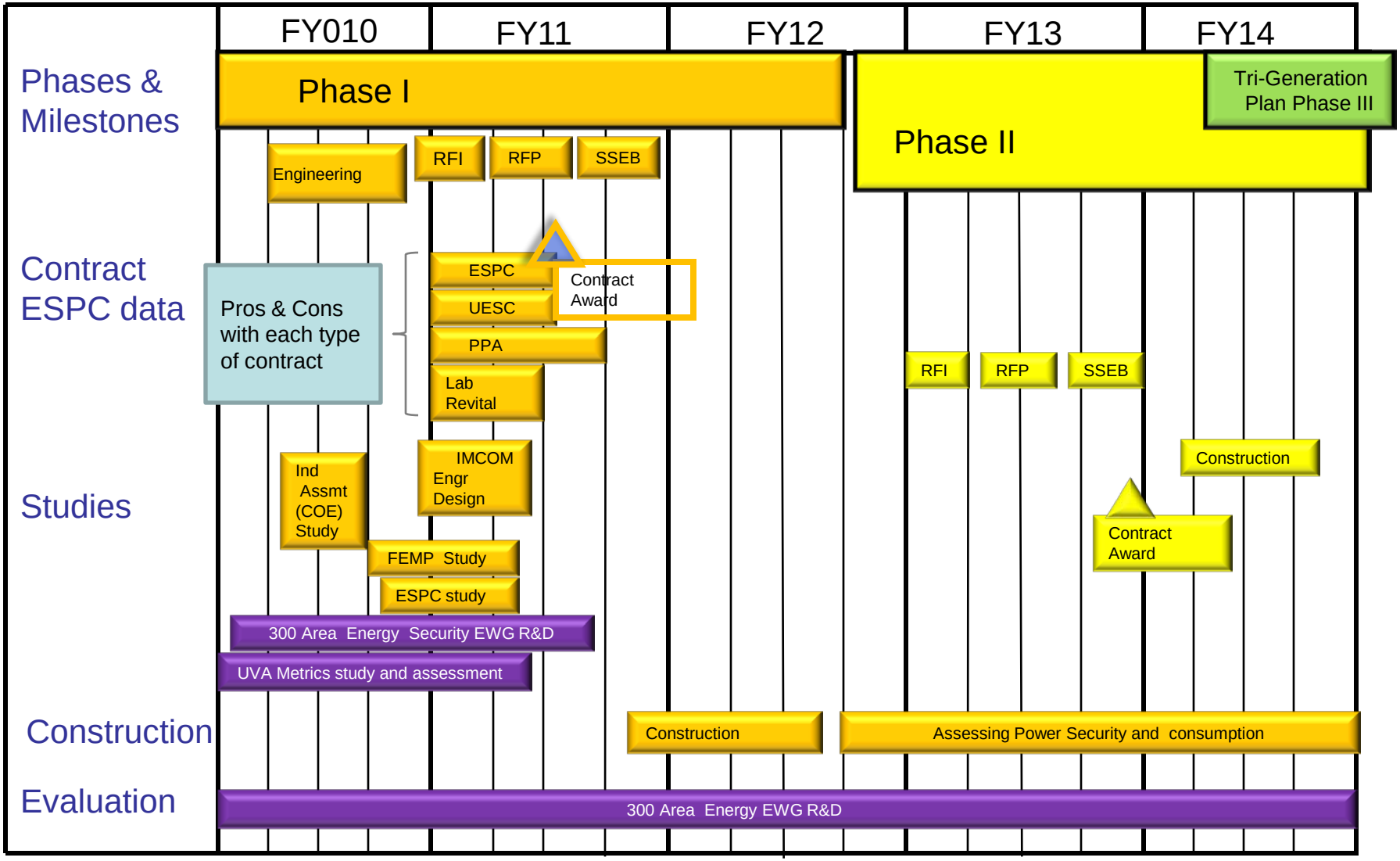
Phase I 52% Reduction in CO2 For 1 mw of Power

Current Energy Supply Configuration



New Energy Supply Configuration



	Annual CO2 emissions
	8,002 tons
	4,029 tons
Current Total :	**12,032 tons**
	5742 tons
New Total:	**5742 tons**
Total annual CO2 reduction:	**6290 tons**

300 Area Schedule