New Construction
Energy Efficiency Design Assistance

Bundle Requirements Document

Jackson County, Health Department Renovations

Sylva, NC

December 11, 2018
4018619

Prepared by

THE WEIDT GROUP®

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Contractor for

DUKE ENERGY®

New Construction Energy Efficiency Design Assistance is available to customers of all Duke Energy utilities except Duke Energy Florida.

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Summary

This document details the selected energy conservation strategies, an approximate timeline for verification, and the submittal information that we will need to complete the process.

The estimated Duke Energy incentive offer is **$16,807** for the implementation of the energy conservation measures, including the HVAC system, that comprise your energy efficiency bundle. To receive the full incentive, all strategies must be verified as functionally installed.

Process

The following list provides the process steps for this energy conservation program.

- Duke New Construction Energy Efficiency Design Assistance
  - Establish goals and intentions
  - Computer modeling of baseline, strategies, and bundles
- Bundle selection by the owner
- **Bundle Requirements Document**
  - **Summarizes key features/CD review plan for all bundle strategies**
  - **Submit Smart $aver Nonresidential Custom Incentive Application to Duke Energy**
  - **Receive Pre-Approval from Duke Energy prior to project commitments**
- Construction Documents Review
  - Reviews construction documents to locate the energy conservation measures and notify the design team of any changes from the selected bundle
  - Estimate incentive range
- Validation (following project completion and occupancy)
  - Request submittals (e.g., glazing, insulation, cooling, heating plants)
  - Completion of final validation report by The Weidt Group, including:
    - Findings of the validation process
    - Estimate of the final energy savings for the building
  - Documentation of projected final custom incentive.
  - Provide assistance with customer submittal of Smart $aver final payment request.
- Duke Energy incentive payment

List of Selected Strategies

The following pages include a summary list of the selected strategies. Please review this list, taking note of the requested submittals. Also, please confirm the project timing and inform us if any of these strategies are no longer planned for implementation.

Space Asset Area	Strategy Description	Portion of Total $ Savings Modeled
HVAC System	Heat recovery VRF with electric backup; DOAS with DX cooling and gas furnace	41%
	Mechanical	
Facility	DOAS fan power at 0.45 W/cfm	1%
Facility	DOAS, 10% improved DX cooling efficiency	< 1%
Facility	DOAS, High efficiency DX compressor part load performance	1%
	Architectural	
Offices	Glazing medium solar gain, metal frame	4%
Treatment	Glazing medium solar gain, metal frame	< 1%
Laboratory	Glazing medium solar gain, metal frame	< 1%
Offices	White roof	< 1%
	Electrical	
Facility	Exterior site lighting reduced to 3.38 kW	8%
Offices	Dimming daylighting control, 75% of space	4%
Treatment	Dimming daylighting control, 75% of space	< 1%
Offices	Vacancy sensor controls, 50% of space	3%
Treatment	Occupancy sensor controls, 25% of space	< 1%
Offices	Lighting power in Offices reduced to 0.54 W/ft^2	15%
Treatment	Lighting power in Treatment reduced to 0.52 W/ft^2	3%
Laboratory	Lighting power in Laboratory reduced to 1.09 W/ft^2	2%
	Service Water Heating	
Facility	95% SWH efficiency	< 1%
	Plug Load	
Facility	Machine roomless elevator	13%
Total Savings		**100%**

Selected Strategies and Requirements

Mechanical Strategies

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Facility	DOAS fan power at 0.45 W/cfm	Implemented	Reduce the fan power from the Baseline allowance by 10%. Fan power allowance accounts for supply, return, and exhaust fans; as applicable.
Facility	DOAS, 10% improved DX cooling efficiency	Implemented	Improve cooling efficiency to values shown in the table below: **Size (tons)** — **Efficiencies (EER)** 0 - 2.5 — 11.62 2.5 - 5.42 — 12.30 5.42 - 11.25 — 12.10 11.25 - 20 — 11.88 20 - 63.35 — 10.78 63.35 - 10000 — 10.45
Facility	DOAS, High efficiency DX compressor part load performance	Implemented	Lowers the minimum compressor unloading ratio to 20%. Compressor cycling will be utilized below 20% loading. This may be accomplished with a digital scroll compressor or multiple staged compressors. This could also be achieved with an inverter compressor, but the improved IEER would not be accounted for.

Architectural Strategies

Roof Reflectivity

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Offices	White roof	Implemented	Install a roof with a reflectance of 0.70 or SRI of 0.82 or greater.

Glazing

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Offices	Glazing medium solar gain, metal frame	Implemented	Glazing strategy: Unit U Value 0.42, Center Of Glass U Value 0.29, SHGC 0.29, VT 0.62
Treatment	Glazing medium solar gain, metal frame	Implemented	Glazing strategy: Unit U Value 0.42, Center Of Glass U Value 0.29, SHGC 0.29, VT 0.62
Laboratory	Glazing medium solar gain, metal frame	Implemented	Glazing strategy: Unit U Value 0.42, Center Of Glass U Value 0.29, SHGC 0.29, VT 0.62

Electrical Strategies

Daylighting Control

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Offices	Dimming daylighting control, 75% of space	Implemented	Provide automatic dimming (down to 10%) daylighting controls for 75% of the area with daylight harvesting potential. Dimming daylighting controls are assumed to control the area within the first 15 feet (4.57 meters) from the perimeter walls or two window head heights, whichever is smaller.
Treatment	Dimming daylighting control, 75% of space	Implemented	Provide automatic dimming (down to 10%) daylighting controls for 75% of the area with daylight harvesting potential. Dimming daylighting controls are assumed to control the area within the first 15 feet (4.57 meters) from the perimeter walls or two window head heights, whichever is smaller.

Lighting Controls

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Offices	Vacancy sensor controls, 50% of space	Implemented	Provide vacancy sensors in 50% of the applicable spaces throughout the building such that manual switches are used to turn lights on and the sensors automatically turn lights off when the space is unoccupied.
Treatment	Occupancy sensor controls, 25% of space	Implemented	Provide occupancy sensors in 25% of the applicable spaces throughout the building. For classrooms, conference, meeting, and employee break rooms provide occupancy sensors and scene control.

Lighting Power Density

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Facility	Exterior site lighting reduced to 3.38 kW	Implemented	Reduce exterior site lighting power by 50% below the baseline allowance.
Offices	Lighting power in Offices reduced to 0.54 W/ft²	Implemented	Reduce lighting power density by 40% below the Baseline specified by building allowances.
Treatment	Lighting power in Treatment reduced to 0.52 W/ft²	Implemented	Reduce lighting power density by 40% below the Baseline specified by building allowances.
Laboratory	Lighting power in Laboratory reduced to 1.09 W/ft²	Implemented	Reduce lighting power density by 40% below the Baseline specified by building allowances.

Other Strategies

Service Water Heating

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Facility	95% SWH efficiency	Implemented	Install an 95% efficient natural gas service hot water heater.

Plug Load

Space Asset Area	Strategy Description	Key Design Parameter	Design Requirements
Facility	Machine roomless elevator	Implemented	Install elevators with machine roomless (MRL) technology that improves mechanical efficiency by housing the traction motor in the hoistway and may represent improvements in rope and motor technology.

Required Submittals

Based on the strategies selected for this project, we anticipate that the documents needed for final validation will include the following:

- As-built Construction Documents
- Construction submittals as noted below

Architectural

- Construction submittals showing glazing characteristics, including C.O.G. U-value, unit U-value, solar heat gain coefficient, and visible transmittance

Electrical

- The most current lighting plans with the accepted fixture schedule (if different from the Construction Documents)
- Lamp submittals showing the lamp type and input wattage
- Lighting control submittals

Mechanical

- All heating and cooling equipment submittals
- HVAC controls submittal
- Fan motor cut sheets showing operating bhp and cfm, use of EC motors
- Service hot water equipment submittals

Process Load

- Elevator submittals showing energy usage

Construction Document Review and Validation

Validation is the final step of the offer. There are two stages in this step: Construction Document (CD) review at CD completion and validation at the completion of construction.

CD Review

The intent of this step is to update and present the construction incentive that the customer may receive after CD completion and based on final CD documentation. **The Weidt Group** will request and review CDs and Specifications, check for all strategies provided in the BRD, and prepare a CD report.

Validation

The intent of validation is to determine final energy savings and incentive dollars for completed projects. **The Weidt Group** will request any additional documents required, validate all energy-efficiency strategies installed within the project, finalize energy savings and project incentive amounts, complete final validation report, and assist the customer in Smart $aver final payment request.

To be eligible for a custom incentive, the owner must receive a pre-approval offer letter from Duke Energy before commitment is made to the project. A commitment could be in the form of signing a contract, purchasing equipment, or starting construction. All lighting must be DesignLights Consortium (DLC) or Energy Star listed to be eligible for incentives.

Selected Bundle Results and Incentive

The New Construction Energy Efficiency Design Assistance program promotes the implementation of cost-effective bundles of strategies by proposing cash incentives to reduce the added cost of implementing the selected energy conserving strategies.

The incentive offers listed on the following pages make the presumption that the selected bundle will be implemented in its entirety. Any changes from the specifications of the selected bundle should be reported to The Weidt Group. If it is deemed that these changes would have a significant impact on energy, then Duke Energy will make adjustments to the incentives accordingly.

*** Please note that at this time the incentive is an estimate. The incentive will be confirmed upon verification and any subsequent strategy modifications.**

The simple payback analysis shows that the Duke Energy incentive has helped reduce the incremental costs associated with the energy conservation strategy investments in this building, resulting in a payback of 3.2 years.

Energy Parameter	Bundle 2
Energy Cost Savings	$12,964
Percent Energy Cost Savings	30%
Electric Demand Savings	23 kW
Percent Electric Demand Savings	16%
Electric Consumption Savings	150,376 kWh
Percent Electric Consumption Savings	30%
Gas Consumption Savings	316 Therm
Percent Gas Consumption Savings	14%
Electric Incremental First Cost	$57,255
Gas Incremental First Cost	$1,421
Total Incremental First Cost	$58,676
Estimated Total Incentive	**$16,807**
Simple Payback with Incentive	**3.2**

** The figures in Bundle 2 are reprinted from the December 3, 2018 Results Meeting Minutes for this project, which were the basis for the original energy savings projections.*

Energy Parameter	Baseline	Bundle 2
Building Results		
Energy Use Intensity (EUI)	59.2 KBtu/ft²/yr	42.4 KBtu/ft²/yr
EUI Savings		16.9 KBtu/ft²/yr
Percent EUI Savings		28%

***Note**: Subject to the following qualifications, the computer model offers sophisticated predictions of energy savings with estimations as good as any other means available for a building that has not been built.*

The strategy and bundle results compare relative differences in net energy use for design alternatives. The results are not appropriate for system design and/or equipment selection; these are responsibilities of the registered design professionals of record.

The actual energy use of this building will be different from simulated results. Building systems and other operating parameters provided by the design team and modeled by The Weidt Group approximate actual conditions, but differences in weather, operating parameters, occupancy level, and changes that occur through the bidding and construction process will result in annual energy costs that will be different from what is predicted here. However, when a bundle of strategies is selected relative to other alternatives, its energy (and dollar) conserving value can be expected to remain constant relative to the other alternatives, and the magnitude of the cost should be approximately as predicted.

Thus, implementation of a bundle of strategies offers the opportunity for energy savings, but the realization of those savings is the responsibility of the owner/operator of the building – not Duke Energy or The Weidt Group. Savings are not guaranteed.

Appendix A. Project Information

Building Summary		
Location	Sylva, NC	
Narrative	Health department renovation of existing 2-story building	
Space Asset Areas	Area	Number of Stories
Offices	26,160 ft²	2
Treatment	5,350 ft²	1
Laboratory	800 ft²	1
Total	**32,310 ft²**	**2**
Utilities		
Electric Utility	Duke Energy	
Gas Utility	N/A	
Schedule		
Construction Documents Complete	12/21/2018	
Construction Start	02/04/2019	
Occupancy	02/01/2020	
Baseline Reference	ASHRAE 90.1-2010 Appendix G	
Other Notes		

Systems Summary	
Selected HVAC	Heat recovery VRF with electric backup; DOAS with DX cooling and gas furnace

Exterior lighting details	
Lease/own/other	Own
Outdoor Lighting Area	60,000 ft^2 of surface parking lot planned for exterior lighting

Appendix B. Baseline Building Description

Item		Baseline - 90.1-2010
Architectural		
Wall Assembly	Offices	R-15.6 Assembly, Steel Frame
Wall Assembly	Treatment	R-15.6 Assembly, Steel Frame
Wall Assembly	Laboratory	R-15.6 Assembly, Steel Frame
Roof Assembly	Offices	R-20.8 Assembly, Insulation above deck
Roof Assembly	Treatment	n/a
Roof Assembly	Laboratory	n/a
Glazing Characteristics	Offices	Assembly Max: U-0.55, Assembly Max: SHGC- 0.40
Glazing Characteristics	Treatment	Assembly Max: U-0.55, Assembly Max: SHGC- 0.40
Glazing Characteristics	Laboratory	Assembly Max: U-0.55, Assembly Max: SHGC- 0.40
Electrical		
Lighting Power	Offices	0.9 W/ft²
Lighting Power	Treatment	0.87 W/ft²
Lighting Power	Laboratory	1.81 W/ft²
Lighting Controls	Offices	Occupancy sensor
Lighting Controls	Treatment	None
Lighting Controls	Laboratory	None
Daylighting Controls	Offices	Multi-stepped daylighting
Daylighting Controls	Treatment	Multi-stepped daylighting
Daylighting Controls	Laboratory	No daylighting
Mechanical		
Service Water Heating		
	Type	Natural Gas
	Efficiency	80%
Boiler Plant		
	Type	Natural Gas
	Efficiency	80%
	Pump Type	Single Speed
Mechanical System	Offices, Treatment	ASHRAE 90.1 Appendix G System 6 - Packaged VAV with PFP Boxes
	Served by DOAS	No
	Cooling Efficiency	<2.5 tons 10.56 EER 2.5-5.42 tons 11.18 EER 5.42-11.25 tons 11.2 EER 11.25-20 tons 11 EER 20-63.35 tons 10 EER >63.35 tons 9.7 EER
	Fan Power	1.3 BHP/1,000 CFM
	Heat Recovery	Refer to ASHRAE 90.1-2010 Appendix G Section 3.1.2.11

Item		Baseline - 90.1-2010
Mechanical System	Laboratory	ASHRAE 90.1 Appendix G System 6 - Packaged VAV with PFP Boxes
	Served by DOAS	No
	Cooling Efficiency	<2.5 tons 10.56 EER 2.5-5.42 tons 11.18 EER 5.42-11.25 tons 11.2 EER 11.25-20 tons 11 EER 20-63.35 tons 10 EER >63.35 tons 9.7 EER
	Fan Power	1.3 BHP/1,000 CFM
	Heat Recovery	Refer to ASHRAE 90.1-2010 Appendix G Section 3.1.2.11

Appendix C. Key Model Inputs

Core Definition

Space Asset Area	Type	Area (ft²)	Floors	Units	Arrangement	Flr/Flr Height (ft)
Offices	Office	26,160	2	n/a	Stacked	12.0
Treatment	Treatment	5,350	1	n/a	Stacked	12.0
Laboratory	Laboratory	800	1	n/a	Adjacent / Grade	12.0

Schedules

Space Asset Area	People Density (ft²/person)	Daily Use							Hours per Day	Applicable Months											
		S	M	T	W	T	F	S		J	F	M	A	M	J	J	A	S	O	N	D
Offices	200.0	🔴	🟢	🟢	🟢	🟢	🟢	🔴	9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Treatment	200.0	🔴	🟢	🟢	🟢	🟢	🟢	🔴	9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Laboratory	100.0	🔴	🟢	🟢	🟢	🟢	🟢	🔴	9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

🟢 *Full Use*
🟡 *Partial Use*
🔴 *No Use*

Thermostat

Space Asset Area	Heating Set Point (°F)		Cooling Set Point (°F)	
	Occupied	*Unoccupied*	*Occupied*	*Unoccupied*
Offices	70	60	75	80
Treatment	72	70	72	75
Laboratory	72	70	72	75

Ventilation Requirements

Space Asset Area	Outside Air Per Person (ft³/min/person)	Outside Air Per Area (ft³/min/ft²)	Exhaust Flow Per Area (ft³/min/ft²)	Air Changes (ACH)	
				Occupied	*Unoccupied*
Offices	5.0	0.06	0.00	n/a	n/a
Treatment	n/a	n/a	n/a	6.0	2.0
Laboratory	n/a	n/a	n/a	6.0	2.0

Power & Process Load

Space Asset Area	Power Density (W/ft²)	Process Load	
	Equipment	*Load (Btu/hr/ft²)*	*Fuel Source*
Offices	0.75	0.00	Gas
Treatment	2.00	0.33	Gas
Laboratory	2.00	0.33	Gas

Utility Rates

Fuel	Utility	Conversion factor	Rate
Electric	Duke Energy	1	Average rate: 0.0844 $/kWh
Gas	n/a	1	Average rate: 0.861 $/therm

Appendix D. Isolated Selected Strategy Results

The savings indicated is based on the performance of the individual strategy relative to the proposed HVAC system illustrating the impact of each strategy alone. The reported savings does not account for the interaction between multiple strategies, and as a result, the summation of the individual savings *may* not equal the total anticipated savings. The savings shown for the proposed HVAC system is in comparison to the baseline mechanical system.

Space Asset Area	Strategy Description	Peak kW Savings	kWh Savings	Gas Savings (Therm)	Energy Cost Savings	Inc. Cost Electric	Inc. Cost Gas
	HVAC	-3	61,801	235	$5,419	$12,868	$501
Facility	DOAS fan power at 0.45 W/cfm	0	2,243	-3	$185	$188	$0
Facility	DOAS, 10% improved DX cooling efficiency	2	832	0	$70	$1,769	$0
Facility	DOAS, High efficiency DX compressor part load performance	0	1,972	0	$168	$8,845	$0
Offices	White roof	0	435	0	$37	$0	$0
Offices	Glazing medium solar gain, metal frame	2	6,350	0	$536	$16,680	$0
Treatment	Glazing medium solar gain, metal frame	0	1,265	0	$105	$2,700	$0
Laboratory	Glazing medium solar gain, metal frame	0	199	0	$17	$515	$0
Facility	Exterior site lighting reduced to 3.38 kW	0	12,561	0	$1,062	$0	$0
Offices	Dimming daylighting control, 75% of space	3	6,298	0	$531	$2,452	$0
Offices	Vacancy sensor controls, 50% of space	1	4,031	0	$341	$955	$0
Offices	Lighting power in Offices reduced to 0.54 W/ft²	9	22,961	0	$1,941	$5,311	$0
Treatment	Dimming daylighting control, 75% of space	1	1,441	0	$122	$544	$0

Space Asset Area	Strategy Description	Peak kW Savings	kWh Savings	Gas Savings (Therm)	Energy Cost Savings	Inc. Cost Electric	Inc. Cost Gas
Treatment	Occupancy sensor controls, 25% of space	0	988	0	$85	$244	$0
Treatment	Lighting power in Treatment reduced to 0.52 W/ft²	2	5,159	0	$437	$1,086	$0
Laboratory	Lighting power in Laboratory reduced to 1.09 W/ft²	0	3,159	0	$265	$163	$0
Facility	Machine roomless elevator	6	19,675	0	$1,662	$2,935	$0
Facility	95% SWH efficiency	0	0	121	$103	$0	$920

Appendix E. Lighting Controls

The following information is for your reference and does not impact the incentive offered for energy savings. Past project review indicates that attention to the following items within the Construction Documents (CDs) tends to result in higher achievement of energy savings when the construction project is completed. We understand that all of this information may not be specified in the CDs; some may be the contractor's responsibility or only appear on shop drawings. In summary, please regard the list below as a guide to actions and items that may be appropriate for the technologies being implemented. They are suggested but not required.

Daylight Control Narrative for Each Unique Zone

- Identify the target design illuminance level within each daylight control zone
- When the controls would turn off or dim the electric lights
- When the controls would turn on or brighten the electric lights
- What type of control algorithm is being used (open or closed loop system)
- Time delay and fade rate response of the daylighting system to changes in light
- Location of manual override switches
- Describe how other lighting controls (i.e. manual overrides) interact with the daylight system

Occupancy Sensor Control Narrative

- Type and location of occupancy sensor
- Sensitivity and time-out settings for the sensor
- Override controls and how they interact with the system and location

Contractor Submittal Requirements

- Product Data Sheets showing the following
  1. Sensor features
  2. Controller features
  3. Dimensions and ratings
- Drawings that locate the sensor and controller in each zone
  1. Specific to the project
  2. Plans, interior elevations, and sections of each zone that show the sensor cone of vision
- Wiring diagrams
  1. Showing entire installation
  2. Specific to the project
  3. Overlaid on Reflected Ceiling Plans

Appendix F. Project Participants

Name	Company	Email	Phone
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