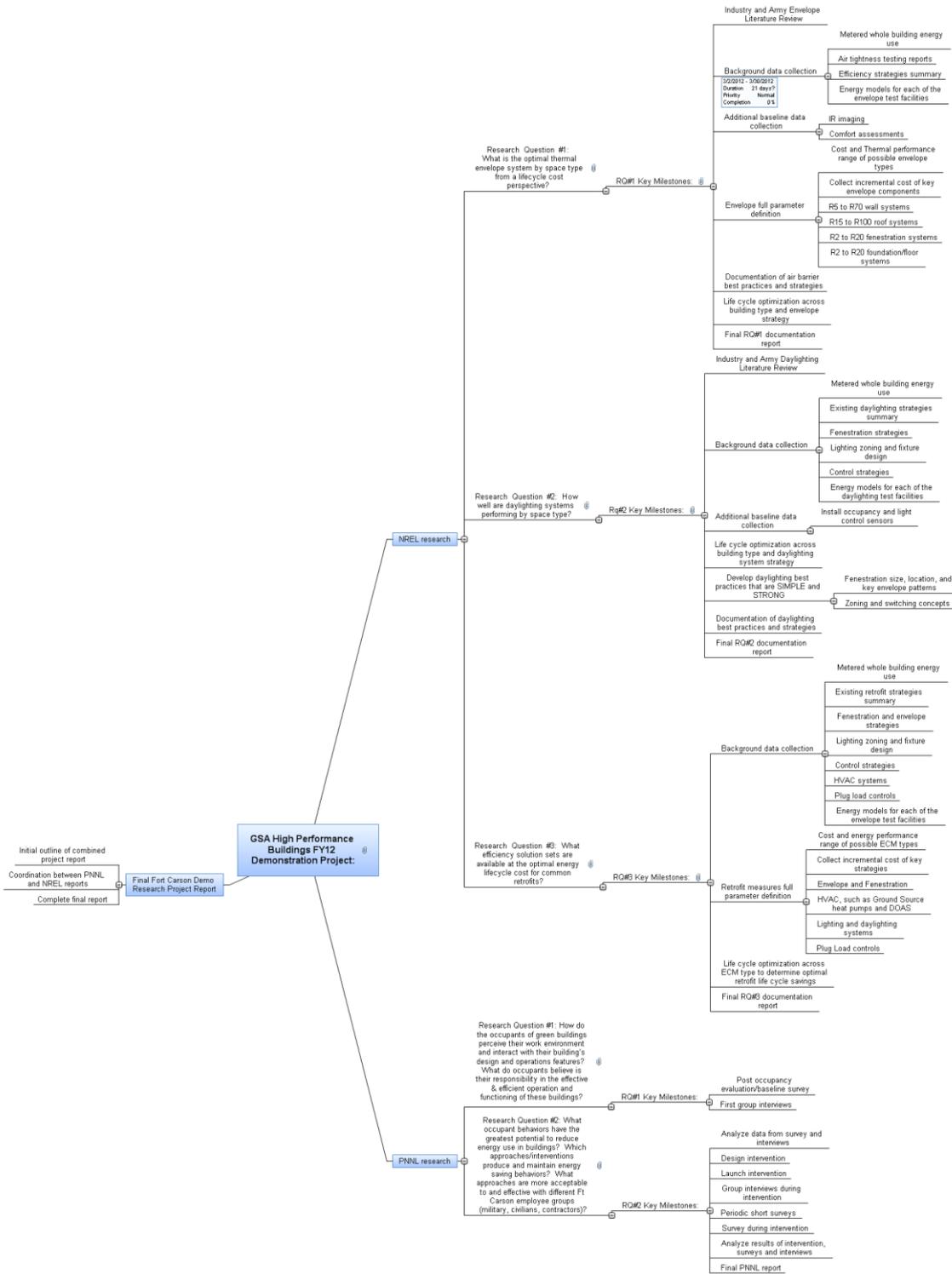


GSA High Performance Buildings FY12 Demonstration Project:



I. NREL research

A. Research Question #1: What is the optimal thermal envelope system by space type from a lifecycle cost perspective?

1. RQ#1 Key Milestones:

a. Industry and Army Envelope Literature Review

b. Background data collection

- (1) Metered whole building energy use
- (2) Air tightness testing reports
- (3) Efficiency strategies summary
- (4) Energy models for each of the envelope test facilities

c. Additional baseline data collection

- (1) IR imaging
- (2) Comfort assessments

d. Envelope full parameter definition

- (1) Cost and Thermal performance range of possible envelope types
- (2) Collect incremental cost of key envelope components
- (3) R5 to R70 wall systems
- (4) R15 to R100 roof systems
- (5) R2 to R20 fenestration systems
- (6) R2 to R20 foundation/floor systems

e. Documentation of air barrier best practices and strategies

f. Life cycle optimization across building type and envelope strategy

g. Final RQ#1 documentation report

B. Research Question #2: How well are daylighting systems performing by space type?

1. Rq#2 Key Milestones:

a. Industry and Army Daylighting Literature Review

b. Background data collection

- (1) Metered whole building energy use
- (2) Existing daylighting strategies summary
- (3) Fenestration strategies
- (4) Lighting zoning and fixture design
- (5) Control strategies
- (6) Energy models for each of the daylighting test facilities

c. Additional baseline data collection

(1) Install occupancy and light control sensors

d. Life cycle optimization across building type and daylighting system strategy

e. Develop daylighting best practices that are SIMPLE and STRONG

(1) Fenestration size, location, and key envelope patterns

(2) Zoning and switching concepts

f. Documentation of daylighting best practices and strategies

g. Final RQ#2 documentation report

C. Research Question #3: What efficiency solution sets are available at the optimal energy lifecycle cost for common retrofits?

1. RQ#3 Key Milestones:

a. Background data collection

(1) Metered whole building energy use

(2) Existing retrofit strategies summary

(3) Fenestration and envelope strategies

(4) Lighting zoning and fixture design

(5) Control strategies

(6) HVAC systems

(7) Plug load controls

(8) Energy models for each of the envelope test facilities

b. Retrofit measures full parameter definition

(1) Cost and energy performance range of possible ECM types

(2) Collect incremental cost of key strategies

(3) Envelope and Fenestration

(4) HVAC, such as Ground Source heat pumps and DOAS

(5) Lighting and daylighting systems

(6) Plug Load controls

c. Life cycle optimization across ECM type to determine optimal retrofit life cycle savings

d. Final RQ#3 documentation report

II. PNNL research

A. Research Question #1: How do the occupants of green buildings perceive their work environment and interact with their building's design and operations features? What do occupants believe is their responsibility in the effective & efficient operation and functioning of these buildings?

1. RQ#1 Key Milestones:

a. Post occupancy evaluation/baseline survey

b. First group interviews

B. Research Question #2: What occupant behaviors have the greatest potential to reduce energy use in buildings? Which approaches/interventions produce and maintain energy saving behaviors? What approaches are more acceptable to and effective with different Ft Carson employee groups (military, civilians, contractors)?

1. RQ#2 Key Milestones:

- a. Analyze data from survey and interviews
- b. Design intervention
- c. Launch intervention
- d. Group interviews during intervention
- e. Periodic short surveys
- f. Survey during intervention
- g. Analyze results of intervention, surveys and interviews
- h. Final PNNL report

III. Final Fort Carson Demo Research Project Report

A. Initial outline of combined project report

B. Coordination between PNNL and NREL reports

C. Complete final report