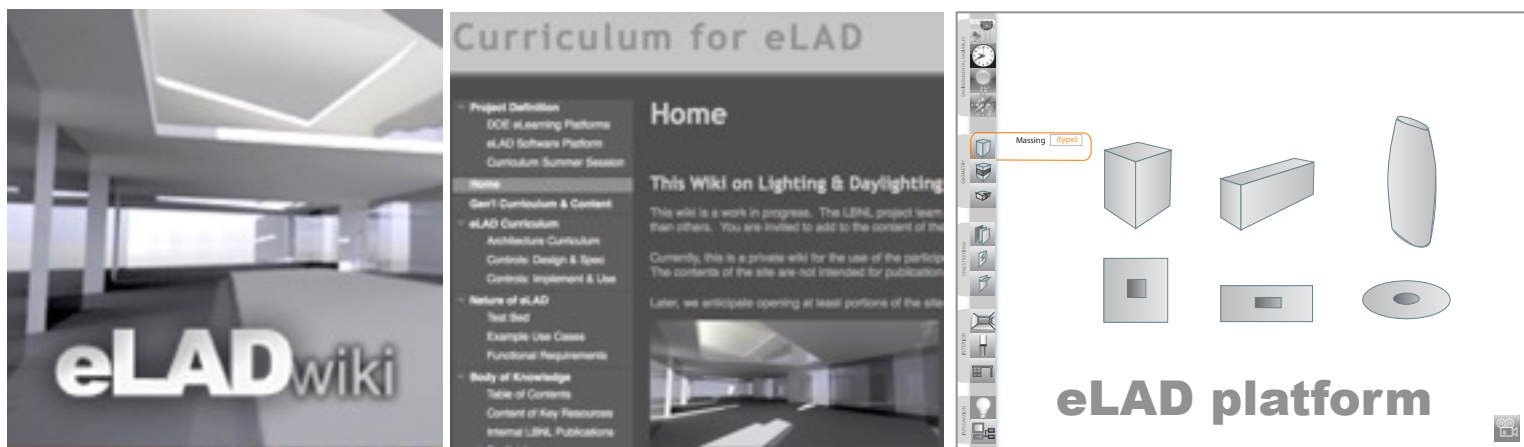


eLAD

eLearning Platform for Lighting and Daylighting

Developed under funding by the
DOE

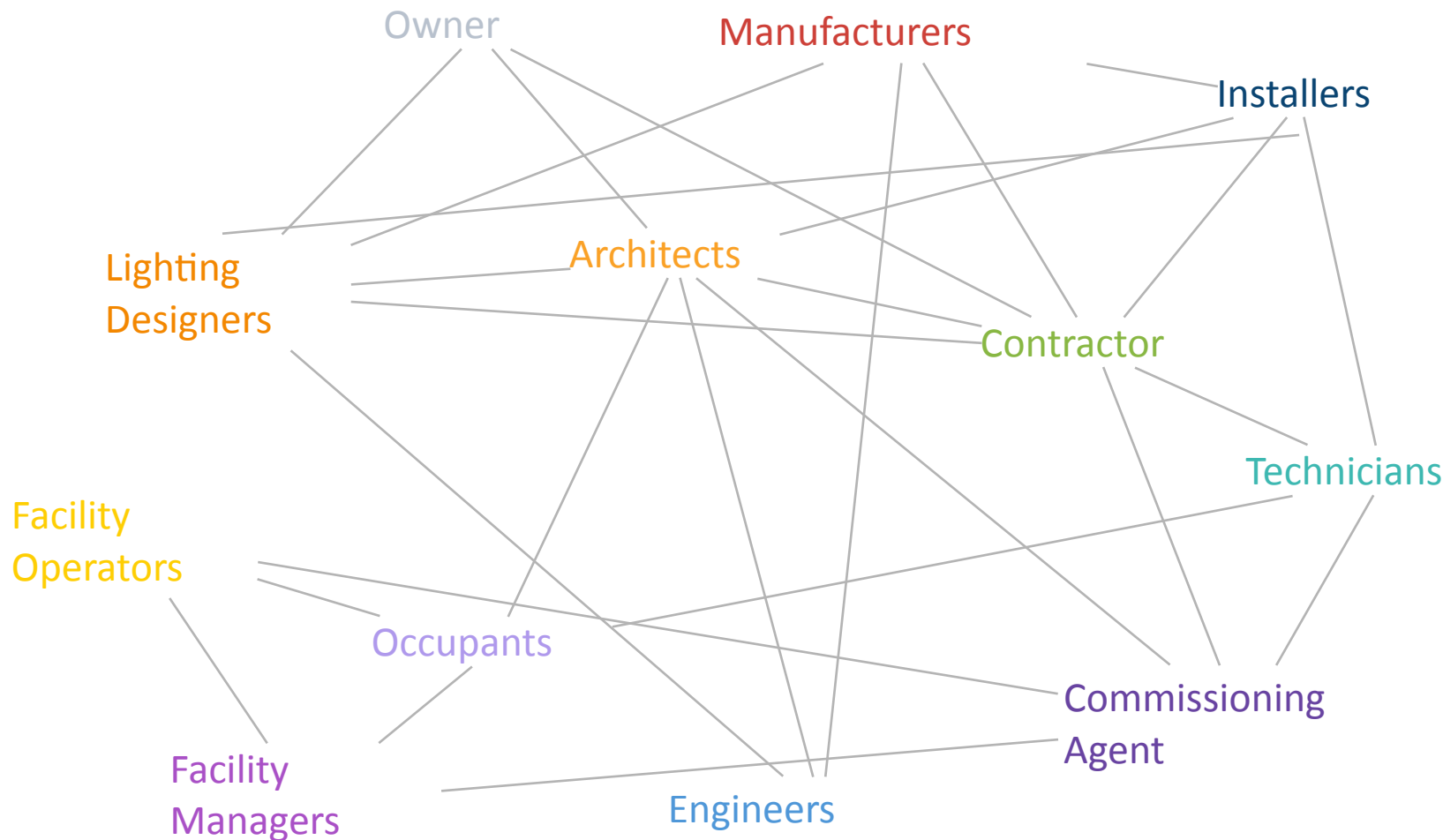


eLearning Platform for Lighting and Daylighting

Need Addressed

Complexity in the groups responsible for **lighting, interiors, and building envelope**

Improve their understanding on daylighting performance and controls



eLearning Platform for Lighting and Daylighting

Project Goal

Development of an on-line Lighting and Daylighting educational resource package that will train / improve the understanding of how to:

design, document construct, install, commission, operate, and maintain complex buildings and systems.

	Design	Documentation	Construction	Testing & Calibration	Operations & Maintenance	Retrofit, Tenant Improvements	Measurement & Verification
Designers	X	X				X	
Modelers	X					X	X
Specifiers		X	X				X
Commissioning Agents (Cx,RCx)	X	X	X	X	X	X	X
Manufacturers		X	X	X			X
Installers			X	X			X
Technicians			X	X	X	X	X
Operators					X	X	X
Facility Managers				X	X	X	X
Owners	X	X	X	X	X	X	X
Bankers, etc.	X				X	X	

eLAD Potential Audiences and Learning Needs

eLearning Platform for Lighting and Daylighting

Approach

- Develop a version of the National Training and Education Resource (NTER) with a focus on lighting and daylighting systems in commercial buildings

- eLAD OER curriculum summer planning session
 - Explore functionality and define content, etc
 - Identify resource materials and tools
 - Development of three educational curricula
 - eLAD wiki

Participants:

- LBNL
- Lighting experts, Educators

RFP to develop prototype software:

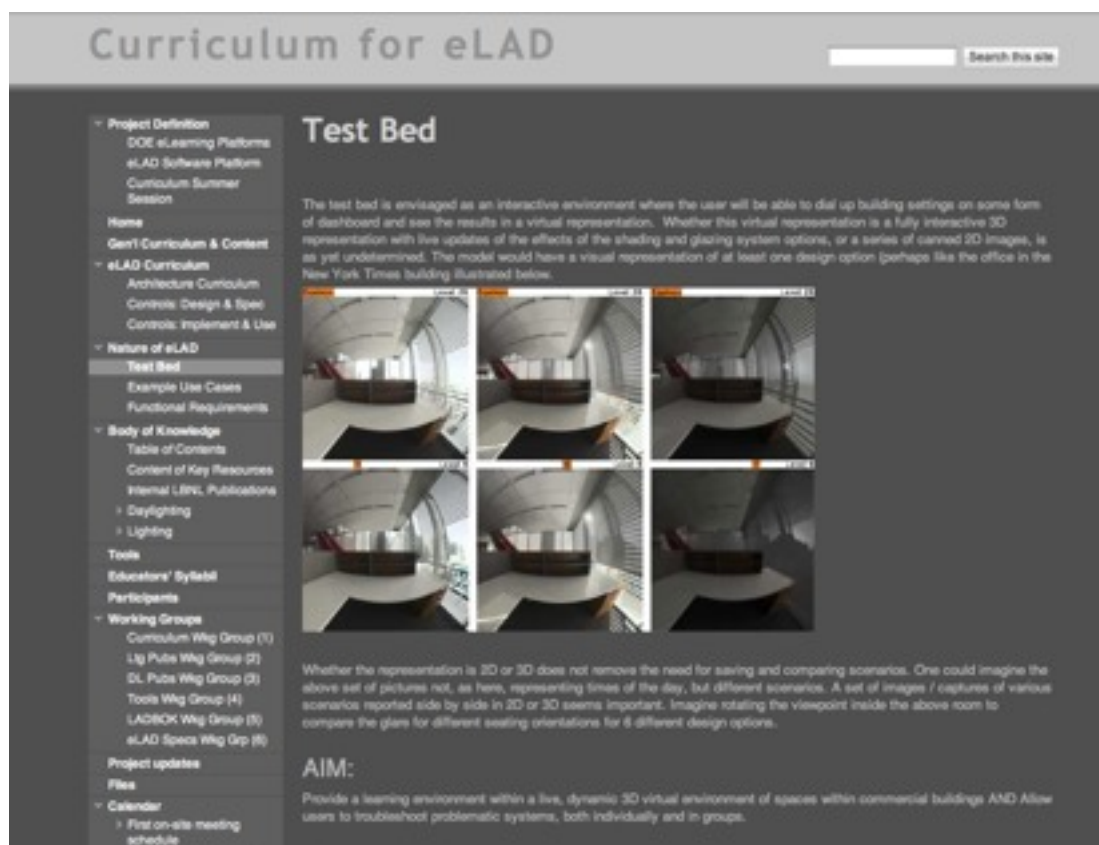
- issued on March 4th
- proposals to be submitted on April 15th

eLearning Platform for Lighting and Daylighting

Current Status

Progress on the two primary components of eLAD:

- Open Educational Curriculum (OEC)
 - eLAD wiki
- eLearning Software Platform



The screenshot shows a web interface titled "Curriculum for eLAD" with a search bar. A sidebar on the left contains a navigation menu with categories like "Project Definition", "Gen'l Curriculum & Content", "eLAD Curriculum", "Nature of eLAD", "Body of Knowledge", "Tools", "Working Groups", "Project updates", and "Calendar". The main content area is titled "Test Bed" and includes a paragraph of text, a 2x3 grid of six images showing a virtual interior space, and another paragraph of text. Below the images is a section titled "AIM:" followed by a description of the platform's goals.

Curriculum for eLAD

Test Bed

The test bed is envisaged as an interactive environment where the user will be able to dial up building settings on some form of dashboard and see the results in a virtual representation. Whether this virtual representation is a fully interactive 3D representation with live updates of the effects of the shading and glazing system options, or a series of canned 2D images, is as yet undetermined. The model would have a visual representation of at least one design option (perhaps like the office in the New York Times building illustrated below).

Whether the representation is 2D or 3D does not remove the need for saving and comparing scenarios. One could imagine the above set of pictures not, as here, representing times of the day, but different scenarios. A set of images / captures of various scenarios reported side by side in 2D or 3D seems important. Imagine rotating the viewpoint inside the above room to compare the glare for different seating orientations for 6 different design options.

AIM:
Provide a learning environment within a live, dynamic 3D virtual environment of spaces within commercial buildings AND Allow users to troubleshoot problematic systems, both individually and in groups.

eLearning Platform for Lighting and Daylighting

Open Educational Curriculum

The eLAD OEC consists of three modules:

- **Daylighting Design**

- Daylighting Fundamentals:
- Integrated Design Process:

- **Controls Design**

- lighting controls concepts
- qualitative issues that are necessary to achieve user acceptance
- design strategies that can increase whole-building energy performance as well as enhance the benefit of controls equipment

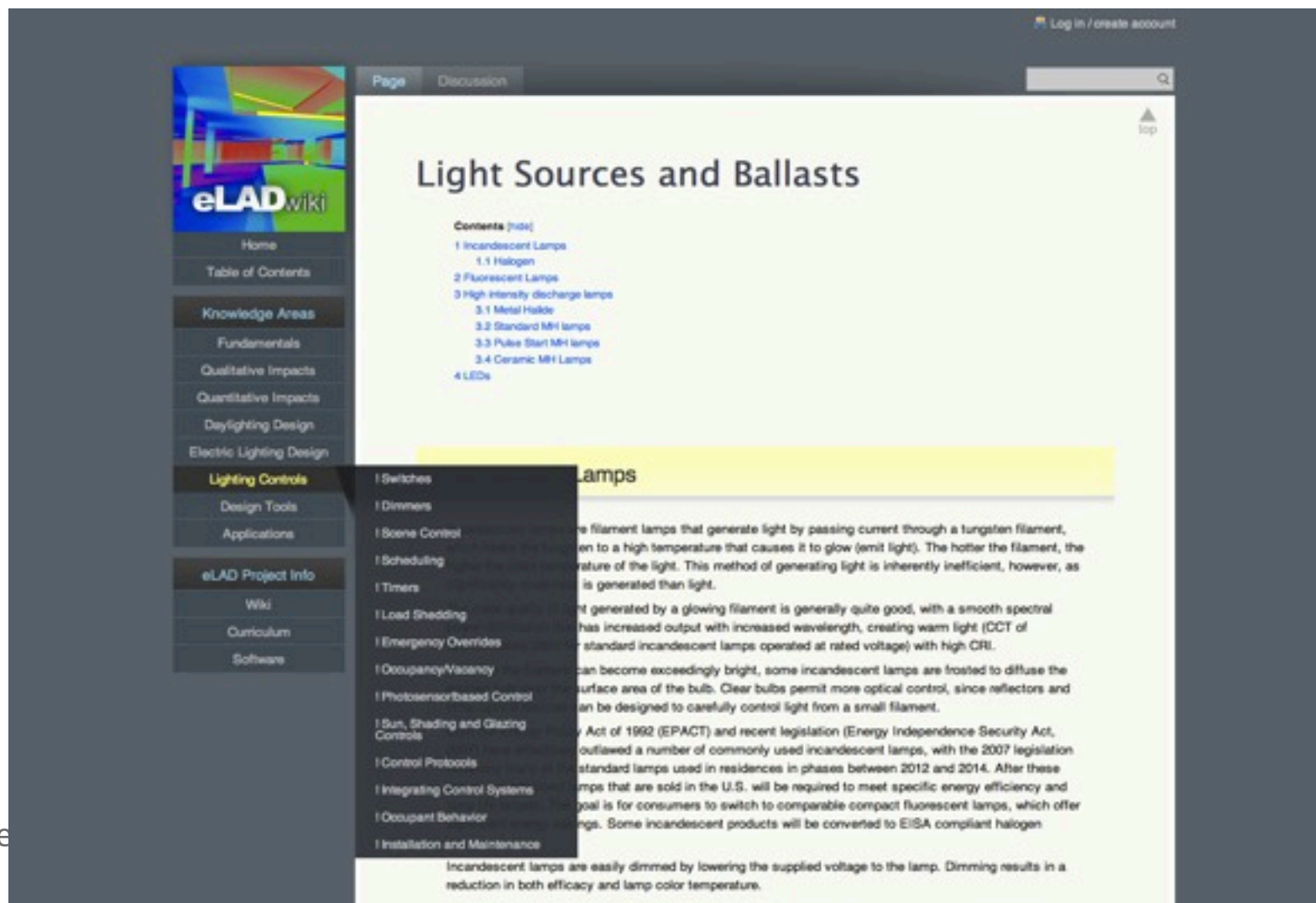
- **Controls Implementation**

- Education to avoid a number of problems that arise during design, installation, and operation of lighting control systems

eLearning Platform for Lighting and Daylighting

Open Educational Curriculum

The participants of the eLAD summer planning session have provided content for a lighting and daylighting wiki, currently public:
[://elad.lbl.gov/index.php/](http://elad.lbl.gov/index.php/)



The screenshot shows the eLAD wiki interface. On the left is a navigation sidebar with categories like 'Home', 'Table of Contents', 'Knowledge Areas', 'Fundamentals', 'Qualitative Impacts', 'Quantitative Impacts', 'Daylighting Design', 'Electric Lighting Design', 'Lighting Controls', 'Design Tools', 'Applications', 'eLAD Project Info', 'Wiki', 'Curriculum', and 'Software'. The 'Lighting Controls' section is expanded, showing a list of topics including 'Switches', 'Dimmers', 'Scene Control', 'Scheduling', 'Timers', 'Load Shedding', 'Emergency Overrides', 'Occupancy/Vacancy', 'Photosensorbased Control', 'Sun, Shading and Glazing Controls', 'Control Protocols', 'Integrating Control Systems', 'Occupant Behavior', and 'Installation and Maintenance'. The main content area is titled 'Light Sources and Ballasts' and includes a 'Contents' table of contents with links to sections on Incandescent Lamps (Halogen, Metal Halide, Standard MH, Pulse Start MH, Ceramic MH), Fluorescent Lamps, High intensity discharge lamps, and LEDs. The text under 'Incandescent Lamps' describes how they generate light by passing current through a tungsten filament, which glows when heated. It also mentions that incandescent lamps can be frosted to diffuse light and that recent legislation (EPA's Energy Star and the Energy Independence Security Act) has phased out many standard incandescent lamps in favor of more efficient alternatives like compact fluorescent lamps (CFLs) and LEDs.

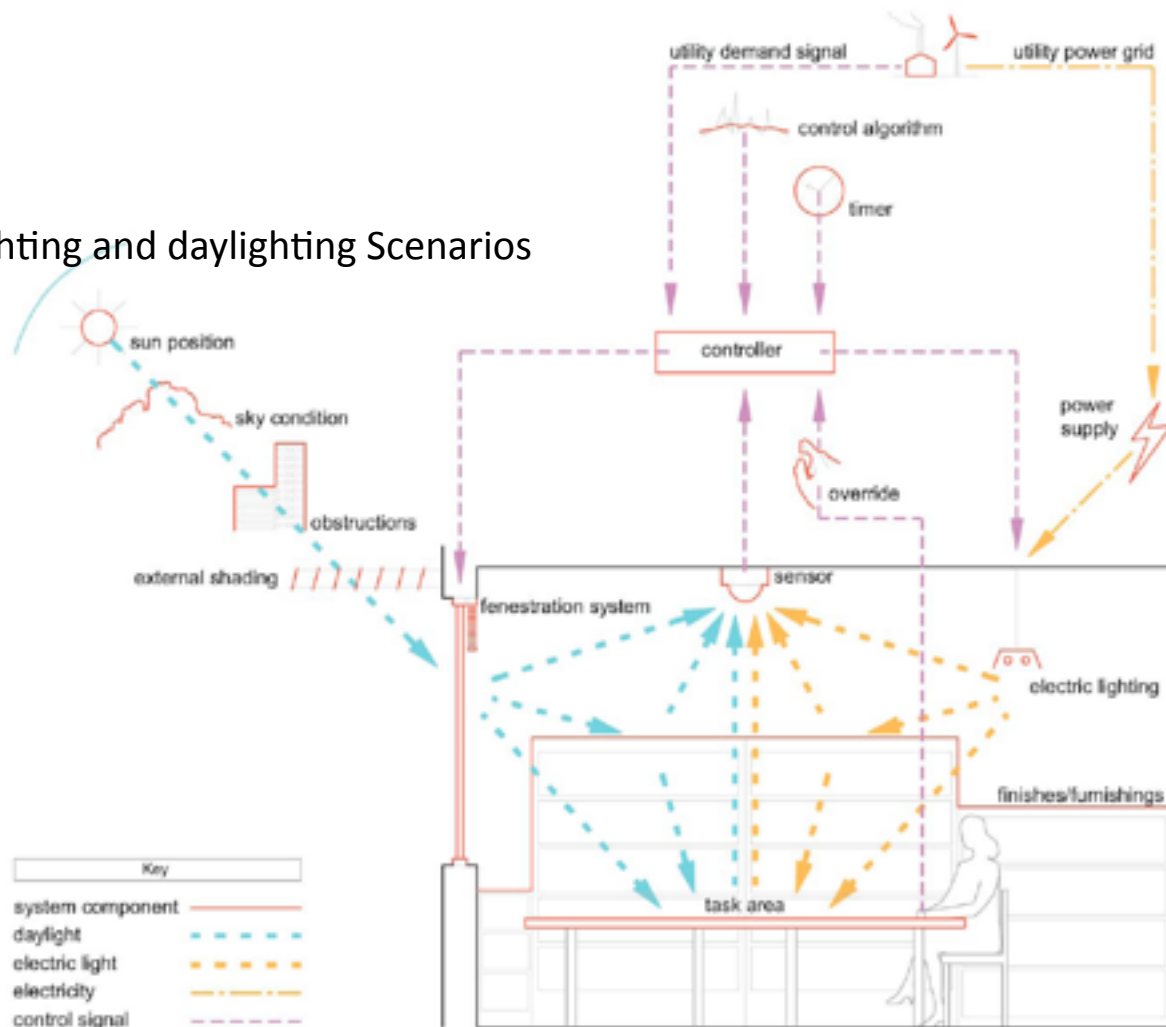
eLearning Software Platform

System Logic:

Using existing LBNL simulation Engines:

Radiance,
Comfen,
EnergyPlus (E+),
Modelica.

For simulation-driven lighting and daylighting Scenarios



eLearning Platform for Lighting and Daylighting

eLearning Software Platform

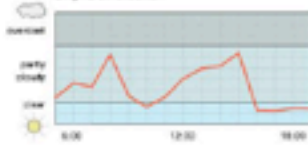
User Variables:

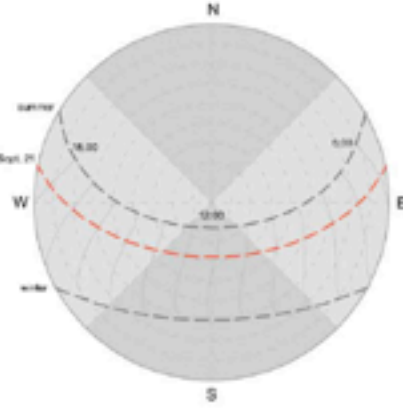
Environmental Variables

City: Date:

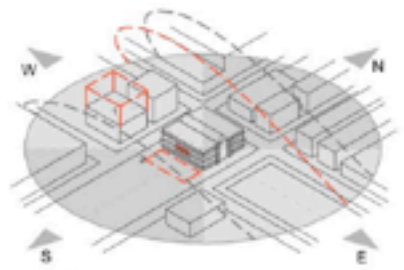
Latitude: Longitude:

Sky Conditions





Orientation and Obstructions



Building Orientation:

Variable Obstructions

- SE Adjacent Building Height:
- South Garden Tree Canopy:

Lighting System Variables

Fenestration (South, exterior)

FEN 1: Glass: Shade: Control:

FEN 2: Glass: Shade: Control:

Lighting

FIXTURE 1	FIXTURE 2	FIXTURE 3
Type: <input type="text" value="2x FT. Strip"/>	Type: <input type="text" value="2x FT. Strip"/>	Type: <input type="text" value="2x FT. Strip"/>
Lamp A: <input type="text" value="F1578-Cool 100"/>	Lamp A: <input type="text" value="F1578-Cool 100"/>	Lamp A: <input type="text" value="F1578-Cool 100"/>
Lamp B: <input type="text" value="F1578-Cool 100"/>	Lamp B: <input type="text" value="F1578-Cool 100"/>	Lamp B: <input type="text" value="F1578-Cool 100"/>

Fenestration (North, atrium)

FEN 3: Glass: Shade: Control:

Zoning/Controls

PC 1: Set Point: Dead Band: Time Delay:

PC 2: Set Point: Dead Band: Time Delay:

Daylight Control Zoning

100%	100%	100%	100%
100%	100%	100%	100%
100%	100%	100%	100%

Lighting Circuit Control

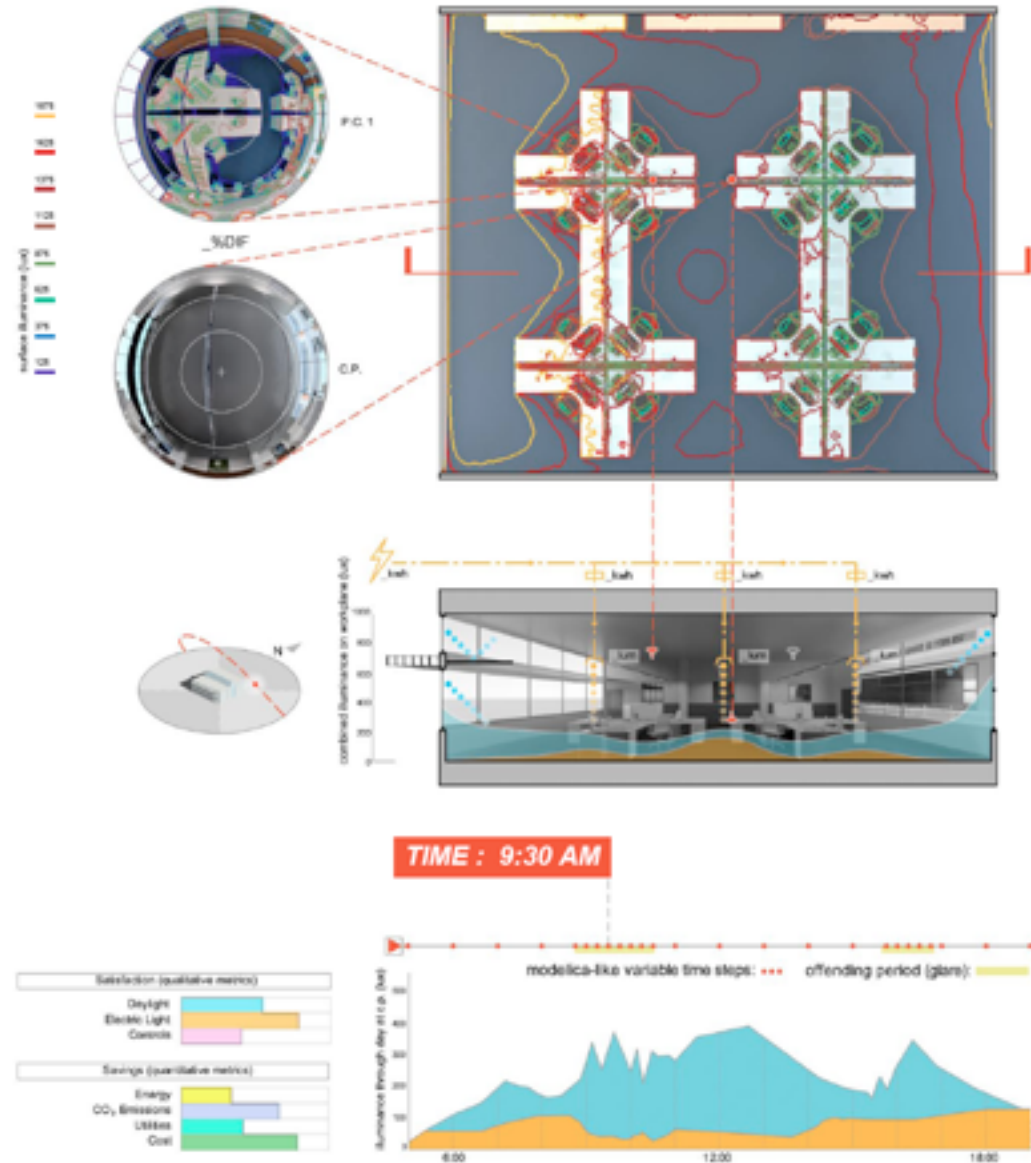
Switch / Levels / Dim:

Closed / Open Loops:

eLearning Platform for Lighting and Daylighting

eLearning Software Platform

Outputs:



eLearning Platform for Lighting and Daylighting

eLearning Software Platform

Applied Lessons: Interior Design Decisions



eLearning Platform for Lighting and Daylighting

	User's background	Field of Interest:	Use Cases:	NEW	Analysis	Schemes
PROGRAM	Target Illuminances					
	Space Function	<ul style="list-style-type: none"> Designers Modelers Specifiers Commissioning Agents Manufacturers Installers Technicians 	<ul style="list-style-type: none"> Daylighting Design Controls Design Controls Implementation 	<ul style="list-style-type: none"> 1_Troubleshoot a non functioning systems 2_Impact of Lighting control Retrofit 3_Rvesolve Glare Situation 4_... etc 	<ul style="list-style-type: none"> Resolution Patterns of Use Units .. 	<ul style="list-style-type: none"> A B C ...
	Occupancy					
ENVIRONMENTAL VARIABLES	Siting					
	Massing					
	Orientation					
FENESTRATION	Daylighting					
	Shading					
	View					
INTERIOR DECISIONS	Materials					
	Walls Partitions					
	Furniture					
INTEGRATION	Electric Light & Controls					
	Systems & Controls					

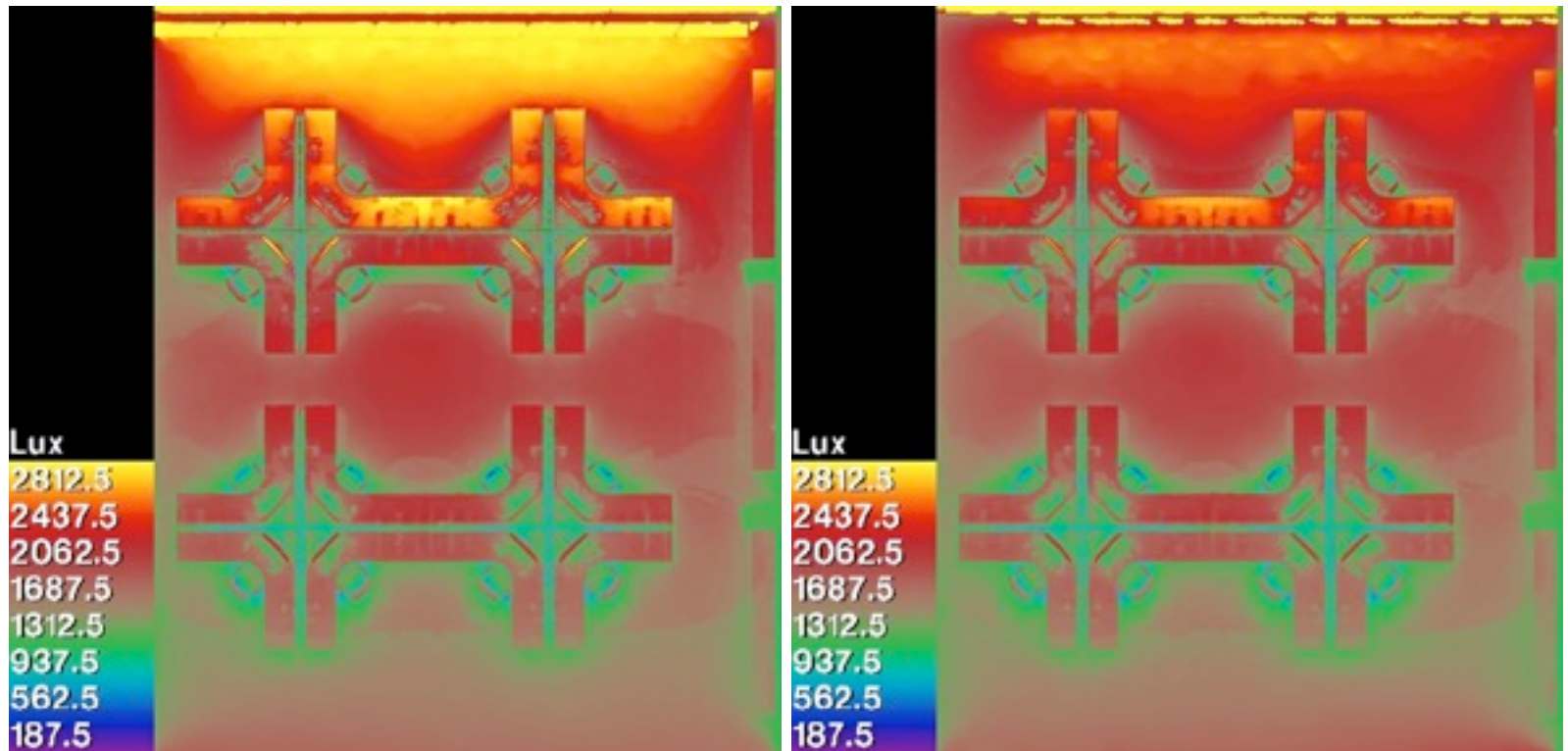
eLAD GUI

Early ideas on the layout of the interface



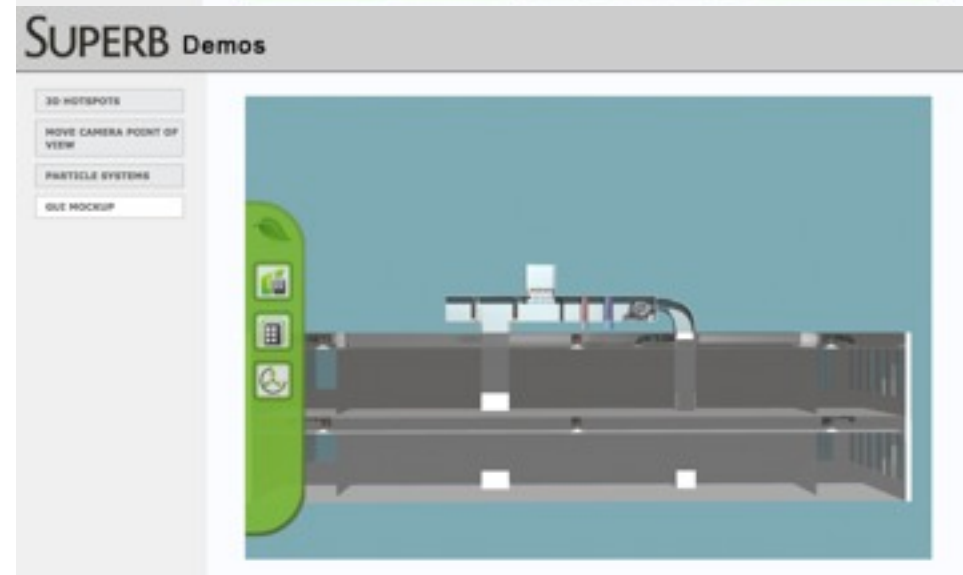
- Target Illuminances
- PROGRAM
- Space Function
- Occupancy
- ENVIRONMENTAL VARIABLES
- Siting
- Massing
- Orientation
- Daylighting
- FENESTRATION
- Shading
- View
- INTERIOR DECISIONS
- Materials
- Walls Partitions
- Furniture
- INTEGRATION
- Electric Light & Controls
- Systems & Controls

eLAD outputs using Radiance



Proof of Concept

Informal collaboration with
the CEC PIER
"Learn Green Buildings"
project.



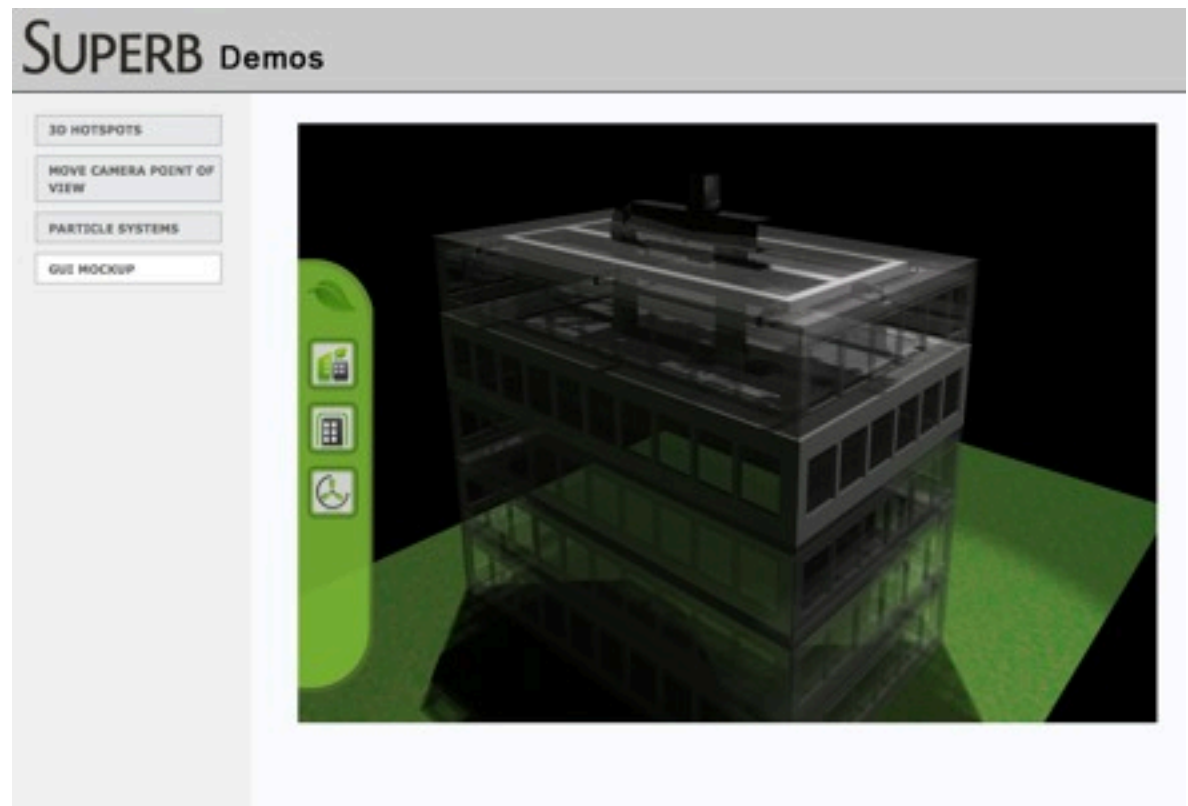
eLearning Platform for Lighting and Daylighting

Proof of Concept

Interactive 3D modeling is using latest:

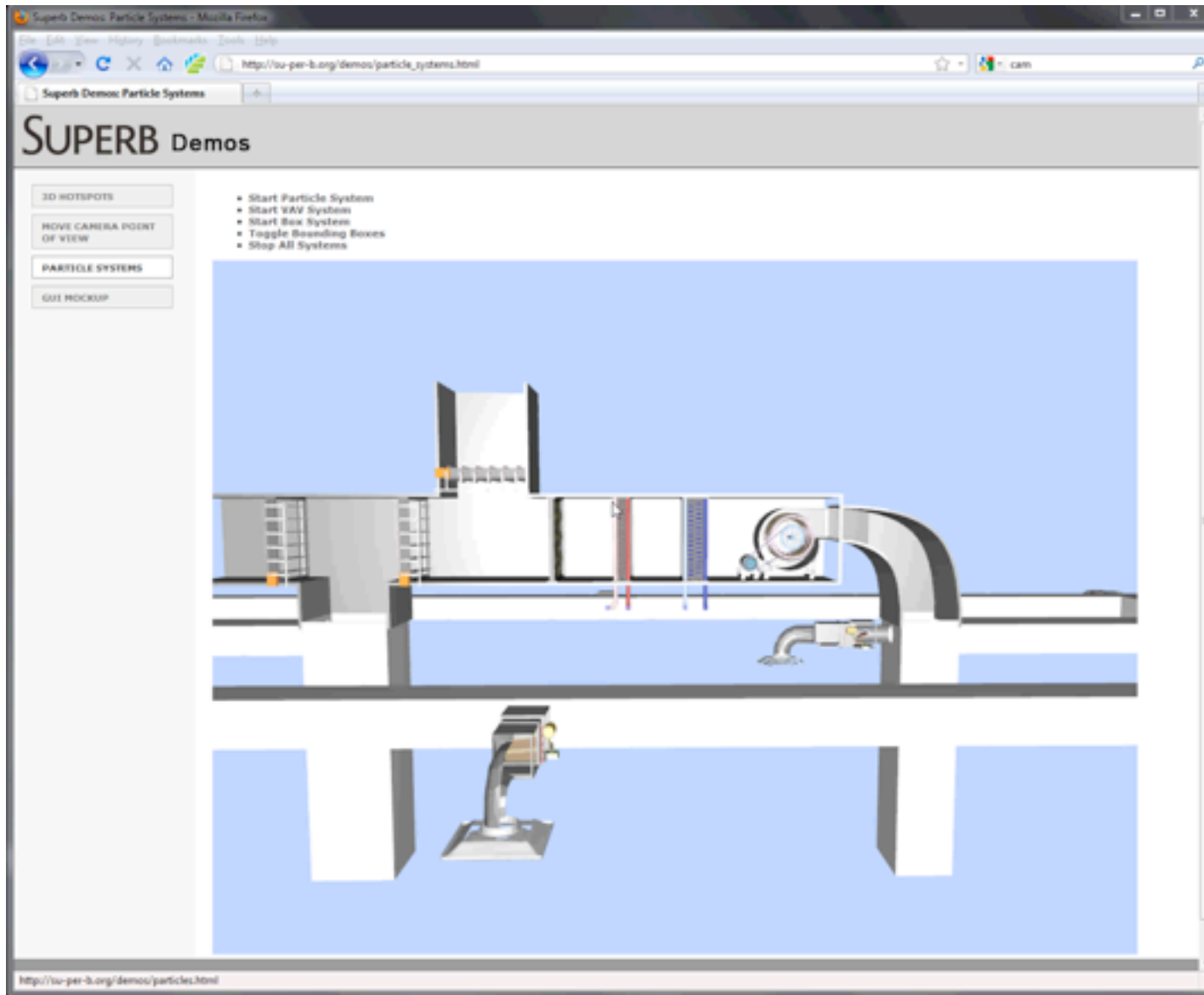
- Kuda 1.3 open source platform developed with DOE funding.
- WebGL approaches

Lighting, daylighting and envelope information to be added



eLearning Platform for Lighting and Daylighting

Proof of Concept



eLearning Platform for Lighting and Daylighting