

# Setting the Stage

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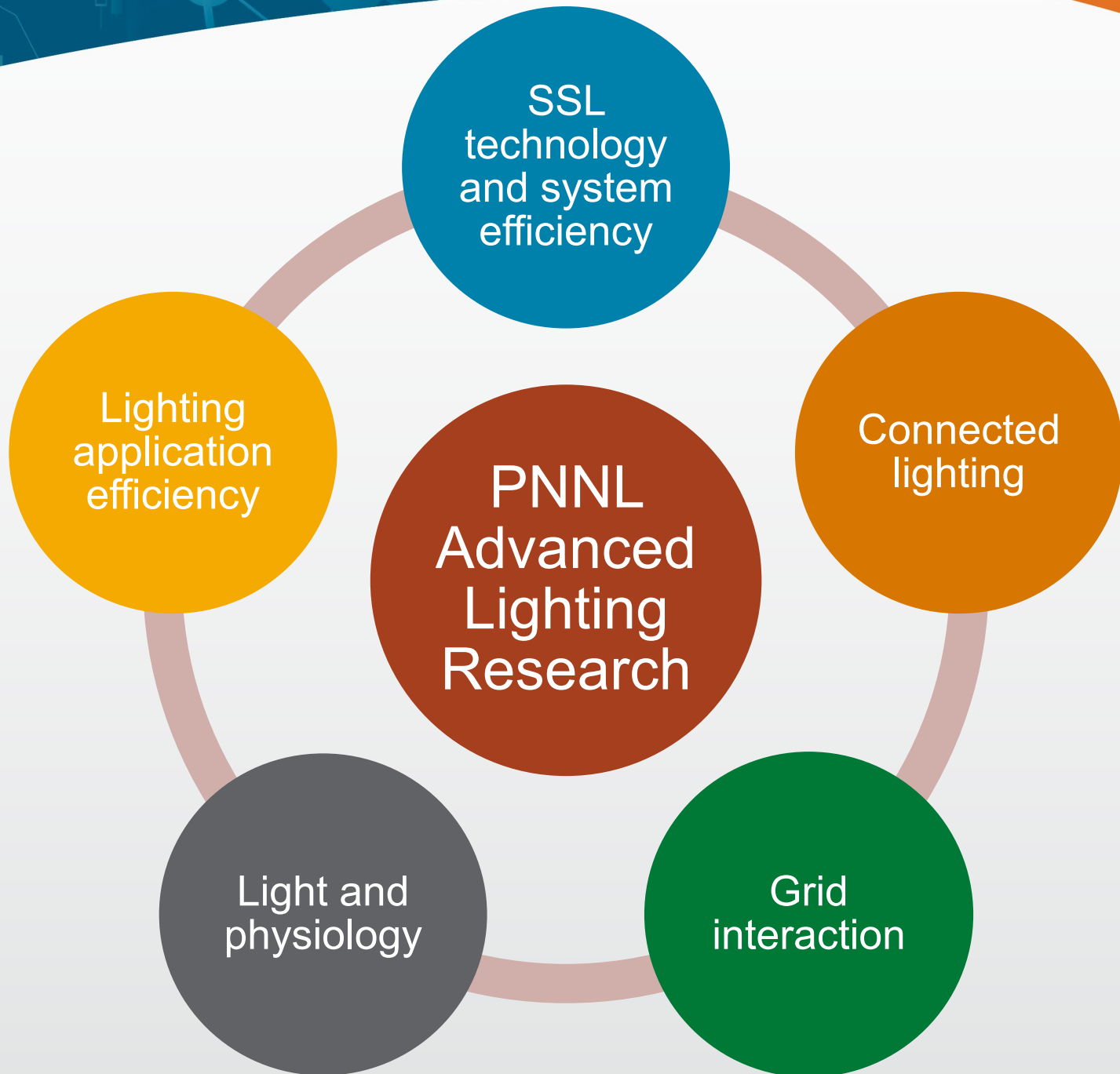
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**U.S. Department of Energy Lighting R&D Workshop • Co-sponsored by the Illuminating Engineering Society**



# **Pacific Northwest National Laboratory**



SSL  
technology  
and system  
efficiency

Connected  
lighting

PNNL  
Advanced  
Lighting  
Research

Grid  
interaction

Light and  
physiology

Lighting  
application  
efficiency



Simulation &  
Modeling



Laboratory  
Studies



Realistic  
Settings



## Simulation & Modeling

- Circadian metrics
  - Energy impacts
  - Electric light
  - Daylight
- Light + grid
  - CLS alone
  - CLS + HVAC
  - CLS + HVAC + battery storage

## Lab Studies

- Human factors
  - Color
  - Glare
  - Flicker
  - Uniformity
- Connected lighting
  - Energy
  - Data
  - Resilience
  - Grid response

## Realistic Settings

- Living Labs
  - Indoor
  - Outdoor
- Early adopters
- Field data
  - Healthcare
  - Education
  - Offices
  - Outdoor



**What is the relationship between “circadian” lighting and energy consumption?**

**What is the potential for optimizing daylight and electric light?**

**Can connected lighting provide grid services?  
Which services? How would that affect building occupants?**



**What light spectra are most preferred and how does that relate to luminous efficacy?**

**How do people perceive flicker and glare under various conditions?**

**How do we get data from connected lighting systems and how accurate is it?**

**What cybersecurity risks does connected lighting present?**



**Are easy-to-configure lighting systems really easy to configure?**

**How and why do people actually use color tunable lighting? Do they like it?**

**Are LED street lights increasing light pollution?**