

# BOC 1014

## Electrification and Building Operation

Credits:	.7
Lecture:	6 hrs
Group Exercises:	1 hr
Total:	7 hrs

**Prerequisites:** None

**Class Description:** Examines how electrification is increasingly a part of a building operator's responsibility. Provides an overview of the fundamentals of electrification technologies, including implementation benefits and barriers, as well as maintenance and troubleshooting of key assets and systems. Reviews applicable best practices, standards and incentives that are moving buildings away from the use of fossil fuels and to 100% electric equipment.

### **Learning Outcomes/Competencies:**

At the completion of Electrification and Building Operation, a participant will be able to:

- Understand the motives for and measure for electrifying buildings
- Demonstrate a fundamental understanding of how electrification influences building performance, safety, and operations and maintenance by discussing the technological, environmental, and utility perspectives
- Explain how electrification impacts the role of building operators
- Identify benefits and barriers to electrification
- Execute basic maintenance on electricity-powered mechanical systems

### **Outline**

1. Introduction to Electrification Concepts
  - 1.1. What is Electrification?
  - 1.2. Drivers
    - 1.2.1.Environmental
    - 1.2.2.Health
  - 1.3. Policy Trends
    - 1.3.1. Global response
    - 1.3.2. National policy
    - 1.3.3. Regional policy
    - 1.3.4. Utility response
  - 1.4. Electrification Benefits
    - 1.4.1. Energy benefits
    - 1.4.2. Non-energy benefits
  - 1.5. Barriers & Solutions
    - 1.5.1. Technical/logistical
    - 1.5.2. Economic

- 1.5.3.Social
- 1.5.4.Funding Options
- 2. Technology and Equipment
  - 2.1. Space Heating and Cooling
    - 2.1.1. Heat pumps
      - 2.1.1.1. Ratings
      - 2.1.1.2. Classification/Types
      - 2.1.1.3. Performance
    - 2.1.2. Variable Refrigerant Flow (VRF)
      - 2.1.2.1. Overview
      - 2.1.2.2. VRF Ventilation Strategies
    - 2.1.3. Multifunction Systems
    - 2.1.4. Energy/Heat Recovery
      - 2.1.4.1. Heat Recovery Chiller
      - 2.1.4.2. Ventilation Energy Recovery
    - 2.1.5. Electric boilers
      - 2.1.5.1. Types
      - 2.1.5.2. Maintenance
  - 2.2. Hospitals, Labs, and Medical Facilities
  - 2.3. Domestic hot water (DHW) heating
    - 2.3.1.Options
    - 2.3.2.Maintenance
  - 2.4. Commercial Kitchen Electrification
  - 2.5. Distributed Energy Resources (DER)
  - 2.6. Grid-Interactive Efficient Buildings (GEB)
    - 2.6.1. Key characteristics
    - 2.6.2. Benefits
    - 2.6.3. Smart Technologies
    - 2.6.4. Demand Flexibility
    - 2.6.5. Transactive energy
  - 2.7. Net Zero Energy Buildings
  - 2.8. Energy Storage
    - 2.8.1. Thermal
    - 2.8.2. Electrical
  - 2.9. EVs as DER
- 3. Impact on Building Operators
  - 3.1. New construction
  - 3.2. Retrofit planning
    - 3.2.1. Considerations
      - 3.2.1.1. Logistical
      - 3.2.1.2. Cost
      - 3.2.1.3. Technical
    - 3.2.2. Identifying replacement options
      - 3.2.2.1. Logistical considerations
      - 3.2.2.2. Refrigerant types and global warming potential (GWP)
  - 3.3. Operations & Maintenance
    - 3.3.1.Considerations

### 3.3.2. Maintenance Overview

#### 3.3.2.1. Heat Pumps

##### 3.3.2.1.1. Air-source

##### 3.3.2.1.2. Water-source

#### 3.3.2.2. VRF

#### 3.3.2.3. DHW

#### 3.3.2.4. Control System

#### 3.3.2.5. Solar PV

#### 3.3.2.6. Battery Storage

### 3.4. Energy Accounting

## 4. Conclusion

### 4.1. Summary

### 4.2. Review of key takeaways