



Final Deliverable:
E2C Expert Match Tama County, IA

**Microlearning modules on residential
energy efficiency- Module 7**

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E2C: Technical Assistance Opportunities

EXPERT MATCH

E2C's Expert Match program connects energy experts with local governments, electric utilities, and community-based organizations to provide technical assistance to inform near-term energy decisions.

Expert Match offers:

- **Access to experts from the U.S. Department of Energy's national lab system.**
- **40–60 hours of support over 3 months from the first kickoff call.**
- **Focus on community-driven challenges or goals.**

For more information, visit:
www.nrel.gov/e2c/expertmatch

Scope

ORNL will develop a set of short microlearning modules to help Montour (Tama County) homeowners better understand and manage household energy use. The work focuses on creating clear, practical, and accessible content that guides residents toward cost-effective improvements and available incentives. Activities in this work may include:

- **Content Development:**
ORNL will prepare seven (agreed upon) modules using plain language, relatable examples, and simple step-by-step guidance covering topics on home energy efficiency improvements.
- **Learning Management System on Website:**
ORNL will use a simple WordPress website of learning management system (LMS) to support hosting the above modules and providing instructions for future updates.

Points of Contact

Community POC

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Microlearning modules on residential energy efficiency

Module 7. Appliance-Specific Modules

A guide to making informed decisions about key household appliances, including HVAC systems, cooking options, and water heaters. The following slides explore the technical considerations, health impacts, and energy efficiency aspects of these essential home systems.

*All the pictures in this presentation slides are generated through various AI tools and are added here for illustrative purpose. The pictures do not represent technical accuracy.



Replacing an Old HVAC?

What to consider when upgrading your heating and cooling system

When it's time to replace your old HVAC system, several critical factors must be evaluated to ensure you select the right option for your home's specific needs.

Key HVAC Considerations

Size

Proper Sizing is Critical

An incorrectly sized HVAC system can lead to inefficiency, inadequate heating or cooling, and unnecessary wear on components. Professional load calculations should be performed to determine the appropriate size for your specific home.

Factors Affecting Size Requirements

- Square footage of your home
- Ceiling height and home layout
- Insulation quality and window efficiency
- Local climate conditions
- Number of occupants

Key HVAC Considerations

Capacity?



Capacity refers to how much heating or cooling an HVAC system can provide, typically measured in BTUs (British Thermal Units) or tons.

- 1 ton = 12,000 BTUs per hour
- Residential systems typically range from 1.5 to 5 tons
- Undersized systems run constantly but may not achieve comfort
- Oversized systems cycle frequently, causing temperature swings and excessive wear

Key HVAC Considerations

COP?



What is COP?

COP (Coefficient of Performance) is a measure of heating or cooling efficiency. It represents the ratio of useful heating or cooling provided to the energy consumed.

Interpreting COP Values

Higher COP values indicate greater efficiency. For example, a heat pump with a COP of 3.0 produces 3 units of heat for every 1 unit of electricity consumed.

Impact on Energy Bills

Selecting a system with a higher COP can significantly reduce long-term operating costs despite potentially higher upfront investment.

Key HVAC Considerations

HSPF2?

HSPF2 (Heating Seasonal Performance Factor 2) is a rating that measures heat pump heating efficiency over an entire heating season.

- The higher the HSPF2 rating, the more efficient the unit.
- Minimum standards in North American standards differ from the UK and EU.
- HSPF2 replaced the older HSPF metric in 2023 with more stringent testing procedures.
- Modern efficient heat pumps typically have HSPF2 ratings of 8.0 or higher.





Induction Cooking vs Gas

Health and energy impacts

Gas Cooking

- Gas cooking produces nitrogen dioxide, carbon monoxide, and particulate matter indoors
- Ventilation (using a range hood vented outside) can reduce exposure
- Gas cooking is about 40% energy efficient
- Familiar technology with lower upfront cost

Induction Cooking

- Does not produce indoor combustion emissions
- Approximately 85–90% energy efficient
- Faster heating times with induction reduce overall energy use
- Requires compatible cookware and higher upfront investment

Water Heater Options

Selecting the right water heater involves balancing initial costs, operating expenses, space requirements, and household hot water demands. Modern options offer improvements in efficiency and performance compared to older models.



Water Heater Comparison

1

Traditional Tank Water Heaters

- Lower initial cost but higher operating expenses
- Available in electric, gas, and oil models
- Standby heat loss reduces efficiency
- Typical lifespan of 8-12 years
- Limited hot water supply based on tank size

2

Tankless Water Heaters

- Higher upfront cost but lower operating expenses
- Provides hot water on demand without storage
- Space-saving wall-mounted design
- Longer lifespan of 15-20 years
- May require electrical or gas service upgrades

3

Heat Pump Water Heaters

- Highest efficiency for electric water heating
- Extracts heat from surrounding air
- Can reduce water heating costs by up to 60%
- Requires adequate air space and moderate ambient temperatures
- Longer payback period but greatest long-term savings

Making the Right Choice for Your Home

HVAC Systems

Consider professional assessment for proper sizing and capacity. Look for high COP and HSPF2 ratings to maximise efficiency and comfort while minimising operating costs.

Cooking Options

Both gas and induction cooking have advantages: gas is widely available and lower in upfront cost, while induction offers higher efficiency and faster heating but requires compatible cookware.

Water Heaters

Evaluate your household's hot water needs, available space, and budget. Heat pump and tankless options offer long-term savings despite higher initial investment.

