Energy Efficiency Assessment Training Program

Chapter 1 - Introduction

Goals of this Presentation

This E2 Intro WILL NOT:

- teach you how to do full-blown energy assessments
- make you an expert on E2 opportunities for all types of processes

This E2 Intro WILL:

- Introduce common energy concepts and terms
- Highlight typical energy systems and ID associated E2 opportunities

What is Energy Efficiency?

According to PADEP, energy efficiency (E2) is

- a practice that reduces the use of non-renewable energy forms such as electricity and natural gas
  - E2 lowers operating costs and can contribute to a company's bottom line without affecting productivity or safety
  - E2 also improves environmental quality

The E2/Environment Connection

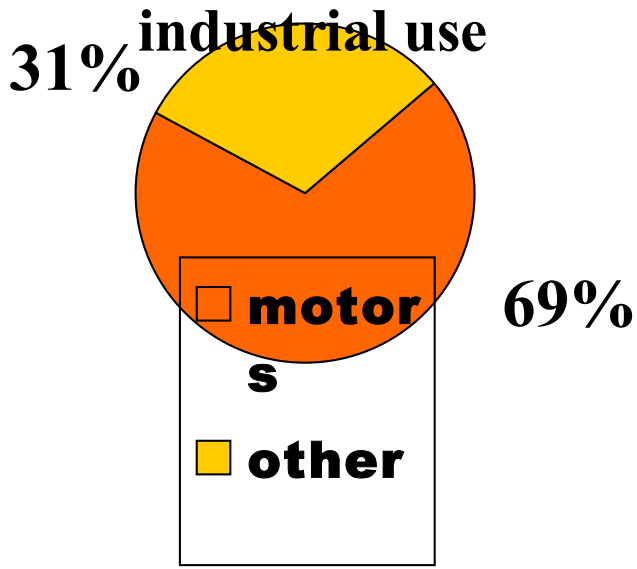
- Increased electricity use ⇨

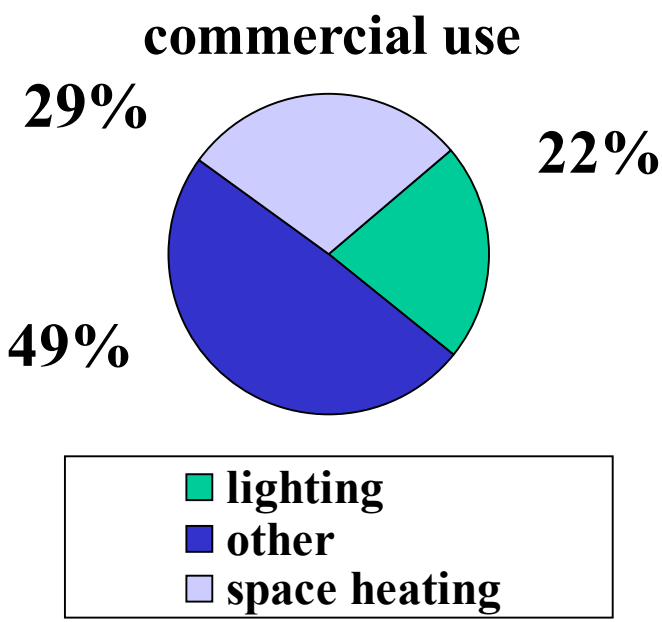
  Increased electricity generation ⇨

  Increased pollution

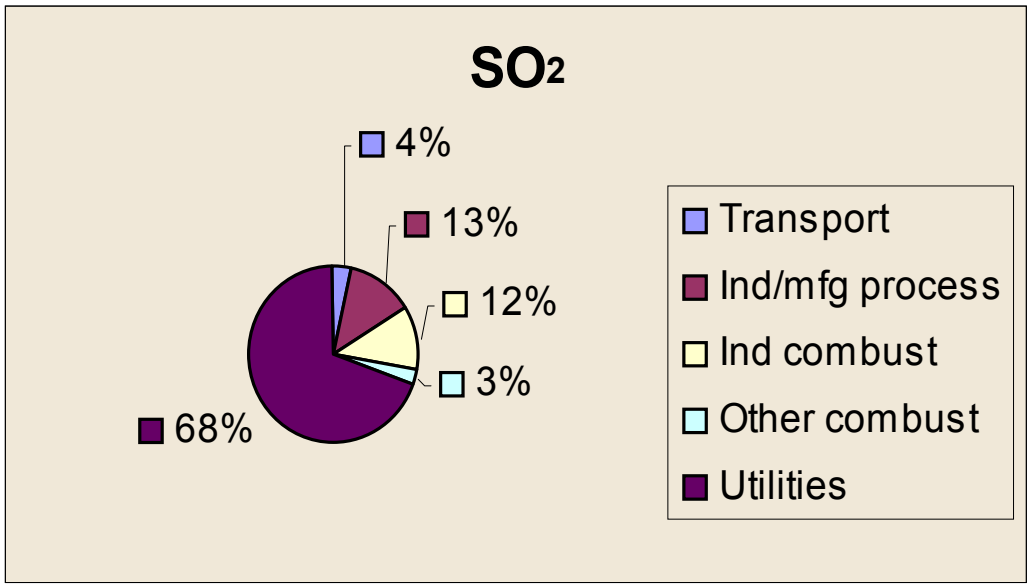
- Power plant construction is energy- and resource-intensive
- PA utilities are 2nd largest emitters in U.S. of SO_2 (6,098,000 tons)

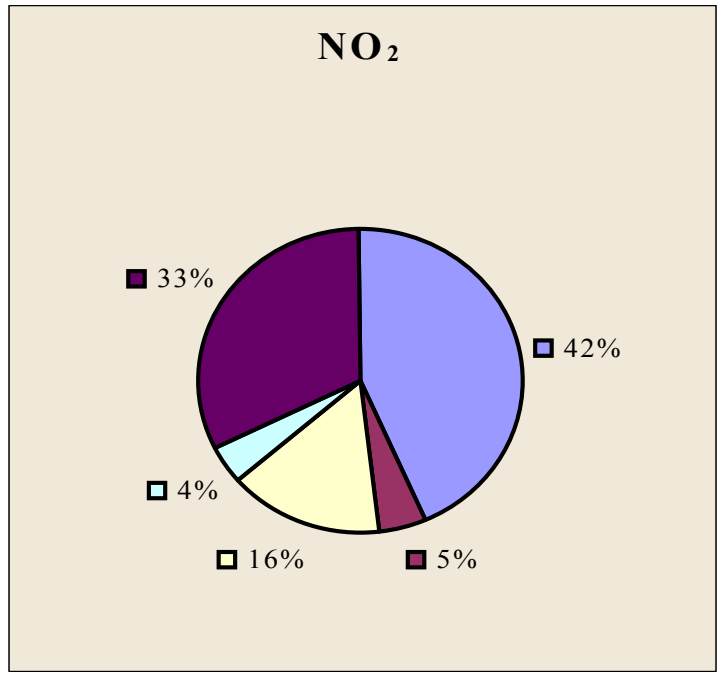
Electricity Use Profile



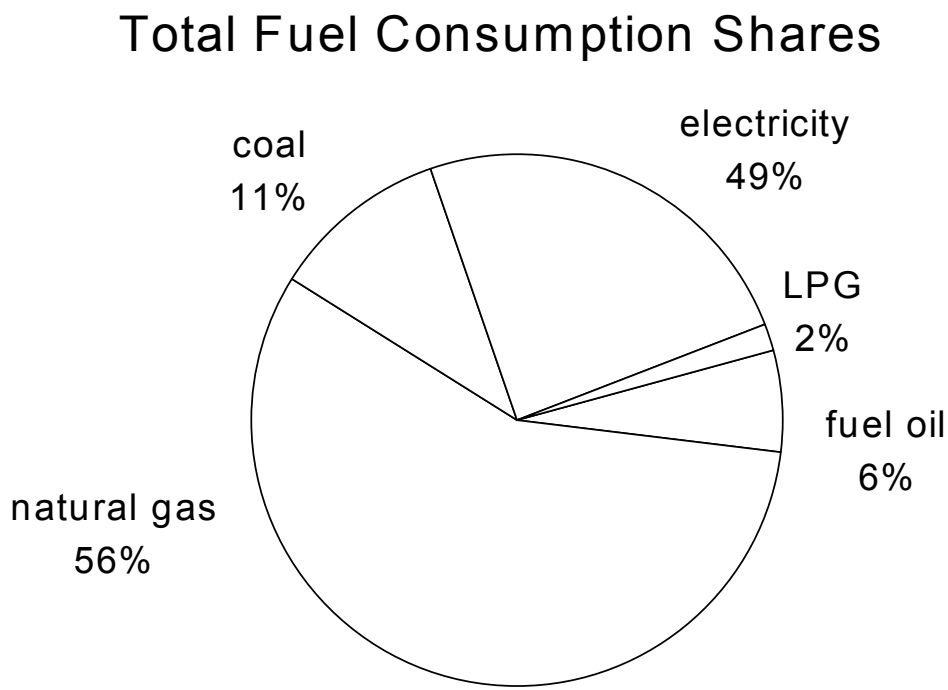


US SOx and NOx Emissions by Source





U.S. Industrial Energy Consumption - Fuel Type (1994)

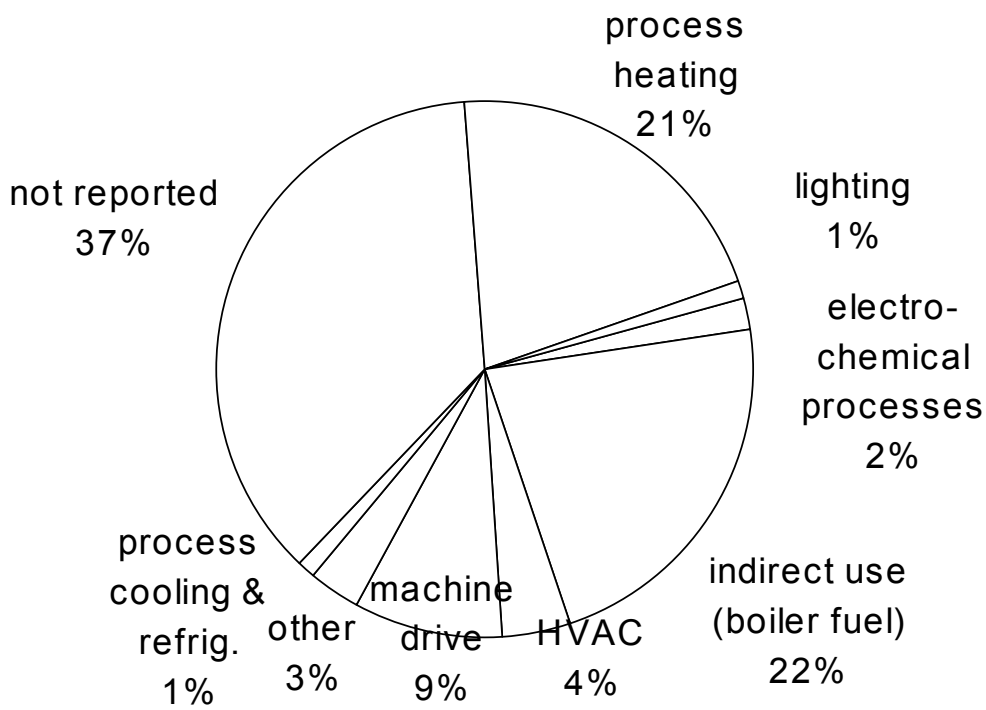


Total consumption = 16.5 Quadrillion Btu

Source: U.S. Department of Energy, Energy Information Administration

U.S. Industrial Energy Consumption - End Use (1994)

Key End-Use Consumption Shares

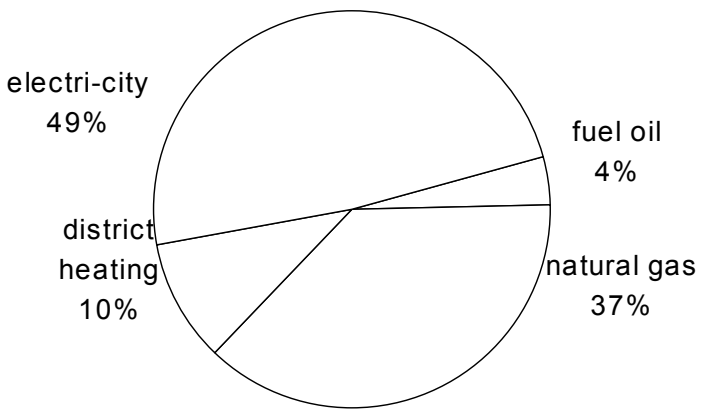


Total consumption = 16.5 Quadrillion Btu

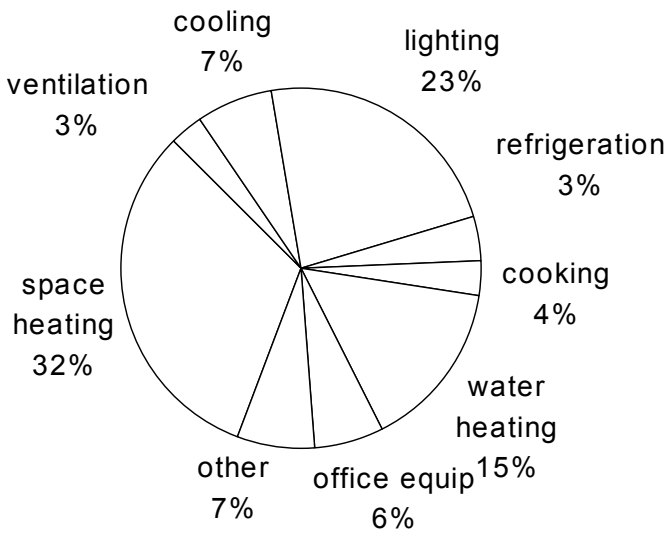
Source: U.S. Department of Energy, Energy Information Administration

U.S. Commercial Buildings - Energy Consumption (1995)

Total Fuel Consumption Shares



Key End-use Consumption Shares

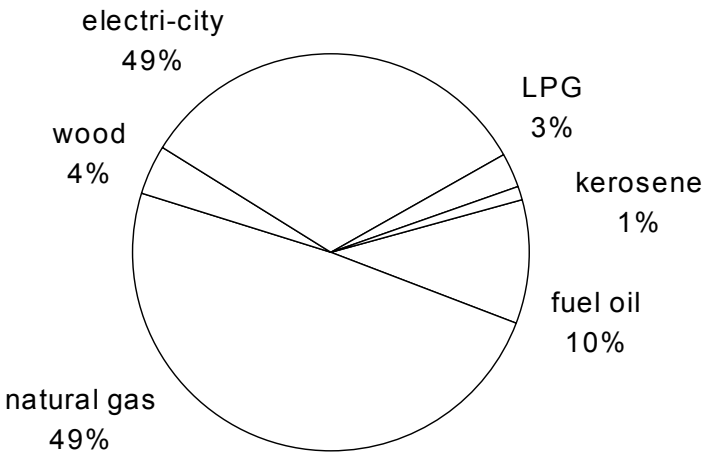


Total consumption = 5.3 Quadrillion Btu

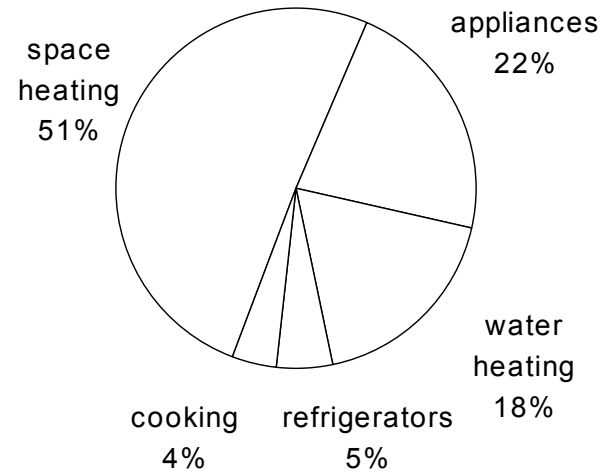
Source: U.S. Department of Energy, Energy Information Administration

U.S. Households - Energy Consumption (1997)

Total Fuel Consumption Shares



Key End-use Consumption Shares



Total consumption = 10.3 Quadrillion Btu

Source: U.S. Department of Energy, Energy Information Administration

Why review utility bills?

- You will find errors
- It is worth the effort
- You can identify consumption patterns
- Data may help you start to prioritize consumption reduction opp'ties

Utility Bill Review

- During the assessment, ask about:
  - billing history
  - who are the suppliers
  - who approves the bill
  - who pays the bill
  - what are the trends

Common Utility Charges

- Customer Charge
- Energy Use Charge
- Demand Charge
- Fuel Rate Charge
- Power Factor Charge
- Environmental Fees
- Taxes

Understanding Utility Bills

- Important terms

DEFINE:

- BTU
- kW
- kWh
- Power Factor

Understanding a BTU

A BTU is

- a British thermal unit
- the amount of energy that raises 1 lb. of water 1°F (at 39.2°F)
- The approximate amount of energy given off by burning one match

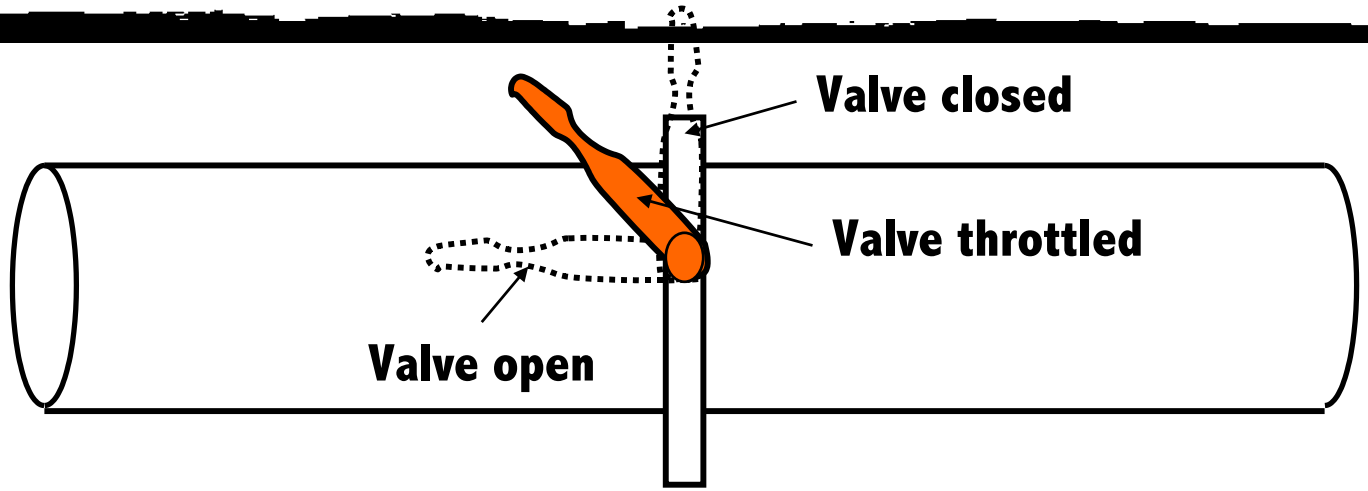
Power factor

- What is power factor?
  - Ratio of real power (kW) to apparent power (kVA). Power factor is low at low load because while the real power approaches the motor losses, the reactive power (kVAR) which creates the magnetic field is constant.
  - Use capacitors to improve power factor
- Heat generation and temperature rise
- Proper sizing

Electrical Cost Savings

- Compare rate schedules
- Know when utility on-peak charges occur
- Run electrical loads (i.e., motors) off-peak
- Encourage routine energy-saving practices
- Use sequenced start-up
- Install capacitors
- Use generators to cut peak demand

Case for a VFD: Throttling



Throttling is like driving the car with the gas pedal to the floor, and using the brake to control speed

- Uses excessive energy
- Rough on mechanical equipment
- Shortens motor life