Overview of DOE EnPI Tool and Demonstration

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Developing a Baseline and Tracking Energy Performance

- **Draw boundary to include all appropriate operations**
  - Treatment plant
  - Lift or pumping stations
  - Admin buildings
  - If under 5% can be deemed insignificant, and left out

- **Choose baseline year**
  - Usually year of joining or year prior
  - Can be up to three years prior to joining

- **Include all relevant energy sources**
  - Electricity (purchased, renewable, etc.)
  - Natural Gas
  - Biogas (optional)

- **Time period for data**
  - Annual reports, based on monthly data
  - Other options, such as weekly or daily data

**Three Approaches:**

- **Corporate-level**
- **Facility-level**
- **Regression-based**

For More Info -
**Better Plants – Energy Intensity Baselining and Tracking Guidance**
Boundary Definition Considerations

**Process**

- **Site boundary**
  - Site-generated Renewable Energy
  - Offsite-generated Renewable Energy
  - Purchased Electricity (Source)
  - Purchased Fuel
  - CHP and/or Boiler
  - Onsite Biogas

**Energy sold**

**Treated Water**

**Wastewater**

**Mandatory energy accounting**

**Optional energy accounting**
Various Levels of Insight

- Create separate analysis for department, facility, or corporate managers to benchmark their processes/facilities.
- Roll up data to different levels (Facility, Business Unit, Corporate)
Multiple Data Levels

- Role up Individual Plants to the Corporate Level
- Plant Energy Intensities
- Facilities
- Corporation
- Report Metrics
  - Corporate Management Reports
  - Company Sustainability Reports
  - Better Plants Report
  - SEP Report
• WERF efforts suggest globally two primary metrics are in use for energy intensity
  – In Europe, facilities use metric based on biological oxygen demand (BOD) whereas in U.S. more facilities use flow-based metric
  – Advantage of flow-based metric is being more accepted in the U.S.
  – If trend is toward reduced flow, flow based intensity could be disadvantageous as energy intensity tends to improve at higher volumes
• NYSERDA provided guidance on developing energy intensity metric
  – Agrees with the use of energy use per volume of flow and per unit of BOD removed for benchmarking purposes
  – More emphasis placed on understanding energy use with given volume of flow
• EPA developed tool for energy intensity benchmarking
  – ENERGY STAR tool expresses source energy intensity in terms of BTU per unit flow
  – Tool provides ENERGY STAR score which considers both BOD and flow
Benefits of Regression Analysis

• More accurate, “apples-to-apples” comparisons, holding critical variables constant over time, such as:
  – Weather, e.g. HDDs, CDDs, rain humidity, etc.
  – Production, e.g. product output, moisture content, raw materials, etc.
• Determine the “True Energy Savings” that occur from energy project implementation
• Tool supports validation of company’s energy management activities
• Supports energy manager’s efforts to report energy intensity impacts
• Improves comparative analyses for companies that benchmark
• Regression analyses help predict future energy needs (utility procurement)
## Comparison of Facility and Regression-based Approaches

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<thead>
<tr>
<th>Regression-based Approach</th>
<th>Facility-level Approach</th>
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<tbody>
<tr>
<td>1 Define the boundary</td>
<td>Define the boundary</td>
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<tr>
<td>2 Choose a baseline year</td>
<td>Choose a baseline year</td>
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<tr>
<td>3 Determine relevant variables affecting energy consumption at each facility</td>
<td>Decide on the energy intensity denominator for each facility, usually units of output</td>
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<tr>
<td>4 Gather data on energy consumption and relevant variables for each facility</td>
<td>Gather data on energy consumption and units of output for each facility</td>
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<tr>
<td>5 Use regression analysis to normalize each facility’s data</td>
<td>Calculate energy intensity for the baseline year and the current year for each facility</td>
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<td>6 Calculate the change in energy intensity from the baseline year for each facility</td>
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<tr>
<td>7 Aggregate the data on energy intensity change from each facility to the corporate level</td>
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<tr>
<td>8 Calculate total and new energy savings</td>
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Purpose

• To assist organizations in calculating energy performance indicators while normalizing for variables such as weather, production, moisture content, etc.
• An additional use of the tool is to evaluate the strength of relationship of certain independent variables to energy consumption
• Automates a manual process

Intended Users

• Better Buildings, Better Plants participants
• Superior Energy Performance participants
• Any organization seeking to create and track facility energy performance over time.
Weather Data Sources

Heating degree days (HDD) and Cooling degree days (CDD) Data

HDD and CDD data can be downloaded from the following websites:

- National Oceanic and Atmospheric Administration
- Weather Data Depot

Precipitation or Monthly Rain Data

- Weather Underground
- Weather Source (some data is free)
Thank you!

EnPI 4.0 Tool
https://ecenter.ee.doe.gov/EM/tools/Pages/EnPI.aspx

Better Buildings, Better Plants:
https://energy.gov/eere/amo/better-plants

Better Buildings Challenge:
https://betterbuildingssolutioncenter.energy.gov/challenge

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