Six Strategies for Performing Facility Evaluations at Small Army Reserve Locations

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**Challenge:** The U.S. Army Reserve (USAR) needed a strategy to efficiently meet facility audit requirements while also expanding the energy and sustainability program impact.

**Solution:** USAR partnered with Pacific Northwest National Laboratory (PNNL) to develop a suite of evaluation approaches that:

- Recognizes that different sites have different needs
- Leverages time in field to identify a broad set of sustainability improvement opportunities (energy, water and waste)
- Uses remote building data to perform assessments - and sometimes implement - building controls re-tuning/optimization
USAR Property Overview

• 5 Installations & 5 Regions with >1000 Reserve Centers
• Low week-day & high weekend occupancy
• Moderate energy and water use intensity: 60 kBtu/SF, 13 Gal/SF
• Typical site has 3 buildings and ~50 kSF
Drivers of the USAR Evaluation Approach

• Meet legislative and policy mandates for
  – Performing “Comprehensive Energy and Water Evaluations” and Retro commissioning Assessment every 4 years (EISA 2007)
  – Construction of net zero energy, water and waste buildings
  – Water reduction
  – Solid waste diversion

• Leverage connected buildings capability
  – Interval utility meter deployment (25% of floor area)
  – USAR enterprise building control system (EBCS) initiative

• Address site-specific needs
  – Active ESPCs and UESCs
  – Plans for decommissioning, etc.
  – Sites with high energy or water intensity

• Keep energy and water project pipeline full
Choosing the Right Evaluation – A Portfolio Approach

Criteria
- Operating Status
- Facility Characteristics
- Utility Profile
- Project Implementation Status

Evaluation Types
- Walk Through
- Remote
- Desk

Scope of Analysis
- ASHRAE Level 1, 2 or 3 & Commissioning Assessment
- Subset of ASHRAE Level 1/2 & Commissioning Assessment
- Subset of ASHRAE Level 1 & Facility Status Eval ECM List Review
Establish Best Evaluation Approach

Step 1
Go through checklist. If a box is checked, follow “yes”. If not, follow “no”.

Step 2

Step 3

Step 4
Past CEWE Completed

Step 5
Are projects
previously
identified still
applicable?

Yes
No

Step 6
Investigate site
conditions, reasons
for changes in
project needs.

or
Walk Through
Appropriate to Audit?
- Is site on BRAC/ scheduled for decommission within 5 years?
- Another entity pays electric bills?
- Building < 2,500 SF
- Site < 10,000 SF
- Energy use < 500 MMBtu
- EUI < 15 kBtu/SF
- Energy Cost is < $10,000

Step 1

Yes ➔ Site is not appropriate to audit

No ➔ Step 2

Does site have Enterprise Building Control System (EBCS)?
- Is BCS connected to ARNet?

Step 2

Yes ➔ Remote

No ➔ Step 3

Not had a past evaluation, or previous audit incomplete or unsatisfactory?
- Site among highest EUI or WUI sites?

Step 3

Yes ➔ Walk Through
Six Types of Facility Evaluations

- **Net Zero Energy, Water & Waste Assessment**
- **Onsite Controls Re-tuning & High-level Evaluation**
- **Standard Energy, Water & Waste Assessment**
- **Remote Re-tuning with Assisted Evaluation**
- **Remote Re-tuning**
- **Desk Audit**

Onsite walk-through
More robust assessment
Higher cost

Remote
Less robust assessment
Lower cost
# Net Zero Energy, Water and Waste Assessment

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Walk through building</td>
</tr>
<tr>
<td>• Evaluate energy and water conservation and efficiency measures; waste reduction measures</td>
</tr>
<tr>
<td>• Assess renewable energy production, water production/treatment, and waste diversion potential; consider microgrids</td>
</tr>
<tr>
<td>• Conduct whole-building/site modeling and consider interactive effects</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>When Applicable</th>
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</thead>
<tbody>
<tr>
<td>• Sites meet screening criteria for net zero energy, water and/or waste</td>
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</table>

<table>
<thead>
<tr>
<th>Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Roadmap with 3 ECM implementation scenarios: cost-effective, recommended and required to achieve net zero</td>
</tr>
</tbody>
</table>
### Description
- Walk through building
- Optimize the control system and assess other energy, water, and waste savings opportunities, including renewable energy
- Assess using simple lifecycle cost tools; typically no modeling

### When Applicable
- Primarily for newer buildings that have:
  - a BCS, but not connected to an enterprise system
  - little need for major HVAC or lighting retrofits as indicated by energy use/intensity, and/or
  - information available on projects recently completed

### Deliverables
- Report summarizing re-tuning™ actions taken with estimated savings and other recommended ECMs including renewable energy production potential
Standard Energy, Water and Waste Assessment

Description
- Walk through building
- Conduct detailed assessment of energy and water conservation and efficiency measures, and renewable energy production potential
  - Use whole-building modeling
  - Assess waste reduction/diversion potential

When Applicable
- Sites that have not conducted a comprehensive audit nor had major renovations to HVAC and lighting systems in past 4 years

Deliverables
- Report with a list of cost-effective energy and water ECMs, waste and recycling opportunities
Remote Re-tuning™ with Assisted Evaluation

**Description**

- Building controls engineer uses enterprise control system to perform majority of controls analysis and implements measures remotely. Conducts site visit only if further investigation required.
- Site contact conducts walk-through with simple checklist to identify obvious energy, water, and waste measures with support from remote auditor.

**When Applicable**

- Buildings connected to the enterprise control system
- Buildings show moderate energy use after re-tuning measures are implemented, indicating moderate potential benefit from additional retrofits

**Deliverables**

- Report summarizing re-tuning™ actions taken with estimated savings and other recommended ECMs
### Remote Re-tuning™

#### Description
- Building controls engineer uses enterprise control system to perform controls analysis and implements measures remotely.

#### When Applicable
- Primarily for newer buildings that have:
  - a BCS that is connected to the enterprise server
  - as-built building drawings available
  - low energy use after the re-tuning™ measures are implemented, indicating low potential benefit from additional retrofits therefore no evaluation of other ECMs is required.

#### Deliverables
- Report summarizing re-tuning™ actions taken with estimated savings, utility analysis and capital project screening results.
Description

- No site visit or remote access to systems
- Review performance, facility information, and past audit retrofit activity

When Applicable

- Buildings that meet specific criteria based on:
  - operational status
  - floor area
  - energy use and intensity
  - seasonal occupancy/use
  - recent major upgrades
  - similar building recently audited
  - past projects identified are still applicable but not funded

Deliverables

- Brief report that provides justification for the desk audit, findings, and CTS reporting
# Evaluation Approach Example: Four Sites with Different Needs

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Site A</th>
<th>Site B</th>
<th>Site C</th>
<th>Site D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facility characteristics</strong></td>
<td>40,000 SF Built 1970</td>
<td>80,000 SF Built 2014</td>
<td>25,000 SF Built 1990</td>
<td>60,000 SF Built 2008</td>
</tr>
<tr>
<td><strong>Building control system</strong></td>
<td>None</td>
<td>Connected to enterprise BCS</td>
<td>None</td>
<td>Not centrally connected</td>
</tr>
<tr>
<td><strong>Utility profile</strong></td>
<td>EUI: 100 WUI: 2</td>
<td>EUI: 70 WUI: 10</td>
<td>EUI: 60 WUI: 1</td>
<td>EUI: 85 WUI: 8</td>
</tr>
<tr>
<td><strong>Audit status</strong></td>
<td>ESCO audit in 2012</td>
<td>Never audited</td>
<td>Audited in 2014</td>
<td>Never Audited</td>
</tr>
<tr>
<td><strong>Project implementation status</strong></td>
<td>Active ESPC with HVAC and lighting retrofits to be completed in 2017</td>
<td>None of the recommended projects have been implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating status</strong></td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
</tr>
</tbody>
</table>
### Evaluation Approach Example: Four Sites with Different Needs

<table>
<thead>
<tr>
<th>4-year Audit Cycle</th>
<th>2013-2016</th>
<th>2017-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site A, ESPC</td>
<td>Standard energy, water, waste evaluation</td>
<td>Desk Audit</td>
</tr>
<tr>
<td>Site B, New</td>
<td>Never audited</td>
<td>Remote Re-tuning/w Assisted Eval</td>
</tr>
<tr>
<td>Site C, Projects</td>
<td>Standard energy, water, waste evaluation</td>
<td>Desk Audit</td>
</tr>
<tr>
<td>Site D, No Audit</td>
<td>Never audited</td>
<td>Onsite Re-tuning and High Level Evaluation</td>
</tr>
</tbody>
</table>

- **Site A, ESPC**
  - Active ESPC
  - Past detailed audit
- **Site B, New**
  - Connect to enterprise BCS
  - Moderate energy use
- **Site C, Projects**
  - Past Projects still Applicable
  - Moderate energy use
- **Site D, No Audit**
  - Relatively high energy
  - Never audited
  - Not remotely connected
Conclusions

Offering a suite of evaluation approaches can help organizations:

• Meet mandates more efficiently
• Address the different needs of different sites/buildings
• Leverage time in field to identify a broad set of sustainability improvement opportunities (energy, water and waste)
• Recognize that identifying, funding, designing, and constructing projects can take more than 4 years.
• Use remote building data to perform assessments and sometimes implement building controls re-tuning™/optimization
Interested in more discussion?

• Federal Facility Audit Working Group
  – Objective:
    • Understand current approaches and challenges to meeting EISA Section 432 facility evaluation requirements
    • Raise awareness of ASHRAE Standard 211P, Standard for Commercial Building Energy Audits
      – Draft for public review is open until September 19th.
    • Consider how this standard could shape Federal facility audits
    • Provide input to the development of updated FEMP guidance that agencies can use to comply with EISA Section 432 facility evaluation requirements
  – Next meeting in October
• FEMP has asked each agency or agency component (e.g. service, bureau) to designate one delegate to participate in the Working Group
  – Ideal delegates have experience overseeing or completing audits and understand challenges to complying with the requirements

• Provide working group delegate contact information to Cyrus Nasseri of FEMP at: cyrus.nasseri@ee.doe.gov.
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