NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Review of Current Data Exchange Practices: Providing Descriptive Data to Assist with Building Operations Decisions

William Livingood and Justin Stein
National Renewable Energy Laboratory

Toby Considine
TC9, Inc.

Chuck Sloup
Sensus Machine Intelligence

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

Technical Report
NREL/TP-5500-50073
May 2011

Contract No. DE-AC36-08GO28308

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Review of Current Data Exchange Practices: Providing Descriptive Data to Assist with Building Operations Decisions

William Livingood and Justin Stein
National Renewable Energy Laboratory

Toby Considine
TC9, Inc.

Chuck Sloup
Sensus Machine Intelligence

Prepared under Task No. BEC7.1311

National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401
303-275-3000 • www.nrel.gov

Technical Report
NREL/TP-5500-50073
May 2011

Contract No. DE-AC36-08GO28308

NOTICE

Available electronically at http://www.osti.gov/bridge

Available for a processing fee to U.S. Department of Energy
and its contractors, in paper, from:

U.S. Department of Energy
Office of Scientific and Technical Information

P.O. Box 62
Oak Ridge, TN 37831-0062
phone: 865.576.8401
fax: 865.576.5728
email: mailto:reports@adonis.osti.gov

Available for sale to the public, in paper, from:

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
phone: 800.553.6847
fax: 703.605.6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/help/ordermethods.aspx

Cover Photos: (left to right) PIX 16416, PIX 17423, PIX 16560, PIX 17613, PIX 17436, PIX 17721

Printed on paper containing at least 50% wastepaper, including 10% post consumer waste.

Acknowledgments

The authors would like to thank the U.S. Department of Energy Building Technologies Program for its support. This report was prepared by the National Renewable Energy Laboratory (NREL) Center for Electricity, Resources, and Building Systems Integration. Larry Brackney and Feitau Kung assisted with peer review.

The authors would like to thank the members of the Retailer Energy Alliance Whole Building Systems Project Team for providing feedback.

The authors also acknowledge the following subcontractor parties who contributed content for Appendices B-D:

Appendix B – Example Point Naming Prototype: content provided by Setpoint Systems Corporation

Appendix C – Example Enhancement to BACnet: written by NREL with input from Setpoint Systems Corporation

Appendix D – Example Enhancement to oBIX: written by NREL with input from Sensus Machine Intelligence

Sensus Machine Intelligence, Omaha, Nebraska, Subcontract LXL-0-40363-01

Setpoint Systems Corporation, Littleton, Colorado, Subcontract LGG-0-40364-01

Executive Summary

Retailers who participate in the U.S. Department of Energy Commercial Building Energy Alliances (CBEA) identified the need to enhance communication standards. The means are available to collect a massive amount of buildings operational data, but CBEA members have difficulty transforming the data into usable information and energy-saving actions. Implementing algorithms for automated fault detection and diagnostics and linking building operational data to computerized maintenance management systems (CMMS) are important steps in the right direction, but have limited scalability for large building portfolios because the algorithms must be configured for each building.

Figure ES-1 depicts the lack of descriptive data, or metadata, in a standardized and structured format. This prevents algorithms from properly connecting to data without tedious customized building-by-building configurations. To enable algorithms to efficiently transform raw data into actionable insights, we propose to enhance communications standards by further defining metadata objects, elements, and attributes.

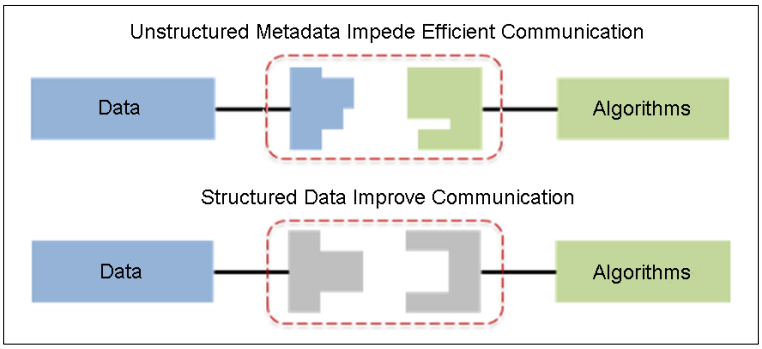

Figure ES-1 Lack of structured metadata

Evaluation Approach

We reviewed and analyzed communication standards in terms of a specific capability: their ability to be sufficiently enhanced to provide descriptive data that assist building operations decisions. To this end, we provide specific examples that further define the metadata objects, elements, and attributes for control and monitoring points. We demonstrate that communication standards can be used to provide the necessary descriptive information for building control and monitoring points—also known as input/output points—that would enable algorithms to transform raw data into actionable information and insights. The goal is to standardize the depiction and base structure of the metadata in various communication standards.

Results

The project successfully established an understanding of the current state of a specific capability of communications standards in the industry. It also identified key barriers to a long-term vision of more efficient practices, as well as next steps for researchers and commercial building owners.

Based on CBEA member experience and feedback, we chose to assess BACnet and oBIX in greater detail as initial examples for this project. In both cases, we were able to further define

the metadata objects, elements, and attributes necessary for eliminating tedious building-by-building configurations and adhere to the framework of the communication standards.

We identified the next steps as follows.

Next Steps

NREL might perform these follow-up activities to improve the scalability of algorithms for automated fault detection and diagnostics and link building operational data to computerized maintenance management systems:

1. Support CBEA members, equipment manufacturers and suppliers, and/or technical committees of standards organizations to develop and implement a standard point naming system as an immediate interim solution. (A preliminary list of typical control and monitoring points is included in Appendix B.)
2. Initiate Cooperative Research and Development Agreements with interested industry partners to enhance communication standards by further defining the metadata objects, elements, and attributes for typical control and monitoring points.
3. Write a specification for requests for proposals that covers new purchases or upgrades of software, equipment, and services to include defined typical control and monitoring points.
4. Work with technical committees of standards organizations to illustrate the industry need of and benefit to enhancing communication standards by further defining the metadata objects, elements, and attributes for typical control and monitoring points.

For commercial building owners, next steps include:

1. Adopt an organization-wide standard point naming system as an immediate interim solution. A combination of resources could facilitate this, including:
    a. Point names listed in this document
    b. Suggestions in other publications, such as the "BACnet Today" article in the November 2010 edition of the *ASHRAE Journal* (Butler and Veelenturf, 2010).
    c. Open source initiatives such as Project Haystack (Project Haystack, 2011).
2. Adopt an organization-wide specification for requests for proposals that covers new purchases or upgrades of software, equipment, and services to include defined typical control and monitoring points.

Nomenclature

AFDD	automated fault detection and diagnostics
AHU	air handling unit
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BACnet/XML/WS	Building Automation Controls Networking Protocol/Extensible Markup Language/Web Services
BAS	building automation system
BIM	building information modeling
CBEA	Commercial Building Energy Alliance
CMMS	computerized maintenance management systems
COBie	Construction-Operations Building Information Exchange
EEMS	enterprise energy management system(s)
FDDI	fault, detection, diagnostics, and impact
gbXML	Green Building Extensible Markup Language
NBIMS	National Building Information Modeling Standard
NREL	National Renewable Energy Laboratory
oBIX	Open Building Information Exchange
OPC UA	Object Linking and Embedding for Process Control – Unified Architecture
POS	point of sale
RTU	rooftop unit
VAV	variable air volume
W3C	World Wide Web Consortium
XML	eXtensible Markup Language

Contents

Figures and Tables

Figures

Tables

1 Introduction

1.1 Opportunity for Improvement

Building owners in the U.S. Department of Energy Commercial Building Energy Alliances (CBEAs) have identified a need in the broader industry to enhance communication standards. Building owners can collect massive amounts of energy-related building data, but they have difficulty transforming the data into usable information and energy-saving actions. The problems include:

- There are too many data to manage with current technology.
- There is too little action as a result.
- Assigning descriptive information, or metadata, to raw data and making these metadata accessible to the end user (point mapping) is a tedious and error-prone manual process.
- New products that do not address the underlying problems specific to this business model continue to enter the market.

1.2 Proposed Solution

CBEA members and product suppliers have stated that the solution should involve enhanced communication standards that further define metadata objects, elements, and attributes for building control and monitoring points. This would enable algorithms to transform raw data into actionable information and insights.

Current standards do not specifically address this challenge, but can serve as starting points and be enhanced to meet this need. Candidates include BACnet Web Services, BACnet XML, and oBIX.

If the tremendous growth in the enterprise energy management systems (EEMS) market were to continue without a standardized method of depicting and transferring the metadata, users would continue to have difficulty extracting useful direction.

For new construction and retrofit cases, enhanced communication standards would increase the scalability of automated fault detection and diagnostics (AFDD) solutions and help link building operational data to computerized maintenance management systems (CMMS). For retrofits, such standards would need to be implemented during a building automation system (BAS) and EEMS upgrade.

1.3 Project Direction

The National Renewable Energy Laboratory (NREL) partnered with Sensus Machine Intelligence (Sensus M.I.) and Setpoint Systems Corporation. Sensus M.I. has expertise in advanced automated fault, detection, diagnostics, and impact (FDDI) analysis; Setpoint Systems has expertise in building control systems (designing, installing, commissioning, and servicing) with a focus on custom and standard BACnet solutions.

We reviewed communication standards and showed how they can be enhanced by further defining the metadata objects, elements, and attributes. Figure 1-1 depicts the enhancement process. Just as BACnet (developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standing Standard Project Committee 135) is compliant with the eXtensible Markup Language (XML) (developed by the World Wide Web Consortium [W3C]), the proposed enhancement would be compliant with BACnet. BACnet includes many

common communication functions (analog input and output, binary input and output, values, etc.). These functions are defined in BACnet in compliance with XML and can be applied to typical control and monitoring points. Standard BACnet objects, elements, and attributes are available; however, they need to be enhanced to include the typical control and monitoring points by further defining the metadata objects, elements, and attributes. A similar enhancement process could be performed on any communication standard (e.g., oBIX, developed by OASIS[1]).

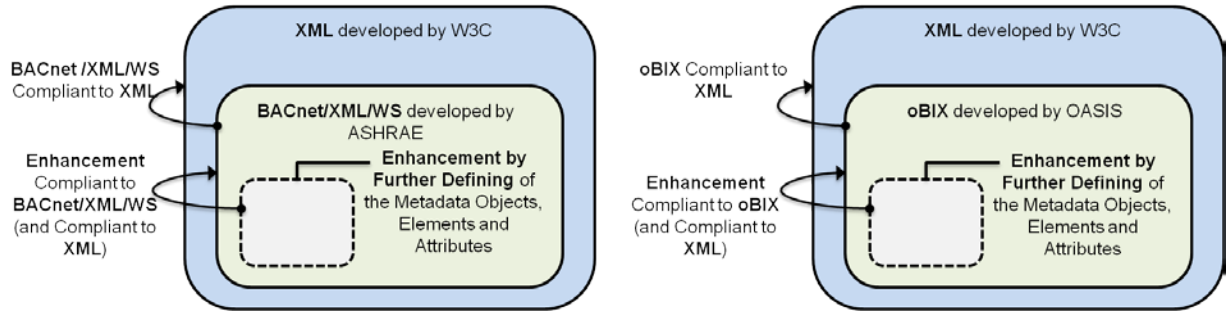

Figure 1-1 Enhancement to a communication standard

We conducted a preliminary review of several standards at various stages of development:

- BACnet/WS (Building Automation Controls Networking Protocol/Web Services)
- BACnet/XML (Building Automation Controls Networking Protocol/Extensible Markup Language)
- oBIX (Open Building Information Exchange)
- OPC UA (Object Linking and Embedding for Process Control – Unified Architecture)
- COBie (Construction-Operations Building Information Exchange)
- NBIMS (National Building Information Modeling Standard)
- gbXML (Green Building Extensible Markup Language).

Based on CBEA member experience and feedback, we pursued BACnet/XML/WS and oBIX first; we may review others later. NREL led the project team, Setpoint Systems performed the analysis on BACnet/XML/WS, and Sensus M.I. reviewed and analyzed oBIX. We demonstrated enhancements by incorporating example building information (see Appendix A) and typical retail building control and monitoring points (see Appendix B). The BACnet and oBIX standards are discussed in Section 2; comprehensive examples are shown in Appendix C and Appendix D, respectively.

[1] Organization for the Advancement of Structured Information Standards

2 Example Enhancements to Communication Standards

Appendix C and Appendix D show example enhancements to BACnet and oBIX, respectively, and adhere to the most recent XML schema for both. BACnet and oBIX were easily enhanced to include building information (see Appendix A) and a list of equipment with associated control and monitoring points (see Appendix B). Both define the objects needed for the retail building control and monitoring points and then set corresponding values for an example building.

BACnet is a network protocol that uses object definitions to define building equipment and associated control and monitoring points; oBIX uses a set of contracts, or XML documents, to define the objects. Both can be used for communication between the BAS and EEMS.

2.1 BACnet

The following BACnet example shows how it is used to define objects:

```
<Definitions>
    <Object name="0-Building_Information">
        <ObjectIdentifier name="object_ID" value="128, 512"/>
        <String name="Owner" propertyIdentifier="513" readable="true" writable
        ="true" displayName="Owner"/>
        <Real name="Bldg_No" propertyIdentifier="514" readable="true"
        writable="true" displayName="Building Number"/>
        <String name="City" propertyIdentifier="515" readable="true" writable="true"
        displayName="City"/>
        <String name="State" propertyIdentifier="516" readable="true" writable="true"
        displayName="State"/>
        <String name="Time_Zone" propertyIdentifier="517" readable="true"
        writable="true" displayName="Time Zone"/>
        <String name="Climate_Zone" propertyIdentifier="518" readable="true"
        writable="true" displayName="Climate Zone"/>
        <Real name="Longitude" propertyIdentifier="519" readable="true"
        writable="true" displayName="Longitude"/>
        <Real name="Latitude" propertyIdentifier="520" readable="true" writable="true"
        displayName="Latitude"/>
        <String name="Bldg_Type" propertyIdentifier="521" readable="true"
        writable="true" displayName="Building Type"/>
        <String name="Bldg_Subtype" propertyIdentifier="522" readable="true"
        writable="true" displayName="Building Subtype"/>
        <String name ="Bldg_Name" propertyIdentifier="523" readable="true"
        writable="true" displayName="Building Name"/>
```

```
        <Real name="Bldg_Area" propertyIdentifier="524" readable="true"
        writable="true" displayName="Building Area"/>

        <String name="Special_Feat" propertyIdentifier="525" readable="true"
        writable="true" displayName="Special Features"/>

    </Object>

</Definitions>
```

The object, 0-Building_Information, includes typical metadata. The numbers represent instances and identification numbers that are defined for each new object. ASHRAE developed BACnet and reserved the ObjectIdentifier numbers from 1 to 127 and the propertyIdentifier numbers from 1 to 511. Custom proprietary objects and properties can use numbers outside the specified ranges.

Many of these objects could be defined, along with the necessary elements (object_ID, Owner, Bldg_No, etc.) for a typical building. New objects and elements could be added according to the communication standard (see Appendix C) when new pieces of equipment are being used or additional control and monitoring points are being recorded or analyzed.

Once the objects are defined for each building or piece of equipment, values can be set for each object and element:

```
<Object type="0-Building_Information" name="S0001" displayName="RSF_NREL">

    <String name="Owner" value="National Renewable Energy Laboratory"/>

    <Real name="Bldg_No" value="1"/>

    <String name="City" value="Golden"/>

    <String name="State" value="Colorado"/>

    <String name="Time_Zone" value="Mountain Time"/>

    <String name="Climate_Zone" value="5B"/>

    <Real name="Longitude" value="-105.2205556"/>

    <Real name="Latitude" value="39.7555556"/>

    <String name="Bldg_Type" value="Office"/>

    <String name="Bldg_Subtype" value="Research Support"/>

    <String name="Bldg_Name" value="Building Research Support Facility 1"/>

    <Real name="Bldg_Area" value="350000"/>

    <String name="Special_Feat" value="labyrinth thermal storage; daylighting; precast
    concrete insulated panels; radiant heating and cooling; transpired solar collectors;
    underfloor ventilation; on-site solar energy system"/>

</Object>
```

2.2 oBIX

Objects can be defined in oBIX similarly to BACnet, using sets of contracts:

```
<obj href="/SiteInformation">
        <str name="owner" displayName="Owner" writable="true"/>
        <str name="buildingid" displayName="Building ID" writable="true"/>
        <str name="city" displayName="City" writable="true"/>
        <str name="state" displayName="State" writable="true"/>
        <str name="timezone" displayName="Time Zone" writable="true"/>
        <str name="climatezone" displayName="Climate Zone" writable="true"/>
        <str name="latitude" displayName="Latitude" writable="true"/>
        <str name="longitude" displayName="Longitude" writable="true"/>
        <str name="buildingtype" displayName="Building Type" writable="true"/>
        <str name="buildingsubtype" displayName="Building Subtype" writable="true"/>
        <str name="buildingname" displayName="Building Name" writable="true"/>
        <str name="buildingarea" displayName="Building Area" writable="true"/>
        <str name="buildingfeatures" displayName="Features" writable="true"/>
</obj>
```

The defined contracts for each object have their own href attributes that are linked to the contract location. For this demonstration, an example link (http://obix.demo.nrel.gov/obix/) was used in the oBIX example enhancement (see Appendix D). The contract for the 'SiteInformation' object is defined and linked to the http://obix.demo.nrel.gov/obix/ site with the '/SiteInformation' extension. Any new contracts that are defined can be identified by their URLs. The subobjects in oBIX (owner, buildingid, city, etc.) are defined similarly to BACnet.

The values of the defined object can be set similarly to BACnet:

```
<obj href="/ResearchSupportFacility1" is ="/SiteInformation">
        <str name="owner" val="National Renewable Energy Laboratory"/>
        <str name="buildingid" val="1"/>
        <str name="city" val="Golden"/>
        <str name="state" val="Colorado"/>
        <str name="timezone" val="MST"/>
        <str name="climatezone" val="5B"/>
        <str name="latitude" val="39.7555556"/>
        <str name="longitude" val="-105.2205556"/>
        <str name="buildingtype" val="Office"/>
```

<str name="buildingsubtype" val="ResearchSupport"/>

<str name="buildingname" val="Research Support Facility 1"/>

<str name="buildingarea" val="350000"/>

<str name="buildingfeatures" val="labyrinth thermal storage; daylighting; precast concrete insulated panels; radiant heating and cooling; transpired solar collectors; underfloor ventilation; on-site solar energy system"/>

</obj>

The coding for BACnet and oBIX was taken from the examples in the appendices.

3 Point Mapping Process

For enterprise-level systems to use data from control and monitoring points, point mapping typically must be done manually at the building and enterprise levels, which is tedious and duplicative. Enhancing the communication standards by further defining the metadata objects, elements, and attributes will eliminate this need.

3.1 Current Process

The current point mapping process is depicted in Figure 3-1. The building documents (schematics, drawings, schedules, etc.) are referenced and the data are manually translated into the building-specific standard format point names and metadata. These data are then manually or semiautomatically entered into the BAS or other control systems. Then, at the enterprise level, all the documents and BAS or other control systems at each building in the portfolio are referenced. This tedious, duplicative process is required to map the building-specific standard format point names and metadata to the enterprise standard format of point names and metadata. The point names and metadata that are now in the enterprise standard format can then be manually or semiautomatically entered into the EEMS.

3.2 Near-Term Target

The near-term target for the point mapping process is depicted in Figure 3-2. Two strategies can be implemented:

- Develop, with careful consideration of the desired metadata behind common points, a prototypical point naming system.

  Examples in this report and elsewhere in industry provide a starting point. Appendix B includes a prototypical point naming system developed by Setpoint. It includes a nomenclature system and lists the resulting names for each control and monitoring point. The November 2010 edition of the *ASHRAE Journal* includes a BACnet Today supplement that explains an example point naming prototype developed by Cimetrics Inc. and includes four example cases (Butler and Veelenturf, 2010). Both prototypes similarly attempt to define and include typical attributes in the naming structure. These include building, store number, equipment category, system type, space type, and point type. A related effort is Project Haystack, an open source initiative developed by SkyFoundry (Project Haystack, 2011). It defines a structure, or meta-model, for building information data (site, equipment, point, weather data, etc.). It uses tags (name/value pairs) to define and structure the building information data.

  Increased adoption of such point naming systems would provide a short-term improvement, but has two limitations:

  - The amount of metadata that could be included would be limited.
  - It would be less able to accommodate diversity between multiple organizations.

  This system would thus ultimately need to be replaced by a more robust strategy.

- Enhance communication standards by further defining metadata objects, elements, and attributes.

The current point mapping process references the building documents (schematics, drawings, schedules, etc.) and manually translates the data into an enterprise standard format of point names and metadata instead of a building-specific format. Structuring the data at each building initially into an enterprise standard format eliminates this tedious process. The enterprise standard format then manually or semiautomatically enters the data into the BAS or other control systems at each building; these data can now be communicated across BAS and other control systems at each building directly with the EEMS at the enterprise level.

This target provides an approach that would standardize the point naming and metadata entry process at each building, eliminate the tedious point mapping process, and ultimately provide the means for the enterprise-wide algorithms to be performed autonomously for any building, piece of equipment, or control and monitoring point.

3.3 Long-Term Vision

Figure 3-3 shows the long-term vision for the point mapping process. The capabilities of Building Information Modeling (BIM), COBie, or other processes could be leveraged to more efficiently extract information that would otherwise have to be manually found in schematics, drawings, and schedules. With the building documents initially in this digital format, the data can be automatically translated into an enterprise standard format of point names and metadata, which would eliminate manual translation. Structuring the data initially into an enterprise standard format eliminates the enterprise-level point mapping. The data can then be automatically entered into the BAS or other control systems at each building. Defining the building data initially in the enterprise format enables effective communication between the BAS and other control systems at each building and the EEMS at the enterprise level.

NREL's long-term vision leans heavily on the potential capabilities of BIM, COBie, and other related processes and protocols. All building data would be documented digitally using these standard processes and protocols, and would thus enable a fully automated process of point name and metadata translations and further data entry. NREL does not intend to pursue this goal without further direction from DOE.

The following advancements would also be enabled by enhancements to communication standards:

- Automated detection of available control and monitoring points would become compelling by virtue of being paired with automated point mapping.
- Building owners would be better able to prioritize investments in additional points and end user tools such as BAS/EEMS utilities, AFDD algorithms, and dashboards.
- Configured points within a BAS/EEMS might become automatically detectable, which would inform users about which BAS/EEMS utilities, AFDD algorithms, and dashboards might improve operations.
- Applications could inform the user about which additional control and monitoring points are missing. These would need to be configured or installed on the local building fieldbus to complete implementation of new BAS/EEMS utilities, AFDD algorithms, or dashboards.

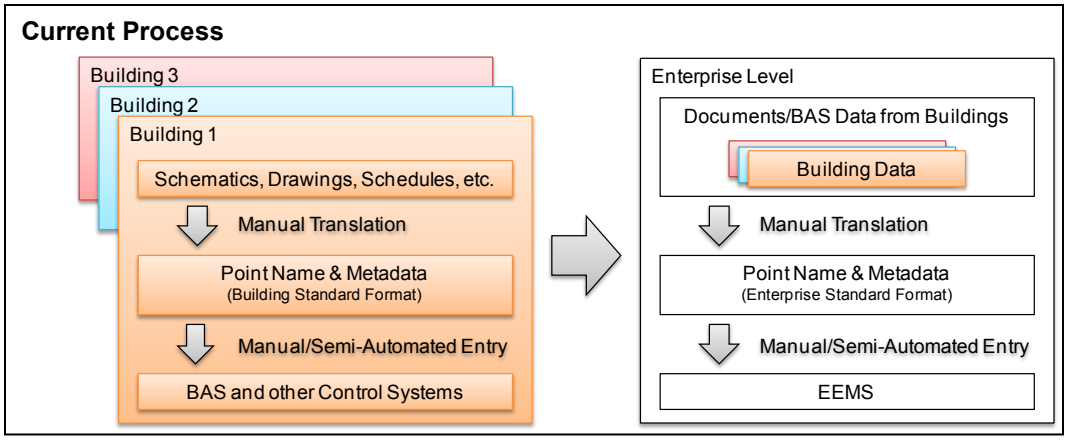

Figure 3-1 Point mapping process—current

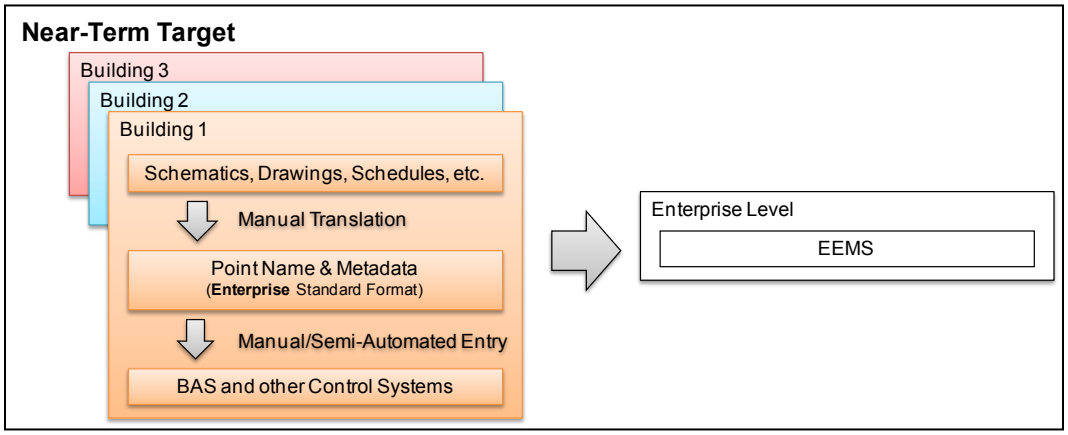

Figure 3-2 Point mapping process—near-term target—requires enhanced communication standards

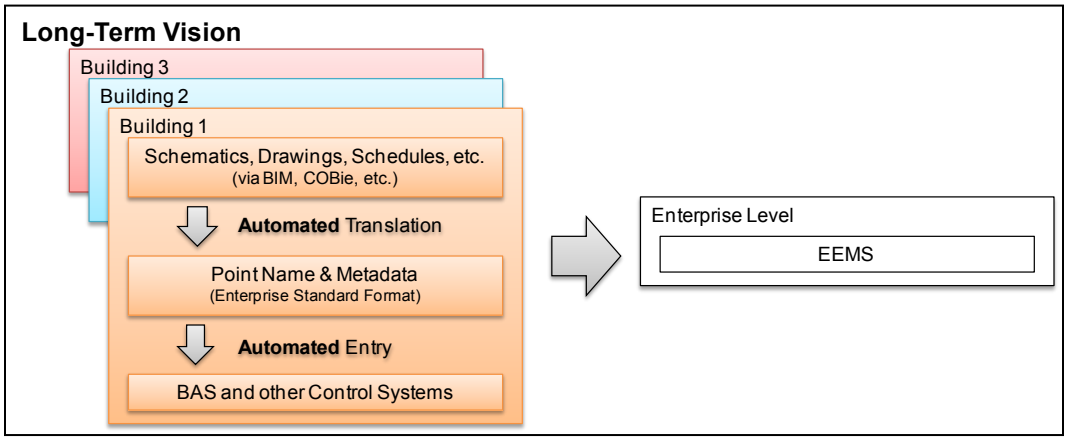

Figure 3-3 Point mapping process—long-term vision—requires enhanced communication standards

4 Verbose and Non-Verbose Data Transfer

The amount of information being transferred from the BAS to the EEMS is a concern when large amounts of metadata are attached to each point. Section 4.1 and Section 4.2 depict example metadata associated with the mixed air temperature of an air handling unit (AHU).

4.1 Project Information

- Building area
- Building name
- Building number
- Building subtype
- Building type
- Climate zone
- Latitude
- Longitude
- Owner
- Special features
- State
- Time zone

4.2 Air Handling Unit Control and Modeling Points

- AHU mode
- Airflow fault
- Airflow switch warning
- Alarm value
- Alarm, faults: clear all
- Alarm, problems: clear all
- Alarm, warnings: clear all
- Application mode
- Building static pressure
- Building static pressure set point
- Clear alarms
- Conductivity warning
- Control temperature
- Control temperature fault
- Control temperature source
- Cooling capacity
- Cooling operating hours
- Cooling status
- Dehumidification status
- Dew point set point
- Dew point temperature
- Dirty filter warning
- Discharge air temperature
- Discharge fan status
- Discharge sensor fault
- Duct high limit fault
- Duct high limit switch
- Duct static pressure
- Duct static pressure set point
- Economizer capacity
- Economizer status
- Economizer valve position (waterside)
- Effective cooling enable set point
- Effective discharge air temperature set point
- Effective minimum outdoor damper point of sale (POS) set point
- Emergency off fault
- Emergency off switch
- Energy recovery supply temperature
- Entering fan temperature/leaving coil temperature problem
- Entering fan/leaving coil temperature
- Entering water temperature
- Entering water temperature problem
- Exhaust fan status
- Fan operation output
- Fault alarm
- Free cooling available
- Freeze fault
- Freeze problem
- Freeze switch (problem)
- Heating capacity
- Heating status
- High discharge temperature fault
- High pressure Circuit 1 problem
- High pressure Circuit 2 problem
- High pressure Circuit 3 problem

- High pressure Circuit 4 problem
- High pressure Circuit 5 problem
- High pressure Circuit 6 problem
- High return temperature fault
- Leaving water temperature
- Local outside air temperature
- Local space temperature
- Low discharge temperature fault
- Low pressure Circuit 1 problem
- Low pressure Circuit 2 problem
- Low pressure Circuit 3 problem
- Low pressure Circuit 4 problem
- Low pressure Circuit 5 problem
- Low pressure Circuit 6 problem
- Maximum discharge air cooling set point
- Minimum discharge air cooling set point
- Mixed air temperature
- Mixed air temperature problem
- Network discharge air cooling set point
- Occupancy
- Occupancy mode
- Occupancy source
- Occupied cooling set point
- Outdoor air damper position (airside)
- Outdoor air temperature
- Outdoor air temperature input
- Outdoor temperature problem
- Problem alarm
- Reheat capacity
- Relative humidity
- Relative humidity control type
- Relative humidity set point
- Remote return/exhaust fan capacity control flag
- Remote supply fan capacity control flag
- Return air temperature
- Return fan status
- Return temperature problem
- Return/exhaust fan capacity
- Space temperature
- Space temperature input
- Space temperature problem
- Sump pump fail problem
- Supply fan capacity
- Supply fan capacity input
- Unit status
- Unoccupied cooling set point
- Variable air volume (VAV) box output
- Warning alarm

Verbose and non-verbose methods are possible for transferring data between the BAS and EEMS. A verbose method of pulling the mixed air temperature from the BAS to the EEMS might include pulling the AHU mixed air temperature and all the metadata (all project information and all AHU control and monitoring points). Pulling large amounts of information when only the mixed air temperature is needed could lead to unnecessary and substantial network throughput, especially for a large portfolio. Conversely, a non-verbose pull might include only the critical metadata, which might consist of only the measured mixed air temperature value and a time stamp showing when that value was recorded. As the investigation into enhancing communication standards continues and the process of pulling information from the BAS to the EEMS is further developed, the amount of information being transferred needs to be considered to accommodate the limited network bandwidth.

5 Conclusions

The project successfully established an understanding of the current state of a specific capability of communications standards in the industry. It also identified key barriers to a long-term vision of more efficient practices, as well as next steps for researchers and commercial building owners.

This project took example building information and showed how communication standards could be enhanced by further defining of the metadata objects, elements, and attributes for control and monitoring points. (See Appendices C and D for example enhancements.) These could be further developed into standardized, publically accessible model examples. This workflow would require a stakeholder in the EEMS community— who might be the developer of an associated communication standard (BACnet, oBIX, etc.)— to manage requests and updates.

Enhanced communication standards could eliminate the duplicative, tedious, error-prone point mapping process at the enterprise level; enable algorithms to efficiently transform raw data into actionable information and insights; and improve communication between devices and users in portfolios with numerous buildings and diverse building equipment from multiple manufacturers.

To continue this study, we must further define the important building information, and then continue to examine how each communication standard can be enhanced within its own framework. The typical retail building control and monitoring points in Section 4 will need to be investigated further to ensure completeness. Once stakeholders agree on building information and building control and monitoring points for typical equipment, we can further defining the metadata objects, elements, and attributes for control and monitoring points to enhance the communication standards. End users, suppliers, and technical committees of standards organizations will need to participate in finalizing the enhancements.

We identified the following steps for future work.

Next Steps

NREL might conduct these follow-up activities to save energy by improving the scalability of algorithms for AFDD and linking building operational data to CMMS:

1. Support CBEA members, equipment manufacturers and suppliers, and technical committees of standards organizations to develop and implement a standard point naming system as an immediate interim solution. (A preliminary list of typical control and monitoring points is included in Appendix B.)
2. Initiate Cooperative Research and Development Agreements with interested industry partners to enhance communication standards by further defining the metadata objects, elements, and attributes for typical control and monitoring points.
3. Write a specification for requests for proposals that covers new purchases or upgrades of software, equipment, and services to include defined typical control and monitoring points.
4. Work with technical committees of standards organizations to illustrate the industry need and benefit of enhancing communication standards by further defining the metadata objects, elements, and attributes for typical control and monitoring points.

For commercial building owners, next steps include:

1. Adopt an organization-wide standard point naming system as an immediate interim solution. A combination of resources could facilitate this, including:
    a. Point names listed in this document
    b. Suggestions in other publications, such as the "BACnet Today" article in the November 2010 edition of the *ASHRAE Journal* (Butler and Veelenturf, 2010).
    c. Open source initiatives such as Project Haystack (Project Haystack, 2011).
2. Adopt an organization-wide specification for requests for proposals that covers new purchases or upgrades of software, equipment, and services to include defined typical control and monitoring points.

6 References

ANSI/ASHRAE Standard 135-2008 (ANSI Approved). (2009). Atlanta, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers: ASHRAE Standards Committee.

ANSI/ASHRAE Addendum t (ANSI Approved). (2010). Atlanta, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers: ASHRAE Standards Committee.

Butler, J.F.; Veelenturf, R. (2010). "Point Naming Standards." *ASHRAE Journal* B16-B20.

Project Haystack (no date). Retrieved April 20, 2011 from http://project-haystack.org/.

Appendix A Example Building Information

A.1 Project Information

- Company: National Renewable Energy Laboratory
- Building Number: 1
- City: Golden
- State: Colorado
- Time Zone: Mountain Time
- Climate Zone: 5B
- Longitude: -105.2205556
- Latitude: 39.7555556
- Building Type: Office
- Building Subtype: Research Support
- Building Name: Research Support Facility I
- Special Features: labyrinth thermal storage; daylighting; precast concrete insulated panels; radiant heating and cooling; transpired solar collectors; underfloor ventilation; on-site solar energy system
- Building Area: 350,000 ft^2

A.2 Example Control and Monitoring Point Information

Mixed Air Temperature for AHU number 2 for the Research Support Facility I
Measurement Information:

- Tagname: S0001_AHU_2_MIX-AIR-TEMP_AI
- Measurement Location: directly downstream of AHU final filter after mixing box
- Zone(s) Served: 1

Appendix B Example Point Naming Prototype

The following tables are included in this appendix:

- Abbreviations
- Control and Monitoring Points and Point Names

The following abbreviations are used in the suggested control and monitoring point names:

Table B-1 Abbreviations

Abbreviation	Definition	Abbreviation	Definition
AC	Alternating current	LL	Line-to-line
AF	Airflow	LN	Line-to-neutral
AHU	Air handling unit	LTG	Lighting
AMB	Ambient	LVG	Leaving
APP	Apparent	LVL	Level
APPL	Application	MAU	Make-up air unit
AVAIL	Available	MAX	Maximum
AVG	Average	MIN	Minimum
BATT	Battery	MISC	Miscellaneous
BLDG	Building	MIX	Mixed
BRKGLS	Breakglass	MOT	Motorized/motor
BYP	Bypass	NET	Network
CAL	Calendar	NITE	Night
CALC	Calculated	NUM	Number
CAP	Capacity	OA	Outside air
CHLR	Chiller	OCC	Occupancy/occupied
CHW	Chilled water	OPE	Operation
CKT	Circuit	OUT	Output
CLG	Cooling	OVR	Override
CMD	Command	PCT	Percent
CO	Carbon monoxide	PF	Power factor
CO2	Carbon dioxide	PH	Phase
COMP	Compressor	PHOTO	Photocell
COND	Condenser	POS	Position
CONDUCT	Conductivity	PREACT	Preaction
CONS	Consumption	PRESS	Pressure
CONT	Contactor	PRI	Primary
CONTR	Controller	PROB	Problem
CTRL	Control	PWR	Power
CURR	Current	RA	Return air
CW	Condenser water	REACT	Reactive

Abbreviation	Definition	Abbreviation	Definition
DEHUM	Dehumidification	REC	Recovery
DEM	Demand	REFRIG	Refrigerant/refrigeration
DET	Detector	REG	Regulating
DEWPT	Dew point	REL	Relative
DHW	Domestic hot water	REM	Remote
DIFF	Differential/difference	RET	Return
DISCH	Discharge	RF	Return fan
DAYLT	Daylight	RH	Relative humidity
DAYLTG	Daylighting	RHT	Reheat
DMPR	Damper	RLA	Rated load amps
DMPRS	Dampers	RPM	Revolutions per minute
EA	Exhaust air	RST	Reset
ECON	Economizer	RTU	Rooftop unit
EF	Exhaust fan	SA	Supply air
EFF	Effective	SAT	Saturated
ELEC	Electric/electrical	SCH	Schedule
EMER	Emergency	SEC	Secondary
ENA	Enable	SEL	Select
ENT	Entering	SENS	Sensor
EVAP	Evaporator	SF	Supply fan
EXH	Exhaust	SMK	Smoke
FAIL	Failure	SOL	Solar
FCTR	Factor	SPD	Speed
FLR	Floor	SS	Start/stop
FLTR	Filter	STBK	Setback
FREQ	Frequency	STG	Stage
FRZ	Freeze	STGS	Stages
GEN	Generator	STPT	Set point
HEATREC	Heat recovery	STS	Status
HI	High	SUCT	Suction
HRS	Hours	SUP	Supply
HTG	Heating	SUPPR	Suppressant
HUM	Humidity / humidifier	TEMP	Temperature
HW	Hot water	TERM	Termination
IAQ	Indoor air quality	TGT	Target
IN	Input	UNOCC	Unoccupied
INTRU	Intrusion	VAV	Variable air volume
KVA	Kilovolt-amp	VFD	Variable frequency drive

Abbreviation	Definition	Abbreviation	Definition
KVAR	Kilovolt-amp reactive	VLV	Valve
KW	Kilowatt	VOLT	Voltage
KWH	Kilowatt-hour	WARN	Warning
LIM	Limit	WTR	Water
LIQ	Liquid		

B.1 Example Point Naming Convention

Store Number_System Type_System Number_Point Name_Object Type

Point naming convention applied to the control and monitoring points:

Table B-2 Control and Monitoring Points and Point Names

Control and Monitoring Point	Suggested Point Name
Chiller	
Active set point	Sxxxx_CHLR_y_ACTIVE-STPT_AV
Actual capacity	Sxxxx_CHLR_y_ACTUAL-CAP_AV
Capacity limit	Sxxxx_CHLR_y_CAP-LIM_AV
Capacity limit output	Sxxxx_CHLR_y_CAP-LIM_AO
Capacity limit set point	Sxxxx_CHLR_y_CAP-LIM-STPT_AV
Chiller enable	Sxxxx_CHLR_y_ENA_BI
Chiller limited	Sxxxx_CHLR_y_LIMITED_BV
Chiller local/remote	Sxxxx_CHLR_y_LOCAL-REMOTE_BV
Chiller mode	Sxxxx_CHLR_y_MODE_MV
Chiller mode output	Sxxxx_CHLR_y_MODE_OUT_MV
Chiller mode set point	Sxxxx_CHLR_y_MODE_STPT_MV
Chiller on off	Sxxxx_CHLR_y_ON-OFF_BV
Chiller status	Sxxxx_CHLR_y_STS_MV
Compressor current	Sxxxx_CHLR_y_COMP-CURR_AI
Compressor discharge temperature	Sxxxx_CHLR_y_DISCH-TEMP_AI
Compressor percent RLA	Sxxxx_CHLR_y_PCT-RLA_AV
Compressor power	Sxxxx_CHLR_y_COMP_PWR_AV
Compressor run hours	Sxxxx_CHLR_y_RUN-HRS_AV
Compressor select	Sxxxx_CHLR_y_COMP_SEL_AV
Compressor starts	Sxxxx_CHLR_y_COMP_STARTS_AV
Compressor suction line temperature	Sxxxx_CHLR_y_SUCT-TEMP_AI
Compressor voltage	Sxxxx_CHLR_y_COMP-VOLT_AI
Condenser entering water temperature	Sxxxx_CHLR_y_COND-ENT-WTR-TEMP_AI
Condenser flow switch status	Sxxxx_CHLR_y_COND-FLOW-SW-STS_BI
Condenser leaving water temperature	Sxxxx_CHLR_y_COND-LVG-WTR-TEMP_AI
Condenser pump run hours	Sxxxx_CHLR_y_COND-PUMP-RUN-HRS_AV
Condenser refrigerant pressure	Sxxxx_CHLR_y_COND-REFRIG-PRESS_AI

Control and Monitoring Point	Suggested Point Name
Chiller (continued)	
Condenser saturated refrigerant temperature	Sxxxx_CHLR_y_COND-SAT-REFRIG-TEMP_AI
Condenser water flow rate	Sxxxx_CHLR_y_COND-WTR-FLOW-RATE_AI
Condenser water pump status	Sxxxx_CHLR_y_COND-WTR-PUMP-STS_BI
Cool set point	Sxxxx_CHLR_y_COOL-STPT_AV
Evaporator entering water temperature	Sxxxx_CHLR_y_EVAP-ENT-WTR-TEMP_AI
Evaporator flow switch status	Sxxxx_CHLR_y_EVAP-FLOW-SW-STS_BI
Evaporator leaving water temperature for unit	Sxxxx_CHLR_y_EVAP-LVG-WTR-TEMP-UNIT_AI
Evaporator leaving water temperature for compressor	Sxxxx_CHLR_y_EVAP-LVG-WTR-TEMP-COMP_AI
Evaporator pump run hours	Sxxxx_CHLR_y_EVAP-PUMP-RUN-HRS_AV
Evaporator refrigerant pressure	Sxxxx_CHLR_y_EVAP-REFRIG-PRESS_AI
Evaporator saturated refrigerant temperature	Sxxxx_CHLR_y_EVAP-SAT-REFRIG-TEMP_AI
Evaporator water flow rate	Sxxxx_CHLR_y_EVAP-WTR-FLOW-RATE_AI
Evaporator water pump status	Sxxxx_CHLR_y_EVAP-WTR-PUMP-STS_BI
Heat recovery entering water temperature	Sxxxx_CHLR_y_HEATREC-ENT-WTR-TEMP_AI
Heat recovery leaving water temperature	Sxxxx_CHLR_y_HEATREC-LVG-WTR-TEMP_AI
Heat set point	Sxxxx_CHLR_y_HEAT-STPT_AV
Ice set point	Sxxxx_CHLR_y_ICE-STPT_AV
Liquid line refrigerant pressure	Sxxxx_CHLR_y_LIQ-REFRIG-PRESS_AI
Liquid line refrigerant temperature	Sxxxx_CHLR_y_LIQ-REFRIG-TEMP_AI
Oil feed pressure	Sxxxx_CHLR_y_OIL-FEED-PRESS_AI
Oil feed temperature	Sxxxx_CHLR_y_OIL-FEED-TEMP_AI
Oil sump pressure	Sxxxx_CHLR_y_OIL-SUMP-PRESS_AI
Oil sump temperature	Sxxxx_CHLR_y_OIL-SUMP-TEMP_AI
Outdoor air temperature	Sxxxx_CHLR_y_OUTDOOR-AIR-TEMP_AI
Pump select	Sxxxx_CHLR_y_PUMP-SEL_AV
Run enabled	Sxxxx_CHLR_y_RUN-ENA_BI
Fluid Cooler	
Glycol supply temperature	Sxxxx_FC_y_GLYCOL-SUP-TEMP_AI
Glycol return temperature	Sxxxx_FC_y_GLYCOL-RET-TEMP_AI
Dampers open/closed	Sxxxx_FC_y_DMPRS-OPEN-CLOSED_BI
VFD frequency/speed	Sxxxx_FC_y_VFD-FREQ/SPD_AV
VFD current	Sxxxx_FC_y_VFD-CURR_AI
VFD status	Sxxxx_FC_y_VFD-STS_BV
VFD fault	Sxxxx_FC_y_VFD-FAULT_BV
VFD on bypass	Sxxxx_FC_y_VFD-ON-BYPASS_BI
Fan low speed	Sxxxx_FC_y_FAN-LOW-SPD_BO
Fan high speed	Sxxxx_FC_y_FAN-HI-SPD_BO
Spray pump status/flow	Sxxxx_FC_y_SPRAY-PMP-STS/FLOW_BI
Basin water temperature	Sxxxx_FC_y_BASIN-WTR-TEMP_AI

Control and Monitoring Point	Suggested Point Name
Fluid Cooler (continued)	
Basin low level switch	Sxxxx_FC_y_BASIN-LOW-LVL-SW_BI
Ambient temperature	Sxxxx_FC_y_AMB-TEMP_AI
Boiler	
Ambient humidity	Sxxxx_FC_y_AMB-HUMID_AI
Burner differential	Sxxxx_BLR_y_BURNER-DIFF_AV
Boost offset	Sxxxx_BLR_y_BOOST-OFFSET_AV
Boost mode	Sxxxx_BLR_y_BOOST-MODE_MV
Bypass time	Sxxxx_BLR_y_BYP-TIME_AV
Burner (typical)	Sxxxx_BLR_y_BURNER_z_BO
Bypass mode	Sxxxx_BLR_y_BYP-MODE_MV
Outdoor day cutoff	Sxxxx_BLR_y_OUTDOOR-DAY-CUTOFF_AV
DHW call mode	Sxxxx_BLR_y_DHW-CALL-MODE_BV
Sensor fault mode	Sxxxx_BLR_y_SENS-FAULT-MODE_BV
Fast cool down	Sxxxx_BLR_y_FAST-COOL-DOWN_BV
Minimum water temperature	Sxxxx_BLR_y_MIN-WTR-TEMP_AV
Outdoor temperature sensor	Sxxxx_BLR_y_OUTDOOR-TEMP-SENS_AI
Outdoor sensor trim	Sxxxx_BLR_y_OUTDOOR-SENS-TRIM_AV
Offset temperature	Sxxxx_BLR_y_OFFSET-TEMP_AV
Output mode	Sxxxx_BLR_y_OUT-MODE_BV
Pump run-on	Sxxxx_BLR_y_PMP-RUNTIME_AV
Pump	Sxxxx_BLR_y_PMP-SS_BO
Reset ratio	Sxxxx_BLR_y_RESET-RATIO_AV
Season	Sxxxx_BLR_y_SEASON_BV
Night setback temperature	Sxxxx_BLR_y_NITE-STBK-TEMP_AV
Day night shift	Sxxxx_BLR_y_DAY-NITE-SHIFT_AV
HW supply temperature sensor	Sxxxx_BLR_y_HWS-TEMP-SENS_AI
HW supply temperature sensor trim	Sxxxx_BLR_y_HWS-TEMP-SENS-TRIM_AV
Calculated target	Sxxxx_BLR_y_CALC-TGT_AV
Motorized valve	Sxxxx_BLR_y_MOT-VLV_AO
Max target temperature	Sxxxx_BLR_y_MAX-TGT-TEMP_AV
HW return temperature sensor	Sxxxx_BLR_y_HWR-TEMP-SENS_AI
Boiler stages	Sxxxx_BLR_y_STGS_AV
AHU	
Unit status	Sxxxx_AHU_y_STS_MV
AHU mode	Sxxxx_AHU_y_MODE_MV
Cooling status	Sxxxx_AHU_y_CLG-STS_MV
Heating status	Sxxxx_AHU_y_HTG-STS_MV
Economizer status	Sxxxx_AHU_y_ECON-STS_MV
Cooling capacity	Sxxxx_AHU_y_CLG-CAP_AV
Heating capacity	Sxxxx_AHU_y_HTG-CAP_AV

Control and Monitoring Point	Suggested Point Name
AHU (continued)	
Supply fan capacity	Sxxxx_AHU_y_SUP-FAN-CAP_AV
Return/exhaust fan capacity	Sxxxx_AHU_y_RET/EXH-FAN-CAP_AV
Economizer capacity	Sxxxx_AHU_y_ECON-CAP_AV
Economizer valve position (waterside)	Sxxxx_AHU_y_ECON-VLV-POS_AO
Outdoor air damper position (airside)	Sxxxx_AHU_y_OA-DMPR-POS_AO
Application mode	Sxxxx_AHU_y_APP-MODE_MV
Occupancy	Sxxxx_AHU_y_OCC_BV
Occupancy mode	Sxxxx_AHU_y_OCC-MODE_MV
Occupancy source	Sxxxx_AHU_y_OCC-SOURCE_MV
Control temperature	Sxxxx_AHU_y_CTRL-TEMP_AI
Discharge air temperature	Sxxxx_AHU_y_DISCH-AIR-TEMP_AI
Return air temperature	Sxxxx_AHU_y_RET-AIR-TEMP_AI
Space temperature	Sxxxx_AHU_y_SPACE-TEMP_AI
Outdoor air temperature	Sxxxx_AHU_y_OUTSIDE-TEMP_AI
Entering fan/leaving coil temperature	Sxxxx_AHU_y_ENT-FAN/LVG-COIL-TEMP_AI
Leaving water temperature	Sxxxx_AHU_y_LVG-WTR-TEMP_AI
Entering water temperature	Sxxxx_AHU_y_ENT-WTR-TEMP_AI
Mixed air temperature	Sxxxx_AHU_y_MIX-AIR-TEMP_AI
Exhaust fan status	Sxxxx_AHU_y_EXH-FAN-STS_BI
VAV box output	Sxxxx_AHU_y_VAV-BOX-OUT_BO
Discharge fan status	Sxxxx_AHU_y_DISCH-FAN-STS_BI
Return fan status	Sxxxx_AHU_y_RET-FAN-STS_BI
Fan operation output	Sxxxx_AHU_y_FAN-OPE-OUT_BO
Duct static pressure	Sxxxx_AHU_y_DUCT-STATIC-PRESS_AI
Duct static pressure set point	Sxxxx_AHU_y_DUCT-STATIC-STPT_AV
Remote supply fan capacity control flag	Sxxxx_AHU_y_REM-SF-CAP-CTRL-FLAG_BV
Supply fan capacity input	Sxxxx_AHU_y_SF-CAP-IN_AV
Building static pressure	Sxxxx_AHU_y_BLDG-STATIC-PRESS_AI
Building static pressure set point	Sxxxx_AHU_y_BLDG-STATIC-STPT_AV
Remote return/exhaust fan capacity control flag	Sxxxx_AHU_y_REM-RF/EF-CAP-CTRL-FLAG_BV
Occupied cooling set point	Sxxxx_AHU_y_OCC-CLG-STPT_AV
Unoccupied cooling set point	Sxxxx_AHU_y_UNOCC-CLG-STPT_AV
Network discharge air cooling set point	Sxxxx_AHU_y_NET-DISCH-CLG-STPT_AV
Minimum discharge air cooling set point	Sxxxx_AHU_y_MIN-DISCH-CLG-STPT_AV
Effective cooling enable set point	Sxxxx_AHU_y_EFF-CLG-ENA-STPT_AV
Cooling operating hours	Sxxxx_AHU_y_CLG-OPE-HOURS_AV
Control temperature source	Sxxxx_AHU_y_CTRL-TEMP-SOURCE_MV
Maximum discharge air cooling set point	Sxxxx_AHU_y_MAX-DISCH-CLG-STPT_AV
Energy recovery supply temperature	Sxxxx_AHU_y_ENERGY-REC-SUPP-TEMP_AI
Effective minimum outdoor damper POS set point	Sxxxx_AHU_y_EFF-MIN-OA-DMPR-POS-STPT_AV

Control and Monitoring Point	Suggested Point Name
AHU (continued)	
Free cooling available	Sxxxx_AHU_y_FREE-CLG-AVAIL_BV
Relative humidity	Sxxxx_AHU_y_REL-HUM_AI
Dew point temperature	Sxxxx_AHU_y_DEWPT-TEMP_AI
Relative humidity set point	Sxxxx_AHU_y_REL-HUM-STPT_AV
Dew point set point	Sxxxx_AHU_y_DEWPT-TEMP-STPT_AV
Reheat capacity	Sxxxx_AHU_y_RHT-CAP_AV
Dehumidification status	Sxxxx_AHU_y_DEHUMID-STATUS_MV
Relative humidity control type	Sxxxx_AHU_y_REL-HUM-CTRL-TYPE_MV
Outdoor air temperature input	Sxxxx_AHU_y_OUTDOOR-TEMP-IN_AV
Space temperature input	Sxxxx_AHU_y_SPACE-TEMP-IN_AV
Effective discharge air temperature set point	Sxxxx_AHU_y_EFF-DISCH-TEMP-STPT_AV
Clear alarms	Sxxxx_AHU_y_CLEAR-ALARMS_BV
Alarm, faults: clear all	Sxxxx_AHU_y_ALARM-FAULTS-CLR-ALL_BV
Alarm, problems: clear all	Sxxxx_AHU_y_ALARM-PROB-CLR-ALL_BV
Alarm, warnings: clear all	Sxxxx_AHU_y_ALARM-WARN-CLR-ALL_BV
Local space temperature	Sxxxx_AHU_y_LOCAL-SPACE-TEMP_AI
Local outside air temperature	Sxxxx_AHU_y_LOCAL-OA-TEMP_AI
Warning alarm	Sxxxx_AHU_y_WARN-ALARM_AV
Problem alarm	Sxxxx_AHU_y_PROB-ALARM_AV
Fault alarm	Sxxxx_AHU_y_FAULT-ALARM_AV
Alarm value	Sxxxx_AHU_y_ALARM-VALUE_AV
Airflow fault	Sxxxx_AHU_y_AF-FAULT_BV
Airflow switch warning	Sxxxx_AHU_y_AF-SW-WARN_BV
Conductivity warning	Sxxxx_AHU_y_CONDUCT-WARN_BV
Control temp fault	Sxxxx_AHU_y_CTRL-TEMP-FAULT_BV
Dirty filter warning	Sxxxx_AHU_y_DIRTY-FLTR-WARN_BV
Discharge sensor fault	Sxxxx_AHU_y_DISCH-SENS-FAULT_BV
Duct high limit fault	Sxxxx_AHU_y_DUCT-HI-LIM-FAULT_BV
Emergency off fault	Sxxxx_AHU_y_EMER-OFF-FAULT_BV
Entering fan temperature /leaving coil temperature problem	Sxxxx_AHU_y_ENT-FAN/LVG-COIL-TEMP_PROB_BV
Entering water temperature problem	Sxxxx_AHU_y_ENT-WTR-TEMP-PROB_BV
Freeze fault	Sxxxx_AHU_y_FRZ-FAULT_BV
Freeze problem	Sxxxx_AHU_y_FRZ-PROB_BV
High discharge temperature fault	Sxxxx_AHU_y_HI-DISCH-TEMP-FAULT_BV
High pressure Circuit 1 problem	Sxxxx_AHU_y_HI-PRESS-CKT-1-PROB_BV
High pressure Circuit 2 problem	Sxxxx_AHU_y_HI-PRESS-CKT-2-PROB_BV
High pressure Circuit 3 problem	Sxxxx_AHU_y_HI-PRESS-CKT-3-PROB_BV
High pressure Circuit 4 problem	Sxxxx_AHU_y_HI-PRESS-CKT-4-PROB_BV
High pressure Circuit 5 problem	Sxxxx_AHU_y_HI-PRESS-CKT-5-PROB_BV

Control and Monitoring Point	Suggested Point Name
AHU (continued)	
High pressure Circuit 6 problem	Sxxxx_AHU_y_HI-PRESS-CKT-6-PROB_BV
High return temperature fault	Sxxxx_AHU_y_HI-RET-TEMP-FAULT_BV
Low discharge temperature fault	Sxxxx_AHU_y_LO-DISCH-TEMP-FAULT_BV
Low pressure Circuit 1 problem	Sxxxx_AHU_y_LO-PRESS-CKT-1-PROB_BV
Low pressure Circuit 2 problem	Sxxxx_AHU_y_LO-PRESS-CKT-2-PROB_BV
Low pressure Circuit 3 problem	Sxxxx_AHU_y_LO-PRESS-CKT-3-PROB_BV
Low pressure Circuit 4 problem	Sxxxx_AHU_y_LO-PRESS-CKT-4-PROB_BV
Low pressure Circuit 5 problem	Sxxxx_AHU_y_LO-PRESS-CKT-5-PROB_BV
Low pressure Circuit 6 problem	Sxxxx_AHU_y_LO-PRESS-CKT-6-PROB_BV
Mixed air temperature problem	Sxxxx_AHU_y_MIX-AIR-TEMP-PROB_BV
Outdoor temperature problem	Sxxxx_AHU_y_OUT-TEMP-PROB_BV
Return temperature problem	Sxxxx_AHU_y_RET-AIR-TEMP-PROB_BV
Space temperature problem	Sxxxx_AHU_y_SPACE-TEMP-PROB_BV
Sump pump fail problem	Sxxxx_AHU_y_SUMP-PUMP-FAIL-PROB_BV
Freeze switch (problem)	Sxxxx_AHU_y_FREEZE-SWITCH-PROB_BV
Duct high limit switch	Sxxxx_AHU_y_DUCT-HI-LIM-SW_BI
Emergency off switch	Sxxxx_AHU_y_EMER-OFF-SW_BI
RTU	
Unit status	Sxxxx_RTU_y_STS_MV
RTU mode	Sxxxx_RTU_y_MODE_MV
Cooling status	Sxxxx_RTU_y_CLG-STS_MV
Heating status	Sxxxx_RTU_y_HTG-STS_MV
Economizer status	Sxxxx_RTU_y_ECON-STS_MV
Cooling capacity	Sxxxx_RTU_y_COOL-CAP_AV
Heating capacity	Sxxxx_RTU_y_HEAT-CAP_AV
Supply fan capacity	Sxxxx_RTU_y_SUP-FAN-CAP_AV
Return/exhaust fan capacity	Sxxxx_RTU_y_RET/EXH-FAN-CAP_AV
Economizer capacity	Sxxxx_RTU_y_ECON-CAP_AV
Occupancy	Sxxxx_RTU_y_OCC_BV
Outdoor air damper position	Sxxxx_RTU_y_OA-DMPR-POS_AO
Control temperature	Sxxxx_RTU_y_CTRL-TEMP_AI
Discharge air temperature	Sxxxx_RTU_y_DISCH-AIR-TEMP_AI
Return air temperature	Sxxxx_RTU_y_RET-AIR-TEMP_AI
Space temperature	Sxxxx_RTU_y_SPACE-TEMP_AV
Outdoor air temperature	Sxxxx_RTU_y_OUTDOOR-TEMP_AV
Entering fan/leaving coil temperature	Sxxxx_RTU_y_ENT-FAN/LVG-COIL-TEMP_AI
Entering water temperature	Sxxxx_RTU_y_ENT-WTR-TEMP_AI
Mixed air temperature	Sxxxx_RTU_y_MIX-AIR-TEMP_AI
Discharge fan status	Sxxxx_RTU_y_DISCH-FAN-STS_BI
Return/exhaust fan status	Sxxxx_RTU_y_RET/EXH-FAN-STS_BI

Control and Monitoring Point	Suggested Point Name
RTU (continued)	
VAV box output	Sxxxx_RTU_y_VAV-BOX-OUT_BO
Duct static pressure	Sxxxx_RTU_y_DUCT-STATIC-PRESS_AI
Building static pressure	Sxxxx_RTU_y_BLDG-STATIC-PRESS_AI
Conductivity	Sxxxx_RTU_y_CONDUCT_AI
SpaceCO2	Sxxxx_RTU_y_SPACE-CO2_AI
Outdoor airflow	Sxxxx_RTU_y_OUT-AF_AI
Relative humidity	Sxxxx_RTU_y_REL-HUM_AI
Dew point temperature	Sxxxx_RTU_y_DEWPT-TEMP_AI
Reheat capacity	Sxxxx_RTU_y_RHT-CAP_AV
Effective enable set point	Sxxxx_RTU_y_EFF_ENA_STPT_AV
Local space temperature	Sxxxx_RTU_y_LOCAL-SPACE-TEMP_AI
Local outside air temperature	Sxxxx_RTU_y_LOCAL-OA-TEMP_AI
Emergency override	Sxxxx_RTU_y_EMER_OVR_BI
Application mode	Sxxxx_RTU_y_APP-MODE_MV
Occupancy mode	Sxxxx_RTU_y_OCC-MODE_MV
Duct static pressure set point	Sxxxx_RTU_y_DUCT-STATIC-STPT_AV
Remote supply fan capacity control flag	Sxxxx_RTU_y_REM-SF-CAP-CTRL-FLAG_BV
Supply fan capacity input	Sxxxx_RTU_y_SF-CAP-IN_AV
Building static pressure set point	Sxxxx_RTU_y_BLDG-STATIC-STPT_AV
Remote return/exhaust fan capacity control flag	Sxxxx_RTU_y_REM-RF/EF-CAP-CTRL-FLAG_BV
Return/exhaust fan capacity input	Sxxxx_RTU_y_RET/EXH-FAN-CAP-IN_AV
Occupied cooling set point	Sxxxx_RTU_y_OCC-CLG-STPT_AV
Unoccupied cooling set point	Sxxxx_RTU_y_UNOCC-CLG-STPT_AV
Discharge air cooling set point	Sxxxx_RTU_y_DISCH-CLG-STPT_AV
Minimum discharge air cooling set point	Sxxxx_RTU_y_MIN-DISCH-CLG-STPT_AV
Occupied heating set point	Sxxxx_RTU_y_OCC-HTG-STPT_AV
Unoccupied heating set point	Sxxxx_RTU_y_UNOCC-HTG-STPT_AV
Discharge air heating set point	Sxxxx_RTU_y_DISCH-TEMP-STPT_AV
Maximum discharge air heating set point	Sxxxx_RTU_y_MAX-DISCH-HTG-STPT_AV
Relative humidity set point	Sxxxx_RTU_y_REL-HUM-STPT_AV
Dew point set point	Sxxxx_RTU_y_DEWPT-TEMP-STPT_AV
Outdoor air temperature input	Sxxxx_RTU_y_OUTDOOR-TEMP-IN_AV
Space temperature input	Sxxxx_RTU_y_SPACE-TEMP-IN_AV
Occupancy scheduler input	Sxxxx_RTU_y_OCC-SCH-IN_BV
Primary cool enable	Sxxxx_RTU_y_PRI-COOL-ENA_BV
Primary heat enable	Sxxxx_RTU_y_PRI-HEAT-ENA_BV
Economizer enable	Sxxxx_RTU_y_ECON-ENA_BV
Water flow switch Input	Sxxxx_RTU_y_WTR-FLOW-SW-IN_BV
Space IAQ input	Sxxxx_RTU_y_SPACE-IAQ-IN_AV
Relative humidity input	Sxxxx_RTU_y_REL-HUMID-IN_AV

Control and Monitoring Point	Suggested Point Name
RTU (continued)	
Temperature set point input	Sxxxx_RTU_y_TEMP-STPT-IN_AV
Outdoor air damper minimum position input	Sxxxx_RTU_y_OA-DMPR-MIN-POS-IN_AV
Clear alarms	Sxxxx_RTU_y_CLEAR-ALARMS_BV
Dirty filter airflow SW	Sxxxx_RTU_y_DIRTY-FLTR-SW_BI
Conductivity water flow SW	Sxxxx_RTU_y_COND-WTR-FLOW-SW_BI
Water regulating valve	Sxxxx_RTU_y_WTR-REG-VLV_BO
Low pressure – Circuit 1	Sxxxx_RTU_y_LO-PRESS-CKT-1-PROB_BV
Low pressure – Circuit 2	Sxxxx_RTU_y_LO-PRESS-CKT-2-PROB_BV
Low pressure – Circuit 3	Sxxxx_RTU_y_LO-PRESS-CKT-3-PROB_BV
Low pressure – Circuit 4	Sxxxx_RTU_y_LO-PRESS-CKT-4-PROB_BV
Low pressure – Circuit 5	Sxxxx_RTU_y_LO-PRESS-CKT-5-PROB_BV
Low pressure – Circuit 6	Sxxxx_RTU_y_LO-PRESS-CKT-6-PROB_BV
High pressure – Circuit 1	Sxxxx_RTU_y_HI-PRESS-CKT-1-PROB_BV
High pressure – Circuit 2	Sxxxx_RTU_y_HI-PRESS-CKT-2-PROB_BV
High pressure – Circuit 3	Sxxxx_RTU_y_HI-PRESS-CKT-3-PROB_BV
High pressure – Circuit 4	Sxxxx_RTU_y_HI-PRESS-CKT-4-PROB_BV
High pressure – Circuit 5	Sxxxx_RTU_y_HI-PRESS-CKT-5-PROB_BV
High pressure – Circuit 6	Sxxxx_RTU_y_HI-PRESS-CKT-6-PROB_BV
Sump pump fail	Sxxxx_RTU_y_SUMP-PUMP-FAIL-PROB_BV
EFT_LCT problem	Sxxxx_RTU_y_EFT-LCT-PROB_BV
Return air sensor problem	Sxxxx_RTU_y_RET-AIR-TEMP-PROB_BV
Space sensor problem	Sxxxx_RTU_y_SPACE-TEMP-PROB_BV
OAT sensor problem	Sxxxx_RTU_y_OUTDOOR-TEMP-PROB_BV
EWT problem	Sxxxx_RTU_y_EWT-PROB_BV
Lighting	
Occupancy sensor (typical)	Sxxxx_LTG_y_OCC-SENS_z_BI
Zone override switch (typical)	Sxxxx_LTG_y_ZONE-OVR-SW_z_BI
Floor sweep input (typical)	Sxxxx_LTG_y_FLR-SWEEP-IN_z_BI
Photocell/daylight sensor (typical)	Sxxxx_LTG_y_PHOTO/DLGT-SENS_z_BI
Zone schedule (typical)	Sxxxx_LTG_y_ZONE-SCH_z_BV
Lighting zone contactor (typical)	Sxxxx_LTG_y_LTG-ZONE-CONT_z_name_BO
Utility Metering	
kWh, consumption	Sxxxx_UTIL-ELEC_y_CONS_AV
kW, real power	Sxxxx_UTIL_ELEC_y_REAL-PWR_AV
kVAR, reactive power	Sxxxx_UTIL_ELEC_y_REACT-PWR_AV
kVA, apparent power	Sxxxx_UTIL_ELEC_y_APP-PWR_AV
Power factor	Sxxxx_UTIL_ELEC_y_PWR-FACTOR_AV
Voltage, line to line	Sxxxx_UTIL_ELEC_y_LL-VOLT-AVG_AV
Voltage, line to neutral	Sxxxx_UTIL_ELEC_y_LN-VOLT-AVG_AV
Amps, average current	Sxxxx_UTIL_ELEC_y_AVG-CURR_AV

Control and Monitoring Point	Suggested Point Name
Utility Metering (continued)	
kW, real power ØA	Sxxxx_UTIL_ELEC_y_REAL-PWR-PH-A_AV
kW, real power ØB	Sxxxx_UTIL_ELEC_y_REAL-PWR-PH-B_AV
kW, real power ØC	Sxxxx_UTIL_ELEC_y_REAL-PWR-PH-C_AV
Power factor ØA	Sxxxx_UTIL_ELEC_y_PWR-FCTR-PH-A_AV
Power factor ØB	Sxxxx_UTIL_ELEC_y_POWER-FCTR-PH-B_AV
Power factor ØC	Sxxxx_UTIL_ELEC_y_POWER-FCTR-PH-C_AV
Voltage, ØA to ØB	Sxxxx_UTIL_ELEC_y_PH-AB-VOLT_AI
Voltage, ØB to ØC	Sxxxx_UTIL_ELEC_y_PH-BC-VOLT_AI
Voltage, ØA to ØC	Sxxxx_UTIL_ELEC_y_PH-AC-VOLT_AI
Voltage, ØA to neutral	Sxxxx_UTIL_ELEC_y_PH-A-N-VOLT_AI
Voltage, ØB to neutral	Sxxxx_UTIL_ELEC_y_PH-B-N-VOLT_AI
Voltage, ØC to neutral	Sxxxx_UTIL_ELEC_y_PH-C-N-VOLT_AI
Amps, current ØA	Sxxxx_UTIL_ELEC_y_PH-A-CURRENT_AI
Amps, current ØB	Sxxxx_UTIL_ELEC_y_PH-B-CURRENT_AI
Amps, current ØC	Sxxxx_UTIL_ELEC_y_PH-C-CURRENT_AI
Natural gas consumption	Sxxxx_UTIL_GAS_y_CONS_AI
Water consumption	Sxxxx_UTIL_WTR_y_CONS_AI
General/IAQ	
Outdoor temperature	Sxxxx_GENERAL_OUTDOOR-TEMP_AI
Outdoor humidity	Sxxxx_GENERAL_OUTDOOR-REL-HUM_AI
Space temperature (typical)	Sxxxx_MISC_SPACE-TEMP_y_name_AI
Space humidity (typical)	Sxxxx_MISC_SPACE-HUMID_y_name_AI
Space CO2 (typical)	Sxxxx_MISC_SPACE-CO2_y_name_AI
Space CO (typical)	Sxxxx_MISC_SPACE-CO_y_name_AI
Space IAQ (typical)	Sxxxx_MISC_SPACE-IAQ_y_name_AI
Refrigerated Casework	
Refrigerant/coolant supply temperature	Sxxxx_REFRIG-CASE_y_REFRIG-SUP-TEMP_AI
Refrigerant/coolant return temperature	Sxxxx_REFRIG-CASE_y_REFRIG-RET-TEMP_AI
Case operating temperature (multiple)	Sxxxx_REFRIG-CASE_y_CASE-OPE-TEMP_z_AI
Control valve position	Sxxxx_REFRIG-CASE_y_CTRL-VLV-POS_AO
Defrost status	Sxxxx_REFRIG-CASE_y_DEFROST-STS_BV
Defrost termination	Sxxxx_REFRIG-CASE_y_DEFROST-TERM_BV
Night curtain position	Sxxxx_REFRIG-CASE_y_NITE-CURTAIN-POS_BV
Evaporator fan command	Sxxxx_REFRIG-CASE_y_EVAP-FAN-CMD_BO
Evaporator fan current	Sxxxx_REFRIG-CASE_y_EVAP-FAN-CURR_AI
Lighting current	Sxxxx_REFRIG-CASE_y_LTG-CURR_AI
Refrigeration Rack Controller	
Compressor status (multiple)	Sxxxx_REFRIG-RACK_y_COMP-STS_z_BI
Unloader status (multiple)	Sxxxx_REFRIG-RACK_y_UNLOAD-STS_z_BI
Phase loss (Phase A)	Sxxxx_REFRIG-RACK_y_PH-LOSS-A_BI

Control and Monitoring Point	Suggested Point Name
Refrigeration Rack Controller (continued)	
Phase loss (Phase B)	Sxxxx_REFRIG-RACK_y_PH-LOSS-B_BI
Phase loss (Phase C)	Sxxxx_REFRIG-RACK_y_PH-LOSS-C_BI
Oil fail switch	Sxxxx_REFRIG-RACK_y_OIL-FAIL-SW_BI
Oil pressure (multiple)	Sxxxx_REFRIG-RACK_y_OIL-PRESS_z_AI
Suction pressure(s)	Sxxxx_REFRIG-RACK_y_SUCT-PRESS_z_AI
Discharge pressure	Sxxxx_REFRIG-RACK_y_DISCH-PRESS_AI
Drop leg pressure	Sxxxx_REFRIG-RACK_y_DROP-LEG-PRESS_AI
Suction temperature(s)	Sxxxx_REFRIG-RACK_y_SUCT-TEMP_z_AI
Discharge temperature	Sxxxx_REFRIG-RACK_y_DISCH-TEMP_AI
Ambient temperature at condenser(s)	Sxxxx_REFRIG-RACK_y_AMB-TEMP_z_AI
Receiver float switch	Sxxxx_REFRIG-RACK_y_RCVR-FLOAT-SW_BI
Receiver level	Sxxxx_REFRIG-RACK_y_RCVR-LEVEL_AI
Heat reclaim temperature	Sxxxx_REFRIG-RACK_y_HEAT-RECL-TEMP_AI
Refrigerant leak detection	Sxxxx_REFRIG-RACK_y_REFRIG-LEAK-DET_BI
System alarm	Sxxxx_REFRIG-RACK_y_SYS-ALARM_BV
Load shed	Sxxxx_REFRIG-RACK_y_LOAD-SHED_BV
Fire	
General alarm (typical)	Sxxxx_FIRE_GENERAL-ALARM_BV
General trouble (typical)	Sxxxx_FIRE_GENERAL-TROUBLE_BV
Alarm by zone (typical)	Sxxxx_FIRE_ALARM-ZONE_y_BV
Trouble by zone (typical)	Sxxxx_FIRE_TROUBLE-ZONE_y_BV
Sprinkler preaction by zone (typical)	Sxxxx_FIRE_PREACT-ZONE_y_BI
Water flow (typical)	Sxxxx_FIRE_WTR-FLOW_BI
Suppressant discharge by zone (typical)	Sxxxx_FIRE_SUPPR-DISCH_y_BI
Access-Security	
Card reader status by door (typical)	Sxxxx_ACCESS_CR-STS-DOOR_y_BV
Request to exit by door (typical)	Sxxxx_ACCESS_RTE-DOOR_y_BI
Lock power status by door (typical)	Sxxxx_ACCESS_LOCK-PWR-DOOR_y_BV
Door status (typical)	Sxxxx_ACCESS_DOOR-STS_y_MI
Door lock/unlock (typical)	Sxxxx_ACCESS_DOOR-LOCK_y_BO
Door alarm indication (typical)	Sxxxx_ACCESS_DOOR-ALARM_y_MV
Emergency/fire input (typical)	Sxxxx_ACCESS_EMER/FIRE-IN_BI
AC power status by controller (typical)	Sxxxx_ACCESS_AC-POWER-CONTR_y_BV
Battery voltage by controller (typical)	Sxxxx_ACCESS_BATT-VOLT-CONTR_y_AI
Motion intrusion by zone (typical)	Sxxxx_ACCESS_MOTION-INTRU_y_BI
Breakglass intrusion by zone (typical)	Sxxxx_ACCESS_BRKGLS-INTRU_y_BI
Door contact intrusion by zone (typical)	Sxxxx_ACCESS_DOOR-CONT-INTRU_y_BI
General intrusion alarm (typical)	Sxxxx_ACCESS_GENERAL-INTRU-ALARM_y_BV
Trouble by zone (typical)	Sxxxx_ACCESS_TROUBLE-ZONE_y_BV

Control and Monitoring Point	Suggested Point Name
Generator	
Control switch	Sxxxx_UTIL-ELEC-GEN_y_CTRL-SW-BI
State	Sxxxx_UTIL_ELEC-GEN_y_STATE_MV
Fault present	Sxxxx_UTIL_ELEC-GEN_y_FAULT_BV
Fault code	Sxxxx_UTIL_ELEC-GEN_y_FAULT-CODE_AV
Fault type	Sxxxx_UTIL_ELEC-GEN_y_FAULT-TYPE_MV
Percent kW	Sxxxx_UTIL_ELEC-GEN_y_PCT-KW_AV
Total kW	Sxxxx_UTIL_ELEC-GEN_y_TOTAL-KW_AV
Frequency	Sxxxx_UTIL_ELEC-GEN_y_FREQ_AI
Total PF	Sxxxx_UTIL_ELEC-GEN_y_TOTAL-PF_AV
Total KVA	Sxxxx_UTIL_ELEC-GEN_y_TOTAL-KVA_AV
Total KVAR	Sxxxx_UTIL_ELEC-GEN_y_TOTAL-KVAR_AV
Volts ab	Sxxxx_UTIL_ELEC-GEN_y_PH-AB-VOLT_AI
Volts bc	Sxxxx_UTIL_ELEC-GEN_y_PH-BC-VOLT_AI
Volts ca	Sxxxx_UTIL_ELEC-GEN_y_PH-AC-VOLT_AI
Volts a	Sxxxx_UTIL_ELEC-GEN_y_PH-A-N-VOLT_AI
Volts b	Sxxxx_UTIL_ELEC-GEN_y_PH-B-N-VOLT_AI
Volts c	Sxxxx_UTIL_ELEC-GEN_y_PH-C-N-VOLT_AI
Amps a	Sxxxx_UTIL_ELEC-GEN_y_PH-A-CURR_AI
Amps b	Sxxxx_UTIL_ELEC-GEN_y_PH-B-CURR_AI
Amps c	Sxxxx_UTIL_ELEC-GEN_y_PH-C-CURR_AI
Percent amps a	Sxxxx_UTIL_ELEC-GEN_y_PCT-AMPS-PH-A_AV
Percent amps b	Sxxxx_UTIL_ELEC-GEN_y_PCT-AMPS-PH-B_AV
Percent amps c	Sxxxx_UTIL_ELEC-GEN_y_PCT-AMPS-PH-C_AV
Battery voltage	Sxxxx_UTIL_ELEC-GEN_y_BATT-VOLT_AI
Oil pressure	Sxxxx_UTIL_ELEC-GEN_y_OIL-PRESS_AI
Oil temperature	Sxxxx_UTIL_ELEC-GEN_y_OIL-TEMP_AI
Coolant temperature	Sxxxx_UTIL_ELEC-GEN_y_COOLANT-TEMP_AI
Miscellaneous temperature 1	Sxxxx_UTIL_ELEC-GEN_y_MISC-TEMP_1_AI
Miscellaneous temperature 2	Sxxxx_UTIL_ELEC-GEN_y_MISC-TEMP_2_AI
Fuel rate	Sxxxx_UTIL_ELEC-GEN_y_FUEL-RATE_AI
Engine RPM	Sxxxx_UTIL_ELEC-GEN_y_ENGINE-RPM_AI
Engine starts	Sxxxx_UTIL_ELEC-GEN_y_ENGINE-STARTS_BV
Engine runtime	Sxxxx_UTIL_ELEC-GEN_y_ENGINE-RUNTIME_AV
Total kWh	Sxxxx_UTIL_ELEC-GEN_y_TOTAL-KWH_AV
Total fuel	Sxxxx_UTIL_ELEC-GEN_y_TOTAL-FUEL_AV

Appendix C Example Enhancement to BACnet

```
<?xml version="1.0" encoding="UTF-8"?>
<CSML xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="file:DR-034A-28 Schema.xsd" defaultLocale="en">

    <!--Definitions-->

    <Definitions>
        <Object name="0-Building_Information">
            <ObjectIdentifier name="object_ID" value="128, 512"/>
            <!-- Proprietary object type 128, instance 512 -->
            <String name="Owner" propertyIdentifier="513" readable="true"
            writable="true" displayName="Owner"/>
            <Real name="Bldg_No" propertyIdentifier="514" readable="true"
            writable="true" displayName="Building Number"/>
            <String name="City" propertyIdentifier="515" readable="true"
            writable="true" displayName="City"/>
            <String name="State" propertyIdentifier="516" readable="true"
            writable="true" displayName="State"/>
            <String name="Time_Zone" propertyIdentifier="517" readable="true"
            writable="true" displayName="Time Zone"/>
            <String name="Climate_Zone" propertyIdentifier="518" readable="true"
            writable="true" displayName="Climate Zone"/>
            <Real name="Longitude" propertyIdentifier="519" readable="true"
            writable="true" displayName="Longitude"/>
            <Real name="Latitude" propertyIdentifier="520" readable="true"
            writable="true" displayName="Latitude"/>
            <String name="Bldg_Type" propertyIdentifier="521" readable="true"
            writable="true" displayName="Building Type"/>
            <String name="Bldg_Subtype" propertyIdentifier="522" readable="true"
            writable="true" displayName="Building Subtype"/>
            <String name="Bldg_Name" propertyIdentifier="523" readable="true"
            writable="true" displayName="Building Name"/>
            <Real name="Bldg_Area" propertyIdentifier="524" readable="true"
            writable="true" displayName="Building Area" units="square-feet"/>
            <String name="Special_Feat" propertyIdentifier="525" readable="true"
            writable="true" displayName="Special Features"/>
        </Object>
    </Definitions>
    <Definitions>
        <Object name="0.1-Zone_Information">
            <ObjectIdentifier name="object_ID" value="129, 526"/>
            <Object name="Zone" readable="true" description="Information about
            the zone in the building">
                <ObjectIdentifier name="object_ID" value="130, 527"/>
```

```
                    <Integer name="Zone_ID_Number" propertyIdentifier="528"
                    readable="true" writable="true" description="AV"/>
                    <Real name="Zone_Area" propertyIdentifier="529"
                    readable="true" writable="true" units="square-feet"
                    description="AV"/>
                    <String name="Zone_Location" propertyIdentifier="530"
                    readable="true" writable="true" description="String"/>
                </Object>
        </Object>
</Definitions>
<Definitions>
        <Object name="1-Refigeration_Equipment">
                <ObjectIdentifier name="object_ID" value="131, 531"/>
                <Object name="1.1-Chiller">
                    <ObjectIdentifier name="object_ID" value="132, 532"/>
                    <String name="Tag_Name" propertyIdentifier="533"
                    readable="true" writable="true" description="Standard Point
                    Name"/>
                    <Real name="Active_Setpoint" propertyIdentifier="534"
                    units="degrees-fahrenheit" readable="true" minimum="-50"
                    maximum="200" description="AV"/>
                    <Real name="Actual_Capacity" propertyIdentifier="535"
                    units="percentage" readable="true" minimum="0"
                    maximum="160" description="AV"/>
                    <Real name="Capacity_Limit" propertyIdentifier="536"
                    units="percentage" readable="true" minimum="0"
                    maximum="160" description="AV"/>
                    <Real name="Capacity_Limit_Output" propertyIdentifier="537"
                    units="percentage" readable="true" minimum="0"
                    maximum="160" description="AO"/>
                    <Real name="Capacity_Limit_Setpoint" propertyIdentifier="538"
                    units="percentage" readable="true" writable="true" minimum="0"
                    maximum="160" description="AV"/>
                    <Integer name="Chiller_Enable" propertyIdentifier="539"
                    readable="true" writable="true" description="BI; 0=Off, 1=On"/>
                    <Integer name="Chiller_Limited" propertyIdentifier="540"
                    readable="true" description="BV; 0=Not Limited, 1=Limited"/>
                    <Integer name="Chiller_Local_Remote" propertyIdentifier="541"
                    readable="true" writable="true" description="BV; 0=Remote,
                    1=Local"/>
                    <Integer name="Chiller_Mode" propertyIdentifier="542"
                    readable="true" description="MV; 1=Ice, 2=Cool, 3=Heat"/>
                    <Integer name="Chiller_Mode_Output" propertyIdentifier="543"
                    readable="true" description="MV; 1=Ice, 2=Cool, 3=Heat"/>
```

<Integer name="Chiller_Mode_Setpoint" propertyIdentifier="544" readable="true" writable="true" description="MV; 1=Ice, 2=Cool, 3=Heat"/>
<Integer name="Chiller_On_Off" propertyIdentifier="545" readable="true" description="BV; 0=Off, 1=On"/>
<Integer name="Chiller_Status" propertyIdentifier="546" readable="true" description="MV; 0=Off, 1=Start, 2=Run, 3=Pre-Shutdown, 4=Service"/>
<Real name="Compressor_Current" propertyIdentifier="547" readable="true" minimum="0" units="amps" description="AI"/>
<Real name="Compressor_Discharge_Temperature" propertyIdentifier="548" readable="true" minimum="-460" maximum="650" units="degrees-Fahrenheit" description="AI"/>
<Real name="Compressor_percentage_RLA" propertyIdentifier="549" readable="true" minimum="0" maximum="110" units="percentage" description="AV"/>
<Real name="Compressor_Power" propertyIdentifier="550" readable="true" minimum="0" units="kilowatts" description="AV"/>
<Real name="Compressor_Run_Hours" propertyIdentifier="551" readable="true" minimum="0" units="hours" description="AV"/>
<Integer name="Compressor_Select" propertyIdentifier="552" readable="true" description="AV; Selection of compressor, 1=compressor #1, 2=compressor #2, etc."/>
<Integer name="Compressor_Starts" propertyIdentifier="553" readable="true" minimum="0" description="AV; indicates the # of starts for the compressor motor of the selected compressor"/>
<Real name="Compressor_Suction_Line_Temperature" propertyIdentifier="554" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Compressor_Voltage" propertyIdentifier="555" readable="true" units="volts" description="AI"/>
<Real name="Condenser_Entering_Water_Temperature" propertyIdentifier="556" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Integer name="Condenser_Flow_Switch_Status" propertyIdentifier="557" readable="true" description="BI; 0=No Flow, 1=Flow"/>
<Real name="Condenser_Leaving_Water_Temperature" propertyIdentifier="558" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Condenser_Pump_Run_Hours" propertyIdentifier="559" readable="true" units="hours" description="AV"/>

<Real name="Condenser_Refrigerant_Pressure" propertyIdentifier="560" readable="true" units="pounds-per-square-inch" description="AI"/>
<Real name="Condenser_Saturated_Refrigerant_Temperature" propertyIdentifier="561" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Condenser_Water_Flow_Rate" propertyIdentifier="562" readable="true" units="gallons-per-minute" description="AI"/>
<Integer name="Condenser_Water_Pump_Status" propertyIdentifier="563" readable="true" description="BI; 0=Pump Off Request, 1=Pump On Request"/>
<Real name="Cool_Setpoint" propertyIdentifier="564" readable="true" writable="true" units="fahrenheit" description="AV"/>
<Real name="Evaporator_Entering_Water_Temperature" propertyIdentifier="565" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Integer name="Evaporator_Flow_Switch_Status" propertyIdentifier="566" readable="true" description="BI; 0=No Flow, 1=Flow"/>
<Real name="Evaporator_Leaving_Water_Temperature_For_Unit" propertyIdentifier="567" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Evaporator_Leaving_Water_Temperature_For_Compressor" propertyIdentifier="568" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Evaporator_Pump_Run_Hours" propertyIdentifier="569" readable="true" units="hours" description="AV"/>
<Real name="Evaporator_Refrigerant_Pressure" propertyIdentifier="570" readable="true" units="pounds-per-square-inch" description="AI"/>
<Real name="Evaporator_Saturated_Refrigerant_Temperature" propertyIdentifier="571" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Evaporator_Water_Flow_Rate" propertyIdentifier="572" readable="true" units="gallons-per-minute" description="AI"/>
<Integer name="Evaporator_Water_Pump_Status" propertyIdentifier="573" readable="true" description="BI; 0=Pump Off Request, 1=Pump On Request"/>

```
        <Real name="Heat_Recovery_Entering_Water_Temperature"
        propertyIdentifier="574" readable="true" units="degrees-
        Fahrenheit" description="AI"/>
        <Real name="Heat_Recovery_Leaving_Water_Temperature"
        propertyIdentifier="575" readable="true" units="degrees-
        Fahrenheit" description="AI"/>
        <Real name="Heat_Setpoint" propertyIdentifier="576"
        readable="true" writable="true" units="degrees-Fahrenheit"
        description="AV"/>
        <Real name="Ice_Setpoint" propertyIdentifier="577"
        readable="true" writable="true" units="degrees-Fahrenheit"
        description="AV"/>
        <Real name="Liquid_Line_Refrigerant_Pressure"
        propertyIdentifier="578" readable="true" units="pounds-per-
        square-inch" description="AI"/>
        <Real name="Liquid_Line_Refrigerant_Temperature"
        propertyIdentifier="579" readable="true" units="degrees-
        Fahrenheit" description="AI"/>
        <Real name="Oil_Feed_Pressure" propertyIdentifier="580"
        readable="true" units="pounds-per-square-inch"
        description="AI"/>
        <Real name="Oil_Feed_Temperature" propertyIdentifier="581"
        readable="true" units="degrees-Fahrenheit" description="AI"/>
        <Real name="Oil_Sump_Pressure" propertyIdentifier="582"
        readable="true" units="pounds-per-square-inch"
        description="AI"/>
        <Real name="Oil_Sump_Temperature" propertyIdentifier="583"
        readable="true" units="degrees-Fahrenheit" description="AI"/>
        <Real name="Outdoor_Air_Temperature"
        propertyIdentifier="584" readable="true" writable="true"
        units="degrees-Fahrenheit" description="AI"/>
        <Integer name="Pump_Select" propertyIdentifier="585"
        readable="true" description="AV; 1=Pump#1, 2=Pump#2,
        3=Pump#3, etc."/>
        <Integer name="Run_Enabled" propertyIdentifier="586"
        readable="true" writable="true" description="BI; 0=Off, 1=Run
        Allowed"/>
</Object>
<Object name="1.2-Fluid_Cooler">
        <ObjectIdentifier name="object_ID" value="133, 587"/>
        <String name="Tag_Name" propertyIdentifier="588"
        readable="true" writable="true" description="Standard Point
        Name"/>
        <Real name="Glycol_Supply_Temperature"
        propertyIdentifier="589" readable="true" units="degrees-
        Fahrenheit" description="AI"/>
```

```
                <Real name="Glycol_Return_Temperature"
                propertyIdentifier="590" readable="true" units="degrees-
                Fahrenheit" description="AI"/>
                <Integer name="Dampers_Open_Closed" propertyIdentifier="591"
                readable="true" description="BI; 0=Closed, 1=Open"/>
                <Real name="VFD_Frequency_Speed" propertyIdentifier="592"
                readable="true" units="hertz-per-percentage" description="AV"/>
                <Real name="VFD_Current" propertyIdentifier="593"
                readable="true" minimum="0" units="amps" description="AI"/>
                <Integer name="VFD_Status" propertyIdentifier="594"
                readable="true" description="BV; 0=Off, 1=On"/>
                <Integer name="VFD_Fault" propertyIdentifier="595"
                readable="true" description="BV"/>
                <Integer name="VFD_on_Bypass" propertyIdentifier="596"
                readable="true" description="BI"/>
                <Integer name="Fan_Low_Speed" propertyIdentifier="597"
                readable="true" description="BO"/>
                <Integer name="Fan_High_Speed" propertyIdentifier="598"
                readable="true" description="BO"/>
                <Integer name="Spray_Pump_Status_Flow"
                propertyIdentifier="599" readable="true" description="BI; 0=No
                Flow, 1=Flow"/>
                <Real name="Basin_Water_Temperature"
                propertyIdentifier="600" readable="true" units="degrees-
                Fahrenheit" description="AI"/>
                <Integer name="Basin_Low_Level_Switch"
                propertyIdentifier="601" readable="true" description="BI; 0=Low
                - ON, 1=Good - OFF"/>
                <Real name="Ambient_Temperature" propertyIdentifier="602"
                readable="true" units="degrees-Fahrenheit" description="AI"/>
                <Real name="Ambient_Humidity" propertyIdentifier="603"
                readable="true" units="percentage-of-relative-humidity"
                description="AI"/>
        </Object>
</Object>
<Object name="2-Heating_Equipment" readable="true" description="Standard
Point Name">
        <ObjectIdentifier name="object_ID" value="134, 604"/>
        <Real name="Burner_Differential" propertyIdentifier="605"
        readable="true" writable="true" units="degrees-Fahrenheit"
        description="AV"/>
        <Real name="Boost_Offset" propertyIdentifier="606" readable="true"
        writable="true" units="degrees-Fahrenheit" description="AV"/>
        <Integer name="Boost_Mode" propertyIdentifier="607" readable="true"
        writable="true" description="MV; 1=Off, 2=Vari Boost, 3=Vari Boost
        and ESD"/>
```

<Real name="Bypass_Time" propertyIdentifier="608" readable="true" units="minutes" description="AV"/>
<Integer name="Burner_Typical" propertyIdentifier="609" readable="true" description="BO"/>
<Integer name="Bypass_Mode" propertyIdentifier="610" readable="true" writable="true" description="BV; 0=Auto, 1=Bypass"/>
<Real name="Outdoor_Day_Cutoff" propertyIdentifier="611" readable="true" writable="true" units="degrees-Fahrenheit" description="AV"/>
<Integer name="DHW_Call_Mode" propertyIdentifier="612" readable="true" writable="true" description="BV; 0=No Priority, 1=Priority"/>
<Integer name="Sensor_Fault_Mode" propertyIdentifier="613" readable="true" writable="true" description="BV; 0=Stages On, 1=Stages Off"/>
<Integer name="Fast_Cool_Down" propertyIdentifier="614" readable="true" writable="true" description="BV; 0=Minimum Target Temp, 1=Off"/>
<Real name="Minimum_Water_Temperature" propertyIdentifier="615" readable="true" writable="true" units="degrees-Fahrenheit" description="AV"/>
<Real name="Outdoor_Temperature_Sensor" propertyIdentifier="616" readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Outdoor_Sensor_Trim" propertyIdentifier="617" readable="true" writable="true" units="degrees-Fahrenheit" description="AV"/>
<Real name="Offset_Temperature" propertyIdentifier="618" readable="true" writable="true" units="degrees-Fahrenheit" description="AV"/>
<Integer name="Output_Mode" propertyIdentifier="619" readable="true" writable="true" description=""/>
<Real name="Pump_Run_On" propertyIdentifier="620" readable="true" writable="true" units="minutes" description="AV"/>
<Integer name="Pump" propertyIdentifier="621" readable="true" description="BO; 0=Off, 1=On"/>
<Real name="Reset_Ratio" propertyIdentifier="622" readable="true" writable="true" description="MV; 1=A, 2=B, 3=C, 4=D, 5=E, 6=F, 7=G, 8=H, 9=I, 10=J"/>
<Integer name="Season" propertyIdentifier="623" readable="true" writable="true" description="BV; 0=Winter, 1=Summer"/>
<Real name="Night_Setback_Temperature" propertyIdentifier="624" readable="true" writable="true" units="degrees-Fahrenheit" description="AV"/>
<Integer name="Day_Night_Shift" propertyIdentifier="625" readable="true" writable="true" description="MV; 1=Day, 2=Night, 3=Day Extended 90 Minutes; 4=Resync to Schedule"/>

```
        <Real name="HW_Supply_Temp_Sensor" propertyIdentifier="626"
        readable="true" units="degrees-Fahrenheit" description="AI"/>
        <Real name="HW_Supply_Temp_Sensor_Trim" propertyIdentifier="627"
        readable="true" writable="true" units="degrees-Fahrenheit"
        description="AV"/>
        <Real name="Calculated_Target" propertyIdentifier="628"
        readable="true" units="degrees-Fahrenheit" description="AV"/>
        <Real name="Motorized_Value" propertyIdentifier="629"
        readable="true" description="AO"/>
        <Real name="Max_Target_Temperature" propertyIdentifier="630"
        readable="true" writable="true" units="degrees-Fahrenheit"
        description="AV"/>
        <Real name="HW_Return_Temp_Sensor" propertyIdentifier="631"
        readable="true" units="degrees-Fahrenheit" description="AI"/>
        <Integer name="Boiler_Stages" propertyIdentifier="632" readable="true"
        description="AV"/>
</Object>
<Object name="3-Packaged_HVAC">
        <ObjectIdentifier name="object_ID" value="135, 633"/>
        <Object name="3.1-AHU">
                <ObjectIdentifier name="object_ID" value="136, 634"/>
                <String name="Tag_Name" propertyIdentifier="635"
                readable="true" writable="true" description="Standard Point
                Name"/>
                <Integer name="Zone_Served" propertyIdentifier="636"
                readable="true" writable="true" description="MV; 1=Zone 1,
                2=Zone 2, 3=Zone 3, etc."/>
                <Integer name="Unit_Status" propertyIdentifier="637"
                readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
                <Integer name="AHU_Mode" propertyIdentifier="638"
                readable="true" description="MV; 0=..., 1=..., 2=... 3=..., etc."/>
                <Integer name="Cooling_Status" propertyIdentifier="639"
                readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
                <Integer name="Heating_Status" propertyIdentifier="640"
                readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
                <Integer name="Economizer_Status" propertyIdentifier="641"
                readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
                <Real name="Cooling_Capacity" propertyIdentifier="642"
                readable="true" units="percentage" description="AV"/>
                <Real name="Heating_Capacity" propertyIdentifier="643"
                readable="true" units="percentage" description="AV"/>
                <Real name="Supply_Fan_Capacity" propertyIdentifier="644"
                readable="true" units="percentage" description="AV"/>
                <Real name="Return_Fan_Capacity" propertyIdentifier="645"
                readable="true" units="percentage" description="AV"/>
```

```
<Real name="Exhaust_Fan_Capacity" propertyIdentifier="646"
readable="true" units="percentage" description="AV"/>
<Real name="Economizer_Capacity" propertyIdentifier="647"
readable="true" units="percentage" description="AV"/>
<Real name="Economizer_Valve_Position_Waterside"
propertyIdentifier="648" readable="true" units="percentage"
description="AV"/>
<Real name="Outdoor_Air_Damper_Position_Airside"
propertyIdentifier="649" readable="true" units="percentage"
description="AV"/>
<Integer name="Application_Mode" propertyIdentifier="650"
readable="true" writable="true" description="MV; 0=..., 1=...,
2=..., 3=..., etc."/>
<Integer name="Occupancy" propertyIdentifier="651"
readable="true" writable="true" description="BV; 0=Not
Occupied, 1=Occupied"/>
<Integer name="Occupancy_Mode" propertyIdentifier="652"
readable="true" writable="true" description="MV; 0=..., 1=...,
2=..., 3=..., etc."/>
<Integer name="Occupancy_Source" propertyIdentifier="653"
readable="true" writable="true" description="MV; 0=..., 1=...,
2=..., 3=..., etc."/>
<Real name="Control_Temperature" propertyIdentifier="654"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Discharge_Air_Temperature"
propertyIdentifier="655" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Return_Air_Temperature" propertyIdentifier="656"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Space_Temperature" propertyIdentifier="657"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Outdoor_Air_Temperature"
propertyIdentifier="658" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Entering_Fan_Leaving_Coil_Temperature"
propertyIdentifier="659" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Leaving_Water_Temperature"
propertyIdentifier="660" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Entering_Water_Temperature"
propertyIdentifier="661" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Mixed_Air_Temperature" propertyIdentifier="662"
readable="true" units="degrees-Fahrenheit" description="AI">
        <Extensions>
```

```
                <String name="Tag_Name"
                propertyIdentifier="784" readable="true"
                writable="true" description="Standard Point
                Name"/>
                <String name="Measurement_Location"
                propertyIdentifier="785" readable="true"
                writable="true" description="Physical location of
                temperature sensor"/>
            </Extensions>
        </Real>
        <Integer name="Exhaust_Fan_Status" propertyIdentifier="663"
        readable="true" description="BI; 0=Off, 1=On"/>
        <Integer name="VAV_Box_Output" propertyIdentifier="664"
        readable="true" description="BO; 0=..., 1=..."/>
        <Integer name="Discharge_Fan_Status" propertyIdentifier="665"
        readable="true" description="BI; 0=Off, 1=On"/>
        <Integer name="Return_Fan_Status" propertyIdentifier="667"
        readable="true" description="BI; 0=Off, 1=On"/>
        <Integer name="Fan_Operation_Output" propertyIdentifier="668"
        readable="true" description="BO; 0=Off, 1=On"/>
        <Real name="Duct_Static_Pressure" propertyIdentifier="669"
        readable="true" units="pressure-inch-of-water" description="AI"/>
        <Real name="Duct_Static_Pressure_Setpoint"
        propertyIdentifier="670" readable="true" writable="true"
        units="pressure-inch-of-water" description="AV"/>
        <Integer name="Remote_Supply_Fan_Capacity_Control_Flag"
        propertyIdentifier="671" readable="true" writable="true"
        description="BV; 0=Good, 1=Flagged"/>
        <Real name="Supply_Fan_Capacity_Input"
        propertyIdentifier="672" readable="true" writable="true"
        units="percentage" description="AV"/>
        <Real name="Building_Static_Pressure" propertyIdentifier="673"
        readable="true" units="pressure-inch-of-water" description="AI"/>
        <Real name="Building_Static_Pressure_Setpoint"
        propertyIdentifier="674" readable="true" writable="true"
        units="pressure-inch-of-water" description="AV"/>
        <Integer name="Remote_Return_Fan_Capacity_Control_Flag"
        propertyIdentifier="675" readable="true" writable="true"
        description="BV; 0=Good, 1=Flagged"/>
        <Integer name="Remote_Exhaust_Fan_Capacity_Control_Flag"
        propertyIdentifier="676" readable="true" writable="true"
        description="BV; 0=Good, 1=Flagged"/>
        <Real name="Occupied_Cooling_Setpoint"
        propertyIdentifier="677" readable="true" writable="true"
        units="degrees-Fahrenheit" description="AV"/>
```

<Real name="Unoccupied_Cooling_Setpoint"
propertyIdentifier="678" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Network_Discharge_Air_Cooling_Setpoint"
propertyIdentifier="679" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Minimum_Discharge_Air_Cooling_Setpoint"
propertyIdentifier="680" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Effective_Cooling_Enable_Setpoint"
propertyIdentifier="681" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Cooling_Operating_Hours"
propertyIdentifier="682" readable="true" units="hours"
description="AV"/>
<Integer name="Control_Temperature_Source"
propertyIdentifier="683" readable="true" writable="true"
description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
<Real name="Max_Discharge_Air_Cooling_Setpoint"
propertyIdentifier="684" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Energy_Recovery_Supply_Temperature"
propertyIdentifier="685" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real
name="Effective_Minimum_Outdoor_Damper_Position_Setpoint"
propertyIdentifier="686" readable="true" units="percentage"
description="AV"/>
<Integer name="Free_Cooling_Available"
propertyIdentifier="687" readable="true" description="BV; 0=No,
1=Yes"/>
<Real name="Relative_Humidity" propertyIdentifier="688"
readable="true" units="percentage-of-relative-humidity"
description="AI"/>
<Real name="Dewpoint_Temperature" propertyIdentifier="689"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Relative_Humidity_Setpoint"
propertyIdentifier="690" readable="true" writable="true"
units="percentage-of-relative-humidity" description="AV"/>
<Real name="Dewpoint_Temperature_Setpoint"
propertyIdentifier="691" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Reheat_Capacity" propertyIdentifier="692"
readable="true" units="percentage" description="AV"/>

<Integer name="Dehumidification_Status"
propertyIdentifier="693" readable="true" description="MV; 0=...,
1=..., 2=..., 3=..., etc."/>
<Integer name="Relative_Humidity_Control_Type"
propertyIdentifier="694" readable="true" writable="true"
description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
<Real name="Outdoor_Air_Temperature_Input"
propertyIdentifier="695" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Space_Temperature_Input"
propertyIdentifier="696" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Effective_Discharge_Air_Temperature_Setpoint"
propertyIdentifier="697" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Integer name="Clear_Alarms" propertyIdentifier="698"
readable="true" writable="true" description="BV; 0=No Action;
1=Clear"/>
<Integer name="Alarm_Faults_Clear_All"
propertyIdentifier="699" readable="true" description="BV; 0=No
Action; 1=All Clear"/>
<Integer name="Alarm_Problems_Clear_All"
propertyIdentifier="700" readable="true" description="BV; 0=No
Action; 1=All Clear"/>
<Integer name="Alarm_Warnings_Clear_All"
propertyIdentifier="701" readable="true" description="BV; 0=No
Action; 1=All Clear"/>
<Real name="Local_Space_Temperature"
propertyIdentifier="702" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Local_Outdoor_Air_Temperature"
propertyIdentifier="703" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Integer name="Warning_Alarm" propertyIdentifier="704"
readable="true" description="AV; 0=No Alarm; 1=Alarm"/>
<Integer name="Problem_Alarm" propertyIdentifier="705"
readable="true" description="AV; 0=No Alarm; 1=Alarm"/>
<Integer name="Fault_Alarm" propertyIdentifier="706"
readable="true" description="AV; 0=No Alarm; 1=Alarm"/>
<Real name="Alarm_Value" propertyIdentifier="707"
readable="true" description="AV"/>
<Object name="Faults" readable="true" description="Possible
faults within the system">
    <ObjectIdentifier name="object_ID" value="137, 708"/>
    <Integer name="Airflow_Fault" propertyIdentifier="709"
    readable="true" description="BV; 0=No Fault, 1=Fault"/>

```
        <Integer name="Control_Temperature_Fault"
        propertyIdentifier="710" readable="true" description="BV;
        0=No Fault, 1=Fault"/>
        <Integer name="Discharge_Sensor_Fault"
        propertyIdentifier="711" readable="true" description="BV;
        0=No Fault, 1=Fault"/>
        <Integer name="Duct_High_Limit_Fault"
        propertyIdentifier="712" readable="true" description="BV;
        0=No Fault, 1=Fault"/>
        <Integer name="Emergency_Off_Fault"
        propertyIdentifier="713" readable="true" description="BV;
        0=No Fault, 1=Fault"/>
        <Integer name="Freeze_Fault" propertyIdentifier="714"
        readable="true" description="BV; 0=No Fault, 1=Fault"/>
        <Integer name="High_Discharge_Temperature_Fault"
        propertyIdentifier="715" readable="true" description="BV;
        0=No Fault, 1=Fault"/>
        <Integer name="High_Return_Temperature_Fault"
        propertyIdentifier="716" readable="true" description="BV;
        0=No Fault, 1=Fault"/>
        <Integer name="Low_Discharge_Temperature_Fault"
        propertyIdentifier="717" readable="true" description="BV;
        0=No Fault, 1=Fault"/>
    </Object>
    <Object name="Warnings" readable="true" description="Possible
    warnings within the system">
        <ObjectIdentifier name="object_ID" value="138, 718"/>
        <Integer name="Airflow_Switch_Warning"
        propertyIdentifier="719" readable="true" description="BV;
        0=No Warning, 1=Warning"/>
        <Integer name="Conductivity_Warning"
        propertyIdentifier="720" readable="true" description="BV;
        0=No Warning, 1=Warning"/>
        <Integer name="Dirty_Filter_Warning"
        propertyIdentifier="721" readable="true" description="BV;
        0=No Warning, 1=Warning"/>
    </Object>
    <Object name="Problems" readable="true" description="Possible
    problems within the system">
        <ObjectIdentifier name="object_ID" value="139, 722"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="723" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
```

<Integer name="Entering_Water_Temperature_Problem" propertyIdentifier="724" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Freeze_Problem" propertyIdentifier="725" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="High_Pressure_Circuit_1_Problem" propertyIdentifier="726" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="High_Pressure_Circuit_2_Problem" propertyIdentifier="727" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="High_Pressure_Circuit_3_Problem" propertyIdentifier="728" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="High_Pressure_Circuit_4_Problem" propertyIdentifier="729" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="High_Pressure_Circuit_5_Problem" propertyIdentifier="730" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="High_Pressure_Circuit_6_Problem" propertyIdentifier="731" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Low_Pressure_Circuit_1_Problem" propertyIdentifier="732" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Low_Pressure_Circuit_2_Problem" propertyIdentifier="733" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Low_Pressure_Circuit_3_Problem" propertyIdentifier="734" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Low_Pressure_Circuit_4_Problem" propertyIdentifier="735" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Low_Pressure_Circuit_5_Problem" propertyIdentifier="736" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Low_Pressure_Circuit_6_Problem" propertyIdentifier="737" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Mixed_Air_Temperature_Problem" propertyIdentifier="738" readable="true" description="BV; 0=No Problem, 1=Problem"/>

```
        <Integer name="Outdoor_Temperature_Problem"
        propertyIdentifier="739" readable="true" description="BV;
        0=No Problem, 1=Problem"/>
        <Integer name="Return_Temperature_Problem"
        propertyIdentifier="740" readable="true" description="BV;
        0=No Problem, 1=Problem"/>
        <Integer name="Space_Temperature_Problem"
        propertyIdentifier="741" readable="true" description="BV;
        0=No Problem, 1=Problem"/>
        <Integer name="Sump_Pump_Fail_Problem"
        propertyIdentifier="742" readable="true" description="BV;
        0=No Problem, 1=Problem"/>
        <Integer name="Freeze_Switch_Problem"
        propertyIdentifier="743" readable="true" description="BV;
        0=No Problem, 1=Problem"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="744" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="745" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="746" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="747" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="748" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="749" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
        <Integer
        name="Entering_Fan_Temperature_Leaving_Coil_Temper
        ature_Problem" propertyIdentifier="750" readable="true"
        description="BV; 0=No Problem, 1=Problem"/>
</Object>
```

```
        <Integer name="Duct_High_Limit_Switch"
        propertyIdentifier="751" readable="true" description="BI; 0=Off,
        1=On"/>
        <Integer name="Emergencey_Off_Switch"
        propertyIdentifier="752" readable="true" description="BI; 0=Off,
        1=On"/>
</Object>
<Object name="3.2-RTU">
        <ObjectIdentifier name="object_ID" value="140, 753"/>
        <String name="Tag_Name" propertyIdentifier="754"
        readable="true" writable="true" description="Standard Point
        Name"/>
        <Integer name="Zone_Served" propertyIdentifier="755"
        readable="true" writable="true" description="MV; 1=Zone 1,
        2=Zone 2, 3=Zone 3, etc."/>
        <Integer name="Unit_Status" propertyIdentifier="756"
        readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
        <Integer name="RTU_Mode" propertyIdentifier="757"
        readable="true" description="MV; 0=..., 1=..., 2=... 3=..., etc."/>
        <Integer name="Cooling_Status" propertyIdentifier="758"
        readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
        <Integer name="Heating_Status" propertyIdentifier="759"
        readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
        <Integer name="Economizer_Status" propertyIdentifier="760"
        readable="true" description="MV; 0=..., 1=..., 2=..., 3=..., etc."/>
        <Real name="Cooling_Capacity" propertyIdentifier="761"
        readable="true" units="percentage" description="AV"/>
        <Real name="Heating_Capacity" propertyIdentifier="762"
        readable="true" units="percentage" description="AV"/>
        <Real name="Supply_Fan_Capacity" propertyIdentifier="763"
        readable="true" units="percentage" description="AV"/>
        <Real name="Return_Fan_Capacity" propertyIdentifier="764"
        readable="true" units="percentage" description="AV"/>
        <Real name="Exhaust_Fan_Capacity" propertyIdentifier="765"
        readable="true" units="percentage" description="AV"/>
        <Real name="Economizer_Capacity" propertyIdentifier="766"
        readable="true" units="percentage" description="AV"/>
        <Integer name="Occupancy" propertyIdentifier="767"
        readable="true" writable="true" description="BV; 0=Not
        Occupied, 1=Occupied"/>
        <Integer name="Occupancy_Mode" propertyIdentifier="768"
        readable="true" writable="true" description="MV; 0=..., 1=...,
        2=..., 3=..., etc."/>
        <Integer name="Occupancy_Scheduler_Input"
        propertyIdentifier="769" readable="true" writable="true"
        description="BV"/>
```

<Real name="Outdoor_Air_Damper_Position"
propertyIdentifier="770" readable="true" units="percentage"
description="AV"/>
<Real name="Outdoor_Air_Damper_Minimum_Position_Input"
propertyIdentifier="771" readable="true" writable="true"
units="percentage" description="AV"/>
<Real name="Temperature_Setpoint_Input"
propertyIdentifier="772" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Control_Temperature" propertyIdentifier="773"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Discharge_Air_Temperature"
propertyIdentifier="774" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Return_Air_Temperature" propertyIdentifier="775"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Space_Temperature" propertyIdentifier="776"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Space_Temperature_Input"
propertyIdentifier="777" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Outdoor_Air_Temperature"
propertyIdentifier="778" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Outdoor_Air_Temperature_Input"
propertyIdentifier="779" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Entering_Fan_Leaving_Coil_Temperature"
propertyIdentifier="780" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Leaving_Water_Temperature"
propertyIdentifier="781" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Entering_Water_Temperature"
propertyIdentifier="782" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Mixed_Air_Temperature" propertyIdentifier="783"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Integer name="Return_Fan_Status" propertyIdentifier="786"
readable="true" description="BI; 0=Off, 1=On"/>
<Integer name="Exhaust_Fan_Status" propertyIdentifier="787"
readable="true" description="BI; 0=Off, 1=On"/>
<Integer name="VAV_Box_Output" propertyIdentifier="788"
readable="true" description="BO; 0=..., 1=..."/>
<Integer name="Discharge_Fan_Status" propertyIdentifier="789"
readable="true" description="BI; 0=Off, 1=On"/>

<Real name="Duct_Static_Pressure" propertyIdentifier="790"
readable="true" units="pressure-inch-of-water" description="AI"/>
<Real name="Building_Static_Pressure" propertyIdentifier="791"
readable="true" units="pressure-inch-of-water" description="AI"/>
<Real name="Conductivity" propertyIdentifier="792"
readable="true" description="AI"/>
<Real name="Space_CO2" propertyIdentifier="793"
readable="true" units="ppm" description="AI"/>
<Real name="Outdoor_Airflow" propertyIdentifier="794"
readable="true" units="CFM" description="AI"/>
<Real name="Relative_Humidity" propertyIdentifier="795"
readable="true" units="percentage-of-relative-humidity"
description="AI"/>
<Real name="Relative_Humidity_Setpoint"
propertyIdentifier="796" readable="true" writable="true"
units="percentage-of-relative-humidity" description="AV"/>
<Real name="Relative_Humidity_Input" propertyIdentifier="797"
readable="true" writable="true" units="percentage-of-relative-
humidity" description="AV"/>
<Real name="Dewpoint_Temperature" propertyIdentifier="798"
readable="true" units="degrees-Fahrenheit" description="AI"/>
<Real name="Dewpoint_Temperature_Setpoint"
propertyIdentifier="799" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Reheat_Capacity" propertyIdentifier="800"
readable="true" units="percentage" description="AV"/>
<Real name="Effective_Enable_Setpoint"
propertyIdentifier="801" readable="true" units="degrees-
Fahrenheit" description="AV"/>
<Real name="Local_Space_Temperature"
propertyIdentifier="802" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Real name="Local_Outdoor_Air_Temperature"
propertyIdentifier="803" readable="true" units="degrees-
Fahrenheit" description="AI"/>
<Integer name="Emergencey_Override" propertyIdentifier="804"
readable="true" writable="true" description="BI"/>
<Integer name="Application_Mode" propertyIdentifier="805"
readable="true" writable="true" description="MV; 0=..., 1=...,
2=..., 3=..., etc."/>
<Real name="Duct_Static_Pressure_Setpoint"
propertyIdentifier="806" readable="true" writable="true"
units="pressure-inch-of-water" description="AV"/>
<Integer name="Remote_Supply_Fan_Capacity_Control_Flag"
propertyIdentifier="807" readable="true" writable="true"
description="BV; 0=Good, 1=Flagged"/>

<Real name="Supply_Fan_Capacity_Input"
propertyIdentifier="808" readable="true" writable="true"
units="percentage" description="AV"/>
<Real name="Building_Static_Pressure_Setpoint"
propertyIdentifier="809" readable="true" writable="true"
units="pressure-inch-of-water" description="AV"/>
<Integer name="Remote_Return_Fan_Capacity_Control_Flag"
propertyIdentifier="810" readable="true" writable="true"
description="BV; 0=Good, 1=Flagged"/>
<Integer name="Remote_Exhaust_Fan_Capacity_Control_Flag"
propertyIdentifier="811" readable="true" writable="true"
description="BV; 0=Good, 1=Flagged"/>
<Real name="Return_Fan_Capacity_Input"
propertyIdentifier="812" readable="true" writable="true"
units="percentage" description="AV"/>
<Real name="Exhaust_Fan_Capacity_Input"
propertyIdentifier="813" readable="true" writable="true"
units="percentage" description="AV"/>
<Real name="Occupied_Cooling_Setpoint"
propertyIdentifier="814" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Unoccupied_Cooling_Setpoint"
propertyIdentifier="815" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Network_Discharge_Air_Cooling_Setpoint"
propertyIdentifier="816" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Minimum_Discharge_Air_Cooling_Setpoint"
propertyIdentifier="817" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Occupied_Heating_Setpoint"
propertyIdentifier="818" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Unoccupied_Heating_Setpoint"
propertyIdentifier="819" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real name="Network_Discharge_Air_Heating_Setpoint"
propertyIdentifier="820" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Real
name="Network_Maximum_Discharge_Air_Heating_Setpoint"
propertyIdentifier="821" readable="true" writable="true"
units="degrees-Fahrenheit" description="AV"/>
<Integer name="Primary_Cool_Enable" propertyIdentifier="822"
readable="true" writable="true" description="BV"/>

<Integer name="Primary_Heat_Enable" propertyIdentifier="823" readable="true" writable="true" description="BV"/>
<Integer name="Economizer_Enable" propertyIdentifier="824" readable="true" writable="true" description="BV"/>
<Integer name="Water_Flow_Switch_Input" propertyIdentifier="825" readable="true" writable="true" description="BV"/>
<Real name="Space_IAQ_Input" propertyIdentifier="826" readable="true" writable="true" units="parts-per-million" description="AV"/>
<Integer name="Clear_Alarms" propertyIdentifier="827" readable="true" writable="true" description="BV; 0=No Action; 1=Clear"/>
<Integer name="Dirty_Filter_Airflow_Switch" propertyIdentifier="828" readable="true" description="BI; 0=Off, 1=On"/>
<Integer name="Conductivity_Waterflow_Switch" propertyIdentifier="829" readable="true" description="BI; 0=Off, 1=On"/>
<Integer name="Water_Regulating_Valve" propertyIdentifier="830" readable="true" description="BO; 0=Closed, 1=Open"/>
<Object name="Problems" readable="true" description="Possible problems within the system">
<ObjectIdentifier name="object_ID" value="141, 830"/>
<Integer name="Sump_Pump_Fail_Problem" propertyIdentifier="831" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="EFT_LCT_Problem" propertyIdentifier="832" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Return_Air_Sensor_Problem" propertyIdentifier="833" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Space_Sensor_Problem" propertyIdentifier="834" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="Outdoor_Air_Temperature_Sensor_Problem" propertyIdentifier="835" readable="true" description="BV; 0=No Problem, 1=Problem"/>
<Integer name="EWT_Problem" propertyIdentifier="836" readable="true" description="BV; 0=No Problem, 1=Problem"/>

```
                        <Integer name="High_Pressure_Circuit_1_Problem"
                        propertyIdentifier="837" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="High_Pressure_Circuit_2_Problem"
                        propertyIdentifier="838" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="High_Pressure_Circuit_3_Problem"
                        propertyIdentifier="839" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="High_Pressure_Circuit_4_Problem"
                        propertyIdentifier="840" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="High_Pressure_Circuit_5_Problem"
                        propertyIdentifier="841" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="High_Pressure_Circuit_6_Problem"
                        propertyIdentifier="842" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="Low_Pressure_Circuit_1_Problem"
                        propertyIdentifier="843" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="Low_Pressure_Circuit_2_Problem"
                        propertyIdentifier="844" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="Low_Pressure_Circuit_3_Problem"
                        propertyIdentifier="845" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="Low_Pressure_Circuit_4_Problem"
                        propertyIdentifier="846" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="Low_Pressure_Circuit_5_Problem"
                        propertyIdentifier="847" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                        <Integer name="Low_Pressure_Circuit_6_Problem"
                        propertyIdentifier="848" readable="true" description="BV;
                        0=No Problem, 1=Problem"/>
                </Object>
        </Object>
</Object>
<Object name="4-Lighting">
        <ObjectIdentifier name="object_ID" value="142, 849"/>
        <Object name="4.1-Interior_Lighting">
                <ObjectIdentifier name="object_ID" value="143, 850"/>
                <Integer name="Zone_Served" propertyIdentifier="851"
                readable="true" writable="true" description="MV; 1=Zone 1,
                2=Zone 2, 3=Zone 3, etc."/>
```

```
                <Integer name="Occupancy_Sensor_Typical"
                propertyIdentifier="852" readable="true" description="BI"/>
                <Integer name="Zone_Override_Switch" propertyIdentifier="853"
                readable="true" description="BI"/>
                <Integer name="Floor_Sweep_Input" propertyIdentifier="854"
                readable="true" description="BI"/>
                <Integer name="Photocell_Daylight_Sensor_Typical"
                propertyIdentifier="855" readable="true" description="BI"/>
                <Integer name="Zone_Schedule_Typical"
                propertyIdentifier="856" readable="true" writable="true"
                description="BV"/>
                <Integer name="Lighting_Zone_Contactor_Typical"
                propertyIdentifier="857" readable="true" writable="true"
                description="BO"/>
        </Object>
        <Object name="4.2-Exterior_Lighting">
                <ObjectIdentifier name="object_ID" value="144, 858"/>
        </Object>
        <Object name="4.3-Signage">
                <ObjectIdentifier name="object_ID" value="145, 859"/>
        </Object>
</Object>
<Object name="5-Utility_Metering">
        <ObjectIdentifier name="object_ID" value="146, 860"/>
        <Real name="kWh_Consumption" propertyIdentifier="861"
        readable="true" units="kilowatt-hours" description="AV"/>
        <Real name="kW_Real_Power" propertyIdentifier="865" readable="true"
        units="kilowatts" description="AV"/>
        <Real name="kVAR_Reactive_Power" propertyIdentifier="866"
        readable="true" units="kilovolt-ampere-reactive" description="AV"/>
        <Real name="kVA_Apparent_Power" propertyIdentifier="867"
        readable="true" units="kilovolt-ampere" description="AV"/>
        <Real name="Power_Factor" propertyIdentifier="868" readable="true"
        description="AV"/>
        <Real name="Voltage_LL" propertyIdentifier="869" readable="true"
        units="volts" description="AV"/>
        <Real name="Voltage_LN" propertyIdentifier="870" readable="true"
        units="volts" description="AV"/>
        <Real name="Average_Current" propertyIdentifier="871" readable="true"
        units="amps" description="AV"/>
        <Real name="kW_Real_Power_Phase_A" propertyIdentifier="872"
        readable="true" units="kilowatts" description="AV"/>
        <Real name="kW_Real_Power_Phase_B" propertyIdentifier="873"
        readable="true" units="kilowatts" description="AV"/>
        <Real name="kW_Real_Power_Phase_C" propertyIdentifier="874"
        readable="true" units="kilowatts" description="AV"/>
```

```
        <Real name="Power_Factor_Phase_A" propertyIdentifier="875"
        readable="true" description="AV"/>
        <Real name="Power_Factor_Phase_B" propertyIdentifier="876"
        readable="true" description="AV"/>
        <Real name="Power_Factor_Phase_C" propertyIdentifier="877"
        readable="true" description="AV"/>
        <Real name="Voltage_Phase_A_B" propertyIdentifier="878"
        readable="true" units="volts" description="AI"/>
        <Real name="Voltage_Phase_B_C" propertyIdentifier="879"
        readable="true" units="volts" description="AI"/>
        <Real name="Voltage_Phase_A_C" propertyIdentifier="880"
        readable="true" units="volts" description="AI"/>
        <Real name="Voltage_Phase_A_Neutral" propertyIdentifier="881"
        readable="true" units="volts" description="AI"/>
        <Real name="Voltage_Phase_B_Neutral" propertyIdentifier="882"
        readable="true" units="volts" description="AI"/>
        <Real name="Voltage_Phase_C_Neutral" propertyIdentifier="883"
        readable="true" units="volts" description="AI"/>
        <Real name="Current_Phase_A" propertyIdentifier="884"
        readable="true" units="amps" description="AI"/>
        <Real name="Current_Phase_B" propertyIdentifier="885"
        readable="true" units="amps" description="AI"/>
        <Real name="Current_Phase_C" propertyIdentifier="886"
        readable="true" units="amps" description="AI"/>
        <Real name="Natural_Gas_Consumption" propertyIdentifier="887"
        readable="true" units="therms" description="AI"/>
        <Real name="Water_Consumption" propertyIdentifier="888"
        readable="true" units="gallons" description="AI"/>
</Object>
<Object name="6-Monitoring">
        <ObjectIdentifier name="object_ID" value="147, 889"/>
        <Object name="6.1-General_IAQ">
                <ObjectIdentifier name="object_ID" value="148, 890"/>
                <Real name="Outdoor_Temperature" propertyIdentifier="891"
                readable="true" units="degrees-Fahrenheit" description="AI"/>
                <Real name="Outdoor_Humidity" propertyIdentifier="892"
                readable="true" units="percentage-of-relative-humidity"
                description="AI"/>
                <Real name="Space_Temperature_Typical"
                propertyIdentifier="893" readable="true" units="degrees-
                Fahrenheit" description="AI"/>
                <Real name="Space_Humidity_Typical" propertyIdentifier="894"
                readable="true" units="percentage-of-relative-humidity"
                description="AI"/>
                <Real name="Space_CO2_Typical" propertyIdentifier="895"
                readable="true" units="parts-per-million" description="AI"/>
```

```
        <Real name="Space_CO_Typical" propertyIdentifier="896"
        readable="true" units="parts-per-million" description="AI"/>
        <Real name="Space_IAQ_Typical" propertyIdentifier="897"
        readable="true" units="parts-per-million" description="AI"/>
</Object>
<Object name="6.2-Refrigerated_Casework">
        <ObjectIdentifier name="object_ID" value="149, 898"/>
        <Real name="Refrigerant_Coolant_Supply_Temperature"
        propertyIdentifier="899" readable="true" units="degrees-
        Fahrenheit" description="AI"/>
        <Real name="Refrigerant_Coolant_Return_Temperature"
        propertyIdentifier="900" readable="true" units="degrees-
        Fahrenheit" description="AI"/>
        <Real name="Case_Operating_Temperature"
        propertyIdentifier="901" readable="true" units="degrees-
        Fahrenheit" description="AI"/>
        <Real name="Control_Valve_Position" propertyIdentifier="902"
        readable="true" units="percentage" description="AO"/>
        <Integer name="Defrost_Status" propertyIdentifier="903"
        readable="true" description="BV; 0=Off, 1=On"/>
        <Integer name="Defrost_Termination" propertyIdentifier="904"
        readable="true" writable="true" description="BV; 0=Off, 1=On"/>
        <Integer name="Night_Curtain_Position" propertyIdentifier="905"
        readable="true" description="BV; 0=Closed, 1=Open"/>
        <Integer name="Evaporator_Fan_Command"
        propertyIdentifier="906" readable="true" description="BO"/>
        <Real name="Evaporator_Fan_Current" propertyIdentifier="907"
        readable="true" units="amps" description="AI"/>
        <Real name="Lighting_Current" propertyIdentifier="908"
        readable="true" units="amps" description="AI"/>
</Object>
<Object name="6.3-Refrigeration_Rack_Controller">
        <ObjectIdentifier name="object_ID" value="150, 909"/>
        <Integer name="Compressor_Status" propertyIdentifier="910"
        readable="true" description="BI; 0=Off, 1=On"/>
        <Integer name="Unloader_Status" propertyIdentifier="912"
        readable="true" description="BI; 0=Off, 1=On"/>
        <Integer name="Phase_Loss_A" propertyIdentifier="913"
        readable="true" description="BI"/>
        <Integer name="Phase_Loss_B" propertyIdentifier="914"
        readable="true" description="BI"/>
        <Integer name="Phase_Loss_C" propertyIdentifier="915"
        readable="true" description="BI"/>
        <Integer name="Oil_Fail_Switch" propertyIdentifier="916"
        readable="true" description="BI; 0=Off, 1=On"/>
```

```
                <Real name="Oil_Pressure" propertyIdentifier="917"
                readable="true" units="pounds-per-square-inch"
                description="AI"/>
                <Real name="Suction_Pressure" propertyIdentifier="918"
                readable="true" units="pounds-per-square-inch"
                description="AI"/>
                <Real name="Discharge_Pressure" propertyIdentifier="919"
                readable="true" units="pounds-per-square-inch"
                description="AI"/>
                <Real name="Drop_Leg_Pressure" propertyIdentifier="920"
                readable="true" units="pounds-per-square-inch"
                description="AI"/>
                <Real name="Suction_Temperature" propertyIdentifier="921"
                readable="true" units="degrees-Fahrenheit" description="AI"/>
                <Real name="Discharge_Temperature" propertyIdentifier="922"
                readable="true" units="degrees-Fahrenheit" description="AI"/>
                <Real name="Ambient_Temperature_At_Condenser"
                propertyIdentifier="923" readable="true" units="degrees-
                Fahrenheit" description="AI"/>
                <Integer name="Receiver_Float_Switch" propertyIdentifier="924"
                readable="true" description="BI; 0=Off, 1=On"/>
                <Real name="Receiver_Level" propertyIdentifier="925"
                readable="true" units="percentage" description="AI"/>
                <Real name="Heat_Reclaim_Temperature"
                propertyIdentifier="926" readable="true" units="degrees-
                Fahrenheit" description="AI"/>
                <Integer name="Refrigerant_Leak_Dectection"
                propertyIdentifier="927" readable="true" description="BI; 0=No
                Leak, 1=Leak"/>
                <Integer name="System_Alarm" propertyIdentifier="928"
                readable="true" description="BV; 0=No Alarm, 1=Alarm"/>
                <Integer name="Load_Shed" propertyIdentifier="929"
                readable="true" writable="true" description="BV"/>
        </Object>
</Object>
<Object name="7-Fire_Detection_Suppression_and_Alarm_System">
        <ObjectIdentifier name="object_ID" value="151, 930"/>
        <Integer name="General_Alarm_Typical" propertyIdentifier="931"
        readable="true" description="BV; 0=No Alarm, 1=Alarm"/>
        <Integer name="General_Trouble_Typical" propertyIdentifier="932"
        readable="true" description="BV; 0=No Trouble, 1=Trouble"/>
        <Integer name="Alarm_Zone" propertyIdentifier="933" readable="true"
        description="BV; 0=No Alarm, 1=Alarm"/>
        <Integer name="Trouble_Zone" propertyIdentifier="934" readable="true"
        description="BV; 0=No Trouble, 1=Trouble"/>
```

```
        <Integer name="Sprinkler_Preaction_Zone" propertyIdentifier="935"
        readable="true" description="BI; 0=Not Active, 1=Active"/>
        <Integer name="Water_Flow_Typical" propertyIdentifier="936"
        readable="true" description="BI; 0=No Flow, 1=Flow"/>
        <Integer name="Suppressant_Discharge_Zone" propertyIdentifier="937"
        readable="true" description="BI; 0=Not Active, 1=Active"/>
</Object>
<Object name="8-Building_Access_Security_Systems">
        <ObjectIdentifier name="object_ID" value="152, 938"/>
        <Integer name="Card_Reader_Status_Door" propertyIdentifier="939"
        readable="true" description="BV"/>
        <Integer name="Request_To_Exit_Door" propertyIdentifier="940"
        readable="true" description="BI"/>
        <Integer name="Lock_Power_Status_Door" propertyIdentifier="941"
        readable="true" description="BV"/>
        <Integer name="Door_Status" propertyIdentifier="942" readable="true"
        description="MI"/>
        <Integer name="Door_Lock_Unlock" propertyIdentifier="943"
        readable="true" writable="true" description="BO; 0=Door Unlocked,
        1=Door Locked"/>
        <Integer name="Door_Alarm_Indication_Typical"
        propertyIdentifier="944" readable="true" description="MV"/>
        <Integer name="Emergency_Fire_Input_Typical"
        propertyIdentifier="945" readable="true" description="BI"/>
        <Integer name="AC_Power_Status_By_Controller_Typical"
        propertyIdentifier="946" readable="true" description="BV; 0=No Power,
        1=Power"/>
        <Real name="Battery_Voltage_By_Controller_Typical"
        propertyIdentifier="947" readable="true" units="volts"
        description="AI"/>
        <Integer name="Motion_Intrusion_Zone_Typical"
        propertyIdentifier="948" readable="true" description="BI"/>
        <Integer name="Break_Glass_Intrusion_Zone_Typical"
        propertyIdentifier="949" readable="true" description="BI"/>
        <Integer name="Door_Contact_Intrusion_Zone_Typical"
        propertyIdentifier="950" readable="true" description="BI"/>
        <Integer name="General_Intrusion_Alarm_Typical"
        propertyIdentifier="951" readable="true" description="BV"/>
        <Integer name="Trouble_Zone" propertyIdentifier="952" readable="true"
        description="BV; 0=No Trouble, 1=Trouble"/>
</Object>
<Object name="9-On-Site_Electric_Generation_and_CHP">
        <ObjectIdentifier name="object_ID" value="153, 953"/>
        <Integer name="Control_Switch" propertyIdentifier="954"
        readable="true" description="BI"/>
```

<Integer name="State" propertyIdentifier="955" readable="true"
description="MV"/>
<Integer name="Fault_Present" propertyIdentifier="956" readable="true"
description="BV; 0=No Fault, 1=Fault"/>
<Real name="Fault_Code" propertyIdentifier="957" readable="true"
description="AV"/>
<Integer name="Fault_Type" propertyIdentifier="958" readable="true"
description="MV"/>
<Real name="percentage_kW" propertyIdentifier="960" readable="true"
units="percentage" description="AV"/>
<Real name="Total_kW" propertyIdentifier="961" readable="true"
units="kilowatts" description="AV"/>
<Real name="Frequency" propertyIdentifier="962" readable="true"
units="hertz" description="AI"/>
<Real name="Total_Power_Factor" propertyIdentifier="963"
readable="true" units="percentage" description="AV"/>
<Real name="Total_kVAR" propertyIdentifier="964" readable="true"
units="kilovolt-ampere-reactive" description="AV"/>
<Real name="Total_kVA" propertyIdentifier="965" readable="true"
units="kilovolt-ampere" description="AV"/>
<Real name="Voltage_Phase_A_B" propertyIdentifier="966"
readable="true" units="volts" description="AI"/>
<Real name="Voltage_Phase_B_C" propertyIdentifier="967"
readable="true" units="volts" description="AI"/>
<Real name="Voltage_Phase_A_C" propertyIdentifier="968"
readable="true" units="volts" description="AI"/>
<Real name="Voltage_Phase_A_Neutral" propertyIdentifier="969"
readable="true" units="volts" description="AI"/>
<Real name="Voltage_Phase_B_Neutral" propertyIdentifier="970"
readable="true" units="volts" description="AI"/>
<Real name="Voltage_Phase_C_Neutral" propertyIdentifier="971"
readable="true" units="volts" description="AI"/>
<Real name="Current_Phase_A" propertyIdentifier="972"
readable="true" units="amps" description="AI"/>
<Real name="Current_Phase_B" propertyIdentifier="973"
readable="true" units="amps" description="AI"/>
<Real name="Current_Phase_C" propertyIdentifier="974"
readable="true" units="amps" description="AI"/>
<Real name="percentage_Current_Phase_A" propertyIdentifier="975"
readable="true" units="percentage" description="AI"/>
<Real name="percentage_Current_Phase_B" propertyIdentifier="976"
readable="true" units="percentage" description="AI"/>
<Real name="percentage_Current_Phase_C" propertyIdentifier="977"
readable="true" units="percentage" description="AI"/>
<Real name="Battery_Voltage" propertyIdentifier="978" readable="true"
units="volts" description="AI"/>

```
            <Real name="Oil_Pressure" propertyIdentifier="979" readable="true"
            units="pounds-per-square-inch" description="AI"/>
            <Real name="Oil_Temperature" propertyIdentifier="980" readable="true"
            units="degrees-Fahrenheit" description="AI"/>
            <Real name="Coolant_Temperature" propertyIdentifier="981"
            readable="true" units="degrees-Fahrenheit" description="AI"/>
            <Real name="Miscellaneous_Temperature" propertyIdentifier="982"
            readable="true" units="degrees-Fahrenheit" description="AI"/>
            <Real name="Miscellaneous_Temperature" propertyIdentifier="983"
            readable="true" units="degrees-Fahrenheit" description="AI"/>
            <Real name="Fuel_Rate" propertyIdentifier="984" readable="true"
            units="gallons-per-minute" description="AI"/>
            <Real name="Engine_RPM" propertyIdentifier="985" readable="true"
            units="rotations-per-minute" description="AI"/>
            <Integer name="Engine_Starts" propertyIdentifier="986" readable="true"
            description="BV"/>
            <Real name="Engine_Run_Time" propertyIdentifier="987"
            readable="true" units="hours" description="AV"/>
            <Real name="Total_kWh" propertyIdentifier="988" readable="true"
            units="kilowatt-hours" description="AV"/>
            <Real name="Total_Fuel" propertyIdentifier="989" readable="true"
            units="gallons" description="AV"/>
        </Object>
</Definitions>

<!--END of Definitions-->
```

```
	<!--Completed EXAMPLES-->

	<Object type="0-Building_Information" name="S0001" displayName="RSF_NREL">
		<String name="Owner" value="National Renewable Energy Laboratory"/>
		<Real name="Bldg_No" value="1"/>
		<String name="City" value="Golden"/>
		<String name="State" value="Colorado"/>
		<String name="Time_Zone" value="Mountain Time"/>
		<String name="Climate_Zone" value="5B"/>
		<Real name="Longitude" value="-105.2205556"/>
		<Real name="Latitude" value="39.7555556"/>
		<String name="Bldg_Type" value="Office"/>
		<String name="Bldg_Subtype" value="Research Support"/>
		<String name="Bldg_Name" value="Building Research Support Facility 1"/>
		<Real name="Bldg_Area" value="350000"/>
		<String name="Special_Feat" value="labyrinth thermal storage; daylighting;
		precast concrete insulated panels; radiant heating and cooling; transpired solar
		collectors; underfloor ventilation; on-site solar energy system"/>
	</Object>
	<Object type="0.1-Zone_Information">
			<Object name="Zone">
				<Integer name="Zone_ID_Number" value="1"/>
				<Real name="Zone_Area" value="1200"/>
				<String name="Zone_Location" value="MAIN ENTRANCE
				LOBBY ON EAST SIDE"/>
			</Object>
	</Object>
	<!--Example Control and Monitoring Point Information:  Mixed Air Temperature for
	AHU number 2 for the Research Support Facility 1-->
	<Object type="3-Packaged_HVAC">
		<Object name="3.1-AHU">
			<String name="Tag_Name" value="S0001_AHU_2"/>
			<Integer name="Zone_Served" value="1"/>
			<Real name="Mixed_Air_Temperature" value="66.5">
				<Extensions>
					<String name="Tag_Name" value="S0001_AHU_2_MIX-
					AIR-TEMP_AI"/>
					<String name="Measurement_Location"
					value="DIRECTLY DOWNSTREAM OF AHU FINAL
					FILTER AFTER MIXING BOX"/>
				</Extensions>
			</Real>
		</Object>
	</Object>
</CSML>
```

Appendix D Example Enhancement to oBIX

```
<?xml version="1.0" encoding="UTF-8"?>
<abstime xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="file:obix.xsd">

<!--Referenced Site:  http://obix.demo.nrel.gov/obix/siteinformation/-->

<!--Contracts (Definitions)-->

<obj href="/SiteInformation">
        <str name="owner" displayName="Owner" writable="true"/>
        <str name="buildingid" displayName="Building ID" writable="true"/>
        <str name="city" displayName="City" writable="true"/>
        <str name="state" displayName="State" writable="true"/>
        <str name="timezone" displayName="Time Zone" writable="true"/>
        <str name="climatezone" displayName="Climate Zone" writable="true"/>
        <real name="latitude" displayName="Latitude" writable="true"/>
        <real name="longitude" displayName="Longitude" writable="true"/>
        <str name="buildingtype" displayName="Building Type" writable="true"/>
        <str name="buildingsubtype" displayName="Building Subtype" writable="true"/>
        <str name="buildingname" displayName="Building Name" writable="true"/>
        <real name="buildingarea" displayName="Building Area" writable="true"/>
        <str name="buildingfeatures" displayName="Features" writable="true"/>
</obj>

<obj href="/ZoneInformation">
        <obj name="zone" href="ZoneInformation/zone" displayName="Zone">
                <int name="zoneidnumber" displayName="Zone ID Number" writable="true"/>
                <real name="zonearea" displayName="Zone Area" writable="true"/>
                <str name="zonelocation" displayName="Zone Location" writable="true"/>
        </obj>
</obj>

<obj href="/chiller" is="/refrigerationequipment">
        <str name="Tag_Name" writable="true" displayName="Tag Name" Display="Standard
        Point Name"/>
<real name="Active_Setpoint" units="obix:units/fahrenheit" min="-50" max="200"
displayName="Active Setpoint" Display="AV"/><int name="Chiller_Enable" writable="true"
displayName="Chiller Enable" Display="BI; 0=Off, 1=On"/></obj>


<obj href="/fluidcooler" is="/refrigerationequipment">
        <str name="Tag_Name" writable="true" displayName="Tag Name" Display="Standard
        Point Name"/>
```

```
<real name="Glycol_Supply_Temperature" units="obix:units/fahrenheit" displayName="Glycol
Supply Temperature" Display="AI"/><int name="Dampers_Open_Closed"
displayName="Dampers Open-Closed" Display="BI; 0=Closed, 1=Open"/></obj>

<obj href="/boiler" is="/heatingequipment">
        <str name="Tag_Name" writable="true" displayName="Tag Name" Display="Standard
        Point Name"/>
<real name="Burner_Differential" writable="true" units="obix:units/fahrenheit"
displayName="Burner Differential" Display="AV"/><int name="Boost_Mode" writable="true"
displayName="Boost Mode" Display="MV; 1=Off, 2=Vari Boost, 3=Vari Boost and
ESD"/></obj>

<obj href="/AHU" is="/packagedHVAC">
        <str name="Tag_Name" writable="true" displayName="Tag Name" Display="Standard
        Point Name"/>
        <int name="Zone_Served" writable="true" displayName="Zone Served" Display="MV;
        1=Zone 1, 2=Zone 2, 3=Zone 3, etc."/><real name="Cooling_Capacity"
        units="obix:units/percentage" displayName="Cooling Capacity" Display="AV"/><real
        name="Mixed_Air_Temperature" units="obix:units/fahrenheit" displayName="Mixed
        Air Temperature" Display="AI">
                <str name="Tag_Name" writable="true" displayName="Tag Name"
                Display="Standard Point Name"/>
                <str name="Measurement_Location" writable="true"
                displayName="Measurement Location" Display="Physical location of
                temperature sensor"/>
        </real>
</obj>

<obj href="/RTU" is="/packagedHVAC">
        <str name="Tag_Name" writable="true" displayName="Tag Name" Display="Standard
        Point Name"/>
        <int name="Zone_Served" writable="true" displayName="Zone Served" Display="MV;
        1=Zone 1, 2=Zone 2, 3=Zone 3, etc."/><real name="Cooling_Capacity"
        units="obix:units/percentage" displayName="Cooling Capacity" Display="AV"/>
</obj>

<obj href="/interiorlighting" is="/lighting">
        <int name="Zone_Served" writable="true" displayName="Zone Served" Display="MV;
        1=Zone 1, 2=Zone 2, 3=Zone 3, etc."/>
</obj>

<obj href="/utilitymetering">
<real name="kWh_Consumption" units="obix:units/kWh" displayName="kWh Consumption"
Display="AV"/><real name="kW_Real_Power" units="obix:units/kW" displayName="Real
Power (kW)" Display="AV"/></obj>
```

```
<obj href="/generalIAQ" is="/monitoring">
<real name="Outdoor_Temperature" units="obix:units/fahrenheit" displayName="Outdoor
Temperature" Display="AI"/></obj>

<obj href="/refrigeratedcasework" is="/monitoring">
<real name="Refrigerant_Coolant_Supply_Temperature" units="obix:units/fahrenheit"
displayName="Refrigerant Coolant Supply Temperature" Display="AI"/><int
name="Defrost_Status" displayName="Defrost Status" Display="BV; 0=Off, 1=On"/></obj>

<obj href="/refrigerationrackcontroller" is="/monitoring">
<int name="Compressor_Status" displayName="Compressor Status" Display="BI; 0=Off,
1=On"/><real name="Oil_Pressure" units="obix:units/psi" displayName="Oil Pressure"
Display="AI"/></obj>

<obj href="/firedetectionsuppressionandalarmsystem">
<int name="General_Alarm_Typical" displayName="General Alarm" Display="BV; 0=No
Alarm, 1=Alarm"/></obj>

<obj href="/buildingaccesssecuritysystems">
        <int name="Card_Reader_Status_Door" displayName="Card Reader Status at Door"
        Display="BV"/>
        <real name="Battery_Voltage_By_Controller_Typical" units="obix:units/volt"
        displayName="Battery Voltage by Controller" Display="AI"/>
</obj>

<obj href="/Onsiteelectricgenerationandchp">
        <int name="Control_Switch" displayName="Control Switch" Display="BI"/>
        <real name="Fault_Code" displayName="Fault Code" Display="AV"/>
</obj>

<!--END of Contracts (Definitions)-->
```

```
<!--Completed EXAMPLES-->

<obj href="/ResearchSupportFacility1" is="/SiteInformation">
        <str name="owner" val="National Renewable Energy Laboratory"/>
        <str name="buildingid" val="1"/>
        <str name="city" val="Golden"/>
        <str name="state" val="Colorado"/>
        <str name="timezone" val="MST"/>
        <str name="climatezone" val="5B"/>
        <real name="latitude" val="39.7555556"/>
         <real name="longitude" val="-105.2205556"/>
        <str name="buildingtype" val="Office"/>
        <str name="buildingsubtype" val="ResearchSupport"/>
        <str name="buildingname" val="Research Support Facility 1"/>
        <real name="buildingarea" val="350000"/>
        <str name="buildingfeatures" val="labyrinth thermal storage; daylighting; precast
        concrete insulated panels; radiant heating and cooling; transpired solar collectors;
        underfloor ventilation; on-site solar energy system"/>
</obj>

<obj href="/Zones" is="/ZoneInformation">
        <obj name="zone" href="zone/">
                <int name="zoneidnumber" val="1"/>
                <real name="zonearea" val="1200"/>
                 <str name="zonelocation" val="MAIN ENTRANCE LOBBY ON EAST
                SIDE"/>
        </obj>
</obj>

<!--Example Control and Monitoring Point Information:  Mixed Air Temperature for AHU
number 2 for the Research Support Facility 1-->

<obj href="/AHU-2" is="/AHU">
        <str name=”Tag_Name”  val=”S0001_AHU_2”/>
        <int name=”Zone_Served” val=”1”/>
        <real name="Mixed_Air_Temperature" val="66.5">
                <str name="Tag_Name" val="S0001_AHU_2_MIX-AIR-TEMP_AI"/>
                 <str name="Measurement_Location" val="DIRECTLY DOWNSTREAM OF
                AHU FINAL FILTER AFTER MIXING BOX"/>
        </real>
</obj>
```