

**Operations, Maintenance and Monitoring Plan**

**Template**

**Version 1.0**

# Introduction

This operations, maintenance and monitoring (OM&M) plan template provides a framework and outline for creating a project specific OM&M plan. The OM&M plan can be used directly to describe the OM&M process to support [Investor Confidence Project](http://www.eeperformance.org/) (ICP) compliant projects. Some sections will require the user to customize the language to fit owner requirements or project specific requirements.

This OM&M plan can be used as a stand-alone document, or included as an appendix to the commissioning (Operational Performance Verification) plan.

# General Building Information

|  |  |
| --- | --- |
| **Project Name** |  |
| **Project Address** |  |
| **Building Type** |  |
| **Square Footage** |  |
| **Building Description** |  |
| **Owner Agency** |  |

1. **Overview**

## Purpose of the Operations, Maintenance and Monitoring Plan

Operations, Maintenance, and Monitoring (OM&M) involves the practice of systematic monitoring of energy system performance and instituting corrective actions to ensure “in specification” energy performance over time.

Ongoing OM&M can be critical to the persistence of energy savings and is designed to:

* Prevent building “drift” and provide sustained energy savings through long-term tracking and trending procedures.
* Give end-users the ability to make informed, effective energy decisions.
* Allow for continuous fine-tuning of measures to ensure optimal operation.
* Protect investments in energy efficiency.

This OM&M plan describes the performance metrics identified for this project, the actions that need to be performed on an ongoing basis to ensure these metrics are being maintained, and the responsibilities of parties involved with the maintenance of energy performance.

# Operations, Maintenance and Monitoring Team Information

*Table 1: OM&M Team*

| **Function** | **Name** | **Contact Info** |
| --- | --- | --- |
| **Owner** |  |  |
| **Project Manager** |  |  |
| **Facility Manager** |  |  |
| **Facility Staff** |  |  |
| **Mechanical Engineer** |  |  |
| **Electrical Engineer** |  |  |
| **Controls Engineer** |  |  |
| **Maintenance Manager** |  |  |
|  |  |  |

# Roles and Responsibilities

##  General Management Plan

In general, the Facility Manager (or INSERT POSITION OR NAME of person assigned to manage the OM&M efforts) will coordinate the OM&M activities, with support from the Project Development Team and the Facility Staff. All members will work together to fulfill contracted responsibilities and meet the objectives of this OM&M Plan.

A strong OM&M management framework needs to illustrate how automated or manual tools or processes are to be used, and provide the guidance, training and support necessary to extract, interpret and act on the data and analysis results. This management framework should dedicate resources to the OM&M effort by establishing roles and responsibilities and assigning them to the appropriate team member. The framework must set quantifiable performance goals, determine accountability, and define the performance tracking methods and metrics.

## Descriptions of Roles

General descriptions of the OM&M roles are as follows:

OM&M Manager: Coordinates the OM&M process, develops building metrics once commissioning is complete, and oversees ongoing maintenance, monitoring, and proper response to performance issues.

Project Manager: Supports OM&M efforts during project development and construction..

Facility Manager: Coordinates maintenance staff participation in OM&M activities.

Facility Staff: Perform assigned duties related to OM&M efforts, including building monitoring and inspections, preventative maintenance, as well as resolution and documentation of issues as they arise. Attend training.

Subs: Demonstrate correct system performance.

Manufacturers: Equipment manufacturers and vendors provide documentation to facilitate the OM&M work and provide assistance with issue resolution..

## Management Plan and Protocols

The following protocols will be used on this project.

*Table 2: OM&M Protocols*

| **Issue** | **Protocol** |
| --- | --- |
| Observed energy or operational performance not meeting established metrics. | If reason for the issue is known, resolve issue, document in the issues log, and report to OM&M Manager the issue and resolution. |
|  | If reason for the issue is not known or cannot be easily resolved, document in the issues log, and report to OM&M Manager for further action. |
| Unknown source of energy or operational performance issue. | OM&M Manager determines how the issue should be investigated and engages appropriate personnel, including controls contractor, mechanical contractor, recommissioning agent, or in-house staff.  |
| Resolved energy or operational performance issue. | Document issue and resolution in the issues log. Revise Systems or Operator’s Manual if necessary. |
| Overall building energy or operational performance not meeting established performance metrics. | OM&M Manager determines how the issue should be investigated and engages appropriate personnel, including controls contractor, mechanical contractor, recommissioning agent, or in-house staff.  |
| Issue resolution. | OM&M Manager determines how to verify that an issue has been resolved, through follow up observations and / or analysis, and assigns responsibilities to verify adequate resolution of the issue. |

# Operations, Maintenance and Monitoring Process

This section sequentially details the OM&M process by OM&M task or activity.

## Definition of Metrics

Once installation and commissioning is complete, define energy and operational performance metrics that will provide adequate representation of system operation and energy performance. If appropriate, develop the monitoring points, interval and duration, and process for monitoring system operation for issue detection and analysis.

Note that these performance metrics often overlap with, and can be coordinated with, metrics used for an Option A and / or Option B approach to measurement and verification.

## Development of OM&M Activities

Once energy and operational performance metrics have been defined, develop an ongoing OM&M approach. The approach selected should be appropriate given the complexity of the measures, and the energy savings associated with each measure or the project as a whole (see the ICP Project Development Specification, section 8.2.1 for more information regarding selection of an appropriate ongoing OM&M method).

Common and acceptable approaches to ongoing OM&M include:

* Periodic inspection of measures and equipment
* Manual observation and analysis of building automation data, or facilitation of data collection and analysis using an energy information system (EIS)
* Automated monitoring and analysis of data using a fault detection and diagnostic system
* Periodic recommissioning of specific systems (targeted recommissioning) or the building as a whole (typically every three to five years).

 The overall OM&M process should involve the following key components:

* *Data collection and performance tracking* - HVAC, lighting, and other energy-consuming equipment performance data are tracked along with energy consumption data.
* *Detection of performance issues* - use of automated tools to perform real-time analysis and identification of issues (fault detection and diagnostics), or the use of tools to present information in a way that facilitates identification of problems manually.
* *Diagnosing issues and identifying solutions* - while automated tools can help facilitate issue diagnostics and the development of solutions, the skill, knowledge and training of building operators, supplemented by the assistance of service contractors or consultants, are critical components in diagnosing issues successfully and identifying appropriate solutions.
* *Resolve issues and verify results* - issues should be resolved in a manner that addresses indoor conditions and occupant comfort and also considers and optimizes energy performance.

## Development of an Owner’s Manual

Existing Owner’s Manuals need to be updated, or if none exists they need to be created, that describes the proper operation and management of any new systems or equipment. The Operator’s Manual should include (as appropriate): photographs; reduced-size as-built drawings and schematics; list of major equipment; invoices for major equipment purchases and repairs; balance reports; equipment locations; control system logic; O&M instructions; and training materials.

The Operator’s Manual prepared by the contractors for the owner’s maintenance personnel are reviewed for completeness. The contractors are encouraged to submit O&M manuals at the earliest possible date. Materials may be added, or requested from the contractors, to stress and enhance the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. A database of preventative maintenance information may also be created from the materials in the O&M manuals.

## OM&M Training

Proper operation, maintenance practices, and monitoring are tasks critical to the ongoing energy-efficient performance of the building’s systems. In conjunction with the training associated with the OPV efforts, a well-developed training plan should be created specific to the OM&M tasks. The OM&M training sessions should be video recorded and supported by comprehensive and useful building documentation. The training should, at a minimum, cover the following OM&M components:

* *Management structure* - Development and structure of the management, responsibility and reporting structure and its components, including operations, maintenance, engineering, training, and administration.
* *Performance metrics* - Development and analysis methods to evaluate maintenance, operational and energy performance of the building’s systems.
* *ECM maintenance* - Responsibility for the operation, maintenance, repair and replacement of each ECM.
* *Reporting* - Reporting requirements for O&M activities and their frequency, including submission of ECM-specific O&M checklists.
* *Manuals* - Review of the Operator’s/Systems Manual(s).
* *Automated management* - Integration of the ECMs into a computerized maintenance management system.
* *Issue resolution* - Discussion of potential issues that can adversely affect operation or savings persistence, and a review of the process to address or report identified issues.

## Development of a Predictive Maintenance Plan

A properly designed O&M program, and associated training, must include predictive maintenance best practices. Predictive maintenance attempts to detect the onset of a degradation mechanism with the goal of correcting that degradation prior to significant deterioration in the component or equipment. Training as it is applied to predictive maintenance is particularly important, as it is continuously becoming more sophisticated and technology-driven.

Predictive maintenance can incorporate many different best practices, and all of the following should be considered for inclusion in the O&M management structure, with associated training: vibration monitoring/analysis, lubricant and fuel analysis, wear particle analysis, bearing and temperature analysis, performance monitoring, ultrasonic noise detection, ultrasonic flow, infrared thermography, non-destructive testing (thickness), visual inspection, insulation resistance, motor current signature analysis, motor circuit analysis, polarization index, and electrical monitoring.