THE CMVP BODY OF KNOWLEDGE AND STUDY GUIDE

Preparation for the CMVP Certification Exam

The CMVP Certification Exam is a four-hour open book exam. The examination questions are based on the Body of Knowledge listed below. Because of diversity of background and experience of Measurement & Verification Professionals, the examination has 12 different subject sections, all of which are included in the exam. You must bring a hand calculator to the exam as the CMVP exam does not allow computers, tablets, or cell phones to be used during the test.

It is highly recommended that you review the complete Study Guide and answer the Exam Review questions included in the Study Guide to determine your readiness for the exam.

The CMVP Examination contains the following mandatory subjects:

Body of Knowledge	Percent of Exam
Basis for Adjustments	7 – 11%
Option A: Retrofit Isolation	3 – 4%
Option B: Retrofit Isolation	4 – 5%
Option C: Whole Facility	4 – 5%
Option D: Calibrated Simulation	7 – 10%
M&V Plans	5 – 6%
Savings Reports	8 – 11%
Adherence	5 – 6%
Metering and Considerations	12 – 16%
IPMVP Options	7 – 10%
Modeling, Sampling and Uncertainty	10 – 14%
Foundational Principles	12 – 16%

BODY OF KNOWLEDGE: STUDY GUIDE TOPICS & REFERENCES

The following is a list of the subjects for the CMVP exam. Each subject covers a number of topics. The primary references are IPMVP Core Concepts, IPMVP Uncertainty Assessment Guide, and M&V Issues and Examples.

The study guide will not lead you to answers to all of the questions, but it will certainly lead you to a very large number of correct answers. A person with the necessary experience who reviews the study guide should not have any problem passing the exam. The exam will: be open book, last four hours, and have 107 questions to answer. There are 12 sections listed below from which questions mainly are drawn.

I. BASIS FOR ADJUSTMENTS

Identification of Key Parameters
Applicability of Routine Adjustments
Applicability of Non-Routine Adjustments

II. OPTION A: RETROFIT ISOLATION

Option A, Appropriate Applications
Identifying the Key Parameter for Measurement
Identifying Parameters for Estimation

III. OPTION B: RETROFIT ISOLATION

Option B Appropriate Applications:
Identifying and Measuring Option B Parameters

IV. OPTION C: WHOLE FACILITY

Option C Appropriate Applications:
Identifying and Measuring Option C Parameters:
Identifying Static Factors

V. OPTION D: CALIBRATED SIMULATION

Minimum Reporting Requirements and Acceptance Criteria
Option D: Appropriate Applications:

VI. M&V PLANS

M&V Plan Contents & Requirements
Methods for Developing Adherent M&V Plans

VII. SAVINGS REPORTS

Tariff Calculations
Rounding

VIII. ADHERENCE

M&V Plan and Adherence
IPMVP-Adherent Process

IX. METERING AND CONSIDERATIONS

Methods of Measuring – Electrical / Thermal / Flow
Planning
Accuracy
Systems

X. IPMVP OPTIONS

Industrial Applications
Commercial / Residential Applications

XI. MODELING, SAMPLING, AND UNCERTAINTY

Modeling
Sampling
Uncertainty

XII. FOUNDATIONAL PRINCIPLES

Framework
Transparency
Accuracy
Relevance
Conservativeness

EXAM REVIEW QUESTIONS (Sample Only)

Some of these review questions may be more complex or difficult than the exam but will be good practice problems.

1. The savings for a Performance Contract on a University Campus are approximately 8.5% of the utility meter's annual billing. The suggested M&V options for a best-fit application would be.
   (A) Options A, B or C
   (B) Options B, C or D
   (C) Options A, B or D
   (D) Option C

2. As the population size to be measured increases, the sampling size for a particular confidence level and precision increases exponentially and drives the cost higher. True or false.
   (A) True
   (B) False

3. Option C is best used for ECMs in Performance Contracting where
   (A) M&V costs need to be minimized.
   (B) Energy savings from the ECMs represent a large percentage of the building's total energy costs.
   (C) There is a large interaction between the selected ECMs/
   (D) Both (B) and (C).

4. The M&V Plan should be written
   (A) After the project is completed as all the facts are now available.
   (B) During the project implementation, but before final completion.
   (C) Prior to the start of any work on the ECM.
   (D) Only if required by a lender.

5. A statistical model is considered good if i) R^2 is closer to unity and ii) CV is closer to zero. Which of the following statements are correct:
   (A) Both (i) and (ii) are correct
   (B) Both (i) and (ii) are incorrect
   (C) (i) is correct and (ii) is incorrect
   (D) (ii) is correct and (i) is incorrect

6. Normalized savings are calculated:
   (A) In the case of missing utility data
   (B) Only using Option A
   (C) By adjusting both the baseline and reporting period to a reference data set
   (D) Only in government contracts

7. Non-routine baseline adjustments should be developed and reviewed by all parties to an energy performance contract:

   (A) monthly
   (B) as their need arises
   (C) at least annually
   (D) b) and c)

8. The baseline power requirement of a circuit is measured to be 100 kW, with a meter rated at ±10% or reading. After retrofit the same meter measures power as 80 kW.

   What is the uncertainty in the demand reduction?

   (A) 10%
   (B) 14%
   (C) 20%
   (D) 64%

CMVP EXAM QUESTIONS KEY

Question	Answer
1	(C)
2	(B)
3	(D)
4	(C)
5	(A)
6	(C)
7	(D)
8	(D)

RECOMMENDED REFERENCE MATERIALS FOR CMVP EXAM PREP:

Available at: www.evo-world.org

IPMVP Core Concepts

In 2014, EVO published the IPMVP Core Concepts. In 2016, EVO published an updated version, the 2016 IPMVP Core Concepts including Application Guides covering additional subject matter from Volume 1.

Currently, the IPMVP® 2016 Core Concepts publication is the most recent version of the IPMVP and the version used in conjunction with the CMVP Program. A correction addendum was made to this document in 2018 and can be found as 2016 IPMVP Core Concepts – Addendum 1 – 2018.

Uncertainty Assessment Guide

This is the latest application guide Uncertainty Assessment for IPMVP 2018. This document is a revised and expanded version of the Statistics and Uncertainty for IPMVP application guide originally published in 2014 which described methods to manage and quantify uncertainty due to random and systematic errors that result from quality of the measurement equipment, the measurement techniques, and the design sampling procedure. The new guide includes examples for each of the four IPMVP options.

This Guide was updated in July 2019.

M&V Issues and Examples to IPMVP 2019

The application guide, Measurement & Verification – Issues and Examples, IPMVP 2019, presents a variety of project types and discusses the key M&V design issues arising from the described situations. More specifically, it illustrates fifteen common M&V issues that may arise during M&V efforts and how they can be addressed, as well as eleven specific examples of M&V applications for various project types and M&V options. Each example shows just one IPMVP adherent M&V design, though there are numerous possible designs for any projects. This guide also addresses issues common to M&V projects.

Introduction to Statistics for M&V (ISM&V)

If you feel you need a refresher for basic statistics this is a good option. This online course is a review of basic statistical concepts consisting of 6 lessons with a quiz that follows each lesson. This course is included with your CMVP Training Program registration or can be purchased from the EVO website for $25.00. If you are unsure if this course is right for you, there is a quick survey you can take free of charge prior to purchase.