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 IPMVP Volume 1, IPMVP Core Concepts, and IPMVP Statistics and Uncertainty.

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. Normalization of energy data is used:
   (A) To perform weather correction
   (B) In case of missing utility data

(C) To perform baseline adjustment
(D) All of the above

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	(A)
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 will publish an updated version, the 2016 IPMVP Core Concepts including Application Guides covering additional subject matter from Volume 1.

Currently, the IPMVP® 2014 Core Concepts publication is the most recent version of the IPMVP and is taken from the 2012 IPMVP Volume I. It does not include all of the applications from Volume I.

2012 IPMVP Volume 1

Volume I - Concepts and Options for Determining Energy and Water Savings, 2012

Volume I defines basic terminology used in the M&V field. It defines general procedures to achieve reliable and cost-effective determination of savings. Verification of actual savings is done relative to a M&V Plan for each project. This volume is written for general application in measuring and verifying the performance of projects which improve energy or water efficiency in buildings and industrial plants. This volume includes examples to assist in understanding IPMVP.

IPMVP Statistics and Uncertainty

This resource describes 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.