

QUESTIONNAIRE REPORT SHEET

iPQ1CMVP.V2.1



B E Y O N D

S M A R T C I T I E S

AEE'S CERTIFIED MEASUREMENT & VERIFICATION PROFESSIONAL
CMVP EXAM QUESTION BANK

iPQ.No	Correct Answer	Points	Explanation
1CMVP001	2	8	<p>Answer = 2 1977</p> <p>Explanation:</p> <p>The National Energy Policy and Conservation Act of 1978 defines what a "energy manager" is. Albert Thumann established the AEE, a non-profit professional society. The US Department of Energy (DOE) and governments dealt with the oil crisis of the 1970s in the same year. President in charge Al Thumann</p>
1CMVP002	1	8	<p>Answer = 1 105</p> <p>Explanation:</p> <p>The Association of Energy Engineers is trusted by over 28,000 professionals in 105 countries to look out for the interests of those who work in the energy industry and to encourage action for sustainable development.</p>
1CMVP003	1	8	<p>Answer = 1</p> <p>Accredited meteorologist.</p>
1CMVP004	4	8	<p>Answer = 4</p> <p>All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Meter installation, calibration, and maintenance • Data gathering and screening, • Development of a computation method and acceptable estimates,
1CMVP005	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Direct project expense • Additional operations and maintenance costs • Training of personnel
1CMVP006	1	8	<p>Answer = 1 True</p> <p>Explanation:</p> <p>ESCOs typically refer to companies that offer comprehensive energy project services, encompassing various stages such as assessment, design, construction or installation, as well as providing engineering and project management services, and facilitating land financing.</p>

iPQ.No	Correct Answer	Points	Explanation
1CMVP007	4	8	<p>Answer = 4 All of the above Explanation:</p> <ul style="list-style-type: none"> • Increase energy savings • Document financial transactions • Enhance financing for efficiency projects
1CMVP008	2	17.4	<p>Answer = 2 Continuous metering of the entire chiller (option B) Explanation: This option is based on short-term, periodic, or continuous measurements of baseline and post-retrofit energy use (or proxies of energy use) taken at the component or system level. Savings are determined from analysis of baseline and reporting-period energy use or proxies of energy use</p>
1CMVP009	4	8	<p>Answer = 4 Energy simulation of the building Explanation: The purpose of performing measurement and verification</p> <ul style="list-style-type: none"> • Validate energy savings. • Validate cost savings. • Validate equipment performance.
1CMVP010	3	8	<p>Answer = 3 Both Explanation:</p> <ul style="list-style-type: none"> • Monitoring and targeting are not integrated with financial accounting. • The output is not given to users or top managers in a way that is easy for them to understand and use.
1CMVP011	4	8	<p>Answer = 4 Consider the interdependencies between projects and the costs of major equipment. Explanation:</p> <ul style="list-style-type: none"> • It evaluates all energy-using systems to provide a complete energy project plan for a building. • Energy savings and prices. • Considers how projects affect each other, how much energy major equipment needs
1CMVP012	1	8	<p>Answer = 1 True Explanation:</p> <p>True, "Measurement and Verification" (M&V) is the process of planning, measuring, collecting and analyzing data for the purpose of verifying and reporting energy savings within an individual facility resulting from the implementation of energy conservation measures (ECMs).</p>

iPQ.No	Correct Answer	Points	Explanation
1CMVP013	2	8	<p>Answer = 2 2</p> <p>Explanation: Evo and AEE</p>
1CMVP014	1	8	<p>Answer = 1 Efficiency Valuation Organization</p> <p>Explanation: Efficiency Valuation Organization</p>
1CMVP015	1	8	<p>Answer = 1 Uganda</p> <p>Explanation: Uganda</p>
1CMVP016	1	8	<p>Answer = 1 True</p> <p>Explanation: The International Performance Measurement and Verification Protocol (IPMVP) has gained significant global recognition and is currently the prevailing protocol utilized for Monitoring and Verification (M&V) purposes. It serves as the fundamental framework for the majority of international M&V initiatives.</p>
1CMVP017	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • IPMVP was originally developed in 1996 as the North American Energy Measurement and Verification Protocol (renamed IPMVP in 1997) and has undergone several modifications and improvements. • Efficiency Valuation Organization² (EVO), a separate organisation, is now in charge of its development and management. EVO makes tools and trains people to measure the results of EE projects and programmes. • A coalition of researchers and practitioners in the U.S. developed the International Performance Measurement and Verification Protocol (IPMVP) to give practitioners a flexible framework of M&V options to create the best M&V plans for their projects.
1CMVP018	4	8	<p>Answer = 4 EVO offers financial assistance and management</p> <p>Explanation:</p> <ul style="list-style-type: none"> • It was developed by a group of experts with substantial experience in EE programs. • It was designed as a high-level tool to give users maximum flexibility while meeting transparency and efficacy standards. • EVO provides technical support and management.

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1CMVP019	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • It has a structure in place to modify and improve the protocol. • Associated methodologies as new requirements emerge.
1CMVP020	4	8	<p>Answer = 4 Energy users seeking ISO 14001 certification.</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Utility demand-side management program designers, managers, and evaluators. • Energy users implementing EEMs and wanting to quantify savings. • Energy users seeking ISO 50001 certification.
1CMVP021	1	8	<p>Answer = 1 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Energy efficiency projects mitigate risk with M&V Plans. • The parties can manage project risks and meet performance goals with a well-crafted M&V Plan. • Stakeholders must understand financial, operational, and performance-related parameter variations to balance risks.
1CMVP022	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The energy-influencing factors (i.e., independent variables and static factors) that affect energy consumption and demand are not excessively difficult or expensive to monitor. • There is no need to directly reconcile savings reports with changes and payments to energy suppliers.
1CMVP023	1	8	<p>Answer = 1 True</p> <p>Explanation: The concept of uncertainty in a reported savings value is appropriately conveyed as a range within which the true value is expected to lie, accompanied by a certain level of confidence.</p>
1CMVP024	1	17.4	<p>Answer = 1 \$0.04000 per kWh.</p> <p>Explanation: A utility rate is an example of an exact number. If a local power company charges \$0.04 per kWh and Company X uses 725,691.0 kWh in one month, the utility bill would be \$43,541.46, not \$40,000, according to the rounding rule. This is due to the fact that the utility rate is precise; it can be represented as \$0.04000 per kWh.</p>

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1CMVP025	1	17.4	<p>Answer = 1 Rs.45,00,000 & Rs.75,000</p> <p>Explanation:</p> <p>Assuming simple interest:</p> <p>Total repayment = $30,00,000 + (10/100 \times 30,00,000 \times 5) = 45,00,000$ Monthly repayment = $45,00,000 / (5 \times 12) = \text{Rs. } 75,000$</p>
1CMVP026	1	8	<p>Answer = 1 True</p> <p>Explanation: In order to enhance the accuracy of determining savings, it is imperative to employ methodologies that enable the quantification, evaluation, and mitigation of various sources of errors and uncertainties. These methods should be incorporated into the development of the Measurement and Verification (M&V) Plan.</p>
1CMVP027	4	8	<p>Answer = 4 The process of monitoring occurs prior to the measurement of savings.</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The M in M&V stands for: Not Monitoring • Monitoring is an activity which takes place after the Measurement of savings. • Monitoring is the evaluation of the savings and taking any necessary action
1CMVP028	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The complexity of factors driving energy use • The requirement for precision • The amount of equipment having its performance evaluated
1CMVP029	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Number of independent variables to be monitored • Frequency of measurement and reporting • Length of the baseline and reporting periods

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1CMVP030	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The project's internal supervisor (client) will send information about project static factor changes for the CMVP-accredited professional to analyse in order to ascertain the direct and indirect effects on anticipated savings. • This professional will then be able to make the necessary adjustments for the reference year to determine the real savings of the measures implemented. • Independent variables: All meteorological data will come from (government weather station) a,more specifically
1CMVP031	4	8	<p>Answer = 4 Demand costs and service costs</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Detailed rate structure • Demand charges and energy charges • Other related energy billing charges (power factor correction)
1CMVP032	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • IPMVP-compliant M&V must assess uncertainty in every savings calculation. • Based on M&V modelling, instrumentation, and sampling, each project must perform an uncertainty assessment.
1CMVP033	4	8	<p>Answer = 4 Utilization of Temporary Savings</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Risk tolerance • Requirement for accuracy • The use of Guaranteed Savings
1CMVP034	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The proposed approach entails the development of a concise plan for short-term measurement and verification (M&V) activities, with a deliberate selection of a methodology and scope that is anticipated to remain stable throughout the process. • To optimize the measurement and verification (M&V) process, it is recommended to either implement permanent metering systems or utilize existing metering infrastructure as the foundation for M&V design. Although an additional initial investment may be necessary, it can lead to significantly reduced ongoing monitoring and verification expenses.

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1CMVP035	1	17.4	<p>Answer = 1 293 kWh Explanation:</p> <p>Baseline energy use(kWh) = $50 \times 90 \times 65 / 1000 = 293$ kWh</p>
1CMVP036	3	8	<p>Answer = 3 Both Explanation:</p> <ul style="list-style-type: none"> • The desired outcomes and limitations, such as budgetary constraints, need to be considered in order to effectively plan and execute a project. • The components of a comprehensive Measurement and Verification (M&V) plan encompass various facets, such as the delineation of tasks, allocation of resources, determination of timing, and estimation of associated costs.
1CMVP037	3	8	<p>Answer = 3 Both Explanation:</p> <ul style="list-style-type: none"> • The individual responsible for approving the site-specific M&V plan and ensuring its implementation throughout the reporting period. • The publication date or the version number of the IPMVP edition and volume being followed are clearly stated.
1CMVP038	4	8	<p>Answer = 4 All of the above Explanation:</p> <ul style="list-style-type: none"> • The objective of this study is to present a comprehensive and meticulously documented approach for manipulating data in order to accurately calculate savings. • In order to ascertain the variables that influence energy consumption, it is necessary to determine the appropriate data types that can be measured. • In order to establish an appropriate physical demarcation within which the project will be executed. This demarcation will serve as a reference point for the purpose of ensuring uniformity.
1CMVP039	1	8	<p>Answer = 1 To provide a documented methodology based on an international standard that will support audit and verification.</p> <p>Explanation: This study aims to establish a comprehensive and well-documented methodology in accordance with an internationally recognized standard, with the purpose of facilitating the process of audit and verification.</p>

iPQ.No	Correct Answer	Points	Explanation
1CMVP040	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Complexity of the project • Underlying purpose of M&V (e.g. funding assistance, energy performance contract) • Explanations required for management sign-off
1CMVP041	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Calculate the magnitude of the adjustments. • To determine the amount of energy savings, it is necessary to calculate the difference in energy consumption between two scenarios.
1CMVP042	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Energy usage refers to the quantifiable amount of energy consumed within a specified boundary, both prior to and subsequent to a given period. • Independent variables refer to the variables that are responsible for regular fluctuations in energy consumption. These variables need to be taken into account and factored in as regular adjustments when calculating savings through Measurement and Verification (M&V) methods. • Static factors refer to the factors that are associated with rare occurrences that have the potential to result in a significant alteration in energy usage.
1CMVP043	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The monitoring of independent variables can be conducted with relative ease. • The exclusive focus is on the ECM. • Electrochemical modules (ECMs) have the capacity to either exist as distinct entities that are fully isolated from each other, or to be contained within a shared boundary.
1CMVP044	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The magnitude of savings is substantial in relation to the total energy consumption of the site. • Numerous enterprise content management systems (ECMs) are being progressively deployed over an extended duration.

iPQ.No	Correct Answer	Points	Explanation
1CMVP045	2	8	<p>Answer = 2</p> <p>Engineering calculations using short term or continuous measurements</p> <p>Explanation:</p> <p>The utilization of engineering calculations involving short-term or continuous measurements is a fundamental aspect of the engineering discipline. These calculations play a crucial role in various engineering applications, enabling engineers to analyze and interpret data collected through short-term or continuous measurement processes. By employing mathematical models and statistical techniques, engineers can derive meaningful insights and make informed decisions based on the collected data. Consequently, the accurate</p>
1CMVP046	1	8	<p>Answer = 1</p> <p>Analysis of whole facility utility meter or sub-meter data using techniques from simple comparison to regression analysis.</p> <p>Explanation:</p> <p>This study focuses on the analysis of utility meter data, either from the entire facility or from sub-meters. Various techniques ranging from simple comparison to regression analysis are employed to examine and interpret the data.</p>
1CMVP047	4	8	<p>Answer = 4</p> <p>Quality assurance</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Calculation of savings for projects with high levels of uncertainty or variability • Installation performance verification compared to manufacturer claims • A confirmed outcome that can be confidently stated and demonstrate return on investment • Quality assurance is commissioning job
1CMVP048	3	8	<p>Answer = 3</p> <p>Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The allocation of responsibilities is guided by principles of logic and cost-effectiveness. • The party responsible for a particular task engages in proactive forecasting of the tasks at hand and the corresponding financial implications in order to effectively discharge its obligations. It ensures that these projected tasks and costs are adequately accounted for within the Energy Savings Performance Contract (ESPC) or the customer's budgetary framework.

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1CMVP049	4	8	<p>Answer = 4</p> <p>All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • There are currently existing submeters that are capable of measuring the energy consumption of specific subsystems that are being examined, such as a dedicated submeter for heating, ventilation, and air conditioning (HVAC) systems. • Control systems provide access to operational data pertaining to the equipment. • The monitoring of independent variables that impact energy consumption is not characterized by complexity or excessive difficulty and cost.
1CMVP050	3	8	<p>Answer = 3</p> <p>Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Option B has the capability to assess various end-use technologies. Nevertheless, as the complexity of the metering system increases, the process of verification becomes increasingly challenging and costly. • The process of quantifying or ascertaining energy conservation utilizing Option B may present greater challenges and expenses compared to Option A. However, it is generally observed that the outcomes derived from Option B exhibit a higher degree of accuracy compared to the estimates obtained from Option A.
1CMVP051	3	8	<p>Answer = 3</p> <p>Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The variables required for performance period models are systematically monitored, and there exists a sufficient amount of data pertaining to independent variables to construct a precise baseline model. • The additional loads on the meter, apart from those associated with the retrofit, are minimal and anticipated to remain consistent over time. These loads, along with other factors that influence energy consumption such as building occupancy, occupant behavior, and usage patterns, are accounted for and documented during the baseline and performance periods.

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1CMVP052	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Please provide details regarding the specific models used for the performance period, as well as the statistical validation targets employed. It is imperative that the final regression models possess statistical validity. • It is imperative to provide comprehensive details of any model modification that incorporates minimum energy or operating standards, including factors such as ventilation rates or lighting levels. • During the performance period, it is necessary to monitor and record any modifications made to the site that are not directly related to the installation of the Energy Conservation Measure (ECM). These changes should be taken into account when evaluating and adjusting the estimated energy savings.
1CMVP053	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • When new construction projects are undertaken • When the amount of savings reaches a point where the expense of conducting a simulation is justified. • In cases where either the baseline or performance period energy data is not available or deemed unreliable, certain challenges may arise.
1CMVP054	4	8	<p>Answer = 4 Utilize typical software and weather data from a relevant location to perform calculations.</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Use measured values whenever you can, especially for parameters that contribute a lot to saving money on a project. • Use the manufacturer's original specifications or industry-accepted performance curves to determine performance. • Use typical meteorological year weather data from an applicable site to perform calculations.
1CMVP055	1	17.4	<p>Answer = 1 \$.4096</p> <p>Explanation:</p> <p>Present Value = $P \times d \times t / (i + d) = (11000 \times 0.35 \times 0.50) / (0.12 + 0.35)$ = \$.4096</p>

iPQ.No	Correct Answer	Points	Explanation
1CMVP056	1	17.4	<p>Answer = 1 52%</p> <p>Explanation:</p> <p>Life of the modified system Expected annual savings</p> <p>Investment: 15 years</p> <p>: 5%</p> <p>: 0.05 x 2300000</p> <p>Rs. 1,15,000/year: Rs 2,20,000/-</p> $S = \frac{(1+i)^n \cdot xi}{(1+i)^n - 1} \cdot I$ <p>S = annual energy savings</p> <p>I = Investment</p> <p>N = years</p> <p>I = Internal rate of return</p> $\frac{115000}{220000} = \frac{(1+i)^{15} \cdot xi}{(1+i)^{15} - 1}$ <p>By trial and error method, I = 52%</p>

iPQ.No	Correct Answer	Points	Explanation										
1CMVP057	1	17.4	<p>Answer = 1 Explanation:</p> <p>Cash flow stream of project</p> <table><tr><td>Investment</td><td>Rs 13,50,000</td></tr><tr><td>Annual savings</td><td>Cashflow</td></tr><tr><td>1</td><td>5,00,000</td></tr><tr><td>2</td><td>5,50,000</td></tr><tr><td>3</td><td>6,50,000</td></tr></table> <p>Cost of capital to the plant is 12%. The net present value of the proposal is:</p> $\begin{aligned} \text{NPV} &= \frac{500000}{(1.12)^1} + \frac{550000}{(1.12)^2} + \frac{650000}{(1.12)^3} \\ &= 446428 + 438456 + 462657 \\ &= 13,47,541 \\ \text{NPV} &= 13,50,000 - 13,47,541 = 2459 \end{aligned}$	Investment	Rs 13,50,000	Annual savings	Cashflow	1	5,00,000	2	5,50,000	3	6,50,000
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1CMVP058	1	17.4	<p>Answer = 1 Explanation:</p> <p>Find the i that will equate the following:</p> <p>Rs.500,000 = 150,000 x PV (A = 10 years, i = ?)</p> <p>To do this, calculate the net present value (NPV) for various i values, selected by visual inspection;</p> <p>NPV 25% = Rs.150,000 x 3.571 - Rs.500,000 = Rs.35,650</p> <p>NPV 30% = Rs.150,000 x 3.092 - Rs. 500,000 = -Rs. 36,200</p> <p>For i = 25 per cent, net present value is positive; i = 30 per cent, net present value is negative. Thus, for some discount rate between 25 and 30 per cent, present value benefits are equated to present value costs. To find the rate more exactly, one can interpolate between the two rates as follows:</p> $\begin{aligned} i &= 0.25 + (0.30 - 0.25) \times 35650 / (35650 + 36200) \\ &= 0.275, \text{ or } 27.5 \text{ percent} \end{aligned}$										
1CMVP059	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none">• If estimates of savings are based on data from high-quality sensors, they can be more precise.• Manufacturer-provided equipment accuracies are only meaningful if the equipment has been calibrated.										

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1CMVP060	4	8	<p>Answer = 4</p> <p>In order for the calibration to be valid, the equipment used to calibrate the sensors and meters must have a lower degree of precision than the sensors and meters themselves.</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The sensors and meters used to collect M&V data should be calibrated against recognized standards (such as those of the National Institute of Standards and Technology). • As part of the M&V reports, a form demonstrating calibration must be included. • The equipment used to calibrate the sensors and meters must be more accurate than the sensors and meters themselves for the calibration to be valid. • In order for the calibration to be valid, the equipment used to calibrate the sensors and meters must have a lower degree of precision than the sensors and meters themselves.
1CMVP061	4	8	<p>Answer = 4</p> <p>The variable is within the ESCO's control (for instance, operating hours).</p> <p>Explanation:</p> <p>The variable is beyond the control of the ESCO (for instance, operating hours).</p>
1CMVP062	4	8	<p>Answer = 4</p> <p>All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The quantity of space that is being heated or air-conditioned. • The type of products being manufactured or the quantity of production shifts conducted on a daily basis. • The building envelope encompasses various characteristics, such as the incorporation of new insulation materials, installation of energy-efficient windows and doors, and the enhancement of air tightness.
1CMVP063	3	8	<p>Answer = 3</p> <p>Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • ECM design and Careful estimating of the parameter • Careful ECM inspection after installation.

iPQ.No	Correct Answer	Points	Explanation
1CMVP064	4	8	<p>Answer = 4 All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The selected option for the International Performance Measurement and Verification Protocol (IPMVP) has been determined. • The quantity of energy transfers occurring across the measurement boundary in Options A, B, or D, solely in the context of a system, • The quantity of extracellular matrix components (ECMs) and the intricacy and extent of their interplay.
1CMVP065	1	17.4	<p>Answer = 1 $\pm 14\%$</p> <p>Explanation:</p> <p>5,300 kWh — (1.645 · 450 kWh) and 5,300 kWh + (1.645 · 450 kWh)</p> <p>And the precision formulas are:</p> <p>Absolute Precision ($\hat{x}$) = 1.645 · 450 kWh = ± 740 kWh Relative Precision ($\hat{x}$) = 740 kWh = $\pm 14\%$</p>
1CMVP066	3	8	<p>Answer = 3 Both</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Increasing the number of samples obtained from the population can effectively mitigate the occurrence of sampling error. • The increase in sample sizes is generally associated with a corresponding increase in costs.

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1CMVP067	1	17.4	<p>Answer = 1 2459</p> <p>Explanation:</p> <p>Cash flow stream of project</p> <table><tr><td>Investment</td><td>Rs 13,50,000</td></tr><tr><td>Annual savings</td><td>Cashflow</td></tr><tr><td>1</td><td>5,00,000</td></tr><tr><td>2</td><td>5,50,000</td></tr><tr><td>3</td><td>6,50,000</td></tr></table> <p>Cost of capital to the plant is 12%. The net present value of the proposal is:</p> $NPV = \frac{500000}{(1.12)^1} + \frac{550000}{(1.12)^2} + \frac{650000}{(1.12)^3}$ $= 446428 + 438456 + 462657$ $= 13,47,541$ $NPV = 13,50,000 - 13,47,541 = 2459$	Investment	Rs 13,50,000	Annual savings	Cashflow	1	5,00,000	2	5,50,000	3	6,50,000
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iPQ.No	Correct Answer	Points	Explanation																				
1CMVP068	1	17.4	<p>Answer = 1 Explanation:</p> <table border="1"> <thead> <tr> <th>Item</th><th>Type of cost</th><th>Calculation</th><th>Cost</th></tr> </thead> <tbody> <tr> <td>Capital cost of generator</td><td>Fixed</td><td>-</td><td>9,00,000</td></tr> <tr> <td>Annual maintenance</td><td>Fixed</td><td>30,000 x 5 (years)</td><td>1,50,000</td></tr> <tr> <td>Fuel cost</td><td>Variable</td><td>219,000 x 3.50 x 5</td><td>3,83,2500</td></tr> <tr> <td></td><td></td><td>Total cost</td><td>4,88,2500</td></tr> </tbody> </table> <p>From Example 1, it can be seen that the fixed costs represent 21.5% of the total cost. In fact, the annual electricity output of 219 MWh assumes that the plant is operating with an average output of 50 kW. If this output were increased to an average of 70 kW, then the fuel cost would become Rs. 53,65,500, with the result that the fixed costs would drop to 16.37% of the total. Thus the average unit cost of production decreases as output increases.</p> <p>The concept of fixed and variable costs can be used to determine the break-even point for a proposed project. The break-even point can be determined by using the following equation.</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> $UC_{util} \times W_{av} \times n = FC + (UC_{prod} \times W_{av} \times n)$ <p>Where, UC_{util} is the unit cost per kWh of energy bought from utility (Rs./kWh) UC_{prod} is the unit cost per kWh of produced energy (Rs./kWh) FC is the fixed costs (Rs.) W_{av} is the average power output (or consumption) (kW) n is the number of hours of operation (hours).</p> </div> <p>Example 2</p> <p>If the electricity bought from a utility company costs an average of Rs.4.5/kWh, the break-even point for the generator described in Example 1, when the average output is 50 kW is given by:</p> $4.5 \times 50 \times n = (9,00,000 + 150,000) + (3.5 \times 50 \times n)$ $n = 21000 \text{ hours}$ <p>If the average output is 70 kW, the break-even point is given by:</p> $4.5 \times 70 \times n = (9,00,000 + 150,000) + (3.50 \times 70 \times n)$ $n = 15000 \text{ hours}$ <p>Thus, increasing the average output of the generator significantly reduces the break-even time for the project. This is because the capital investment (i.e. the generator) is being better utilised.</p>	Item	Type of cost	Calculation	Cost	Capital cost of generator	Fixed	-	9,00,000	Annual maintenance	Fixed	30,000 x 5 (years)	1,50,000	Fuel cost	Variable	219,000 x 3.50 x 5	3,83,2500			Total cost	4,88,2500
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1CMVP069	1	17.4	<p>Answer = 1</p> <p>Explanation:</p> <p>Assuming compound interest repayment at the end of the first year Repayment at the end of the second year</p> $= 30,00,000 + (10/100 \times 30,00,000) = \text{Rs. } 33,00,000 = 33,00,000 + (10/100 \times 33,00,000) = \text{Rs. } 36,30,000$ <p>Similarly, the repayments at the end of years 3, 4 and 5 can be calculated:</p> <p>Repayment at end of year 3 = Rs. 39,93,000 Repayment at end of year 4 = Rs. 43,92,300 Repayment at end of year 5 = Rs. 48,31,530</p> <p>Alternatively, the following equation can be used to determine the compound interest repayment value.</p> $\begin{aligned} \text{Total repayment value} &= 30,00,000 \times (1 + 10 / 100)^5 = \text{Rs. } 48,31,530 \\ \text{Monthly repayment} &= \frac{4831530}{5 \times 12} = \text{Rs. } 80,525 \end{aligned}$
1CMVP070	1	17.4	<p>Answer = 1</p> <p>5.0 years</p> <p>Explanation:</p> $PB = 22,20,000 / (4,86,000 - 42,000) = 5.0 \text{ years}$
1CMVP071	1	8	<p>Answer = 1</p> <p>CO₂, CH₄,</p>
1CMVP072	1	8	<p>Answer = 1</p> <p>United Nations Framework Convention on Climate Change</p> <p>Explanation:</p> <p>The United Nations Framework Convention on Climate Change established an international environmental treaty to combat "dangerous human interference with the climate system", in part by stabilizing greenhouse gas concentrations in the atmosphere.</p>

iPQ.No	Correct Answer	Points	Explanation
1CMVP073	1	8	<p>Answer = 1 6</p> <p>Explanation:</p> <p>The Kyoto protocol covers six categories of greenhouse gas (GHG) emissions: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF₆).</p>
1CMVP074	3	8	<p>Answer = 3 Energy Policy</p> <p>Explanation:</p> <p>Energy policy encompasses a range of attributes, such as legislative measures, international agreements, investment incentives, energy conservation guidelines, taxation policies, and various other techniques employed in public policy. Governmental and inter-governmental bodies often employ economic and energy modelling as a means of providing advice and conducting analysis</p>
1CMVP075	2	8	<p>Answer = 2 Achieve the best interests of the company.</p> <p>Explanation:</p> <p>Achieve the best interests of the company.</p>
1CMVP076	2	8	<p>Answer = 2 Energy Policy</p> <p>Explanation:</p> <p>Energy Policy</p>
1CMVP077	1	8	<p>Answer = 1 Energy action planning</p> <p>Explanation:</p> <p>Energy management includes planning and operation of energy production and energy consumption units as well as energy distribution and storage. Objectives are resource conservation, climate protection and cost savings, while the users have permanent access to the energy they need.</p>
1CMVP078	1	8	<p>Answer = 1 A corporate energy policy that does not exist</p> <p>Explanation:</p> <p>A corporate energy policy that does not exist</p>

iPQ.No	Correct Answer	Points	Explanation
1CMVP079	4	8	<p>Answer = 4 All of the above Explanation:</p> <ul style="list-style-type: none"> • Discuss metering. Meters tested? The manufacturer's accuracy claims? • Which variables are independent and dependent? Any crucial variables missing? Why? Sensitivity analysis plan? • Design the sample clearly. How many and how long? How does a metered period compare to a year? What confidence and precision are expected?
1CMVP080	1	17.4	<p>Answer = 1 Boost M&V spending by up to \$10,000 annually (or 10% of the savings), Explanation: Boost M&V spending by up to \$10,000 annually (or 10% of the savings),</p>
1CMVP081	4	8	<p>Answer = 4 All of the above Explanation:</p> <ul style="list-style-type: none"> • The requirements and procedures for meter calibration. • This section provides an overview of the methods employed for data collection and transfer. • The approach for addressing lost or missing data.
1CMVP082	4	8	<p>Answer = 4 All of the above Explanation:</p> <ul style="list-style-type: none"> • The prerequisites for third-party oversight or review. • The present study aims to conduct a peer review of the savings calculations and explore the methodology for calculating uncertainty in savings. The focus is on critically evaluating the accuracy and reliability of the savings calculations, as well as examining the methods employed to quantify the level of uncertainty associated with these calculations. By engaging in a rigorous assessment of these aspects, this research seeks to enhance the robustness and validity of the savings estimates and provide a comprehensive understanding of the potential variability in • Evaluating the Precision of Measurement Techniques
1CMVP083	3	8	<p>Answer = 3 Both Explanation:</p> <ul style="list-style-type: none"> • The utilization of non-key parameter estimation can be advantageous in mitigating the need for complex and non-routine adjustments when there are anticipated changes within the measurement boundary. • The level of uncertainty resulting from the estimates is deemed to be within acceptable limits.

iPQ.No	Correct Answer	Points	Explanation
1CMVP084	4	8	<p>Answer = 4</p> <p>Key parameters are parameters that are not used to evaluate the project's or ESCO's performance.</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The ongoing efficacy of the EEM(s) can be evaluated through regular and systematic retesting of essential parameters. • The cost associated with estimating certain parameters is lower compared to the cost of measuring them under Option B or simulating them under Option D. • The essential parameter(s) utilized in the calculation of savings can be easily discerned. Key parameters refer to the specific parameters that are utilized to evaluate the performance of a project or an Energy Service Company (ESCO).
1CMVP085	4	8	<p>Answer = 4</p> <p>Other uses for BMS data and systems</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The potential for savings to be realized is accompanied by a degree of uncertainty or risk. • Additional applications of measurement and verification (M&V) data and systems • The quantity of interconnected Environmental Control Measures (ECMs) within a singular establishment.
1CMVP086	4	8	<p>Answer = 4</p> <p>All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • The product in question is readily accessible for purchase, accompanied by professional assistance, and accompanied by comprehensive documentation. • The ability to effectively model the project site and evaluate energy conservation measures (ECMs) is crucial. • The device possesses the ability to be adjusted to a level of precision that meets the required standards.
1CMVP087	4	8	<p>Answer = 4</p> <p>All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • When energy savings values per individual measure are desired • When new construction projects are involved • When savings levels are sufficient to warrant the cost of simulation

iPQ.No	Correct Answer	Points	Explanation
1CMVP088	4	8	<p>Answer = 4</p> <p>Multifaceted energy management program affecting numerous building systems.</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Complex lighting retrofits • Motor Replacement and VSD • Renewable energy generation <p>C. Whole Facility</p> <p>Multifaceted energy management program affecting many systems in a building. Energy use is measured by the gas and electric utility meters for a twelve month baseyear period and throughout the post-retrofit period.</p>
1CMVP089	1	17.4	<p>Answer = 1</p> <p>9.0 years</p> <p>Explanation:</p> <p>$PB = 32,20,000 / (5,86,000 - 52,000) = 9.0 \text{ years}$</p>
1CMVP090	3	8	<p>Answer = 3</p> <p>Internal rate of return</p> <p>Explanation:</p> <p>The internal rate of return (IRR) is a financial metric used to evaluate the profitability of an investment. It represents the discount rate at which the net present value (NPV) of the investment becomes zero.</p>
1CMVP091	2	8	<p>Answer = 2</p> <p>Negative</p> <p>Explanation:</p> <p>At the conclusion of the fiscal year, the cash flow for all plant expenditures will exhibit a negative value.</p>
1CMVP092	3	8	<p>Answer = 3</p> <p>Zero</p> <p>Explanation:</p> <p>The set net present value to determine internal rate of return is zero(0).</p>
1CMVP093	2	8	<p>Answer = 2</p> <p>Discount rate</p> <p>Explanation:</p> <p>The factor that reflects the risk of the project while evaluating the present value of the expected future cash flow is discount rate.</p>
1CMVP094	3	8	<p>Answer = 3</p> <p>Net Present Value</p> <p>Explanation:</p> <p>Net Present Value (NPV) refers to the aggregate present value of all cash flows linked to a particular entity or investment.</p>

iPQ.No	Correct Answer	Points	Explanation
1CMVP095	3	8	<p>Answer = 3</p> <p>ROI</p> <p>Explanation:</p> <p>The Return on Investment (ROI) serves as a comprehensive metric for estimating the anticipated annual return on the initial capital investment.</p>
1CMVP096	3	8	<p>Answer = 3</p> <p>Return on investment</p> <p>Explanation:</p> <p>Return on investment (ROI) is defined as the ratio of annual net cash flow to capital cost.</p>
1CMVP097	4	8	<p>Answer = 4</p> <p>All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • By raising money from the stock market • By obtaining a bank loan • Derived from the budget of a particular department or section
1CMVP098	1	17.4	<p>Answer = 1</p> <p>AED 3750</p> <p>Explanation:</p> <p>$PresentValue = Pxdxt/(i+d)=(10000 \times 0.3 \times 0.5)/(0.1+0.3)$ $= AED\ 3750$</p>
1CMVP099	4	8	<p>Answer = 4</p> <p>All of the above</p> <p>Explanation:</p> <ul style="list-style-type: none"> • Further energy conservation strategies • Activities that are necessary to create the optimal conditions for efficient energy management, yet do not inherently lead to immediate cost reductions. • The task at hand involves the maintenance or enhancement of the management information system.
1CMVP100	1	17.4	<p>Answer = 1</p> <p>According to the payback criterion, the shorter the payback period, the more desirable the project ,Simple payback period is 3 years 3 months</p> <p>Explanation:</p> <p>Simple payback period = $60 / (20 - 1.5) = 3\text{ years } 3\text{ months}$</p>