

CDSM BODY OF KNOWLEDGE AND STUDY GUIDE

Preparation for the CDSM Certification Exam



The CDSM Certification Exam is a four-hour open book exam. The examination questions are based on the Body of Knowledge listed below. Because of the diversity and background and experience of demand side manager, the examination has 7 different subject sections, all of which are included in the exam. You must bring a hand-held calculator to the exam as the CDSM 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 60 Exam Review questions included in the Study Guide to determine your readiness for the exam.

The CDSM Examination contains the following subjects:

Body of Knowledge		Percent of Exam
1	History of Demand Side Management (DSM), Demand Response (DR), and Load Management (LM)	11% - 17%
2	Planning and Evaluating DSM, DR, and LM	24% - 36%
3	Designing DSM, DR, and LM programs	16% - 24%
4	Implementing DSM, DR, and LM Programs	11%-17%
5	Managing DSM, DR, and LM Programs	10%-14%
6	Verification and Analysis of DSM, DR, and LM Programs	14%-22%
7	Future DSM, DR, and LM Programs	9%-13%

CERTIFIED DEMAND SIDE MANAGER (CDSM) EXAM

The following is a list of the subjects for the CDSM exam. Each subject covers several topics.

The primary reference is the [CDSM Training Workbook](#) (only available to attendees of the course).

Additional textbooks that will help you prepare for the examination as well as serve as resources utilized in running DSM programs include:

[The Smart Grid](#) by Clark Gellings

[Finance and Accounting for Energy Engineers](#) by S. Bobby Rauf.

[Energy Management Handbook](#), 9th edition by Stephen Rosa, Steve Doty, and Wayne C. Turner

[Residential Energy Auditing and Improvement](#) by Stan Harbuck and Donna Harbuck

[Saving Energy and Reducing CO₂ Emission with Electricity](#) by Clark Gellings

The additional textbook resources are available through the [AEE eLibrary](#), which is a great source for accessing searchable content as well as highlighting and taking notes. *Digital books cannot be accessed during the certification exam.*

The exam will be open book, four hours, and have 120 multiple choice questions. There are 7 sections listed below from which questions mainly are drawn.

BODY OF KNOWLEDGE: STUDY GUIDE TOPICS & REFERENCES

1	History of Demand Side Management (DSM), Demand Response (DR), and Load Management (LM)
101	Various definitions of DSM and DR
102	Benefits that DSM, DR and LM programs
103	History and various international legislation, Federal Acts and Energy Policy Acts that influenced DSM, DR and LM
104	Driving factors for DSM programs
105	Local context / policies
106	Greenhouse gasses
107	Understand the lifecycle of a DSM program
108	Wholesale power price discovery and impacts
109	DSM program types
110	DSM load shapes
111	Storage technologies
112	Distributed generation
113	Understand the difference between Energy, Power, and Demand
114	Economic/incentive demand response
115	Customer, utility, contractor perspectives of DSM programs

2 Planning and Evaluating DSM, DR and LM Programs

- 201 Financial terms
- 202 DSM programs fundamental evaluation formula
- 203 Net present value and present value with interest tables
- 204 DSM Program Validation
- 205 Pros/cons of Cost-effectiveness tests
- 206 Inputs into Cost-effectiveness tests
- 207 Cost-effectiveness calculations
- 208 Total Resource Cost (TRC)
- 209 Rate Impact Measure (RIM)
- 210 Societal Cost Test (SCT)
- 211 Utility Cost Test (UCT)/Program Administrator Cost Test (PACT)
- 212 Participant Cost Test (PCT)
- 213 Other cost-effectiveness tests
- 214 Emissions data, cost and acceptability
- 215 Acceptable data and precautions
- 216 Data input needs and analysis; different data sources
- 217 Characteristics of programs
- 218 Rate making methodology
- 219 Balancing the program with other corporate goals
- 220 Utility revenue (coupled and decoupled)
- 221 Evaluating for potential program pitfalls

3 Designing DSM, DR, and LM programs

- 301 Information required to design an effective program
- 302 Consideration prior to design
- 303 DSM design process and steps
- 304 Measures and baseline determination
- 305 Technical potential data
- 306 Sensitivities
- 307 Design process information needs
- 308 Participation
- 309 Free riders and paid non-participants
- 310 Portfolio standard impacts
- 311 Determining the rebate/incentive
- 312 Making the program manageable and steering clear of potential issues
- 313 Outsourcing DSM programs
- 314 Demand side service provider / Aggregator in DR

4 Implementing DSM, DR and LM Programs

- 401 Key stakeholders involved
- 402 Filing Strategies

- 403 Understanding the filing process
- 404 Responsibilities of the Utility vs the PSC/PUC
- 405 Implementation process
- 406 Program policies and documentation
- 407 Compliance and program integrity
- 408 Communication and marketing
- 409 Communication with stakeholders
- 410 Use of Contractors
- 411 When to use
- 412 When not to use
- 413 RFP's and contracts
- 414 Using technology for control, monitoring & evaluation

5 Managing DSM, DR and LM Programs

- 501 Managing DSM programs
- 502 Maturity roadmap; Retiring programs; Sunsetting
- 503 Effective engagement and oversight
- 504 Overcoming & preventing pitfalls in program operation
- 505 Program trending for program adjustments, changes, retirement
- 506 Data and analysis for trending
- 507 Effective planning/trending

6 Verification and Analysis of DSM, DR and LM Programs

- 601 Purpose and types of measurement and verification (M&V)
- 602 Micro level vs program level (macro); when is each appropriate?
- 603 Technology and test equipment supporting M&V
- 604 Types of M&V
- 605 Initial M&V
- 606 Ongoing M&V
- 607 Need for consistency
- 608 Demand side service provider
- 609 Duplicable M&V
- 610 Management of M&V
- 611 M&V advice on monitoring programs
- 612 Cautions when performing M&V
- 613 Measuring program effectiveness
- 614 Effective reporting metrics and responses to audits
- 615 Interrogatory response strategies

7 Future DSM, DR and LM Programs

- 701 DSM changers, in different regions

- 702 Utility revenue; cost recovery & business models
- 703 Market structure and deregulation
- 704 Role of Aggregators
- 705 Local and regional changers
- 706 Environmental
- 707 Building codes
- 708 Electrical Grid code - standards for equipment
- 709 Economy
- 710 Smart grid and technology
- 711 Consumer
- 712 Balancing generation and renewables
- 713 Energy security

EXAM REVIEW QUESTIONS

1. Which of the following is not a current trend in offering DSM Programs?
 - a. Focus on low-income customers
 - b. Consideration of green-house gas impacts
 - c. Electrification to leverage renewables
 - d. Incorporation of DSM into smart grid and grid edge applications
 - e. None of the above, all are trends in 2022

2. How long does a typical stand-alone energy efficiency rebate program take to start up, assuming the program requires permission from a Commission before implementing (i.e. – you must file a formal petition asking for it to be approved)?
 - a. 2 - 3 months
 - b. 4 - 6 months
 - c. 7 – 11 months
 - d. 1 years
 - e. 2 years

3. Energy savings is measured in _____ and demand savings is measured in _____:
 - a. J, J
 - b. J, kW
 - c. kW, J
 - d. kW, kW
 - e. J, kW/h

4. Which of the following would not be considered a driving factor for a DSM program?
 - a. Regulatory philosophy
 - b. Population growth
 - c. Consumer income growth
 - d. Advances in technology
 - e. None of the above, all are driving factors

For questions 5 through 7, use the following information:

An airport recently replaced a portion of its runway lighting by installing LED lights. The new LED lights are rated at 18-Watts and are replacing existing 65-Watt lamps on a one-for-one basis. The project will replace 1,000 lights. The lights are estimated to operate 3,000 hours per year. Assume that the projected hours, the lights are not dimmed.

5. What is the projected amount of energy that will be saved on an annual basis from this lighting retrofit?
 - a. 11,500 kWh
 - b. 101,500 kWh
 - c. 113,500 kWh
 - d. 141,000 kWh
 - e. 155,500 kWh

6. What is the projected winter demand savings from this lighting retrofit?
 - a. 0.0 kW
 - b. 4.7 kW
 - c. 47 kW
 - d. 147 kW
 - e. 247 kW

7. What is the projected summer demand savings from this lighting retrofit?
 - a. 0.0 kW
 - b. 4.7 kW
 - c. 47 kW
 - d. 147 kW
 - e. 247 kW

8. For verifying this project's operating hours, which of the following would be the most appropriate method?
 - a. Engineering calculation
 - b. Retrofit isolation of distinct energy consumption parameters
 - c. Retrofit isolation of all energy consumption for the affected system
 - d. Whole facility measurement
 - e. Calibrated simulation

9. Which of the following is/are units of energy?
 - a. kWh
 - b. Btu
 - c. Gallons of propane
 - d. A and b
 - e. All of the above

10. Conservation programs are mainly categorized as which of the following?
 - a. Energy savings
 - b. Demand savings
 - c. Energy and demand savings
 - d. Demand response
 - e. Voluntary demand response

11. Source emissions from a power plant are mainly dependent on:
 - a. Rating of the power plant
 - b. Transmission and distribution losses
 - c. Fuel used in the power plant
 - d. How close the power plant is to the cooling source
 - e. Ability to sequester the emissions

12. Given the following, calculate the weighted average cost of capital.
- Cost of debt: 5.5%
 - Capital structure: 54% debt / 46% equity
 - Agreed upon rate of return allowance for the utility: 9.95%
- a. 7.25%
 - b. 7.55%
 - c. 8.25%
 - d. 8.55%
 - e. 9.25%
13. For justifying DSM Programs, if the WACC used above in the cost-effectiveness test was decreased, how would this affect the cost-effectiveness of the proposed DSM Programs?
- a. They would increase in cost-effectiveness
 - b. They would decrease in cost-effectiveness
 - c. Their cost-effectiveness would not change
 - d. Not enough information to determine
14. In an integrated resource plan, a power plant is projected to be needed by starting construction in 7 years. The specified power plant will be 900 MW in size and projected to cost \$330 million dollars. Using a WACC of 9%, how much would the power plant cost in today's dollars per kW of capacity?
- a. \$201 / kW
 - b. \$251 / kW
 - c. \$271 / kW
 - d. \$289 / kW
 - e. \$339 / kW
15. A program administrator is updating factors in the cost-effectiveness tests. The power plant that was to be constructed in 7 years is now being moved up by 3 years. How will this shift in time affect the potential incentives paid to customers?
- a. It will cause any potential incentives to increase
 - b. It will cause any potential incentives to decrease
 - c. It will not cause any change in level of potential incentives
 - d. Not enough information to determine

For problems 16 through 25 use the following set of data:

	Benefits	Costs
Program costs		5,000,000
Program incentives		12,000,000
Program measure costs (net)		22,000,000
Avoided energy savings	220,000,000	
Customer bill savings		380,000,000
Carbon dioxide costs (net)	35,000,000	
Other non-energy benefits (net)	9,000,000	
Totals	264,000,000	419,000,000

When performing, assume you will follow the prescribed requirements from the California Public Utility Commission's prescribed cost-effectiveness manual.

16. What is the benefit to cost ratio using the total resource cost test?
 - a. 5.62
 - b. 6.45
 - c. 6.59
 - d. 7.62
 - e. 9.44

17. What are the net benefits using the total resource cost test?
 - a. 193 million
 - b. 228 million
 - c. 237 million
 - d. 352 million
 - e. 392 million

18. What is the net benefit using the societal cost test?
 - a. 142 million
 - b. 168 million
 - c. 172 million
 - d. 237 million
 - e. 325 million

19. What is the benefit to cost ratio using the societal cost test?
 - a. 3.42
 - b. 4.19
 - c. 5.49
 - d. 6.79
 - e. 9.77

20. What is the benefit to cost ratio using the rate impact measure test?
- 0.55
 - 0.62
 - 0.79
 - 0.92
 - 1.04
21. What is the net benefit using the rate impact measure test?
- 237 million
 - 177 million
 - 177 million
 - 237 million
 - 325 million
22. What is the benefit to cost ratio using the participant cost test?
- 11.04
 - 12.67
 - 15.78
 - 15.24
 - 17.82
23. What is the net benefit using the participant cost test?
- 22 million
 - 177 million
 - 277 million
 - 325 million
 - 370 million
24. What is the benefit to cost ratio using the program administrator cost test?
- 10.42
 - 11.80
 - 13.62
 - 15.00
 - 17.12
25. What is the net benefit using the program administrator cost test?
- 22 million
 - 177 million
 - 238 million
 - 277 million
 - 325 million
26. When justifying DSM Programs, which cost-effectiveness test is considered to be the most restrictive?
- RIM
 - TRC
 - SCT
 - PACT

27. When evaluating programs, are all programs required to pass the required cost effectiveness tests as set forth by the formal approving body.
- Yes
 - No
28. This ratio is used to adjust the cost effectiveness test result so that only the direct energy savings obtained from the DSM program are used:
- Benefit to cost ratio
 - Net cost ratio
 - Gross ratio
 - Net to gross ratio
 - Net benefit ratio
29. If there is a direct correlation between a utility's profits and the amount of kWh's sold, the utility's revenue would be considered to be what type?
- Coupled
 - Decoupled
 - Guaranteed
 - Prudent
 - Direct rate profit
30. One proven successful method in controlling participating contractor costs in a given year is to:
- Write an email to the participating contractor letting them know the expectations
 - Limit the participation of customers in the program
 - Make participation numbers public on the utility website and explain the limit
 - Have separate smaller contracts throughout the year
 - Have a discussion with the participating contractor
31. The utility cost test is the same as which of the following cost effectiveness tests?
- RIM
 - PCT
 - PACT
 - SCT
 - TRC
32. When performing a SCT for cost effectiveness, the discount rate chosen should be?
- The lowest amongst of the five main cost-effectiveness tests
 - The middle amongst of the five main cost-effectiveness tests
 - The highest amongst of the five main cost-effectiveness tests
 - The same discount rate as the one chosen for PCT
 - The same discount rate as the one chosen for RIM

33. A program manager is raising the incentive level for a specific program as part of the company's DSM Plan filing with its Commission. The incentive level is being increased to assist in gaining more participants and ultimately more energy and demand savings for the DSM Goals. The Commission utilizes the Total Resource Cost Test as its primary cost-effectiveness test, what will happen to the TRC's cost-effectiveness results for this program from increasing the incentive?
- The cost-effectiveness results will increase
 - The cost-effectiveness results will decrease
 - The cost-effectiveness results will not change
 - Not enough information to determine
34. If one therm of gas was conserved, it would prevent this amount of carbon dioxide from being released to the environment?
- 0.005 metric tons
 - 0.024 metric tons
 - 0.048 metric tons
 - 0.0718 metric tons
 - 0.124 metric tons
35. This DSM program characteristic pays only for the exact amount of energy and/or demand was shifted:
- Demand response
 - Pay for performance
 - Measured performance
 - Load management
 - Direct load control
36. Which of the following sources dictates what the base efficiency shall be set at?
- State and local building codes
 - Minimum efficiency standards by a set of manufacturers
 - Federal efficiency requirements
 - Federal executive order requirements
 - All of the above
37. A DSM program has experienced a change where after close scrutiny the majority of participants in the program would be considered free riders. What should be done with this DSM program?
- Change the incentive level to decrease free riders
 - Retire the program
 - Nothing, free riders are considered a cost of business
 - Petition the formal approving body to seek recovery of funds from these free riders
 - Inform upper management and let them decide what to do

38. A DSM program facilitator receives an interrogatory with fifteen questions concerning the operation and facilitation of the utility's DSM programs. What guidance would you provide to this DSM program facilitator regarding the questions?
- Answer all the questions fully and add history items which explains the answers
 - Answer all the questions and provide documentation for how the programs are facilitated/operated
 - Answer all the questions and limit the answers to only the questions and do not elaborate
 - Answer some of the questions with vague answers
 - Answer none of the questions directly
39. Third-party outsourcing of DSM programs is an attractive feature if which of the following conditions exist?
- The utility lacks DSM program expertise
 - The utility lacks funding for the DSM programs
 - The utility lacks sufficient technology to facilitate and track DSM programs
 - The utility lacks materials needed to facilitate DSM programs
 - All of the above
40. A DSM program manager is concerned that one of the programs they facilitate is potentially having issues. What is a good recommendation for this DSM program manager to do?
- Contact the formal approving body and/or staff and make them aware of the issue
 - Release a formal notice to the press
 - Contact the internal audit department of the utility and ask for an audit of the program and process
 - Issue a temporary stop of the program until a formal investigation can be completed
 - Issue a temporary stop of the program and inform upper management of the cause
41. For effective planning and keeping free riders to as minimal as practical, program managers should:
- Keep a redline log of identified needed changes
 - Keep a calendar of upcoming filing dates
 - Keep a log of upcoming legislative changes
 - Keep a shortcut sheet which contains current efficiency baselines
 - All of the above
42. Which of the following should be documented to determine effective trending for an occurrence in a DSM program?
- Date of occurrence
 - How many times the occurrence happened
 - The pattern of occurrences
 - What happened to the DSM program
 - All of the above

43. When managing a portfolio of DSM programs, the program manager must ensure which of the following?
- The programs remain cost-effective
 - The programs are easy to participate in
 - The programs' participation requirements are clear and concise
 - The programs are changed whenever changes occur to building codes
 - The programs' requirements always prevent free riders
44. What 3 items should be the core vision items when managing DSM Programs?
- Compliance; Integrity; Accepting of different views and approaches
 - Compliance; Integrity; Engaged Leadership
 - Compliance; Engaged Leadership; Cost Controls
 - Integrity; Cost Controls; Engaged Leadership
 - Integrity; Engaged Leadership; Understanding the DSM Portfolio
45. Which type of monitoring should be done every six months to validate DSM program goal achievements?
- Spot measurements within the facility
 - Continuous metering in the facility
 - Utility bill comparisons via a 12-month rolling summary
 - Computer simulations
 - Customer interviews and surveys
46. One of the main purposes of measurement and verification when dealing with DSM programs is to:
- Detect changes and adjust programs when necessary
 - Immediately retire programs
 - Immediately change programs
 - Shift emphasis from one program to another
 - All of the above
47. A coordinated voltage profile and capacitor control program (Volt/Var) is designed primarily to operate as which of the following DSM programs?
- Demand response
 - Energy savings only
 - Energy and demand savings
 - Demand savings only
 - Customer DSM program

CDSM Review Key

1.	e	21.	b	41.	e
2.	b	22.	e	42.	e
3.	b	23.	e	43.	a
4.	e	24.	d	44.	a
5.	d	25.	c	45.	c
6.	c	26.	a	46.	e
7.	a	27.	b	47.	a
8.	b	28.	d		
9.	e	29.	a		
10.	a	30.	d		
11.	c	31.	c		
12.	b	32.	a		
13.	a	33.	c		
14.	a	34.	a		
15.	a	35.	b		
16.	e	36.	e		
17.	b	37.	a		
18.	d	38.	c		
19.	e	39.	e		
20.	a	40.	c		

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