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Job Task Analysis
Building Energy Manager

November 2013 – December 2014

An Authoritative Source of Innovative Solutions for the Built Environment

Job Task Analysis

Energy Manager

November 2013 — December 2014

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Executive Summary

This report describes the process for and results of a comprehensive Job Task Analysis (JTA) of Energy Managers. This study was performed by Professional Testing, Inc., on behalf of the National Renewable Energy Laboratory. The competency (domains, tasks, and associated knowledge) list, which defines the work performed by practitioners, was initially developed by a representative panel of practitioners during a meeting held January 22–24, 2014, in Orlando, Florida. After the job tasks and associated knowledge and skills were identified, a validation survey was conducted of the finding of the JTA, and the results of the validation study were reviewed by a representative panel of practitioners during a conference call held on June 2, 2014. The committee finalized the JTA and examination blueprints for the Energy Manager credential scheme based on the survey results.

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Acronyms

A&E	architects and engineers
AFDD	Automated Fault Detection and Diagnostics
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BAS	building automation system
CBECS	Commercial Buildings Energy Consumption Survey
CMMS	Computerized Maintenance Management Software
DACUM	Developing a Curriculum
DOE	U.S. Department of Energy
EEM	energy efficiency measure
EIA	Energy Information Administration
EIS	energy information system
EMCS	energy management control system
EMS	energy management system
EnPl	energy performance indicators
ESCO	energy services coordinator
EUI	energy utilization index
IAQ	indoor air quality
IEQ	indoor environmental quality
IPMVP	International Performance Measurement and Verification Protocol
ISO	International Organization for Standardization
JTA	Job Task Analysis
M&V	measurement and verification

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NIBS	National Institute of Building Sciences
NREL	National Renewable Energy Laboratory
O&M	operations and maintenance
PC	performance contractor
PPA	power purchasing agreement
PR	public relations
PUC	public utilities commission
RFP	request for proposal
ROI	return on investment
SD	standard deviation
SEM	standard error of the mean
SME	subject matter expert
USGBC	U.S. Green Building Council

Note: Wherever the term *energy* appears in this document, this is meant to include water as in "energy and water."

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1 Introduction

The National Renewable Energy Laboratory (NREL), in conjunction with the National Institute of Building Sciences (NIBS) and the U.S. Department of Energy (DOE), led a study to identify the critical duties and tasks required of an Energy Manager. Professional Testing, Inc., used the DACUM (Developing a Curriculum) process to conduct a Job Task Analysis (JTA) and identify the competencies.

A panel of subject matter experts (SMEs) was selected by NIBS and convened by Professional Testing for a 3-day meeting held January 22–24, 2014, in Orlando, Florida. The competencies identified during the meeting were then validated via a survey. This report reflects the completion and results of the study, and is organized with section 2 containing the proposed final content outline, and the later sections containing the details of the JTA development process, including results of the validation survey.

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2 Final Energy Manager DACUM Job/Task Analysis

2.1 Energy Manager Job Description

An Energy Manager is responsible for managing and continually improving energy performance in commercial buildings by establishing and maintaining an energy program management system that supports the mission and goals of the organization.

2.2 Job/Task Analysis DACUM Chart for Energy Manager

A proposed content outline resulting from this Job/Task Analysis follows.

Table 1. Final Examination Blueprint for Energy Managers

		Duties and Tasks	Final Weight	Final Items
A	**Planning Effective Energy Management**		**29%**	**29**
	1	Identify the energy management scope	2%	2
	2	Develop energy management policies and objectives	2%	2
	3	Assess energy usage	4%	4
	4	Identify energy performance baselines	1%	1
	5	Planning energy audits	3%	3
	6	Identify energy opportunities	7%	7
	7	Prioritize energy opportunities	7%	7
	8	Consult on capital (non-energy) projects	1%	1
	9	Coordinate with other departments/divisions	2%	2
B	**Managing Energy Information**		**11%**	**11**
	1	Gather energy management data (utility, weather, etc.)	3%	3
	2	Analyze energy management data	6%	6
	3	Complete reports (internal and external)	2%	2
C	**Implementing the Energy Management Program**		**20%**	**20**
	1	Implement the energy program managerial initiatives (training, procurement, communication, and design standards)	8%	8
	2	Coordinate team resources	3%	3
	3	Evaluate results of managerial initiatives (training, procurement, communication, and design)	5%	5
	4	Manage ongoing commissioning	4%	4
D	**Managing Budgets and Finances**		**13%**	**13**
	1	Audit utility invoices	4%	4
	2	Forecast energy costs	6%	6
	3	Procure cost effective energy sources	1%	1
	4	Prepare budgets	2%	2
E	**Implementing Energy Efficient Projects**		**22%**	**22**
	1	Plan project implementation	5%	5
	2	Implement energy projects	8%	8
	3	Conduct project close-out activities	1%	1
	4	Monitor Project Performance	8%	8
F	**Managing Energy Communications**		**5%**	**5**
	1	Advocate for energy conservation	1%	1
	2	Communicate energy information to senior management	3%	3
	3	Coordinate energy program with external parties	1%	1
	Total		**100%**	**100**

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Table 2. Specialized Knowledge Appearing in DACUM Chart of Energy Managers

Specialized Knowledge	
Applicable energy regulations	Basic database usage, design, and management
Basic energy concepts and principles (See Table 3)	Basic energy engineering calculations
Basic statistics	Benefits of energy efficiency
Best maintenance practices	Best practices for energy efficiency
Best practices in measurement and verification methodology	Building and Energy Codes and Standards
Building automation control systems and programming	Building operation plan (including original design load)
Building sciences (See Table 3)	Building systems (See Table 3)
Commissioning process	Construction management
Contract administration	Energy accounting
Energy audit methodology	Energy calculations
Energy certification programs	Energy efficiency measures (EEMs) and economics
Energy information systems (EISs)	Energy management control systems (EMCSs)
Energy source pricing structures (demand charges, power factor charges, time of use charges, etc.)	Energy systems
Energy unit calculations	Environmental impacts of energy consumption
Evaluation methodologies	Facility type hazards
Facility type processes and operations	Financial analysis methodologies and threshold (e.g., life cycle costs analysis, ROI)
Grants	Health and safety (See Table 3)
How to interpret interval data	How to interpret weather data
How to verify data (check meters, etc.)	Human behavior
Indoor environmental quality	Impact of building systems on health and wellbeing
Incentive programs	Indoor environmental quality standards (e.g., lighting, temperature, etc.)
Industry accepted Codes, Standards and Regulations (for industries served by the Energy Manager)	Industry terminology, jargon, and acronyms
M&V methodologies	Normalization
Occupant requirements and standards	Organizational awareness
Procurement process	Project delivery methods (ESCO, PPA, etc.)
Reliability of sources of meter data	Resource planning
Risk assessment	Sequence of operation
Stakeholder groups (health and safety, facility operations, occupants, etc.)	Systems thinking (thinking of the interactions between systems)
Trend analysis	Typical ranges of energy performance metrics
Understanding of auditing equipment	Understanding of various specialized facility types (labs, clean rooms, hospitals, etc.)
Utility and tax incentives	Utility invoicing
Utility meter types	Utility rate structures and schedules
Utility rates, tariffs, and contracts (including specialized rates and programs)	Utility regulations and requirements
Weather effects on energy use	

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Table 3. Building Systems, Building Sciences, Health and Safety, and Basic Energy Concepts and Principles Required for Energy Manager

Building Systems	Building Sciences
Air compressor and distribution system	Glare Control
Air distribution system	Heat transfer
Building automation system	Indoor air quality
Building control system	Orientation/daylighting
Building envelope	Photometrics
Chilled water system	Psychrometrics
Combined heat and power system	Thermal comfort
Cooling tower system	Thermodynamics (1st and 2nd)
Electrical power system	
Energy metering and monitoring system	**Health and Safety**
Energy recover system	Construction safety
Heating hot water system	Electrician safety
Hot water system	Indoor air quality
HVAC control system	Outdoor air quality
HVAC system	Worker safety
Lighting control system	
Lighting system	**Basic Energy Concepts and Principles**
Potable cold water system	Energy unit conversion
Pumps and pumping system	Power vs. energy
Renewable energy system	1st Law
Steam and hot water system	2nd Law
Steam distribution system	
Variable drive system	

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Table 4. General Knowledge for Energy Managers Ordered by Importance

General Knowledge
Calculations
Collect information to solve a problem
Compare numbers
Perform simple math operations of addition
Perform simple math operations of subtraction
Perform simple math operations of multiplication
Perform simple math operations of division
Use a calculator
Perform mathematical operations with decimals
Perform math operations using single and multiple digit numbers
Make rough estimates
Solve ratio problems
Solve percent problems
Change numbers from percentages into decimals and back
Change numbers from fractions into decimals and back
Perform math operations using signed (positive and negative) numbers
Solve problems with graphs
Figure averages
Transfer number sequences from a source into a column
Perform mathematical operations with fractions
Multiply and factor algebraic expressions
Basic Measurement
Estimate and approximate measurements
Use tools to measure quantities and solve problems involving measurements
Record measurements, using appropriate unit notations (feet, yards, etc.)
Convert measurements from one unit to another (English to Metric, etc.)
Measure temperature to within 1 degree Fahrenheit
Read and use the scale of a drawing
Read measurements taken with common measuring tools
Find the dimensions of an object from a scale drawing
Read and apply coefficient measurements indicated in a table or chart
Measure volume (cubic inches, liters, etc.)
Read, interpret, and use size-scale relationships
Calculate the perimeter and areas of common figures
Measure area (square inches, square centimeters, etc.)
Make simple scale drawings
Measure linear distances (length, width, etc.)
Communications
Ask questions

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General Knowledge
Communicate with co-workers and/or business people verbally (face-to-face)
Evaluate options/alternatives
Evaluate solutions
Listen
Write reports
Communicate using the vocabulary/terminology of a related trade
Communicate with co-workers and/or business people verbally (telephone, radio)
Communicate with co-workers and/or business people in writing (letters, memos)
Present to others
Summarize information
Explain procedures
Participate in brainstorming
Read codes (building codes, electrical codes, standards, etc.)
Read drawings and specifications sheets
Read information from tables and graphs (bar, circle, etc.)
Research information
Write words and numbers legibly
Read and follow a map, chart, plan, etc.
Read and follow directions found in equipment manuals and code books
Read statistical data
Apply assertiveness
Find information in references (Machinery handbook, tap/drill charts, etc.)
Read and interpret directions found on labels, packages, or instruction sheets
Follow verbal job instructions
Read flowcharts
Speak to large groups
Find information in catalogs

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Table 5. Skills and Abilities of Energy Managers Appearing in DACUM Chart

Skills and Abilities	
Ability create and utilize spreadsheets and databases	Ability to communicate technical information to others
Ability to communicate to specific audiences	Ability to create graphs, charts, etc.
Ability to create project scope documents	Ability to download data from different types of meters
Ability to interpret baselines	Ability to interpret nationally recognized energy benchmarking standards (ENERGY STAR, etc.)
Ability to multitask	Ability to think creatively and holistically
Ability to read and interpret construction documents	Ability to read and interpret utility bills, rate structures, utility contracts
Ability to read future markets	Ability to research and interpret Codes and Standards
Ability to write proposals and cost estimates	Ability to use Energy STAR portfolio manager
Adept at reusing and reapplying existing systems	Analytical skills
Basic accounting skills	Basic accounting skills
Basic skills in conducting energy audits	Basic statistical skills
Business acumen	Data manipulation skills
Energy accounting skills	Facilitation skills
Interpersonal skills	Management skills
Negotiation skills	Presentation skills
Prioritizing skills	Project management skills
Project scheduling skills	Reading ability
Reasoning skills	Regression analyses
Relationship building skills	Report writing skills
Spreadsheet analysis skills	Troubleshooting skills
Verbal communication skills	Written communication skills

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Table 6. Attitudes for Energy Managers Ordered by Importance

Attitudes			
1	Analytic	28	Eager to learn new things
2	Accurate/Accuracy/Precise/Precision	29	Good time manager
3	Common sense	30	Pride in job
4	Critical thinker	31	Respectful
5	Integrity	32	Work efficiently (time)
6	Professional	33	Organized
7	Adaptable/Flexible	34	Focused
8	Creative	35	Open-minded to change
9	Ethical	36	Quality focused
10	Goal-oriented	37	Self-control
11	Safety conscious	38	Conscientious
12	Team player	39	Customer-oriented
13	Trustworthy	40	Free of substance abuse
14	Good listener	41	Patience
15	Honest	42	Positive attitude
16	Initiative	43	Self-discipline
17	Responsible/accountable	44	Confident
18	Self-motivated	45	Manage stress/pressure
19	Work in teams	46	Self-esteem
20	Cooperative	47	Social skills
21	Detail-oriented	48	Tactful
22	Industrious	49	Courteous
23	Leader	50	Enthusiasm
24	Multi-tasker	51	Helpful
25	Persistent	52	Lack of prejudice (bias)
26	Work efficiently (resources)	53	Meticulous
27	Dependable		

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Table 7. Tools, Equipment, and Resources of Energy Managers Appearing in DACUM Chart

Tools, Equipment, and Resources	
AFDD (Automated Fault Detection and Diagnostics)	ANSI standards pertaining to Energy
ASHRAE guidelines and standards	ASHRAE procedures for commercial buildings energy audits
ASHRAE standards (62, 55, 90.1, etc.)	Building codes
Building operation plan	CMMS
Computer	Construction documents
Contract documents	EISs
EMCS/BAS	EMCSs
Energy codes	Energy forecast tables (EIA, NIST)
HR policies and procedures (job descriptions, etc.)	Illumination Engineering Society of North America
Interval data	ISO 50001
Latest journals and other references	M&V Protocols
Measurement & Verification Standards	Metering tools
Modeling software	National benchmarking data (e.g., EIA, Energy STAR, CBECS)
Nationally recognized energy benchmarking standards (e.g., ENERGY STAR)	Printer
Real time access to utility account	Scheduling software
Sequence of operation plan	Software
Specialized training	Testing instruments (See Table 8)
Utility accounting software	Utility rate schedules

Table 8. Testing Instruments for Energy Managers Appearing in DACUM Chart

Testing Instruments	
Air balance hood	Anemometer
Combustion analyzer	Data loggers (temperature, RH, current, light, etc.)
Electric press gauge (manometer)	I.A.Q Meter (CO_2, CO, RH, temperature)
Infrared camera	infrared temperature gun
Light meter	Multimeter (air data)
Multimeter (electric)	Power analyzer/meter
Psychrometer	Tachometer
Thermometer (air, water, type-K)	Velocity grid (Vel-Grid)
Vibration analyzer	Water manometer (D.P.)

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Table 9. Tasks, Steps, Specialized Knowledge, Skills, Abilities, Tools, Equipment, and Resources Required for Planning Effective Energy Management

Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Identify the energy management scope			
Review job description Identify regulatory requirements Review organizational mission Identify organizational assets Review budget Review organizational structure and responsibilities Discuss scope and priorities with senior management Define utilities that are being managed Identify stakeholders	• Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • EEMs and economics • Facility type processes and operations	• Written communication skills	• ISO 50001
Develop energy management policies and objectives			
Identify organizational goals Review current policies, commitments, and regulations Establish strategies Obtain management approval Create energy management policies and objectives Seek input from stakeholders Review budgets and spending limits	• Applicable energy regulations • Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • Building Energy Codes and Standards	• Ability to research and interpret Codes and Standards • Energy accounting skills • Negotiation skills • Presentation skills • Written communication skills	• Building codes • Computer • Energy codes • National benchmarking data (e.g., EIA, Energy STAR, CBECS) • Printer

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Determine responsibility for utility expenditures Obtain buy-in from stakeholders	• EEMs and economics • Energy unit calculations • Industry terminology, jargon, and acronyms • Organizational awareness		
Assess energy usage			
Gather historical utility bill data Identify energy sources Identify what is controllable and what is not Perform an energy balance Identify and document significant uses Obtain interval data Compile energy usage data Determine indices that should be tracked Review energy contracts Identify historical weather data Identify other relevant variables (occupancy data, etc.) Analyze performance (load profile, correlation, utility consumptions, long term trend analyses, etc.) Verify accuracy of data Calculate performance metrics (EUI, EnPI, etc.)	• Basic energy concepts and principles (See Table 3) • Basic statistics • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • Energy calculations • Energy source pricing structures (demand charges, power factor charges, time of use charges, etc.) • Energy systems • How to interpret interval data • How to interpret weather data • How to verify data (check meters, etc.) • Normalization • Reliability of sources of meter data • Utility rate structures and schedules	• Ability create and utilize spreadsheets and databases • Ability to read and interpret utility bills, rate structures, utility contracts • Troubleshooting skills • Accuracy • Precision • Regression analyses	• Computer • Software
Identify energy performance baselines			
Determine historical timeframe (3 years, 5 years, etc.)	• Basic energy concepts and principles (See Table 3)	• Ability to use Energy STAR portfolio	• Measurement & Verification

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
		manager	Standards
Establish baseline metrics (average, base-year, etc.) Review standards/codes for baseline Determine benchmark to compare to (Energy STAR PM, etc.) Forecast energy usage baseline Benchmarking	• Ability to interpret nationally recognized energy benchmarking standards (ENERGY STAR, etc.) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • Occupant requirements and standards	• Nationally recognized energy benchmarking standards (e.g., ENERGY STAR)	
Planning energy audits			
Identify facility and scope of the audit Review previous audits Establish audit methodology Develop RFP Provide utility and interval data Provide building documentation Coordinate access and scheduling Conduct/supervise energy audits Review and share preliminary results with other stakeholders Approve final audit report	• Basic energy concepts and principles (See Table 3) • EEMs and economics • Best practices for energy efficiency • Best practices in measurement and verification methodology • Building sciences (See Table 3) • Building systems (See Table 3) • Contract administration • Energy audit methodology • Facility type hazards • Health and safety (See Table 3) • IEQ • Understanding of auditing equipment • Understanding of various	• Basic skills in conducting energy audits • Reading ability • Project management skills	• ASHRAE procedures for commercial buildings energy audits • Interval data • Metering tools

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
	specialized facility types (labs, clean rooms, hospitals, etc.)		
Identify energy opportunities			
Review energy audit and baseline results Forecast energy opportunities Review capital plan Survey facility staff and occupants Review maintenance logs Identify data gaps List energy opportunities	• Basic energy concepts and principles (See Table 3) • EEMs and economics • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3)	• Ability to interpret baselines	• ASHRAE guidelines and standards
Prioritize energy opportunities			
Establish financial analysis methods (life cycle costs analysis, ROI, simple payback, etc.) Align prioritized opportunities with organizational mission, goals and capital plans Identify non-energy benefits (e.g. IEQ, productivity, reliability) Identify external funding Establish criteria for prioritization Conduct prioritization Review with management	• Basic database usage, design, and management • Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • EEMs and economics • Financial analysis methodologies and threshold (e.g., life cycle costs analysis, ROI) • Grants • Indoor environmental quality standards (e.g., lighting, temperature, etc.) • Project delivery methods (ESCO, PPA, etc.) • Utility and tax incentives	• Prioritizing skills	• ANSI standards pertaining to Energy • ASHRAE standards (62, 55, 90.1, etc.) • Illumination Engineering Society of North America

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Consult on capital (non-energy) projects			
Obtain project construction documents	• Basic energy concepts and principles (See Table 3) • Building sciences (See Table 3) • Building systems (See Table 3) • Best practices for energy efficiency • Systems thinking (thinking of the interactions between systems)	• Troubleshooting skills • Ability to read and interpret construction documents • Adept at reusing and reapplying existing systems • Negotiation skills • Reasoning skills • Ability to think creatively and holistically	
Review construction documents for energy efficiency			
Review construction documents to ensure that metrics previously defined are adhered to			
Review construction documents to ensure they are aligned with energy program mission and goals			
Attend meetings related to capital projects			
Advocate for energy efficiency measures			
Ensure correct equipment is specified			
Propose energy efficient and cost effective alternatives			
Advocate for commissioning			
Coordinate with other departments/divisions			
Identify internal stakeholders		• Presentation skills • Relationship building skills	
Create structure for coordination (energy committee, etc.)			
Communicate planning decisions or outputs			

Table 10. Tasks, Steps, Specialized Knowledge, Skills, Abilities, Tools, Equipment, and Resources Required for Managing Energy Information

Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Gather energy management data (utility, weather, etc.)			
Develop monitoring methodology	• Basic energy concepts and principles (See Table 3)	• Ability to download data from different types of meters	• EISs • EMCSs
Define data collection infrastructure and methods			
Assign responsibilities for data			

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
(obtaining, entering, etc.) Set up trend histories (BAS, EMS, etc.) Determine information reliability Correct data gaps Implement facility metering and sub-metering Implement data collection (EDI, etc.) Define recordkeeping and reporting requirements	• Building automation control systems and programming • Building sciences (See Table 3) • Building systems (See Table 3) • EISs • EMCSs • Utility invoicing		
Analyze energy management data			
Calculate energy performance metrics Identify source of data for metrics desired Calculate metrics on an ongoing basis Compare results to baselines and benchmarks Define level of deviation to be labeled "significant" Identify cost implications	• Basic energy concepts and principles (See Table 3) • Basic statistical skills • Best practices for energy efficiency • Building automation control systems and programming • Building sciences (See Table 3) • Building systems (See Table 3) • EEMs and economics • Normalization • Typical ranges of energy performance metrics • Weather effects on energy use	• Troubleshooting skills • Analytical skills • Data manipulation skills	• AFDD (Automated Fault Detection and Diagnostics)
Complete reports (internal and external)			
Identify reporting needs Identify audience for reports		• Ability to communicate to	

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Complete recurring reports		specific audiences • Presentation skills • Verbal communication skills • Written communication skills	
Complete exception reports			
Complete project reports			

Table 11. Tasks, Steps, Specialized Knowledge, Skills, Abilities, Tools, Equipment, and Resources Required for Implementing the Energy Management Program

Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Implement the energy program managerial initiatives (training, procurement, communication, and design standards)			
Identify energy management initiatives	• Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • EEMs and economics • Health and safety (See Table 3) • Human behavior	• Ability to multitask	• Latest journals and other references
Design the energy management initiatives in accordance with planned policies and objectives			
Identify the resources required to implement the energy management initiatives			
Implement the energy management initiatives			
Create initiative success criteria			
Develop awareness programs for stakeholders (behavioral, etc.)			
Coordinate team resources			
Manage staff		• Troubleshooting skills • Facilitation skills • Interpersonal skills	• HR policies and procedures (job descriptions, etc.)
Assign roles and responsibilities			
Obtain and retain external expertise			

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Maintain professional requirements		• Management skills	
Obtain buy-in of stakeholders Obtain authorization/approval for energy management activities			
Evaluate results of managerial initiatives (training, procurement, communication, and design)			
Evaluate the energy management initiatives (training, behavioral and capital) Implement improvements for energy management initiatives Communicate findings to appropriate parties	• Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • EEMs and economics • Evaluation methodologies	• Troubleshooting skills • Business acumen • Verbal communication skills • Written communication skills	
Manage ongoing commissioning			
Evaluate facility energy performance Maintain operational controls Analyze trend data Identify operations and maintenance (O&M) deficiencies Implement corrections, preventative actions or corrective actions Conduct Building systems re-training Verify outcome of corrections, preventative actions or corrective actions Manage user behaviors Document system and procedural	• Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building operation plan (including original design load) • Building sciences (See Table 3) • Building systems (See Table 3) • Commissioning process • EEMs and economics • Health and safety (See	• Troubleshooting skills	• CMMS • AFDD (Automated Fault Detection and Diagnostics) • Building operation plan • Construction documents • EMCS/BAS • Sequence of operation plan • Specialized training • Testing instruments (See Table 8)

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
changes	Table 3)		
Repeat commissioning activities	• Sequence of operation • Trend analysis		

Table 12. Tasks, Steps, Specialized Knowledge, Skills, Abilities, Tools, Equipment, and Resources Required for Managing Budgets and Finances

Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Audit utility invoices			
Refer to collected data Gather rate and contract information (e.g., schedules, etc.) Validate bills with meter data (monthly and interval) Conduct component analysis (KW, KWH, KVAR, taxes, transportation costs, water and sewage credits, etc.) Compare with historical and benchmark trends for abnormalities and opportunities Review and approve invoices Report results Pursue corrective actions, if required	• Basic energy concepts and principles (See Table 3) • Building systems (See Table 3) • EEMs and economics • Utility meter types • Utility rates, tariffs, and contracts (including specialized rates and programs)	• Basic accounting skills • Basic statistics • Spreadsheet analysis skills	• Computer • Real time access to utility account • Utility accounting software • Utility rate schedules
Forecast energy costs			
Review baseline forecast and historical data Check contract expiration dates Plan for capital and operational changes	• Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See	• Ability to read future markets • Basic accounting skills • Basic statistical skills • Spreadsheet analysis skills	• Energy forecast tables (EIA, NIST)
Check for utility rate increases Apply corrections to baseline			

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<table>
<tr><th>Duties, Tasks, and Steps</th><th>Specialized Knowledge</th><th>Skills and Abilities</th><th>Tools, Equipment, and Resources</th></tr>
<tr><td>forecasts
Report forecasted energy cost</td><td>Table 3)
• EEMs and economics
• Health and safety (See Table 3)
• Utility meter types
• Utility rates, tariffs, and contracts (including specialized rates and programs)</td><td></td><td></td></tr>
<tr><td colspan="4">Procure cost effective energy sources</td></tr>
<tr><td>Identify potential supply opportunities
Evaluate alternative supply options (dynamic pricing, renewable, deregulated purchasing, etc.)
Evaluate rate plan options
Investigate demand response programs
Review impact on charge backs (tenants)
Make recommendations to procurement
Implement procurement changes
Communicate procurement changes with operations</td><td>• Basic energy concepts and principles (See Table 3)
• Basic energy engineering calculations
• Best practices for energy efficiency
• Building systems (See Table 3)
• EEMs and economics
• Procurement process
• Utility meter types
• Utility rates, tariffs, and contracts (including specialized rates and programs)</td><td>• Ability to read future markets</td><td>• Modeling software</td></tr>
<tr><td colspan="4">Prepare budgets</td></tr>
<tr><td>Review previous budget results and accuracy
Review operations and capital master plans
Budget for utilities
Budget for energy program costs (including initiatives and projects)</td><td>• Basic energy concepts and principles (See Table 3)
• Best practices for energy efficiency
• EEMs and economics</td><td>• Ability to write proposals and cost estimates
• Basic accounting skills
• Negotiation skills
• Written communication skills</td><td></td></tr>
<tr><td>Review impact on charge backs (tenants)</td><td></td><td></td><td></td></tr>
</table>

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Prepare supporting documentations			
Review with senior management			
Communicate results and progress			

Table 13. Tasks, Steps, Specialized Knowledge, Skills, Abilities, Tools, Equipment, and Resources Required for Implementing Energy Efficient Projects

Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Plan project implementation			
Create a baseline and set up the M&V Create the scope of work Determine procurement path (bid, internal, etc.) Develop specifications and guidelines Review specifications for code compliance Coordinate work with stakeholders and user groups Create the project plan	• Basic energy concepts and principles (See Table 3) • Best practices for energy efficiency • Building sciences (See Table 3) • Building systems (See Table 3) • Energy accounting • EEMs and economics • Health and safety (See Table 3) • Resource planning • Risk assessment • Stakeholder groups (health and safety, facility operations, occupants, etc.)	• Ability to create project scope documents • Ability to read and interpret construction documents • Project scheduling skills • Project management skills	• Scheduling software
Implement energy projects			
Manage project contractors Conduct construction management activities (change	• Building and Energy Codes and Standards	• Troubleshooting skills • Negotiation skills	• Scheduling software

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Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
orders, submittals, RFIs, contractor invoices, etc.) Monitor project progress Report on project progress Conduct commissioning activities Initiate M&V activities	• Building sciences (See Table 3) • Building systems (See Table 3) • Construction management • Health and safety (See Table 3) • Industry accepted Codes, Standards and Regulations (for industries served by the Energy Manager)	• Project management skills	
Conduct project close-out activities			
Conduct final inspections and testing Define maintenance requirements Obtain close-out documentation (As-Builts, sequence of operations, warranties, etc.) Conduct training Review lessons learned Obtain incentives Conduct financial close-out activities Prepare final reports (executive summaries, white papers, etc.)	• Best maintenance practices • Building sciences (See Table 3) • Building systems (See Table 3) • Construction management • Health and safety (See Table 3) • Incentive programs	• Ability to read and interpret construction documents • Negotiation skills • Report writing skills • Troubleshooting skills	• Scheduling software
Monitor Project Performance			
Conduct M&V activities Conduct ongoing monitoring activities Report on project monitoring Verify maintenance is performed Take corrective actions as required	• Basic energy concepts and principles (See Table 3) • Building sciences (See Table 3) • Building systems (See Table 3) • EEM and economics • M&V methodologies	• Basic accounting skills • Basic statistical skills • Spreadsheet analysis skills • Troubleshooting skills • Verbal communication skills • Written communication skills	• Contract documents • M&V Protocols • Testing instruments (See Table 8)

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Table 14. Tasks, Steps, Specialized Knowledge, Skills, Abilities, Tools, Equipment, and Resources Required for Managing Energy Communications

Duties, Tasks, and Steps	Specialized Knowledge	Skills and Abilities	Tools, Equipment, and Resources
Advocate for energy conservation			
Share success stories	• Basic energy concepts and principles (See Table 3) • Benefits of energy efficiency • Best practices for energy efficiency • EEMs and economics • Environmental impacts of energy consumption • Human behavior • Impact of building systems on health and wellbeing	• Ability to communicate technical information to others • Interpersonal skills • Presentation skills • Verbal communication skills • Written communication skills	
Communicate the benefits of energy efficiency (climate change effects, air quality, savings, non-energy benefits, etc.)			
Network with other energy managers			
Network with Energy organizations			
Educate stakeholders about why energy is important			
Evaluate effectiveness of communications efforts			
Communicate progress towards energy goals and objectives			
Support organization (PR) in communications to media/press and/or stakeholders			
Communicate energy information to senior management			
Create progress report	• Basic energy concepts and principles (See Table 3) • EEMs and economics	• Ability to create graphs, charts, etc.	
Tailor data for audience			
Offer suggestions for improvement			
Prepare standard and ad-hoc reports (legal compliance, regulatory agencies, etc.)			
Coordinate energy program with external parties			
Interface with regulatory bodies (e.g. PUCs, municipalities)	• Energy certification programs • Utility rate structures and schedules • Utility regulations and requirements	• Verbal communication skills • Written communication skills	
Interface utility companies and other supplies			
Interface with certification groups (Energy Star, USGBC, Green Globes, ISO, etc.)			

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3 Examination Blueprint

The Final Proposed Examination Blueprint for Energy Manager is shown below in Table 15. The exam blueprint identifies subject matter areas covered on a certification exam. Table 15 column headings are defined as follows:

Duties and Tasks: Description of the work

Analytical Weights: The weights calculated by taking the average of the tabulated individual ratings on frequency and importance (2 times importance plus frequency). See Section 6.2.

Holistic Weights: These are the weights calculated by taking the average the individual responses regarding the overall percentage that should be in each of the Duties and Tasks. See Section 6.2.

Final Weight: These are the weights agreed upon by the JTA committee during the post-validation study webinar. See Section 6.

Final Items: These are the quantity of items (i.e., test questions) that should be on each examination in each of the categories as agreed to by the JTA committee during the post-validation study webinar.

Table 15. Final Proposed Examination Blueprint for Energy Manager

Duties and Tasks	Analytical Weights	Holistic Weights	Final Weights	Final Items
Planning Effective Energy Management	35%	17%	29%	29
Identify the energy management scope	4%		2%	2
Develop energy management policies and objectives	4%		2%	2
Assess energy usage	5%		4%	4
Identify energy performance baselines	4%		1%	1
Plan energy audits	3%		3%	3
Identify energy opportunities	5%		7%	7
Prioritize energy opportunities	4%		7%	7
Consult on capital (non-energy) projects	3%		1%	1
Coordinate with other departments/divisions	4%		2%	2
Managing Energy Information	12%	17%	11%	11
Gather energy management data (utility, weather, etc.)	4%		3%	3
Analyze energy management data	4%		6%	6
Complete reports (internal and external)	4%		2%	2
Implementing the Energy Management Program	13%	21%	20%	20
Implement the energy program managerial initiatives (training, procurement, communication, and design standards)	4%		8%	8
Coordinate team resources	3%		3%	3
Evaluate results of managerial initiatives (training, procurement, communication, and design)	3%		5%	5
Manage ongoing commissioning	3%		4%	4
Managing Budgets and Finances	13%	13%	13%	13
Audit utility invoices	3%		4%	4

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Duties and Tasks	Analytical Weights	Holistic Weights	Final Weights	Final Items
Forecast energy costs	3%		6%	6
Procure cost effective energy sources	3%		1%	1
Prepare budgets	3%		2%	2
Implementing Energy Efficient Projects	15%	22%	22%	22
Plan project implementation	4%		5%	5
Implement energy projects	4%		8%	8
Conduct project close-out activities	3%		1%	1
Monitor Project Performance	4%		8%	8
Managing Energy Communications	12%	11%	5%	5
Advocate for energy conservation	4%		1%	1
Communicate energy information to senior management	4%		3%	3
Coordinate energy program with external parties	3%		1%	1
	100%	100%	100%	100

To arrive at the final blueprint, the JTA committee was asked to consider the tabulated frequency and importance scales together with the holistic weights.

Respondents were asked to provide a holistic weighting to the domain areas. Based on the responses, an examination blueprint was calculated for each domain. This information appears in Table 16.

Table 16. Summary of Respondent Holistic Ratings

Domain	%
Planning Effective Energy Management	16.76%
Managing Energy Information	16.99%
Implementing the Energy Management Program	20.66%
Managing Budgets and Finances	12.99%
Implementing Energy Efficient Projects	22.16%
Managing Energy Communications	10.57%

The remainder of this document describes the process for conducting the job task analysis and administering the validation survey.

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4 Job Task Analysis and Survey Validation

NIBS and NREL organized a group of panelists consisting of 14 SMEs representing Energy Managers to conduct a JTA using the DACUM methodology. The 14 experts are listed in Table 17.

Table 17. List of DACUM JTA Participants

A. Morton Archibald, Jr., P.E.	Affordable Solar Energy Solutions LLC Huntsville, AL
Fran Boucher	National Grid Waltham, MA
Phil Coleman	Lawrence Berkeley National Lab Swarthmore, PA
Randy Despain	Taylor RyMar Corporation Tempe, AZ
Jeffrey Engelstad	General Services Administration Denver, CO
Randy Green	Georgia Tech Dublin, Georgia
Andy Heitman	Building Energy Sciences, LLC Pensacola, FL
Don Juhasz, P.E., CEM	Dept of Defense – DLA Ft. Belvoir, VA
Andrew Knox	Naval Facilities Engineering Command (NAVFAC) Washington, DC
Emile Lauzzana	Detroit Public Schools Ann Arbor, MI
Ralene Molina-Kreiser	PennTAP Penn State University University Park, PA
Anas Sadkhi	Via Christi Health Wichita, KS
Premnath Sundharam	DLR Group Phoenix, AZ
Wayne Turner	Energy Management Consultant Fairplay, CO

The DACUM JTA meeting was facilitated by Dr. Cynthia Woodley, psychometrician, and Ms. Tracey Paschal, project manager with Professional Testing, Inc. The 3-day meeting developed a list of five domains or duties and 42 tasks through group discussions.

4.1 Survey Development

The task list was used to build a survey that was delivered using an online mechanism. The survey consisted of two major sections: Demographic Information and Energy Manager Tasks. The draft survey was shared with NREL/NIBS/DOE staff for initial review and then NIBS volunteered to send the survey to appropriate respondents. Appendix A includes a copy of the survey.

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4.2 Survey Dissemination

NIBS sent the survey to several Energy Managers. The survey was open for approximately 30 days in the spring of 2014 for data collection, during which time email reminders were sent. The final dataset included 356 respondents, some of whom did not complete the survey.

5 Results

All data were included in the analyses, since people who skipped a question or task rating may have done so either accidentally or because they felt that the item was not applicable to their position. The sample size is large enough (356) to allow reasonable confidence in the results. Results from the demographics questions will be presented first.

5.1 State of Primary Employment

The largest number of respondents reported working in multiple states or "other" for which they wrote in responses. The states with the largest numbers of respondents were California (6.8%, n = 18), Texas (6.8%, n = 18), New York (5.6%, n = 15), and Virginia (5.6%, n = 15). Table 18 provides the summary of these data.

Table 18. State of Employment of Respondents

State	%	#	State	%	#
Multiple States	12.4%	33	**Kansas**	1.1%	3
Other (please specify)	10.2%	27	**Massachusetts**	1.1%	3
California	6.8%	18	**Oklahoma**	1.1%	3
Texas	6.8%	18	**Utah**	1.1%	3
New York	5.6%	15	**Alaska**	0.8%	2
Virginia	5.6%	15	**Arkansas**	0.8%	2
Florida	4.9%	13	**Idaho**	0.8%	2
Washington	4.1%	11	**Iowa**	0.8%	2
Michigan	3.8%	10	**New Mexico**	0.8%	2
Minnesota	3.4%	9	**Oregon**	0.8%	2
New Jersey	3.4%	9	**Rhode Island**	0.8%	2
Ohio	3.4%	9	**Delaware**	0.4%	1
Pennsylvania	3.4%	9	**Maine**	0.4%	1
Arizona	3.0%	8	**Wisconsin**	0.4%	1
North Carolina	3.0%	8	**Wyoming**	0.4%	1
Georgia	2.6%	7	**Alabama**	0.0%	0
Kentucky	2.6%	7	**Louisiana**	0.0%	0
Colorado	1.9%	5	**Mississippi**	0.0%	0
Maryland	1.9%	5	**Montana**	0.0%	0
Missouri	1.9%	5	**Nebraska**	0.0%	0
Tennessee	1.9%	5	**Nevada**	0.0%	0
Indiana	1.5%	4	**New Hampshire**	0.0%	0
South Carolina	1.5%	4	**North Dakota**	0.0%	0
Connecticut	1.1%	3	**South Dakota**	0.0%	0
Hawaii	1.1%	3	**Vermont**	0.0%	0
Illinois	1.1%	3	**West Virginia**	0.0%	0
Answered question		**266**			

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Table 19 contains a list of the write-in comments associated with "other." Several of the write-in comments were states for which the respondents could have checked participant states. However, Table 19 highlights international locations where respondents work (yellow highlight).

Table 19. List of "Other" Write-In Comments

"Other" Write-in Comments	
Missouri	District of Columbia
Kingston, Jamaica	Jakarta, Indonesia
WI, IA, ND	Shaanxi Province, China
District of Columbia	Turkey
NM, LA, KY, MO, OK	Canada Ontario
Missouri	Ontario, Canada
District of Columbia	Serbia
Puerto Rico	Germany
DC Metro	Pakistan
National	Puerto Rico
Indiana and Illinois	Mid Atlantic
Washington DC	Italy
NY, IA, IL, SC, FL	Chile
	Croatia

5.2 Highest Level of Education

Respondents were asked about the highest level of education reached. The majority indicated completing a Bachelor's degree (47%, n = 151) followed by a graduate degree (39.9%, n = 128). The result is that almost 87% (86.9%, n = 279) have a Bachelor's degree or higher. Table 20 and Figure 1 depict this information.

Table 20. Highest Level of Education

What is your highest level of education?		
Answer Options	**Response Percent**	**Response Count**
Less than High School	0.3%	1
High School or Equivalent	0.9%	3
Some College	3.7%	12
Two Years of College/Technical School/Community College	8.1%	26
Bachelor's Degree	47.0%	151
Graduate Degree	39.9%	128
Answered question		**321**

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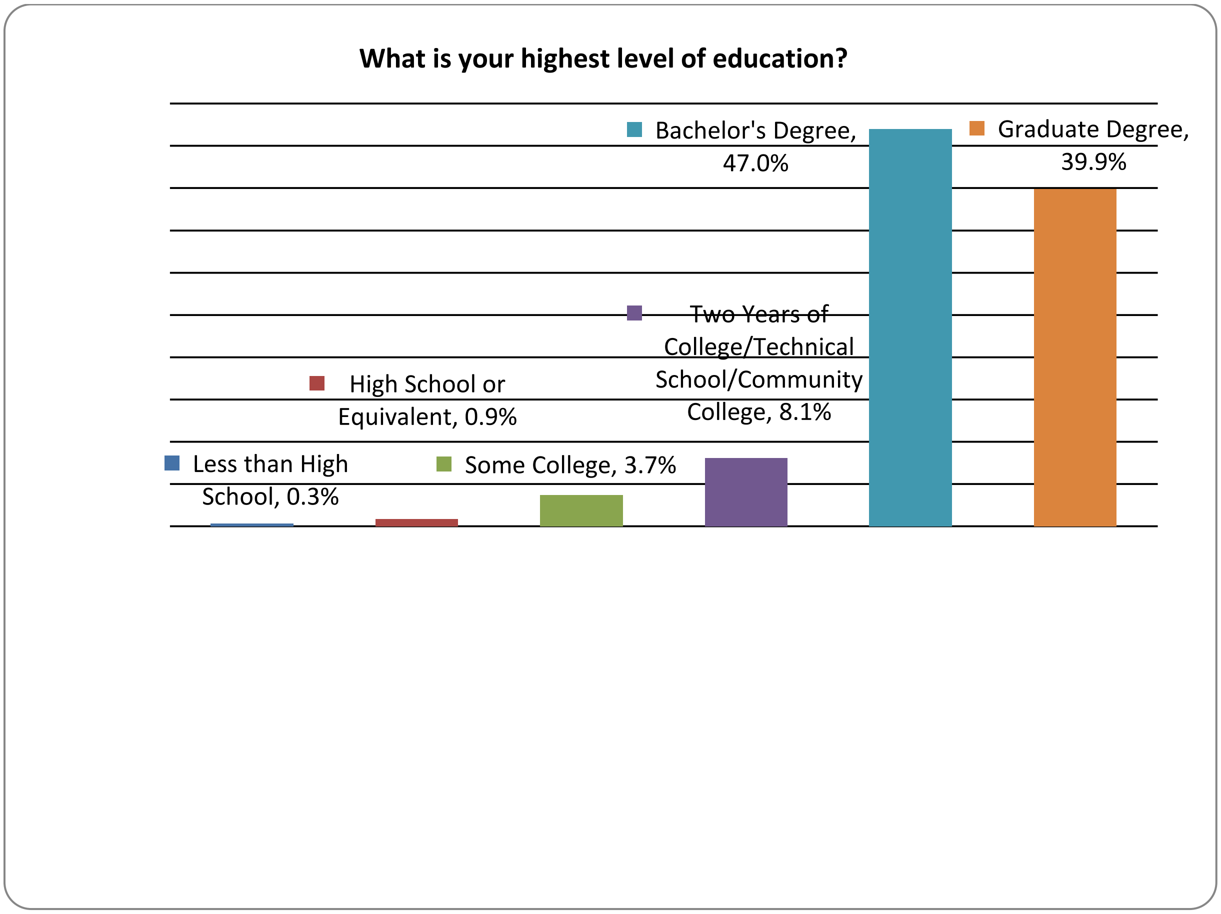

Figure 1. Highest level of education

5.3 Years of Energy Experience

Respondents were asked how many years of experience they had in an energy-related industry (all jobs combined), not necessarily specifically as an Energy Manager. The majority (46.4%, n = 149) have more than 21 years of experience. Table 21 and Figure 2 depict this information.

Table 21. Years of Energy Experience

How many years of experience do you have in an energy related industry (all jobs combined)?		
Answer Options	**Response Percent**	**Response Count**
5 years or less	10.3%	33
6–10 years	15.3%	49
11–15 years	13.7%	44
16–20 years	14.3%	46
21 or more years	46.4%	149
Answered question		**321**

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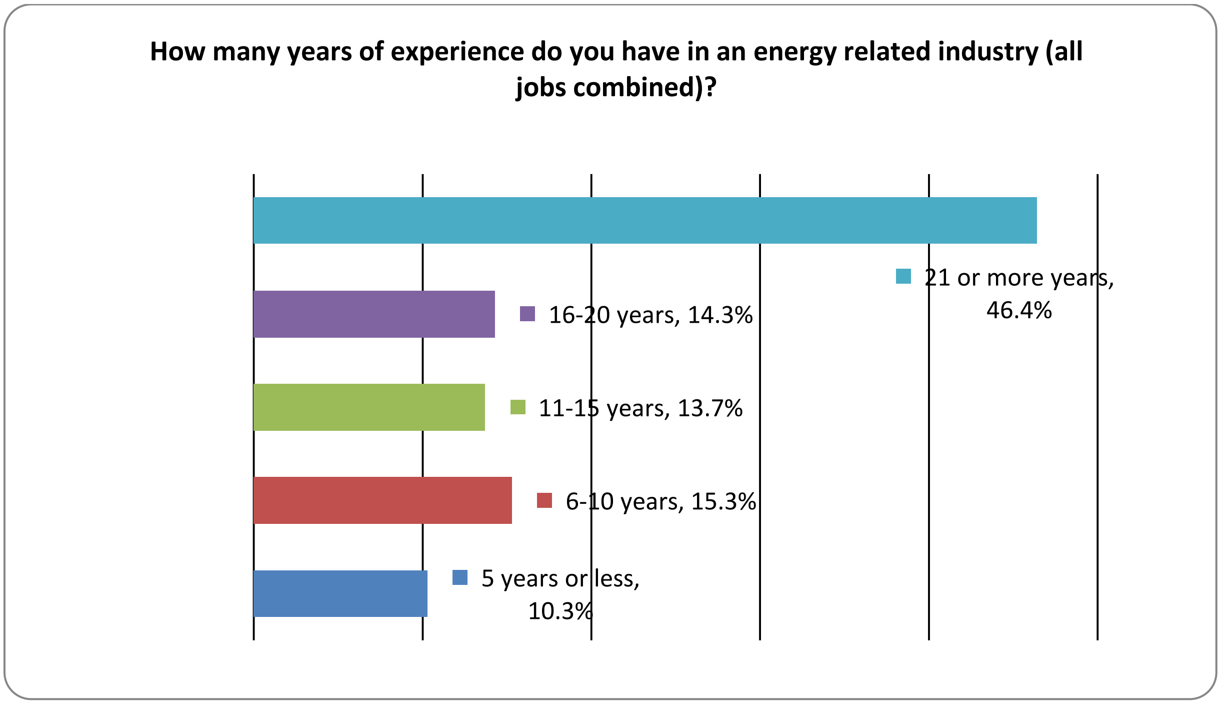

Figure 2. Years of energy experience

5.4 Years of Energy Manager Experience

Respondents were asked how many years of experience they had specifically as Energy Managers. Even though the majority had more than 21 years of experience in an energy-related field, the majority (27.1%, n = 87) had fewer than 5 years of experience as Energy Managers. And 24.3% (n = 78) had 6–10 years of experience. Together this represents more than 50% (51.4%, n = 166) of the respondents having fewer than 10 years of experience as an Energy Manager. The SMEs who reviewed the results of the validation study were asked if this represented a shortcoming in the type of individuals who responded to the survey and if additional respondents with more experience should be targeted. The SMEs felt this was not necessary and believed the responses to be reflective of the industry. They felt that Energy Manager as an occupation is a relatively new field, and although a majority had more than 21 years of experience in an energy-related field, the majority with fewer than 10 years of experience reflected the fact that energy professionals have more recently transferred into the field of energy management. Table 22 and Figure 3 reflect this information.

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Table 22. Years of Experience Specifically as an Energy Manager

How many years of experience do you have specifically as an Energy Manager?		
Answer Options	**Response Percent**	**Response Count**
None	4.4%	14
5 years or less	27.1%	87
6–10 years	24.3%	78
11–15 years	16.8%	54
16–20 years	12.1%	39
21 or more years	15.3%	49
Answered question		**321**

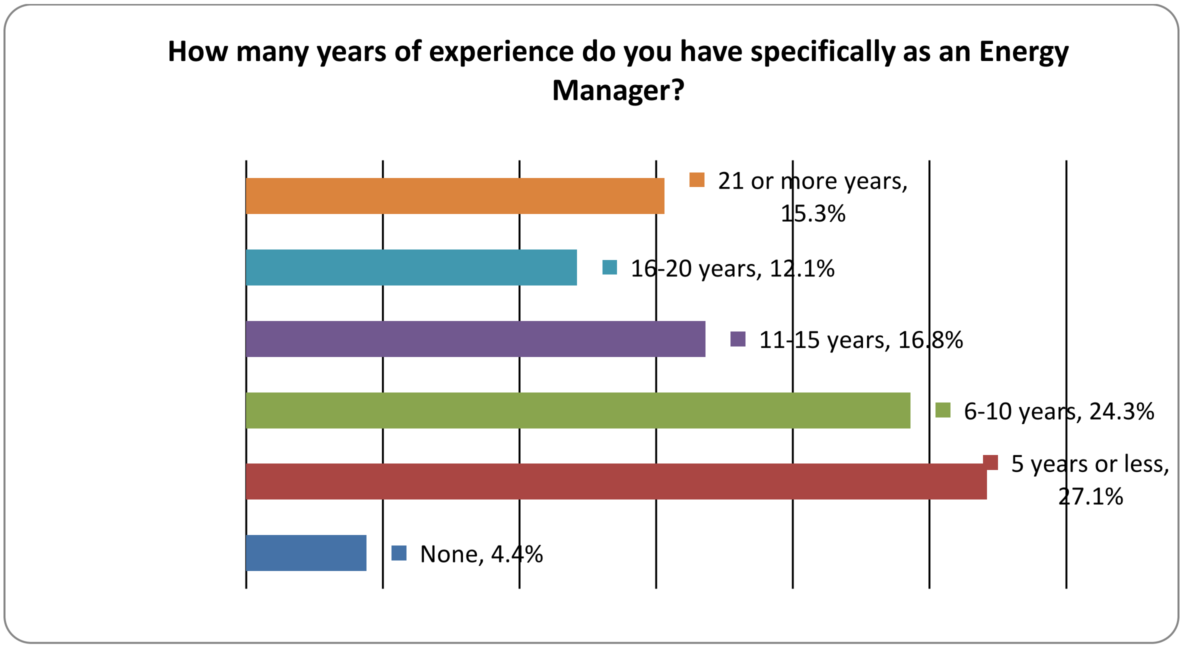

Figure 3. Years of experience specifically as an energy manager

5.5 Work Sector

Respondents were asked whether they worked in a private or public (government) work sector. A slight majority (54.7%, n = 174) indicated they worked in a private sector. Table 23 and Figure 4 reflect this information.

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Table 23. Sector in Which Respondent Works

In which sector do you currently work?		
Answer Options	**Response Percent**	**Response Count**
Public (government at any level)	45.3%	144
Private	54.7%	174
Answered question		**318**

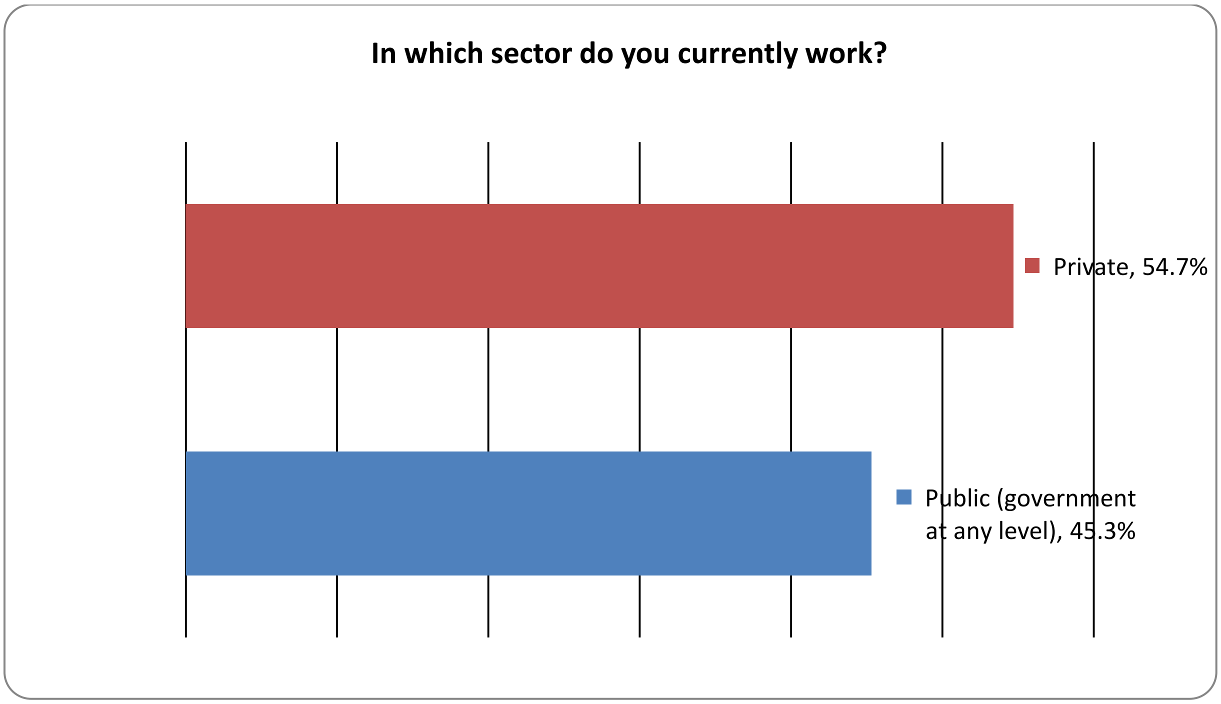

Figure 4. Sector in which respondent works

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6 Post-Survey Conference Call/Webinar

Based on this information, Professional Testing, Inc., facilitated a conference call on June 2, 2014, to review and discuss the survey results. The meeting began with a review of the demographic question results to confirm that the sample appeared to be representative of the industry. The attending Energy Manager SMEs agreed that the group of respondents was representative of the industry. They then reviewed the tasks that were flagged for potential elimination. The resolution of this conference call was to remove none of the competency statements.

6.1 Adequacy of Respondent Demographics

Based on the results of the demographic data, the JTA Committee felt that the respondents were demographically representative and in fact the correct target population was reached.

6.2 Job Task Ratings

Twenty-seven tasks were included in the final version of the validation survey. These tasks were grouped based on the six content domains to be covered by the Energy Manager examination scheme. The survey used a four-point rating scale for importance of task performance, using the following scale:

1	Not important
2	Somewhat important
3	Important
4	Very Important

In addition to the rating scale for task importance, the survey used a six-point rating scale for the frequency of the task, using the following scale:

1	Never
2	1% to 25% of the time
3	26% to 50% of the time
4	51% to 75% of the time
5	76% to 99% of the time
6	100% of the time

Responses were tabulated, and means, standard deviations (SDs), and standard errors of the mean (SEMs) were calculated for the frequency and the importance scales. This information appears in Table 24.

In Table 24, tasks in red represent tasks with less than 2.0 on frequency AND importance. The SMEs considered these tasks during the follow-up webinar to determine whether they should be dropped. The SMEs determined all tasks were needed.

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Table 24. Means, SDs, and SEM of Rating Scale Responses

Duties and Tasks	Frequency			Importance		
	Means	SD	SEM	Means	SD	SEM
Planning Effective Energy Management						
Identify the energy management scope	2.45	1.65	0.09	2.40	0.72	0.06
Develop energy management policies and objectives	2.04	1.39	0.08	2.37	0.71	0.06
Assess energy usage	3.12	1.52	0.08	2.71	0.55	0.05
Identify energy performance baselines	2.48	1.57	0.09	2.39	0.72	0.06
Plan energy audits	2.05	1.43	0.08	2.11	0.75	0.06
Identify energy opportunities	3.00	1.54	0.09	2.68	0.51	0.05
Prioritize energy opportunities	2.69	1.58	0.09	2.47	0.63	0.05
Consult on capital (non-energy) projects	1.78	1.20	0.08	1.76	0.90	0.07
Coordinate with other departments/divisions	2.65	1.56	0.09	2.27	0.76	0.06
Managing Energy Information						
Gather energy management data (utility, weather, etc.)	2.73	1.64	0.09	2.53	0.65	0.06
Analyze energy management data	2.88	1.50	0.08	2.67	0.57	0.05
Complete reports (internal and external)	2.50	1.53	0.09	2.28	0.77	0.06
Implementing the Energy Management Program						
Implement the energy program managerial initiatives (training, procurement, communication, and design standards)	2.31	1.45	0.08	2.19	0.78	0.06
Coordinate team resources	2.18	1.40	0.08	2.00	0.79	0.06
Evaluate results of managerial initiatives (training, procurement, communication, and design)	1.97	1.34	0.08	1.92	0.77	0.06
Manage ongoing commissioning	1.83	1.28	0.08	2.09	0.88	0.07
Managing Budgets and Finances						
Audit utility invoices	2.02	1.51	0.09	2.06	0.85	0.06
Forecast energy costs	1.88	1.39	0.08	1.98	0.87	0.07
Procure cost effective energy sources	1.71	1.40	0.08	1.99	0.91	0.07
Prepare budgets	1.88	1.47	0.09	2.14	0.85	0.06
Implementing Energy Efficient Projects						
Plan project implementation	2.36	1.46	0.08	2.28	0.73	0.06
Implement energy projects	2.55	1.49	0.09	2.39	0.73	0.06
Conduct project close-out activities	2.02	1.47	0.08	2.07	0.80	0.06
Monitor Project Performance	2.41	1.57	0.09	2.49	0.71	0.06
Managing Energy Communications						
Advocate for energy conservation	2.77	1.72	0.09	2.46	0.73	0.06
Communicate energy information to senior management	2.53	1.57	0.09	2.57	0.65	0.06
Coordinate energy program with external parties	2.17	1.50	0.09	1.90	0.90	0.07

Responses to frequency and importance rankings were combined by doubling the importance and adding frequency to arrive at a single scale. Table 25 shows the tabulated results.

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Table 25. Combined Frequency and Importance Scales

Duties and Tasks	Frequency			Importance			Combined Ratings	Overall Weights
	Means	SD	SEM	Means	SD	SEM		
Planning Effective Energy Management								
Identify the energy management scope	2.45	1.65	0.09	2.40	0.72	0.06	7.25	3.91%
Develop energy management policies and objectives	2.04	1.39	0.08	2.37	0.71	0.06	6.78	3.66%
Assess energy usage	3.12	1.52	0.08	2.71	0.55	0.05	8.53	4.60%
Identify energy performance baselines	2.48	1.57	0.09	2.39	0.72	0.06	7.26	3.92%
Plan energy audits	2.05	1.43	0.08	2.11	0.75	0.06	6.27	3.38%
Identify energy opportunities	3.00	1.54	0.09	2.68	0.51	0.05	8.36	4.51%
Prioritize energy opportunities	2.69	1.58	0.09	2.47	0.63	0.05	7.62	4.11%
Consult on capital (non-energy) projects	1.78	1.20	0.08	1.76	0.90	0.07	5.29	2.86%
Coordinate with other departments/divisions	2.65	1.56	0.09	2.27	0.76	0.06	7.18	3.88%
Managing Energy Information								
Gather energy management data (utility, weather, etc.)	2.73	1.64	0.09	2.53	0.65	0.06	7.79	4.20%
Analyze energy management data	2.88	1.50	0.08	2.67	0.57	0.05	8.21	4.43%
Complete reports (internal and external)	2.50	1.53	0.09	2.28	0.77	0.06	7.06	3.81%
Implementing the Energy Management Program								
Implement the energy program managerial initiatives (training, procurement, communication, and design standards)	2.31	1.45	0.08	2.19	0.78	0.06	6.68	3.61%
Coordinate team resources	2.18	1.40	0.08	2.00	0.79	0.06	6.19	3.34%
Evaluate results of managerial initiatives (training, procurement, communication, and design)	1.97	1.34	0.08	1.92	0.77	0.06	5.81	3.14%
Manage ongoing commissioning	1.83	1.28	0.08	2.09	0.88	0.07	6.02	3.25%
Managing Budgets and Finances								
Audit utility invoices	2.02	1.51	0.09	2.06	0.85	0.06	6.14	3.32%
Forecast energy costs	1.88	1.39	0.08	1.98	0.87	0.07	5.84	3.15%
Procure cost effective energy sources	1.71	1.40	0.08	1.99	0.91	0.07	5.68	3.07%
Prepare budgets	1.88	1.47	0.09	2.14	0.85	0.06	6.16	3.32%

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Duties and Tasks	Frequency			Importance			Combined Ratings	Overall Weights
	Means	SD	SEM	Means	SD	SEM		
Implementing Energy Efficient Projects								
Plan project implementation	2.36	1.46	0.08	2.28	0.73	0.06	6.93	3.74%
Implement energy projects	2.55	1.49	0.09	2.39	0.73	0.06	7.34	3.96%
Conduct project close-out activities	2.02	1.47	0.08	2.07	0.80	0.06	6.17	3.33%
Monitor Project Performance	2.41	1.57	0.09	2.49	0.71	0.06	7.38	3.99%
Managing Energy Communications								
Advocate for energy conservation	2.77	1.72	0.09	2.46	0.73	0.06	7.70	4.15%
Communicate energy information to senior management	2.53	1.57	0.09	2.57	0.65	0.06	7.67	4.14%
Coordinate energy program with external parties	2.17	1.50	0.09	1.90	0.90	0.07	5.97	3.22%
							185.28	100.00%

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6.3 Tasks or Knowledge Missing

Survey respondents were asked if they felt there were any tasks or knowledge missing from the JTA. Appendix B lists all of the write-in responses. The JTA Committee reviewed all the comments and determined that the following content should be added to the JTA:

- Information indicating when the JTA refers to *energy* that *energy* also includes water.

6.4 Discussion of Assessment

During the post survey validation conference call, the JTA committee discussed the assessment associated with the JTA. It was determined that a multiple choice examination would be sufficient to measure the knowledge. The JTA committee was presented sample surveys at the 100 item, 120 item and 150 item levels. Each content domain and task area was reviewed for content depth and breadth at each of the various exam length levels with discussion regarding what length examination would be sufficient to cover the content. The committee felt that 100 test items would be needed to sufficiently cover the depth and breadth of the content so a 100 item examination length was selected.

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7 Conclusions and Next Steps

The JTA is the first step in the test development process; it is the primary source of evidence for the examination's validity. The final DACUM JTA is now validated and may be used by training organizations to develop training programs and by a certification body or scheme committee to develop a certification scheme.

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Appendix A: Energy Manager Validation Study Survey

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Commercial Workforce Credentialing Council Job Task Analysis Validation

Welcome!

The National Institute of Building Sciences Commercial Workforce Credentialing Council and industry stakeholders have a project to improve the quality and consistency of commercial buildings workforce training and certification programs for four key energy-related jobs.

In support of this project, the National Institute of Building Sciences (NIBS), and Professional Testing, Inc. are seeking members of the commercial buildings industry to participate in a nationwide research study validating job task analyses (JTAs) of four key energy-related jobs in the commercial buildings sector. The JTA is a procedure for analyzing the tasks performed by individuals in a specific job, as well as the knowledge, skills, and abilities necessary to perform those tasks. JTAs are critical elements of quality training programs and professional certifications.

Current industry practitioners whose work falls into one or more of the following job categories may complete a validation study by **April 25, 2014**. Each energy-related job area survey is nine pages. For each survey you will rate the frequency and importance of the work activities associated with each area of responsibility. Participation should take approximately 30–45 minutes and individuals may complete more than one validation study, if applicable. When determining applicability, practitioners should focus on the details of the job descriptions rather than on the job title, as job titles frequently vary from one employer to another.

You do not have to respond to all surveys however we ask you to please finish any survey you start.

If you do not have time to complete the survey in one sitting, you can stop and complete the survey later (provided you use the same computer and have cookies enabled on that computer). The survey will resume where you stopped. If you do not have cookies enabled, the survey will start over from the beginning again.

Your responses will be kept confidential, and we appreciate your assistance. If you have any difficulty responding to this survey, please contact NIBS at dsmith@nibs.org.

On the next page you will be given the opportunity to select the energy-related job survey you are interested in responding to.

Commercial Workforce Credentialing Council Job Task Analysis Validation

Following is a description of each of the four energy-related surveys you may respond to. Please review the job descriptions and select the survey for which you feel most qualified.

Please note: Validation studies should be completed only by professionals who have actual job experience in the specific job or who have trained those performing the job, **specifically for** commercial buildings. Participation is voluntary and individual responses will be kept confidential. Responses will be combined with those from other respondents and used to improve the JTAs for the commercial buildings workforce.

*

Please select the survey for which you wish to respond:

- Energy Manager - Responsible for managing and continually improving energy performance in commercial buildings by establishing and maintaining an energy program management system that supports the mission and goals of the organization.
- Building Energy Auditor - Energy solutions professional who assesses building systems and site conditions; analyzes and evaluates equipment and energy usage; and recommends strategies to optimize building resource utilization.
- Building Operations Professional - Manages the maintenance and operation of building systems and installed equipment, and performs general maintenance to maintain the building's operability, optimize building performance, and ensure the comfort, productivity and safety of the building occupants.
- Building Commissioning Professional - Leads, plans, coordinates and manages a commissioning team to implement commissioning processes in new and existing buildings.

Commercial Workforce Credentialing Council Job Task Analysis Validation

Please answer the following background questions. Your responses will be kept confidential and this information will only be used for statistical purposes.

In which state do you primarily work?

Other (please specify)

What is your highest level of education?

- Less than High School
- High School or Equivalent
- Some College
- Two Years of College/Technical School/Community College
- Bachelor's Degree
- Graduate Degree

How many years of experience do you have in an energy related industry (all jobs combined)?

- 5 years or less
- 6-10 years
- 11-15 years
- 16-20 years
- 21 or more years

How many years of experience do you have specifically as an Energy Manager?

- none
- 5 years or less
- 6-10 years
- 11-15 years
- 16-20 years
- 21 or more years

In which sector do you currently work?

- Public (government at any level)
- Private

Commercial Workforce Credentialing Council Job Task Analysis Validation

Instruction Page

In the following pages, you will be asked to think about tasks that an Energy Manager does and to indicate the frequency with which an Energy Manager performs each task on a job. Then, considering the same task statement, you will be asked to indicate how important it is that an Energy Manager knows how to do each of these tasks. To respond click the drop down menu and select your response.

Commercial Workforce Credentialing Council Job Task Analysis Validation

When an Energy Manager is <u>Planning Effective Energy Management</u>, please indicate how frequently this task is performed on the job and how important this task is to an Energy Manager.

	Frequency - How often is this task performed on the job?	Importance - How important is this task to the overall successful performance of an Energy Manager?
Identify the energy management scope		
Develop energy management policies and objectives		
Assess energy usage		
Identify energy performance baselines		
Plan energy audits		
Identify energy opportunities		
Prioritize energy opportunities		
Consult on capital (non-energy) projects		
Coordinate with other departments/divisions		

When an Energy Manager is <u>Managing Energy Information</u>, please indicate how frequently this task is performed on the job and how important this task is to an Energy Manager.

	Frequency - How often is this task performed on the job?	Importance - How important is this task to the overall successful performance of an Energy Manager?
Gather energy management data (utility, weather, etc.)		
Analyze energy management data		
Complete reports (internal and external)		

When an Energy Manager is <u>Implementing the Energy Management Program</u>, please indicate how frequently this task is performed on the job and how important this task is to an Energy Manager.

	Frequency - How often is this task performed on the job?	Importance - How important is this task to the overall successful performance of an Energy Manager?
Implement the energy program managerial initiatives (training, procurement, communication, and design standards)		
Coordinate team resources		
Evaluate results of managerial initiatives (training, procurement, communication, and design)		
Manage ongoing commissioning		

Commercial Workforce Credentialing Council Job Task Analysis Validation

When an Energy Manager is <u>Managing Budgets and Finances</u>, please indicate how frequently this task is performed on the job and how important this task is to an Energy Manager.

	Frequency - How often is this task performed on the job?	Importance - How important is this task to the overall successful performance of an Energy Manager?
Audit utility invoices		
Forecast energy costs		
Procure cost effective energy sources		
Prepare budgets		

When an Energy Manager is <u>Implementing Energy Efficient Projects</u>, please indicate how frequently this task is performed on the job and how important this task is to an Energy Manager.

	Frequency - How often is this task performed on the job?	Importance - How important is this task to the overall successful performance of an Energy Manager?
Plan project implementation		
Implement energy projects		
Conduct project close-out activities		
Monitor Project Performance		

When an Energy Manager is <u>Managing Energy Communications</u>, please indicate how frequently this task is performed on the job and how important this task is to an Energy Manager.

	Frequency - How often is this task performed on the job?	Importance - How important is this task to the overall successful performance of an Energy Manager?
Advocate for energy conservation		
Communicate energy information to senior management		
Coordinate energy program with external parties		

Commercial Workforce Credentialing Council Job Task Analysis Validation

Review the specialized knowledge below and indicate the depth of knowledge that is required of an Energy Manager.

	No knowledge needed	Some knowledge needed	Moderate knowledge needed	Extensive knowledge needed
Applicable energy regulations				
Applicable local codes				
Basic database usage, design, and management				
Basic energy concepts and principles				
Basic energy efficiency economics				
Basic energy engineering calculations				
Basic statistics				
Benefits of energy efficiency				
Best maintenance practices				
Best practices for energy efficiency				
Best practices in measurement and verification methodology				
Building and Energy Codes and Standards				
Building automation systems				
Building operation plan (including original design load)				
Building sciences				
Building systems				
Calendarization				
Changes in reporting requirements				
Commissioning process				
Construction management				
Contract administration				
Data security, safety and storage				
Databases				
Energy accounting				
Energy audit methodology				

Commercial Workforce Credentialing Council Job Task Analysis Validation

Energy calculations	◯	◯	◯	◯
Energy certification programs	◯	◯	◯	◯
Energy efficiency economics	◯	◯	◯	◯
Energy information systems (EISs)	◯	◯	◯	◯
Energy management control systems (EMCSs)	◯	◯	◯	◯
Energy source pricing structures (demand charges, power factor charges, time of use charges, etc.)	◯	◯	◯	◯
Energy systems	◯	◯	◯	◯
Energy unit calculations	◯	◯	◯	◯
Environmental impacts of energy consumption	◯	◯	◯	◯
Evaluation methodologies	◯	◯	◯	◯
Facility type hazards	◯	◯	◯	◯
Facility type processes and operations	◯	◯	◯	◯
Financial analysis methodologies and threshold (e.g., life cycle costs analysis, ROI)	◯	◯	◯	◯
Grants	◯	◯	◯	◯
Health and safety	◯	◯	◯	◯
How to interpret interval data	◯	◯	◯	◯
How to interpret weather data	◯	◯	◯	◯
How to verify data (check meters, etc.)	◯	◯	◯	◯
Human behavior	◯	◯	◯	◯
IEQ	◯	◯	◯	◯
Impact of building systems on health and wellbeing	◯	◯	◯	◯
Incentive programs	◯	◯	◯	◯
Indoor environmental quality standards (e.g., lighting, temperature, etc.)	◯	◯	◯	◯
Industry specific Codes and Standards (for industry served by the Energy Manager)	◯	◯	◯	◯

Industry terminology, jargon, and acronyms	○	○	○	○
M&V methodologies	○	○	○	○
Normalization	○	○	○	○
Occupant requirements and standards	○	○	○	○
Organizational awareness	○	○	○	○
Organizational structures	○	○	○	○
Procurement process	○	○	○	○
Project delivery methods (ESCO, PPA, etc.)	○	○	○	○
Reliability of sources of meter data	○	○	○	○
Resource planning	○	○	○	○
Risk assessment	○	○	○	○
Sequence of operation	○	○	○	○
Stakeholder groups (health and safety, facility operations, occupants, etc.)	○	○	○	○
Systems thinking (thinking of the interactions between systems)	○	○	○	○
Trend analysis	○	○	○	○
Typical ranges of energy performance metrics	○	○	○	○
Understanding of auditing equipment	○	○	○	○
Understanding of various specialized facility types (labs, clean rooms, hospitals, etc.)	○	○	○	○
Utility and tax incentives	○	○	○	○
Utility invoicing	○	○	○	○
Utility meter types	○	○	○	○
Utility rate structures	○	○	○	○
Utility rates, tariffs, and contracts (including specialized rates and programs)	○	○	○	○
Utility regulations and requirements	○	○	○	○
Weather effects on energy use	○	○	○	○

Commercial Workforce Credentialing Council Job Task Analysis Validation

Are there any <u>job related</u> tasks that are missing from this survey?

- ○ No
- ○ Yes

If yes, what?

Is there any knowledge that we did not include in this survey that should have been included?

- ○ No
- ○ Yes

If yes, what?

Commercial Workforce Credentialing Council Job Task Analysis Validation

If a certification examination were to be developed based on this information, please enter the percentage of the exam that should be devoted to each of the content areas listed below.

(Note: Your responses should add up to 100.)

Planning Effective Energy Management	
Managing Energy Information	
Implementing the Energy Management Program	
Managing Budgets and Finances	
Implementing Energy Efficient Projects	
Managing Energy Communications	

* **Do you wish to respond to another survey?**

- Yes
- No

Appendix B: List of Write-In Comments

- Proposal evaluation - Creating an inventory of installed systems and technologies; building profiles, etc.
- Monitoring of the energy markets for intelligent decision-making. 2) Forming and leading a site Energy Team (or Sustainability Team). 3) Strategic planning which could include active participation in lobbying groups to formulate effective policy, regulations, and utility rates.
    - Renewable energy and applications 2. New product evaluation and testing 3. Basic mechanical and electrical engineering knowledge, hands-on experience 4. Benchmarking methods and process 5. CFD knowledge is useful, but not necessary 6. ASHRAE 55, 62.1, NEC, and other applicable codes in addition to energy codes.
- A fundamental knowledge of "renewable" energy sources, how to calculate wind and solar potentials, pitfalls, cost related calculations etc. Should include ground source heat pumps, PV, solar heating, wind energy generation, natural lighting, lighting upgrades, lumens per square foot for various areas, power generation to include islanding, peak-shaving, isolation of loads, also should have working knowledge of maintenance principles and how they relate to energy consumption.
- Ability to read drawings
- Building Energy Modeling
- Business Economics Sustainable Technologies
- Communication skills Team Building
- Control Systems Programming - Software Development
- Controlling quality of energy assessments, whether in-house or contractor supplied. Reviewing energy assessment reports for completeness and accuracy. Engaging and utilizing influence of top management. Changing human behavior for energy management purposes.
- Customer outreach, understanding and analyzing the energy water nexus, tracking changes and advancements in technology and renewable energy.
- Direct training of line personnel and managers to use energy efficiently. In manufacturing, the workers control 100% of the variability in energy use.
- Directly managing people: skilled trades and/or office staff
- Dog and Pony Shows - time wasted showing off projects and giving presentations that will yield no energy savings and take time away from important tasks. This is widespread as "energy" is a "focus" now.
- Energy analysis model development which includes fundamental understanding of processes being modeled. Engineering calculation software skills (Excel, Matlab, etc.). Training of users of calculation tools.
- Energy Manager needs to expertise in building systems: Missing the technical component of Building Systems Motors & Drives Boilers Lighting HVAC Pumps
- Energy modeling.
- Energy Project approval processes
- Exhaustive knowledge of energy consuming systems (boilers, air compressors, lighting, HVAC, etc.)
- Failure analysis of energy systems and solutions for future projects
- How to be a Beta test site for new technology. Need a clearinghouse for new technology. Information on new Technology being developed or that is available is difficult to find. Many

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companies will install the new technology at no cost for the opportunity to test the new technology.

- I may have misinterpreted your categories but I find the following lacking: - Campus master planning - Review of prototype and new technologies that can be deployed - Evaluate proposals and assess performance of renewable energy systems and campus power plants - Managing competing interests among tenants, clients and owners on implementing energy projects for new and existing buildings - Develop energy persistence or continuous improvement plans for non-energy staff (i.e. typical maintenance folks)
- I would have highlighted more the knowledge of equipment maintenance and operations.
- Implement staff development programs to increase awareness and participation. After all, people use energy, not buildings or equipment. Implement methods for measuring and recognizing success. Again, it is more about people than things.
- Importance of industry societies, i.e. ASHRAE, AEE, IEEE.
- Industry group participation to shape state energy policy
- Managing an energy team made up from proactive and reliable other-than-energy personnel. Energy Awareness Award Programs
- More on utilizing incentives in the tasks (it was included as a knowledge) Managing consultants
- Must understand technology options, renewable energy, Climate Change, Extreme Weather, Energy Density, Energy Star Portfolio Manager.
- o Green House Gases o Renewable Energy o Chiller Plant Operations o Boiler Plant Operations o Building Envelope o Commissioning, Retro Commissioning, and Continuous Commissioning o Training on the Energy and Water program o Fleet Management • CARS • FAST - Research new technologies, applications procedures and policies related to that program element in order to maximize system efficiencies and optimize performance while minimizing maintenance requirements. - Participates in network and national committees, work groups, task forces as needed in support of the VHA energy program. • Technical advisor to the facilities, Medical Centers, CBOC's, National Cemeteries, and VBA facilities to which she/he is assigned where it concerns energy or water consuming equipment, activities and functions. • Serves as the local point of contact and subject matter expert for all issues related to the Energy and Water management programs • Serves as the local subject matter expert for Fleet Management working directly with the local fleet managers to ensure proper reporting and compliance. • Serves as the local subject matter expert on evaluation of new and renewed leases to ensure compliance with applicable laws and regulations where they pertain to the Energy and Water management program. • Establishes operating set points and monitor performance of Variable Frequency Speed Drives or similar devices. - Works with Acquisition and Material Management Services, Facility Equipment Committees and other facility services in the selection of the most energy efficient equipment to procure or lease, including fleet vehicles. - Will conduct HVAC, lighting, building, steam generation system, domestic hot water and other energy audits using industry standard energy analysis tools to minimize energy consumption. He/she must be proficient in the use of energy survey equipment (light meters, power quality meters, multimeters, differential pressure gages, anemometers and associated software) and computerized energy survey software (FEDS, ASEAM, or equal computer applications). The incumbent should also be familiar with computer-based Building and Energy Management Systems. - Serves as a Contracting Officers Technical Representative (COR), a Technical Monitor (TM) and as a Technical Evaluation Board member at the request of the VISN Energy Manager or Capital Asset Manager. Shall independently determine and obtain the necessary training and

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certifications to provide supportive service in the contracting and contract administration process.

- Often the role of the energy manager is to manage a team of energy engineers. The tasks don't seem to address management functions.
- Oversight of operation of building systems in accordance with approved criteria, e.g., temperatures, schedules, humidity, redundancy, etc. Oversight of building system maintenance programs Oversight of utility services to ensure services provided are properly matched to actual building requirements
- Prepare briefings and information papers. Submit projects into various Army funding systems and understanding how these Web-based systems work.
- Presentation of data and reports to all parties involved, management, customers etc.
- Presentation Skills
- Preventive maintenance How to operate systems at peak efficiency Retrocommissioning Energy modeling and/or using BIN analysis to estimate ECMs HVAC Design Electrical Design Piping Design
- Project cost estimating
- Psychological effects on job performance analysis. Especially important in educational settings, as well as special visual applications.
- Renewables i.e. Solar Installation Economics
- Setting up and utilization of automation in building, substation controls, site use metering and using this data to alarm and report information. All of these interact and thus provide 100% monitoring with very little oversight. These replace humans for reading data/meters and provide very accurate reenactment of problems. Thus the problems can be analyzed for prevention etc. With myself or staff being on call 24x7 in case of critical energy consumption...such as bad weather, electrical brown outs etc. Also the simple volume of data because more buildings, sections of building and individual pieces of equipment is now being data uploaded to online. I have access anywhere in the world via standard browsers...13 buildings on site and various buildings miles away. All being actively done while I perform other energy duties...but still have to respond to these interactively while doing the planning, development, auditing etc.
- Staff training
- Standard engineering analysis tools, spreadsheet analysis, technical writing
- Supply risk management
- Sustainability Metrics Reporting Greenhouse Gas Accounting
- System Diagrams
- Terrence Rollins, MBA, CEM, CDSM, CSDP RHC Global Energy Solutions trollins@earthlink.net Regarding training, some federal government and private industry companies do not internally train to the AEE standards when performing energy audits. When CEU's are needed to renew the CEM certification, thus I maintain my own CEM as a professional. An question could read, does your organization provide AEE sponsored training to maintain the CEU's?
- The survey seems to overlook tasks related to obtaining the necessary budget, staff and vendor resources for energy management. We are never funded to fully implement our plans, and therefore must spend significant time learning and applying a variety of finance tools. Getting qualified staff assigned or hired takes significant time. Managing vendor resources, including everything from taking sales calls to guiding complex (ESPC) acquisitions, all can fall on the energy manager.
- Time-of-day scheduling, plug load assessment

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- Training and Awareness for Building Operators
- Training/updating personnel on changes made.
- Understanding long range energy cost projections and determining their validity. Integrating building systems like Computerized Maintenance Management Software (CMMS), building automation systems (BAS), Life Safety to insure optimization and safety of operation.
- Understanding of the types of systems that use energy
- Utility Master Planning Utility Infrastructure Deferred Maintenance and Condition Index Auditing Utility Infrastructure Preventive Maintenance
- Utility procurement strategies.
- Utility P&L explanations
- Water conservation
- Water conservation/efficiency specifically.
- Water treatment Leak detection Chiller/boiler plant troubleshooting
- Water usage and management. This entire area appears to have been neglected. Water usage often goes hand-in-hand with energy use and management and is a vital portion of an Energy Manager's duties, which are really more of a Resource Management task. This is currently a vital aspect of energy management in California, and will become, perhaps more important than energy management itself in coming decades.
- Writing skills-
- Writing specifications Drafting Policy Drafting Blue Prints Design Review Public Relations Review and interpretation of executive Orders and applicable laws (where regulations have not caught up) Re-writing or defining Standard Operating Procedures Re-writing or defining O&M practices
- You included commissioning but for those of us who have mostly older buildings retrocommissioning or recommissioning is extremely important. Yes, it is almost the same in certain respects; however, it can be extremely different when historical building issues arise.
- - Mastery of, and skill in applying, advanced theories, concepts, and principles practiced in the science of professional engineering sufficient to serve as a consultant and expert advisor on the engineering aspects of proposed and existing plans, designs, and construction activities for a wide range of agency facilities assigned and within the VISN for areas that the incumbent has program lead responsibilities. - Shall utilize pilot projects to resolve unique or novel problems conditions or issues within the VA system in applying new technologies processes and procedures within the VA to maximize system performance throughout the VA. This could include but is not limited to: Lighting systems, HVAC systems, Control systems, Control methods and techniques, Chillers, Boilers, irrigation, heating systems, cooling systems, steam systems, building envelop, windows, roofing systems and integration of multiple systems. - Extensive Knowledge of various energy systems, including building envelopes, HVAC, local controls, system controls, and facility wide controls, steam distribution and lighting and their retrofit potential for energy conservation and/or energy recovery in Medical Center/Hospital environments is essential. - Shall have good oral and written communication skills in order to effectively communicate technically complex information with A/E firms, contractors, equipment manufacturers and vendors during the design and construction of energy conservation projects. - Shall have the ability to effectively communicate with contractors, professional engineers, public officials and professional medical and administrative staff. - Must have demonstrable experience in the design, construction, maintenance and inspection of the installation of all medical center related utility systems. Utility systems include electrical power distribution, electronics, plumbing, water distribution, steam generation and distribution, vacuum, medical gas, fire alarm, fire sprinklers, pneumatic and other electrical and mechanical

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systems. - Must be knowledgeable in the evaluation of alternative fuels and fuel consumption for vehicles. - Shall have the ability to use , and train others in the use of , energy and project management software, such as construction estimating, scheduling, life cycle cost analysis spreadsheets and word processing. - Plans and carries out assignments; resolves most conflicts independently; coordinates the work with others as necessary; interprets policy and regulatory requirements in terms of established objectives; keeps the supervisor informed of progress and potentially controversial problems, concerns, issues, or other matters; develops changes to plans and/or methodology; and provides recommendations for improvements in order to meet program objectives. - Performs the duties of the position without specific instructions relying primarily on his/her professional engineering and management judgment to independently research, define, plan and execute their positions duties and activities to meet National, VA, VISN and Medical Center mandates, requirements, goals and objectives. - Work, because of his/her engineering training and professional experience, is expected to be technically correct and is given only cursory review by management/supervisory staff.

- Ongoing professional development (continued training on emerging technologies and approaches) - Professional networking - Presentation skills - Influence without authority skills
- A lot of survey questions seemed devoted to efficiency (stuff that can do a job with les energy) as opposed to conservation (just using less energy.) This "blind side" is a widespread industry problem in my opinion. The knowledge that energy managers need to manage people is not included. It is possible to be quite successful as an energy manager without knowing any engineering calculations, having no knowledge of products, and never implementing a single efficiency project. I'm not advocating for elimination of, or trying to downplay the importance of those tasks, but I want to call attention to the fact that the people side of the equation is worth so much more than the equipment side.
- Another question could be? Are you or your organization involved in the local AEE Chapter, and are you trained to conduct Level I Level II and Level III Energy Audits? If not, why? If your agency is not able to conduct these levels of energy audits, then what additional AEE training are you pursuing to gain this experience?
- As a Federal energy manager, I am also tasked with sustainability planning and reporting for my agency, and greenhouse gas emission inventory and reduction. In my opinion, agency sustainability planning and reporting are not duties that belong with an energy manager. However, we do need knowledge of sustainable buildings and applicable rating systems. When an energy manager is responsible for greenhouse gas emissions inventories and reductions, he/she needs not only knowledge emission sources directly related to energy use, but also some knowledge of other sources including but not limited to fleet operations, employee commuting, business travel, solid waste, refrigerant management.
- Basic understanding of primary and secondary energy sources and how they relate. energy conversions and how to place them on an equal apples-to-apples basis.
- Building Energy Modeling
- Building System Interrelated effects
- Climate specific constrains such as humidity in Florida, motivating team and building managers to operate efficient buildings accordingly
- Construction cost estimating. Building systems design would help to identify what can and cannot be do regarding energy conservation measures.
- Corporate communication skills; i.e. how to effectively communicate and promote energy efficiency.

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- Creation of Graphical Users Interface - GUI Creation of such screens are critical to convert field hardware diagrams and live data into a user accessible format that allows for operational control and troubleshooting. Active energy usage and savigns potential can be identified here.
- Credentialing and Continuous education and training is required. Certified Energy Manager and LEED AP are really helpful. Professional Engineer is helpful if you are designing for construction.
- Dashboard to communicate efforts to employees.
- Employee behavior Bypassing or overriding energy management systems
- Energy Modeling Alternative Energy Technologies
- Energy modeling methodology, retro-commissioning
- Energy Procurement Risk Management
- Environmental issues such as the water-energy nexus is a definite knowledge need in the southwest. Historical building knowledge for those dealing with energy use in older buildings (usually 50 years plus) in cities, military installations, etc. You "sort-of" touched on it but knowledge of using different types of renewable energy (RE) storage (for instance hydroelectric solar pumped storage) is important today with RE storage being a challenge for energy managers dealing with RE.
- How Energy Managers educate and convince stakeholders concerning energy management equipment and energy management strategies. How energy management programs will free energy dollars, to enhance budgets for other projects
- Human behavior and how to change it. WELL, THE LAST QUESTION ON THE NEXT PAGE LACKS AT LEAST ONE VERY IMPORTANT ITEM: MANAGING ENERGY CONSUMPTION BY MANAGING ENERGY-CONSUMING SYSTEMS AS PART OF ONE LARGER SYSTEM TO MOST IMPORTANTLY CONTROL COST, SAVE ENERGY, AND PROTECT THE ENVIRONMENT.
- I am a professional engineer, LEED, CEM and CECP. My main job is being auditor, policy maker and standard writer for an organization which owns and operates app. 30 buildings. I do not know why "JTA" for CEM or CECP is required. I strongly recommend that government do not create another bureaucracy. Additionally, do not create a program similar to the new LEED certification program by Green Building Council several years ago. I understand that NREL need to collect information from public. However, the survey content is too narrow and inadequate. Do NREL professionals really understand what energy professionals do???
- I found the following missing, or not explicit enough: - Understanding of building design beyond a "systems thinking" and equipment performance ratings - Master planning that involves the politics, design standards, energy benchmarking targets and standard operating procedure for O&M staff - Knowledge of mechanical and electrical systems AND components, and how they relate to current or planned building load - Public speaking and influencing others - Understanding of net zero carbon and energy requirements - Understanding of renewable energy systems
- Identifying different lighting technologies and controls Identifying common energy conservation measures (ECMs) fundamentals of HVAC systems, boilers, chillers, etc. Use of evaluation/survey tools (IR cameras, combustion analyzers, data loggers, etc.)
- Involvement in the industry, writing papers, research, etc.
- Knowledge gained through membership and participation (on committees and seminar attendance) in key related professional trade associations, such as ASHRAE, AEE, etc.
- Knowledge of Building Simulation Software
- Knowledge of energy consuming systems is the single most important part of this job
- Knowledge of equipment maintenance and operations.

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- Knowledge of how to prepare energy results and data taylored to a specific audience. (Impact) Knowledge and implementation of an energy award program for awareness progression.
- Knowledge of utility production plants and distribution systems and best operations and maintenance practices
- Knowledge of water-energy nexus.
- Learned experience has measurable value and metic should be included
- Marketing or selling your energy program. Red Tape Management
- Mechanical and electrical engineering concepts.
- New interactive meters to utilities with spot charges due to peaking and seasonal/daily rate changes. These are pushing the envelope for users to automatically cut back usages at peak times. I manage over 3M sq. ft and we are developing systems that will cut back ornamental and architectural lighting systems during signaled peak times. ALSO new "Analytic" programs residing in the cloud such as Building Analytics™, SkySpark or Struxware are becoming critical to reduction of manpower, building maintenance/programing and energy mandates. We are implementing those on a Beta site.
- No specifically but general engineering knowledge is the cornerstone for energy engineering and management.
- Operations and Maintenance
- people who have common sense is un-common these days
- Perhaps personal certifications. The Association of Energy Engineers' (AEE) Certified Energy Manager (CEM) is the gold standard for energy managers. It's a tough certification to acquire with a high first-time failure rate for those attempting the certification.
- Presenting project proposals to different levels of management to gain approval
- Preventive maintenance How to operate systems at peak efficiency Retrocommissioning Energy modeling and/or using BIN analysis to estimate ECMs HVAC Design Electrical Design Piping Design Business analysis, Program Management, ISO 50001
- Preventive maintenance
- Probably a subset of other knowledge but having a good handle on likely modalities of equipment and systems malfunction and degradation and the capabilities and likely response of the O&M organization are very useful in assessing the true viability of a proposed energy conservation measure. If the only impact of a failure and malfunction is increased energy use without disruption of occupants, repair priority can plummet when resources are needed for other needs.
- Programming Engineering - Multi-discipline Basic economics
- Programming -VBA, spreadsheets, minitab
- Project management
- Question: How important are scotopic/photopic values for various applications?
- Renewable energy, energy water nexus, consensus building, and tenant outreach.
- Renewables i.e. Solar Installation Economics
- Requirement for a degreed engineer as energy manager. We have one energy manager that is not an engineer and it is a huge hindrance to his effectiveness. He is smart, energetic and hard working, but is not anywhere near as effective as my energy managers that are engineers. There is simply no replacement for the knowledge he lacks. Energy managers that are not engineers have the technical skills to provide leadership, make effective decisions, understand the technologies and systems in-depth, provide effective commissioning, and to participate in and/or manage the construction process (project inception, pre-design, design, construction, post-construction).

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- Requirement for excellent communication skills. Extensive knowledge of HVAC and electrical systems design requirements, operation requirements, and optimization processes.
- Same as above
- Schematic design or conceptual design, design reviews, peer review of designs
- See above.
- Social and culture, particularly on human interaction, might be also be needed.
- Standards used in the building industry - need to be familiar with Consensus Based Standard developments.
- Survey does not have the technical component needed> NEED TECHNICAL Lighting never listing Combined Heat and Power Insulation Controls Waste Heat Recovery
- Sustainability and Climate Adaptation planning Emergency operations
- The best energy managers have an ability to sell themselves and the project they are working on to stakeholders including executives, operational staff and site workers. There is a moderate to high need to build a toolkit of soft skills. Energy Management has become as much about business development opportunities as it is about crunching numbers.
- The opposite - much duplication of the knowledge topics
- The percentages were set up such that almost all answers would be in the lowest bracket.
- The questions regarding knowledge base were pretty inclusive from my standpoint. However, a good portion of my duties and Energy Manager of a large campus involve management of recharge systems. A few additional questions might be developed to address particulars of utility recharge mechanics.
- There are so many missing things it's unbelievable. Where is all the requisite systems knowledge in this survey?
- There is a current Energy Manager Certification in place. The "Certified Energy Manager" designation and the associated exam do cover the subject matter discussed in great detail.
- There is a great deal of marketing and sales involved in an Energy Management role, especially if you are responsible for promoting energy conserving behaviors. Community Based Social Marketing (CBSM) training would be invaluable.
- Understanding of where to go to get reliable information on renewable energy systems
- Water treatment: both chemicals and filtration Test and balance analysis
- World-wide area supply issues and mitigation
- You mentioned statistics as an important knowledge area but this is a very broad subject. I'd suggest targeting specific statistical subject areas such as "sampling" and "regression."

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