

**Global Superior Energy Performance  
Energy Management Working Group  
Qualified Workforce Task Force**

*Skills and Knowledge for Selected Job Types*

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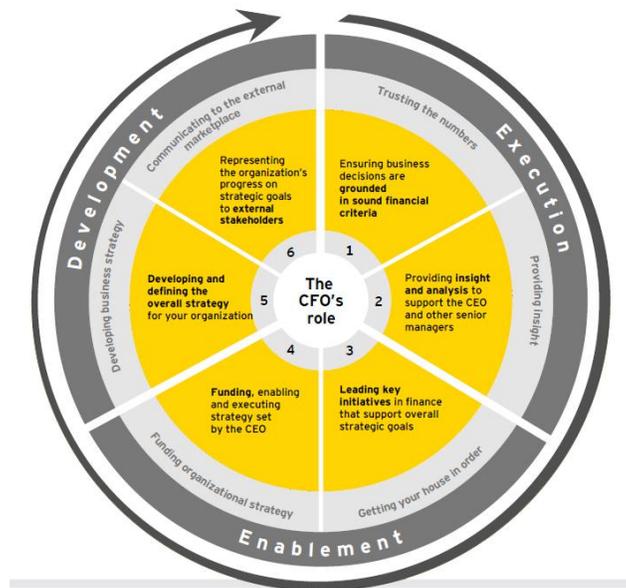
## Overview of Skills and Knowledge for Chief Financial Officers

### Summary

The Chief Financial Officer (CFO) has a number of key roles within an organization, and several of these are quite relevant to corporate energy management. The graphic below shows six key CFO roles, and was developed by the management consulting firm Ernst & Young based on research and surveys of CFOs.

Implementation of energy management often requires significant capital investment, and the CFO should have the responsibility for ensuring that business decisions such as capital investments are based on sound financial criteria (roles #1 & 4 in the graphic below). The CFO should understand financial principles and financing options for energy projects. Risk management skills are essential when companies consider long term fuel procurements and energy service contracts.

CFOs should also be capable of establishing policies and strategies, and leading key new initiatives related to the financial aspects of energy management (roles #3 & 5 in the graphic below). The CFO should be able to provide leadership to other members of the energy team as they develop financial analysis methodologies that “level the playing field” for energy investments relative to other capital investments, and ensuring that environmental, maintenance, and other factors are properly considered.



Source: Ernst & Young; <http://www.ey.com/GL/en/Issues/Managing-finance/The-DNA-of-the-CFO---perspectives-on-the-evolving-role---The-CFO-s-contribution>

### Body of Knowledge Areas Relevant to CFOs

The following areas from the GSEP EMWG QWTF Bodies of Knowledge table are relevant to CFOs:

- Energy efficiency tax incentives
- Business improvement skills
- Business case development skills
- Change management
- Innovation skills
- Risk management skills
- Managing integration of energy-efficiency projects and goals into cross-business operational plans, procedures, and KPIs
- Understanding financial decision-making processes
- Performing financial analyses, including payback, rate-of-return, life cycle cost, and cost-benefit analyses that include environmental and social considerations
- Identifying “out-of-box” solutions
- Understanding financial decision-making processes
- Economic aspects of effective energy management
- Using financial structuring tools to attract investors
- Understanding electricity markets
- Interpreting forecasts
- Financial principles and management
- Accounting principles, energy accounting
- Utility contracts, rate structures, tariffs
- Procurement, energy procurement

## Overview of Skills and Knowledge for Environmental, Health & Safety (EH&S) Professionals

### Summary

The roles of Environmental, Health & Safety (EH&S) professionals vary from organization to organization based upon a number of factors, such as the type and size of the organization. Due to the relatedness of energy consumption and environmental & health issues, some organizations place energy management responsibility within the EH&S department. Regardless of whether energy management is within this department, EH&S professionals need broad interdisciplinary knowledge and skills.

EH&S professionals need to understand federal, state, and local environmental regulations and reporting relevant to their organization's processes, and the regulatory implications of energy optimization projects such as boiler system replacement. These professionals should also be knowledgeable on the built environments within their organization. For example, they must be able to assess the impact of heating, ventilating, and air conditioning renovations on indoor air quality. In addition to possessing knowledge of regulations and having relevant technical skills, EH&S professionals may be expected to collaborate across departments and communicate to all levels of personnel in the organization.

Over time, the publication of ISO 50001 in 2011 is expected to result in increased overlap of energy- and environmental-related duties and responsibilities. Professionals using the ISO 14001 framework are more likely to be called upon, or will initiate, the implementation of ISO 50001.

### Body of Knowledge Areas Relevant to EH&S Professionals

The following areas from the GSEP EMWG QWTF Bodies of Knowledge table are relevant to EH&S Professionals. The profession is broad, and responsibilities and duties will vary among organizations and among personnel within the EH&S department. However, these areas are relevant to a larger cross section of EH&S professionals:

- National environmental regulations
- National GHG and energy reporting systems
- State-level environmental regulations
- HVAC and indoor air quality standards (ASHRAE and others)
- "Whole-of-systems analysis skills
- Assessing organizational barriers
- Cultural change skills
- Risk management skills
- Developing multi-disciplinary teams
- Developing & implementing communications & engagement plans
- Understanding financial decision-making processes
- Communication skills
- Organizational and leadership skills
- Interpersonal skills
- Critical thinking skills
- Facility planning
- Business decision-making fundamentals

- Identifying factors influencing energy use or waste
- Cost-benefit analysis including evaluation of environmental and social benefits
- Identifying “out-of-box” solutions
- Understanding financial decision-making processes
- Performing financial analyses, including payback, rate-of-return, life cycle cost, and cost-benefit analyses that include environmental and social considerations
- Project planning and management
- Calculating GHG emissions and carbon footprints
- Carbon markets, carbon finance, and carbon project development process
- Reducing risks associated with climate change
- Creating a green office
- Indoor air quality control
- Sustainability statutes, codes, and requirements
- Sustainability standards, and best practices
- Water management best practices
- Local recycling capabilities
- Local waste management operations
- Corporate social responsibility



## Overview of Skills and Knowledge for Mechanical or Electrical Engineers

### Summary

Mechanical and electrical engineers working in commercial and industrial facilities must be knowledgeable in a range of areas and must have many technical skills. Engineers must be able to understand the operation of the variety of systems within their control and the effects of operation on production, energy use, and EH&S issues. Engineers are often responsible for measuring and monitoring of buildings and industrial processes, and performing analyses of the collected data to identify maintenance, reliability, and safety issues in addition to identifying energy optimization opportunities.

As organizations and facilities become more complex, it is increasingly important that engineers be able to communicate to other personnel with organizations, such as facilities managers, EH&S professionals, and corporate decision-makers.

### Body of Knowledge Areas Relevant to Mechanical or Electrical Engineers

A large number of the skills and knowledge areas identified within the GSEP EMWG QWTF Bodies of Knowledge table are needed by mechanical and electrical engineers:

- National energy regulations and laws
- Energy measurement and verification guides and protocols
- National, state, and local building regulations and codes
- ISO 50001 concepts
- HVAC and indoor air quality standards (ASHRAE and others)
- Green building programs
- “Whole-of-systems” analysis skills
- Stakeholder engagement skills
- Communication and interpersonal skills
- Problem-solving skills
- Critical thinking skills
- Industry scorecards and dashboards
- Facility planning
- Understanding and analysis of process, site, or sector
- Awareness and understanding of new and existing technologies
- Developing and implementing energy efficiency assessment plan
- Identifying factors influencing energy use or waste
- Energy and other data collection skills, and setting analysis boundaries
- Metering and monitoring
- Developing & implementing data management, tracking & reporting systems
- Developing energy mass balance diagrams and models
- Developing energy intensity indicators and benchmark
- Building energy rating, simulation, and simulation methodologies
- Building operation, interoperability and optimization (HVAC, lighting, boilers, steam & hot water systems)
- Industrial equipment operation and optimization
- Power systems analysis
- Thermodynamics and heat transfer
- Instrumentation and controls

- Operations & maintenance requirements and actions
- Commissioning principles
- Building trades
- Electrical systems evaluation
- Combined heat and power
- Data collection and recording
- Mechanical and electrical engineering principles
- Project planning and management
- Energy accounting
- Cost-benefit analysis including evaluation of environmental and social benefits
- Statistical analysis, including regression analysis
- Identifying “out-of-box” solutions
- Economic aspects of effective energy management
- Renewable energy fundamentals
- Indoor air quality control
- Sustainability standards and best practices
- Water management best practices

## Overview of Skills and Knowledge for Technicians/Tradespeople

### Summary

Technicians/tradespeople, such as electricians, HVAC technicians, and maintenance personnel, are critical to achieving successful energy management at both commercial buildings and industrial facilities. These personnel are responsible for the daily operation of energy-using equipment and processes, and for organizations with energy management systems in place, are responsible for the efficient operation of the equipment and processes. Maintenance is another important component in energy efficiency, and it is crucial that maintenance personnel understand the impacts of maintenance on system efficiency and reliability. In addition, at many small and medium-sized facilities, a technician may be the de facto energy manager. So a broad range of skills is required.

In many ways, the role of technicians/tradespeople is evolving, due in large part to the increasing penetration of building and facility automation. Buildings and facilities are becoming more complicated to operate, so technicians need the skills to operate sophisticated computerized energy monitoring systems, electrical distribution systems, HVAC systems, and metering equipment. At many facilities, these personnel must now also be knowledgeable of local, state, and federal regulations, including those related to environment, health, and safety.

The relevant skills and knowledge for technicians/tradespeople also includes communication skills. They are typically in regular contact with equipment operators or office staff, and therefore can have a significant role in creating awareness of the benefits of energy management as well as facilitating culture change within the organization. Finally, as technicians' responsibilities grow, the need for critical thinking and problem-solving skills also grows.

### Body of Knowledge Areas Relevant to Technicians/Tradespeople

The following areas from the GSEP EMWG QWTF Bodies of Knowledge table are relevant to Technicians/Tradespeople. Due to specialization, such as electricians or HVAC Technicians, not every type of Technician or Tradesperson will need to be knowledgeable in all of these areas:

#### *Primary areas:*

- Building codes
- Understanding of M&V and other standards and models
- HVAC standards (e.g. ASHRAE in U.S.)
- Internal audit/assessment skills
- Data logging
- Data collection and use
- Energy fundamentals
- System optimization fundamentals
- Operation of energy-using equipment & systems operation
  - Boilers
  - Steam systems
  - Electric motors

- Drives
- Pump systems
- Compressed air systems
- Fan systems
- HVAC
- Lighting
- Understanding of facility and industrial processes
- Building automation and interoperability
- Instrumentation and controls
- Building construction techniques
- Building envelope
- Operations and maintenance practices and requirements
- Electrical and power systems
- Power factor
- Combined heat & power systems
- Domestic water systems
- Load factors
- Managing energy demand
- Cost implications of wasting energy
- Efficient use of energy in buildings
- Awareness and understanding of new and existing technologies
- Energy metrics
- Implementation costs
- Organizational skills
- Metering, monitoring, measurement, and verification
- Installation and operation of appropriate measurement, monitoring, and test equipment

*Secondary areas:*

- Environmental regulations
- Thermal energy storage systems
- Facilitate and manage energy-efficiency opportunities identification process
- Ability to calculate energy savings
- Develop and implement data management, tracking & reporting systems
- Analytical skills
  - Identifying significant energy use
  - Establishing energy performance indicators
  - Evaluating energy usage
  - Performance improvement
- Develop & implement data management, tracking & reporting systems
- Communication skills
- Critical thinking skills
- Interpersonal skills
- Information management principles
- Commissioning principles
- Manage energy efficiency opportunity implementation
- Plumbing systems and codes
- Water management best practices
- Indoor air quality

## **Overview of Skills and Knowledge for Sustainability Officers**

### Summary

A number of large organizations now have a senior level executive with the broad responsibilities of improving the sustainability of their organizations. These positions may have the job title of Chief Sustainability Officer, Sustainability Manager, Vice President for Sustainability, or some other title. Much like the definition of sustainability, the roles of these positions are evolving and will vary to a certain degree from one company to another. Energy management is a key responsibility for any Sustainability Officer, whose other responsibilities are likely to include:

- Environmental compliance
- Waste management
- Water conservation
- Carbon management
- Environmentally-preferred purchasing
- Supply chain engagement

The Sustainability Officer may have a Corporate Energy Manager reporting to him/her, and therefore may not be involved in energy management on a daily basis. However, the Sustainability Officer will need to have an understanding of all aspects of energy management and the effects of energy decisions on the organization.

A thorough understanding of the organization's operations, structure, culture, and products is typically necessary, which is why, to date, as organizations create the position of Sustainability Officer, the successful candidates are usually from within the organizations, and have a number of years' experience at the organizations. The knowledge areas and skills required largely fall into the following broad categories:

- Communication – ability to educate, persuade, and facilitate culture change
- Technical understanding of energy use and other sustainability issues
- Quantitative skills – ability to baseline, benchmark, and set goals based on data
- Financial skills
- Innovation skills
- Engaging supply chain
- Understanding the operations, structure and culture of the organization

### Body of Knowledge Areas Relevant to Sustainability Officers

The following areas from the GSEP EMWG QWTF Bodies of Knowledge table are relevant to Sustainability Officers. Although the role of Sustainability Officers will be defined differently at different organizations, the core knowledge areas and skills are:

*Primary areas:*

- Business improvement skills
- Stakeholder engagement skills
- Business case development skills
- Develop multi-disciplinary teams
- Determine stakeholder roles
- Understand financial decision-making processes
- Various pieces of state-level legislation
- Energy management
- Energy planning
- Energy review and analysis
- Energy fundamentals
- Energy conservation laws and policies
- Organizational and leadership skills
- Business decision-making fundamentals
- Financial principles and management
- Creating an energy management policy & plan
- Understanding key energy efficiency program requirements
- Regulatory aspects of effective energy management
- Regulatory requirements, federal regulations
- Building codes
- Environmental regulations
- Green building standards and programs
- Energy data analysis
- Whole system and services analysis skills
- Awareness and understanding of new and existing technologies
- Identify “out-of-box” solutions
- Building Energy Audits
- Cost implications of wasting energy
- Energy optimisation
- Efficient use of energy in buildings
- Identifying inefficiencies in building systems
- Energy accounting & analysis
- System optimization fundamentals
- Building functions, operations & systems, interoperability
- Develop energy intensity indicators and benchmark
- Ability to calculate energy savings – simple payback and/or other relevant financial analysis
- Cost-benefit analysis including evaluation of environmental and social benefits
- Develop & implement data management, tracking & reporting systems
- Organizing improvement activities
- Economic aspects of effective energy management
- Designing and implementing Rate of Return methodologies
- Life cycle cost analysis
- Benchmarking
- Building Energy Modeling
- Energy metrics
- Economic analysis techniques
- Accounting principles, energy accounting
- Financing options, alternative financing
- Innovation skills
- Risk management skills
- Facilitation & negotiation
- Culture & behavioral change management
- Industry Guidelines
- Assessing organizational barriers
- Develop & implement communications & engagement plan
- Report, document & present key data & findings
- Develop & manage ongoing communication with stakeholders

- Communicate to influence; esp. energy benefits in context of broader business benefits
- Collaborative & cultural change skills
- Manage integration of energy-efficiency projects and goals into cross-business operational plans, procedures, and KPIs.
- Understanding of energy optimization and energy economics by non-technical professionals; e.g. accounting, procurement professionals
- Understanding and analysis of design, procurement, commissioning, operational & maintenance practices
- Writing an effective energy management report
- Financial analysis, investment, electricity market
- Interpreting forecasts correctly
- Problem-solving skills
- Critical thinking skills
- Personnel motivation techniques
- Building an energy performance awareness program
- Analytical skills
- Communication skills
- Interpersonal skills
- Information management principles
- Facility planning
- Procurement, energy procurement
- Project management, project planning
- Contract development, contract management
- Cost control and budgeting
- Evaluating achievements

*Secondary areas:*

- Understanding of energy markets, pricing, and tariffs
- Calculating GHG emissions
- Economic regulation of utilities
- Determining the carbon footprint for a large corporation
- Carbon markets, carbon finance, and the carbon project development process
- Policy interventions to promote renewable energy value chains
- How to reduce risks associated with climate change
- How to be green in the office (recycling, cleaning, energy efficiency, supplies, transport and commuting)
- Energy & sustainability statutes, requirements
- Local sustainability codes & requirements
- Sustainability standards and best practices
- Water management best practices
- Local recycling capabilities
- Local waste management operations
- Carbon footprints, GHG accounting
- Corporate social responsibility