NABCEP PV Technical Sales

Job Task Analysis

Introduction

This document presents an in-depth Job Task Analysis for solar electric professionals who gather site specific information and analyze customer needs and energy usage for the purpose of advising and providing customers with the most appropriate proposal for a solar photovoltaic (PV) system given their situation. This Job Task Analysis was created by a committee of Subject Matter Experts representative of the solar photovoltaic field.

Purpose and Scope

The purpose of this job task analysis is to define a general set of knowledge, skills and abilities typically required of Solar PV Salespersons who are responsible for site analysis, system design, ethical presentation, and accurate analyses and projections of electrical, environmental, and financial performance of PV systems.

A job task analysis is a foundational document for the development of certification programs, and helps define the requirements for the assessment and credentialing of practitioners. It also helps establish the requirements for accrediting training and educational programs and in developing curricula. These tasks, or modified versions thereof, may be used by states or organizations that wish to develop requirements for education or training to qualify existing or new workers to be involved in the design and sales of Solar PV systems.

This job task analysis is intended to be all-inclusive of the skills and knowledge expected for any qualified PV system salesperson of any type of PV system, including grid-connected or stand-alone systems, with or without battery storage. In general, these tasks include fundamental site analysis and system design skills, as well as the ability to perform complex financial analyses by estimating the performance of the system.

Although the concentration is on PV system design and analysis, the job task analysis addresses energy efficiency in such a manner that the salesperson is able to include energy efficiency improvements as part of the system design. Electrical codes, safety standards, and accepted industry practice are central to this job task analysis, and are implicit to nearly every task.

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Primary Objective for the Photovoltaic Technical Salesperson

Given a potential site for a solar photovoltaic system installation, the PV Technical Salesperson will analyze customer needs and conduct a site analysis to develop a proposal which includes a conceptual design, financial analysis, and performance projections for the system. The PV Technical Salesperson should be able to design and specify PV systems that meet the performance and reliability needs of the customer, and comply with all applicable codes, standards, and safety requirements by demonstrating expertise in the following content domains:

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NABCEP PV Technical Sales

Examination Specifications

Exam Items	Content Domain
15	Qualify the Customer
10	Site Analysis
14	Conceptual Design
5	Financial Costs, Incentives, and Savings
4	Financial Benefit Analysis and Financing
3	Non-financial Benefit Analysis
5	Performance Analysis
4	Prepare Proposals
60	(total)

Job Description:

A PV Tech Salesperson is a solar electric professional with demonstrated expertise in the siting, design, analysis and performance of PV systems who gathers site specific information, analyzes customer needs and energy usage for the purpose of advising and providing customers with the most appropriate solution for their situation.

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NABCEP PV Technical Sales Content Outline

A. Qualify the Customer

1. Analyze electric bill

- Gather bills
- Look for seasonal patterns
- Look at different fuel sources being used
- Review utility rates
- Explain why solar may not be appropriate

2. Perform remote site assessment

- Determine house orientation
- Determine roof tilt/angle, available area
- Determine shading
- Evaluate obstructions
- Inquire about type and condition of roof
- Determine ownership status
- Determine type of property (residential commercial, non-profit)

Knowledge of:

- How site conditions impact feasibility of solar system
- Internet tools
- The limitations of remote tools
- Magnetic declination

3. Identify customer needs

- Ask about reasons for going solar
- Evaluate future energy usage
- Determine desired time frame
- Determine whether customer needs financial assistance
- Determine electric usage pattern, time of day
- Discuss pros/cons of battery backup vs. generator

Knowledge of:

- Basic sales skills
- Financial tools
- The use electric rates function
- Batteries
- Electrical terminology

- Correlating usage to specific appliances

4: Perform ball park estimate

- Estimate array size based on kWh consumption and available array area
- Price array size based on average $/watt
- Evaluate potential price adders
- Factor in incentives
- Develop price range
- Develop savings estimate
- Develop preliminary economic analysis
- Present (verbally/brief) initial ballpark proposal and benefits
- Discuss customer budget limits

Knowledge of:

- Price adders
- Roof type
- Licensing requirements
- How the height of building impacts installation costs
- Impact of long runs of conduit, wiring on costs
- Steepness
- Distance from load center

5: Identify jurisdictional issues

- Determine zoning
- Determine fire marshal awareness
- Determine reservation issues
- Check city county and utility requirements
- Identify utility
- Identify homeowner association

Knowledge of:

- Zoning issues for your area
- Codes for your area
- Utilities process, interconnection procedures, rules
- Laws relating to homeowner's associations
- Insurance limitations

6. Manage customer expectations

- Advise customer that system doesn't provide backup power; when grid is down, it won't work
- Explain differences between battery and non-battery systems
- Explain that PV does not heat water, space, or pools
- Explain that PV generates electricity, does not offset gas loads
- Explain seasonal variations in output
- Explain required level of routine maintenance
- Explain system equipment manufacturer warranties

- Review life expectancy of equipment
- Discuss aesthetics
- Discuss ROI
- Explain emerging vs. existing technologies
- Explain expected output vs. system capacity
- Explain instantaneous power vs. annual energy production
- Explain installation warranties
- Explain manufacturer warranties
- Explain insurance issues, worker's comp, liability
- Explain effects on homeowner's insurance
- Explain potential impact on roof warranty
- Explain performance validation methods

Knowledge of:

- Basic solar system knowledge
- General financial understanding
- Product knowledge
- Knowledge of return on investment
- Product limitations

B: Site Analysis

1. Inspect electrical service

- Determine service rating current and voltage
- Identify buss bar and main breaker
- Identify line tap vs. panel upgrade
- Determine available breaker space
- Determine grounding
- Identify manufacturer of panel
- Determine method of interconnection
- Determine limits (max back fed breaker) based on local electrical code
- Inform customer of potential additional costs related to utility hardware, transformers
- Discuss findings with customer

Knowledge of:

- Electrical safety
- OSHA
- Electrical principles
- Electrical codes

2. Identify locations for system components

- Identify inverter location
- Identify array location options
- Identify AC DC disconnects

- Identify junction box
- Locate conduit runs
- Identify utility disconnect if applicable
- Determine lengths of conduit runs

Knowledge of:

- NEC and manufacturer clearance requirements
- Solar exposure
- Hazards (e.g., power lines, gas lines, meters)
- The difference between AC & DC disconnects
- Voltage ratings on fuses, AC & DC switches
- Utility differences on requirements for disconnects
- Tape measure
- Laser level

3. Assess mounting location

- Identify roofing material
- Identify framing
- Identify spacing and spans
- Determine if there is an attic space vs. flat roof
- Assess structural integrity of roof (look at underside)
- Document condition of roof (photos, notes, etc.)
- Determine soil composition for ground/pole mounts
- Identify underground obstructions (septic, gas lines)
- Determine solar exposure
- Measure roof area or ground area

Knowledge of:

- Roofing materials
- Basic framing
- Standard building practices (spacing)
- Roofing terminology
- Risks of falling
- Walking on roofs without causing damage
- Reading blueprints
- Angle gauge
- Safety harness

4. Perform shade analysis

- Identify existing shading obstructions
- Consider future shading obstructions
- Perform inter-row shading analysis
- Complete shade study
- Analyze annual loss from shading
- Analyze seasonal/daily variations in shade

- Determine whether rooftop analysis is necessary
- If safe, proceed with rooftop analysis
- If necessary, bring in crew for rooftop analysis
- If rooftop analysis is not feasible, incorporate buffer
- Calculate within acceptable limits of third-party audit, 3-5%
- Prepare the report

Knowledge of:

- The impact of shade on solar systems
- The proper use of the available tools

C: Conceptual Design

1. Select appropriate equipment

- Explain module aesthetic options to customer
- Explain efficiency, cost, aesthetic differences
- Consider geographic location, climate
- Select the module(s)
- Match inverter to array
- Match inverter to service voltage

Knowledge of:

- Product
- Voltage windows
- Websites that provide insolation data

2. Determine equipment location

- Avoid locations that will expose modules to salt water
- Comply with manufacturer specifications for inverter location
- Discuss potential sites for inverter with customer
- Ask customer about long term plans for renovations, etc.
- Consider type of monitoring system, broadband vs. wired
- Discuss conduit runs

Knowledge of:

- Noise level generated by equipment
- Risks of damage to equipment
- NEC requirements and local codes (AHJ)
- Cooling requirements
- Manufacturer's clearances
- Fire department requirements

3. Plan system layout

- Determine module layout
- Determine electrical layout
- Determine which faces of roof to use

- Sketch system layout

Knowledge of:

- String layout
- Roof set backs
- Geometry
- Computer skills
- Spacing between modules

4. Perform string sizing

- Select string sizing method
- Consider min, max temperatures, site
- Stand off distance (re: airflow)
- Match array voltage to inverter voltage with applicable temperature conditions
- Consider module voltage degradation over time

Knowledge of:

- Applying temperature coefficients
- Correlation between temperature and voltage

5. Determine breaker size or supply side connection

- Determine max inverter output given buss bar
- Evaluate whether there is room for a breaker
- Evaluate the service amperage
- Determine whether new electrical service is needed
- Determine whether line side tap can be used

Knowledge of:

- Spacing between modules
- Electrical service sizes
- Current ratings
- Line side tap

6. Determine mounting method and tilt angle

- Evaluate roof type and material
- Evaluate roof pitch
- Evaluate structural members (wood, steel, trusses, rafters)
- Determine space required under modules
- Consider impact on roofing warranties
- Select racking
- Determine number and type of roof penetrations, flashing
- Evaluate performance and aesthetic impact of various tilt angles
- Identify trenching considerations
- Determine local height restrictions

Knowledge of:

- Roofing
- Product
- Mounting systems

D. Financial Costs, Incentives, and Savings

1. Explain types of incentives and net cost

- Explain local net metering policies
- Explain feed-in tariffs
- Identify utility financial models
- Explain state, city and federal tax credits, treasury grants, depreciation, property tax exemptions, RECs, PBIs, rebates, tax deductions, transfer credits, sales tax exemptions
- Calculate net cost after incentives

2. Explain types of utility rates and net electric bill savings

- Explain time of use
- Explain tiered rate structures
- Explain what energy and demand charges are
- Explain how solar impacts demand charges
- Explain how solar impacts energy charges
- Discuss possibility of switching from one rate structure to another
- Explain potential future rate escalations, decreases
- Calculate electric bill savings

E. Financial Benefit Analysis and Financing

1. Calculate financial analysis

- Calculate cash flow analysis
- Calculate bill savings
- Calculate maintenance expenses
- Calculate replacement/repair costs for inverter
- Develop multi-year timeline detailing costs/benefits
- Calculate internal rate of return (exclude financing costs)
- Calculate simple return on investment
- Calculate years to payback
- Explain pre-tax and after-tax benefits
- Calculate theoretical resale value increase on property
- Explain to customer potential property equity impact
- Explain degradation rate
- Calculate net savings
- Inform customer that projections are not legally binding, disclaimer

Knowledge of:

- Financials
- Compound interest calculations

2. Evaluate appropriate financing options

- Cash up front
- Home equity loan
- Leasing
- Power Purchase Agreement (PPA)
- Consumer loans
- Community based financing, PACE
- Utility loans

Knowledge of:

- Financing options

F. Non-Financial Benefit Analysis

1. Calculate/quantify environmental benefits proportional to estimated production

- Calculate Co2 avoidance
- Calculate tons of coal saved
- Calculate water saved
- Calculate miles not driven in car
- Calculate acres of trees saved
- Calculate barrels of oil saved

2. Describe non-financial non-environmental benefits

- Articulate/calculate energy independence
- Articulate social benefits
- Articulate other non-environmental benefits

G. Performance Analysis

1. Calculate production

- Consider insolation data
- Review temperature data for the area
- Consider microclimate data if available
- Consider impact of dust and dirt
- Module name plate rating
- Consider time of use
- Consider shading
- Consider wire losses
- Consider module operating temperature, regional ambient temperatures and air flow
- Consider component efficiencies (e.g., inverter, DC modules)
- Consider tilt
- Consider azimuth
- Consider diodes and connections
- Consider module mismatch

- Consider system availability
- Consider tracking, dual or single axis
- Consider system age or degradation

Knowledge of:

- Sites that can provide data
- PVWATTS or SAM
- RETScreen
- How various factors impact production

2. Identify factors that degrade system performance over time

- Module degradation over time
- Landscaping issues, tree growth
- New construction

H. Prepare Proposals

1. ***Create minimum acceptable proposal***

- Include production estimate
- Include STC DC system power rating (and CEC AC or other rating as applicable)
- Include average monthly electric bill savings estimate
- Include total cost, rebates, tax incentives, and net cost
- Identify and estimate permit fees, interconnection fees, taxes and other foreseeable costs
- Identify variable or unknown costs and provide estimated range of cost
- Include payment schedule
- Identify incentives paid over time (PBI, FIT, SRECs)
- Include construction timeline and milestone dates
- Include major equipment list, power ratings, and part count
- List assumptions, special factors, and locations for equipment installation

Knowledge of:

- Reading manufacturer data sheets
- Rating specs
- Documents required for completing the sale

2. Include additional elements as applicable and/or appropriate

- Include financial benefit and/or financing discussion as applicable
- Include non-financial benefit discussion as applicable
- Include energy efficiency and conservation discussion as applicable