

N A B C E P

PV Technical Sales



Job Task Analysis

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North American Board of
NABCEP
Certified Energy Practitioners®

NABCEP PV Technical Sales Examination Specifications



N 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.

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, workers' 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 setbacks
- 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

PV Technical Sales Certification Requirements

I. General Eligibility Requirements for the PV Technical Sales Certification

In order to be eligible for the NABCEP PV Technical Sales Certification, applicants must satisfy the following requirements:

- Be at least 18 years of age;
- Complete the OSHA 10 Hour Construction Training Course Class (a certificate of course completion must be submitted with application);
- Satisfy at least one (1) of the qualifying certification eligibility categories (Qualifying Categories) identified below;
- Complete the NABCEP PV Technical Sales Certification Examination Application (printed or online application);
- Accept the NABCEP Code of Ethics & Standards of Conduct;
- Pay applicable Application fees; and,
- Achieve a passing score on the NABCEP PV Technical Sales Certification Examination.

II. PV Technical Sales Certification Eligibility Categories

The NABCEP Board of Directors and PV Technical Sales Technical Committee have established the following seven (7) Qualifying Categories for the NABCEP PV Technical Sales Certification. Applicants must satisfy at least one (1) of the following categories in order to qualify for certification.

A. Qualifying Category 1

- At least sixty (60) cumulative hours of training directly related to the subjects identified in the NABCEP PV Technical Sales Certification Job Task Analysis;
- Verifiable sales experience, including the completion of at least four (4) solar PV system sales proposals within the twelve (12) month period

prior to applying for the NABCEP PV Technical Sales Certification; and,

- Achieve a passing score on the NABCEP PV Entry Level Examination.

B. Qualifying Category 2

- At least thirty-two (32) cumulative hours of training directly related to the subjects identified in the NABCEP PV Technical Sales Job Task Analysis;
- Verifiable sales experience, including the completion of at least eight (8) solar PV system sales proposals within the twenty-four (24) month period prior to applying for the NABCEP PV Technical Sales Certification; and,
- Achieve a passing score on the NABCEP PV Entry Level Examination.

C. Qualifying Category 3

- Associates Degree from an accredited educational institution in renewable energy technology or related field of study;
- Verifiable sales experience, including the completion of at least four (4) solar PV system sales proposals within the twelve (12) month period prior to applying for the NABCEP PV Technical Sales Certification; and,
- Achieve a passing score on the NABCEP PV Entry Level Examination.

D. Qualifying Category 4

- Bachelors Degree from an accredited educational institution; and,
- Verifiable sales experience, including the completion of at least four (4) solar PV system sales proposals within the twelve (12) month period prior to applying for the NABCEP PV Technical Sales Certification.

E. Qualifying Category 5

- Currently credentialed as a NABCEP Certified Solar PV Installer in good standing; or,

- Currently recognized by NABCEP as a NABCEP Certified Solar PV Installer Emeritus.

NOTE: A minimum of thirty (30) hours of additional training in non-installation aspects of the PV Technical Sales Job Task Analysis is strongly recommended.

F. Qualifying Category 6

- Currently licensed as an electrician in the State in which the applicant performs his/her occupational activities; and,
- Achieve a passing score on the NABCEP PV Entry Level Examination.

NOTE: A minimum of thirty (30) hours of additional training in all aspects of the PV Technical Sales Job Task Analysis is strongly recommended.

G. Qualifying Category 7

- Verifiable sales experience, including the completion of at least twenty (20) solar PV system sales proposals within the sixty (60) month period prior to applying for the NABCEP PV Technical Sales Certification; and,
- At least five (5) years of cumulative, documented solar PV systems sales-related experience.

NOTE: A minimum of thirty (30) hours of additional training in all aspects of the PV Technical Sales Job Task Analysis is strongly recommended.

III. Verifiable Sales Experience/ Definitions and Documentation Supporting Experience

A. Definitions

1. Verifiable Sales Experience

Verifiable sales experience = Actively engaged in solar PV systems sales-related activities, including the completion of the number of solar PV system proposals required by the applicant's Qualifying Category. See, Section II.

For each of the four (4) solar PV system proposals to be completed in each twelve (12) month period prior to applying for NABCEP PV Technical Sales Certification, the following requirements apply:

- At least two (2) must have resulted in completed sales and installation;
- At least 2 must relate to systems larger than 2kW DC (peak);
- At least 1 of the installations must be a system that is grid connected; and,
- No more than 1 proposal may be submitted to a relative or someone residing at the applicant's address. This proposal must have resulted in a completed sales and installation.

Examples of Appropriate Verifiable Sales Experience:

Qualifying Category 1

Applicant must submit documentation showing at least 4 proposals completed in the 12-month period



prior to applying for certification, including at least: 2 resulting in completed sales and installation; 2 that relate to systems larger than 2kW (peak); and, 1 that is grid connected.

Qualifying Category 7

Applicant must submit documentation showing at least 20 proposals completed in a 60-month period prior to applying for certification, including at least: 10 resulting in completed sales and installation; 10 that relate to systems larger than 2kW (peak); and, 5 that are grid connected.

2. Solar PV Systems Sales-Related Activities

Engaging in the sale and/or design of solar PV systems, including but not limited to, individuals employed as sales managers, site analysts, system designers, technical support personnel, and project finance analysts.

3. Solar PV Systems Sales Proposals

Sales proposals must include the following information: proposed PV system size in kW; evidence of a shade analysis; the amount of kWh the PV system is expected to produce annually; the revenue that the electricity generated will produce; the total cost of the system; any incentive or tax benefits that may be applied to the total cost. Additional information may include the internal rate of return (IRR), payback period, cash flow over the life of the system, non-financial benefits, and any income that will be gained from renewable energy credits.

B. Documentation of Verifiable Sales Experience

1. Proposal Documentation

For each of the Qualifying Categories requiring verifiable sales experience, an applicant must submit the identified number of sales proposals for solar PV systems, consistent with the requirements of Section III.A. All solar PV systems claimed must be accompanied by a complete and accurate copy of the original proposal. See, definition of “proposal” in Section III.A.3. If the applicant’s name is not identified on a proposal, then

that proposal must be accompanied by a letter from the applicant’s employer or supervisor stating that the applicant was the person who performed a lead role in the development of the proposal, or held a position of responsibility in reviewing and approving the proposal developed by others.

2. Permits and Inspection Records

If the solar PV system identified in a proposal has been installed, the applicant must submit electrical permits and inspection records. If permits are not available, an applicant may submit:

- A signed letter from the customer stating that the purchased solar PV system met their expectations; or,
- A signed letter from the applicant’s employer or supervisor documenting the applicant’s roles and responsibilities in the sales process, along with the outcome of the sales process.



3. Customer Letters

If the system has been sold but not installed, the applicant must submit a signed letter (emails will not be accepted) from the customer stating that he/she is satisfied with the sales process and the purchased solar PV system.

4. Additional Information and Documentation

Applicants may also attach photographs of the solar PV system as supplemental documentation. All proposals and related proprietary information will be treated as confidential.

When completing the application, applicants will be asked to describe the scope of work he/she was responsible for on each installation. NABCEP reserves the right to contact system owners/operators, permitting authorities, and responsible contractors to verify work listed in the Application. The NABCEP Application Review Committee will make decisions regarding applicant eligibility based on the Application information and documentation submitted in support of the Application.

IV. Training Requirement for the PV Technical Sales Certification

Applicants applying through Qualifying Categories 1 and 2 must submit documentation supporting the required cumulative hours of training directly related to the subjects identified in the NABCEP PV Technical Sales Job Task Analysis.

A. Acceptable Training

NABCEP will accept training that meets the following requirements:

1. Formal Training Format. The training program must have a formal training format, which includes a teacher-student structure, i.e., a student and an instructing source. Acceptable training formats may include:

a. In-person/classroom training courses led by an instructor and/or discussion leader; or,

b. Activities in which a student is engaged in a planned learning event, receives feedback concerning his/her progress, and the student's progress is monitored. In some cases, such activities may be distance learning, i.e., the student is separated from faculty and other students. Examples include computer-assisted instruction, interactive video/CD/DVD, and/or website learning.

2. Training Covers PV Technical Sales Job Task Analysis Subjects

The training must directly relate to the subjects identified in the NABCEP PV Technical Sales Job Task Analysis.

B. Acceptable Training Providers

Acceptable training providers include, but are not limited to:

1. An educational institution accredited by an accreditation organization recognized by the U.S. Department of Education (e.g., universities and community colleges) or a similar Canadian government agency;

2. Independent renewable energy training programs. NOTE: NABCEP recommends that applicants consider training courses accredited by IREC under the ISPQ Standard, or taught by instructors certified by IREC. Please visit www.IRECusa.org for full course listings;

3. Apprenticeship training programs recognized by the U.S. Department of Labor or equivalent programs, or those recognized by a Canadian government agency;

4. Training programs approved by State or Provincial Contractor Licensing Boards; and,

5. Vocational technical training programs.

Although additional training is not required for Qualifying Categories 3 through 7, NABCEP strongly encourages training in all aspects of the PV Technical Sales Job Task Analysis. Such training may assist applicants in achieving a passing score on the PV Technical Sales Certification Examination.

V. Documentation of Training, Education & Credentials

Following is a list of documents and materials that an applicant must submit with his/her PV Technical Sales Certification Application:

A. Applicants applying under Qualifying Categories 1 and 2

- Copies of certificates of completion for each training program.
- A signed letter from the training program instructor(s) or education program administrator(s) identifying the specific aspects of the PV Technical Sales Job Task Analysis covered by the training and number of contacts hours spent covering those subjects.

B. Applicants applying under Qualifying Categories 3 and 4

- A copy of the official diploma and academic transcript from an accredited educational institution.

C. Applicants applying under Qualifying Categories 1, 2, 3, 5, or 6

- Applicants must identify the professional credential, certificate, and/or occupational license held as satisfying the applicable certification eligibility Qualifying Category.
- Copies of the credential certificate or license indicating current, active status as a credential holder or licensee in good standing.

VI. About the NABCEP PV Entry Level Examination Requirement

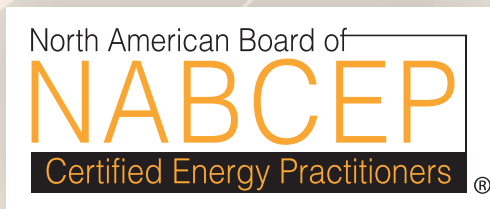
Qualifying Categories 1, 2, 3, and 6 require an applicant to successfully pass the NABCEP PV Entry Level Examination, which demonstrates a basic understanding of PV system design and installation. The NABCEP PV Entry Level Examination is not a certification exam.

Training courses directly related to preparation for the NABCEP PV Entry Level Examination will not count towards the requisite cumulative training hours for Qualifying Categories 1 and 2 unless subjects identified in the PV Technical Sales Job Task Analysis (JTA) are covered by such courses. In order for such training coursework to be accepted by NABCEP, the applicant must submit documentation signed by the course instructor or program administrator detailing the material covered and time spent covering PV Technical Sales JTA subjects. See, Section V.A.

For information concerning the NABCEP PV Entry Level Examination and for the complete list of all current, registered PV Entry Level Providers, please visit the NABCEP website, located at: www.nabcep.org/entry-level-program-2/for-students.

Licensure Requirement

If a license is required in the jurisdiction in which the work is performed, candidates must submit their license number—or the license number under which the work was performed.



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