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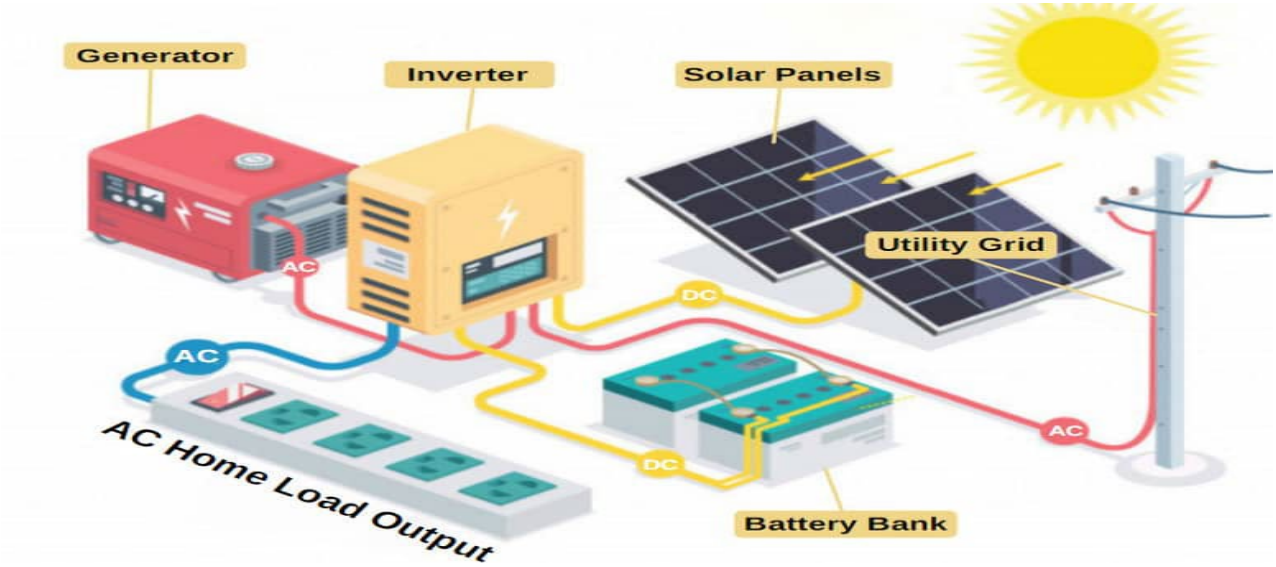
Photovoltaic Associate Job Task Analysis (PVA) 2026

Introduction

The NABCEP Photovoltaic Associate™ (PVA™) Program identifies individuals who have obtained the knowledge of the fundamental principles of the application, design, installation, and operation of Photovoltaic (PV) systems. This document presents a comprehensive Job Task Analysis (JTA) for individuals who are eligible for the PV Associate exam. The tasks described in this JTA are based on conventional designs, equipment, and practice used in the industry today; they do not seek to limit or restrict innovative equipment, designs, or installation practice. As with any developing technology, it is fully expected that the skills required of the practitioner will develop and change over time as new materials, techniques, codes, and standards evolve.

Anyone who passes the NABCEP PV Associate Exam has demonstrated a basic knowledge of photovoltaic systems. The knowledge demonstrated by passing this test does not replace the knowledge, skills or abilities of the electrical or other construction trades, or those of other professions or degree programs that require considerably more academic and practical experience. Please note that the NABCEP PV Associate Credential should not be confused with NABCEP's PV Installation Professional Certification. The latter can only be achieved by highly experienced individuals who have passed a much more rigorous examination and have demonstrated the capability to supervise complete PV system installations, and who have a detailed working knowledge of the electrical codes, standards and accepted industry practice associated with PV installations. PV Associates who want to qualify for the PVIP Exam, may apply 18 hours toward the non-accredited requirements.



Task Steps and Knowledge in Each Category Level

Scope of Job Task Analysis

The scope of the NABCEP PV Associate Job Task Analysis is meant to encompass the knowledge of the fundamental principles of application, design, installation, safety protections, economics and operation & maintenance of Photovoltaic (PV) systems. NABCEP PV Associates fill a wide range of entry-level positions within the industry, and the extent of their duties may vary considerably. Due to the range of responsibilities and skills that may fall within the scope of a NABCEP PV Associate's job duties, this Job Task Analysis is broad in scope: not all PV Associates will perform all the tasks described. This JTA is used to create the PVA test specifications (e.g., test blueprint) to ensure that the knowledge and skills measured by the PVA examination reflect current practice in the field.

The passing score of NABCEP examinations are set by a criterion-referenced standard-setting exercise by experts in the field under the guidance of a psychometrician. NABCEP Associate examinations are not graded "on a curve" – any Candidate who meets the eligibility requirements and achieves a passing score on the examination will earn the credential. Testing industry best practice is to report exam results as scaled scores. Scaled scores are statistically derived by adjusting the raw score (the number of questions a Candidate answers correctly) by a factor that accounts for the difficulty of a particular exam format relative to other formats. A scaled score of 65 is required to achieve a passing score on a NABCEP Associate Examination.

A panel of NABCEP Subject Matter Experts (SMEs) identified the most important information for anyone working in photovoltaics to understand. These six performance domains contain the essential tasks necessary to demonstrate that understanding.

Content Domains

Content Domain	Percentage of Examination
Safety	20%
Core Knowledge	20%
Sales & Economics	10%
Design	18.3%
Installation	18.3%
Operations & Maintenance	13.3%

*Listed percentiles do not equal 100% due to rounding.

CATEGORIZATION OF TASK STEPS USED BY NABCEP PHOTOVOLTAIC ASSOCIATES

Domain I: Safety 20%

Task 1: Hazard Identification and Controls

Knowledge of:

a. Hierarchy of Controls (e.g., elimination, substitution, engineering controls, administration controls, and PPE)
b. Fall hazards (e.g., leading edge, roof openings)
c. Environmental hazards (e.g., extreme temperature, inclement weather, animal encounters)
d. Hazardous materials (e.g., chemical, physical)
e. Digging hazards (e.g., trenching, ground mount systems, underground utilities, soil contamination)
f. Personal protective equipment (PPE) (e.g., hard hats, safety glasses, gloves, ear protection, arc and fire rated clothing, footwear)

Task 2: Safe Work Practices

Knowledge of:

a. Ergonomics (e.g., manual handling, body positioning, lifting)
b. Safe use of hand and power tools
c. Equipment inspections
d. Vehicle safety and equipment transport (e.g., heavy equipment)

Task 3: Safety Plan

Knowledge of:

a. Safety regulations (e.g., OSHA, NFPA)
b. Equipment staging (e.g., roof load distribution)
c. Access control (e.g., fence, screening)
d. Emergency response plan (e.g., first aid, hazardous materials, fire, fall rescue)
e. Safety meetings
f. Required on-site documentation (e.g., injury and illness prevention program, safety data sheets)

Task 4: Electrical Safety

Knowledge of:

a. Electrical hazards and control methods (e.g., DC/AC, electrical shock, arc flash, de-energization plan, lockout/tagout, working clearance, ground fault)
b. Safe use of electrical testing equipment
c. Risk in working with energized and/or faulty equipment (e.g., rapid shutdown)
d. Battery safety (e.g., insulated tools, face guard, chemical goggles, eye wash, gloves, aprons)

Task 5: Working at Height

Knowledge of:

a. Protection systems (e.g., harness, personal fall arrest systems, guardrails, scaffolding, skylight guards)
b. Equipment handling techniques (e.g., hoisting and rigging methods, tool tethering)
c. Ladder safety (e.g., selection, use)

Domain II: Core Knowledge 20%

Task 1: Types of PV Systems

Knowledge of:

a. PV Direct
b. Stand-alone
c. Grid-tied
d. Multimode (e.g., grid-tied with energy storage)

Task 2: Applications and Features of PV Systems

Knowledge of:

a. Energy security (e.g., reliability, resiliency)
b. Predictable electricity costs
c. Environmental impact
d. Economic benefits
e. Distributed generation

Task 3: Components of PV Systems and Functionality

Knowledge of:

a. PV modules
b. Mounting structures
c. Inverters (e.g., string, micro, multimode, central)
d. Power electronics (e.g., rapid shutdown devices, DC-to-DC converter)
e. Energy storage
f. Load control
g. Balance of system (BOS) components (e.g., panelboard and disconnects, raceways and conduit, wire and conductors, overcurrent protection devices)
h. Monitoring equipment
i. Grounding and bonding elements (e.g., equipment grounding conductor, grounding electrode conductor, grounding electrode, bonding jumper)

Task 4: Electrical Concepts

a. Photovoltaic effect
b. Ohm's law
c. Power and energy (e.g., watts verses watt-hours)
d. Electrical measurements (e.g., voltage, current, impedance, resistance)
e. Alternating current (AC) and direct current (DC)
f. Single-phase, split-phase, and three-phase circuits
g. Series and parallel circuits
h. Grounding and bonding (e.g., system and equipment)

Domain III: Sales and Economics 10%

Task 1: Critical Information to Qualify a Customer

Knowledge of:

a. Contact information and physical location
b. Utility information (e.g., utility bill)
c. Property ownership
d. Motivations (e.g., financial, environmental and health, energy choice)

Task 2: Preliminary System Estimate

Knowledge of:

a. Customer energy usage (e.g., current and anticipated)
b. Customer usage profile (e.g., daily patterns, seasonal patterns)
c. Utility rate structure (e.g., net metering, time of use, demand charges)
d. Energy storage requirements (e.g., backup load, days of autonomy, self-consumption, load shifting)
e. Site information (e.g., shading factors, roof type and age, orientation, pitch)
f. Utility interconnection requirements

Task 3: Factors that Impact the Economics of PV Systems

Knowledge of:

a. PV markets (e.g., residential, commercial, non-profit, utility-scale PV)
b. System price (e.g., equipment, labor, permitting, administrative)
c. Types of incentives (e.g., tax credits, rebates, low-interest loans)
d. Cost to finance (e.g., interest rates)
e. Cost of electricity from utility (e.g., rate structure, inflation)
f. Revenue opportunities (e.g., net metering, virtual power plant, Solar Renewable Energy Certificates)
g. Energy storage (e.g., avoided costs, load shifting, self-consumption, peak load reduction)
h. System performance (e.g., efficiencies of equipment, expected production output)
i. Environmental conditions (e.g., temperature, weather patterns, solar resources)
j. Equipment degradation (e.g., modules) and/or replacement (e.g., power electronics)
k. Warranty limitations (e.g., company stability, existing roof, equipment, workmanship)

Task 4: Financing Options

Knowledge of:

a. Cash purchase
b. Lease
c. Power purchase agreement (PPA)
d. Loan (e.g., Property Assessed Clean Energy [PACE], line of credit, home equity)

Task 5: Maintenance Costs

Knowledge of:

a. Service contracts (e.g., preventative and reactive maintenance, inspections, cleaning, vegetation management, remote monitoring)
b. Equipment replacement costs
c. Roofing replacement

Domain IV: Design 18.3%

Task 1: Equipment Specifications

Knowledge of:

a. PV module specifications (e.g., Standard Test Conditions [STC], open circuit voltage, short circuit current)
b. Manufacturer documentation (e.g., datasheets, installation manuals)
c. Inverter specifications (e.g., voltage, current, frequency, surge)
d. Existing service and/or equipment (e.g., voltage, current, phase)
e. Energy Storage Systems (e.g., type, capacity, voltage)
f. National recognized testing labs [NRTL]
g. Product safety standards (e.g., IEEE standards, UL, national standards)
h. Location conditions (e.g., wind, snow, seismic activity)

Task 2: Codes and Standards

Knowledge of:

a. Electrical codes (e.g., national, state, local)
b. Building codes (e.g., national, state, local)
c. Fire codes (e.g., national, state, and local)
d. Workplace safety standards (e.g., OSHA, ANSI, NFPA)
e. Permitting, utility, and inspection requirements (e.g., authorities having jurisdiction [AHJ])

Task 3: Factors Impacting Design and Performance

Knowledge of:

a. Local conditions (e.g., weather, soiling)
b. Peak sun hours
c. Shading analysis (e.g., current and future)
d. Array orientation (e.g., tilt, azimuth)

Task 4: PV System Sizing

Knowledge of:

a. Derating factors
b. System losses (e.g., DC losses, AC losses)
c. Power rating
d. Energy production
e. Energy efficiency
f. Electric service infrastructure
g. Interconnection requirements
h. Load analysis
i. System modeling tools
j. String configuration
k. Inverter compatibility (e.g., inverter types, ratings, DC:AC ratio)

Task 5: PV System Plan Sets

Knowledge of:

a. Site plan and array layout
b. Electrical diagrams (e.g., one-line or three-line diagrams, wiring diagram, string diagram)
c. Conductor properties (e.g., temperature ratings, ampacity ratings, UV resistance, moisture rating)
d. Electrical and plan set symbols
e. Electrical equipment (e.g., wire, conduits, raceways, disconnects)
f. Equipment data sheets and installation instructions
g. Details (e.g., structural, electrical, grounding, labeling)
h. Permit documents

Task 6: Structural Considerations

Knowledge of:

a. Static and dynamic loads (e.g., wind, snow, seismic)
b. Mounting systems (e.g., ground mount, roof mount, canopy)
c. Roofing systems (e.g., rafter, trusses, membranes)

Domain V: INSTALLATION 18.3%

Task 1: Mounting Structure Types and Installation Considerations

Knowledge of:

a. Types of mounting structure and components (e.g., flat roof, pitched roof, ground mount)
b. Manufacturer manuals and specifications (e.g., installation manuals, site engineered plans)
c. Roof considerations (e.g., type, pitch, warranty)
d. Structural considerations (e.g., rafter, truss, stud, decking, beams, purlins, span, cantilever)
e. Fastener types and sizes (e.g., metal, wood, concrete fasteners; material - stainless steel/galvanized; grade, strength markings, compatibility of metals/materials)
f. Grounding and bonding methods (e.g., integrated grounding, listed grounding components, star washers)
g. Common power and hand tools

Task 2: Electrical Equipment Installation Considerations

Knowledge of:

a. Manufacturer manuals and specifications (e.g., termination torque specifications, NEMA ratings, sunlight exposure)
b. Working clearances
c. Common electrical fittings and uses (e.g., connectors, couplings, grounding bushings, strain reliefs, raceway)
d. Labeling and marking requirements (e.g., code requirements, durability)
e. Wiring best practices (e.g., PV connector compatibility, drip loops, service loops, minimum bend radius, support, exposure to damage)
f. Material compatibility (e.g., conductor type, terminations, splices)

Task 3: Energy Storage Installation Considerations

Knowledge of:

a. Common types of energy storage (e.g., lithium batteries, lead acid batteries)
b. Manufacturer manuals and specifications (e.g., installation manuals, system programming and controls, product safety guidelines)
c. Labeling and marking requirements (e.g., code requirements)

Task 4: System Commissioning

Knowledge of:

a. Visual inspection (e.g., Quality Assurance Quality Control [QAQC], installation checklists)
b. Testing (e.g., thermography, string voltage, polarity)
c. Proper operation of equipment (e.g., inverter operation, monitoring/communication, disconnects)
d. Documentation (e.g., commissioning forms, manufacturer checklists, photo checklists, permission to operate [PTO])
e. Owner/operator orientation (e.g., walk-through, training, monitoring, expected operations and maintenance, emergency response)

Domain VI: Operations & Maintenance 13.3%

Task 1: Electrical Test Equipment and Application

Knowledge of:

a. Multimeters (e.g., current, voltage, resistance, continuity)
b. Insulation testing devices (e.g., megohmmeter)
c. IV curve tracer
d. Infrared thermometer
e. Irradiance meter
f. Battery capacity testing devices (e.g., load tester)
g. Hydrometer
h. Refractometer
i. Thermal camera

Task 2: Performance Parameters

Knowledge of:

a. Temperature effects (e.g., cell temperature, ambient temperature)
b. Wind speed effects
c. IV curve characteristics (e.g., short circuit, open circuit, maximum power point [MPP])
d. Irradiance effects
e. Inverter AC and DC voltage (e.g., operating voltage, maximum power point tracker [MPPT] range)
f. Utility voltage and frequency
g. Battery voltage
h. Battery state of charge (SOC)

Task 3: System Monitoring Equipment and Applications

Knowledge of:

a. Monitoring methods (e.g., app- and web-based, on-site)
b. Data acquisition and control (e.g., DAS, SCADA)
c. Instrumentation transformers (e.g., current transformers [CT], potential transformer [PT])
d. Revenue grade meter
e. Weather monitoring systems (e.g., albedometer, pyranometer, anemometer, thermometer)
f. Battery temperature sensors
g. Amp hour meter

Task 4: Deviations from Expected Performance

a. Test conditions (e.g., Standard Test Conditions [STC], nominal operating cell temperature [NOCT])
b. Installation deficiencies
c. Electrical faults (e.g., arc fault, ground fault)
d. Production enhancements and their causes (e.g., albedo, edge of cloud, low temperature, high altitude)
e. Production losses and their causes (e.g., weather, pollution, shading, animals, soiling, system degradation)
f. System curtailment (e.g., export limitation, load control)

Task 5: Maintenance of PV Systems

a. Record keeping (e.g., system logging, data sheets, user manuals, as-built plan set, maintenance plan, photography)
b. Visual inspection
c. Equipment replacement (e.g., installation practices, lockout/tagout, service life)
d. Equipment-specific maintenance requirements (e.g., lockout/tagout, torque requirements, cleaning)

NABCEP's mission is to support and work with the renewable energy and energy efficiency industries, professionals, and stakeholders to develop and implement quality credentialing and certification programs for practitioners.

NABCEP's PVIP and ESIP Certifications are North America's only renewable energy personnel certifications that have been ANSI accredited to the internationally recognized ISO/IEC 17024 standard.

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