REP™
Renewable Energy Professional

CERTIFICATION SCHEME **1.0**

Version No: 1

Effective Date: 5/1/2023

Association of Energy Engineers

Scope

A Renewable Energy Professional (REP™) is an energy professional that has chosen to focus on renewable energy generation, production, and storage, plus the strategies and programs that support sustainable energy technologies. These professionals use their specialized knowledge to assist corporations or organizations in setting goals for sustainability through renewable energy projects. They select the most appropriate and viable renewable energy technologies and assist in maximizing the benefits when deploying these systems at small or large scales.

A Renewable Energy Professional is expected to have competency in the following areas (that are included in the REP™ Body of Knowledge) in order to gain certification: renewable energy and environmental impacts, solar energy (PV and thermal), wind energy, hydropower, geothermal energy, biomass energy, waste-to-energy systems, hydrogen applications, hybrid systems, energy storage, alternative energy strategies for buildings, transportation systems, financing and incentives for alternative energy, and renewal energy applications for microgrids.

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Eligibility Requirements for Competence

Individuals applying for the REP™ Certification Examination must attend an approved preparatory training course, meet the following education, and experience requirements, and complete a certification application.

Education and Experience Requirements

Education		Work Experience
4-year related degree OR Professional Engineer (PE) OR Registered Architect (RA)	and	2+ years related* experience
2-year associate degree	and	5+ years related* experience
NONE	and	10+ years related** experience
Current Status of Certified Energy Manager (CEM®)		

*Related degree includes engineering, architecture, science, business, or related and related experience includes renewable, alternative energy, biomass, biofuel, solar or related.

Examination Requirements for Competence

To earn the REP™ Certification, candidates must pass the certification examination. The competency requirements assessed are the following:

Certified Renewable Energy Professional – Examination Blueprint

Body of Knowledge / Percentage of exam	
1	**Renewable Energy and Environmental Impacts 6-10%**
101	Policies and programs (Agenda 21 + Kyoto Protocol + Paris Agreement)
102	Impacts associated with renewable energy production
103	Comparative assessment of renewable to fossil fuels
104	Environmental Impact of Fossil Fuels and Renewable Energy
105	Cost and benefits of Fossil Fuels and Renewable Energy
106	Primary Energy Consumption Resources
107	Hubbert Peak
108	Impacts of Climate change
109	Approaches to atmospheric carbon mitigation
110	Carbon intensity of fuels
111	Calculating Carbon Emissions Reductions
112	Carbon Emissions and its impact , Carbon Footprints of Energy Applications
113	Carbon management
114	Sox, Nox, Particles, Hg
115	Green House Gases (GHG)
116	Solid Waste
117	Capacity Factors, Power Capacity Penetration

2	Solar Energy 11-17%
201	Passive solar applications
202	Solar air, heating, cooking, storage, food drying, water distillation
203	High Temperature - Hot water, A/C, Domestic Hot Water - Solar, Thermal
204	Solar hot water heating
205	Solar PV electric generation
206	Concentrated Solar PV
207	Solar thermal electric generation (CSP)
208	Economics and feasibility
209	Calculating Annual Energy Production (AEP) for PV
210	Resource Evaluation PV, Thermal production, GHI Resource Map, DNI Resource Map
211	General Aspects of Mounting and Racking Tracking Systems
212	Pond/lake PV applications

3	Wind Energy 10-16%
301	Small scale wind turbine generation (WTG) systems
302	Onshore wind energy technologies
303	Offshore wind farms
304	Economics and feasibility (Bentz Limit)
305	Vertical and Horizonal Turbines / Lift and drag
306	Mechanical applications of wind mills and pumps
307	Control Systems - pitching, yaw, emergency shutdown, turbine speed
308	Wind Resource (Map, Classes of Turbines, Wind Shear, risks, turbulence index, wind rose)
309	Calculating AEP
310	Resource Evaluation
311	Capacities and Limitations

4	Hydropower 7-11%
401	Concept of generation technologies, hydropower basics and hydro resource
402	Large hydro systems
403	Hydro Resource (hydrology cycle, tidal, wave, OTEC)
404	Micro-hydro turbine technologies (low head systems)
405	Pumped storage
406	Estimating power output
407	Ocean Energy Systems (OTEC, Osmotic, Wave Energy, Tidal, Ocean Currents)
408	Economics and feasibility
409	Capacities and Limitations

5	Geothermal Energy 6-10%
501	Resource Evaluations
502	Geothermal Energy of low enthalpy - Ground source, Heat pumps Applications, Cool tubes, DHW, Horizontal tubes, and Vertical tubes
503	Geothermal Energy of High enthalpy - Electric generation (Direct, flash, binary)
504	Economic and feasibility
505	Calculating Carnot efficiency
506	Geothermal resource
507	Capacities and Limitations

6	Biomass Energy 6-8%
601	Biomass Resource
602	Biomass thermochemical processes: Combustion, Pyrolysis and Gasification
603	Biofuels (Bioethanol, Biodiesel, 2nd generation biofuel, algae)
604	Biogas anaerobic digesters, municipal solid waste (MSW)
605	Biological mechanical treatment (BMT)
606	Economics and feasibility
607	Capacities and Limitations

7	Waste-to-Energy Systems 3-5%
701	Waste to energy systems (general)
702	Differences between thermal and non-thermal technologies
703	Waste fuels and their uses
704	Landfill gas and gas turbines and engines
705	Plasma-arc gasification processes (PGP)
706	Economics and feasibility
707	Waste Resource Applicability
708	Capacities and Limitations

8	Hydrogen Applications 3-5%
801	Sources of Hydrogen
802	Transport and Storage of Hydrogen
803	Fuel cell technologies and micro turbines technologies
804	Differences between low, intermediate and high temperature systems
805	Applications of fuel cell technologies
806	Economics and feasibility
807	Pros and Cons
808	Capacities and Limitations

9	Hybrid Systems 4-6%
901	Definition and types of hybrid energy systems
902	Benefits of hybrid energy systems
903	How to choose a hybrid system, schematic configurations
904	Pros and cons of a typical solar and wind power combination
905	Pros and cons of a typical pumped-storage and wind combination
906	Capacities and Limitations

10	Energy Storage 6-8%
1001	Types of energy storage (thermal, electrical)
1002	Mechanical energy storage systems (pump storage, compressed air, fly wheel)
1003	Electrical / electro chemical (compositors, batteries, fuel cells, grid storage)
1004	Common Chemical energy storage systems (hydrogen, biofuels, fossil fuels)
1005	Thermal energy storage systems (molten salt, seasonal)
1006	Comparative capabilities of energy storage systems
1007	Energy Storage Calculations
1008	Transformation of energy
1009	Capacities and Limitations

11	Alternative Energy Strategies for Buildings 6-8%
1101	Energy & Buildings (key terms, energy use, energy flows)
1102	Site solutions to optimize alternative energy potential
1103	Energy Efficiency & Energy Management
1104	Measures of Energy Reduction
1105	Demand-side conservation approaches
1106	Rating Systems (LEED, Energy Star and others)
1107	Integration of renewable energy and alternative energy technologies in buildings
1108	Net zero energy and net-positive energy buildings

12	Transportation Systems 3-5%
1201	Strategies for sustainable transportation systems
1202	Passive approaches to improving transportation
1203	Renewable fuels used in vehicles (ethanol, bio-diesel, algae oil)
1204	Gasification and synthetic fuel production for vehicles
1205	Renewable electrification for vehicles
1206	Hydrogen as a renewable fuel for vehicles
1207	General concept programs for renewable transportation
1208	Integration Transport and Power Generation Sector

13	Financing and Incentives for Alternative Energy 6-10%
1301	Government Renewable Energy Programs
1302	Economic and financial approaches for project justification
1303	Basic financial analysis and assessments
1304	Life-cycle cost and levelized analysis methodologies
1305	Bankability and Risk Assessment
1307	Tax considerations (rates, depreciations, etc.)
1308	Measurement and verification
1309	Financing by combining approaches and incentives

14	Renewable Energy Application for Micro-grids 2-4%
1401	Fundamentals of Micro-grids
1402	Central plants vs. distributed generation
1403	Virtual Powerplants
1404	Smart Grids
1405	Smart Energy Networks
1406	Interconnection requirements
1407	Vehicle to Grid Storage Applications
1408	Grid limitations
1409	Design considerations such as intermittency and penetration limits

Exam Specifications

The examination will be 4-hours, open book / open notes and follow the specifications outlined in the examination blueprint. All questions will be multiple-choice questions in accordance with the percent of exam range for each task.

Code of Ethics

Codes of Practice are found in the Code of Ethics for Certified Professionals V1.1 dated November 21, 2019, available at www.aeecenter.org/CodeofEthics.

Recertification Requirements

An REP™ must accumulate ten professional credits every three years and submit a completed Renewal Form to AEE to remain certified. Professional credits for recertification can be accumulated at any time within the three-year period. Detailed explanation of activities applicable as credits for certification renewal available at www.aeecenter.org/certification/renewal.

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Activities for REP™ Renewal Credits

Continued employment in Renewable Energy activities:
– 1 credit per year

Membership in a professional engineering society
– 1 credit per year

Offices held in a professional engineering society
– 1 credit per year

Continuing education (CEU's) / professional activities (seminars or conferences) including but not limited to renewable energy, alternative energy, etc.
– 2 credits per CEU, college credit hour or 10 contract hours for training

Awards presented and/or papers published involving Renewable Energy:
– 2 credits each

Certified Professionals who do not acquire sufficient REP™ renewals credits to be recertified on the recertification date will no longer have an active certification and be notified in writing of suspension from using the REP™ designation. They will also no longer be listed as an REP™ in any AEE publication. A lapsed REP™ must resubmit to the certification process and successfully meet the criteria for certification by personal data information and examination. Another option for certified professionals is to acquire make-up points at a cumulative total equal to 3.5 per year for every year since date of expiration. This option is available one-time only. Certifications that have lapsed more than three renewal cycles must retake the REP™ exam.

An REP™ upon retiring and reaching the age of sixty-five, can be designated as "REP – Retired," will no longer be required to pay renewal fees, and will no longer be listed in our directory of actively practicing REPs. No further reporting is necessary except to notify AEE of meeting the age requirement by sending a copy of the retired REP's Driver's License.

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