Federal Sector Renewable Energy Project Implementation: "What's Working and Why"

DOD-DOE Waste-to-Energy and Fuel Cell Workshop
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Federal Sector Renewable Energy Project Implementation: "What's Working and Why"

- Commercially viable RE technologies
- RE project economic drivers
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DOE FEMP Mission: The Department of Energy's Federal Energy Management Program's (FEMP) mission is to facilitate the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship.

Commercially Viable RE Technologies (Large scale)

- Photovoltaics (PV)
- Concentrating Solar Power (CSP) (with storage)
- Wind
- Biomass power (waste-to-energy (WTE), wood feed stock combustion, etc.)
- Geothermal

RE Project Economic Drivers ("Show me the money")

In general, Federal RE projects are economically viable when three revenue sources can be leveraged.

- Federal tax credits (investment tax credit (ITC) or production tax credit (PTC))*
- Sale/purchase of power produced
- State incentives ("make or break" project revenue source)

Bottom line: RE project economics are in general "razor thin" (incremental "project costs" are potential show stoppers).

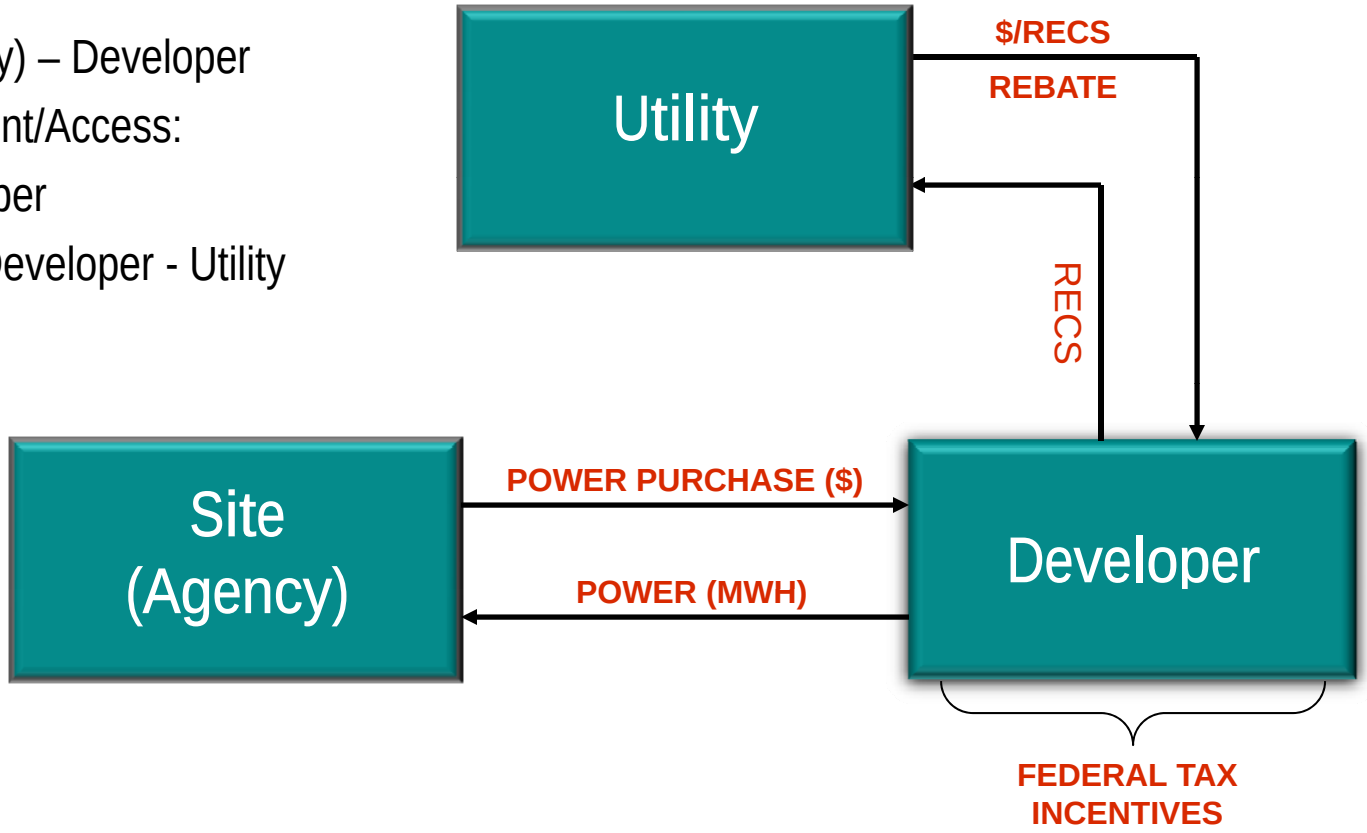
* Ownership by private sector required (e.g. developers including investor owned utilities)

Power Purchase Agreement (PPA) "Wiring Diagram"

("Behind the Meter" Project)

Agreements

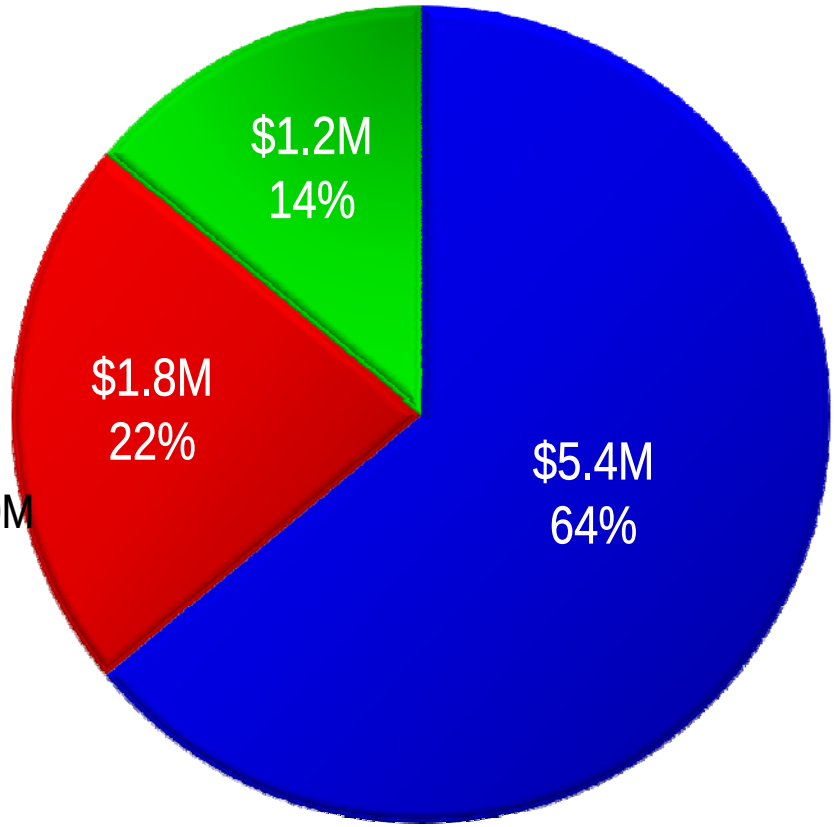
- PPA: Site (Agency) – Developer
- Lease or Easement/Access:
  Agency - Developer
- REC Purchase: Developer - Utility



PV PPA Economics Example (Revenue Source Sensitivity Analysis)

Actual Project Economics

Project
- PV: 720 kW/ 1,200 MWh/year
- CO (Xcel Energy)
- "Behind the meter"
- Cost estimate:$7.0M
- Circa 2007



- State Incentive: $225/MWh, 20 years
- Federal Tax Credits: 30% ITC, ACRS
- Sale of Power: $0.05+/kWh, 2% escalation

$8.4M
(not adjusted for time value of money)

California Solar Incentives (Performance Based Incentives)

CSI Step table: CSI Rebate Levels by Incentive Step and Rebate Type

		EPBB Payments (per Watt)			PBI Payments (per kWh)		
Step	Statewide MW in Step	Residential	Non-Residential		Residential	Non-Residential	
			Commercial	Government/ Non-Profit		Commercial	Government/ Non-Profit
1	50	n/a	n/a	n/a	n/a	n/a	n/a
2	70	$2.50	$2.50	$3.25	$0.39	$0.39	$0.50
3	100	$2.20	$2.20	$2.95	$0.34	$0.34	$0.46
4	130	$1.90	$1.90	$2.65	$0.26	$0.26	$0.37
5	160	$1.55	$1.55	$2.30	$0.22	$0.22	$0.32
6	190	$1.10	$1.10	$1.85	$0.15	$0.15	$0.26
7	215	$0.65	$0.65	$1.40	$0.09	$0.09	$0.19
8	250	$0.35	$0.35	$1.10	$0.05	$0.05	$0.15
9	285	$0.25	$0.25	$0.90	$0.03	$0.03	$0.12
10	350	$0.20	$0.20	$0.70	$0.03	$0.03	$0.10

*** The non-residential customer class includes commercial, private, government, and non-profit participants.**

Please be aware that the final CSI incentive rate that is reserved for you will be determined by your CSI Program Administrator at the time your reservation request (RR) application is approved, and may be lower than the current incentive rate shown in the CSI Statewide Trigger Point Tracker. Please note that final incentive amounts are subject to change based upon the configuration of the as-built system. (Per the CSI Handbook, no projects or applications are reserved CSI funding until all required information has been submitted and approved in writing by the Program Administrator.)

For more information about the California Solar Initiative, visit GoSolarCalifornia.ca.gov.

Fuel Cell Project Financing (generalized observations for stationary applications)

General

- Tri-generation applications attractive: combined heat, hydrogen and power (CHHP) facilities applications maximize revenues and state incentives
  - Offset/sale of power and natural gas and offers H2 source
  - Maximizes capture of available state incentives
- CA incentives particularly attractive
  - Self Generation Incentive Program (SGIP)
  - Biofuels feedstock incentive
  - Manufacturing incentive

Project costs (stationary application-molten carbonate technology)

- Equipment and installation (first costs and installation costs indicative of early market)
- Cost of capital (debt to equity ratio (debt level/ interest), early market perceived risk)

Fuel Cell Project Financing (cont.)

Project costs (cont.)

- Operation and maintenance
  - Fuel cost (biofuel opportunity (vs. natural gas))
  - Maintenance (not insignificant)

Project revenues

- Federal and state incentives
  - Federal tax credits (Investment Tax Credit (ITC) and accelerated cost recovery)
  - State incentives (decreasing levels-market based, varying term)
- Sale of power revenue
  - Local electric rate key (higher rates support project economics)
  - Dispatchable power source (significant revenue source)

RE Project Construct Alternatives (Initial project development consideration)

Load offset alternative: Developer sells power to site

- Sale of power to site at site's retail rate ("behind the meter"/net metering)
  - Starting point for PPA price negotiation
- Avoids sale of power complexities

Load offset/sale of power alternative: Developer sells power to site and off taker

- Sale of power to site based on project economics and to off taker at competitively determined whole sale rate
- Project complexities/costs (whole sale power purchaser?, transmission availability, NEPA, mission mitigation, etc.)

Sale of power alternative: Developer sells power to off taker

- Agency leases land to developer for whole sale of power by developer
- Public lands (BLM, "brownfields", DOE Environmental Management, etc.)

Implementation Mechanisms
(What's working)

- Power Purchase Agreements (PPA)
  - Multiple projects across the agencies
  - Project examples (Nellis AFB (14MW), USCG-Petaluma (855 kW), Ft. Carson (2MW), NREL (4MW), etc.

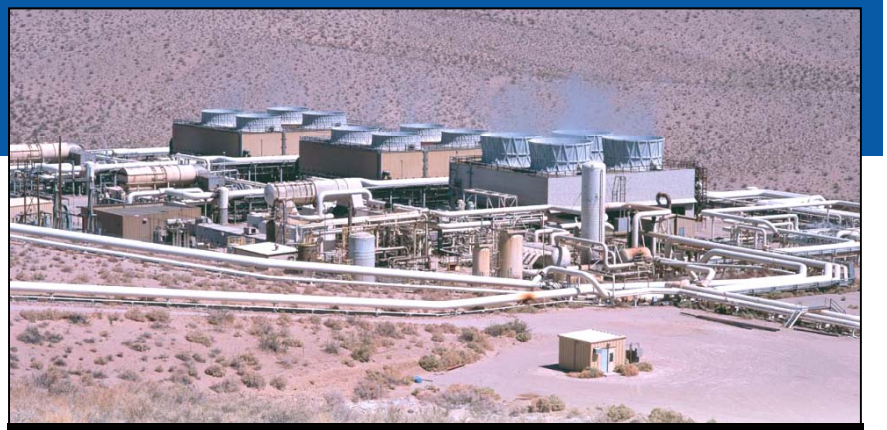
- Energy Savings Performance Contracting (ESPC)
  - Up to 25 year term authorized
  - Tax credit issue (agency retains project ownership)-Energy Services Agreement (ESA) embedded in ESPC
  - "Bundled solutions" (Hill AFB (210 kW))
  - Projects examples (biomass combustion)
    - ✓ NREL Renewable Fuel Heating Plant (6-8mmBtu/hr hot water boiler-displaces natural gas use)
    - ✓ Savannah River Site biomass CHP (240,000 pph, 20 MW)
    - ✓ Oak Ridge National Laboratory biomass gasification
  - Hill AFB Landfill Gas to Energy Electrical Generation (2,250 kW)

- Utility Energy Service Contracts
  - Project examples
    - ✓ Marine Corps Barstow/SCE-1.5 MW wind turbine
    - ✓ Camp Pendleton/SDG&E-75 KW PV system

Nellis Air Force Base, Nevada


NREL Renewable Fuel Heating Plant

Implementation Mechanisms
(What's working) - continued



Coso Geothermal Development (NAWS China Lake)

Enhanced Use Lease (EUL)

- Real estate transaction ("under utilized land" requirement; <50 year term)
  - Current agency authorities (DoD:10 USC 2667, NASA)
- Benefit: "fair market value" plus "in kind" value (competitive determination)
- Project example (NASA Kennedy Space Center (10 MW PV FP&L , 990 kW in kind PV system))
- Proposed projects (Air Force Real Property Agency (AFRPA) actively promoting (proposed Edwards AFB project), Army COE (proposed Ft. Irwin project)
- DOE Brookhaven National Laboratory (37 MW, 0.5-1.0MW in kind PV system ("one off" LIPA lease arrangement)

"Energy Joint Venture"

- Contracting authority for energy related procurements (10 USC 2922a (DoD), <30 year term)
- Benefit: Agency takes project development risks/costs in exchange for financial benefits commensurate with project value
- Project example: Navy China Lake (Coso Geothermal-270 MW, site power and significant sale of energy to SCE [some $17M annually])

NREL Project Development Financial Evaluation Capabilities

- Fuel Cell Power Model-facilitates analysis of fuel cell technologies with facilities. Allows analysis of combined heat, hydrogen, and power (CHHP) systems

- To facilitate agency site project development and negotiations , NREL project development services include development of tailored project financial pro forma spreadsheets

- Solar Advisor Model (SAM)-evaluates utility scale financing for a variety technology specific cost models. See link below for down loadable version:

https://www.nrel.gov/analysis/sam/

Thank You!
QUESTIONS?

For more information:

DOE Federal Energy Management Program ♦ 202-586-5772 ♦ *www.eere.energy.gov/femp/*

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RE Use Requirements (Primary)

Executive Order 13514 (all Agencies)

- Incorporates EPAct 2005 (RE use: 2.5%-2007, 5%-2010, 7.5%-2013)
- Federal agency GHG reduction goals (more stringent-drives more aggressive RE use)

National Defense Authorization Act (NDAA) (DoD)

- 25% renewable energy use by 2025 (2008 “electric energy use”, 2010 “all energy”)

RE Use Requirements (Primary) - continued

Army

- Five Army installations will be net zero* by 2020, 25 installations by 2030, and all Army installations by 2058

Air Force

- 25 percent of base energy needs will be met with renewable energy sources by 2025

Navy

- 50% of all shore-based energy requirements will be met from alternative sources** and 50% of all bases will be net-zero* in energy consumption by 2020

Marines

- Increase renewable electric energy use to 25 percent by 2025

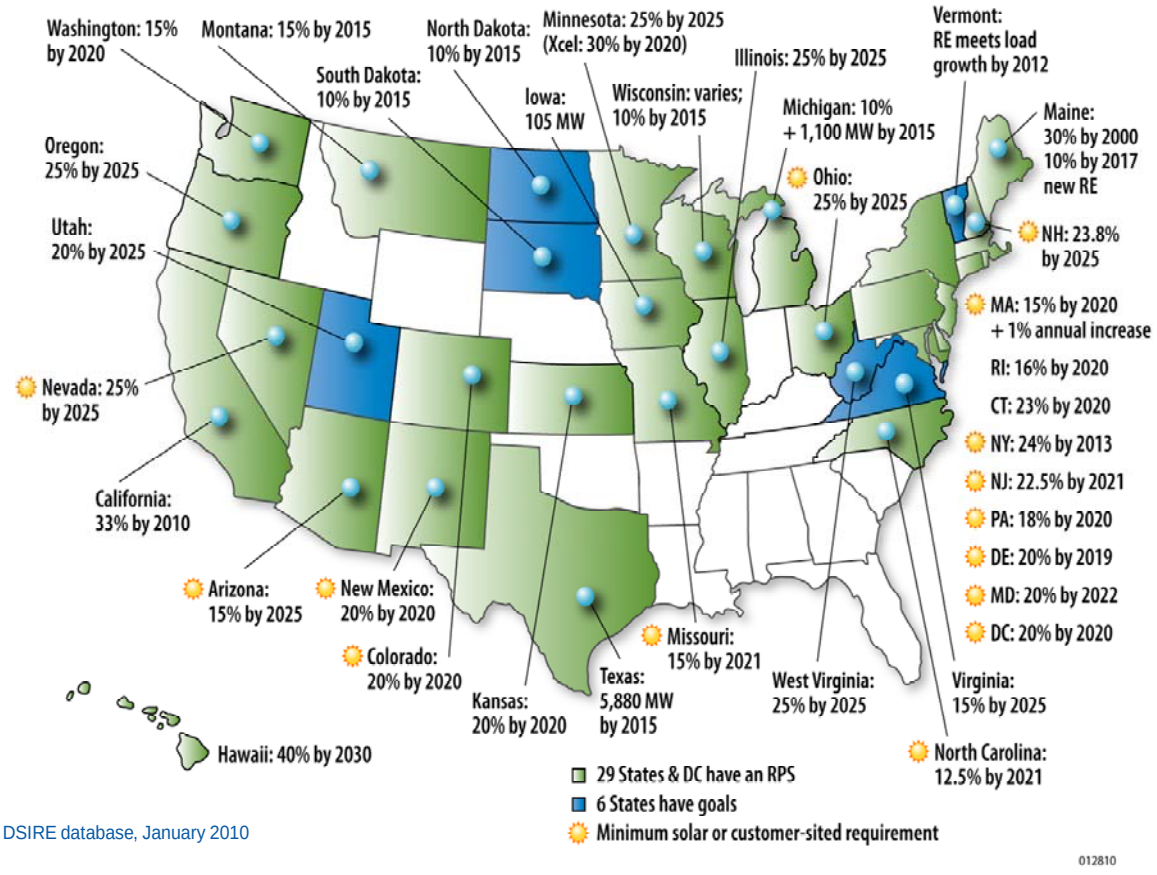
* *Net Zero Energy Installation(NZEI) compliance and security goals focus on maximizing use of RE*

** *Alternative sources" definition pending*

States Offering RPS Incentives

State Policies Advance Renewable Energy

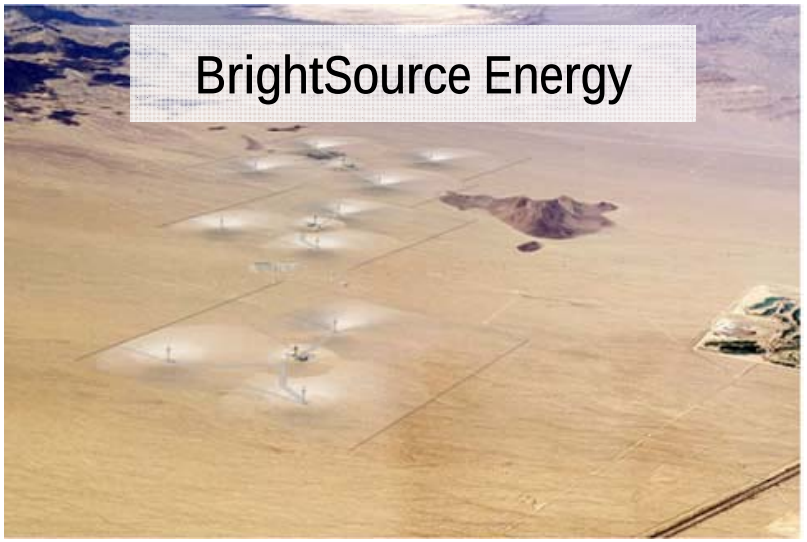
Renewable Portfolio Standards



Source: DSIRE database, January 2010

BLM Fast Track RE Projects (10/2010) ("Sale of Power" Project Examples)

Developer	Project	State	Technology	BLM Acres	MW
Tessera	Imperial Valley	CA	Dish Stirling	6,140	709
Chevron	Lucerne valley	CA	Thin film PV	516	45
Brightsource	Ivanpah	CA	Power Tower	4,073	380
Nextlight	Silver State	NV	First Solar PV	7,840	50
Tessera	Calico	CA	Dish Stirling	8,230	663
				26,799	1847



PV Project Financing Considerations/Updates

Project costs

- Equipment and installation(´economics“d'river", current project costs= $4-5/watt)
- Cost of capital (perceived risks trending down-maturing market)
- Resource/fuel (free)
- O&M (minimal, repair and replacement)

Project Revenues

- Project incentives
  - Tax credits (Investment Tax Credit (ITC) and accelerated cost recovery)
  - State incentives (decreasing levels-market based, varying term)
- Sale of power
  - Local electric rate key (higher rates support project economics)
  - Intermittent system output (capacity factor key (11-19%))