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How Incentives Impact your Renewable Energy Project

Doug Dixon, Alice Orrell
Pacific Northwest National Laboratory

Outline of Presentation

- Renewable Energy Assessments for the Army
- Renewable Energy Project Economics
 - Ownership Options
 - Financial Incentives
 - Financial Analysis Tool
 - Wind Project Examples
 - Solar Project Examples
- Summary

Legislated Renewable Energy Targets for DoD

	EPAct Section 203	Executive Order 13423	National Defense Authorization Act	Energy Independence and Security Act 2007
Target / Goal	Increasing targets reaching 7.5% of electric energy from renewables	7.5% of electric energy from renewables; 50% from new (post-1998) sources	Equivalent of 25% of electric energy from renewables	All buildings built or renovated to use no fossil-fuel derived energy, including for thermal uses.
Target Dates	2013	2013	2025	2030
Mandatory?	Yes	Yes	No	Yes
Considers thermal energy "renewable"?	No	Yes	Yes	N/A

Renewable Energy Assessments Completed

by PNNL

NERO

NWRO

Dugway Proving Ground

Fort Carson

Fort Riley

Fort Leavenworth

Fort Leonard Wood

SWRO

Yuma Proving Ground

White Sands Missile Testing Center

Fort Sill

Fort Hood

Fort Polk

Fort Campbell

Fort Benning

Fort Bragg

Fort Gordon

SERO

PARO

Fort Wainwright

Ft. Greely

Tokyo/Yokohama
Akizuki/Kure
Zama/Sagamihara

Fort Shafter

Schofield Barracks

Okinawa

Natick R & D Ctr

Devens RFTA (USAR)

Ft. Hamilton

Picatinny Arsenal

Fort Monmouth

Fort Dix (USAR)

Aberdeen Proving Ground

Ft. AP Hill

Fort Eustis

Fort Monroe

Fort Story

Walter Reed

Fort McNair

Fort Myer

Fort Belvoir

Ft. Meade

MOT Sunny Point

Fort Jackson

Fort McPherson

Fort Gillem

Fort Stewart/Hunter AAF

USAG Miami

Fort Buchanan

Fort Drum

Fort Lee

Fort Bragg

Fort Campbell

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RE Assessment Results

Installation	Biomass/Waste-to-Energy	Geothermal	Ground Source Heat Pumps	Solar	Wind
Fort Bliss	Good Potential	Secondary Potential	No Immediate Potential	No Immediate Potential	Good Potential
Fort Bragg	Good Potential	No Immediate Potential	Good Potential	Secondary Potential	No Immediate Potential
Fort Carson	Good Potential	No Immediate Potential	Good Potential	Secondary Potential	Secondary Potential
Fort Hood	Good Potential	No Immediate Potential	Good Potential	No Immediate Potential	Good Potential
Fort Huachuca	Good Potential	No Immediate Potential	No Immediate Potential	Secondary Potential	No Immediate Potential
Fort Benning	Good Potential	No Immediate Potential	Secondary Potential	No Immediate Potential	No Immediate Potential
Fort Leavenworth	Secondary Potential	No Immediate Potential	Good Potential	No Immediate Potential	No Immediate Potential
Fort Leonard Wood	Good Potential	No Immediate Potential	Good Potential	No Immediate Potential	Secondary Potential
Fort Lewis/Yakima Training Center	Good Potential	No Immediate Potential	Good Potential	Secondary Potential	Secondary Potential
Fort Riley	Good Potential	No Immediate Potential	Good Potential	No Immediate Potential	No Immediate Potential
Fort Wainwright	Good Potential	No Immediate Potential	Secondary Potential	Secondary Potential	Good Potential
Fort Greely	No Immediate Potential	No Immediate Potential	Secondary Potential	No Immediate Potential	Secondary Potential
White Sands Missile Range	Good Potential	Good Potential	Good Potential	No Immediate Potential	Secondary Potential
Yuma Proving Grounds	No Immediate Potential	No Immediate Potential	Secondary Potential	Secondary Potential	No Immediate Potential
Dugway Proving Grounds	No Immediate Potential	Secondary Potential	Good Potential	Secondary Potential	No Immediate Potential
Fort Lee	Secondary Potential	No Immediate Potential	Good Potential	No Immediate Potential	No Immediate Potential

Good Potential
Secondary Potential
No Immediate Potential

Renewable Energy Opportunities

	Renewable Resource and Technology	Resource Estimate	Earliest Output	Figures of Merit
Good Potential	Municipal Waste-to-Energy Plant using combustion or gasification technologies	40-60 MW (variable resource as a function of MSW availability and technology efficiency)	2012	Payback = 7-10 years SIR: 1.4-1.9 IRR: 11-15% (function of technology and plant size)
	Ground Source Heat Pump (Thermal Energy)	Many buildings with specific heating and cooling combinations	2010	Payback = 1.3 - 11.5 years (using appropriated funding) 1.1 - 9.4 years (using alternative financing)
Secondary Potential	Utility-Grade Solar Electric Power Plant	up to 3 MW of roof-integrated PV generating 4,300 MWh annually	2010	\$0.35/kWh without REC sales \$0.10/kWh with REC sales \$0.1045/kWh without RECs
	Utility-Grade Wind Farm	20-60 MW	NA	Payback = 29.4 years SIR: 0.5 Negative IRR

Renewable Energy Project Economics

Federal Renewable Energy Projects

- Ownership makes a significant difference in the economic viability of RE projects
 - Most tax based incentives are not directly available to federal customers, but use of third party contracts can provide the benefit indirectly
 - Third party entities may also sell and swap RECs with greater flexibility than the government to maximize project revenues
- Incentives are essential to achieving a cost effective project
 - Renewable energy certificates (RECs) can be sold by federal customers or third parties to reduce the capital costs of renewable energy projects
 - Incentives can change rapidly, so federal customers need to have projects prepared for implementation at the opportune time

Renewable Energy Project Implementation Options

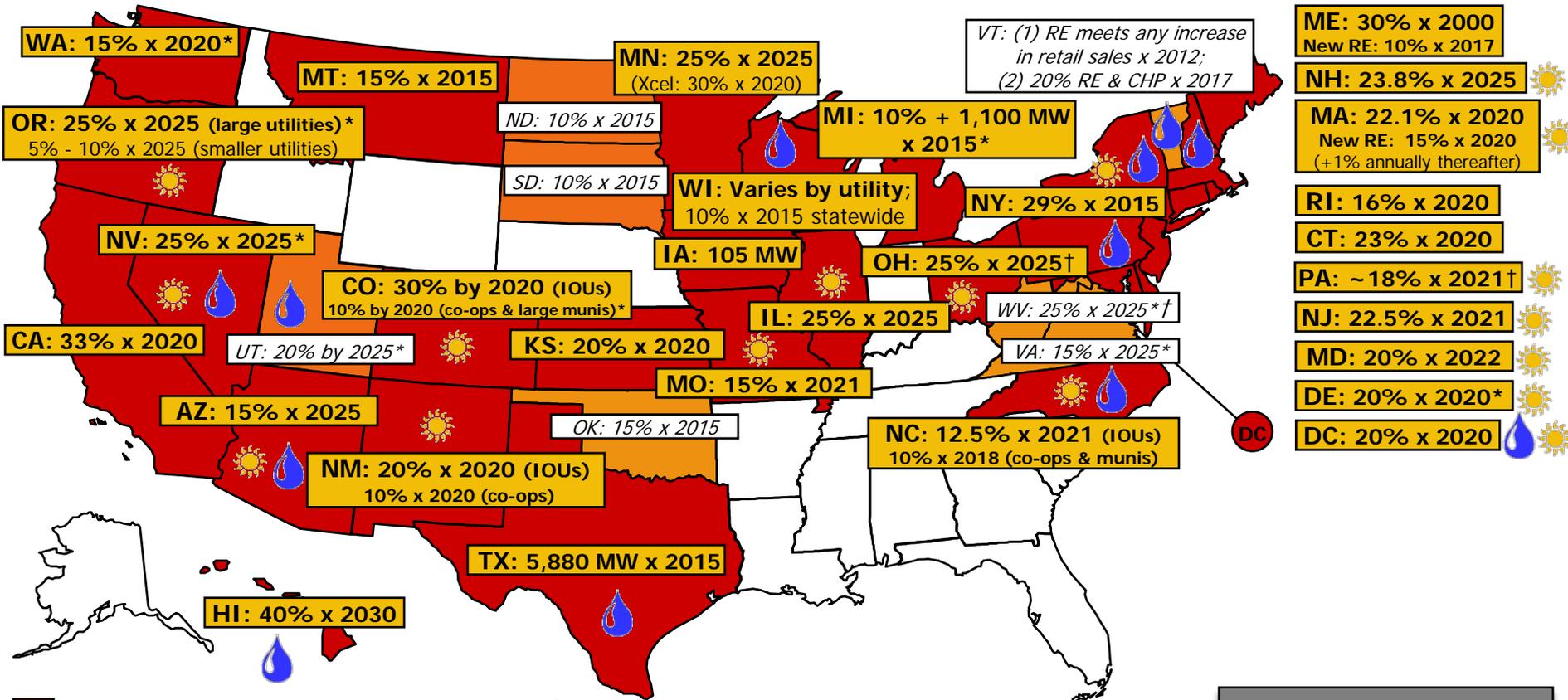
- Government ownership
 - Energy Conservation Investment Program (ECIP) – Subset of the DOD Military Construction (MILCON) program for projects that reduce energy use through construction of new, high efficiency energy systems or retrofit existing energy systems or buildings
- Third Party ownership options
 - Enhanced Use Lease (EUL) allows use of DOD lands for “non-military” purposes in exchange for “value in kind (or cash).” So a utility could site its power plant on DOD land and, in exchange, provide a back-up power source and “free” efficiency services.
 - Energy Joint Venture (EJV) uses the Navy “Geothermal Model,” which allows use of DOD lands in exchange for a negotiated “royalty” payment. Under 10 USC 2917, royalties accrue to a DOD energy program fund.
 - Power Purchase Agreement (PPA) is a generic term for a government energy purchase agreement that sets price and terms for energy supplied by a third party, typically on a long term contract. Power can be purchased from project on-site, owned and operated by third party.

Renewable Energy Financial Incentives

- State
 - Sales, income, and/or property tax exemptions
 - Investment tax credits
 - Production tax credits
 - Rebates
 - Renewable portfolio standards (RPS)/Renewable energy certificates (RECs)
 - Resource specific RECs (i.e., solar REC)
 - Distributed generation RECs
 - Varies for each resource and sometimes technology used
- Federal
 - Investment tax credits
 - Modified Accelerated Cost Recovery System (MACRS) depreciation
 - Production tax credits
- Source: Database of State Incentives for Renewables and Efficiency (DSIRE) <http://www.dsireusa.org/>

Renewable Portfolio Standards

www.dsireusa.org / July 2010



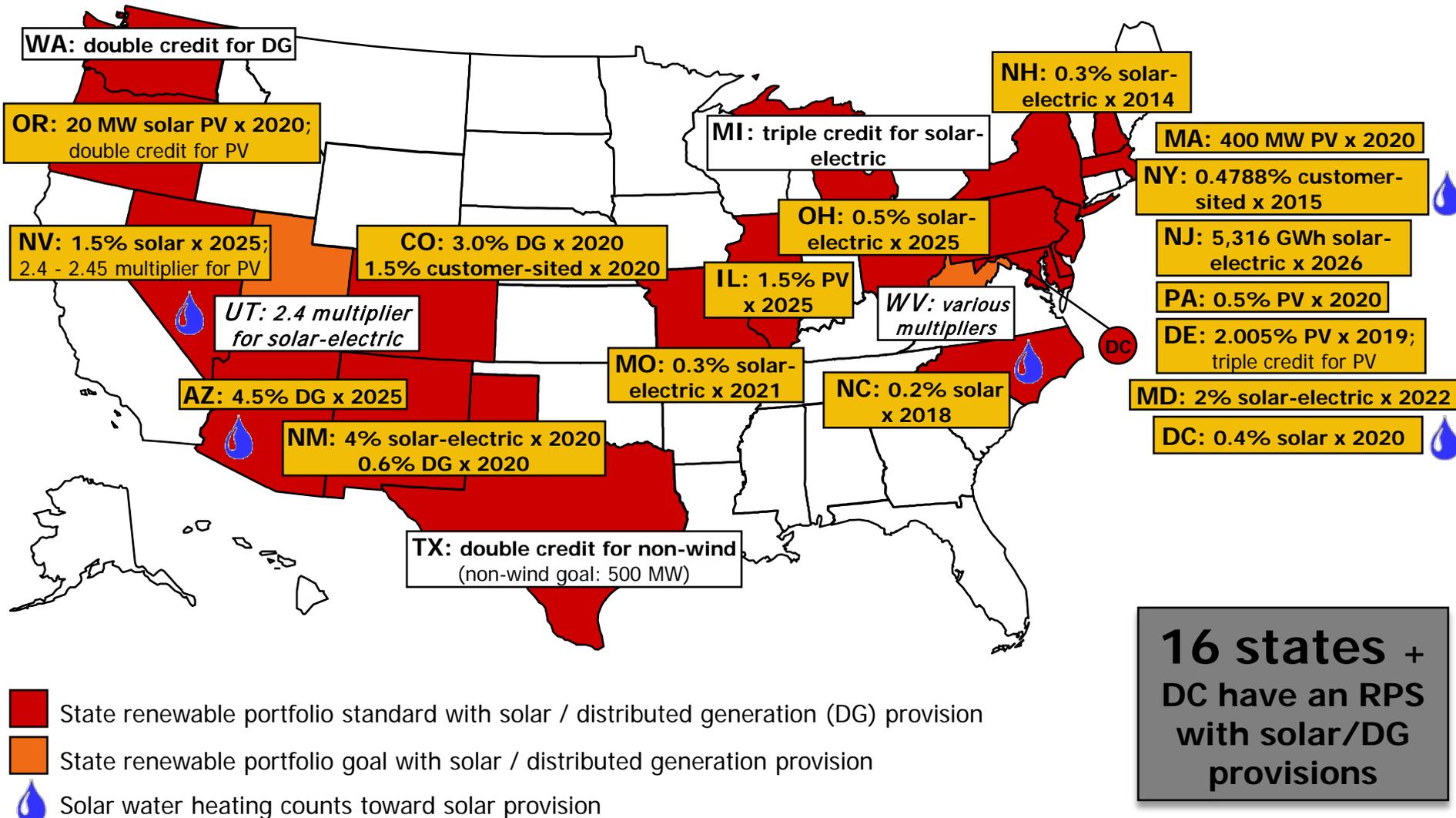
-  State renewable portfolio standard
-  State renewable portfolio goal
-  Solar water heating eligible

-  Minimum solar or customer-sited requirement
-  Extra credit for solar or customer-sited renewables
-  Includes non-renewable alternative resources

29 states + DC have an RPS
(7 states have goals)

RPS Policies with Solar/DG Provisions

www.dsireusa.org / July 2010



Financial Analysis Tool for Electric Energy Projects (FATE2-P)

- Developed by Princeton Economic Research, Inc. and the National Renewable Energy Laboratory for the U.S. Department of Energy
- Private ownership rate of return module
- Develops an annual after-tax cash flow based on:
 - the revenues defined in the power purchase contract, and
 - costs associated with constructing and operating the renewable generation facility
- Includes all state and federal incentives for renewable energy technologies
- PNNL requires at least a 10% internal rate of return (IRR) after tax for project to “work”
- PNNL modified to include MILCON Energy Conservation Investment Program module with NIST Building Life-Cycle Cost (BLCC) methodology

Economic Evaluation Criteria

- For “firm” or dispatchable resources: avoided retail power costs, i.e. average avoided retail rate (includes all retail rate elements, including demand charges)
- For “intermittent” resources = avoided “energy” component of electricity costs, i.e. only energy component of the retail rate

Wind Project Examples

- Comparison of actual Army sites:
 - Ownership: Government (ECIP funded) vs. Third Party Independent Power Producer (IPP)
 - Location: Oklahoma vs. New York
- Impact of incentives: state, federal, and renewable energy credits (RECs)
- Other differences
 - Avoided energy costs
 - Wind resource

Oklahoma Wind Project

- Wind Resource
 - OK has the full range from no wind in the eastern part of state to Class 5 winds in the panhandle
 - This site is in the middle with a Class 3 resource
- Incentives
 - No state Renewable Portfolio Standard (RPS), just a Renewable Energy Goal
 - REC value is therefore based on National Green-E Wind Certificates
 - State Production Tax Credit: 0.5¢/kWh for projects 1 MW or greater

New York Wind Project

- Wind Resource
 - Except for offshore and mountains, NY generally has only up to a Class 3 wind resource
 - This site is in a Class 2 resource
- Incentives
 - Aggressive RPS
 - 30% by 2015
 - NYSERDA is only buyer of RECs
 - No other applicable incentives

Wind Project Assumptions

Location	Oklahoma	New York
Average Wind Speed	7.07 m/s at 65 m	6.44 m/s at 100 m
Net Capacity Factor	29.7%	26.0%
Project Size	1.5 MW	1.5 MW
Net Annual Energy Production	3,903 MWh/yr	3,461 MWh/yr
Energy Cost	1.36¢/kWh	7.54¢/kWh
State Incentive	State PTC	None
Total Capital Cost (includes incentives and taxes)	\$2,362/kW	\$2,337/kW
Fixed O&M Cost	\$60/kW	\$60/kW
Federal Production Tax Credit	2.1¢/kWh	2.1¢/kWh
MACRS Depreciation (5-year)	Included	Included

Wind Project Economic Results

- Without REC sales

Location	Oklahoma	New York
ECIP Funded	negative SIR, negative payback @ 1.36¢/kWh	0.6 SIR, 25 year payback @ 7.54¢/kWh
Third-Party IPP	Undefined IRR @ 1.36¢/kWh 10% IRR @ 12.92¢/kWh	0.76% IRR @ 7.54¢/kWh 10% IRR @ 14.71¢/kWh

- With REC sales

Location	Oklahoma	New York
Third-Party IPP	10% IRR @ 12.83¢/kWh	10% IRR @ 12.91¢/kWh
REC Value*	\$1.00/MWh	\$20.00/MWh

* Assume REC value is available for 20 year contract, but actual contracts and market rates can vary.

Solar Project Examples

- Comparison of actual Army and Air Force sites:
 - Ownership: Government (ECIP funded) vs. Third Party Independent Power Producer (IPP)
 - Locations: Arizona and New Jersey
- Impact of incentives: state, federal, and renewable energy credits (RECs)
 - AZ RPS has a distributed generated requirement, which is an advantage for solar projects
 - NJ has an aggressive RPS that requires utilities to purchase solar RECs (SRECs) or pay a maximum penalty of 59 - 68¢/kWh when out of compliance.

Arizona Solar Project Examples

Location	Site 1	Site 2
Average Solar Resource	8.74 kWh _{solar} /m ²	5.70 kWh _{solar} /m ²
Net Capacity Factor	28.2%	19.4%
Project Size	1.0 MW ground-mounted, axis-tracking	0.6 MW flat, roof-mounted
Net Annual Energy Production	2,473 MWh/yr	1,022 MWh/yr
Energy Cost	4.7¢/kWh	3.2 ¢/kWh
State Incentives	Investment Tax Credit, Reduced Property Taxes, Sales Tax Exemption, RPS with a DG carve-out. Utilities must purchase bundled RECs.	
Total Capital Cost (includes incentives and taxes)	\$7,956/kW	\$4,304/kW
Fixed Annual O&M Cost	\$12/kW	\$20/kW
Federal Investment Tax Credit	30%	30%
MACRS Depreciation (5-year)	Included	Included

New Jersey Solar Project Example

Location	New Jersey
Average Solar Resource	3.98 kWh _{solar} /m ²
Net Capacity Factor	13.9%
Project Size	0.6 MW flat, roof-mounted
Net Annual Energy Production	735 MWh/yr
Energy Cost	8.1¢/kWh
State Incentives	Property Tax Exemption, Sales Tax Exemption. State requires utilities to submit SRECs.
Total Capital Cost (includes incentives and taxes)	\$4,000/kW
Fixed Annual O&M Cost	\$20/kW
Federal Investment Tax Credit	30% of installed cost
MACRS Depreciation (5-year)	Included

Solar Project Economic Results

Location	Arizona Site 1	Arizona Site 2	New Jersey Site
ECIP Funded	0.2 SIR, 64 year payback @ 4.7¢/kWh	0.1 SIR, 154 year payback @ 3.2¢/kWh	0.2 SIR, 63 year payback @ 8.1¢/kWh
Third-Party IPP	undefined IRR @ 4.7¢/kWh 10% IRR @ 30.5¢/kWh	6.2% IRR @ 3.2¢/kWh 10% IRR @ 9.6¢/kWh	18.7% IRR @ 8.1¢/kWh includes 55¢/kWh SRECs
REC Value Required to Close Gap	25.8¢/kWh	6.4¢/kWh	Utility required to purchase SRECs.
Current Market REC Value	Unknown because of bundled requirement, but this high of a REC value is unlikely.	Unknown because of bundled requirement, but this REC value is reasonable.	68¢/kWh maximum. SRECs typically trade lower than maximum.

Summary

- A resource assessment provides an estimate of the relative cost-effectiveness of the various renewable energy technologies
- Financial attractiveness of the RE technologies can change significantly with modifications to state and federal incentives
- Third party investment/ownership is key to obtaining the most attractive project for federal customers
- Incentives can change rapidly, so federal customers need to have projects prepared for implementation at the opportune time

Doug Dixon

doug.dixon@pnl.gov

509-372-4253



Pacific Northwest
NATIONAL LABORATORY

Alice Orrell

alice.orrell@pnl.gov

509-372-4632



Pacific Northwest
NATIONAL LABORATORY