



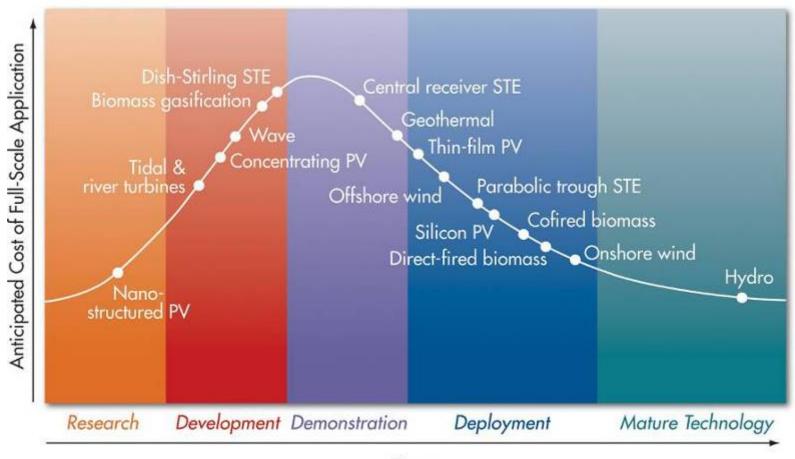
Challenges for Widespread Renewables Deployment

Bryan Hannegan
Vice President, Environment & Generation

EIA 2009 Energy Conference April 7, 2009

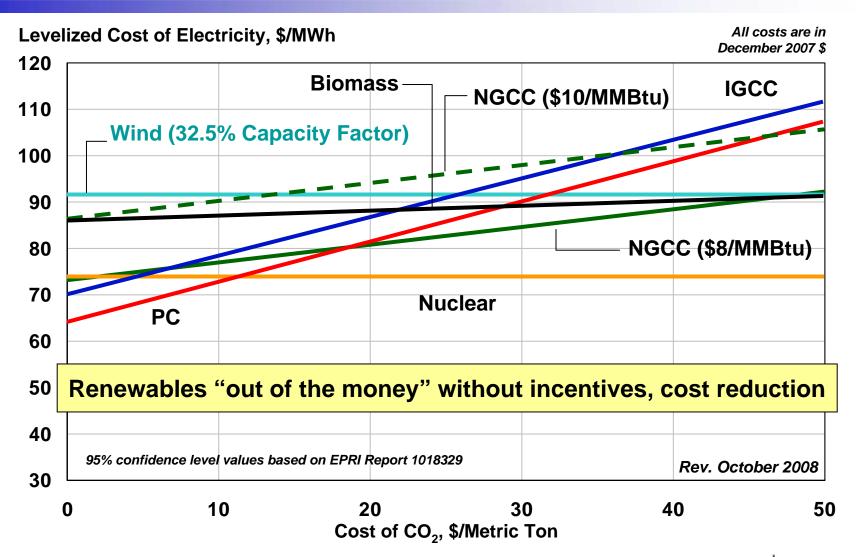
Renewables in Various Stages of Maturity

Renewables Technology Development

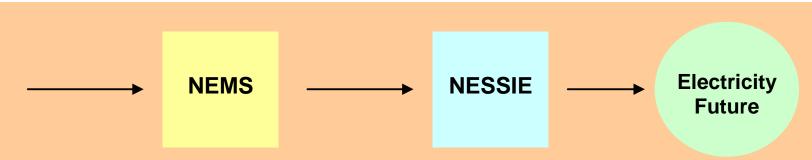


Time

Comparative Levelized Costs of Electricity – 2015



EPRI's NEMS-NESSIE Modeling Framework



NEMS Inputs

- Energy System Characteristics
- Fuel Cost Models
- Energy Policy Incentives
- Environmental Policies
- Load Demand Curves
- EPRI Technology Cost & Performance Data
- EPRI Policy Scenarios

NESSIE Inputs

- NEMS Fuel & Emission Allowance Prices
- NEMS Loads
- EPRI Technology Cost & Performance Data
- EPRI Climate Policy Scenarios (Carbon Prices)
- EPRI RPS Scenarios

NESSIE Outputs

- Capacity Expansion (GW)
- System Operations (GWh)
- Electricity Prices
- Emissions
- Consumer, Producer & Social Welfare



Energy Scenarios

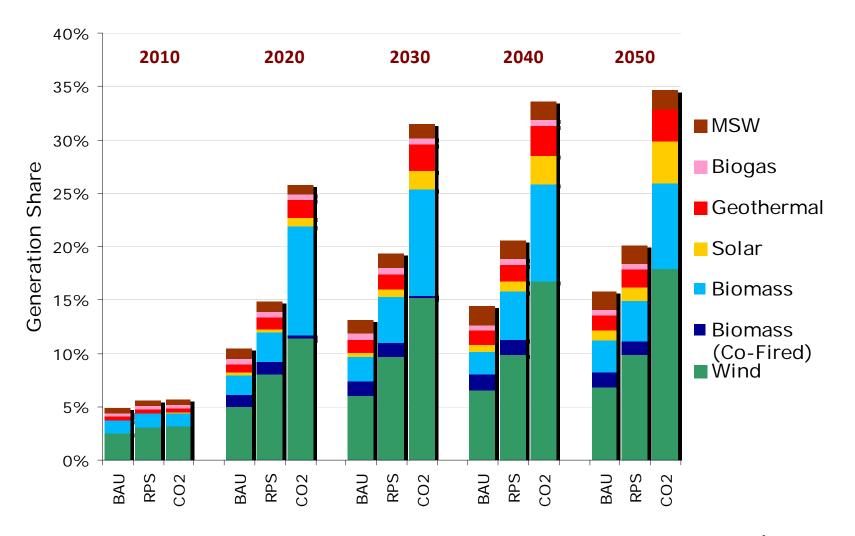
Future Scenario	Name	РТС	RPS	CO ₂ Price
No new policy	BAU	Yes	No	No
Federal RPS	RPS	Yes	Yes	No
Federal carbon policy	CO2	Yes	No	Moderate

- Load growth based on AEO 2008
- RPS policy assumptions based on the revised Bingaman Bill
- For carbon case, CO₂ price in 2015 is approximately \$27 per ton
- Natural gas prices vary from \$4.91 to \$7.28/MMBtu

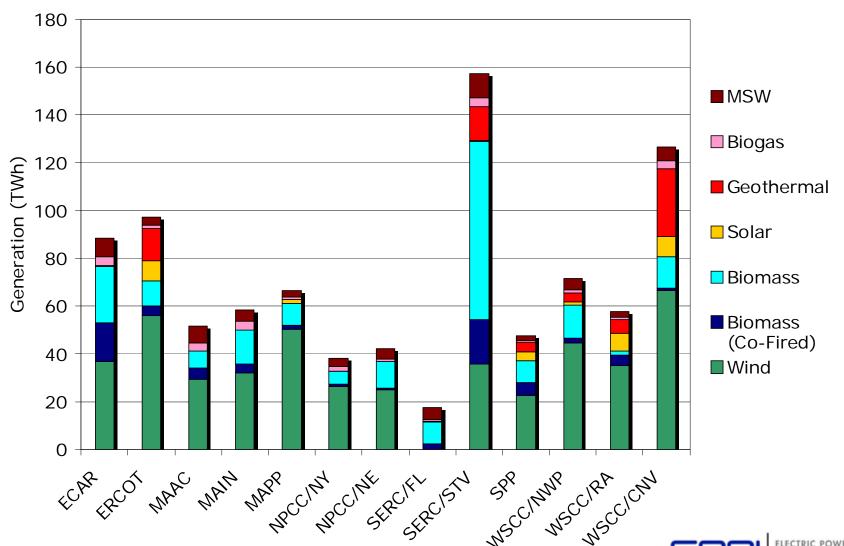
<u>Source:</u> Role of Future Generation Options for the U.S. Electric Sector, EPRI Report 1015805, March 2009 (available at epri.com)



NESSIE Renewable Share of Total Generation



NESSIE Renewables by Region – 2030 RPS



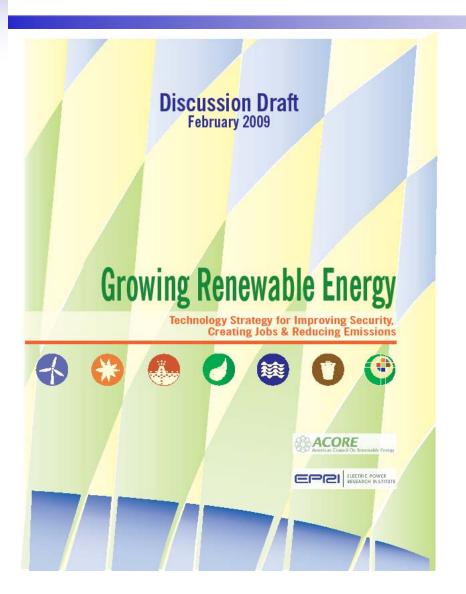
Key Issues for Further Study

- National or local?
- "Wind-PS" or carve-outs for others?
- Resource economics/limitations (esp. biomass)
- Energy storage, gas backup or integration issues?
- What triggers new transmission build?
- Tradeoff with climate policy
 - RPS or PTC lifts renewables
 - CO₂ price lifts renewables <u>and</u> retires fossil

Renewables are <u>here</u> → make them affordable, reliable



ACORE – EPRI Renewable Technology Strategy



To review the discussion draft and contribute your ideas, send contact information to:

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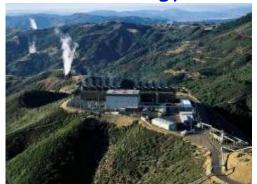
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Technology Areas in Plan



Solar Energy - PV



Geothermal Energy - Power Production



Integration



Bioenergy - Fuels



Waterpower



Bioenergy - Power Production



Solar Energy - Central Station



Geothermal Energy - Space Heating

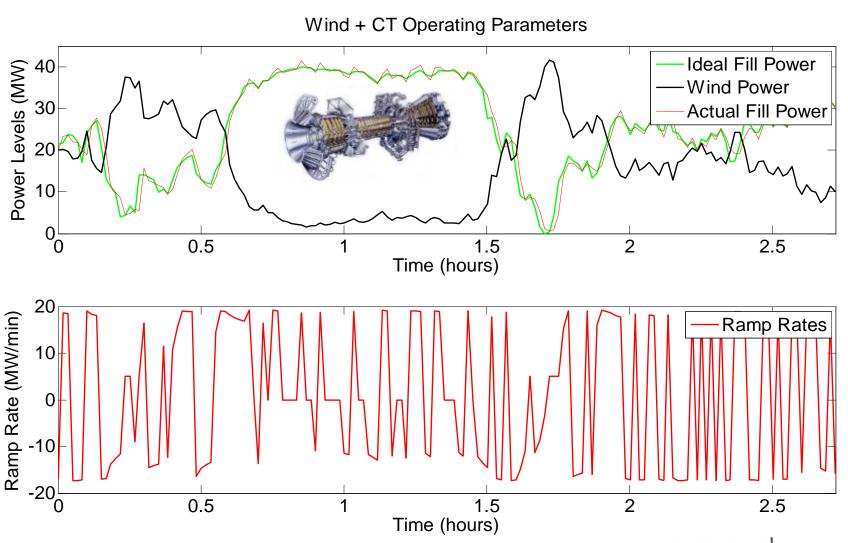


Waste to Energy

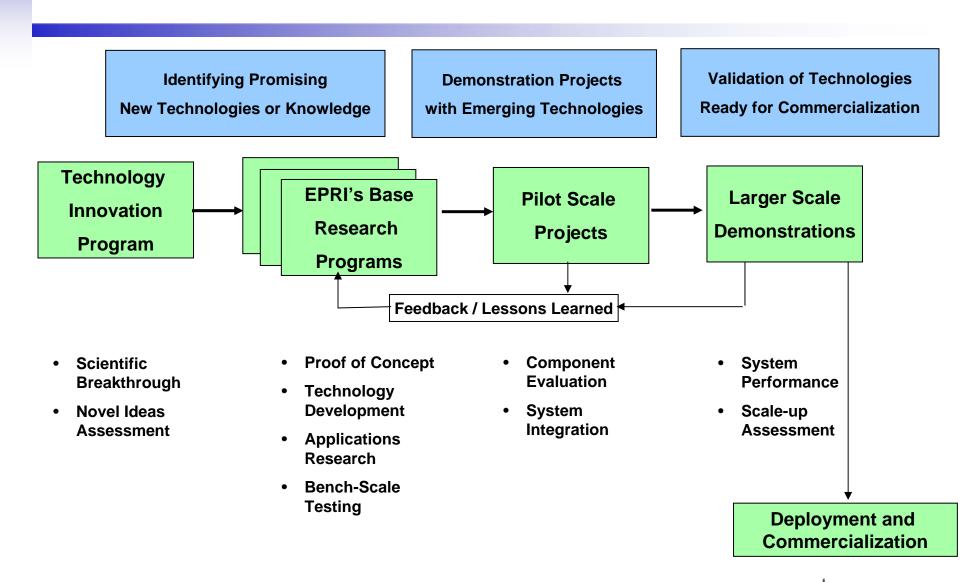




Integration Cannot Rely on Gas CTs Alone



EPRI's Role as Technology Accelerator



EPRI Renewables Activities Expanding

	Large Renewable Integration	Large Renewable Integration
	Distributed Integration	Distributed Integration
Renewables	Renewables	Economics and Technology Status
Water Power	Water Power	Solar
		Wind
		Geothermal
		Biomass
		Water Power

Together...Shaping the Future of Electricity