

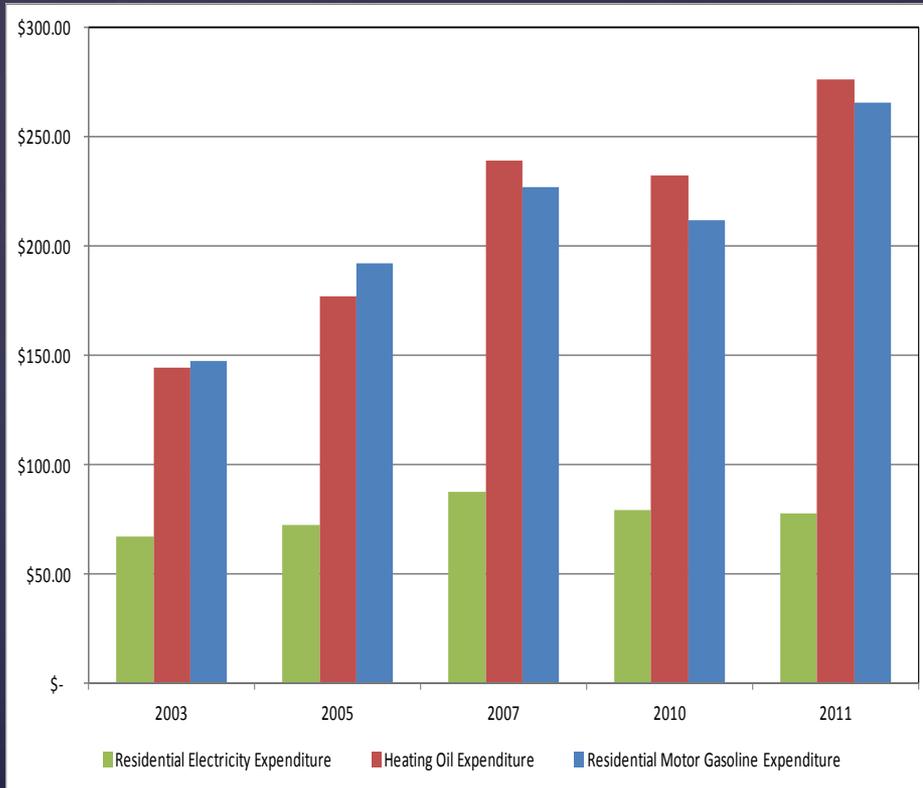
ALIGNING MAINE'S RENEWABLE ENERGY OPPORTUNITIES WITH OUR ENERGY CHALLENGES

{ PERSPECTIVE FROM THE
GOVERNOR'S ENERGY OFFICE

November 14, 2013

MAINE'S ENERGY CHALLENGES

Residential Energy Costs



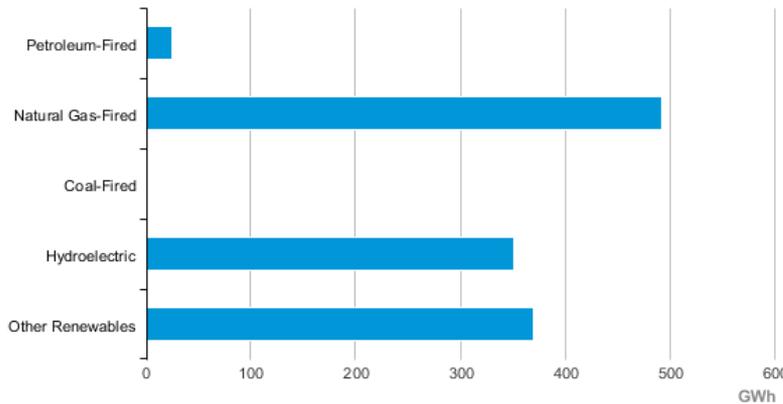
- Maine experiences the highest residential energy costs in the country.
- Maine businesses have the 8th highest electricity prices.

Business Electricity Prices

Census Division and State	Industrial		All Sectors	
	November 2012	November 2011	November 2012	November 2011
Washington	4.23	4.26	7.04	6.95
Nevada	4.39	4.13	7.57	7.41
Oklahoma	4.65	5.15	6.98	7.31
Louisiana	4.73	5.31	6.79	7.08
Idaho	4.77	4.47	6.84	6.38
Iowa	4.89	4.85	7.12	7.11
Montana	5.12	5.24	8.32	8.08
Tennessee	6.68	6.47	9.19	8.94
Kansas	6.71	6.50	8.82	8.51
District of Columbia	6.93	4.85	11.53	12.16
Colorado	6.99	7.32	9.33	9.35
Pennsylvania	7.29	7.30	9.86	10.19
Wisconsin	7.31	7.24	10.26	10.11
Middle Atlantic	7.38	7.60	12.33	12.73
Michigan	7.59	6.86	10.84	9.92
Pacific Contiguous	7.88	7.56	11.09	10.67
Florida	8.06	8.21	10.81	10.61
Delaware	8.35	8.06	11.11	10.98
Maine	8.40	8.54	11.96	12.43
Maryland	8.53	8.30	10.92	11.16
Vermont	9.36	9.95	15.03	13.90
California	10.50	9.83	13.11	12.52

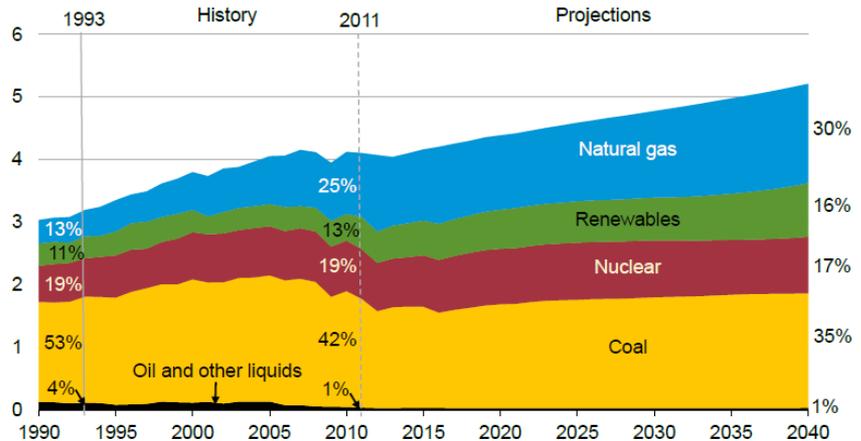
MAINE'S ELECTRICAL PRODUCTION IN COMPARISON TO NATIONAL PRODUCTION

Maine Net Electricity Generation by Source, Jul. 2013



Source: Energy Information Administration, Electric Power Monthly

U.S. electricity net generation trillion kilowatthours



Source: EIA, Annual Energy Outlook 2013

- Maine has a significantly more electrical generation from renewable sources than the U.S. – more than 50 percent of generation is from hydro and other sources compared to 13 percent nationally.
- Maine is more reliant on natural gas production than the rest of the country.

MAINE RANKS 10TH RENEWABLE PRODUCTION

Table P5. Energy Production Estimates in Trillion Btu, Ranked by State, 2011 (Continued)

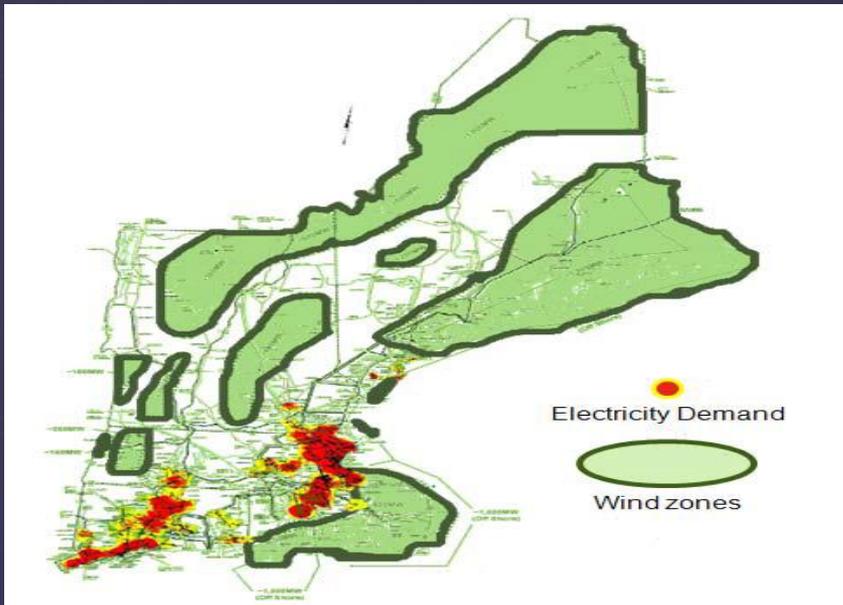
Rank	Renewable Energy						Total Energy Production	
	Biofuels ^f		Other ^g		Total		State	Trillion Btu
	State	Trillion Btu	State	Trillion Btu	State	Trillion Btu		
	United States	1,919.1	United States	7,125.9	United States	9,045.0	United States ^h	77,825.9
1	Iowa	505.3	Washington	1,051.6	Washington	1,051.6	Texas	12,582.2
2	Nebraska	272.7	California	812.8	California	837.8	Wyoming	10,353.4
3	Illinois	174.0	Oregon	508.0	Iowa	645.9	Louisiana	3,976.3
4	Minnesota	159.3	Texas	387.7	Oregon	513.7	Pennsylvania	3,858.4
5	South Dakota	143.8	New York	369.1	Texas	431.7	West Virginia	3,820.8
6	Indiana	130.5	Florida	266.7	New York	392.3	Kentucky	2,840.6
7	Wisconsin	71.1	Alabama	245.3	Nebraska	307.5	Colorado	2,746.7
8	Ohio	62.6	Georgia	192.1	Minnesota	303.5	Oklahoma	2,722.8
9	Kansas	61.8	Idaho	172.8	Illinois	276.3	California	2,624.6
10	North Dakota	53.5	Maine	154.3	Florida	266.7	New Mexico	2,261.2
11	Texas	44.1	Tennessee	147.8	Alabama	245.3	Illinois	2,200.5
12	Michigan	37.9	North Carolina	144.8	South Dakota	237.8	Alaska	1,641.9
13	Missouri	36.2	Minnesota	144.2	Georgia	206.3	North Dakota	1,518.4
14	Tennessee	31.3	Iowa	140.7	Indiana	201.7	Alabama	1,401.2
15	California	25.0	Montana	140.1	Wisconsin	197.1	Arkansas	1,390.0
16	New York	23.2	Pennsylvania	139.3	Idaho	180.4	Utah	1,128.7
17	Colorado	17.7	Wisconsin	126.0	Tennessee	179.1	Montana	1,104.6
18	Pennsylvania	15.6	Arkansas	113.5	Pennsylvania	154.9	Washington	1,101.9
19	Georgia	14.2	Louisiana	109.5	Maine	154.3	Virginia	1,087.8
20	Arizona	7.8	South Carolina	108.1	North Carolina	144.8	Ohio	1,066.2
21	Idaho	7.6	Arizona	107.4	Michigan	144.5	Indiana	1,063.4
22	Mississippi	7.6	Michigan	106.6	Montana	140.1	New York	873.1
23	Oregon	5.7	Virginia	102.5	North Dakota	132.9	Kansas	780.1
24	Kentucky	5.0	Illinois	102.3	Ohio	121.7	Iowa	700.5
25	New Mexico	4.2	Oklahoma	95.6	Arizona	115.2	Michigan	672.9
26	Wyoming	1.4	South Dakota	94.0	Arkansas	113.5	South Carolina	661.6
27	Louisiana	0.2	Colorado	84.0	Louisiana	109.7	Arizona	617.7
28			North Dakota	79.4	South Carolina	108.1	North Carolina	568.9
29			Indiana	71.2	Kansas	105.1	Georgia	544.4
30			Kentucky	63.8	Virginia	102.5	Florida	524.2
31			Ohio	59.2	Colorado	101.7	Oregon	515.0
32			Wyoming	58.6	Oklahoma	95.6	Tennessee	506.4
33			Maryland	56.9	Missouri	91.7	Mississippi	440.8
34			Missouri	55.4	Kentucky	68.8	Minnesota	428.7
35			Mississippi	55.4	Mississippi	63.0	Nebraska	396.8
36			Nevada	51.4	Wyoming	60.0	New Jersey	386.8
37			Massachusetts	47.8	Maryland	56.9	Wisconsin	318.1
38			West Virginia	44.8	Nevada	51.4	Maryland	273.4
39			Kansas	43.3	Massachusetts	47.8	South Dakota	249.0
40			New Hampshire	42.5	West Virginia	44.8	Missouri	200.5
41			New Jersey	35.1	New Hampshire	42.5	Connecticut	196.5
42			Nebraska	34.8	New Mexico	36.7	Idaho	180.4
43			New Mexico	32.4	New Jersey	35.1	Maine	154.3
44			Vermont	30.5	Vermont	30.5	New Hampshire	130.0
45			Connecticut	29.9	Connecticut	29.9	Massachusetts	101.0
46			Utah	24.4	Utah	24.4	Vermont	81.8
47			Hawaii	19.1	Hawaii	19.1	Nevada	53.8
48			Alaska	15.7	Alaska	15.7	Hawaii	19.1
49			Delaware	3.8	Delaware	3.8	Delaware	3.8
50			Rhode Island	3.4	Rhode Island	3.4	Rhode Island	3.4
51			District of Columbia	0.1	District of Columbia	0.1	District of Columbia	0.1

Renewable Electricity Generation Per Capita

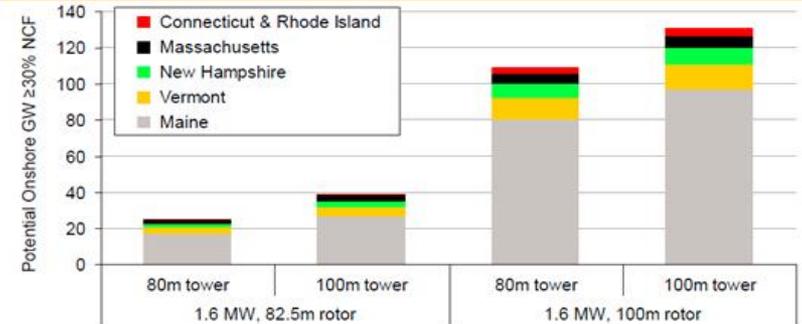
Rank	State	MWh/Capita
1	Washington	12.8
2	Montana	10.4
3	Oregon	9.6
4	Idaho	6.5
5	Maine	6.0
6	South Dakota	3.9
7	North Dakota	3.0
8	Wyoming	2.8
9	Alaska	1.9
10	New Hampshire	1.8

- Maine's total renewable energy production is 10th in the country
- Maine's per capita renewable energy production is 5th in the country.

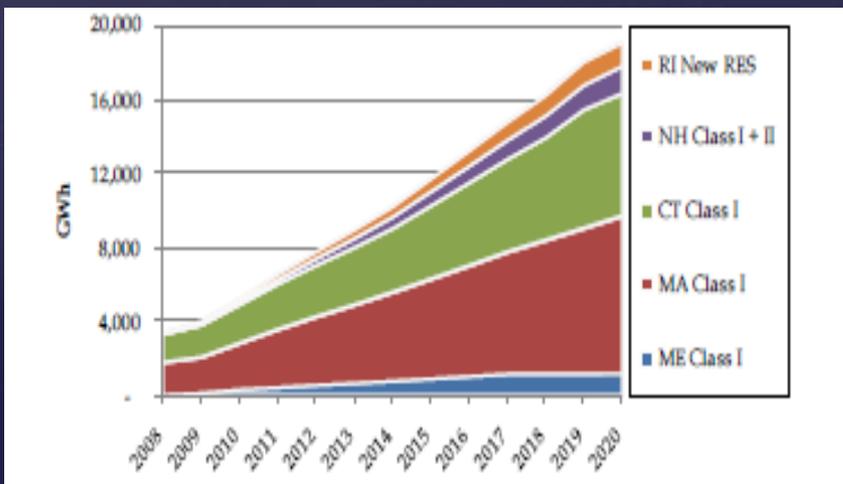
RENEWABLE POTENTIAL VERSUS DEMAND



Maine Dominates New England's Wind Potential



- Maine (and CT & RI) benefits the most from turbine scaling because it has more low-elevation terrain with a suitable wind resource (amenable to scaling)
- In contrast, the wind resource in VT and NH tends to be more concentrated along ridgelines, where scaling won't add as much potential capacity



- ISO-NE identified wind zones for regional energy planning.
- Lawrence Berkeley National Laboratory identified Maine's wind resource as dominating New England's Wind Potential.
- Maine's RPS is not a driver for renewable energy growth in the region.

RESULT: SIGNIFICANT RENEWABLE PROJECTS PLANNED



Maine wind projects

To comply with new renewable power laws in Massachusetts and Connecticut, utilities in those states have signed long-term power purchase contracts with major wind projects in Maine. This is a list of the projects, their locations, developers, power outputs and buyers.



Massachusetts contracts for Unitil, National Grid and Northeast Utilities subsidiaries NStar Electric Co. and Western Massachusetts Electric Co.

- 1 **Fletcher Mountain:** Lexington Township, Iberdrola Renewables, 76 mw.
- 2 **Oakfield Wind:** Oakfield, First Wind, 148 mw.
- 3 **Bingham Wind:** Bingham, First Wind, 186 mw.
- 4 **Passamaquoddy Wind:** Two projects on Passamaquoddy Reservation land near Columbia Falls, Exergy Development Group, 38 and 20 mw.

Connecticut contracts for United Illuminating and Connecticut Light & Power

Number Nine Wind Farm: West of Bridgewater, EDP Renewables, 250 mw.

SOURCE: Massachusetts Department of Public Utilities and EDP
STAFF GRAPHIC | MICHAEL FISHER

QP	Updated	Type	Requested	Alternative Name	Unit	Fuel Type	Net MW	SumMW	WinMW	County	ST	OpDate	SyncDate	Interconnection Point
272	9/23/2013	G	8/1/2008	Oakfield II Wind - Keene Road	WT	WND	147.6	147.6	147.6	Aroostook	ME	12/31/2015	11/30/2015	BHE Keene Road Substation
287	5/30/2013	G	12/18/2008	Saddleback Ridge Wind Project	WT	WND	33	33	33	Franklin	ME	11/15/2014	6/2/2014	115kV Line 229
300	6/10/2013	G	5/14/2009	Canton Mountain Winds	WT	WND	19.25	19.25	19.25	Oxford	ME	11/1/2014	10/1/2014	229 Line near Riley Substation
324	6/21/2013	ETU	1/22/2010	345kV Tie Line - Part 1	NA	N/A				N/A	ME	12/1/2016	9/1/2016	Houlton, ME to MEPCO Line
324	6/21/2013	ETU	1/22/2010	345 kV Tie Line - Part 2	NA	N/A				N/A	ME	12/31/2016	9/1/2016	MEPCO to Bridgewater, ME
327	8/13/2013	G	5/4/2010	Wind	WT	WND	48	48	48	Penobscot/Washington	ME	10/31/2015	8/1/2015	BHE Keene Rd Substation
333	8/13/2013	G	5/14/2010	Wind	WT	WND	186	186	186	Somerset	ME	12/31/2015	10/1/2015	CMP Guilford Substation
349	8/13/2013	G	10/20/2010	Pisgah Mountain	WT	WND	9	9	9	Penobscot	ME	6/1/2014	5/1/2014	BHE Line 66
350	1/22/2013	G	11/10/2010	Wind	WT	WND	92.25	92.25	92.25	Washington	ME	12/31/2014	10/1/2014	BHE Washington County 115 kV substation
350	10/10/2013	G	11/10/2010	Wind	WT	WND	96.6	96.6	96.9	Somerset	ME	12/31/2015	10/1/2015	CMP Wyman substation
357	9/16/2013	G	2/24/2011	Wind	WT	WND	36.95	36.95	36.95	Penobscot	ME	12/31/2014	11/1/2014	BHE 115 kV between Enfield and James River Substat
372	9/23/2013	G	8/3/2011	Skelton Station Modernization Phase 1	HD	WAT	1.083	21.083	21.083	York	ME	1/7/2014	12/19/2013	CMP 34.5 kV Louden substation
372	9/23/2013	G	8/3/2011	Skelton Station Modernization Phase 2	HD	WAT	1.083	22.2	22.2	York	ME	1/3/2014	12/14/2013	CMP 34.5 kV Louden substation
391	10/21/2013	G	2/2/2012	Hydro Uprate U4	HD	WAT	1.6	14.806	14.806	Somerset	ME	11/25/2015	11/25/2015	CMP 34.5 kV Weston Substation
391	10/21/2013	G	2/2/2012	Equipment Replacement U1	HD	WAT	0	14.806	14.806	Somerset	ME	12/13/2013	12/13/2013	CMP 34.5 kV Weston Substation
391	4/26/2013	G	2/2/2012	Hydro Equipment Replacement U2-4	HD	WAT	0	14.806	14.806	Somerset	ME	10/3/2015	10/3/2015	CMP 34.5 kV Weston Substation
393	12/12/2012	G	5/7/2012	Wind	WT	WND	101.75	101.75	101.75	Somerset	ME	11/1/2016	10/1/2016	CMP 115 kV W. S. Wyman Hydro Substation
397	8/13/2013	G	8/30/2012	Wind	WT	WND	51	51	51	Hancock	ME	12/31/2015	10/1/2015	BHE Line 66 - Bull Hill substation
400	12/27/2012	G	10/3/2012	Wind	WT	WND	90	90	90	Washington	ME	12/31/2016	11/30/2016	BHE Epping Substation
401	7/17/2013	G	10/5/2012	Wind	WT	WND	19.8	19.8	19.8	Washington	ME	12/31/2014	11/30/2014	BHE Epping 115 kV substation or BHE 34.5 kV
403	8/13/2013	G	12/6/2012	Pisgah Mountain Increase (see Q349)	WT	WND	0.075	9.075	9.075	Penobscot	ME	6/1/2014	5/1/2014	BHE Line 66
406	9/26/2013	G	2/22/2013	Canton Increase and CNR (see Q300)	WT	WND	3.55	22.8	22.8	Oxford	ME	11/1/2014	10/1/2014	CMP Ludden Lane Substation
407	9/26/2013	G	2/27/2013	Saddleback Increase and CNR (see Q287)	WT	WND	1.2	34.2	34.2	Franklin	ME	11/15/2014	6/2/2014	CMP Ludden Lane Substation
417	10/21/2013	G	4/25/2013	Wind	WT	WND	301.29	301.29	301.29	Aroostook	ME	12/30/2016	9/15/2016	MEPCO 345 kV
419	10/21/2013	G	5/2/2013	Wind	WT	WND	33	33	33	Franklin	ME	11/1/2016	10/1/2016	CMP 115 kV Bigalow Substation
420	10/21/2013	G	7/15/2013	Wind	WT	WND	99	99	99	Hancock	ME	10/31/2016	6/1/2016	BHE 115 kV Rebel Hill Substation
422	7/26/2013	G	7/26/2013	Wind CNR	WT	WND	0	301.29	301.29	Aroostook	ME	12/30/2016	9/15/2016	MEPCO line in Haynesville, ME

RENEWABLE HYDRO RESOURCES ARE EXPANSIVE AND HAVE POTENTIAL TO GROW

Bangor Daily News

November 4, 2013

BROOKFIELD RENEWABLE ENERGY PARTNERS TO ACQUIRE 9 MAINE

"The nine new dams will bring the total to 38 and increase its capacity to 340 megawatts. The total generating capacity for all Maine hydroelectric facilities is roughly 762 megawatts, according to the Maine Department of Environmental Protection."

THE WALL STREET JOURNAL.

November 13, 2013

WHAT'S GREEN AND STRONG? HYDROPOWER, WHICH IS POISED FOR MAJOR GROWTH

"Additional hydroelectric power can come from upgrading existing dams that produce power and by converting non-hydroelectric dams and canals...such changes could bring online ...the equivalent of 20 nuclear power stations, says Jose Zayas, director for the Department of Energy's Wind and Water Technologies Office."

New England is Looking To Hydro for GHG Reductions/Renewable Compliance

“We were the first state to declare hydro as green, clean power along with solar and wind and some of the other projects that we're working so hard on. As you know, there was a prohibition against big hydro in Vermont...while you can explain to me the difference between coal and oil and hydro and solar and wind, I have trouble when you try to make a distinction between big coal or little coal, big hydro or little hydro, big solar or little solar. So we made the case in Vermont. We became the first state to take away what I thought was a discriminatory prohibition against hydro and we're intending to continue to do that.”

- Governor Shumlin (D-VT) September 9, 2013

“The fossil fuels, that's coal, that's oil, that's natural gas or it's nuclear or it's wind or solar or it's hydro, and all of them have their liabilities. But hydro in particular, the abundance of it and particularly with the new projects coming on here in this region, and it's not just Hydro-Québec, it's also Nalcor, Muskrat Falls another 824 MW, Gull Island over 2000 MW, and here with Hydro-Québec the Eastmain-Sarcelle-Rupert project with 900 MW. These are all new projects...So it's an area that helps every one of us here at this Conference.”

- Governor Chafee (D-RI) September 9, 2013

MAINERS SHOULD BENEFIT FROM MAINE RESOURCES

Legislative Record

OF THE

Eighty-First Legislature

OF THE

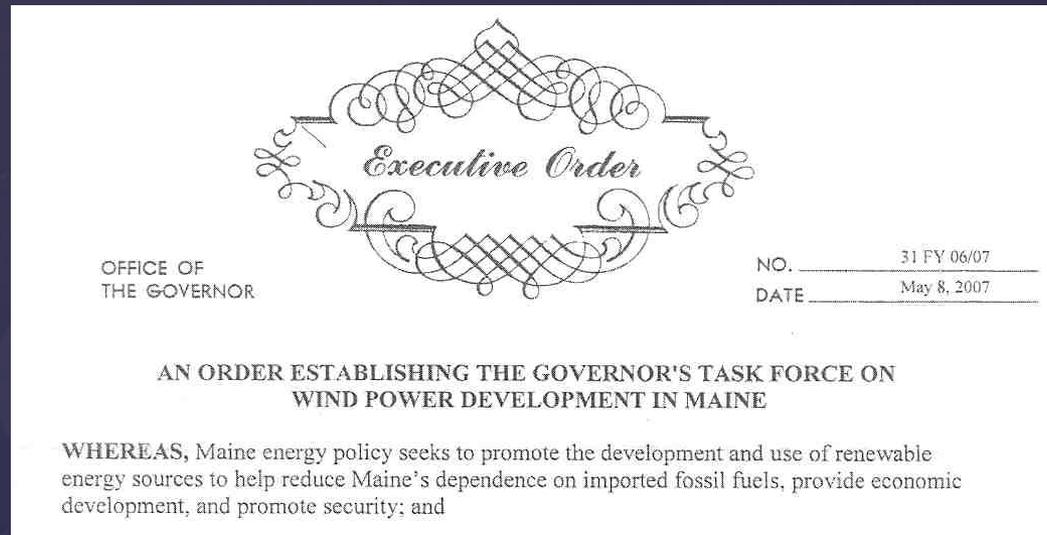
STATE OF MAINE

1923

“The Act presents to the 81st Legislature a clean-cut issue: shall private corporations be given the remaining rights that the people have in a great natural resource? Shall this and other valuable storage systems be given away forever or shall the people themselves retain them?”

“There is but one answer. The people of the State of Maine never should part with any more of their inherent rights in the State’s natural resources. These should be held in perpetuity for the benefit of the present and future generations.”

CURRENT POLICIES – WIND ENERGY



Underlying Objectives:

- To make Maine a leader in wind power development;
- To protect Maine's quality of place and natural resources; and
- To maximize the tangible benefits Maine people receive from wind power development.

MAINE SHOULD IMPROVE OUR WIND ENERGY POLICIES

MAINE WIND ENERGY DEVELOPMENT ASSESSMENT

REPORT AND RECOMMENDATIONS

Prepared by:
Governor's Office of
Energy Independence
and Security

March 2012

Governor's Office of Energy
Independence and Security



- Create Realistic Wind Energy Goals;
- Maximize Tangible Benefits to Mainers;
- Increase the Supply Chain to maximize economic benefit;
- Develop a Process to Remove areas from the expedited wind permitting zones;
- Promote long-term contracting in a manner that prioritizes lower costs of electricity for ratepayers over the life of the contracts.

Current Renewable Policies

- **Poorly Defined.**

- A. **Long-Term Contracting Authority.**

- Rollins Contract NPV loss of \$6.35 million. Verso Contract will result in a range of outcomes between a benefit of \$575K or a loss of \$3.9 million.

- B. **Renewable Portfolio Standard**

- Prevents key regional resource from being eligible increasing compliance costs. The total costs equal \$12.4 million annually increasing monthly electricity bills by 50-55 cents per month.

- **Unnecessarily Costly.**

- A. **Net Energy Billing.**

- Provided 13 cents/kWh for wholesale electricity product that has a market value of around 5 cents/kWh.

- B. **Community Renewable Energy.**

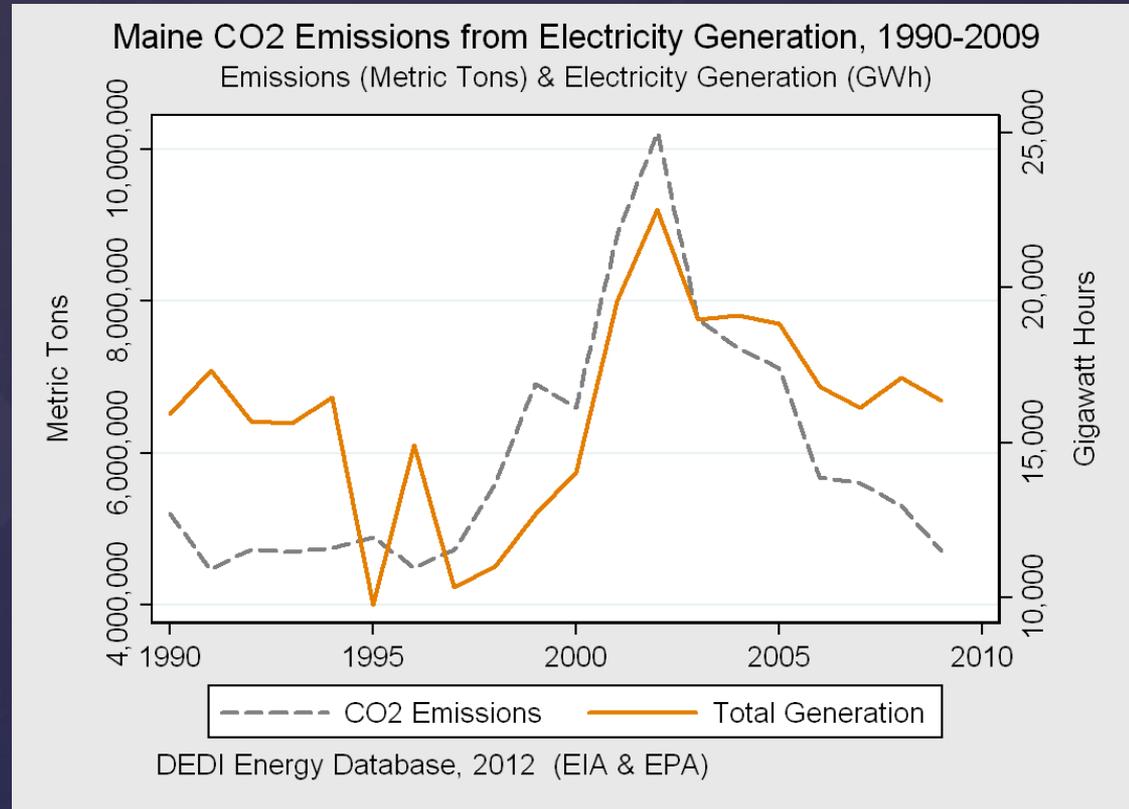
- \$47 million in above market costs for 50MW. Effectively, the program has been over-subscribed.

MAINE'S CARBON EMISSIONS

Rank	State	Emissions
1	TX	652.6
2	CA	369.8
3	PA	256.6
4	OH	249.1
5	FL	246
6	IL	230.4
7	LA	223.5
8	IN	219.1
9	GA	173.7
10	NY	172.8
11	MI	165.9
12	KY	150.7
13	NC	142.9
14	MO	135.7
15	AL	132.7
16	NJ	115.4
17	VA	109.8
18	TN	107.1
19	OK	103.4
20	WI	99.2
21	WV	98.9
22	CO	96.5
23	AZ	95.9
24	MN	93.4
25	IA	88.7
26	SC	84
27	WA	76.1
28	KS	75
29	MA	73
30	MD	70.5
31	AR	66.1
32	MS	65.5
33	WY	64.9
34	UT	64.2
35	NM	54.8
36	ND	52.5
37	NE	48
38	OR	40.3
39	AK	38.7
40	NV	38.1
41	CT	36.9
42	MT	34.9
43	HI	18.9

44 ME 18.5

45	NH	17
46	ID	16.2
47	SD	15.1
48	DE	11.7
49	RI	11
50	VT	6
51	DC	3.3



- Maine's CO2 emissions have declined significantly over the last ten years.
- Maine's CO2 emissions economy wide rank 44th in the country.

FOCUS RENEWABLE POLICIES TOWARDS OUR CHALLENGES AND USE METRICS



TO DESIGN PROGRAMS

Measure	Assumed Installed Cost	Simple Payback (Years)
Basic Air Sealing	\$ 600	2.5
Heat pump (single zone, 50% of load)	\$ 3,500	2.7
Pellet Stove (50% of load)	\$ 4,000	3.6
ES Propane	\$ 2,500	3.6
Heat Pump (whole home)	\$ 8,000	3.8
Attic Insulation	\$ 1,300	4.1
ES Natural Gas Boiler	\$ 10,000	5.3
Wall Insulation	\$ 1,600	5.3
Basement Insulation	\$ 1,800	7.3
Heat Pump Water Heater	\$ 1,500	8.8
EPA Pellet Boiler 83% AFUE	\$ 18,000	10.3
ES Oil Boiler 87% AFUE	\$ 9,000	19.3
Solar PV/thermal 3kw	\$ 12,000	23.8
Electric Resistance	\$ 5,000	(10.5)

- Instead of allowing specific technology drive policy – let the policy objective drive technology.
- Align Maine’s renewable energy policies towards our challenges – lower the price of electricity for businesses and lower residential energy costs for Mainers.
- Focus on the development of all renewable resources – not just wind. Develop regulatory environment for increasing hydropower in State of Maine at existing dams.