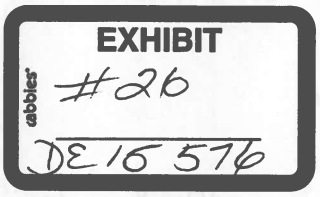

Schedules and Attachments

Schedule CCB-1	Actual NH Hourly PV Generation Worksheet # 1
Schedule CCB-2	Actual NH Hourly PV Generation Worksheet # 1
Schedule CCB-3	Actual NH Hourly PV Generation Worksheet # 1
Attachment A	Clifton C. Below, Background and Experience
Attachment B	RSA 53-E
Attachment C	AFFIDAVIT of Jameson Brouwer, CTO of EKM Metering, Inc.

	A	B	C	D	E	G	I	K	M	O	Q	S
1	**ACTUAL NH HOURLY PV GENERATION WORKSHET # 1**				Notes: Data for leap day (2/29/16) has been skipped (not used). Note that there is a 25 hour day 11/1/15 with an extra hour for the end of DST (2X) and there is a skipped hour (2 am) on 3/13/16 for the start of DST. Thus Hour = hour ending EST or EDT as applicable. NHSEA data adjusted to correct for DST and corrected hour ended based on actual sunrise and sunset times across NH.							
2	System ID #				Party w/info	Location		DATA SOURCE and other info:				
3	Lebanon-1	1			C. Below	25 Perley Ave. Lebanon, NH 03766		Total Hourly Enphase Microinverter AC output provided by Enphase. 32 Solar World 280 panels, 13 at 187°, 21° tilt; 9 at 277° & 27° tilt; and 10 at 277° & 11° tilt. 7.68 kW rated				
4	Solaflect-1	2			Solaflect Energy	Lyme NH		Solaflect Dual-axis PV tracker, 4.0 kW DC, Inverter: 3.8 kW nameplate ; 4.15 kW max AC output. Significant shading to the E, little to the W.				
5	Solaflect-2	3			Solaflect Energy	Norwich, VT (next to Hanover NH)		Solaflect Dual-axis PV tracker, 4.0 kW DC, Inverter: 3.8 kW nameplate ; 4.15 kW max AC output; Solar access: 92%, ~ equal shading on E & W.				
6	Raymond-1	4			NHEC public website	264 Route 27, Raymond, NHEC District Garage		40 kW DC, appoximatey due south facing, ~45° tilt, http://live.deckmonitoring.com/?id=nhec_raymond_pv_system				
7	Sunapee-1	5			NHEC public website	604 Sunapee St, Newport, NHEC Sunapee Garage		18.6 kW DC, 72 panels, approximately due south facing, ~45° tilt, http://live.deckmonitoring.com/?id=nhec_sunapee_pv_system				
8	NHSEA Group West	6			NHSEA	various		The more westerly oriented 10 NHSEA systems for which data was submitted in discovery.				
9	East	7			NHSEA	various		The more easterly oriented 10 NHSEA systems for which data was submitted in discovery.				
10												
11					AC Output (W)							
12	**System ID #**				**TOTAL**	**Lebanon-1**	**Solaflect-1**	**Solaflect-2**	**Raymond-1**	**Sunapee-1**	**NHSEA**	**NHSEA**
13	**System Type:**					residential	residential	residential	commercial	commercial	**Group West**	**Group East**
14	**System Size (KW DC):**					8.96			40	18.6		
15	**System Size (KW AC):**					7.68	3.8	3.8			81.22	161.08
16	**Tilt (degrees):**					20 (Ave)	tracking	tracking	~45	~45		
17	**Azimuth True (deg.):**					240 (Ave.)	tracking	tracking	~180	~180	180 to 220	145-175
18	**Location (NH):**					Lebanon	Lyme	Norwich, VT	Raymond	Sunapee		
19	**Monitoring:**					Enphase			Deck	Deck		
20	Capacity Factor					14.6%	14.2%	19.7%			15.2%	14.3%
21	kWh at system peak				123,443							
22	Solar Fraction at system peak hou				0.0306%							
24	Solar Fraction at monthly peak h				0.168%	0.170%	0.185%	0.158%	0.150%	0.177%	0.179%	0.165%
25	Solar % @ May-Sept. monthly pe				0.165%	0.170%	0.183%	0.157%	0.146%	0.175%	0.177%	0.163%
26	Capacity Value converted to $/MWH				$ 11.80	$ 16.92	$ 23.44	$ 15.20	$ 11.61	$ 11.00	$ 12.47	$ 10.95
27	Solar Weighted Ave. Costs for LMP & Regulati				$ 35.06	$ 35.83	$ 37.86	$ 35.86	$ 34.42	$ 35.88	$ 35.16	$ 34.96
28	Total Energy & Cap. Value or Avoided Cost in $/MWH:				$ 46.87	$ 52.75	$ 61.31	$ 51.06	$ 46.02	$ 46.88	$ 47.63	$ 45.91
29	% OF Load Weighted Ave.		Mo. Peak = P		110%	124%	144%	120%	108%	110%	112%	108%
30	% of Average of All Hours				127%	143%	167%	139%	125%	127%	129%	125%
31	Date	Hour		$/MWH	**Watts Total**	watts	watts	watts	watts	watts	watts	watts
32				30.37	**403,885,745**	**9,820,857**	**4,719,899**	**6,567,750**	**52,080,120**	**20,360,220**	**108,198,392**	**202,187,344**

	A	B	C	D	E	G	I	K	M	O	Q	S	U	W	Y
1	**ACTUAL NH HOURLY PV GENERATION WORKSHET #2**				Notes: Data for leap day (2/29/16) has been skipped (not used). Note that there is a 25 hour day 11/1/15 with an extra hour for the end of DST (2X) and there is a skipped hour (2 am) on 3/13/16 for the start of DST. Thus Hour = hour ending EST or EDT as applicable. NHSEA data adjusted to correct for DST and corrected hour ended based on actual sunrise and sunset times across NH.										
2						AC Output (kW)									
3	**System ID #**				**TOTAL**	**Data Set 1**	**Data Set 12**	**Data Set 2**	**Data Set 3**	**Data Set 16**	**Data Set 18**	**Data Set 19**	**Data Set 8**	**Data Set 7**	**Data Set 13**
4	**System Type:**				**NHSSEA GRP W**	Residential	Residential	Residential	Residential	Residential	Residential	Residential	Residential	Residential	Residential
5	**System Size (KW DC):**					8.46	5.61	5.39	6.63	4.68	7.8	7.2	5.98	10.4	26.78
6	**System Size (KW AC):**				**81**	7.74	5.3	4.83	5.805	5	7	7	4.945	8.6	25
7	**Tilt (degrees):**					32	26	18 & 35	36	26	26	32	15	30	22
8	**Azimuth True (deg.):**					220	215	200	190	190	190	185	110, 200, & 290	160 & 250	180
9	**Location (NH):**					Rye	Plainfield	Portsmouth	Chester	Nashua	Hampton	Danville	Hampton	Wakefield	Candia
10	**Monitoring:**					Enphase	Solectria	Enphase	Enphase	Solectria	SMA	SMA	Enphase	Enphase	Solectria
11	Capacity Factor				15%	18%	14%	16%	15%	13%	17%	14%	18%	15%	14%
12	kWh at system peak														
13	Solar Fraction at system peak hour														
14	Capacity Value, MW equiv.														
15	Solar Fraction at monthly peak hou				0.179%	0.216%	0.226%	0.137%	0.142%	0.216%	0.172%	0.167%	0.176%	0.249%	0.148%
16	Solar % @ May-Sept. monthly peak				0.177%	0.213%	0.226%	0.134%	0.138%	0.211%	0.169%	0.165%	0.173%	0.247%	0.147%
17	Capacity Value converted to $/MW				$ 12.47	$ 9.57	$ 21.67	$ 7.08	$ 14.33	$ 16.40	$ 11.05	$ 10.67	$ 10.44	$ 16.34	$ 11.72
18	Solar Weighted Ave. Costs for LMP & Regula				$ 35.16	$ 35.95	$ 37.35	$ 33.93	$ 34.34	$ 36.17	$ 35.36	$ 34.18	$ 35.22	$ 36.38	$ 34.42
19	Total Energy & Cap. Value or Avoided Cost in $/MWH:				$ 47.63	$ 45.52	$ 59.02	$ 41.01	$ 48.67	$ 52.58	$ 46.41	$ 44.85	$ 45.66	$ 52.72	$ 46.14
20	% of Load Weighted Ave.		Mo. Peak = P		112%	107%	139%	97%	115%	124%	109%	106%	108%	124%	109%
21	% of Average of All Hours				129%	124%	160%	111%	132%	143%	126%	122%	124%	143%	125%
22	Date	Hour		$/MWH	**KW TOTAL**	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
23				30.37	**108,198**	**11,897**	**6,418**	**6,874**	**7,511**	**5,887**	**10,605**	**8,564**	**7,846**	**11,612**	**30,985**
24	4/1/2015	1		35.32	0	0	0	0.0	0	0	0	0	0	0	0
25	4/1/2015	2		38.07	-	-	-	0.0	0	0	-	-	0	0	0
26	4/1/2015	3		39.66	-	-	-	0.0	0	0	-	-	0	0	0
27	4/1/2015	4		30.73	-	-	-	0.0	0	0	-	-	0	0	0
28	4/1/2015	5		40.34	-	-	-	0.0	0	0	-	-	0	0	0
29	4/1/2015	6		43.32	-	-	-	0.0	0	0	-	-	0	0	0
30	4/1/2015	7		56.60	0	0.05	-	0.0	0.036	0	0.04	0.03	0.098	0.08	0.1
31	4/1/2015	8		65.02	4	0.27	-	0.4	0.283	0	0.32	0.27	0.945	0.397	0.7
32	4/1/2015	9		62.72	14	0.74	0.10	1.7	1.581	0.3	1.38	2.07	1.855	0.935	2.9
33	4/1/2015	10		59.38	37	2.85	0.70	3.2	3.411	1.8	3.49	3.89	2.744	2.976	12.3
34	4/1/2015	11		42.24	60	5.24	2.10	4.3	5.252	3	5.17	5.28	3.751	6.304	19.3
35	4/1/2015	12		40.73	73	6.85	3.30	5.1	6.157	3.6	6.14	5.95	4.414	8.515	23.1
36	4/1/2015	13		38.42	79	8.03	4.30	5.4	6.382	4	6.69	6.43	4.786	9.439	23.8
37	4/1/2015	14		38.13	80	8.63	4.80	5.2	6.383	4.2	6.95	6.45	4.849	9.556	23.1

	A	B	C	D	E	G	I	K	M	O	Q	S	U	W	Y
1	**ACTUAL NH HOURLY PV GENERATION WORKSHET # 3**				Notes: Data for leap day (2/29/16) has been skipped (not used). Note that there is a 25 hour day 11/1/15 with an extra hour for the end of DST (2X) and there is a skipped hour (2 am) on 3/13/16 for the start of DST. Thus Hour = hour ending EST or EDT as applicable. NHSEA data adjusted to correct for DST and corrected hour ended based on actual sunrise and sunset times across NH.										
2										AC Output (kW)					
3	**System ID #**				**TOTAL**	**Data Set 10**	**Data Set 9**	**Data Set 14**	**Data Set 5**	**Data Set 6**	**Data Set 11**	**Data Set 4**	**Data Set 15**	**Data Set 20**	**Data Set 21**
4	**System Type:**				**NHSSEA GRP E**	Residential	Residential	Commercial	Residential	Residential	Commercial	Residential	Residential	Residential	Commercial
5	**System Size (KW DC):**					5.1	7.35	70.98	11.22	8.415	15.6	9.1	6.24	9.18	39.66
6	**System Size (KW AC):**				**161**	5	6.5	60	9.46	7.095	15	7.525	6.5	8	36
7	**Tilt (degrees):**					30	34	34	26	26	34	25	20	27	37
8	**Azimuth True (deg.):**					201 & 100	200 & 100	175	165	165	165	160	145	145	145
9	**Location (NH):**					Durham	Durham	Andover	Moultonborough	Londonderry	Durham	Barrington	Windham	Madbury	Durham
10	**Monitoring:**					Solectria	Solectria	Solectria	Enphase	Enphase	Solectria	Enphase	Solectria	SMA	SMA
11	Capacity Factor				14%	14%	15%	14%	16%	14%	12%	16%	13%	16%	14%
12	kWh at system peak														
13	Solar Fraction at system peak hour														
14	Capacity Value, MW equiv.														
15	Solar Fraction at monthly peak hour				0.165%	0.237%	0.194%	0.167%	0.181%	0.151%	0.163%	0.111%	0.187%	0.155%	0.157%
16	Solar % @ May-Sept. monthly peak h				0.163%	0.231%	0.189%	0.165%	0.180%	0.147%	0.161%	0.109%	0.183%	0.152%	0.153%
17	Capacity Value converted to $/MWH				$ 10.95	$ 19.71	$ 13.37	$ 11.95	$ 9.94	$ 9.07	$ 11.66	$ 5.56	$ 15.17	$ 9.60	$ 8.85
18	Solar Weighted Ave. Costs for LMP & Regulat				$ 34.96	$ 37.25	$ 36.06	$ 36.11	$ 34.17	$ 33.79	$ 34.76	$ 33.01	$ 35.44	$ 33.92	$ 33.66
19	Total Energy & Cap. Value or Avoided Cost in $/MWH:				$ 45.91	$ 56.96	$ 49.43	$ 48.06	$ 44.10	$ 42.87	$ 46.42	$ 38.57	$ 50.60	$ 43.52	$ 42.51
20	% of Load Weighted Ave.		Mo. Peak = P		108%	134%	116%	113%	104%	101%	109%	91%	119%	102%	100%
21	% of Average of All Hours				125%	155%	134%	131%	120%	116%	126%	105%	138%	118%	116%
22	Date	Hour		$/MWH	**KW TOTAL**	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
23				30.37	**202,187**	**6,074**	**8,664**	**75,627**	**13,170**	**8,469**	**16,233**	**10,309**	**7,640**	**11,440**	**44,560**
24	4/1/2015	1		35.32	-	-	-	0.0	0	0	0	-	0	0	0
25	4/1/2015	2		38.07	-	-	-	0.0	0	0	-	-	0	0	0
26	4/1/2015	3		39.66	-	-	-	0.0	0	0	-	-	0	0	0
27	4/1/2015	4		30.73	-	-	-	0.0	0	0	-	-	0	0	0
28	4/1/2015	5		40.34	-	-	-	0.0	0	0	-	-	0	0	0
29	4/1/2015	6		43.32	-	-	-	0.0	0	0	-	-	0	0	0
30	4/1/2015	7		56.60	1	-	-	0.0	0.149	0.045	-	0.04	0	0.067	0.263
31	4/1/2015	8		65.02	24	-	0.10	9.5	0.945	0.404	0.50	0.41	0.2	1.317	10.553
32	4/1/2015	9		62.72	67	0.10	1.10	28.3	2.69	1.908	1.60	3.53	1.8	4.808	21.623
33	4/1/2015	10		59.38	117	0.70	2.90	46.2	6.552	4.068	9.00	6.65	3.4	6.673	31.219
34	4/1/2015	11		42.24	147	2.10	4.70	57.1	9.127	7.184	12.40	8.01	4.5	7.612	33.834
35	4/1/2015	12		40.73	159	3.10	5.60	62.3	10.087	8.099	13.50	8.51	5.2	7.825	35.052
36	4/1/2015	13		38.42	162	3.90	6.00	63.6	10.542	8.107	13.70	8.53	5.5	7.853	34.083
37	4/1/2015	14		38.13	156	4.40	6.30	62.0	9.554	7.975	13.30	7.96	5.4	7.604	31.156

CLIFTON C. BELOW
1 Court Street, Suite 300
Lebanon, NH 03766
(603) 448-5899 (o)
clifton.below@gmail.com

BACKGROUND & EXPERIENCE

RECENT VOCATIONAL

- **Managing General Partner of One Court Street Associates**, 1985-present (reduced responsibilities and activity, 2006-2/2012), responsible as a sweat equity partner for the development and ongoing management of One Court Street, a commercial building in downtown Lebanon that is home to Three Tomatoes Trattoria, University Press of New England, and other business and medical offices. Development work included planning, regulatory approvals, financial projections, financing, design and construction coordination, marketing and leasing. Refinanced property on favorable terms in 2013.
- **Vice President, Ardent Realty Services, Ltd,** 1992-present (with greatly reduced direct activity 2006-2/2012 while a PUC Commissioner), provides ongoing property management services to One Court Street Associates including marketing and showing of available space, lease negotiations and preparation, design and execution of tenant fit-outs, property management (including vendor and tenant relations), bookkeeping, accounting, tax return preparation, and odds & ends from changing light bulbs to shoveling snow.
- **Home Improvement Design & Build,** 2012-present, working, as time allows, on completing over 30 years work on home energy efficiency and asset preservation improvements such as structural repairs and improvements to roof and front porches. Removed 4 layers of old shingles and re-sheathed the entire roof in preparation for new standing seam metal roof, now installed. Upgraded electrical system including new 7.7 kW (AC) PV system. Replaced old oil heating system with new automatic wood pellet boiler system, including new radiant heat zones and custom built pellet store. Demolished old garage in preparation for planned new garage with a super insulated apartment over it, so we can afford to age in place (and stay warm).

STATE, REGIONAL & NATIONAL REGULATORY, LEGISLATIVE & PUBLIC POLICY EXPERIENCE

- **New Hampshire Public Utilities Commission, Commissioner,** 12/27/2005 – 2/6/2012:

The NHPUC is vested with general jurisdiction over regulated electric, telecommunications, natural gas, water, and sewer utilities for issues such as rates, quality of service, finance, accounting, and safety. The NHPUC's core mission is to ensure that customers of regulated utilities receive safe, adequate and reliable service at just and reasonable rates. The NHPUC also advocates on behalf of the state in certain regional and national forums (such as ISO-NE stakeholder processes and FERC) and administers the state's Renewable Energy and Greenhouse Gas Emissions Reduction Funds. Participated in approximately 360 adjudicatory and rulemaking proceedings with public hearings and over 1,000 published adjudicatory orders and decisions. Approved, with two other Commissioners, agency proposed budget, policies and procedures, and hiring/selection of general counsel, staff attorneys, and division directors. Often served as agency point person in legislative hearings and proposed administrative rules.

- **National Association of Regulatory Utility Commissioners** (NARUC) Energy Resources & Environment Committee; 2006-2011; **Co-Vice-Chair**, 2009-2011.
- FERC-NARUC Smart Grid/Demand Response Collaborative, 2008-2011.
- **New England Conference of Public Utility Commissioners** (NECPUC), Vice President, 9/09-9/10; **President,** 9/10-9/11.
- Electric Power Research Institute (EPRI), Advisory Council to the Board of Directors, 2009-2011; Energy Efficiency/Smart Grid Public Advisory Group, 2008-2010.
- Regional Evaluation, Measurement & Verification (EM&V) Forum, Steering Committee, Northeast Energy Efficiency Partnership, 2007-2011; Co-Chair, 2011.
- RGGI (Regional Greenhouse Gas Initiative) one of two NH agency head representatives and **RGGI, Inc.; Secretary** (2007-2009); **Vice-Chair** (2009-2011). Participated as a corporate officer and thus as a member of the Executive Committee of the Board of Directors from inception to 10/11 when I stepped down. RGGI Inc. is the regional organization supporting implementation of RGGI. Participated in selection of the first Executive Director and in the review, revision, and adoption of all corporate governance polices, annual budgets, and governance matters.
- NH Energy & Climate Collaborative, 2009-2011.
- Governor's Climate Change Policy Task Force, NH's Climate Action Plan, 2008.
- Northeast International Committee on Energy (NICE) and Climate Change Steering Committee of the Conference of New England Governors and Eastern Canadian Premiers, 2007-2008.
- NH Site Evaluation Committee, 2006-2011 and Energy Planning Advisory Board, 2006.
- ISO-New England Scenario Analysis Steering Committee Co-Chair (for NECPUC, 2007).
- Collective Bargaining Team for State of New Hampshire (as employer), 2007.
- Speaker and panel moderator at various meetings or conferences of NECPUC, NARUC, ISO-NE, NEEP, ACEEE, NEPPA, NECA, NESEA Building Energy, ACI New England, Restructuring Roundtable, and other forums.

- Commission to Study Child Support and Related Child Custody Issues, 2003-2006; 2003-2004 as a State Senator; 2005-2006 as Governor's designee, Vice-Chair.
- **NH State Senator,** District 5, 1998-2004:
  - **Senate Finance Committee**, 1998-2004, over the course of 3 state budget cycles worked on detailed review and recommendations for each of the 3 divisions of the state's approximately $4 billion annual budget.
  - **Senate Energy & Economic Development Committee**, 1998-2004; **Chair**, 2000-2002; **Vice Chair,** 2002-2004.
  - **Senate Ways & Means Committee**, 1998-2000, **Chair**.
  - Senate Environment Committee, 1998-2004.
  - Senate Transportation Committee, 1998-2000, 2003-2004.
  - **Joint Legislative Committee on Administrative Rules**, 2001-2004; **Chair**, 2001-2002; **Vice Chair** 2002-2004.
  - Fiscal Committee of the General Court, 1999-2000.
  - **Electric Utility Restructuring Oversight Committee**, 1998-2004; **Co-Chair**, 1998-2000.
  - Telecommunications Planning and Development Advisory Committee, 2001-2004.
  - **Nuclear Decommissioning Finance Committee,** 2003-2004.
  - Dam Management Review Committee, 1999-2004.
  - Oil Fund Disbursement Board, 1999-2000.
  - NH Business Finance Authority Board, 1999-2002.

- Assessing Standard Board, 2002-2004.
- **Equalization Standards Board,** 2001-2004, **Chair and Vice Chair.**
- Land Use Management & Farmland Preservation Study Committee, 1998-1999.
- Mercury Source Reduction and Recycling Issues Study Committee, 1999.
- Sullivan County Regional Refuse District Issues Study Committee, 1999.
- Requirements for use of Methyl T-Butyl Ether & Gasoline Components Study Committee, 1999-2000.
- **State Wireless Communications Policy Study Committee,** 2000, **Chair.**
- Salary Structure for Unclassified State Officers Study Committee, 2000.
- Renewable Energy Sources Promotion Methods Study Committee, 2000.
- 211 Commission, 2002.
- Exemption from Property Taxes for Not-For-Profit Hospitals Study Committee, 2003.
- Methods of Supporting Continued Operation of Wood-Fired Electrical Generating Facilities Study Committee, 2002.
- Eminent Domain Proceedings Study Committee, 2003.
- Pricing of Milk Products Study Committee, 2003.
- Options for Reducing the Impact of Exhaust Emissions from Diesel Engines Study Committee, 2004.
- Commission on Setback Requirements for Land Application of Septage, Biosolids and Short Paper Fibers, 2004.
- Commission on Encouraging Municipal Recycling and Tax Exemptions for Water and Air Pollution Control Facilities under RSA 72:12-a, 2004.
- Committee to Study the Effects that Utility Restructuring has had on the State's Hydro-Lease Program and the State Dam Maintenance Fund and to Study Alternatives for Funding the Operation and Maintenance of State-Owned Dams, 2003-2004.
- Establishment of a Farm Viability Program Study Committee, 2004.
- Speaker on Genetic Testing Issues and Public Policy, Dartmouth Community Medical School, spring, 2000.
- Speaker on NH's restructuring experience at New England "Mid-Course Review of Electric Restructuring," sponsored by National Council on Electricity Policy and NCSL, 2000.
- Speaker at the Lebanon, Hanover, Claremont, New London, and Nashua Rotary Clubs, Concord Chamber of Commerce, BIA committees, and other forums; various topics; various dates.
- Commencement Speaker: Lebanon College, 1999; NH Community Technical College at Claremont, 2004.
- Speaker at NH Bar CLE course on the Administrative Rules process, November 2004.

- **NH State Representative,** 1992-1998:
  - **Science, Technology & Energy Committee,** 1992-1998; dealt with utility, energy, telecommunications, and air quality policy; Chair of Electric Utilities Subcommittee.
  - Small Power Producers and PSNH Renegotiations Legislative Oversight Committee, 1994.
  - Retail Wheeling and Restructuring Study Committee, 1995, Chair of Policy Principles, Social and Environmental Issues Subcommittee whose report became the foundation for NH's Electric Utility Restructuring statute, RSA 374-F.
  - **Electric Utility Restructuring Oversight Committee,** 1996-1998.
  - Member of state's negotiating team with Public Service Company of NH and prime sponsor of securitization (debt refinancing) legislation that ended litigation, and resulted in one of the largest, if not the largest, voluntary write-off of equity by a US electric utility, large reductions in interest costs, and a reduction of average NH electric rates from the highest in the nation to

the regional average. Sponsor of over a dozen bills dealing with energy policy and electric utilities, most of which became law, including prime sponsorship of NH's first solar/renewable net energy metering law and an update of the energy facility siting statute.

- **Testified on State-Federal issues related to electric utility restructuring before the Energy & Power Subcommittee of the U.S. House Committee on Commerce,** February, 1996.
- Testified before the Maine legislature on New Hampshire's restructuring efforts.
- Speaker on "Tax Aspects of Restructuring NH's Electric Utility Industry" at NCSL seminar, 1998.

- **Legislative Regional and National Work:**
  - **Council of State Governments, Eastern Regional Council (CSG/ERC):**
    - **Energy and Environment Committee,** member, 1997-2004; **Vice-Chair,** 2001-2003.
    - Executive Committee, member, 1999-2002.
    - Northeast Electric Restructuring Task Force, 1998-2000.
  - **National Conference of State Legislatures (NCSL):**
    - **Advisory Council on Energy,** 1997-2004; **Chair,** 2001-2004. As Chair facilitated structured discussions between federal and state energy and utility officials, private sector experts, various stakeholders, state legislators, and NCSL staff to anticipate new trends in energy issues and to assist state legislatures in responding to those trends. Reviewed and commented on drafts of various publications.
    - **Energy and Transportation Committee, Assembly on Federal Issues, (and successor Energy & Electric Utilities Committee),** 1998-2004; **Chair,** 2000-2001. As Chair facilitated a consensus based comprehensive update of NCSL's National Energy Policy (and other policies) used for lobbying the federal government on behalf of all state legislatures.
    - Partnership on Electric Industry Taxation, 2002-2004.
    - Environment Committee, 1999-2002.
    - **Testified before the United States Senate Committee on Energy and Natural Resources on "Electric Industry Restructuring," with a particular focus on transmission issues, on behalf of NCSL,** April, 2000.
    - Speaker on "Electric Power: to the States or the Federal Government," (state/federal jurisdictional issues) at NCSL Annual Meeting, 1996.
    - Speaker on "Stranded Costs: Who Pays for Electric Industry Restructuring?" at NCSL Annual Meeting, 1998.
    - Speaker on Regional & State Policy Option & NH's 4-pollutant legislation at NCSL Energy Institute on Energy and Air Quality Issues, June, 2002.
    - Moderator, panel on State Policy & Greenhouse Gases, NCSL Annual Meeting, 2003.
  - **National Council on Electricity Policy, Steering Committee,** member, 2001-2004. The National Council was a joint venture of NCSL, the National Association of Regulatory Utility Commissioners (NARUC), the National Association of State Energy Officials, and the National Governor's Association (NGA) to assist policymakers with the challenges posed by the dramatic changes brought about by the reexamination of the traditional franchise electric system with funding from the U.S. Department of Energy. (Formerly the National Council on Competition and the Electric Industry.)
  - Speaker on "Regional State Committees – How do they fit into the bigger picture? – Effective Regulatory Policies for Supporting New England's Markets," at Emerging Issues in New England conference, sponsored by Edison Electric Institute and ISO-New England (among others), Nashua, NH, November, 2003.

- Speaker on "The Legislative Process: How can it support renewable energy?" at Building Energy 04 and 05 conferences, sponsored by the Northeast Sustainable Energy Association, Boston, MA, March 2004 and 2005.

OTHER VOCATIONAL EXPERIENCE:

- Managing General Partner, TCG Development Group, 1986-1994. Developed and operated the Courtyard Pavillion, retail building at 45 Hanover St. in downtown Lebanon.
- Various jobs from 1976 –1985 including waiting on tables, job training assessment specialist, and a partner in Retrofit Associates, an energy conservation/renewable energy consulting and contracting business.

EDUCATION:

- Mt. Ararat School (public high school), Topsham, Maine, 1974, 2nd in class.
- **Dartmouth College, class of 1978, B.A.** with Distinction in major of Geography and Environmental Studies, **1980,** with course work including New England Energy Futures, Environmental Systems, Environmental Policy Formulation, and engineering courses in Community Systems (e.g. electric and water utilities) and Principles of Systems Design. Authored 60 page independent research paper (Xerox grant) on "Ownership and Control in the U.S. Electric Utility Industry: Policy Implications."
- **M.S. in Community Economic Development, Southern NH University, 1985,** with course work in such areas as accounting, financial and organizational management, financing, and housing and business development.

COMMUNITY SERVICE:

- City of Lebanon:
  - **City Council, Ward 3 Councilor, March 2015-March 2017.**
  - Lebanon Energy Advisory Committee (LEAC), 2013-present, currently Chair.
  - Pedestrian and Bicyclist Advisory Committee, 1995-present; Chair, 1995-1998.
  - Lebanon Economic Vitality Exchange, City Council representative, 2016-present
  - Class VI Roads Advisory Committee, 2005-2007.
  - Planning Board member, 1995-1998.
  - Building Codes Review Committee, 1993-1994.
  - Downtown Parking Committee, 1993-1994.
  - Downtown Improvement Committee, 1990-1991.
  - Downtown Revitalization Study Committee, 1983-1984.
  - Energy Commission, 1980-1982.
- Sustainable Energy Resource Group, Board of Directors, 2013 – 2015 (merged into Vital Comm.).
- Vital Communities, Board of Directors, May 2012 – present, Advisory Council, 2002-2012.
- Lebanon Garden Club, Treasurer, 1986- present.
- Lebanon Opera House Improvement Corporation, founding incorporator and Board of Directors, 1991-1998.
- Friends of the Northern Rail Trail in Grafton County, founding incorporator and Board of Directors, 1996-1998.
- Headrest, 24 hotline volunteer and Alcohol Crisis Team, EMT, 1981-1983.
- LISTEN, Board of Directors (VP, Clerk, Chair of numerous committees), 1978-1984.

Note: some lists are partial and some dates may be approximate. 6/16

TITLE III
TOWNS, CITIES, VILLAGE DISTRICTS, AND UNINCORPORATED PLACES

CHAPTER 53-E
AGGREGATION OF ELECTRIC CUSTOMERS BY MUNICIPALITIES AND COUNTIES

53-E:1 Statement of Purpose. – The general court finds it to be in the public interest to allow municipalities and counties to aggregate retail electric customers, as necessary, to provide such customers access to competitive markets for supplies of electricity and related energy services. The general court finds that aggregation may provide small customers with similar opportunities to those available to larger customers in obtaining lower electric costs, reliable service, and secure energy supplies. The purpose of aggregation shall be to encourage voluntary, cost effective and innovative solutions to local needs with careful consideration of local conditions and opportunities.

Source. 1996, 192:2, eff. Aug. 2, 1996.

53-E:2 Definitions. – In this chapter:

I. "Aggregation" means the grouping of retail electric customers to broker or contract for electric power supply and energy services for such customers.

II. "Aggregator" means, unless the context indicates otherwise, a municipality or county that engages in aggregation of electric customers within its boundaries.

III. "Commission" means the public utilities commission.

IV. "Committee" means the electric aggregation committee established under RSA 53-E:6.

V. "County" means any county within the state.

VI. "Municipality" means any city, town, unincorporated place, or village district within the state.

53-E:3 Municipal and County Authorities. – Any municipality or county may:

I. Aggregate the retail electric customers within its boundaries who consent to being included in an aggregation program.

II. (a) Enter into agreements for:

(1) The supply of electric power.

(2) Demand side management.

(3) Conservation.

(4) Meter reading.

(5) Customer service.

(6) Other related services.

(b) Such agreements may be entered into by a single municipality or county, or by a group of such entities pursuant to RSA 53-A.

53-E:3-a Municipal Aggregators Authorized. – Municipal aggregators of electricity load under this chapter, and municipalities operating municipal electric utilities under RSA 38, are expressly authorized to aggregate other services commonly and regularly billed to customers. Nothing in this chapter shall be deemed to limit the capacity of customers to select any service or combination of services offered by such municipal aggregators or to limit the municipality from combining billing for any or all utility services.

Source. 1997, 298:20, eff. June 20, 1997.

53-E:4 Regulation. –

I. An aggregator operating under the provisions of this chapter shall not be considered a utility engaging in the wholesale purchase and resale of electric power. Providing electric power or energy services to aggregated customers within a municipality or county shall not be considered a wholesale utility transaction.

II. The provision of aggregated electric power and energy services as authorized by this chapter shall be regulated by this chapter and any other applicable laws governing aggregated electric power and energy services in competitive electric markets.

III. Transmission and distribution services shall remain with the transmission and distribution utilities, who shall be paid for such services according to rate schedules approved by the applicable regulatory authority. An aggregator shall not be required to own any utility property or equipment to provide electric power and energy services to its customers.

53-E:5 Financial Responsibility. – Retail electric customers who choose not to participate in an aggregation program adopted under RSA 53-E:7 shall not be responsible for, and no entity may require them to pay, any costs associated with such program, through taxes or otherwise except for electric power supply or energy services consumed directly by the municipality or county, or incidental costs.

53-E:6 Electric Aggregation Plan. –

I. The governing body of a municipality or county may form an electric aggregation committee to develop a plan for an aggregation program for its citizens. A municipality or county may join other municipalities or counties in developing such plans.

II. The plan shall provide universal access, reliability, and equitable treatment of all classes of customers and shall meet, at a minimum, the basic environmental and service standards established by the commission and other applicable agencies and laws concerning aggregated service.

III. The plan shall detail:

(a) The organizational structure of the program;

(b) Operation and funding;

(c) Rate setting and other costs to participants;

(d) The methods for entering and terminating agreements with other entities;

(e) The rights and responsibilities of program participants; and

(f) Termination of the program.

IV. The committee shall approve a final plan which the committee determines is in the best, long-term interest of the municipality or county and the ratepayers.

V. The committee shall solicit public input in the planning process and shall hold public hearings.

53-E:7 Aggregation Program Adopted. –

I. The governing body of a municipality or county may submit to its legislative body for adoption a final plan for an aggregation program, to be approved by a majority of those present and voting.

II. If the plan is adopted, the municipality or county shall mail written notification to each retail electric customer within the municipality or county. Notification shall include a description of the aggregation program, the implications to the municipality or county, and the rights and responsibilities that the participants will have under the program. No retail electric customer shall be included in the program unless the customer affirmatively responds to the notification or requests in writing to be included in the program.

III. Within 15 days after notification of the plan has been sent to retail electric customers in the service area, a public information meeting to answer questions on the program shall be held.

53-E:8 Other Aggregators. – Nothing in this chapter shall preclude private aggregators from operating in service areas served by municipal or county aggregators.

THE STATE OF NEW HAMPSHIRE

PUBLIC UTILITIES COMMISISON

DE 16-576

ELECTRIC DISTRIBUTION UTILITIES

Development of New Alternative Net Metering Tariffs and/or Other Regulatory Mechanisms and Tariffs for Customer-Generators

AFFIDAVIT of Jameson Brouwer, CTO of EKM Metering, Inc.
In Support of City of Lebanon, NH Testimony

I, Jameson Brouwer of EKM Metering Inc. with a business address of 122 Benito Avenue, Santa Cruz, California 95062, do state that the following responses to the questions set forth herein are true and accurate to the best of my knowledge and belief:

1. **Would you please briefly describe what EKM Metering, Inc. (EKM) does as a business and your position and responsibilities with the company?**

EKM aims to provide affordable, accurate, scalable, and open data systems to our customers versus the expensive, complicated, and closed systems of our competitors. As a 9 year old startup, we have to be distinctly better than our entrenched competitors. As one of the owners of a small company, with the title of Chief Technology Officer (CTO), I wear a lot of hats. My personal responsibilities include product development, project management, quality control, inventory, and budget management. But my main interest in metering is the potential to save electricity and water for our customers, via awareness, incentivizing savings through billing, or load shifting to take advantage of renewable resources and lessen the impact on the grid. (There are many other tertiary benefits as well.) For additional information, I am happy to answer your questions directly (jameson@ekmmetering.com) or you can find more about our systems on our website: www.ekmmetering.com.

2. Does EKM manufacture and sell revenue grade electrical meters that are certified as built to comply with ANSI C12.1-2008 of the American National Standard Code for Electricity Metering or ANSI C12.20-2010?

Yes, we do. For example, our Omnimeter Pulse UL v.4 electric meter has been tested and certified to both ANSI C12.1 and ANSI C12.20 accuracy standards. Our Omnimeters are highly accurate (+/- 0.5%) revenue grade kilowatt hour meters that can legally be used for sub-billing. They have also been certified as revenue grade by the California Department of Weights and Measures (California Type Approval). They are solid state electric meters, with no moving parts that will wear out or degrade over time. This means that they never need recalibration after they leave the factory. Our meters are held to a much higher standard than utility meters that are only required to be 2.0% accurate. Here is a link to our certificate from the California Department of Weights and Measures: http://documents.ekmmetering.com/California-Type-Approval.pdf.

3. Why does your website state that EKM offers "unrivaled value and quality" with "metering solutions that offer unparalleled accuracy, functionality and affordability"?

We know of no other company that offers what we do; complete water, gas and electric metering, with easy and free access to your data in globally scalable systems at a very affordable price. In some cases our systems are an order of magnitude less expensive than our competitors. In addition to the cost savings, we also provide free data via our EKM Push system, and free software to take advantage of the data. This plug and play system makes use of existing internet infrastructure to send meter data to our cloud database. Once it's there it can be securely accessed from anywhere in the world.

4. In addition to sending data through an internet router can your PUSH system also be configured to work worth with ZigBee networks and cellular data plans?

We use the internet as the backbone of our systems. So yes, you can use cellular data

modems to get your data to the cloud. Each EKM Push gateway can be connected to a cellular data modem and up to 50 EKM Omnimeters. We have a lot of customers that do this. For wireless mesh networks, we do use a form of Zigbee in our 485Bee radios called digimesh, this will not work with existing Zigbee networks however.

5. Your website describes your meters as primarily for submetering applications, but are they also suitable for obtaining granular revenue grade interval data such as for real time valuation and visibility of power imports and exports across a utility meter point from a customer-generator premises, as well as for Renewable Energy Credit (REC) production?

Yes, there are many potential uses of our meters and data systems. Our universal meters and EKM Push data systems provide much more granular data than is commonly available. Our Omnimeters can be installed on most commonly used electrical systems in the world. They can be used on systems sized from less than an amp to up to 15,000 amps. Omnimeters can be installed to measure load anywhere in the electrical system, including directly behind the utility meter in order to meter the entire building, on a single tenant space, on a single machine or circuit. In addition the Omnimeter Pulse v.4 has 3 separate pulse counting inputs that can be used to count the pulses from a pulse output water meter or gas meter, or connected to the pulse output of an existing utility electric meter. This data then also becomes available via our EKM Push system. By default each of our customers' Omnimeters are read once per minute for free (they can be read as fast as once per second). Each read contains about 45 different data points. Our meters can be installed anywhere behind the utility meter, and can even count pulses from the utility meter on a secondary pulse input (there are 3 pulse inputs per v.4 Omnimeter), in addition to metering the load directly via voltage reference(s) and current transformer(s). And because our meters are so accurate and are certified to ANSI C12.2 and ANSI C12.20 they can be used for

tracking SREC credits and other renewable energy incentives.

6. How tamper resistant or tamper evident can your metering installations be? Specifically are your electric meters susceptible to physical or software hacking? Might the data stream through a customer computer, router or LAN be susceptible to hacking and alternation?

All of our meters, current transformers, and meter enclosures can be physically sealed with either wire lock seals, tamper evident tape, or both. This tamper evidence is a strict requirement of revenue grade metering (CA Type Approval for example). Ultimately this makes our meters as secure as utility meters. The Push data is not corruptible and is stored anonymously in our cloud database. It can only be accessed by the meter owner via a software key.

7. Once the metering data is sent to the cloud for storage and retrieval how secure is the cloud storage?

Our data is secured in our system by a unique API key, https, and obfuscation of data and location. Our current database architecture has three redundant databases that are geographically distributed. This prevents potential data loss if one or even two of the databases go down for any reason. We also make the data available in real time so users can download the data into their own backup at any time.

8. What is the default frequency at which metering data gets pushed to the cloud and what interval frequency of stored data is included in the $100 cost of each push device and how long will that data be available at no additional cost?

Our EKM Push reads each meter once per minute and sends this data to the cloud account for that meter (this can be as fast as once per second, but there will be data charges for more frequency than once per minute). We store 1000 of these real-time reads. We then summarize these reads into 15 minute data intervals. We store these 15 minute intervals indefinitely. In other words, we maintain a long-term dataset for

each meter, forever, for free. To the extent ISO New England shifts to 5 minute intervals to charge load for real time locational marginal prices and ancillary services, and those rates are available to retail load, such as for a real time pricing pilot as I understand is being proposed by the City of Lebanon, NH, we would consider modifying our data summarization and storage system to support such a pilot by preserving 5 minute interval data for basic forward and reverse (import and export) kWh data. This would also implicitly preserve demand data to 5 minute intervals or greater.

9. What is the interoperability for 3rd parties to access your metering data?

Being open to how our customers are able to access and view their data is a high priority for us. Our business model is based on meter sales, so giving away the data is one way that we accomplish this goal. We encourage 3rd parties to build software solutions that make use of Push data. We make the data available to all developers via our Open API (http://documents.ekmmetering.com/api-docs/?shell). This is the same API that we use to make our own software options (such as www.encompass.io and EKM widget, described at: http://www.ekmmetering.com/widget).

10. Is there data logging by your meters or if there is a communications disruption, such as from a router that losses power, is interval data lost?

Yes, interval data (volts, amps, watts, power factor, etc) is lost. But the more important data (kWh, Pulse Counts, etc) is not lost. Our meters do not need the data system (EKM PUSH) to be active and accurate on a cumulative basis. For example, a meter could be read once a month and still be accurate for billing for total kWh, both forward and reverse. If there were to be a data interruption in the connection of our EKM Push to the internet, our current generation of the EKM Push will not store the interval data on

board and upload this data when the internet connection is re-established. In the near future, we plan to include the ability to store the data on-board and offload this data once the internet connection is re-established.

11. How much bandwidth does your PUSH device use to send data once per minute and might that interfere with, for example, streaming video on a residential DSL connection?

Our Push system is extremely data efficient. We use UDP to transfer data versus TCP. This results in a much more efficient transfer of data. We have the equivalent of about 2,000 meters on a single normal internet connection with no noticeable effect on our internet service. Each meter read is about 200 bytes to transfer the meter data. Multiply this by the number of meters you have connected to the Push. 300 bytes per minute transfer is just the EKM Push checking in with the database.

For example if you have 1 Meter connected it would be:

200 bytes + 300 bytes = 0.5 kilobytes per minute or 720 kilobytes per day, or less than 1 MB per day.

For 14 meters it would be:

(14 x 200 bytes) + 300 bytes = 3.1 kilobytes per minute or 4,464 kilobytes per day (or 4.5 MB, which is equivalent to about 1 music download or a few seconds of video).

Signature:  Date: October 24, 2016