Form E3A

The State of New Hampshire
Public Utilities Commission, Concord, NH
Annual Report

Selective Meter Tests (Self Contained Single-Phase Meters)

of the Public Service Company of NH, Year Ending September 30, 2012

	Year	2009		2010		2011		2012	
1	Meters on Lines	562,158		563,470		563,445		563,119	
1a	Sample Meters on Lines	536,213		537,427		536,901		536,951	
2	Sample	year	cum	year	cum	year	cum	year	cum
3	Percent Out of Limits	0.78%	0.58%	0.71%	0.63%	0.39%	0.62%	0.56%	0.61%
4	Additional Meters	2,190		2,570		3,097		3,081	
5	Non-Register	8	27	8	27	4	27	10	30
6	Less Than 94%	7	29	6	29	3	25	5	21
7	94% to 98%	21	44	18	53	8	56	7	54
8	98% to 101%	5,289	21,075	5,303	21,151	5,344	21,224	5,321	21,257
8a	101% to 102% electromechanical	35	115	39	137	30	134	36	140
8b	101% to 102% electronic	0	0	0	0	0	0	0	0
9	102% to 106%	6	19	5	21	5	22	8	24
10	Over 106%	0	4	1	4	1	4	0	2
11	Total Sample For Year	5,366		5,380		5,395		5,387	
12	Maintenance	0		0		0		0	
13	Miscellaneous	1,219		1,585		1,145		1,734	
14	Additional Meters	3,295		4,584		4,210		4,448	
	Grand Total	9,880		11,549		10,750		11,569	

(line 14 should be greater than or equal to line 4)

Signed by: ____________________ **Title:** ____________________

Date: ____________________

Sum of COUNT(*)	Unit Of Property																
Purch. Year	**KY00000**	**KY10670**	**KY10671**	**KY10672**	**KY10673**	**KY10675**	**KY10677**	**KY16921**	**KY16967**	**KY16968**	**KY16969**	**KY19000**	**KY19547**	**KY19583**	**KY19625**	**KY19867**	**Grand Total**
1933		1															1
1934		46															46
1935		6	2	5	12	2			2								29
1936		19															19
1937		18															18
1938		37				2											39
1939		108							1								109
1940		112									1						113
1941		88								1							89
1942		9															9
1943		5															5
1944		1															1
1945		57	2		1				1								61
1946		874				1			4								879
1947		2652				11			7								2670
1948		2556				10			6								2572
1949		1519				9			1								1529
1950		3631				11			6	1							3649
1951		1479			1	28				17	5						1530
1952		1285			3	15			1	3	4						1311
1953		1273				26			4	26	3						1332
1954		5583		1	5	166			25	19	3						5802
1955		3590			1	207			22	18	3						3841
1956		3535			9	208			154	70	6						3982
1957		2794		2	2	59			12	31	9						2909
1958		2552			1	76			10	25	7						2671
1959		4523			1	8			14	20	1						4567
1960		5680			1	9			21	141	10						5862
1961		5517		1	1	6			4	65	5						5599
1962		5295			2	3			18	4	4						5326
1963		5198				6			37	36							5277
1964		5036				3			13	12	2						5066
1965		6292							65	101	2						6460
1966		4369		1		8			1	42	4						4425
1967		5275		2	3	1			1	30	6						5318
1968		6687		2	2	2			9	51	3						6756
1969		7607			1				13	77	4						7702
1970		9859		2		2			29	126	8						10026
1971		11669		1		4			84	263	12						12033
1972		11771		5		2			48	175	7						12008
1973		14303		7	5	1			54	473	18						14861
1974		8921		12	2	3			47	589	20						9594
1975		10944		6					230	198	12						11390
1976		9730		17		4			77	66	10						9904
1977		10569		24	2				74	176	7						10852
1978		10133		45	1				74	350	29						10632
1979		12339		20	2				69	339	35						12804
1980		11085		20	1	3			74	446	13						11642
1981		9305		9	4	26			107	542	36						10029
1982		9481		20	1	92			107	1658	28						11387
1983		11133		27		34			168	1494	105						12961
1984		10622		30		62			30	1502	160						12406
1985		11700		32		5			190	1757	183						13867
1986		18373		61		35			341	1217	138						20165
1987		11590		92	1	33			432	786	125						13059
1988		10798		119		14			594	937	107						12569
1989		7108		216	2				642	361	57						8386
1990		4646		54					431	414	50						5595
1991		2951		190					347	87	50						3625
1992		6797		162	1				515	92		1		2			7570
1993		4666		94	1	2			642	179							5584
1994		5562	4	712		1			584	181	108						7152
1995		5042	1	536					525	355	94						6553
1996		4513	4	575					540	186	89		13	19			5939
1997		7874	11	657	1				369	458	64			7			9441
1998		7771	4	503					489	260		9		12			9048
1999		6671		375	1			1	608	278	84	1	232	42			8293
2000		9218		543				4	590	355	129	2	920	709			12470
2001		6806	19	948					905	455	134		949	30			10246
2002		10207	20	944				1	566	463	42	2	1504	240			13989
2003		7409	9	1233					1157	663	87	3	2836	73	46	21	13537
2004		12194	7	1475					964	665	170		1749	193			17417
2005		8482	11	1046					413	661	65		557	48			11283
2006		10237	10	1608		2		50	545	952	68		95	167			13734
2007		9000	11	1399					498	380	65		568	57		3	11981
2008		8204	4	1329	1				294	236	43		482	197		20	10810
2009		8019	1	1353					382	590	44	1	128	116		44	10678
2010	62	7293		1466					1019	304	73	1	2136	182		30	12566
2011	564	4288		910			644		829	459	53		3860	62		53	11722
2012	173	3313		482					158	309	33		2793	56			7317
Grand Total	**799**	**477905**	**120**	**19373**	**72**	**1202**	**644**	**56**	**17293**	**23227**	**2737**	**20**	**18822**	**2212**	**46**	**171**	**564699**

UNITOFPROPNO	DESCRIPTION
EV17613	RADIO CONTROL UNIT
KY00000	Virtual Meter
KY10549	TIME SWITCH
KY10670	SINGLE PHASE WITHOUT DEMAND
KY10671	POLYPHASE 3 - WIRE
KY10672	POLYPHASE 4 - WIRE
KY10673	SPECIAL SWITCHBOARD MOUNTED
KY10674	SPECIAL KVA INDICATING AND RECORDING DEMAND
KY10675	SINGLE PHASE COMBINATION WATTHOUR AND TIME SWITCH
KY10676	POLYPHASE COMBINATION WATTHOUR AND TIME SWITCH
KY10677	THERMAL DEMAND
KY10678	POLYPHASE 5 - WIRE
KY12576	QUADRAPHASER (PHASING TRANSFORMER)
KY13128	SPECIAL RECORDING DEMAND
KY16921	SINGLE PHASE TIME OF DAY
KY16967	SINGLE PHASE WITH DEMAND
KY16968	NETWORK WITHOUT DEMAND
KY16969	NETWORK WITH DEMAND
KY17507	TOTALIZER
KY17609	METER TIME OF USE RECORDING DEMAND
KY19000	POLYPHASE TIME OF DAY
KY19547	SINGLE PHASE AMR
KY19583	MULTIFUNCTION WATTHOUR METER
KY19625	NETWORK AMR
KY19867	SINGLE PHASE DEMAND AMR
KY19868	THREE PHASE AMR VAN DEMAND 27033117
KY19869	THREE PHASE AMR VAN DEMAND 27034137 27034117
KY19870	AMR NETWORK DEMAND
KY19963	ami 2 way communication
KY21150	CURRENT TRANSFORMER
KY21151	POTENTIAL TRANSFORMER
KY23145	single phase meter with remote disconnect capabilities
KY23148	Single Phase Meter with Disconnect capability

PYEAR	UNITOFPROPNO	COUNT(*)
2012	KY00000	173
2012	KY10670	3313
2012	KY10672	482
2012	KY16967	158
2012	KY16968	309
2012	KY16969	33
2012	KY19547	2793
2012	KY19583	56
2011	KY00000	564
2011	KY10670	4288
2011	KY10672	910
2011	KY10677	644
2011	KY16967	829
2011	KY16968	459
2011	KY16969	53
2011	KY19547	3860
2011	KY19583	62
2011	KY19867	53
2010	KY00000	62
2010	KY10670	7293
2010	KY10672	1466
2010	KY16967	1019
2010	KY16968	304
2010	KY16969	73
2010	KY19000	1
2010	KY19547	2136
2010	KY19583	182
2010	KY19867	30
2009	KY10670	8019
2009	KY10671	1
2009	KY10672	1353
2009	KY16967	382
2009	KY16968	590
2009	KY16969	44
2009	KY19000	1
2009	KY19547	128
2009	KY19583	116
2009	KY19867	44
2008	KY10670	8204
2008	KY10671	4
2008	KY10672	1329
2008	KY10673	1
2008	KY16967	294
2008	KY16968	236
2008	KY16969	43
2008	KY19547	482

2008	KY19583	197
2008	KY19867	20
2007	KY10670	9000
2007	KY10671	11
2007	KY10672	1399
2007	KY16967	498
2007	KY16968	380
2007	KY16969	65
2007	KY19547	568
2007	KY19583	57
2007	KY19867	3
2006	KY10670	10237
2006	KY10671	10
2006	KY10672	1608
2006	KY10675	2
2006	KY16921	50
2006	KY16967	545
2006	KY16968	952
2006	KY16969	68
2006	KY19547	95
2006	KY19583	167
2005	KY10670	8482
2005	KY10671	11
2005	KY10672	1046
2005	KY16967	413
2005	KY16968	661
2005	KY16969	65
2005	KY19547	557
2005	KY19583	48
2004	KY10670	12194
2004	KY10671	7
2004	KY10672	1475
2004	KY16967	964
2004	KY16968	665
2004	KY16969	170
2004	KY19547	1749
2004	KY19583	193
2003	KY10670	7409
2003	KY10671	9
2003	KY10672	1233
2003	KY16967	1157
2003	KY16968	663
2003	KY16969	87
2003	KY19000	3
2003	KY19547	2836
2003	KY19583	73
2003	KY19625	46

2003	KY19867	21
2002	KY10670	10207
2002	KY10671	20
2002	KY10672	944
2002	KY16921	1
2002	KY16967	566
2002	KY16968	463
2002	KY16969	42
2002	KY19000	2
2002	KY19547	1504
2002	KY19583	240
2001	KY10670	6806
2001	KY10671	19
2001	KY10672	948
2001	KY16967	905
2001	KY16968	455
2001	KY16969	134
2001	KY19547	949
2001	KY19583	30
2000	KY10670	9218
2000	KY10672	543
2000	KY16921	4
2000	KY16967	590
2000	KY16968	355
2000	KY16969	129
2000	KY19000	2
2000	KY19547	920
2000	KY19583	709
1999	KY10670	6671
1999	KY10672	375
1999	KY10673	1
1999	KY16921	1
1999	KY16967	608
1999	KY16968	278
1999	KY16969	84
1999	KY19000	1
1999	KY19547	232
1999	KY19583	42
1998	KY10670	7771
1998	KY10671	4
1998	KY10672	503
1998	KY16967	489
1998	KY16968	260
1998	KY19000	9
1998	KY19583	12
1997	KY10670	7874
1997	KY10671	11

1997	KY10672	657
1997	KY10673	1
1997	KY16967	369
1997	KY16968	458
1997	KY16969	64
1997	KY19583	7
1996	KY10670	4513
1996	KY10671	4
1996	KY10672	575
1996	KY16967	540
1996	KY16968	186
1996	KY16969	89
1996	KY19547	13
1996	KY19583	19
1995	KY10670	5042
1995	KY10671	1
1995	KY10672	536
1995	KY16967	525
1995	KY16968	355
1995	KY16969	94
1994	KY10670	5562
1994	KY10671	4
1994	KY10672	712
1994	KY10675	1
1994	KY16967	584
1994	KY16968	181
1994	KY16969	108
1993	KY10670	4666
1993	KY10672	94
1993	KY10673	1
1993	KY10675	2
1993	KY16967	642
1993	KY16968	179
1992	KY10670	6797
1992	KY10672	162
1992	KY10673	1
1992	KY16967	515
1992	KY16968	92
1992	KY19000	1
1992	KY19583	2
1991	KY10670	2951
1991	KY10672	190
1991	KY16967	347
1991	KY16968	87
1991	KY16969	50
1990	KY10670	4646
1990	KY10672	54

1990	KY16967	431
1990	KY16968	414
1990	KY16969	50
1989	KY10670	7108
1989	KY10672	216
1989	KY10673	2
1989	KY16967	642
1989	KY16968	361
1989	KY16969	57
1988	KY10670	10798
1988	KY10672	119
1988	KY10675	14
1988	KY16967	594
1988	KY16968	937
1988	KY16969	107
1987	KY10670	11590
1987	KY10672	92
1987	KY10673	1
1987	KY10675	33
1987	KY16967	432
1987	KY16968	786
1987	KY16969	125
1986	KY10670	18373
1986	KY10672	61
1986	KY10675	35
1986	KY16967	341
1986	KY16968	1217
1986	KY16969	138
1985	KY10670	11700
1985	KY10672	32
1985	KY10675	5
1985	KY16967	190
1985	KY16968	1757
1985	KY16969	183
1984	KY10670	10622
1984	KY10672	30
1984	KY10675	62
1984	KY16967	30
1984	KY16968	1502
1984	KY16969	160
1983	KY10670	11133
1983	KY10672	27
1983	KY10675	34
1983	KY16967	168
1983	KY16968	1494
1983	KY16969	105
1982	KY10670	9481

1982	KY10672	20
1982	KY10673	1
1982	KY10675	92
1982	KY16967	107
1982	KY16968	1658
1982	KY16969	28
1981	KY10670	9305
1981	KY10672	9
1981	KY10673	4
1981	KY10675	26
1981	KY16967	107
1981	KY16968	542
1981	KY16969	36
1980	KY10670	11085
1980	KY10672	20
1980	KY10673	1
1980	KY10675	3
1980	KY16967	74
1980	KY16968	446
1980	KY16969	13
1979	KY10670	12339
1979	KY10672	20
1979	KY10673	2
1979	KY16967	69
1979	KY16968	339
1979	KY16969	35
1978	KY10670	10133
1978	KY10672	45
1978	KY10673	1
1978	KY16967	74
1978	KY16968	350
1978	KY16969	29
1977	KY10670	10569
1977	KY10672	24
1977	KY10673	2
1977	KY16967	74
1977	KY16968	176
1977	KY16969	7
1976	KY10670	9730
1976	KY10672	17
1976	KY10675	4
1976	KY16967	77
1976	KY16968	66
1976	KY16969	10
1975	KY10670	10944
1975	KY10672	6
1975	KY16967	230

1975	KY16968	198
1975	KY16969	12
1974	KY10670	8921
1974	KY10672	12
1974	KY10673	2
1974	KY10675	3
1974	KY16967	47
1974	KY16968	589
1974	KY16969	20
1973	KY10670	14303
1973	KY10672	7
1973	KY10673	5
1973	KY10675	1
1973	KY16967	54
1973	KY16968	473
1973	KY16969	18
1972	KY10670	11771
1972	KY10672	5
1972	KY10675	2
1972	KY16967	48
1972	KY16968	175
1972	KY16969	7
1971	KY10670	11669
1971	KY10672	1
1971	KY10675	4
1971	KY16967	84
1971	KY16968	263
1971	KY16969	12
1970	KY10670	9859
1970	KY10672	2
1970	KY10675	2
1970	KY16967	29
1970	KY16968	126
1970	KY16969	8
1969	KY10670	7607
1969	KY10673	1
1969	KY16967	13
1969	KY16968	77
1969	KY16969	4
1968	KY10670	6687
1968	KY10672	2
1968	KY10673	2
1968	KY10675	2
1968	KY16967	9
1968	KY16968	51
1968	KY16969	3
1967	KY10670	5275

1967	KY10672	2
1967	KY10673	3
1967	KY10675	1
1967	KY16967	1
1967	KY16968	30
1967	KY16969	6
1966	KY10670	4369
1966	KY10672	1
1966	KY10675	8
1966	KY16967	1
1966	KY16968	42
1966	KY16969	4
1965	KY10670	6292
1965	KY16967	65
1965	KY16968	101
1965	KY16969	2
1964	KY10670	5036
1964	KY10675	3
1964	KY16967	13
1964	KY16968	12
1964	KY16969	2
1963	KY10670	5198
1963	KY10675	6
1963	KY16967	37
1963	KY16968	36
1962	KY10670	5295
1962	KY10673	2
1962	KY10675	3
1962	KY16967	18
1962	KY16968	4
1962	KY16969	4
1961	KY10670	5517
1961	KY10672	1
1961	KY10673	1
1961	KY10675	6
1961	KY16967	4
1961	KY16968	65
1961	KY16969	5
1960	KY10670	5680
1960	KY10673	1
1960	KY10675	9
1960	KY16967	21
1960	KY16968	141
1960	KY16969	10
1959	KY10670	4523
1959	KY10673	1
1959	KY10675	8

1959	KY16967	14
1959	KY16968	20
1959	KY16969	1
1958	KY10670	2552
1958	KY10673	1
1958	KY10675	76
1958	KY16967	10
1958	KY16968	25
1958	KY16969	7
1957	KY10670	2794
1957	KY10672	2
1957	KY10673	2
1957	KY10675	59
1957	KY16967	12
1957	KY16968	31
1957	KY16969	9
1956	KY10670	3535
1956	KY10673	9
1956	KY10675	208
1956	KY16967	154
1956	KY16968	70
1956	KY16969	6
1955	KY10670	3590
1955	KY10673	1
1955	KY10675	207
1955	KY16967	22
1955	KY16968	18
1955	KY16969	3
1954	KY10670	5583
1954	KY10672	1
1954	KY10673	5
1954	KY10675	166
1954	KY16967	25
1954	KY16968	19
1954	KY16969	3
1953	KY10670	1273
1953	KY10675	26
1953	KY16967	4
1953	KY16968	26
1953	KY16969	3
1952	KY10670	1285
1952	KY10673	3
1952	KY10675	15
1952	KY16967	1
1952	KY16968	3
1952	KY16969	4
1951	KY10670	1479

1951	KY10673	1
1951	KY10675	28
1951	KY16968	17
1951	KY16969	5
1950	KY10670	3631
1950	KY10675	11
1950	KY16967	6
1950	KY16968	1
1949	KY10670	1519
1949	KY10675	9
1949	KY16967	1
1948	KY10670	2556
1948	KY10675	10
1948	KY16967	6
1947	KY10670	2652
1947	KY10675	11
1947	KY16967	7
1946	KY10670	874
1946	KY10675	1
1946	KY16967	4
1945	KY10670	57
1945	KY10671	2
1945	KY10673	1
1945	KY16967	1
1944	KY10670	1
1943	KY10670	5
1942	KY10670	9
1941	KY10670	88
1941	KY16968	1
1940	KY10670	112
1940	KY16969	1
1939	KY10670	108
1939	KY16967	1
1938	KY10670	37
1938	KY10675	2
1937	KY10670	18
1936	KY10670	19
1935	KY10670	6
1935	KY10671	2
1935	KY10672	5
1935	KY10673	12
1935	KY10675	2
1935	KY16967	2
1934	KY10670	46
1933	KY10670	1

ELECTRIC POWER RESEARCH INSTITUTE

Accuracy of Digital Electricity Meters

May 2010

An EPRI White Paper

Background

The meter is a critical part of the electric utility infrastructure. It doesn't provide a control function for the power system, but it is one of the most important elements from a monitoring and accounting point of view. Meters keep track of the amount of electricity transferred at a specific location in the power system, most often at the point of service to a customer. Like the cash-register in a store, these customer meters are the place where the transaction occurs, where the consumer takes possession of the commodity, and where the basis for the bill is determined. Unlike a cash-register, however, the meter sits unguarded at the consumer's home and must be trusted, by both the utility and the home owner, to accurately and reliably measure and record the energy transaction.

Electricity is not like other commodities because it is consumed in real-time. There is nothing to compare or measure later, nothing to return, nothing tangible to show what was purchased. This makes the meter all the more critical for both the utility and the homeowner. For this reason, meters and the sockets into which they are installed are designed to standards and codes that discourage tampering and provide means of detecting when it is attempted. Intentional abuses aside, the electricity meter itself must be both accurate and dependable, maintaining its performance in spite of environmental and electrical stresses.

In general, electricity meters have been able to achieve these goals and in so doing to earn the trust of utilities and homeowners alike. The average person may have experienced a broken-down car, a worn-out appliance, or a piece of electrical equipment that died in a lightening storm, but most don't likely recall their electricity meter ever failing. Such is the reliable legacy of the electromechanical meter.

Historical Perspective – The Electromechanical Meter

By anyone's assessment, traditional electromechanical meters are an amazing piece of engineering work. Refined over a hundred years, the design of a standard residential electricity meter became an impressive combination of economy, accuracy, durability, and simplicity. For this reason, electricity meters have been late in converting to solid state electronics, compared to other common devices.

Three phase commercial and industrial meters, being inherently more complex, were first to make the transition to solid state, beginning in the 1980s, and becoming the norm in the 1990s. As recently as the year 2000, however, some still questioned if and when the simpler residential meter would be replaced by a solid state version, and whether they could attain the same balance of economy and durability.

Now just a decade later, it is clear that this conversion has taken place. Over the last decade, major electricity meter manufacturers have introduced solid state models and discontinued electromechanical production as indicated in Figure 1. This transition diminished the value of both the facilities and the art of traditional meter making and opened the doors of the meter business to new companies.

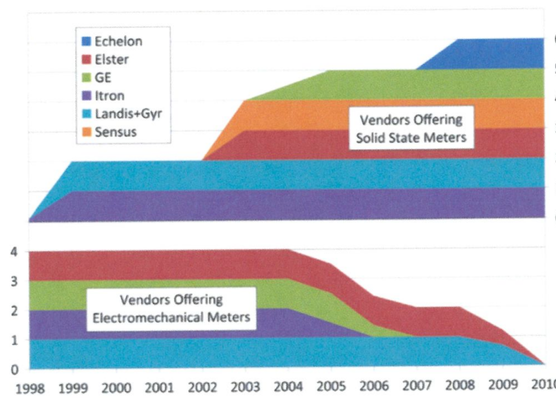

Figure 1 – Replacement of Electromechanical Meter Production with Solid State Versions

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This white paper was prepared by Brian Seal and Mark McGranaghan of Electric Power Research Institute.

Functionality, the Driving Factor for Change

The impetus that finally drove the transition to solid state metering was not cost reduction, nor improvements in service life or reliability, but the need for more advanced functionality. Electromechanical meters, with that familiar spinning disk, did a fine job of measuring total energy consumption, but became extremely complex if required to do anything more. Versions that captured peak demand and versions that measured consumption in multiple time-of-use (TOU) registers have existed, but were not economical for residential purposes.

Today, residential meters are expected to provide a range of measurements, with some including demand, TOU, or even continuous interval data. Some may also be required to keep a record of additional quantities like system voltage – helping utilities maintain quality of service in a world that includes fast-charging electric vehicles and solar generation. In many cases, these solid state meters also include communication electronics that allow the data they measure to be provided to the utility and to the home owner without requiring a meter reader to visit the site.

The Solid State Electricity Meter

Manufacturers who designed the first solid state residential meters understood the challenge they faced. The electromechanical devices they intended to replace held the trust of both utilities and the general public. Because dependable power delivery is critical for the economy, public safety and national security, utilities and regulators have been appropriately cautious in undertaking change. Manufacturers had to not only design a suitable replacement, but also to prove that the new meters could perform and be trusted.

From a utility perspective, several meter performance factors are of concern, including robustness, longevity, cost, and accuracy. But from the homeowner's perspective, the dominant concern is accuracy. If a meter breaks, the utility will fix it. If it becomes obsolete, it is the utility's problem to deal with. If however, a meter is inaccurate in the measurement of energy use, there is a potential that customers could be charged for more energy than they actually used. If the effect were only slight, then it could go undetected. For this reason, accuracy and dependability remain a common concern and a continued focus of dialogue regarding solid state meters.

Keeping in-step with the technology improvements associated with solid state metering, the American National Standards Institute (ANSI) developed new standards with more stringent accuracy requirements during the late 1990s. ANSI C12.20[1] established Accuracy Classes 0.2 and 0.5, with the Class numbers representing the maximum percent metering error at normal loads. Typical residential solid state electricity meters are of Class 0.5, whereas electromechanical meters were typically built to the less stringent ANSI C12.1 standards, as illustrated in Figure 2.[2] In addition, C12.20 compliant meters are required to continue to meter down to 0.1A (24 Watts), whereas C12.1 allowed metering to stop below 0.3A (72 Watts). While metering of such low loads is not likely significant on a residential bill, it is an accuracy improvement nonetheless.

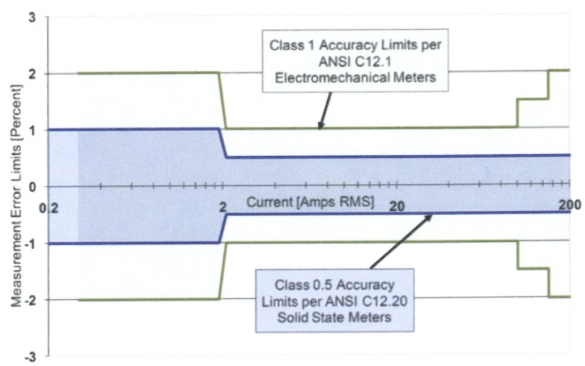


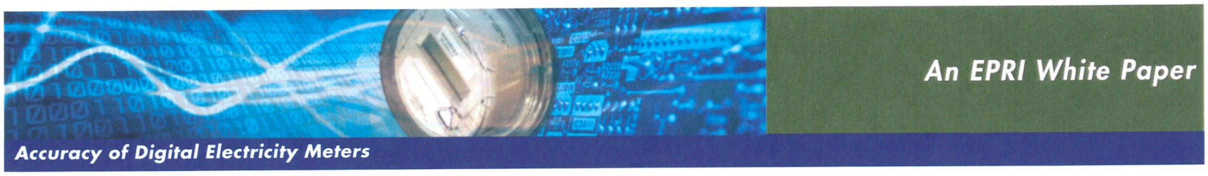
Figure 2 – Accuracy Class Comparison

Manufacturers and utilities use a range of tests and equipment to verify that meters adhere to the ANSI requirements. During the manufacturing process, it is common that each individual meter is calibrated and verified. Once a utility receives new meters, there is often another accuracy test, either on each meter or on a sample basis. States generally establish requirements for how utilities are to check accuracy when new meters are received and at intervals thereafter.

Regardless of their specified performance, solid state meters have been met with mistrust in some early deployments. The most significant of the complaints has been that the meters are simply inaccurate, resulting in higher bills. Given that these new meters are designed to the more stringent ANSI requirements, the factors that may lead to these observations and perceptions are important to understand.

1 American National Standards Institute, 1998, 2002, available from NEMA at http://www.nema.org/stds/c12-20.cfm

2 Data from Metering Standards ANSI C12.1-1988 and ANSI C12.20-2002



Factors in How Digital Meters May Be Perceived

Changes in Billing Periods

The duration of billing periods can vary from month to month, making it difficult to compare one month's bill to the next. If deployment of solid-state meters happens to correspond to a month with a billing period that is particularly long, then customers could incorrectly interpret the associated higher bill with the meter itself. An example of such a long billing period during new meter deployment occurred in January for many customers of Texas utility Oncor. Due to holidays, this billing period was as long as 35 days for some customers.

Complexity of Commissioning New Meters of Any Type

When meters are replaced, and automated reading is instituted, care must be taken to associate the new meter with the correct billing address. Automated tools and processes may be used to aid in this process and are important to guarantee that the right consumption is associated with each residence.

When a meter is replaced, the metering and billing process for that month is more complicated than usual. A closing read from the old meter has to be captured and the associated consumption added to that from the new meter to cover the full billing period. Although the meter replacement process is generally automated to minimize opportunity for human mistakes, the data-splicing process adds complexity and opportunity for error.

If such an error were unreasonably large, it would be recognized as such by both the homeowner and the utility. If, however, a small error occurred, it could be difficult to distinguish from real consumption. It is therefore hypothetically possible that a bill could be in error for the month when the meter replacement occurred, even if both the old and the new meter were accurate.

Connectivity and Estimation

Utility billing systems often have an estimating capability that can apply an algorithm to estimate a customer's bill until an actual read is collected. Historically, such estimation has been used when a manual meter read is missing and any errors in the estimation are corrected in the next bill.

When solid state meters are installed as part of an advanced metering infrastructure program, manual meter reading will halt as the automated process begins. New communication systems may not have good connectivity to every premise at first, so the number and frequency of estimated intervals may be elevated during the first few months after deployment. It is possible that such estimation could result in consumption from one month being billed in another, and hence more variation in bills.

Early Life Failures

Products of many kinds exhibit changes in failure rate over time. As illustrated in Figure 3, these changes often follow a familiar trend. More products tend to fail either very early or very late in the service life of individual devices, with the rate of failure stabilizing at a low level during most of the useful life of the product.

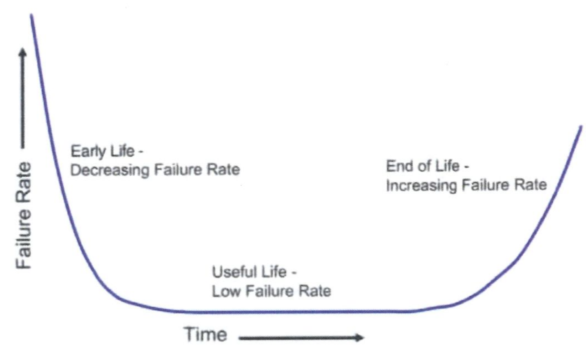
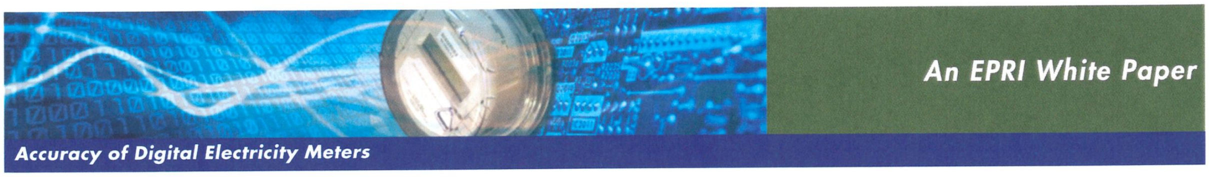


Figure 3 – The Failure Rate Bathtub Curve

Electricity meters are no exception. Both electromechanical and solid state meters have components and assemblies that can result in higher failure rates early in life, and wear-out after their useful life expires. A typical meter population is mature, is centered in the "useful-life" portion of the bathtub curve, and includes only a few new meters installed each year.

Today, the majority of solid state meters put into service are elements of advanced metering systems that are being mass deployed. These deployments can result in an entire meter population that is just a year or two old and therefore may experience sharply increased, but not unexpected, early-life-failure rates. If high registration were among the failure modes of a meter, then an exaggerated percentage of the population could experience higher bills during a new deployment.



Extraordinary Weather

Extraordinary weather can occur at any time. Both record cold winters and hot summers have occurred in North America in recent years and can result in electric bills that are higher than normal. If such events coincide with a deployment of solid-state meters, some may conclude that the new meter is the cause.

One example of how extraordinary weather can result in higher consumption of electricity relates to the use of electric heat pumps used to heat homes in moderate climate zones. These heat pumps, while normally much more efficient than resistive heating, are typically designed with a second stage of electric resistance heat which is triggered when the heat pump itself can no longer satisfy the indoor set point temperature. As outdoor temperature declines, this second stage is called for more frequently. As was the case in many parts of the U.S. this past winter, extreme cold causes abnormally high dependence on second-stage electric heat and in-turn, unusually high electric bills.

Growing Consumption

Average residential electricity consumption has risen for decades, with the addition of increasing numbers and types of electronic devices. Larger televisions, outdoor lighting, and new pools and spas are common additions that can result in notable increases in residential consumption. In other cases, faulty equipment can cause increases. Loss of refrigerant in an HVAC system or a duct that has fallen loose in an attic can cause devices to run excessively, unnoticed until exposed by an electric bill.

If these new purchases or equipment failures happen to coincide with a new electricity meter, one might assume that the resulting bill is the fault of the metering device.

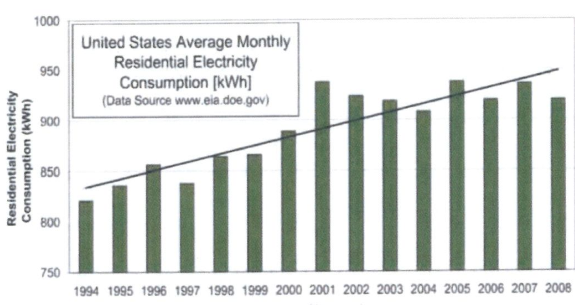


Figure 4 – Residential Electricity Consumption vs. Time

New Rate Structures

New meters may enable new rate structures such as time-of-use or critical peak pricing. These programs offer to make the grid more efficient by motivating consumers to use less energy during times of peak consumption and more when energy is readily available. The improvement in load factor allows for better utilization of assets and, in some cases, deferral of infrastructure upgrades.

While new rate structures may benefit customers on average, individual results depend on the degree to which the consumer heeds the high and low price periods. Customers who select time-based rate plans and do not modify their behavior accordingly could experience higher bills, even though lower bills were possible. Because the new rate plans may go into effect about the same time as a meter-replacement, homeowners could mistakenly associate increased bills with metering errors.

Replacing Defective Meters

Although electromechanical meters are extremely reliable, they do fail. The most common "failure" mode is reduced registration. Anything that increases the drag on the rotating disk can cause a meter to run slow, resulting in reduced bills. Worn gears, corrosion, moisture, dust, and insects can all cause drag and result in an electromechanical meter that does not capture the full consumption of the premise. Failure modes also exist that could cause an electromechanical meter to run fast, but are less common. Figure 5[3] illustrates this effect, based on the average registration versus years-of-service for a sample of 400,000 electromechanical meters.

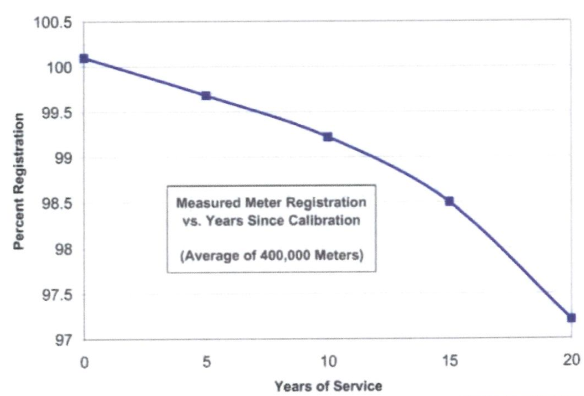
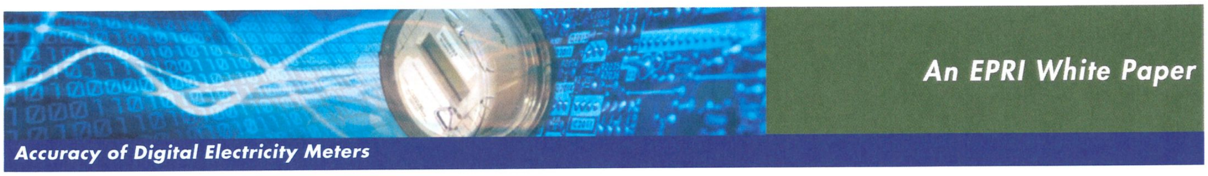
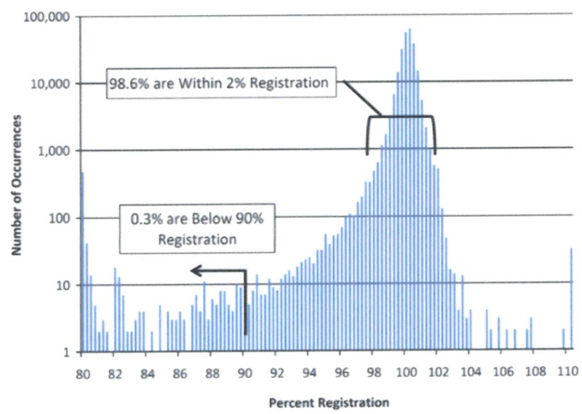


Figure 5 – Electromechanical Meter Registration Loss vs. Time

3 Data by permission from Chapman Metering, www.chapmanmetering.com



When all the meters in a service area are replaced, it is reasonable to expect that some of those taken out of service were inaccurate and running slow. Some may have gradually slowed over many years so that the homeowner never noticed and became accustomed to lower electricity bills. The sudden correction to full accounting and billing could naturally surprise these homeowners and result in questioning of a new meter. While the average meter might be only slightly slow, a few could be significantly so. As indicated in the distribution shown in Figure 6,[4] 0.3% of electromechanical meters tested registered less than 90% of actual consumption. Although 0.3% is small as a percentage, in a service area of a million meters, it represents 3,000 residences that might be under-billed by 10 to 20% prior to a new meter deployment.



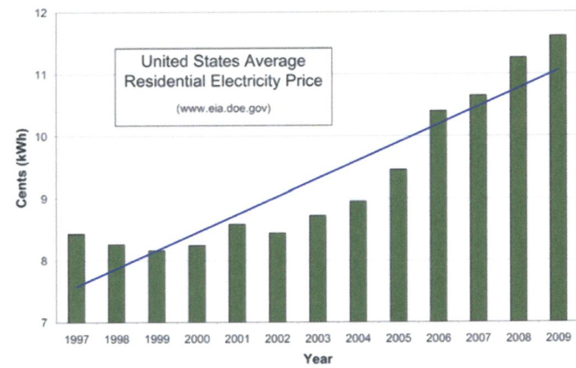
Note the Logarithmic Vertical Scale for Better Resolution

Figure 6 – Electromechanical Meter Registration Distribution

Rising Electricity Costs

Although not the case everywhere, basic energy rates have risen in most areas as a result of increased costs of generating electricity and increased costs of the infrastructure required to deliver electricity to the consumer. As indicated in Figure 7, the average residential electricity price in the United States has increased at an average rate of 0.3 cents per kilowatt-hour per year over the last 12 years. In the event that a rate increase coincides with a rollout of new meters, homeowners experiencing higher bills might conclude that their new meter is in error.

4 Data by permission from Chapman Metering, www.chapmanmetering.com



Note the Exaggerated Vertical Scale

Figure 7 – Average Residential Electricity Price vs. Time

Use of Embedded Software

Electromechanical meters utilized a set of gears and dials to keep a running count of how many times the disk rotated. This assembly, referred to as a "register," maintained a measure of the total power consumption that passed through the meter over time. Like a car's mileage odometer, each gear fed the next so that ten turns of the less significant dial were required to make one turn of the next. These registers had only one input, driven by the spindle of the meter's disk, and could not be moved from one reading to another by any other mechanism. Although simple and mechanical, the result was like a vault, locking-in and protecting the reading of cumulative consumption and immune to sudden shift or loss of data.

Solid state electronic meters are designed to provide this same register function, but using embedded software and non-volatile memory chips as the storage mechanism. Even before the recent deployment of "smart meters," millions of solid state meters have been deployed by utilities since the 1990s and the accuracy of their registration has not been an issue.

Still, as electronic devices, there is the possibility of imperfections in the embedded software or sensitivities in the electronic circuitry. Hypothetically, such imperfections or sensitivities could result in glitches that could affect the meter reading. An error of this nature that occurred only rarely would be difficult to detect prior to field deployment.

With electromechanical meters, modes of failure tend to be permanent. Once a meter or its register fails, due to wear, dust, etc, it is

generally still found to be in a failed state when tested later. Software flaws, on the other hand, could create a transient glitch, leaving a meter that checks-out perfectly afterwards. This possibility complicates the diagnostic process for solid state meters and may make it difficult to discern the root cause of problems.

If it were to occur, the effect of a glitch in a solid state meter or in an AMI system may be mitigated using interval data. Typically, the homeowner's consumption is measured in individual time intervals, such as 15 minutes or 1 hour. This interval data is typically collected by the utility every few hours or daily. Verification of data is thereby made simple because the sum of the entries in each time interval must add up to the total. If a meter's aggregate reading were to suddenly shift, or if a single interval suggested an unrealistic level of consumption, then validation, estimation, and editing software in the utility office could automatically identify the problem and either correct it or flag the issue for customer service.

Voltage Transient Susceptibility

The electronic circuits of solid state meters connect to the AC line to draw operating power and to perform voltage measurement. Although the line voltage is nominally regulated to a stable level, such as 240VAC, transients and surges can occur during events such as electrical storms. A range of electronic clamping and filtering components are used to protect the electronics from these voltage surges, but these components have limitations. The ANSI C12.1 metering standard specifies the magnitude and number of surges that meters must tolerate. In addition, some utilities have instituted surge withstand requirements for their meters that exceed the specification. In any case, surges that exceed the tested limits, either in quantity or magnitude, could cause meter damage or failure.[5]

Electromechanical meters had no digital circuitry. They utilized spark-gaps to control the location of arc-over and to dissipate the energy of typical voltage events. As a result, they were generally immune to standard surge events. This nature is evidenced in the section of ANSI C12.1 that specifies voltage surge testing, but allows that "This test may be omitted for electromechanical meters and registers."[6]

Summary

Electromechanical meters are dependable products that have served society well. Over a hundred years, their design was optimized so that they provided an excellent combination of simplicity and reliability while providing a single measurement - cumulative energy consumption. Unfortunately, these products did not support the additional functionality needed to integrate customers with a smart grid, such as time of use and real time prices, a range of measured quantities, communication capability, and others.

For these utilities, the transition to solid-state electric meters is therefore not one of choice, but of necessity. Due in part to the large number of announced AMI programs, many homeowners in the United States will likely see their electromechanical meter replaced by a solid-state electronic device in the next five to ten years. During such a transition, there will likely be both real and perceived issues with solid-state designs that need addressing. Care must be taken to consider each case thoroughly and to use sound diagnostic practices to trace each issue to its root cause. Temptations to either blame or exonerate the solid state meter must be resisted. Ideally, each investigation should not only resolve any homeowner concerns, but also discover any product imperfections so that solid-state meter designs may be continually improved. When advanced metering functions are needed, reverting to electromechanical meters is not a viable option.

5 *Testing and Performance Assessment for Field Applications of Advanced Meters*, EPRI, Palo Alto, CA. 2009. 1017833

6 ANSI C12.1-2001, Section 4.7.3.3 Test No. 17: *Effect of High Voltage Line Surges*

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Smart Distribution Applications and Technologies (Program 124)

1020908

May 2010

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From: Galuska, Tom <tom.galuska@xyleminc.com>
Sent: Thursday, February 13, 2020 10:19 AM
To: Overton, Bruce W <bruce.overton@eversource.com>
Cc: Genardo, Kim <kim.genardo@xyleminc.com>
Subject: RE: Request for assistance - Sensus retrofit ERTs

Bruce,

Sensus has never sold ERTs as we have our own radios that we market. Our meter manufacturing facility does install ERTs on new meters but those ERTS are provided by the end customer or Itron for installation on new meters.

Tom

Thomas Galuska
Senior Product Manager | **Sensus** | **Xylem**
O: +1.919.376.2641 | M: +1.412.327.7972
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LinkedIn | Twitter | YouTube | Facebook | Instagram | 3D Tour

From: Overton, Bruce W [mailto:bruce.overton@eversource.com]
Sent: Thursday, February 13, 2020 9:27 AM
To: Galuska, Tom <tom.galuska@xyleminc.com>
Cc: Genardo, Kim <kim.genardo@xyleminc.com>
Subject: RE: Request for assistance - Sensus retrofit ERTs

Thanks Tom. My inquiry is seeking support of our rebuttal to the claim from another party in the Rate Case proceedings. That claim is that in 2013 when we opted to replace our entire mechanical meter population with new AMR meters we should have instead opted to install retrofit ERTs in that population of meters. We are an Itron customer and Itron has already provided us a good deal of information supporting our initial rebuttal to the claim, which is that retrofit ERTs were not an option in 2013 as they ceased to be manufactured in 2005 and they were no longer sold or installed in mechanical meters by 2013. The claimant then responded that Sensus sold them at that time and he even provided that the cost of the unit plus it's installation in a mechanical meter was about $5. Itron does not believe this is true, but cannot speak for Sensus. So I reached out to Sensus and Xylem to try to establish the facts. If you can either confirm or deny that in 2013 Sensus had the ability and would have sold and installed retrofit ERTs into Itron mechanical meters that would be what I am looking for. If a phone conversation would be helpful I'd be happy to arrange that, just let me know.

Thank you.

Bruce

Bruce Overton PMP
Senior Business Project Manager
Eversource
Office: NH (603) 634-2473
Cell: (603) 396-4866
Email: bruce.overton@eversource.com

High Level Estimated Capital Costs for full AMI deployment and Opt-Out TVR billing

AMR vs Retrofit ERT Costs

Cost Category	General/Generic Functionality of Costs Category	2015 MA From MA Grid Mod filing 1,400,000 Meters	2018 CT From Internal Draft Analysis 1,200,000 Meters	2013 NH From AMR Project Business Case 552,000 Meters AMI Estimated Costs	2013 NH From AMR Project Business Case 552,000 Meters AMR Estimated Costs	2013 NH 552,000 Meters ERT MINIMUM POTENTIAL Estimated Costs	ERT Notes		
Meters	Physical devices. Needed to provide interval based metered usage data	$181,802,000	$192,681,542	$75,364,000	$26,801,000	$1,400,000	**Still have some new meter purchase cost.** Initial purchase of a minimum 35,000 "seed stock" meters.		35,000 * $40
ERTs	Physical devices. Installed in existing devices and configured to transmit monthly consumption reading via RF	N/A	N/A	N/A	Not Estimated	$35,162,400	**Increases** by $8.3M over AMR meter purchase costs. 552,000 meters * $63.70 per meter installed (minimum estimated cost)	$63.70	$48 per ERT $15.70 per ERT for retrofit Note: We paid $32.25 per AMR meter
Remote Disconnect Switch	Physical devices. A specific type of specialized meter.	N/A	N/A	N/A	$740,000	$0	**Functionality no longer available**, and therefore manual reset visit reqiuired to all 48,000 Demand meters each month and no ability to perform "curb side" remote disconnects.		
Meter Installation	Labor, materials, equipment, transportation, warehousing sometimes software. Needed to get new meter from warehousing to installed at service location including return and retirement of old meter.	$29,830,000	Included in "Meters"	$9,172,000	$9,172,000	$12,863,500	**Increases** by estimated $3.7M as it would be Itron's original contract cost **PLUS** the additional costs of round-trip packaging and shipping of 550,000 meters NH to NC for retrofit work.	$3,691,500	552,000 meters / 96 meters per pallet = 5,750 pallets. $200-$250 per pallet one-way averages to $450 per pallet round-trip. $450 * 5,750 = $2,587,500 $2/meter for packaging/handling round trip 552,000 meters = $1,104,000 Total additional installation services costs would be estimated to be $3,691,500 Note: One-Way shipping for new/purchased meters is covered in the price of the meter.
Meter Acceptance Testing	Labor. Standard process to test % of all manufacturer lots for functionality and accuracy.	$5,481,000	Included in "Meters"	$2,238,000	$2,238,000	$2,760,000	**Increases** by estimated $522,000 as 10% of shipments are normally tested upon delivery from vendor and we'd likely increase the percentage due to the retrofit and mechanical meter testing also takes longer than solid state testing.		$40 per AMR meter, $50 per ERT retrofitted meter
Field Communication Equipment	Physical devices and service provider fees. Needed to communicate with AMI meters and transport data from meters to utility IT systems.	$8,500,000	$69,885,068	$25,000,000					
Hardware Testing	Labor. I suspect this would be testing all of the Field Communication equipment and communication paths.	$1,450,000	Not Estimated	Not Estimated					
IT/Systems**		$500,000,000	$134,964	$25,000,000	$845,000	$870,000	**Increase**s by estimated minimum $25,000 to automate "marrying" ERT serial numbers to meter serial numbers in Meter Asset Management System (Power Track) from delivery data supplied by Itron.		
Service Orders	Labor, perhaps hardware and software contracts. Needed to conduct all new meter installations, old meter retirements, and all meter visits/maintenance following installation.	$4,000,000	Not Estimated	Not Estimated	Not Estimated	Not Estimated			
Data Collection/Head End System	Hardware, software contracts, labor. Needed to collect data delivered from meters/field communication equipment.	$6,000,000	$15,122,510	Not Estimated	Not Estimated	Not Estimated			
Data Management & Storage (MDM)	Hardware, software contracts, labor. Needed to manage and process raw meter data and prepare it to be sent to billing systems.	$100,000,000	$47,357,749	Not Estimated	Not Estimated	Not Estimated			
Billing System (New)	Hardware, software contracts, labor. Needed to bill interval meter data and time varying rates.	$373,000,000	Not Estimated	$25,000,000	Not Estimated	Not Estimated			
Billing System (Integration)	Labor primarily, may include software contracts and potentially even hardware. Needed to support continued communication between the new billing system and all of the many peripheral systems which interact with customer and billing information.	Not Estimated	$40,845,418	Not Estimated	Not Estimated	Not Estimated			
Cyber Security	Labor, software contracts, perhaps hardware. Needed to secure customer data from meter to bill.	$10,000,000	$21,160,508	Not Estimated	Not Estimated	Not Estimated			
Customer Data Presentment	Labor, potential software contracts and perhaps even hardware. Needed to make interval data information available to customers via self-service.	$6,000,000	$10,477,838	Not Estimated	Not Estimated	Not Estimated			
Customer Communications	Labor, materials. Needed to proactively inform and educate customers of numerous and varied aspects of the project and change that will impact them in one way or another.	$1,000,000	Not Estimated	Not Estimated	Not Estimated	Not Estimated			
Project Management	Labor. Resources required to plan, manage, monitor and communicate on all aspects of the project and it's many resources and costs.	$21,711,000	Not Estimated	$471,000	$471,000	$471,000	No change		
Organizational Change Management	Labor and materials. Needed to support planned and communicated business process change across the numerous business areas affected by the project.	$32,567,000	Not Estimated	Not Estimated	Not Estimated	Not Estimated			
Stranded Costs	Financial Statement. This represents existing infrastructure investments which will become redundant based on depreciation schedules for capital investments.	$165,000,000	$69,900,000	Not Estimated	Not Estimated	Not Estimated			
Total		**$946,341,000**	**$467,430,632**	**$137,245,000**	**$40,267,000**	**$53,526,900**	**25%**	**<== Project Cost Increase**	

**All In, "Opt-In TVR" IT numbers shown below

Service Orders	$1,000,000
Data Collection	$3,000,000
Data Management & Storage (MDM)	$39,000,000
"Bolt On" Complex Billing System	$26,000,000
Cyber Security	$5,000,000
Customer Data Presentment	$3,000,000
Customer Communications	$1,000,000
Total	**$78,000,000**

7/30/2012

AEP Ohio to Install Automated Meter Reading Equipment throughout Service Territory

CANTON, Ohio, July 30, 2012 – Approximately 204,000 AEP Ohio customers throughout the service territory will receive updated electric meters over the next several months as the company expands the use of automated meter reading (AMR) technology. AMR technology provides a means of reading electric meters remotely.

The company will install radio frequency (RF) meters that send information over radio waves making it possible for meter readers to gather meter information remotely using either a handheld device or a vehicle mounted mobile unit. AMR meters only transmit meter readings which are collected by the meter reader remotely unlike Smart meters which use two-way communications to receive and transmit information between the meter and the utility on a continuous basis.

"The main purpose of installing the AMR meters is to increase meter reading percentages across AEP Ohio service territory and reduce the number of estimated bills. In addition, the decision to strategically increase the use of AMR technology will provide a safer work environment for AEP Ohio employees," said Doug Ickes, AEP Ohio's Manager of Meter Revenue Operations.

The project will start at the beginning of August and should be completed by the end of the first quarter in 2013. AEP Ohio is partnering with Metadigm for the installation of meters across the AEP Ohio service territory. Meter installations will be conducted Monday through Saturday between the hours of 7:00 a.m. and 5:30 p.m. and should go virtually unnoticed by customers. Customers will be notified by mail if their meter will be replaced and a door hanger will be left when the installation is complete.

For more information regarding the Automated Meter Reading (AMR) project, contact our 24 hour Customer Solution Center at 1-800-672-2231 or visit our website at https://aepohio.com/info/projects/AMR/ .

AEP Ohio provides electricity to nearly 1.5 million customers of major AEP subsidiaries Columbus Southern Power Company and Ohio Power Company in Ohio, and Wheeling Power Company in the northern panhandle of West Virginia. AEP Ohio is based in Gahanna, Ohio, and is a unit of American Electric Power.

# # #

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The Smart Meter Landscape: 2012 and Beyond

The GTM Scott AMI Market Tracker finds Itron, Silver Spring Networks and Sensus jockeying for top North American smart meter share.

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Who has networked the most smart meters in North America?

We've got a lot more clarity into the different ways one could go about answering that question, with the launch of the GTM Scott AMI Market Tracker. The smart grid market service takes a deep dive into the raw numbers of North American smart meter communications deployments, starting with Monday's launch (http://www.greentechmedia.com/articles/read/ami-vendors-ship-3.2-million-units-in-q1-

2012/) of collected figures through the first quarter of 2012.

So, who's winning? The answer to that question, according to the latest and greatest numbers, is 'It depends.'

Let's take the category that most smart grid industry watchers are talking about when they use the term "smart meter." That's an electric meter that's capable of full two-way communications, rather than the older, one-way communicating digital meters known as AMR (automated meter reading).

As for the two-way communicating electric meters, known under the term AMI (advanced metering infrastructure), the current leader in North American deployments is not one of the legacy metering companies, but startup Silver Spring Networks (http://www.greentechmedia.com/articles/read/silver-spring-brings-new-smart-grid-partners-on-board/). As of the first quarter of 2012, the Redwood City, Calif.-based company held a 23 percent market share, leading North American metering heavyweights Itron, at 20 percent, and Sensus, at 19 percent, respectively.

That's quite a feat for the 10-year-old company, which builds networking technology that goes into meters built by other vendors and has landed major deployments with big utilities like Pacific Gas & Electric, Florida Power & Light, Pepco, Oklahoma Gas & Electric (http://www.greentechmedia.com/articles/read/oklahoma-gas-electric-is-not-scared-of-the-home/), Commonwealth Edison (http://www.greentechmedia.com/articles/read/silver-springs-comed-project-4-million-endpoints/) and Progress Energy (http://www.greentechmedia.com/articles/read/distributech-roundup-silver-spring-lands-progress-saic-and-c3-join-forces-a/). Right now it is connecting 22 million meters deployed or under contract, putting it far ahead of other companies that provide similar third-party communications services, such as Trilliant (http://www.greentechmedia.com/articles/read/trilliant-lands-smart-grid-foothold-in-asia/) and SmartSynch (http://www.greentechmedia.com/articles/read/itron-buys-smartsynch/).

The question for Silver Spring is whether it can turn that market share into a profitable (http://www.greentechmedia.com/articles/read/silver-spring-brings-new-smart-grid-partners-on-board/) and growing business. The company has continued to report growing revenues and shrinking losses in the 11 months since it filed plans for an IPO, but it still hasn't pulled the trigger on those plans.

In the meantime, we've got a very different set of North American market leaders when it comes to networking both AMI and AMR electric meters. According to Monday's report, the leader in that category is Itron, the Liberty Lake, Wash.-based metering giant, with more than 46.6 million units in the field as of the first quarter of 2012.

That's nearly twice the deployments of Landis+Gyr, with 23.4 million units, and far ahead of third-place Aclara, a subsidiary of Esco Technologies that's an important contender in North America. Silver Spring's 11.9 million meter chipsets puts it in fourth place in these terms.

Of course, measuring total installed base isn't a good measure of who's been installing the most smart meters lately. In those terms, Itron, which fell behind Silver Spring in annual deployments in 2009, has seen its share pick up in recent years, and retained its lead in the first quarter of 2012.

In second place for the quarter, and among the top three contenders for the past few years, is Sensus, the Raleigh, N.C.-based (http://www.greentechmedia.com/articles/read/from-smart-meters-to-streetlights-sensus-expands-its-network/) metering company with a point-to-multipoint networking topology that differs from the mesh-based networking that Silver Spring and most of its North American competitors rely on. Sensus may be for sale, according to anonymous reports (http://www.greentechmedia.com/articles/read/is-sensus-for-sale/) from October. The company has declined to comment on the report, which set an $800 million to $1 billion price tag for the privately held company.

Another big meter maker that's definitely for sale is Elster (http://www.greentechmedia.com/articles/read/elster-confirms-talks-of-2.3b-aquisition/), the publicly traded German electric, gas and water metering company, which is seeking $2.3 billion for a sale of its assets from majority owner CVC Capital to Melrose PLC (http://www.melroseplc.net/Homepage.html), a British buyout firm. Speculation that a massive grid company like Siemens (http://www.greentechmedia.com/articles/read/siemens-competitors-snapping-up-smart-grid-software/) or ABB may be in the market (http://www.greentechmedia.com/articles/read/abb-ceo-automation-controls-are-next-targets-for-acquisition/) for one or another metering giant has been rampant since last year's $2.3 billion acquisition of Landis+Gyr by Toshiba (http://www.greentechmedia.com/articles/read/as-rumored-toshiba-buys-landis-gyr-for-2.3b-cash/), with Itron and San Jose, Calif.-based Echelon names as some more potential targets.

It's important to note that these new deployments are on a downward trend. Monday's report projects that 13.2 million smart meters will be shipped by the end of 2012, compared to 13.5 million in 2011 and 15.7 million in 2010. That's not surprising, considering that the billions of dollars in stimulus funding for smart grid projects, which helped boost investment to record levels in the past few years, has largely been spent. Even so, there's room for growth. Monday's report estimated that 62 million of the 145 million electric meters in the United States will be "smart" by the end of 2012, leaving more than half of the country awaiting upgrade eventually.

At the same time, water and natural gas utilities need smarter meters as well, and annual deployment figures have been growing, not shrinking, over the past several years. Neptune and Badger, two smart water meter vendors, are among the report's top-ten vendors, alongside AMI/AMR meter providers like Itron, Elster and Sensus. These companies also network gas meters, along with Landis+Gyr and

Aclara.