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# Minimizing Operating Costs

# Your questions please?

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Questions

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# Agenda

- Short discussion with panelists
- Round table discussion with attendees
  - We can unmute for audio, but can also handle typed input
  - We want your thoughts, ideas, comments or questions!
  - What you've done, what you'd like to do, questions on how to do something.

# Ideas for things to discuss

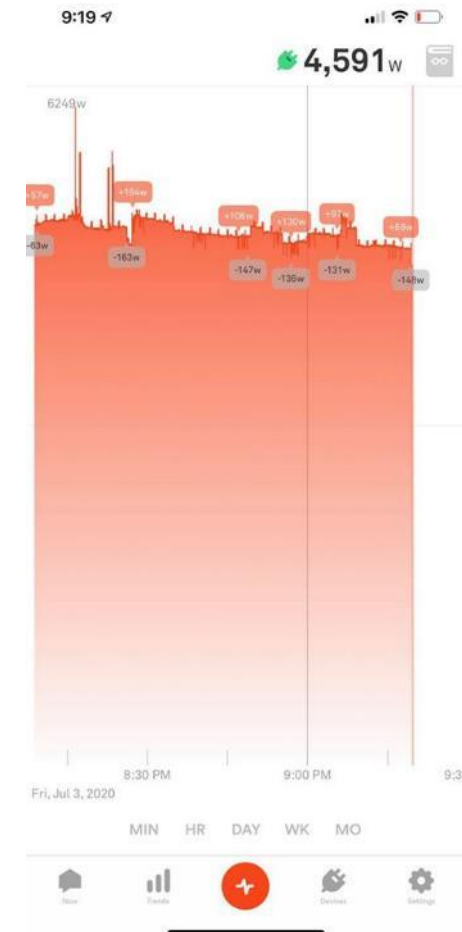
- **ROI**
  - New vs existing
  - How to tell which works
- **Simple Things**
  - Incremental gains
- **AM vs FM vs FM+HD**
  - MDCL
  - Cost of Operation
  - Spectral Optimization
- **Other thoughts**
  - How to cut costs and maintain quality

# Do an Audit

You can't begin to sort out where to save money if you don't know where you're spending it!



Sense Energy Monitor, from [amazon.com](https://www.amazon.com)

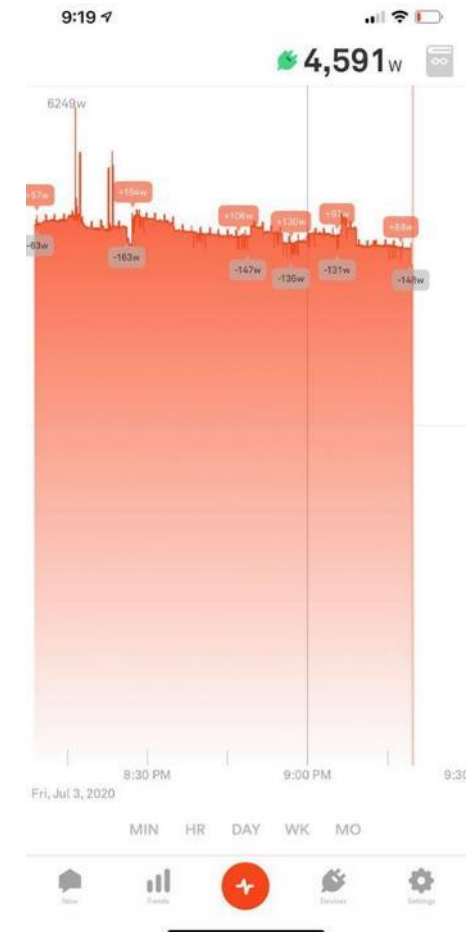


# Do an Audit

You can't begin to sort out where to save money if you don't know where you're spending it!



Sense Energy Monitor, from [amazon.com](https://www.amazon.com)



# Start at the top

LEDs vs incandescent  
Strobes vs beacons





# Compare Options

## FM Transmitter Cost Comparison

Prepared By: Jeff Welton for MTI2016

Date: 21-Jun-16



### Required Information (complete the yellow shaded areas)

	Existing tx:	BTA-5	Proposed tx:	NX5
Day Power		5 kW		5 kW
for		24 hrs/day		24
Overall Efficiency		40 percent		86 percent
Base Electricity cost		11.5 cents/kWh		11.5 cents/kWh
Parts Cost (incl. Labor)		\$3,000.00 per year		\$450.00 per year

### Calculated Power Consumption and Costs

Power Consumption (in kWh)	BTA-5	Cost	NX5	Cost	Cost Savings:
per month:	9,900	\$1,138.50	4,605	\$529.53	\$608.97
per year:	118,800	\$13,662.00	55,256	\$6,354.42	\$7,307.58
over 5 years:	594,000	\$68,310.00	276,279	\$31,772.09	\$36,537.91
over 10 years:	1,188,000	\$136,620.00	552,558	\$63,544.19	\$73,075.81
over 15 years:	1,782,000	\$204,930.00	828,837	\$95,316.28	\$109,613.72

Parts cost per year:	\$3,000.00	\$450.00	\$2,550.00
5 yr cost:	\$15,000.00	\$2,250.00	\$12,750.00
10 yr cost:	\$30,000.00	\$4,500.00	\$25,500.00
15 yr cost:	\$45,000.00	\$6,750.00	\$38,250.00

### Total Projected Cost of Operation:

	BTA-5	NX5	Savings Realized:
Year 1	\$16,662.00	\$6,804.42	\$9,857.58
Year 2	\$33,324.00	\$13,608.84	\$19,715.16
Year 3	\$49,986.00	\$20,413.26	\$29,572.74
Year 4	\$66,648.00	\$27,217.67	\$39,430.33
Year 5	\$83,310.00	\$34,022.09	\$49,287.91
Year 6	\$99,972.00	\$40,826.51	\$59,145.49
Year 7	\$116,634.00	\$47,630.93	\$69,003.07
Year 8	\$133,296.00	\$54,435.35	\$78,860.65
Year 9	\$149,958.00	\$61,239.77	\$88,718.23
Year 10	\$166,620.00	\$68,044.19	\$98,575.81



# Audit Communications

Lots of stations are paying for POTS and T1 lines they aren't using.



# Cost of Services vs Repair

Usually maintenance  
is less expensive





# AM MDCL



# AM MDCL

File Home Insert Page Layout Formulas Data Review View Help																									
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A1 Dir ID																									
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	Dir ID	Rec ID	Point Nun	Tx ID	Call Sign	Tx Freque	Measuren	Radial	Pattern	Initials	Note	Meas. Poi	UTC Time	Local Time	Harmonic	RF Source	GPS Valid	Latitude	Longitude	Elevation	Fld Str 1	Units 1	Fld S		
2																									
3	0	0	72	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 19:30	2019-09-15 15:30		1 Loop Ant	TRUE	43.12608	-115.451	1054	62.7	dBuV/m			
4																									
5	1	1	73	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 19:31	2019-09-15 13:31		1 Loop Ant	TRUE	43.12608	-115.451	1055	62.6	dBuV/m			
6																									
7	2	2	74	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 19:31	2019-09-15 13:31		1 Loop Ant	TRUE	43.12608	-115.451	1054	62.8	dBuV/m			
8																									
9	3	3	75	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 19:31	2019-09-15 13:31		1 Loop Ant	TRUE	43.12608	-115.451	1055	62.6	dBuV/m			
10																									
11	4	4	76	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 19:39	2019-09-15 13:39		1 Loop Ant	TRUE	43.12608	-115.451	1055	62.8	dBuV/m			
12																									
13	5	5	77	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 19:39	2019-09-15 13:39		1 Loop Ant	TRUE	43.12608	-115.451	1055	62.8	dBuV/m			
14																									
15	6	6	78	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 22:47	2019-09-15 16:47		1 Loop Ant	TRUE	44.34261	-116.889	784	59.8	dBuV/m			
16																									
17	7	7	79	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-15 22:49	2019-09-15 16:49		1 Loop Ant	TRUE	44.34259	-116.889	785	60.1	dBuV/m			
18																									
19	8	8	80	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-16 16:29	2019-09-16 10:29		1 Loop Ant	TRUE	43.51736	-116.343	826	115	dBuV/m			
20																									
21	9	9	81	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-16 16:37	2019-09-16 10:37		1 Loop Ant	TRUE	43.51728	-116.341	827	118.2	dBuV/m			
22																									
23	10	10	82	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-16 21:47	2019-09-16 15:47		1 Loop Ant	TRUE	43.51728	-116.341	826	112	dBuV/m			
24																									
25	11	11	83	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-16 22:59	2019-09-16 16:59		1 Loop Ant	TRUE	43.08714	-115.609	953	61.8	dBuV/m			
26																									
27	12	12	84	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-16 23:21	2019-09-16 17:21		1 Loop Ant	TRUE	43.12608	-115.451	1053	59.3	dBuV/m			
28																									
29	13	13	85	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-16 23:35	2019-09-16 17:35		1 Loop Ant	TRUE	43.06798	-115.441	977	55.5	dBuV/m			
30																									
31	14	14	86	3	KFXD	630	630	227.6	Dy	CTC		6 --	2019-09-17 15:03	2019-09-17 9:03		1 Loop Ant	TRUE	43.06798	-115.441	977	57.8	dBuV/m			
32																									
33	15	15	87	3	KFXD	630	630	227.6	Dv	CTC		6 --	2019-09-17 15:25	2019-09-17 9:25		1 Loop Ant	TRUE	43.068	-115.441	980	52.7	dBuV/m			
Boise_Testing_PI4100_Data_18SEP																									

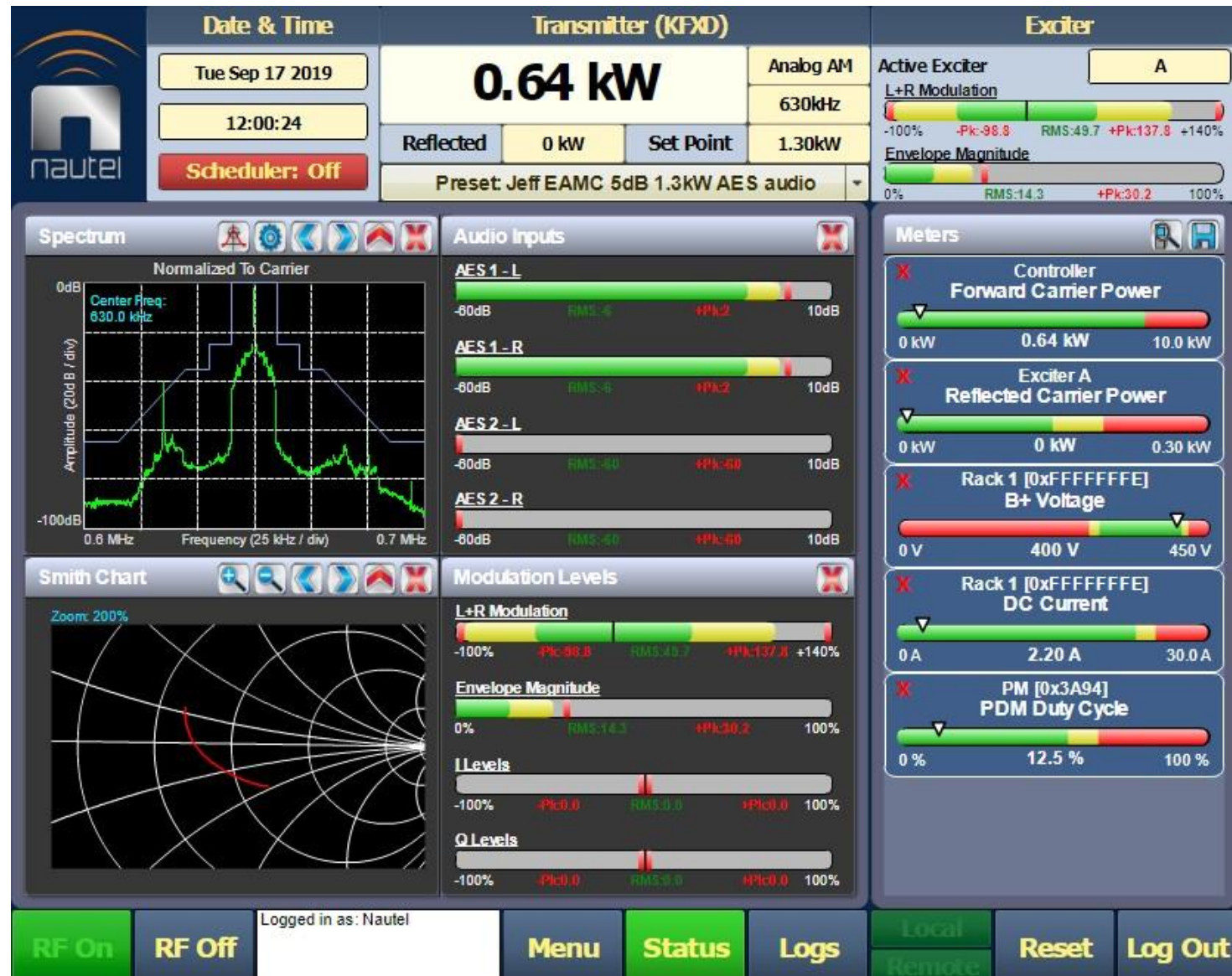




# AM MDCL

R3																																
S(SUM)																																
	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1	Date	Time	V12	Unit	V23	Unit	V31	Unit	A1	Unit	A2	Unit	A3	Unit	P(SUM)	Unit	S(SUM)	Unit	Q(SUM)	Unit	PF(SUM)	Unit	PFH	Unit	WH	Unit	SH	Unit	QH	Unit	FREQ	Unit
2	2019-09-16	19:26:10	209.9	ACV	209	ACV	210.3	ACV	12.33	ACA	12.1	ACA	11.87	ACA	3.757	KW	4.392	KVA	2.275	KVAR	0.85		0.86		0.78	KWH	0.904	KVAH	0.471	KVARH	60	Hz
3	Date	Time	V12	Unit	V23	Unit	V31	Unit	A1	Unit	A2	Unit	A3	Unit	P(SUM)	Unit	S(SUM)	Unit	Q(SUM)	Unit	PF(SUM)	Unit	PFH	Unit	WH	Unit	SH	Unit	QH	Unit	FREQ	Unit
4	2019-09-17	8:33:47	207.6	ACV	207.2	ACV	208.6	ACV	16.23	ACA	15.8	ACA	15.7	ACA	5.017	KW	5.724	KVA	2.755	KVAR	0.87		0.88		0.287	KWH	0.324	KVAH	0.161	KVARH	60	Hz
5	2019-09-17	8:33:51	207.5	ACV	207.1	ACV	208.8	ACV	15.45	ACA	17.3	ACA	15.04	ACA	5.046	KW	5.732	KVA	2.717	KVAR	0.88		0.88		0.292	KWH	0.33	KVAH	0.164	KVARH	60	Hz
6	2019-09-17	8:33:55	207.8	ACV	207.3	ACV	208.7	ACV	14.11	ACA	15.36	ACA	13.46	ACA	4.511	KW	5.149	KVA	2.484	KVAR	0.87		0.88		0.297	KWH	0.336	KVAH	0.167	KVARH	60	Hz
7	2019-09-17	8:33:59	207.6	ACV	207.2	ACV	208.5	ACV	15.31	ACA	15.67	ACA	14.55	ACA	4.783	KW	5.458	KVA	2.628	KVAR	0.87		0.88		0.303	KWH	0.342	KVAH	0.17	KVARH	60	Hz
8	2019-09-17	8:34:03	207.5	ACV	207.3	ACV	208.6	ACV	14.84	ACA	15.77	ACA	14.2	ACA	4.689	KW	5.374	KVA	2.627	KVAR	0.87		0.88		0.308	KWH	0.349	KVAH	0.173	KVARH	60	Hz
9	2019-09-17	8:34:07	207.5	ACV	207.1	ACV	208.6	ACV	15.61	ACA	15.95	ACA	15.09	ACA	4.912	KW	5.59	KVA	2.669	KVAR	0.87		0.88		0.314	KWH	0.355	KVAH	0.176	KVARH	60	Hz
10	2019-09-17	8:34:11	207.5	ACV	207	ACV	208.5	ACV	15.61	ACA	14.34	ACA	13.7	ACA	4.476	KW	5.089	KVA	2.421	KVAR	0.87		0.88		0.319	KWH	0.361	KVAH	0.179	KVARH	60	Hz
11	2019-09-17	8:34:15	207.6	ACV	206.9	ACV	208.6	ACV	16.12	ACA	15.7	ACA	15.53	ACA	4.969	KW	5.676	KVA	2.742	KVAR	0.87		0.88		0.324	KWH	0.367	KVAH	0.182	KVARH	60	Hz
12	2019-09-17	8:34:19	207.5	ACV	207	ACV	208.6	ACV	16.66	ACA	14.67	ACA	13.35	ACA	4.696	KW	5.356	KVA	2.575	KVAR	0.87		0.88		0.33	KWH	0.373	KVAH	0.184	KVARH	60	Hz
13	2019-09-17	8:34:23	207.5	ACV	207.2	ACV	208.6	ACV	15.31	ACA	15.69	ACA	14.78	ACA	4.796	KW	5.488	KVA	2.666	KVAR	0.87		0.88		0.335	KWH	0.379	KVAH	0.188	KVARH	60	Hz
14	2019-09-17	8:34:27	207.8	ACV	207.2	ACV	208.7	ACV	15.14	ACA	15.86	ACA	14.7	ACA	4.81	KW	5.482	KVA	2.628	KVAR	0.87		0.88		0.34	KWH	0.385	KVAH	0.191	KVARH	60	Hz
15	2019-09-17	8:34:31	207.7	ACV	207.1	ACV	208.8	ACV	15.72	ACA	14.28	ACA	15.21	ACA	4.747	KW	5.423	KVA	2.623	KVAR	0.87		0.88		0.346	KWH	0.391	KVAH	0.194	KVARH	60	Hz
16	2019-09-17	8:34:35	207.6	ACV	207.1	ACV	208.9	ACV	15.76	ACA	15.17	ACA	14.64	ACA	4.78	KW	5.469	KVA	2.657	KVAR	0.87		0.88		0.35	KWH	0.396	KVAH	0.197	KVARH	60	Hz
17	2019-09-17	8:34:39	207.8	ACV	207.2	ACV	208.5	ACV	15.85	ACA	15.79	ACA	15.21	ACA	4.933	KW	5.614	KVA	2.681	KVAR	0.87		0.88		0.357	KWH	0.404	KVAH	0.2	KVARH	60	Hz
18	2019-09-17	8:34:43	207.7	ACV	207.3	ACV	208.7	ACV	14.77	ACA	15.85	ACA	14.3	ACA	4.714	KW	5.389	KVA	2.611	KVAR	0.87		0.88		0.362	KWH	0.41	KVAH	0.203	KVARH	60	Hz
19	2019-09-17	8:34:47	207.7	ACV	207.2	ACV	209.1	ACV	14.71	ACA	15.63	ACA	14.39	ACA	4.708	KW	5.372	KVA	2.588	KVAR	0.87		0.88		0.367	KWH	0.416	KVAH	0.206	KVARH	60	Hz
20	2019-09-17	8:34:51	207.7	ACV	207	ACV	208.9	ACV	16.44	ACA	16.18	ACA	16.09	ACA	5.104	KW	5.842	KVA	2.842	KVAR	0.87		0.88		0.373	KWH	0.422	KVAH	0.209	KVARH	60	Hz
21	2019-09-17	8:34:55	207.6	ACV	207.3	ACV	208.7	ACV	16.08	ACA	16.05	ACA	15.58	ACA	4.98	KW	5.72	KVA	2.813	KVAR	0.87		0.88		0.378	KWH	0.429	KVAH	0.212	KVARH	60	Hz
22	2019-09-17	8:34:59	207.7	ACV	207.1	ACV	208.7	ACV	15.76	ACA	16.85	ACA	15.32	ACA	5.02	KW	5.749	KVA	2.802	KVAR	0.87		0.88		0.384	KWH	0.435	KVAH	0.215	KVARH	60	Hz
23	2019-09-17	8:35:03	207.8	ACV	207	ACV	208.9	ACV	15.04	ACA	16.15	ACA	14.59	ACA	4.825	KW	5.489	KVA	2.618	KVAR	0.87		0.88		0.389	KWH	0.441	KVAH	0.218	KVARH	60	Hz
24	2019-09-17	8:35:07	207.6	ACV	207.1	ACV	208.8	ACV	14.91	ACA	16.52	ACA	14.5	ACA	4.849	KW	5.507	KVA	2.61	KVAR	0.88		0.88		0.395	KWH	0.447	KVAH	0.221	KVARH	60	Hz
25	2019-09-17	8:35:11	207.7	ACV	206.9	ACV	208.9	ACV	15.23	ACA	15.79	ACA	14.58	ACA	4.791	KW	5.471	KVA	2.641	KVAR	0.87		0.88		0.4	KWH	0.454	KVAH	0.224	KVARH	60	Hz
26	2019-09-17	8:35:15	207.8	ACV	207	ACV	208.8	ACV	15.87	ACA	15.87	ACA	15.37	ACA	4.94	KW	5.652	KVA	2.746	KVAR	0.87		0.88		0.406	KWH	0.46	KVAH	0.227	KVARH	60	Hz
27	2019-09-17	8:35:19	207.8	ACV	207	ACV	208.8	ACV	15.76	ACA	17.75	ACA	15.21	ACA	5.126	KW	5.845	KVA	2.809	KVAR	0.87		0.88		0.411	KWH	0.466	KVAH	0.23	KVARH	60	Hz
28	2019-09-17	8:35:23	207.8	ACV	207.3	ACV	208.7	ACV	14.29	ACA	15.2	ACA	13.83	ACA	4.552	KW	5.194	KVA	2.501	KVAR	0.87		0.88		0.416	KWH	0.472	KVAH	0.233	KVARH	60	Hz
29	2019-09-17	8:35:27	207.7	ACV	207.3	ACV	208.5	ACV	16.35	ACA	15.86	ACA	15.72	ACA	5.044	KW	5.744	KVA	2.749	KVAR	0.87		0.88		0.422	KWH	0.478	KVAH	0.236	KVARH	60	Hz
30	2019-09-17	8:35:31	207.6	ACV	207.1	ACV	208.8	ACV	15.5	ACA	16.38	ACA	14.97	ACA	4.924	KW	5.62	KVA	2.709	KVAR	0.87		0.88		0.427	KWH	0.485	KVAH	0.239	KVARH	60	Hz
31	2019-09-17	8:35:35	207.6	ACV	207.1	ACV	208.7	ACV	16.6	ACA	15.96	ACA	16.14	ACA	5.114	KW	5.839	KVA	2.818	KVAR	0.87		0.88		0.433	KWH	0.491	KVAH	0.242	KVARH	60	Hz
32	2019-09-17	8:35:39	207.6	ACV	207	ACV	208.5	ACV	15.89	ACA	16.32	ACA	15.31	ACA	4.993	KW	5.692	KVA	2.733	KVAR	0.87		0.88		0.439	KWH	0.498	KVAH	0.245	KVARH	60	Hz
33	2019-09-17	8:35:43	207.6	ACV	207.1	ACV	208.6	ACV	15.86	ACA	16.07	ACA	15.34	ACA	4.974	KW	5.668	KVA	2.718	KVAR	0.87		0.87		0.444	KWH	0.504	KVAH	0.248	KVARH	60	Hz
34	2019-09-17	8:35:47	207.6	ACV	207.1	ACV	208.6	ACV	15.64	ACA	15.9	ACA	14.97	ACA	4.873	KW	5.575	KVA	2.707	KVAR	0.87		0.88		0.45	KWH	0.51	KVAH	0.251	KVARH	60	Hz
35	2019-09-17	8:35:51	207.5	ACV	207.2	ACV	208.5	ACV	16.43	ACA	15.27	ACA	15.77	ACA	4.947	KW	5.69	KVA	2.81	KVAR	0.86		0.88		0.455	KWH	0.516	KVAH	0.254	KVARH	60	Hz
36	2019-09-17	8:35:55	207.6	ACV	207.2	ACV	208.7	ACV	15.54	ACA	15.6	ACA	14.96	ACA	4.834	KW	5.531	KVA	2.688	KVAR	0.87		0.88		0.461	KWH	0.523	KVAH	0.257	KVARH	60	Hz
37	2019-09-17	8:35:59	207.6	ACV	207	ACV	208.7	ACV	16.12	ACA	16.76	ACA	15.56	ACA	5.099	KW	5.807	KVA	2.778	KVAR	0.87		0.87		0.466	KWH	0.529	KVAH	0.26	KVARH	60	Hz
38	2019-09-17	8:36:03	207.7	ACV	206.5	ACV	208.6	ACV	16.73	ACA	15.69	ACA</																				

# AM MDCL





# MDCL

The screenshot displays a computer desktop with two primary applications open. On the left is the 'Optimod XPN-AM- Local:Processor 1 - [AM Less-More]' window. It features a menu bar (File, Edit, View, Tools, Connect, Help) and a toolbar. The main interface shows various audio processing modules with sliders and meters: Input, AGC <L R>, HF Enhancer, Stereo Enhancer, Gain Reduction <L R>, Limiter, Bass Limiter, Loudness Level, Output Left %, and Output Right %. Below these are tabs for 'AM Less-More', 'AM/HD AGC', 'AM/HD Stereo Synthesizer', 'AM/HD Stereo Enhancer', 'AM EQ', 'AM Multiband', 'AM Compressors', 'AM Speech Mode', 'AM Bandmix', and 'AM Limiters'. The 'AM Less-More' tab is active, showing a 'Less-More' slider set to 8.5, a 'Phase Corrector' set to 453.0 Hz, and a 'Target Loudness' set to -6 LUFS. A 'TeamViewer' window is overlaid on the bottom right of the Optimod window, showing a session list with 'MPs-MacBook-Pro.local (351 467 126)'. On the right is the 'KiwiSDR' web interface, titled 'Not Secure - bikedork.myddns.me:8073'. It shows a 'MW Broadcast' map with stations like Winnipeg, MB, WHO, Des Moines, IA, WTAM Cleveland, OH, KTLK, Minneapolis, WCTS, Plymouth, MN, KYMN, Northfield, and KFAB Omaha, NE. Below the map is a spectrum plot showing frequency from 1.00 MHz to 1.15 MHz. A control panel on the bottom right of the KiwiSDR interface includes a 'select band' dropdown, a '10' button, and various mode buttons (AM, SAM, DRM, LSB, USB, CW, NBFM, IQ). It also shows 'RX0 "W9CN" (Denver, Colorado, USA)' with a frequency of 1030.00 kHz and a time of 0:27:16. A signal strength bar at the bottom ranges from -54 dBm to +40 dBm.



# FM+HD efficiency

## System Settings

Reboot

Upgrade Software

Exciter TCXO

IBOC Settings

**Spectrum/Eff. Optimizer**

Hardware Configuration

FM Polarity

Audio Input Calibration

### Spectrum/Eff. Optimizer

Optimization Enabled	<div>Yes</div>	
Desired Mask Delta	<div>-1.0</div>	dB
Required Mask Delta	<div>0.0</div>	dB
Reduce Digital Power If Required	<div>Yes</div>	
Reduce Power Set-Point If Required	<div>No</div>	

Apply

Cancel

# Online Information



## **Webinars**

<https://www.nautel.com/resources/webinars/>



## **Nautel Waves Newsletter**

<https://www.nautel.com/newsletters/>



## **YouTube**

<http://www.youtube.com/user/NautelLtd>



# THANK YOU!

