

April 4, 2011



Radio TechCheck



The Weekly NAB Newsletter for Radio Broadcast Engineers

The Transmitter Efficiency Calculator



NAB FASTROAD today unveiled a new, Internet-based [Transmitter Efficiency Calculator](#) that broadcasters can use to predict approximate transmitter system energy costs both for present operations and for the "what if" evaluation of prospective, future purchases. With funding from the NAB FASTROAD technology advocacy program, this Web tool was developed by the broadcast engineering consulting firm of Cavell, Mertz & Associates (CMA, Manassas, Va.), and builds upon the data presented in a FASTROAD-funded Transmission Efficiency [White Paper](#) authored by CMA and released earlier this year.

The FASTROAD Transmitter Efficiency Calculator is useful for planning of AM, FM and DTV transmission facilities, both analog and digital. The database that serves as the engine for the Calculator utilizes data provided by equipment manufacturers, which may be expanded in the future as manufacturers provide additional information.

Transmitter site power consumption and costs may be quickly and easily approximated using the Calculator based on the answers to a series of simple questions relating to the broadcast transmitter configuration, geographical location, the building structure in which the transmission equipment is housed and the on-site cooling capabilities. One possible set of input parameters for a 50 kW AM station are shown in the screen capture at right.

In addition to the input parameters, the results of the Calculator depend upon a set of assumptions regarding transmission facilities including:

- The database that serves as the engine for the Calculator utilizes data provided by transmitter equipment manufacturers and is by no means complete. As an example, there is presently no manufacturer-provided data available for VHF television transmitters;
- For the efficiency calculations, the manufacturer's stated efficiency of the transmitter is used, no matter the power output selected. Therefore, if a 20 kW transmitter is rated as 88% efficient, and it is being operated at 10 kW, the Calculator makes the assumption that the transmitter is still 88% efficient at 10 kW, which may or may not be the case;
- A typical air-conditioner efficiency (SEER=10) is utilized to determine HVAC power consumption. Actual efficiency may vary;
- Due to wide variations in heating fuel types, fuel costs and heating system configurations, the cost of heating was ignored;
- Only one radio or television transmitter is located in each building;

Transmitter Efficiency: Calculator

Transmitter

Frequency Band ⓘ

AM - Daytime Operation Only

AM - Same Power 24 Hours

AM - Different Power Day/Night

FM

TV - Channels 2-6 (Low VHF)

TV - Channels 7-13 (High VHF)

TV - Channels 14-52 (UHF)

Transmitter Power Output ⓘ

50 Kilowatts

Watts

Selection Method ⓘ

Choose from Transmitter List

Average of Transmitter List

Enter Measured Efficiency

Digital Mode ⓘ

None - Analog Only

IBOC Hybrid

Location & HVAC

State ⓘ

Maryland

Electricity Cost ⓘ

Billed Rate 11.53 ¢ per kWh

Maryland Average Residential Rate

Maryland Average Commercial Rate

Maryland Average Industrial Rate

Transmitter Building Insulation ⓘ

Cinder Block - 8-inch (R: 2)

Transmitter Waste Heat ⓘ

Heat Never Exhausted

Heat Always Exhausted

Region ⓘ

Northern Central

Air Conditioning ⓘ

Transmitter Room Has A/C

Transmitter Room Lacks A/C

Transmitter Building Size ⓘ

Small (15x15 feet)

Exhaust Volume ⓘ

1000 Cubic Feet per Minute - Air

Liquid Cooled - No Air Exhausted

- The transmitter building is located on a ground-level, concrete slab;
- Roof insulation has the same R-value as wall insulation;
- FM IBOC stations using high-level combining have a 10 dB combiner. Other combiner types will result in more or less reject load heat, which may become a factor in cooling calculations;
- If transmitter heat is exhausted, 85% of the transmitter's heat leaves the building;
- Climate considerations are based on historical records of monthly heating and cooling degree-days, which, in turn, are based on daily mean temperatures. While these estimates consider the regional differences in climate, they are not known to be precise.

The Calculator results for the input parameters shown in the first screen capture (above) are shown in the second screen capture (at right). This Calculator's strength comes from the ability to generate consistent and repeatable results. Therefore, while the assumptions and simplifications may impact bottom-line accuracy, results are believed valid when making "what if" comparisons of different transmitters and scenarios.

The Transmission Efficiency Calculator, the full text of the CMA White Paper, entitled "Power Efficient Broadcast Facility Transmission Design," and information on the NAB FASTROAD technology advocacy program are available at www.NABFASTROAD.org. Comment and feedback on the Calculator are encouraged and can be directed to [David Layer](#), senior director, advanced engineering in NAB's Science and Technology department. The Calculator will be discussed at the 2011 NAB Show in the [NAB Broadcast Engineering Conference](#) (April 9-14, 2011, Las Vegas, Nev.) on Thursday morning, April 14 as part of the "Green Technology" session.

Monthly HVAC Totals						
Month	Transmitter Heat Indoors (kWh/mo)	Building Heat Ingress (kWh/mo)	Make Up Air Heat Ingress (kWh/mo)	Building Heat Egress (kWh/mo)	Make Up Air Heat Egress (kWh/mo)	Total Heat Load (kWh/mo)
January	2687	0	0	-2760	-7967	0
February	2448	0	0	-2283	-6592	0
March	2687	0	0	-1820	-5255	0
April	2600	8	23	-1013	-2924	51
May	2687	147	425	-371	-1071	1817
June	2600	484	1397	-34	-99	4348
July	2687	844	2438	-3	-8	5960
August	2687	702	2028	-8	-23	5387
September	2600	271	782	-145	-418	3090
October	2687	37	106	-829	-2392	257
November	2600	0	0	-1586	-4579	0
December	2687	0	0	-2386	-6888	0

Monthly AC Power Totals				
Month	Transmitter AC Power Requirement (kWh/mo)	HVAC AC Power Requirement (kWh/mo)	Total AC Power Requirement (kWh/mo)	Total AC Power Cost (\$)
January	55111	0	55111	6354.30
February	50222	0	50222	5790.60
March	55111	0	55111	6354.30
April	53333	1	53334	6149.41
May	55111	53	55164	6360.41
June	53333	127	53460	6163.94

Results

Estimated Annual Power Cost

\$74,938.56

 [Print Results](#)

Transmitter One

Manufacturer: Generic
 Model: Generic
 Efficiency: 67.5%
 RF Power Output: 50000 Watts
 AC Power Input: 74074.1 Watts
 Heat Output: 24074.1 Watts
 Heat Indoors: 3611.1 Watts

FCC to Conduct Training for Consultants on Communications Towers and Environmental/Historic Preservation Compliance

The Federal Communications Commission (FCC) is conducting a session for consultants on Tuesday, June 21, 2011 at their headquarters in Washington, DC on Communications Towers and Environmental/Historic Preservation Compliance. Training will be provided by staff from the FCC, USDA Rural Utilities Service, NTIA, FEMA and the Advisory Council on Historic Preservation.

For additional information contact [Steve DeSordo](#) and to register contact [James Swartz](#) who are both at the FCC. To attend the session you must preregister.

Announcing the Newest
NAB Member Benefit

ADVERTISEMENTS

FREE
Exhibits-only Pass
code: [Click here!](#)

NABSHOW
Where Content Comes to Life™

NAB Engineering Handbook

"A big thumper of an engineering resource...written by a list of veritable engineering all-stars."

- Radio World Online



BUY NOW!

INTRODUCING

AmWINS

PROGRAM UNDERWRITERS

An AmWINS Group Company

Announcing the Newest

