1cf Gas (Power) = ? (Energy)[1]

	Energy	Power		
	Cubic Foot/Feet	British Thermal Units	MMBtu	Therm
2017	cf (1)	1032	0.001032	0.01032
	CcF (100)	103200	0.1032	1.032
	McF (1000)	1032000	1.032	10.32
2018	cf (1)	1036	0.001036	0.01036
	CcF (100)	103600	0.1036	1.036
	McF (1000)	1036000	1.036	10.36

1kWh = ? (Energy Table)[2]

	Energy	Power		
	Watts	British Thermal Units	MMBtu	Therm
Standard	Wh (1)	3.413	0.00000341	0.00003413
	kWh (1000)	3,413	0.003413	0.03413

Important Resources

	Source
[1]Power to Energy Conversion for a CcF of Natural Gas	https://www.eia.gov/tools/faqs/faq.php?id=45&t=8
[2]Conversion Tables	https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php
[3]Average Cost of Electricity	https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a
Understanding the difference between Power and Energy	Holladay, Martin. (2012, June 22). Understanding Energy Units. Green Building Advisor. Retrieved from: https://www.greenbuildingadvisor.com/article/understanding-energy-units

Heating Analysis - Figuring out (1) MMBtu needed heat your home and (2) Cost/MMBtu for each system

	Gas - 2017		Gas - 2019*		Electric Heat Pump		Ducted Mini-Split PVA-A30AA7	Electric Mini-Splits - MXZ-4C36NAHZ	Electric Wall mount, nonducted, Mini-Split Downstairs (65% of heat) - MUZ-GL09NA	Electric Ducted Mini-Split Upstairs (35% of heat) - PVA-A12AA7	Totals
	Rationale	Actual Cost	Rationale	Todays Cost	8.3 HSPF	9 HSPF	10 HSPF	11.3 HSPF	12.8 HSPF	10 HSPF	
Cost per CcF (see DPU bill)	$.983 =$.450+$.533	0.983		1.015							
How many CcFs were used to heat our home?	It took 180 CcF (309 total CcF minus ~ 130 for regular needs for basic hot water) November to March. However, the water tank is only 80% effecient, so 20% of those CcF's went up the flue, and 80% were used to heat the home. So in reality, 180 x .8 = 144 CcF were used to heat the home, and 36 went up the flue.	144.000	It took 162 CcF (292 total CcF minus ~ 130 for regular needs for basic hot water) November to March. However, the water tank is only 80% efficient, so 20% of those CcF's went up the flue, and 80% were used to heat the home. So in reality, 162 x .8 = 129.6 CcF were used to heat the home, and 36 went up the flue.	129.600							
Cost per CcF figuring 80% efficiency	$.952 / .80 (80% efficiency on a hot water heater)	1.230	$1.015 / .80 (80% efficiency on a hot water heater)	1.268							
HSPF = How BTUs per watt hour?					8.3000	9.000	10.000	11.300	12.800	10.000	
How many BTUs per kWh?					8300.0000	9000.000	10000.000	11300.000	12800.000	10000.000	
How many MMBTUs per kWh?					0.0083	0.0090	0.0100	0.0113	0.0128	0.0100	
kWh need to produce one MMBTU (assuming proper sizing) = 1kWh = G9MMBTUs, then 1/G9					120.4819	111.1111	100.0000	88.4956	78.1250	100.0000	
Current Cost per KwH[33]					0.1212	0.121	0.121	0.121	0.121	0.121	
How many MMBTUs were used to heat our home?	144 * .1032	14.860	129.6 * .1036	13.426	13.4260	13.4260	13.4260	13.4260	13.4260	13.4260	
									8.723	4.690	
Cost Per MMBtu		11.919		12.240	14.6024	13.467	12.120	10.726	9.469	12.120	
Cost of Heating our Home, annually	C4 x C5	$177.12	C4 x C5	$164.33	$196.05	$180.80	$162.72	$144.00	$82.60	$56.84	$139.44
Heating Related Charges / Total Gas Related Charges		30.5%		33.59%							
Tax and Base Fees		$186.36		$196.42							
Tax and Base Fees / Total Gas Related Charges		32.06%		40.15%							
Baseline Heating Needs (Stove, Hot Water)	130 CcF x .983	$127.79	130 CcF x 1.015	$131.95							
Baseline Heating Needs (Stove, Hot Water) / Total Gas Related Charges		21.98%		26.97%							
Total Gas Related Charges		$581.33		$489.16							
Notes			*CcF's estimated for 2019 based on incomplete data sets.								

Key

	= known data from utility bills and equipment labels
	= conclusionary data
	= recommended system