Hash power consumption based on Bitcoin

2018.12.31

Sample product as advertised	Product performance	1.4E+13	Hash/sec	14 Terahash per second
AntMiner S9	Required electricity during 1 second	1375	Watt/sec	

Energy for a single hash operation	9.82143E-11	Watt		equal to	98	Picowatt

Average hash needed for one block	2.36118E+21	varies with difficulty	Higher mining speed results in higher difficulty

72 0's in target

~ nr of hash = 2**71

Total energy required for hashing 1 block	2.31902E+11	Watt	Energy for single hash * no. of hash
	231,901,925	in Kilowatt	

This energy is spend in 10 minutes

This energy is spend in ~ 10 minutes (the time required to mine one new block)

386,503	KW/10 min
64,417	in KW/h

There is an energy overhead, which is often forgotten. The energy the hash consumes must be transported to the environment using huge arrays of fans. This is calculated as 5%.

67,638	in KW/h inc. 5% overhead

This amount of energy is spend every 10 min with the mining process.

1,623,313	Megawatt/h per day
592,509,420	Megawatt/h per year

1 block contains ~ 1000 transactions

Power for 1 transaction	**68**	KW/h

Note: 1 money transfer may have multiple transactions

Difficulty calculation

Hash result must be smaller than target !
Difficulty defines the targetvalue
A 4 byte long field in the block defines the dificulty. That field is named BITS
The leftmost byte defines where in the 32 byte long target the the rightmost 3 byte end. Easier to calculate is first byte of BITS -3 is the start position of the 3 rightmost bytes of the BITS field.

BITS	17 371EF4	0x17 - 3 = 0x14 or 20 decimal
Example:	00000000-00000000-00371eF4-0000-0000-0000-0000-0000	
Real block	00000000-00000000-0005db1d-dad8e0a5-6aadabe9-8666bf0c-975c7ca9-2d86d3bd	
Hash is accepted, because	05db1d is smaller than 371EF4	

Hash requires on the left 74 bit of 0. This defines the required work.