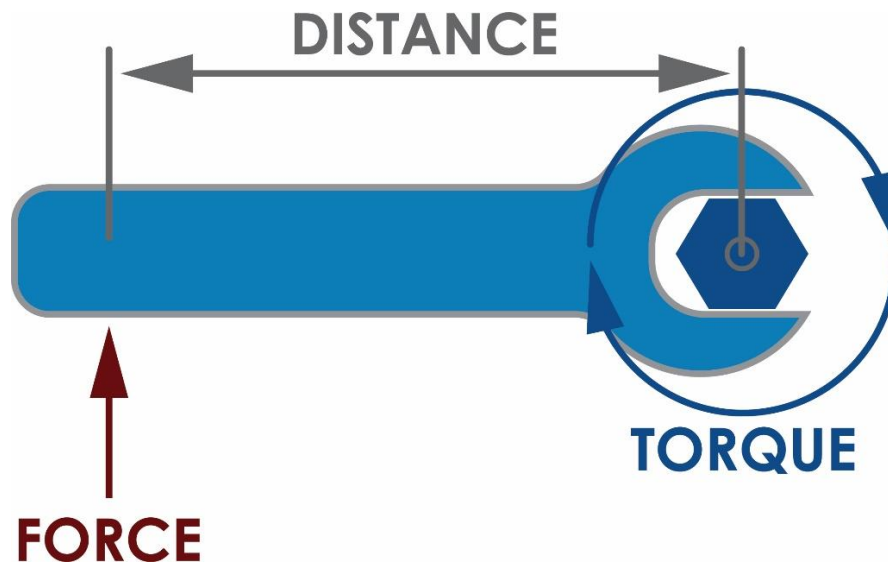


**2021Q17****(FORCE, TORQUE)**

To have the longest engineered lifespan possible, wind turbines are designed to withstand large amounts of force. To that end, the bolts that we use to stabilize the wind turbine are designed to be incredibly sturdy! To tighten these bolts, One Energy uses a tool called a pneumatic torque wrench. The drive socket (see image on next page) of the pneumatic torque wrench attaches to the bolt, and when the trigger is pulled, torque is applied to the bolt to tighten it. Torque can be calculated using the equation:

$$\text{Torque} = \text{Distance} * \text{Force}$$



Where the *distance* measures the length between the center of rotation, and the point at which the force is applied.

**Level 1:** 20 lbs of force is applied to an 8 in. wrench. What is the torque on the bolt in lbf-in?

**Level 2:** For a pneumatic torque wrench to have the desired torque output, the gun needs to be set to a certain pressure. If a bolt needs to be torqued to 2,925 Nm, what pressure should a J3 torque wrench be set to? Use the conversion chart on the next page.

PRESSURE (PSI)	TORQUE (Nm)			
	J1	J2	J3	J5
20	348	728	968	1,444
25	430	912	1,226	1,833
30	512	1,095	1,487	2,222
35	594	1,279	1,747	2,611
40	676	1,462	2,007	3,000
45	758	1,623	2,239	3,392
50	839	1,779	2,467	3,785
55	921	1,935	2,696	4,177
60	1,003	2,091	2,925	4,570
65	1,085	2,242	3,147	4,971
70	1,167	2,389	3,368	5,372
75	1,249	2,537	3,590	5,774
80	1,330	2,684	3,812	6,176
85	1,412	2,843	4,011	6,798
90	1,494		4,208	6,798

Table 1: Pneumatic Torque Wrench Conversion Chart

A Pneumatic Torque Wrench. The Drive Socket Is Labelled By The Red Circle

