

The Development of Electricity: A Look into Thomas Edison and Nikola Tesla

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It would be hard to refute that one of the most important developments of the 20th Century was the development of the electrical grid. It radically changed our society; allowing simultaneously larger windows of working hours and giving us far more leisure time than was possible without it; in fact, it has been suggested that electricity was the catalyst for the expansion of the middle class. It was also an instrumental catalyst for the second industrial revolution, which propelled the world into a new age of technological development and advancement. Nearly all of our industrial and mechanical progress since is only made possible because of electricity. There are a number of figures that are important to this discovery that predate the century, but two figures consistently come up in talks about the subject: Nikola Tesla and Thomas Edison. At the time, both of these inventors were generally considered to be celebrities and showmen. To the average person, they were impressive men of science that traveled the country showing off their magnificent inventions. Common knowledge tends to attribute Thomas Edison to be the more popular and prestigious of the two. This paper investigates whether or not this convention is supported by historical evidence.

Thomas Edison was an American inventor and businessman born in February of 1847. He was a prolific inventor of his era with over a thousand patents registered in the United States alone. The question asked here, however, is how much of an overall role he actually plays in the popularization of the electric grid. In 1870, Thomas Edison founded the electric utility firm Edison Illuminating Company, a means to attempt to compete with existing gas lighting utilities. His power distribution system ran on a D/C, or Direct Current system. A Direct Current is a unidirectional flow of an electrical charge, meaning the electrical current moves in a single direction. The most common example of simple direct current use is that of a battery; it holds a charge and delivers it directly to a system (Bhargava, Gupta and Kulshreshtha, 2013, p.

25). Edison's use of DC power delivery was an intentional choice on his part. He believed that the alternative A/C or Alternating Current was both more expensive, and possibly more dangerous (Bailey, 2010, p. 56-57). While the wiring of his system was considerably cheaper than that of an A/C based system, it had severe drawbacks for supplying power over larger distances. For instance, Edison's plants could not supply power to customers over a mile away. This also became exceedingly cost prohibitive in rural areas, as building multiple plants to supply a low number of customers was impractical, and not very profitable (Ersnburger 2014).

While Edison himself had issues with his actually supplying power to customers with his D/C system, it by no means determines that he didn't have an effect on the development of the modern electrical grid. Edison had made a number of steps in the development of a commercially viable, long-lasting incandescent light bulb. Though many people believe Thomas Edison invented the light bulb, it is surprisingly untrue (Ernsberger, 2014). Many inventors prior to Edison devised, and even built similar concepts. The major difference was that almost all of these designs suffered from issues of efficiency, much like his D/C circuits. They had numerous flaws; namely extremely short lifespans, expensive to produce, or needs for an excessive amount of power. His light bulb solved the majority of these issues and was the first successful electric lighting product for major commercial and residential use.

Edison plays his own significant role in the broader topic of electricity, but nothing quite like his contemporary, Nikola Tesla and the establishment of a widespread electrical grid. Tesla was a Serbian-American Inventor born in 1856 who would serve as the other incredible influence on the field of electricity, and power distribution coming into the 20th century. Nikola Tesla had over three hundred patents in the United States (Sarboh, 2006), and though many of these were incredibly important developments in the field, he saw considerably less financial success than

Edison. There are a number of potential reasons for this, most of which can be generalized as a lack of business acumen or just a long line of unlucky circumstances. Modern hindsight into his inventions has shown him to have had ideas and concepts that were revolutionary, even compared to his peers. His induction motor and the famed Tesla Coil are two noteworthy examples. He was also absolutely pivotal in the development and popularization of A/C power distribution (Wasik, 2017). In Alternating Current systems, the movement of electric charge periodically reverses direction. The distinct advantage of this system in comparison to D/C currents is that it allows for a large amount of power to be transported over a substantial distance. Tesla did not invent or discover A/C power distribution, but he was the key to its further developments and refinement, which ultimately led to its popularization.

Tesla was unfortunately considered a failure within his own lifetime, for despite being responsible for many improvements and inventions across a number of different fields, he had not been able to turn such success into financial stability. He died alone at 86 years of age in a hotel room in New York in 1943. He had little wealth to his name, and few prospects for the future. While a rather anticlimactic and somber end, this does not change the impact he would ultimately have on both culture and development of our modern day power system. Nikola Tesla in recent years has taken on somewhat of a cult following in popular culture. Many view him as the original “Mad Scientist” archetype, whose outlandish and bizarre inventions and concepts were far beyond their time (Wasik 2017). This is obviously somewhat of a hyperbolic look at the man's work, but it has definitely brought a new view on to his work and has brought a resurgence of attention to the progress he made as an inventor.

So, with both of these inventors established, the question remains; which of the two was more influential on the development of our modern power grid? Well, there is something to

argued for both having their place in the story. There certainly could be educated claims for both perspectives, and those who see the question as fundamentally absurd. It might be that the question itself is somewhat of a pointless measuring game between two historical figures that both had their parts to play in the story. There is something to be said, however, about giving credit where credit is due. Looking at the most readily apparent evidence, both inventors championed a different form of power distribution. Thomas Edison was a proponent and supplier of D/C power, outspoken in asserting that A/C was unsafe and uneconomical (Bailey, 2010, p. 56). Nikola Tesla, while not the inventor of the more sophisticated A/C power distribution system, was instrumental in improving its efficiency. Today, A/C is the predominant system by which the entire world distributes power across electrical grids. The benefits of A/C as a current for this role have already been mentioned, but what sold society on alternating currents over direct currents? The answer to this comes from an event that both of these inventors participated in: The 1893 Chicago World's Fair.

The 1893 World's Fair in Chicago was a perfect time for the two inventors to properly show case the developments made to their distribution systems. Thomas Edison pitched his D/C system to the organizers under his company at the time Edison General Electric. Meanwhile, an engineer and businessman by the name of George Westinghouse had taken interest in Tesla and his developments in A/C distribution systems. He hired Nikola Tesla into his company, Westinghouse Electric, and was instrumental in the company's pitch to provide A/C power to the event (Palmer, 2009). Initially both companies made bids to the organizers on price, with the final price of each coming down to Edison's General Electric with a bid at a cost of \$554,000 and Westinghouse Electric with a bid at \$399,000 (Moran, 2003, p. 97). Westinghouse ultimately won the contract. The 1893 Chicago World's fair had a huge turnout and was a massive success, demonstrating the true capabilities of electrical light and the A/C. In many ways it was here that

the true potential of AC distribution became known to the populace, along with the benefits of electrical lighting. It was unquestionably the tipping point of development for the two distribution systems, with A/C from that moment on becoming the far preferred system of distribution.

It is rationally undeniable that both of these men had a crucial role in the development of electricity. Both men had exceptional inventions that were popularized at the time and both ended up being staples in the development of modern power distribution. But, to draw back to the original question; whose influence is still felt more often to this day? Since incandescent bulbs have been phased out over the last century, and A/C currents remain in the vast majority of our systems, Tesla, and the support of Westinghouse, is the clear answer. While of course, the methods have been improved and expanded upon since, his ingenuity and expansion upon the invention of A/C current was the work of a technological pioneer. Edison, despite failing to produce a practical D/C system for mass power distribution, was immensely important in the economic viability of electrical lighting; and these two technologies work hand-in-hand to this day. Until the last ten years started phasing them out, everyone did indeed use the incandescent lights, many of which are based on Edison's design. Simultaneously, the entire modern framework used to power them is based on the system of power distribution that Tesla was instrumental in popularizing. One cannot look at a major city or power network and not see the baseline framework and inventions popularized by Tesla, and if it had not been for his advocating of A/C, it is likely D/C may have been a widespread system for a long time, and perhaps some cities still would using it to this day. As far as our power lines and electrical grid are concerned, it is easy to assert that Tesla is the more impactful historical figure for this area of study, in contrast to Thomas Edison who while important in his own right, will in time be remembered for technologies largely left in the past.

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