



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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<b>Project Title</b> <b>AA Showdown</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This project is intended to produce a battery among a chosen set of Duracell and Energizer batteries which will save you time and money in various situations such as emergency preparedness, as knowing the better choice is crucial for surviving natural and man-made disasters, camping and hiking preparations, business or work readiness, and obtaining maximum performance in battery-powered devices.</p> <p><b>Methods/Materials</b> We found an Arduino-based battery tester to collect data and display it on a program called CoolTerm. The software was slightly modified with guidance from Hans Poggemeyer. We used two resistors to run the battery down and used a Mosfet, an electronic switch, to control when the Arduino UNO took measurements and when it ran the battery down. The data was then transferred to KaleidaGraph, where we plotted our graphs.</p> <p><b>Results</b> The Energizer Ultimate Lithium lasted the longest, at 49.33 hours with an exceedingly low discharge rate at a price of \$0.40 per hour and \$0.26 per mA. We also found that the Energizer MAX had similar performance while costing less, \$0.02 per hour and \$0.19 per mAh, even though it pulled in at 41.1 hours. Therefore, the Energizer MAX provided the best cost to performance rate in this experiment.</p> <p><b>Conclusions/Discussion</b> In conclusion, the Ultimate Lithium should be used in devices that require a large, constant current, like digital cameras and RC vehicles, as it boasts a high current with an exceedingly slow discharge rate. Rechargeables should be used in toys which require constant replacement of batteries as they can be recharged multiple times. Alkalines like the Energizer MAX can supply good performance for any situation like emergencies, recreation, entertainment, or work efficiency if you cannot afford the more expensive lithiums and rechargeables.</p>	
<b>Summary Statement</b> We built our own tester to monitor the performance of a chosen set of batteries to find which one had the best cost to performance rate, and discovered that the Energizer MAX was the most cost efficient.	
<b>Help Received</b> The circuit was created and programmed with guidance from Hans Poggemeyer.	