



## Response to Senator Paul's "September 2017 Waste Report"

The National Science Foundation (NSF) has been the backbone of America's science and engineering research enterprise for over 70 years. In fact, NSF is the only federal agency that supports all fields of fundamental science and engineering research and education. NSF supports cutting-edge research projects — many of which serve as bellwethers for solutions to the myriad complex issues facing society. NSF programs also traditionally integrate research and education, fast tracking innovation excellence via hands-on learning to train our next generation of researchers and innovators.

Each year, NSF competitively awards thousands of grants that collectively advance our nation's scientific capabilities and engage the talents of hundreds of thousands of researchers, postdoctoral fellows, technicians, teachers and students in every field of science and engineering.

NSF is the primary source of federal funding for non-medical basic research, providing approximately 12,000 new awards annually. Through its merit review process, NSF ensures that proposals submitted are reviewed in a fair, competitive and in-depth manner. Competition for funding is intense, with only about one out of five proposals ultimately being approved.

Each proposal submitted to NSF is reviewed by science and engineering experts well-versed in their particular discipline or field of expertise. All proposals submitted to NSF are reviewed according to two merit review criteria: *Intellectual Merit* and *Broader Impacts*. NSF's merit review process is widely considered to be the "gold standard" of scientific review. Perhaps the best evidence of NSF's success is the repeated replication of its merit review model for discovery, education and innovation around the globe.

The results of this process — funding the best and brightest ideas through competitive merit review — have been profound. NSF-supported research has underpinned multitudinous discoveries leading to new inventions — the Internet, web browsers, Doppler radar, Magnetic Resonance Imaging, DNA fingerprinting, and bar codes — to name a few. These diverse examples underscore NSF's significant contributions to our nation's prosperity, health and wellbeing. NSF-funded discoveries have expanded our understanding of the world in which we live, led to life-saving medical advances, enhanced our national security, improved our everyday lives and yielded insights into the creation of the universe.

NSF's task of identifying and funding work at the frontiers of science and engineering requires keeping close track of research around the United States and the world; maintaining constant contact with the research community to advance the horizons of inquiry; and choosing the most promising people to conduct the research.

The following grant cited in the "September 2017 Waste Report" illustrates an example of promising NSF-funded research awarded support through the merit review process.

*Refueling Infrastructure Preferences and the Adoption of Alternative-Fuel Vehicles*

NSF Award 1660514

September 2017 Waste Report: “Too far to charge/waste”

Arizona State University

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This project examines how the spatial distribution of alternative-fuel stations affects people’s decisions to purchase an alternative-fuel vehicle (AFVs). The project engages the science of spatial-choice modeling to determine how the geographical locations and spatial arrangements of fueling and charging networks promote or inhibit the decision to purchase or lease vehicles that operate with liquid biofuels, compressed natural gas, electricity, or hydrogen.

This research is helping to address a major barrier to consumer adoption of alternative-fuel vehicles: the lack of conveniently located fuel stations. The findings will contribute to planning more efficient and effective station networks, thereby facilitating the use of such vehicles and enabling them to serve as a more viable complement to other modes of transportation.

The analysis of the data produced by this research is the basis for a geo-design process that uses a geographic information system to develop planning designs of fueling stations that best promote adoption of AFVs. The methods and results of this work are also adaptable for use in examining other types of facilities beside fuel stations.

Preliminary results have revealed an array of factors important to consumers considering an AFV, from incentives and rebates to station locations. Station reliability, secondary stations, freeway access, and convenience to a variety of destinations all are important, especially while awaiting the opening of planned stations.

A key implication of the research is that stations should be located to serve not only “targeted” nearby residents but also others who may visit or pass nearby regularly. Likewise, developers should also locate stations far from these neighborhoods to benefit the wider travel of residents and the local travel of those who live elsewhere. Based on the study, industry stakeholders including automobile manufacturers and station developers agreed that three to five stations would be sufficient infrastructure to initiate vehicle sales in a given spatial region.