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(ALERT)

NSF Org:	ECCS Div Of Electrical, Commun & Cyber Sys
Awardee:	TEXAS A&M ENGINEERING EXPERIMENT STATION
Initial Amendment Date:	August 5, 2021
Latest Amendment Date:	August 20, 2021
Award Number:	2125985
Award Instrument:	Standard Grant
Program Manager:	Aranya Chakrabortty achakrab@nsf.gov (703)292-8113 ECCS Div Of Electrical, Commun & Cyber Sys ENG Directorate For Engineering
Start Date:	September 1, 2022
End Date:	August 31, 2026 (Estimated)
Total Intended Award Amount:	$1,498,793.00
Total Awarded Amount to Date:	$1,498,793.00
Funds Obligated to Date:	FY 2021 = $1,498,793.00
History of Investigator:	Mladen Kezunovic (Principal Investigator) kezunov@ece.tamu.edu Zoran Obradovic (Co-Principal Investigator) Alexander Brown (Co-Principal Investigator) Paul Pavlou (Co-Principal Investigator) Roger Enriquez (Co-Principal Investigator)
Awardee Sponsored Research Office:	Texas A&M Engineering Experiment Station 400 Harvey Mitchell Pkwy S College Station TX US 77845-4645 (979)862-6777
Sponsor Congressional District:	17
Primary Place of Performance:	Texas A&M Engineering Experiment Station 188 Bizzell St College Station TX US 77843-3128
Primary Place of Performance Congressional District:	17
DUNS ID:	847205572
Parent DUNS ID:	042915991
NSF Program(s):	S&CC: Smart & Connected Commun

Primary Program Source:	040100 NSF RESEARCH & RELATED ACTIVIT
Program Reference Code(s):	042Z
Program Element Code(s):	033Y
Award Agency Code:	4900
Fund Agency Code:	4900
Assistance Listing Number(s):	47.041

ABSTRACT

This NSF S&CC project aims to predict the State of Risk (SoR) of electricity outage occurrence and develop risk management and mitigation strategies to minimize the impact of outages. Currently, electric utilities are only able to reactively respond to outages. Consumer are left in a passive role of struggling to cope with the consequence without a preemptive option to manage the outage impacts. The project brings a transformative change that will allow utilities to predict outages, and then provide consumers with both individual and community mitigation measures. This will be achieved by increasing the S&CC awareness of how to deal with the outage impacts equitably and effectively. We will deploy advanced data analytics to train machine learning outage prediction algorithms using weather and historical outage data. The intellectual merits of the project include new risk prediction approaches, study of behavioral aspects of the outage prediction, and experiments that measure the effectiveness of predictive alert messages. Broader impacts include education and outreach efforts across PreK-20 students, their teachers and parents, through public services of museums and libraries by all-inclusive age-appropriate STEM programming. We will communicate with the broader community of citizens through the invited talks and videos at appropriate city offices in San Antonio, and at the headquarters of one of the major retail providers of electricity in Philadelphia. The emphasis on inclusive workforce development is broadly applicable and highly impactful to advance the S&CC human resource needs and resilience plans.

To achieve the spatiotemporal prediction of the SoR, ALERT will perform integrative research by merging methodologies from several disciplines: a) Advanced Data Analytics (ADA); b) Social, Behavioral, and Economic Sciences (SBE); and c) Smart Grid Fundamentals (SGF). The project activity will integrate ADA and SGF data and physical power system models, respectively, and then design SBE interventions based on the survey and experimental data to define SoR models and make mitigation decisions to reduce outage risk. The innovation is in the physics-constrained and structured learning-based prediction of the SoR using big data from historical utility records, weather records, grid topology and vegetation data.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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