High Level Overview of Argonne National Lab (ANL) Study on Potential Severe Weather Event Scenarios

ANL and ERCOT
August 13, RPG meeting

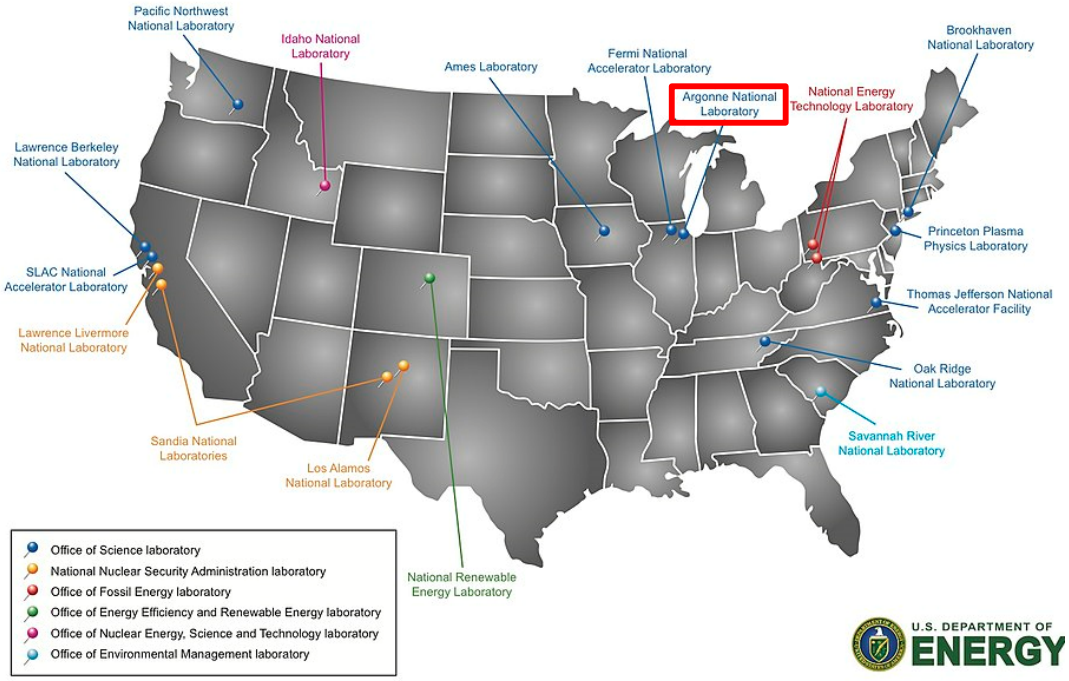
About Argonne National Laboratory

- Part of the U.S. Department of Energy (DOE) laboratory complex of 17 National Laboratories
- Argonne has broad energy Resilience Capabilities
  - From development of advanced algorithms and models to commercialization and deployment

$1.1B
OPERATING BUDGET IN 2022

3,700+
EMPLOYEES IN 2022

7,600+
EXTERNAL USERS OF RESEARCH FACILITIES



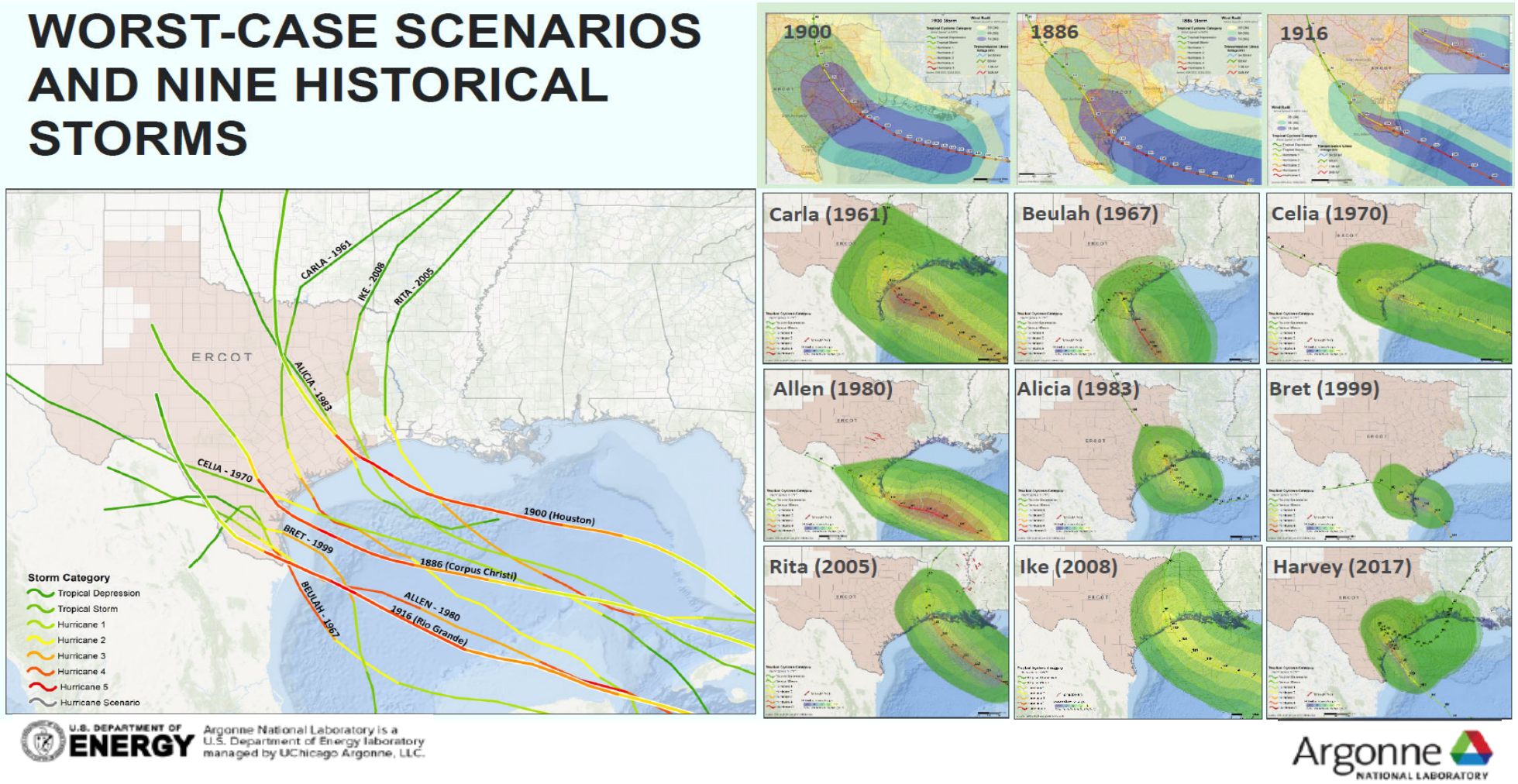
Introduction

- In late 2023, due to heightened interest in severe weather impacts, ERCOT engaged Argonne National Lab (ANL) for a hurricane impact study

- ERCOT and ANL outlined the study scope to study:
  - Three hypothetical Category 5 hurricanes impacting Houston, Corpus Christi, and Lower Rio Grande Valley (LRGV)
  - Nine historical hurricanes (Category 3+) based on the review of historical hurricanes that landed on Texas

- ANL utilized their "Hurricane Electric Assessment Damage Outage (HEADOUT)" tool along with various datasets

Hurricane Scenarios

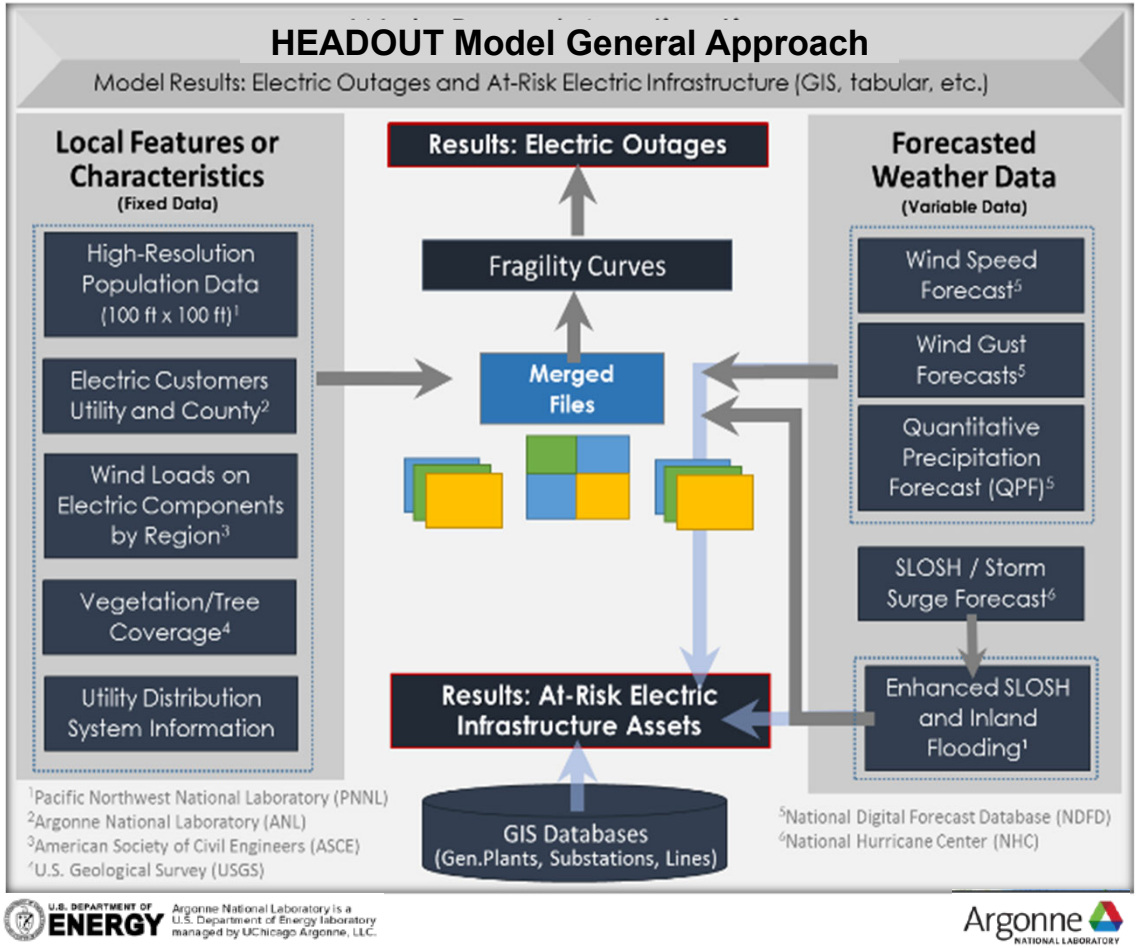


* ANL conducted the study and estimated the bulk-level assets at risk, which include generators, transmission lines, and substations for the year 2027, assuming that the historical hurricanes will hit the Texas region again

Hurricane Scenarios (Continued)

Season	Hurricane Name	Landfall Date Time	Landfall Location	Hurricane Category	Wind Speed (mph)	Barometric Pressure (mbar)	Storm Surge (ft)
2017	Harvey	8/26/2017	San Jose Island/Rockport,Texas	Category 3	125	938	12.5
2008	Ike	9/13/2008	Galveston Island, Texas	Category 2	110	950	17
2005	Rita	9/24/2005	Johnson's Bayou, Louisiana	Category 3	115	937	15
1999	Bret	9/23/1999	Padre Island, Texas	Category 3	115	951	10
1983	Alicia	8/18/1983	Galveston Island, Texas	Category 3	115	962	12
1980	Allen	8/10/1980	Port Isabel, Texas	Category 3	115	952	12
1970	Celia	8/3/1970	Port Aransas, Texas	Category 2	105	945	9.2
1967	Beulah	9/20/1967	Brownsville, Texas	Category 3	136	923	18
1961	Carla	9/11/1961	Matagorda Island, Texas	Category 4	140	931	22
1900 Scenario	Houston	Scenario	Houston, Texas	Category 5	160	915	22+
1886 Scenario	Corpus Christi	Scenario	Corpus Christi, Texas	Category 5	160	915	22+
1916 Scenario	Lower Rio Grande	Scenario	Port Isabel, Texas	Category 5	160	915	22+

ANL's HEADOUT Tool Model



- Aids Mission Support activities within DOE Headquarters and across the Federal Government since 2013
- Used in support of grid operator drills (PJM, MISO, NYISO, ISONE, PREPA), and power-outage-related emergency management exercises (FEMA, DOE, DHS, utilities)

Summary of Study and Outcomes

- ANL leveraged its unique expertise in complex energy-systems modeling and advanced hurricane analysis tools for potential extreme event scenarios
- ANL evaluated historical and hypothetical hurricanes impacting ERCOT's grid using relevant datasets and grid topology data
- The results estimated wind and storm surge damage by asset type (e.g., transmission, generation, substation)

Next Step

- ERCOT plans to share the ANL's study results with relevant TSPs

- ERCOT RTP team will conduct the biennial grid resilience study directed by SB1281 and amended 16 Texas Administrative Code (TAC) § 25.101, using the system topology associated with the worst hypothetical hurricane
  - The high-level scope of this study was presented at the June RPG meeting

Questions?

- For any comments on ANL's study, please contact sunwook.kang@ercot.com or moinul.islam@ercot.com

- For any comments on the biennial grid resilience study, please contact ping.yan@ercot.com