

GMLC 1.3.11 - Grid Analysis and Design for Energy and Infrastructure Resilience in New Orleans, LA

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Sheraton Pentagon City – Arlington, VA

1.3.11 Grid Analysis and Design for Energy and Infrastructure Resilience in New Orleans, LA

High Level Summary

Project Description

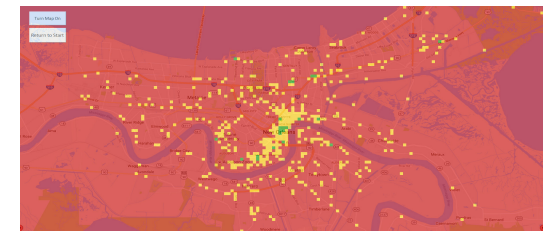
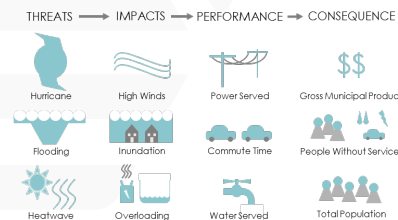
Supports NOLA's resilience goals by leveraging infrastructure and grid modeling to develop cost-effective grid resilience enhancements for NOLA and the surrounding region. Focused on enhancing grid resilience in order to improve overall community resilience.

Value Proposition

- ✓ Technical assistance from the national labs can be the catalyst for collaborative resilience planning between utilities and cities
- ✓ We are showing how investments in grid modernization improve community resilience, and how these investments can be prioritized

Project Objectives

- ✓ Improved understanding of how infrastructure and community resilience are dependent on grid performance in NOLA
- ✓ A set of risk-informed cost-effective recommendations for grid enhancements that improve NOLA community resilience
- ✓ Conceptual designs utilized by NOLA, Entergy, and others to prioritize energy infrastructure improvement options
- ✓ A utilization of existing DOE security and resilience research to improve real-world community resilience



1.3.11 Grid Analysis and Design for Energy and Infrastructure Resilience in New Orleans, LA Project Team



PROJECT FUNDING			
Lab	FY16 \$	FY17\$	FY18 \$
SNL	800k	0	0
LANL	200k	0	0

Project Participants and Roles

SNL

- Project manager, infrastructure resilience analysis, grid prioritization and design

LANL

- Hurricane modeling, grid impact analysis

City of New Orleans

- Multiple offices providing subject matter expertise, data, prioritization

Entergy New Orleans

- Electric utility for NOLA, subject matter expertise, data, potential implementation

US Army Corps of Engineers

- Subject matter expertise and threat characterization reviewer

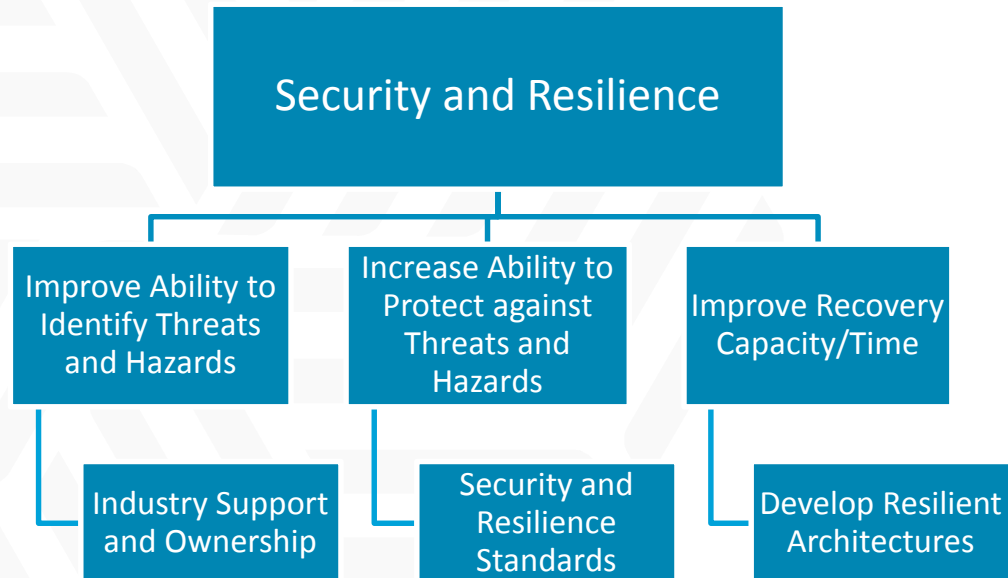
100 Resilient Cities

- Catalyst for partner collaboration, information dissemination and outreach

1.3.11 Grid Analysis and Design for Energy and Infrastructure Resilience in New Orleans, LA Relationship to Grid Modernization MYPP

Addresses the Security & Resilience technical area by focusing on:

- Improving the Ability to **Identify** Threats and Hazards
- Improving the Ability to **Protect** Against Threats and Hazards
- Improving the Time and Capacity to **Recover**



1.3.11 Grid Analysis and Design for Energy and Infrastructure Resilience in New Orleans, LA Approach



- ▶ Infrastructure Impact Modeling and Analysis
 - Model high-consequence hurricane impacts to the grid and critical infrastructure services
 - Populate a baseline resilience metric useful to project partners and stakeholders
- ▶ Design and Integration of Grid Modernization Options
 - Suggest grid resilience improvement portfolios that improve community resilience
 - Show the improvement in resilience metrics
- ▶ Resilience Cost/Benefit
 - Ensure grid resilience improvements are cost effective for the intended resilience benefits
- ▶ Transactive Control Feasibility
 - Explore how building/customer resources can be engaged through a transactive energy scheme to provide energy and infrastructure resilience

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Key Project Milestones



Milestone (FY16-FY18)	Status	Due Date
Briefing to NOLA stakeholders on infrastructure resilience analysis	Complete	6/29/16
Outline of transactive controls feasibility study	Complete	6/29/16
Draft report to NOLA stakeholders and DOE on infrastructure resilience analysis	Complete	8/18/16
Draft report of transactive controls feasibility study	Complete	10/18/16
Briefing to NOLA stakeholders on grid modernization options for NOLA resilience	Complete	10/26/16
Draft report to NOLA stakeholders and DOE on grid modernization options for NOLA resilience	Complete	11/29/16
Finalize transactive controls feasibility study	Complete	12/15/16
Finalize grid modernization for NOLA resilience analysis, including cost/benefit metrics	Complete	1/15/17
Draft unclassified, unlimited release report providing project overview and key findings	Complete	2/15/17

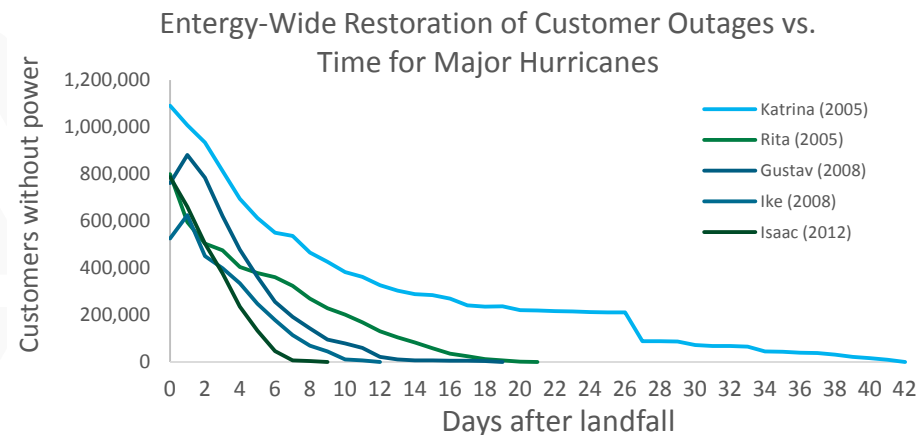
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Accomplishments to Date

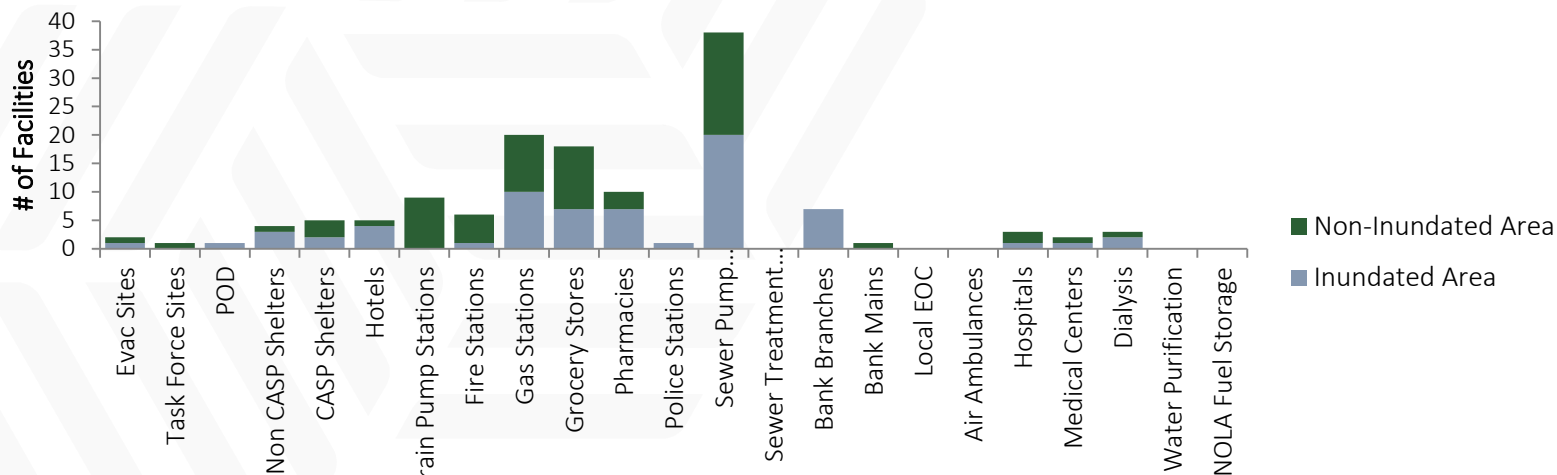


Baseline Resilience of NOLA:

- ▶ Improvements since Katrina result in large decrease of surge-induced flood risk (e.g. levee failures and overtopping)
- ▶ Widespread power outage expected, potentially transmission-driven but certainly distribution damage and recovery
- ▶ Different communities experience different infrastructure service impacts



Inundation Impacts, Zone 1 - New Orleans East



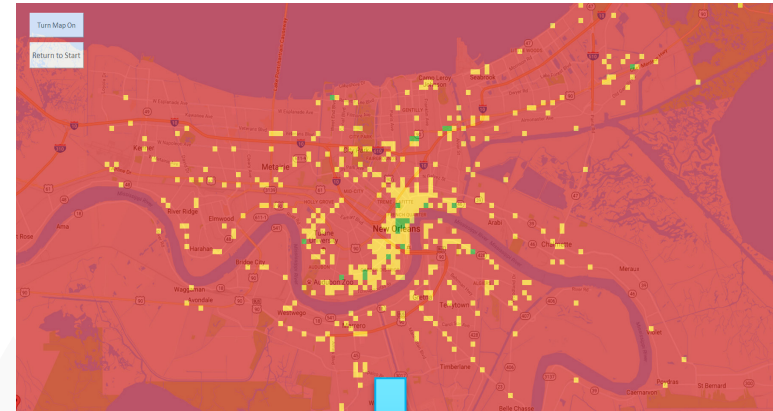
1.3.11 Grid Analysis and Design for Energy and Infrastructure Resilience in New Orleans, LA Accomplishments to Date

Grid Improvements for Community Resilience:

- ▶ Selected to provide greatest support to critical community services for the greatest number of citizens
- ▶ Greatest grid modernization focus on microgrids

Collaborative planning for grid investment to support community resilience:

- ▶ First ever meeting between partners to collaboratively prioritize resilience-focused grid investments in NOLA
- ▶ Also including non-resilience benefits in the prioritization, such as reliability, community engagement, support for underrepresented or underprivileged communities



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Response to December 2016 Program Review



Recommendation	Response
Coordinate with Institutional Support Team	Discussing how to use NOLA as exemplar for Valuation and Future Regulation projects (with support from 1.1 Metrics)
Inform the development of metrics regarding resilience. Coordinate with 1.1	Project 1.1 is using NOLA as one of their year 2 exemplars
Make sure the deliverable will be accessible to other cities in 100RC network	The open access report is finalized and progressing through review and approval now. We are actively engaged with 100RC.
Confer with other microgrid projects (AK, KY) to see if need for coordination	Sharing lessons learned
Work with communications team on success stories	Yes – working with Kelly Yee on this

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Project Integration and Collaboration

Project Integration:

1.1 Foundational Metrics

- ▶ Our work is a baseline for year 2 proof of concept for resilience and reliability metrics

1.3.4 Industrial Microgrids

- ▶ Sharing lessons learned on how to translate system-level needs to optimal designs

1.4.23 Threat Detection...

- ▶ Sharing lessons learned on connection between improvements in threat detection and resilience

1.4.29 Future Regulation

- ▶ Discussing how to provide Entergy with regulatory resilience incentives w/in NOLA's framework

Communications:

- ▶ Presented to Sandia external advisory board on Resilience in Complex Systems
- ▶ Updates shared with 100 Resilient Cities on numerous occasions



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Next Steps and Future Plans



This project is complete, however:

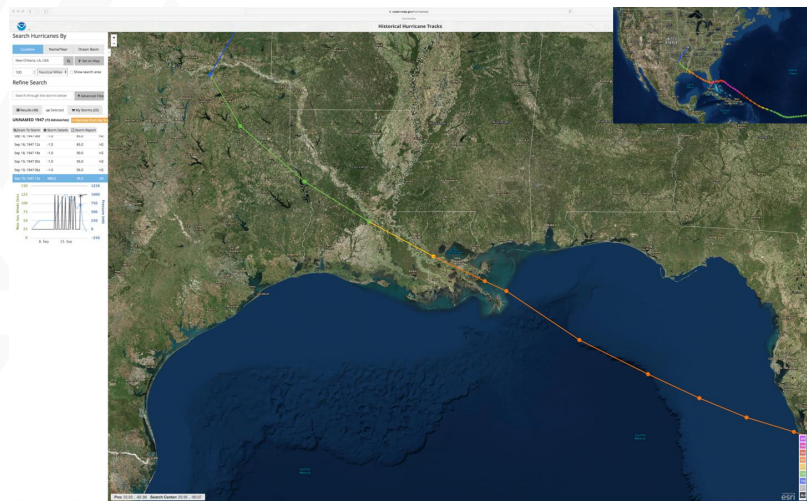
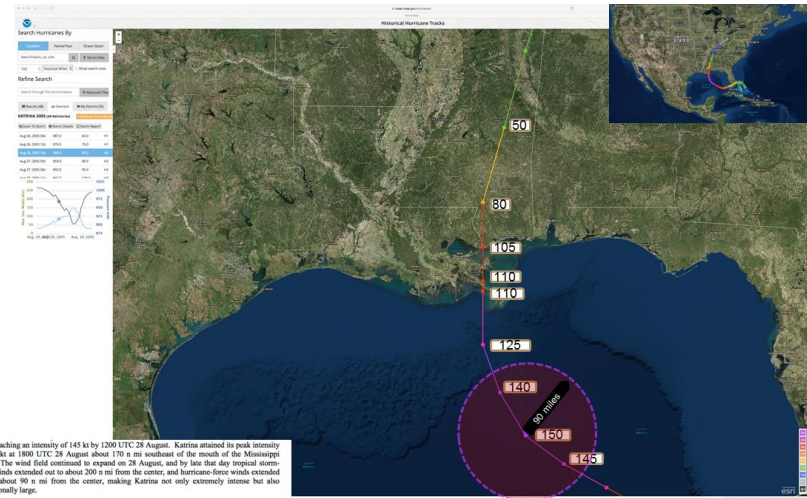
1. SNL and City of NOLA are working with HUD and 100RC to identify funding mechanisms for microgrids (three specific avenues identified). Use of NOLA's existing NDRC funding is also being discussed. Dept of Transportation a new avenue not yet pursued.
2. SNL and Entergy are discussing multiple avenues to support microgrids and resilience in NOLA
3. SNL on GMLC 1.1 (Metrics) is working to support Entergy and NOLA in improving confidence in the necessary metrics to make prioritization decisions
4. Discussion with Institutional Support about City of NOLA's interest in Technical Assistance for alternative regulatory schemes and valuation of microgrids

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Technical Details

Contrasting *Worst Consequence* with *Worst Threat* analysis

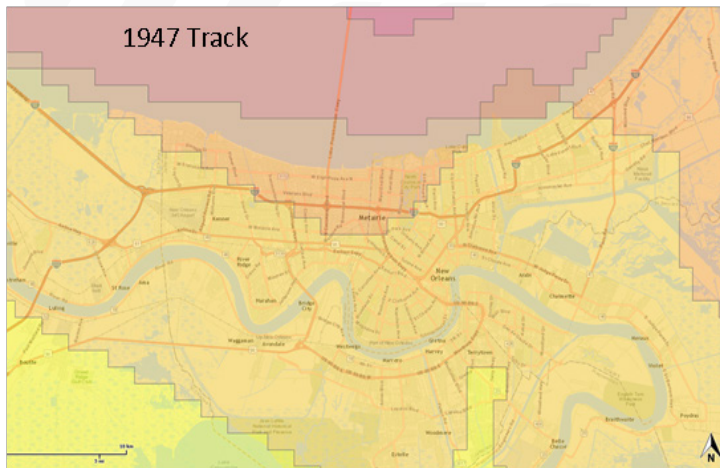
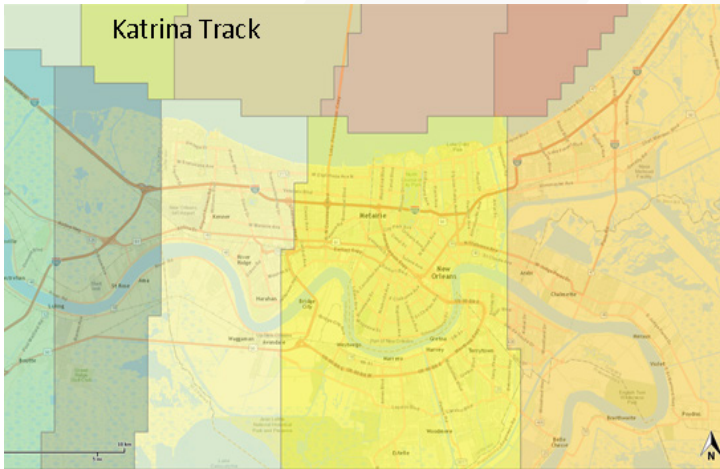
- ▶ In NOLA, the worst likely consequence is a high category 2 that may strengthen to a category 3 just before landfall
 - NOLA's policy is to call for mandatory evacuation for cat 3 and higher
- ▶ 20" or more of rain in 24 hours
- ▶ Dewatering system performance impacted by storm
- ▶ Two types of trajectories identified



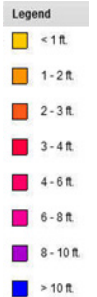
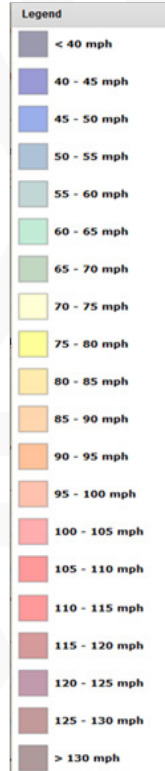
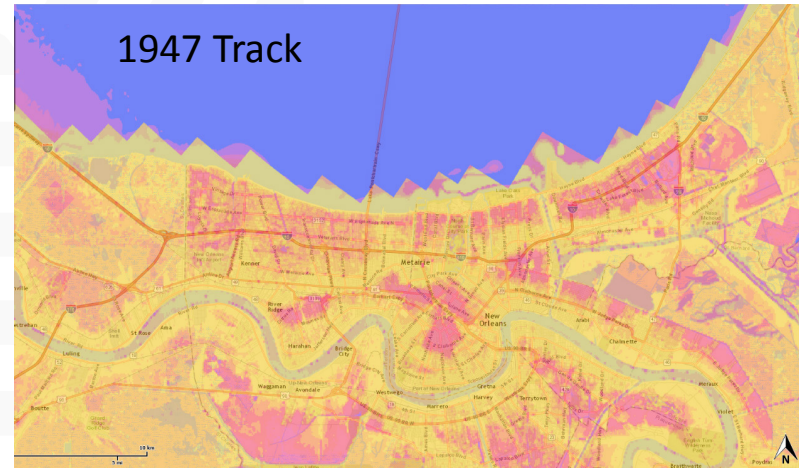
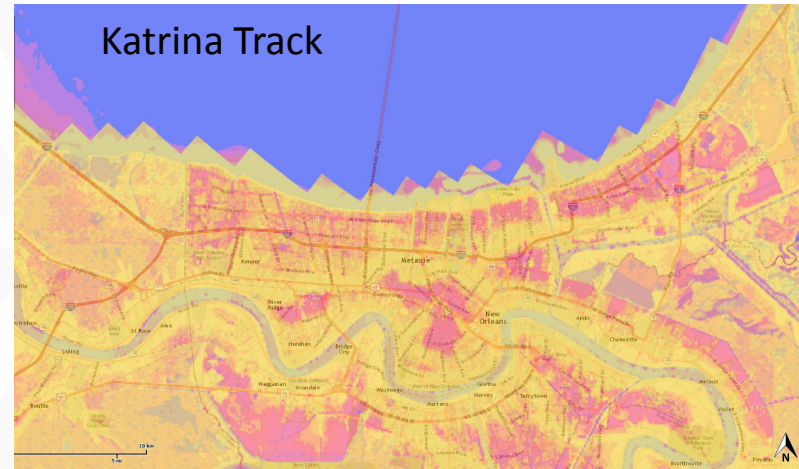
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Technical Details

► Wind:



► Inundation:

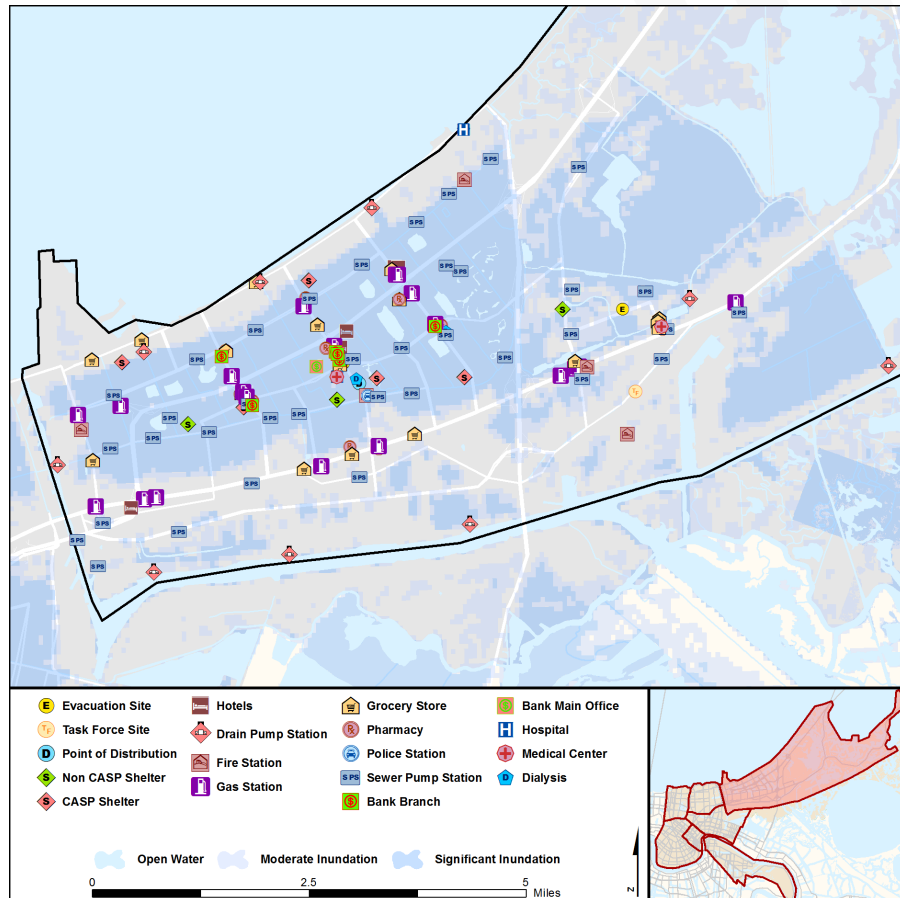


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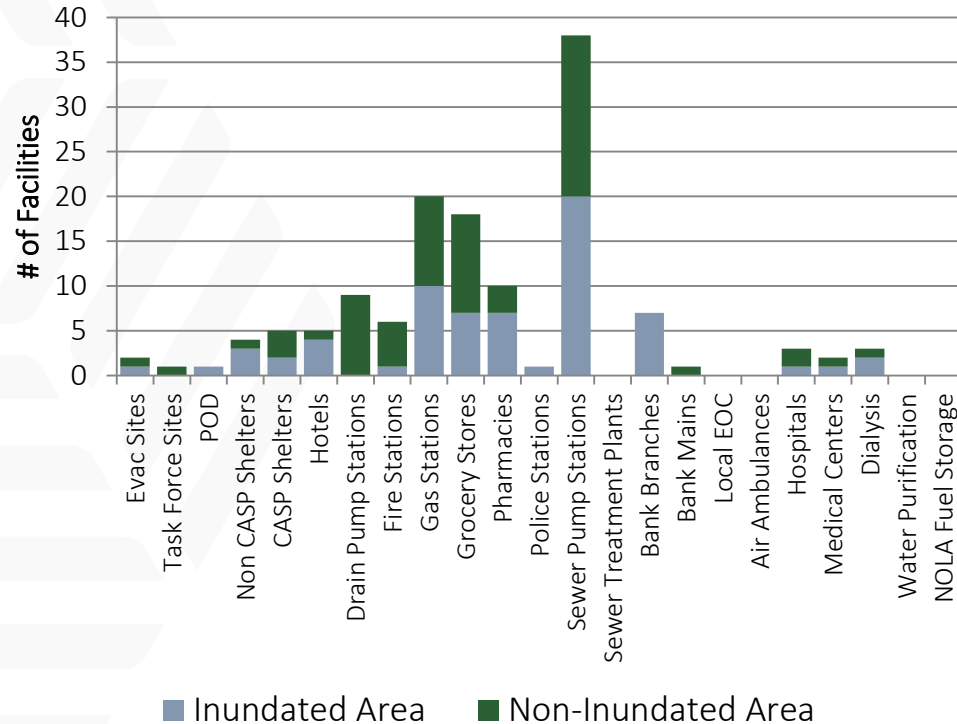
Technical Details

► Example analysis zone, New Orleans East:

□ Goal is to provide infrastructure services to a broad set of needs and locations



Inundation Impacts, Zone 1 - New Orleans East

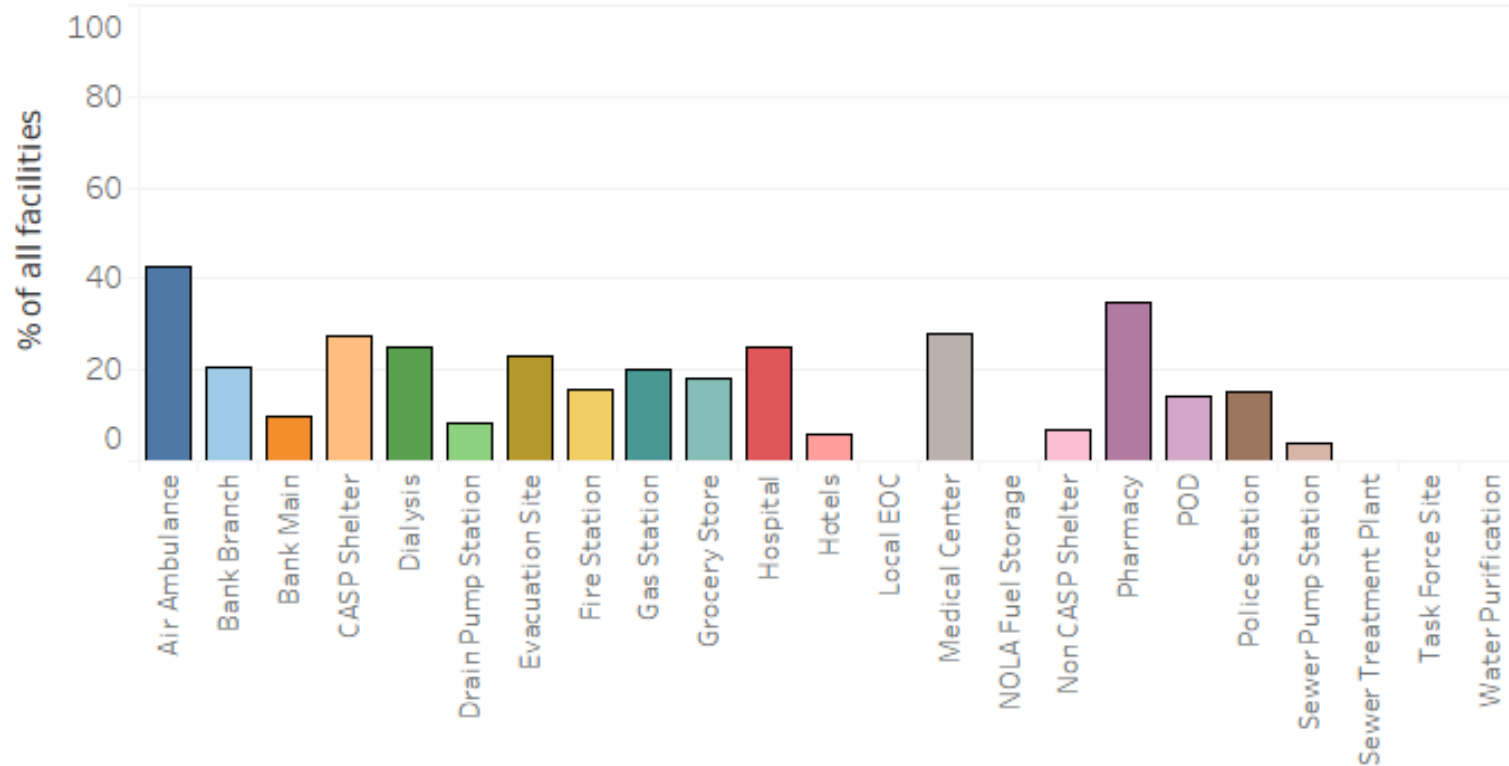


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Technical Details

► City wide impact if all resilience nodes supported by microgrids

Percentage of Total Infrastructure Supported by Resilience Nodes



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Technical Details



► Example analysis zone, New Orleans East

