Analyzing How Entergy New Orleans' Resiliency Plan Will Benefit the City's Most Vulnerable Populations

November, 2023

Resilience New Orleans, a new 501(c)(4) organization in New Orleans, led by energy expert and consumer advocate Casey DeMoss, engaged HedgeRow Analysis, LLC to quantify the investments in grid resilience in communities experiencing energy vulnerability and estimate the benefits these communities should receive as a result. Entergy New Orleans (ENO) has proposed $1.0 billion of investments including hardening grid structures, fortifying substations, improving communications, and bolstering vegetation management efforts from 2024 through 2032. ENO has also published maps and information about a Minimum Resilience Portfolio ($750 million) and an illustrative scenario that differentiates the impact of a smaller, less desirable investment level of $250 million.

Based on our research, it is clear that all New Orleans residents stand to benefit from ENOs' resilience investments. HedgeRow's analysis, using only publicly available data, indicates that a significant portion of those benefits will flow to those experiencing financial, medical, food, or other social vulnerabilities. Higher per capita investments will be made in neighborhoods with a greater percentage of these energy vulnerable populations, and these residents will receive more benefits per capita as a result.

Reduced duration and frequency of outages should reduce food loss impacts on food insecure populations and allow SNAP authorized grocery stores to remain open after storms. Increased resilience to storm damage should increase the number urgent care clinics, dialysis centers, and nursing homes to maintain operation, and reduce strain and financial impacts on the chronically and acutely ill. Likewise, the decreased length of outages should benefit those that require electricity-dependent durable medical equipment and reduce hospitalizations and evacuations.

A. Key Findings

- Preliminary analysis of the $1.0 billion investment level indicates that disadvantaged communities within the City of New Orleans will reap approximately **$1.25 billion in benefits** from approximately **$453 million in investments** in those areas (Table 1).
- Additional benefits will be realized from decreased response times after outages, and decreased frequency and duration of outages. Vulnerable areas make up 38% of communities but will **receive nearly 44% of the resilience investments**. Estimated spending per capita are higher in vulnerable communities ($2,937) than in less vulnerable communities ($2,495). Similarly, the estimated benefits per capita in vulnerable communities ($6,016) exceed those in less vulnerable communities ($5,236).

- ENO's' resilience investments will have positive impacts on residents that experience food insecurity, those that have chronic or acute illnesses or injury, and for hourly wage earners. Reduction in food losses from less frequent and shorter duration outages could save $10.8 million to $141 million per year. 63% of SNAP authorized grocery retailers are located within 50 meters of a proposed line upgrade, and 73 of those grocery stores are located within food deserts.
- While the proportion of medical facilities impacted by resilience investments varies among City Council Districts, 11 of 23 urgent care facilities, 12 of 19 dialysis centers, and 7 of 12 nursing homes examined will benefit. For every treatment day these 12 dialysis centers remain open saves residents from $350 to $900 thousand. Likewise, if the 11 urgent care centers near upgraded lines remain operational after a storm event, it would save $1.3 to $1.8 million per day.
- Nearly 86,000 employees work in areas that will have some level of resilience upgrade, including 20,500 lower wage positions earning less than $1,250 per month.

Table 1 - Estimated investment and benefits in vulnerable and less vulnerable areas

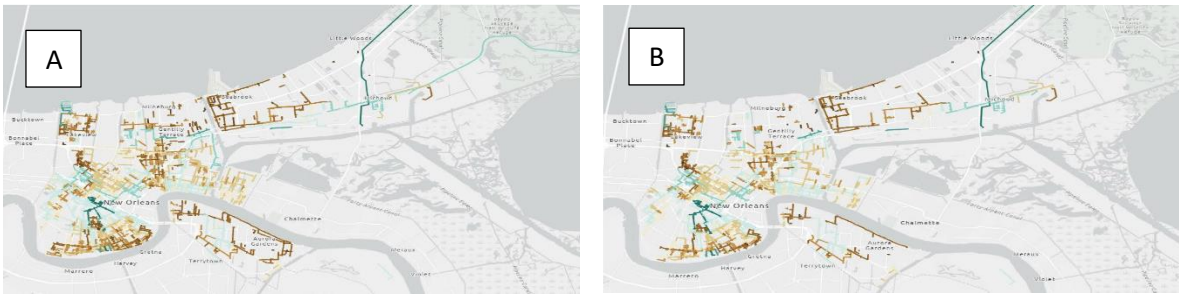
				$1.0B plan					$750M plan				
	Count (n tracts)	Proportion of tracts	Total Pop	Total mi. measured	Miles upgraded per 1000 people	Proportion of mi.	Investment (est.)	Benefits (est.)	Total mi. measured	Miles upgraded per 1000 people	Proportion of mi.	Investment (est.)	Benefits (est.)
Most vulnerable (top 1/3)	70	38%	155,215	212.92	1.37	44%	$453M	$1.25B	172.64	1.11	43%	$316M	$381M
Less vulnerable (bottom 2/3)	113	62%	236,034	275.11	1.17	56%	$585M	$1.62B	224.93	0.95	57%	$412M	$471M

B. Methods

Using publicly available data (ENO Resilience Filing 7-1-2022, Docket UD-21-03; ENO Final Comments 2023-07-21 (provided to New Orleans City Council), Docket UD-21-03; ENO Resilience Filing 4-17-2023, Docket UD-21-03; Entergy "View Power Outages Map"), we've been able to create a GIS of the electrical lines within the New Orleans city limits, identify which sections of those lines are included in proposed upgrade plans by level of investment[1]. We have cross referenced the distribution of these investments with a more comprehensive table (SM-2) of projects from a regulatory filing (ENO Resilience Filing 4-27-2023, Docket UD-21-03). This allowed us to estimate the proposed spending for each NO City Council District as well as by US Census tracts within the city (Table 2). We also added the Centers for Disease Control Social Vulnerability Index (CDC/ATSDR SVI 2020) and 5 other map layers depicting various social vulnerability metrics: CEQ Climate and Economic Justice Screening Tool, HHS Empower Map of vulnerable patients with electricity dependent medical equipment, USDA Food Access Research Atlas, data

[1] The maps in Figures 1 and 2 from ENO Final Comments 2023-07-21 document were scanned, georeferenced, and projected to create the project intervention maps (see Figure 1). Similarly, we created a layer of the entire power line system in New Orleans from Entergy New Orleans real-time outage map (Entergy "View Power Outages Map"). We created mask layers from the scanned project maps and selected power lines that would be upgraded from the powerline system map. Additional editing by hand was needed to ensure that the selected lines matched the project layers as closely as possible. The miles of line upgrades tallied in the resulting project maps for each district were within -6% to +5% of the distance tallied per district in Table SM-2, and within 2.7% citywide (Figure 1).

from USDOT Equitable Transportation Community Explorer, and finally a map of "Energy Stressed" communities paying 10% or more of their household income to utility bills – metric originally outlined in HHS 2005 (Table 3).



Next, we calculated the average cost per structure upgraded or overhead line converted to underground using example data given in (ENO Resilience Filing 7-1-2022). We calculated that the average cost per structure hardened was $39,198, and the average cost per mile of overhead line converted to underground was $4.375 million. We used these estimates to estimate the investment level per city council district: quantifying costs by multiplying the number of structures hardened indicated per sub-project in Table SM-2 (ENO Resilience Filing 4-17-2023, Docket UD-21-03) by the cost per structure. Benefits accruing to the population in those areas were quantified by multiplying the subproject cost estimate times the Benefit-Cost Ratio (BCR) for that subproject in Table SM-2. So, if the subproject cost is $1.5 million and the BCR is 3.0 then we assumed the benefits to be $4.5 million.

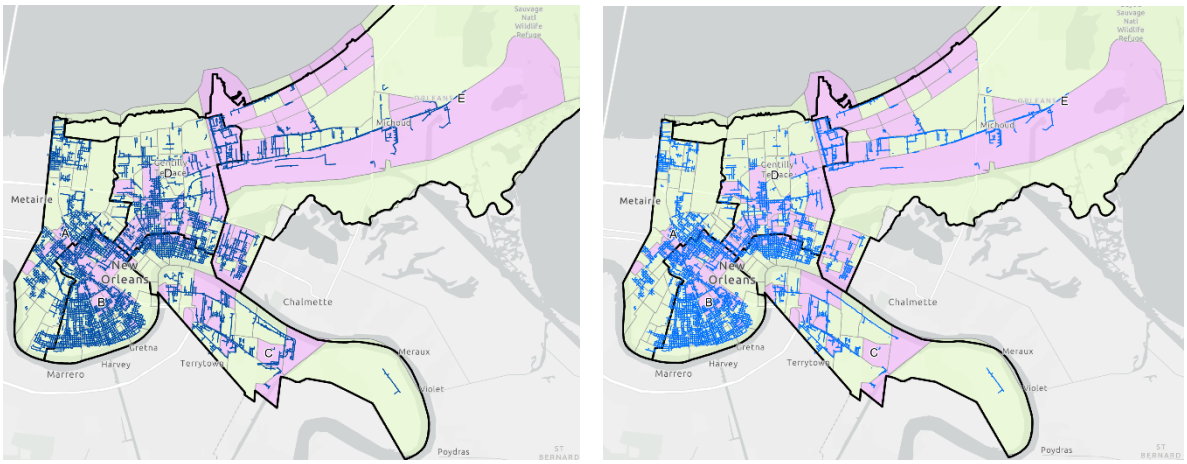


Figure 1 - Upper: Original Scanned maps of upgraded lines. Lower: GIS layers created from scanned project maps and power line maps. A) $1.0 Billion Resilience Plan, B) $750 million Resilience Plan

Because the location of the subprojects was redacted in SM-2, we used a conversion factor to relate the length in line miles upgraded with the number of structures upgraded in that subproject. We found that for every line mile of upgrades, there are, on average, ~47.1 structures hardened. This allowed us to disaggregate the investment down from the council

district to the census tract level. We calculated the estimated total investment and per capita investment for the $1.0 billion and $750 million project levels at the tract level and for vulnerable and less vulnerable communities as a whole. Due to using average number of structures hardened and having slightly less total line miles of upgrades in the GIS, the calculations produced an underestimate at the $1.0 billion project level. To account for this we applied a correction factor of 1.16x to investments at the tract level. No correction factor was needed at the $750 million project level as the sum of tract level investments was within 2.1% of $750 million.

To estimate the benefits, we multiplied the investments by the weighted average BCR for the council district in which the tract was situated (Average BCR, Table 2), and summed benefits for vulnerable and less vulnerable areas.

Table 2 - Calculated investments and benefits by New Orleans City Council District

Row Labels	Average of Project Start Year	Average of Benefit-Cost Ratio (BCR)	Sum of Total Line Miles	Structures to be Hardened	Total investment (nominal $)	Sum of Benefits
Council District A	July 2028	2.67	91.9	4,843	$ 189,833,642	$ 521,760,070
Council District B	Mar 2027	2.84	149.5	8,447	$ 331,101,543	$ 1,029,382,919
Council District C	July 2027	3.07	87.8	4,923	$ 192,969,444	$ 546,526,744
Council District D	Jan 2029	2.42	99.7	4,927	$ 193,126,235	$ 494,405,806
Council District E	May 2029	2.92	72.5	3,442	$ 134,917,901	$ 309,819,154
Total				26,582	$ 1,041,948,765	$ 2,901,894,692

Table 3 – Vulnerability of New Orleans communities based on 6 common metrics/indices

Level of analysis	Vunerability	CDC	CEQ	HHS	USDA	DOT	Energy Stress
Tract	Vulnerable	38%	57%	59%	59%	36%	45%
	Less Vulnerable	62%	43%	41%	41%	64%	55%
Households	Vulnerable	39%	56%	41%	62%	28%	42%
	Less Vulnerable	61%	44%	59%	38%	72%	58%
Population	Vulnerable	40%	56%	41%	67%	32%	43%
	Less Vulnerable	60%	44%	59%	33%	68%	57%
	Index of:	Post-disaster	Climate and Econ	Medical device	Food availability	Transport	Financial burden

C. Publicly Available Outage Data

We purchased historical electricity outage data (May 2015 to September 2023) from Data Fusion Solutions, a data aggregator that collects real-time outage reports from electric utilities. The outage data are provided for Orleans Parish in hourly increments, and the number of customers without power and total customers are provided. From these hourly data points we can estimate the frequency and duration of outages and tally the number of customers affected. We also estimated the annual average number of minutes without power per customer. This metric is similar to the System Average Interruption Duration Index (SAIDI). We also calculate the total number of interruptions per year and divide that by the total customers served which is comparable to the System Average Interruption Frequency Index (SAIFI). Because we have hourly time step data instead of the minute-by-minute data available to the utilities, these

methods overestimate the SAIDI and SAIFI metrics compared to the values reported by utilities to the Energy Information Administration (EIA, Figure 2).

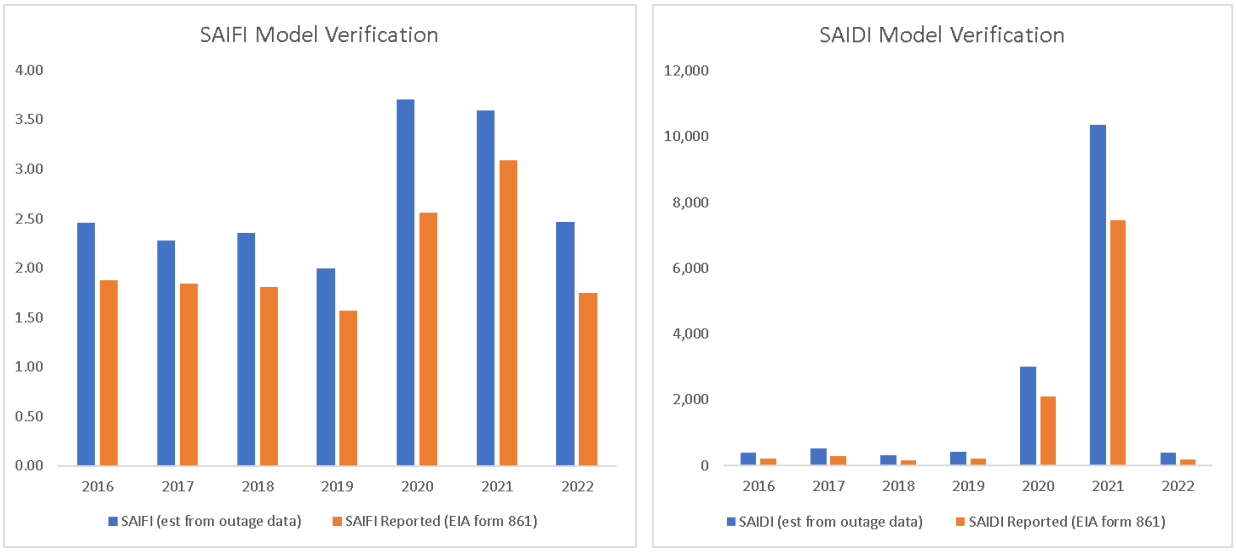


Figure 2 – Comparison of SAIDI and SAIFI as reported by Entergy New Orleans (EIA form 861) in orange, to the SAIDI and SAIFI-like metrics calculated from the publicly available outage data. On average, our SAIDI estimates are 1.76x, and our SAIFI estimates are 1.3x the value reported to the EIA. However the pattern and trend is preserved. These discrepancies stem from the more coarse hour-by-hour dataset available to us, and the methods used to determine length of outages and number of customers affected.

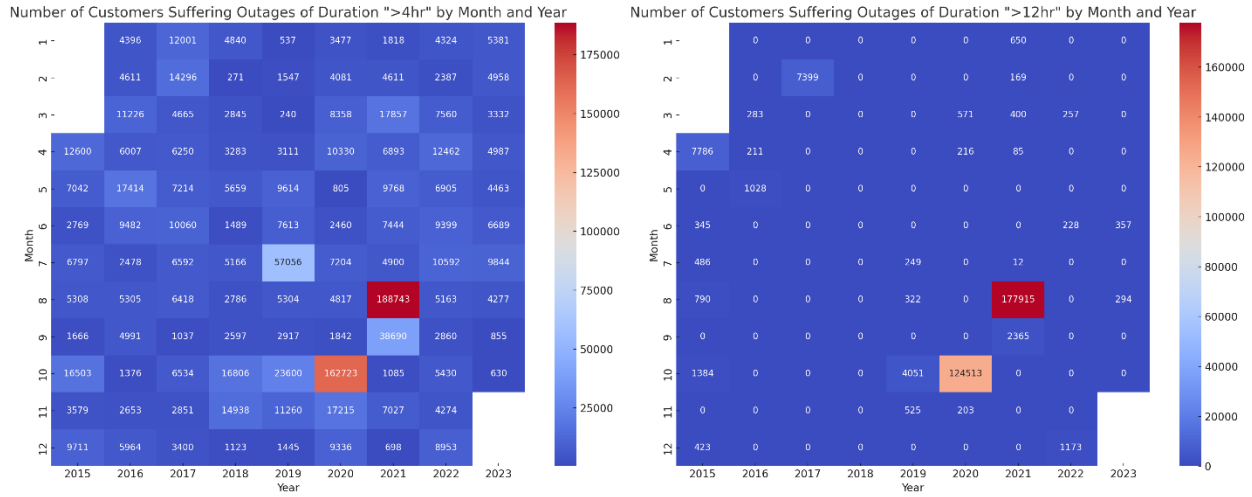


Figure 3 – Heat plots of the monthly number of episodes of outages greater than 4 hours and greater than 12 hours derived from the Data Fusions Solutions outage data. Outages related to major storm events are evident: Hurricane Barry (July 2019), Zeta (October 2020), Ida (Aug 2021).

Outages lasting longer than key thresholds (Figure 3) can be used to estimate food losses and other damages, and also consider how these damages might be reduced under ENO's resilience investments.

D. Selecting Vulnerable Communities

We used the Centers for Disease Control Social Vulnerability Index (CDC/ATSDR 2023) to select census tracts ranked in the top third most vulnerable statewide. 70 out of the 179 tracts considered in this analysis were selected as vulnerable for this preliminary analysis. The CDC/ATSDR SVI uses 16 U.S. census variables, in 4 themes (socioeconomic, household, racial and ethnic minority status, and housing type/transportation) and is designed to help local officials identify communities that may need support before, during, or after disasters. The other vulnerability indexes related to climate and income, electricity-dependent medical equipment, food availability, transportation, energy stress (Figure 4) will be used in additional benefits calculations.

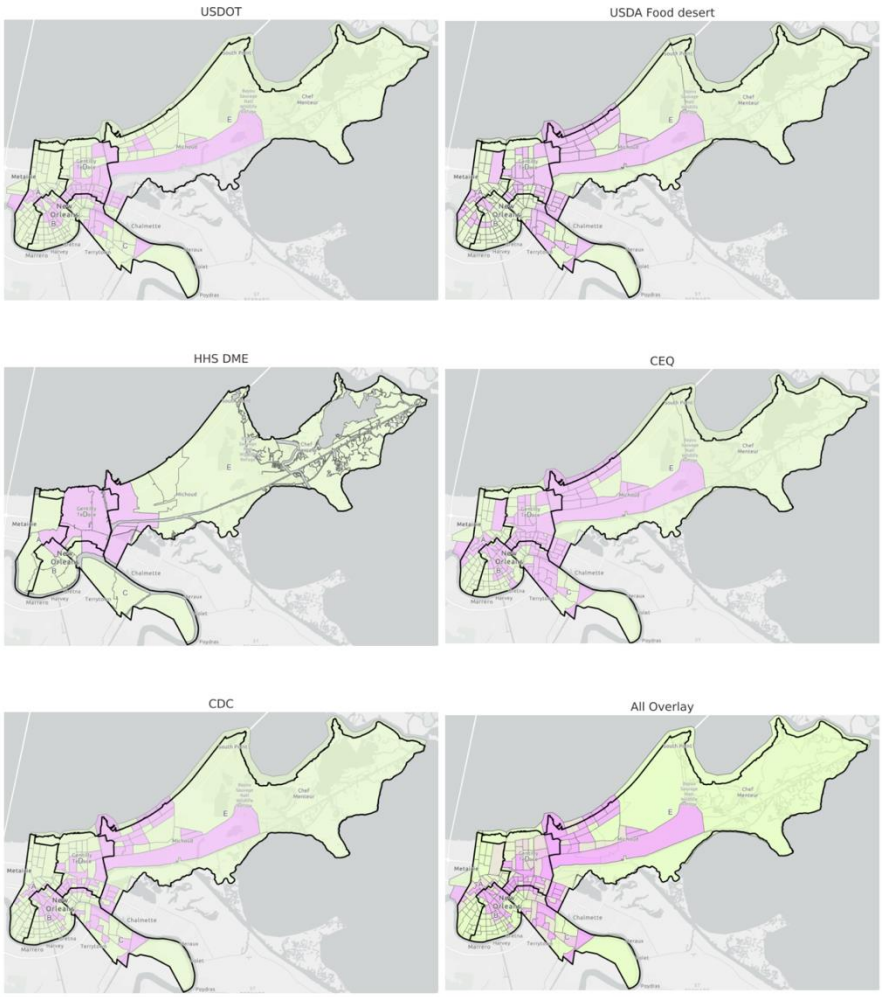


Figure 4 – Maps depicting communities experiencing energy vulnerability in New Orleans using five common metrics/indices and including an overlay of all indicators

E. Additional Benefits

Long term power outages affect residents through food loss and decreased access to grocery stores, reduced access to medical care, and reduced earnings for hourly employees whose place

of work is closed. Lower-income households, residents with acute of chronic medical conditions, those experiencing food insecurity, and other socially vulnerable households may lack emergency resources or transportation options to access more distant areas with functioning electrical grids, and therefore experience increased impacts from prolonged outages. Hardening structures against storm damage and other resilience investments can reduce the duration and frequency of outages which can reduce food loss, keep grocery stores and medical facilities open, and reduce the impact on medically vulnerable residents that require electricity to power their medical devices. Businesses located near resilience upgrades will be less likely to experience power outages, and as long as transportation isn't also restricted, should reduce the wage losses for residents. We quantify these benefits using the map of line upgrades, publicly available GIS layers, and electricity outage data purchased from a data aggregator.

F. Food Losses

Food loss impacts on the finances of both wealthy families and families experiencing financial hardship. Outages lasting greater than 4 hours require food in one refrigerator to be discarded and can cost residents around $175, the average weekly spending on food (USDA 2023, Visually.com). Outages greater than 12 hours impact foods stored in the freezer can increase financial impacts to $500 to $700 (monthly spending, USDA 2023; cap for food loss insurance claim). For those participating in food aid programs such as SNAP, power outages lasting between 4 and 24 hours are especially trying, as the power must be out for more than 24 consecutive hours to qualify for replacement SNAP benefits. Prolonged outages also cause additional strain for families living within lower food availability areas known as "food deserts". In these areas, if the scant grocery stores are also hit by power outages, food availability will further be constrained. Even in grocery stores with backup generators, communication lines must also remain open for SNAP beneficiaries to use their EBT cards to make purchases.

Investments in grid resilience will have positive impacts on those experiencing food insecurity as well as the broader population. We quantify these benefits in two ways: First we use publicly available data to examine the past history of outages in New Orleans, and use ENO's projected reductions in outage length and frequency to estimate the reduced food loss expenses for all residents. Next we overlay a recent map of SNAP grocery stores with the map of resilience investments at the $1.0B and $750M levels, to determine which stores will have decreased likelihood of outages going forward. We determine the percent of stores adjacent to upgraded infrastructure in each City Council district and also compare between low income/low availability (LI/LA) and non-LI/LA census tracts. More detailed methods follow.

We analyzed the hourly outage data for ENO's customers compiled by Data Fusion Solutions (May 2015 to September 2023) to determine the frequency of outages greater than 4 and 12 hours and the number of customers impacted. By multiplying the number of outages x number of customers affected x the damage functions for each outage length above, we estimate that the cost of food loss each year for New Orleans residents ranges from $10.8 million (2018) to

$141 million (2021) over the past 8 years (Figure 5). By applying an assumed reduction in outages of 45% after storm events (ENO Resilience Filing 4-17-2023, Docket UD-21-03) to the outage patterns in years with the highest and lowest outages, we estimate the future reduction in outage length and frequency. Next, we tally the updated frequency and duration of outages lasting more than 4 and 12 hours and apply the same damage functions. Looking ahead, we quantify the reduced food loss costs as the difference between total losses in prior years and prospective future years after resilience investments. Potential savings from decreased losses ranges from $4.9 million in lower outage years, to $63.7 million per year in years with above average severe weather events.

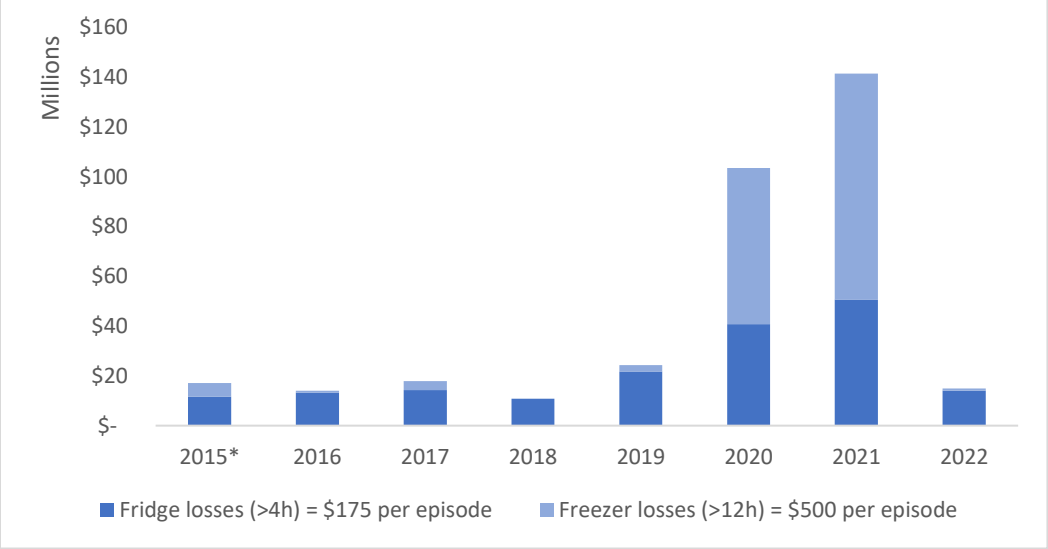


*Figure 5 - Estimated nominal value of food losses due to outages lasting greater than 4 or greater than 12 hours, May 2015 to Dec 2022. *2015 represents only 7 mo. of outages. Assumes $175 in losses for outages lasting 4-11 hours, and $500 for those lasting greater than 12 hours.*

Nearly two-thirds (176 out of 275) of SNAP authorized grocery retailers within New Orleans are located within 50 meters of planned distribution line hardening. Seventy-three (41%) of these are in Low Income / Low Availability areas of the city where many residents experience food insecurity (Table 4). 58% of the 126 stores in LI/LA areas will have improved resilience to storm related outages (Figure 6). Families experiencing food insecurity exist in all City Council districts in New Orleans, and 44% to 81% of the grocery stores within each district will have improved resilience resulting from ENO investments under the $1.0B plan. Council District B has both greatest number of stores (48) and percentage of stores upgraded (81%), while Council District E has the fewest and lowest proportion (25 and 44% respectively, Table 4).

Figure 6 – SNAP grocery stores within City of New Orleans. Green icons indicate stores within 50 m of a proposed line hardening investment, the remainder are not proximate to proposed line hardening. Pink areas indicate areas of Low Income / Low Availability of food.

Table 4 – SNAP grocery stores located within 50 meters of a line hardening investment by City Council District and for census tract areas with USDA Low Income / Low Availability ($1.0B investment level)

Facility Type	Council District	Facilities with direct upgrade	Facilities without direct upgrade	Total	Percentage directly upgraded
SNAP Stores	A	28	18	46	61%
	B	48	11	59	81%
	C	34	20	54	63%
	D	42	18	60	70%
	E	25	32	57	44%

Facility Type	USDA Low Income / Low Access	Facilities with direct upgrade	Facilities without direct upgrade	Total	Percentage directly upgraded
SNAP Stores	TRUE	73	53	126	58%
	FALSE	103	46	149	69%

G. Medical Vulnerability

Residents with chronic illness, mobility issues, and those that require electricity-dependent durable medical equipment (DME) are especially vulnerable to electricity outages. Reducing power outage duration and frequency improves access to local medical facilities for treatment of acute and chronic illness after storm events. If dialysis centers are closed, patients must travel further to more expensive and more crowded emergency departments of area hospitals. Residents with electricity-dependent DME, such as ventilators, oxygen concentrators, power wheelchairs, intravenous or feeding equipment, often have backup batteries, but these are often limited to covering shorter duration outages before they need to be recharged. Lower income households are less likely to have access to portable generators to bridge longer duration outages.

H. Local Medical Facilities

To examine the amount and distribution of the benefits of ENO resilience investments we perform a spatial analysis comparing the location of key medical facilities: urgent care centers, dialysis clinics, and nursing homes, and the proposed line hardening upgrades under the $1.0B and $750M investment levels. We compare the number and proportion of facilities near upgraded distribution lines by district. We also compared upgrades in areas with the top 1/3 most vulnerable populations and the less vulnerable, and for areas with a high proportion of households having 1 or more members with a disability.

At the City Council District level, there is a wide disparity between the number and proportion of medical facilities that are located near proposed line hardening upgrades. All of the facilities in District A are located near upgrades, while a much lower percentage of facilities in Districts D and E will benefit from resilience investments (Table 5, Figures 7 and 8).

Table 5 - Medical facilities located within 50 meters of a proposed distribution line upgrade in New Orleans under the $1.0B plan by New Orleans City Council District.

Facility Type	Council District	Facilities with direct upgrade	Facilities without direct upgrade	Total	Percentage directly upgraded
Urgent Care Facilities	A	**5**	0	5	**100%**
	B	**4**	5	9	**44%**
	C	**1**	1	2	**50%**
	D	**1**	4	5	**20%**
	E	**0**	2	2	**0%**
Dialysis Centers	A	**2**	0	2	**100%**
	B	**6**	1	7	**86%**
	C	**2**	1	3	**67%**
	D	**1**	2	3	**33%**
	E	**1**	3	4	**25%**
Nursing Homes	A	**2**	0	2	**100%**
	B	**1**	2	3	**33%**
	C	**3**	1	4	**75%**
	D	**0**	1	1	**0%**
	E	**1**	1	2	**50%**

Similarly, we can look at the comparative resilience benefits to residents living in the top 1/3 most socially vulnerable areas (CDC/ATSDR 2023) versus the less vulnerable areas (Table 6).

Table 6 - Medical facilities located within 50 meters of a proposed distribution line upgrade in New Orleans under the $1.0B plan for areas in the top 1/3 most socially vulnerable and less vulnerable areas.

Facility Type	CDC Social Vulner.	Facilities with direct upgrade	Facilities without direct upgrade	Total	Percentage directly upgraded
Urgent Care Facilities	TRUE	**2**	3	5	**40%**
	FALSE	**9**	9	18	**50%**
Dialysis Centers	TRUE	**7**	4	11	**64%**
	FALSE	**5**	3	8	**63%**
Nursing Homes	TRUE	**5**	2	7	**71%**
	FALSE	**2**	3	5	**40%**

A higher proportion of the distribution lines serving dialysis centers and nursing homes will be upgraded in the top 1/3 most socially vulnerable areas. For urgent care facilities the opposite is true, a greater proportion of facilities will be served by more resilient distribution lines in less vulnerable areas. Surprisingly there were far fewer urgent cares serving the more vulnerable areas of the city overall.

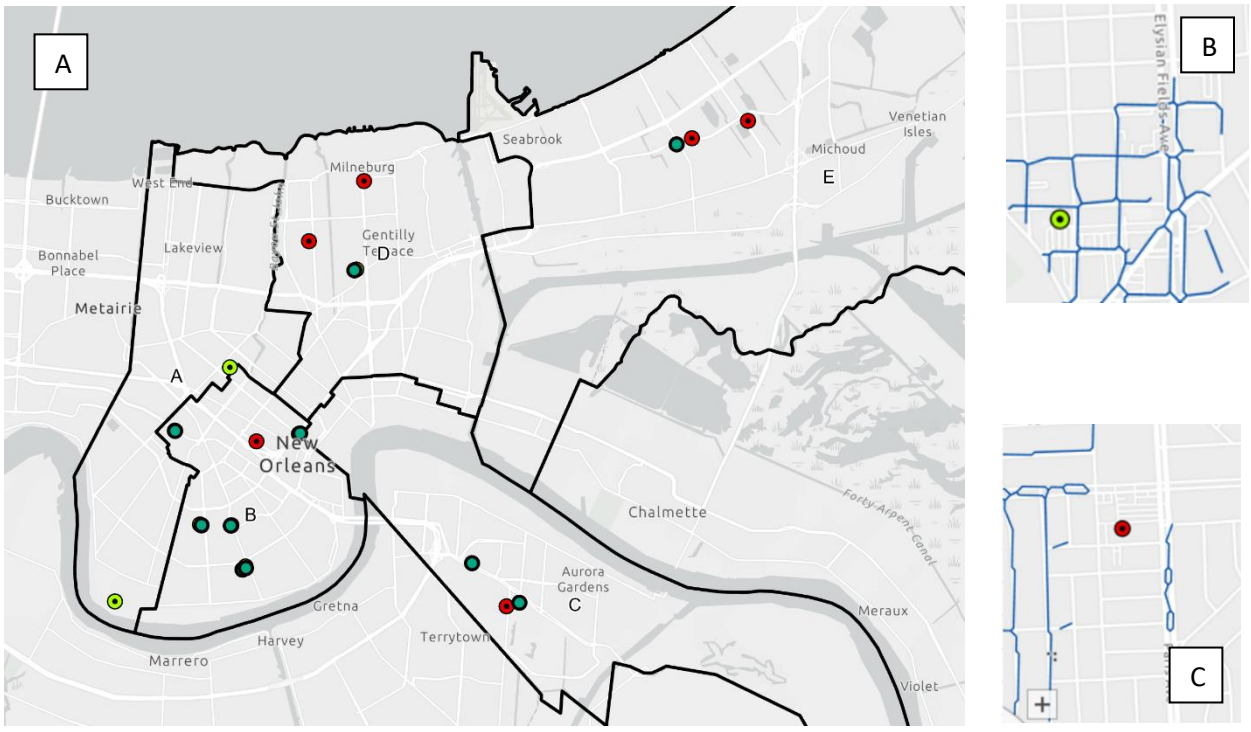


Figure 7 - A) Map of dialysis centers in New Orleans (HIFLD 2023, LDOH 2023). B) Green dots indicate centers located within 50 meters of a proposed line upgrade, while C) Red dots indicate location is not within 50 meters of a proposed line upgrade.

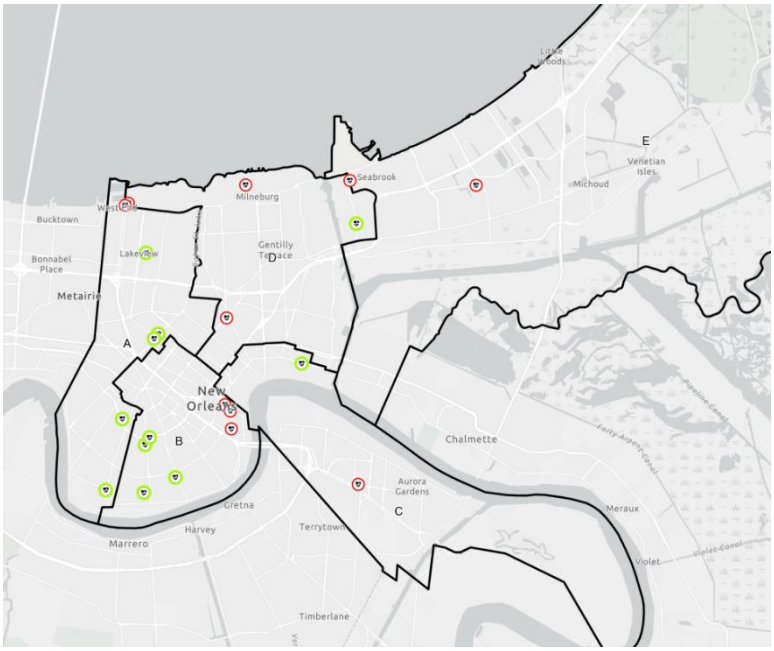


Figure 8 – Map of urgent care facilities in New Orleans. Green dots indicate urgent care facilities located within 50

It is more challenging to quantify the financial benefit of improved resilience of the electrical grid to storms for medically vulnerable residents. However, we can use the number of facilities upgraded and the average number of patients served, multiplied by the difference in price for alternative treatment options (typically the emergency department of hospitals) to estimate potential benefits from ENO's $1.0B resilience investment.

Note, the cost of evacuation from major storms is often cost prohibitive for low-income households, as average costs per family in the 2000s were $1,137: $341 for transportation, $333 for food, and $405 for lodging (Wu et al. 2012). Additionally, patients with chronic conditions may be mobility impaired, making a long journey outside of the area of impact difficult to impossible.

For every 1-2 days that a free-standing dialysis center remains open when it would otherwise be closed reduces medical costs by $35,000 to $80,000. If all 12 of the dialysis centers located near line hardening investments were able to stay open, this would save up to $960,000 per treatment day (see Appendix A for details). Emergency dialysis treatments also raise the risk of serious complications or death (Rizzolo et al. 2020).

Each day an urgent care clinic is open when it would normally not have been results in savings of $120k to $160k per day of operation per facility. The savings comes from preventing additional costs of emergency room treatment for non-life threatening injury or illness.

In nearby Texas, prices for urgent care centers were only $164 and $168 in 2012 and 2015 (Ho et al. 2017), while the cost of an emergency department visit in 2015: $2,259. This is 13.4 times more expensive than urgent care, over $2,000 more expensive. If the average urgent care clinic

sees 60-80 patients per day (AAUCM 2023), and 11 New Orleans urgent care facilities are made more resilient to outages, from $1.3 to $1.8 million would be saved per outage day, if all are able to remain open.

I. Electricity-Dependent DME

We also assessed the potential benefits accruing to residents requiring electricity-dependent durable medical equipment (DME) by using the same outage time-series data sets as we did for food insecure populations to determine the reduction in frequency and number of outages lasting for 2, 4 and 12 hours. Oxygen concentrators and ventilators have a battery backup of 2-4 hours, and with external batteries and reduced settings some can be used up to 12 hours (Molinari et al. 2017). If the number of episodes of 2-, 4-, and 12-hour outages are reduced by 45%, total episodes of >2-hour power loss will decrease by nearly 125,000 to 225,000 per year, and 12-hour power outage episodes will decrease by up to 82,000 per year. This will decrease the chances that the 4,362 New Orleans residents that are reliant on electricity-dependent DME can avoid costly emergency department visits, avoid evacuation during storm events, and reduce anxiety and mental strain during storm related outages.

J. Workers

Over 86 thousand employees out of 180 thousand jobs in the city should benefit from ENO's resilience investments (Table 7, Figure 9). Of these, one quarter are lower-wage positions earning less than $1,250 per month. These employees are least likely to be compensated if they are unable to work during a prolonged outage, and the among the most vulnerable to wage losses when they occur. Most jobs impacted by the resilience investments are in Districts A and B, and impact those earning $3,333/month or more. However, 40% to 54% of jobs within each wage level are located in areas with upgrades (Table 8).

Table 7 – Sum of job positions located in census blocks that intersect proposed resilience investments and their distribution by district.

Council District	All jobs near upgrade	% of all jobs near upgrade	Total lower income jobs	% of lower income jobs near upgrade	Total middle income jobs	% of middle income jobs near upgrade	Total upper income jobs	% of upper income jobs near upgrade
A	18,756	22%	5,264	28%	4,983	27%	8,510	45%
B	40,660	47%	8,713	21%	12,395	30%	19,552	48%
C	9,686	11%	3,077	32%	3,163	33%	3,446	36%
D	7,782	9%	2,259	29%	2,539	33%	2,984	38%
E	9,094	11%	1,185	13%	1,940	21%	5,969	66%
Total	***85,978***		***20,498***	***24%***	***25,019***	***29%***	***40,461***	***47%***

Table 8 - Number of jobs near line upgrades under $1.0B investment scenario, by monthly earning level.

	<$1,250/mo.	$1,250 - $3,333/mo.	>$3,333/mo.
Jobs near line upgrades	20,504	25,032	40,539
Total jobs	50,837	45,743	83,884
Percent near upgrades	40%	55%	48%

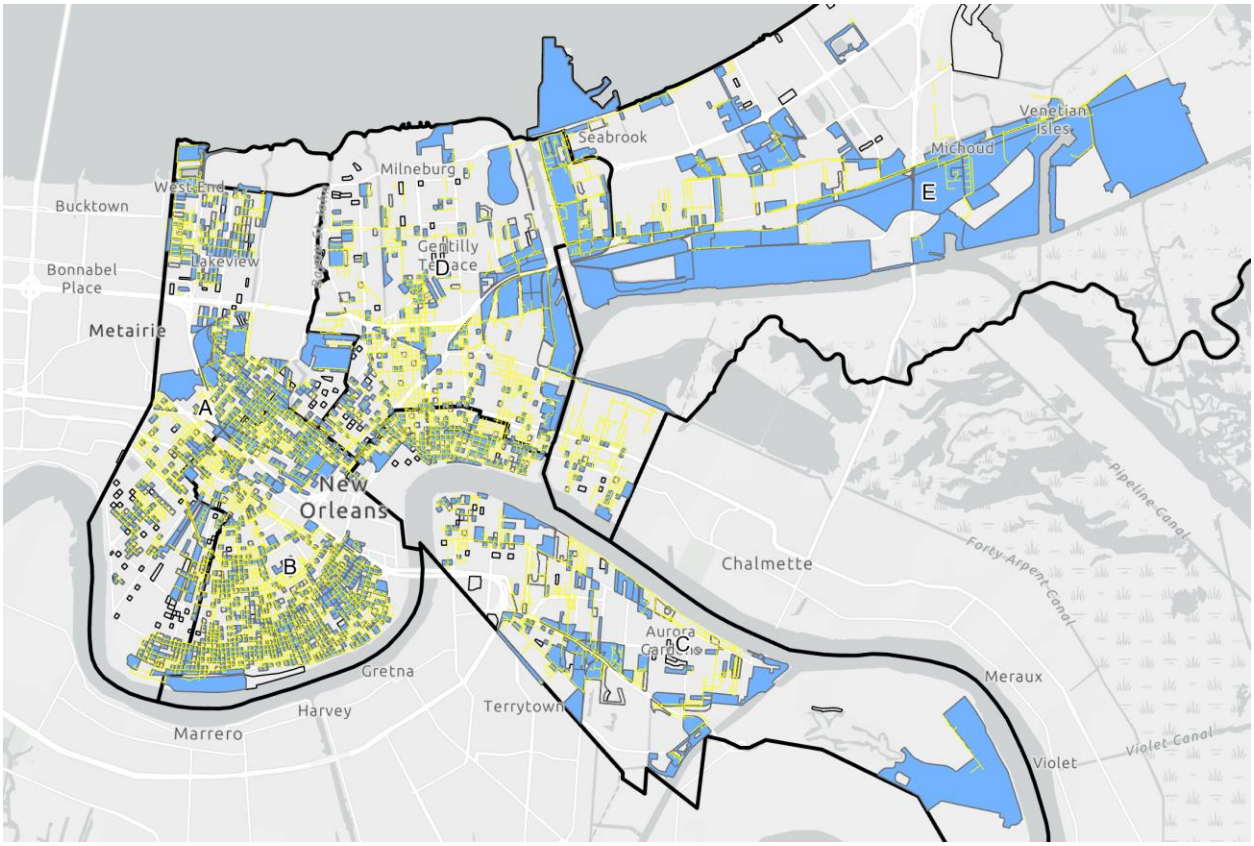


Figure 9 – Map of census blocks with employment (Workplace Area Characteristics data from LODES/US Census 2023). Blue polygons indicate census blocks with employment which intersect with proposed distribution line upgrades under the $1.0B investment level. Hallow polygons are census blocks with employment but do not intersect the upgraded lines. The line upgrades are indicated in yellow.

Appendix A: Estimated savings from improved resilience investments

Medical treatment centers

Number of estimated dialysis patients:

Incidence of CKD patients in Louisiana: 230.05/100,000 residents (Molinari et al. 2017) x 384,000 residents = approximately 881 dialysis patients

Divided among the city's 19 dialysis centers = ~46 patients per facility

Cost comparison:

CMS cost per outpatient dialysis treatment = $257.90

Cost per emergency treatment = $1,031 to $2,000

The difference in charges between outpatient and emergency treatment ranges from **$770 to $1740** per treatment x 3 per week **= $2,300 to $5,200 saved per patient per clinic per week of outage.**

Savings / Benefits:

At the facility level this translates to 46 patients * $2,300 - $5,200 per week = $106k to $239k saved per week.

The 12 dialysis centers receiving upgrades, then, represent a benefit of $1.3 million to $2.9 million per week of outages or $430k to $960k every 2 days.

Sources:

Thousands of uninsured kidney disease patients strain Texas emergency departments | Healthcare Finance News

Emergent dialysis also carries a substantial price tag. Scheduled dialysis in an outpatient clinic costs about $250, while intermittent treatment in the emergency department costs eight times more, about $2,000.

Cost of Dialysis - 2023 Healthcare Costs - CostHelper

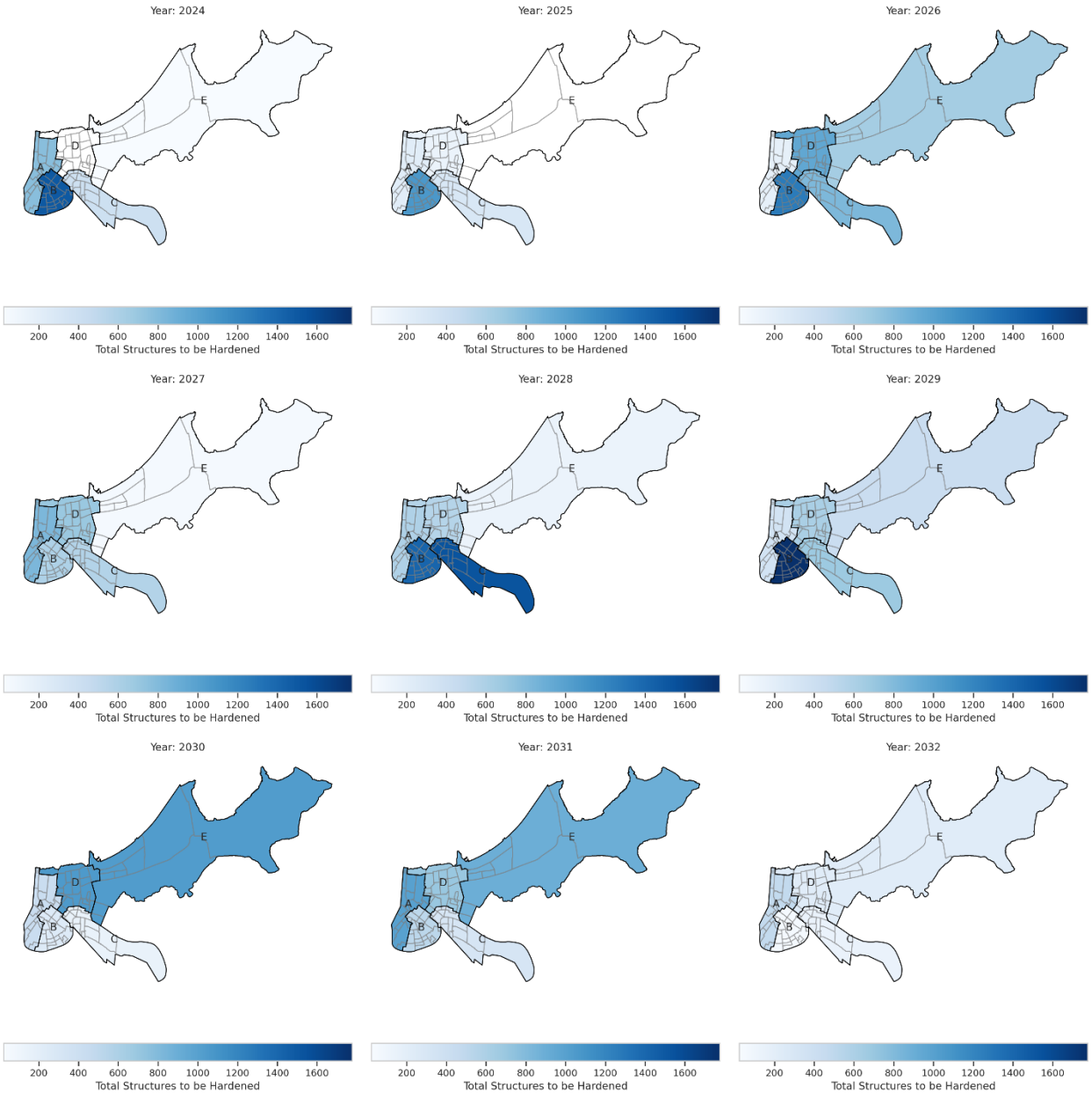
An emergency, unscheduled dialysis treatment at a hospital can cost much more; for example, Baptist Memorial Health Care in Memphis charges about **$9,900** for a single treatment.

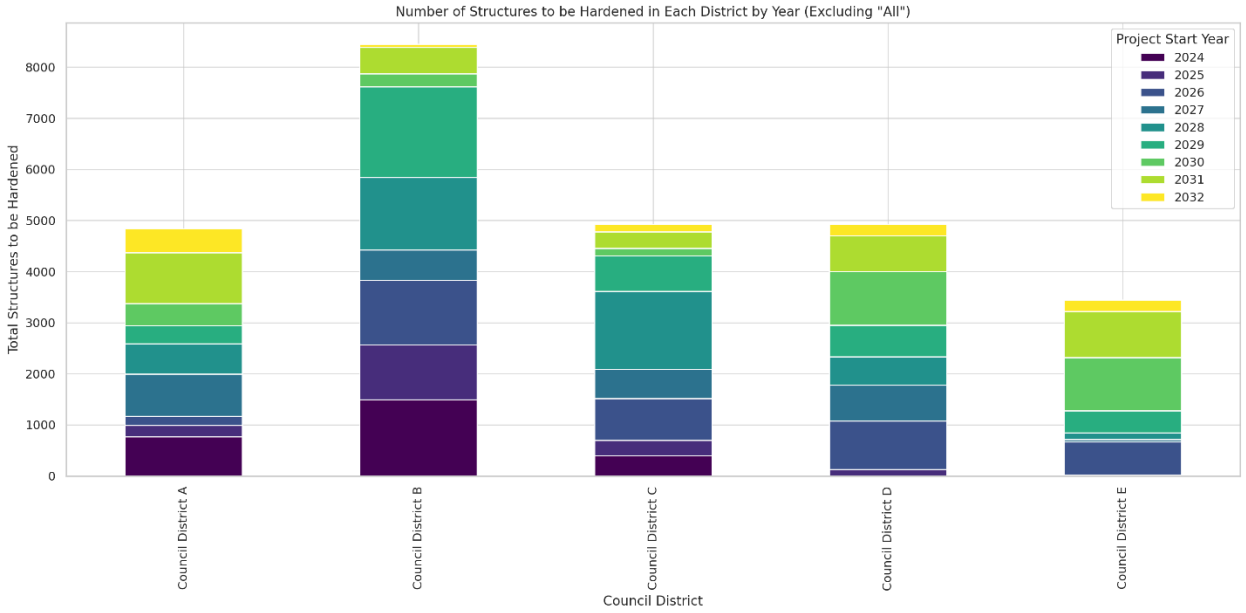
EMERGENCY-ONLY DIALYSIS: A COMPASSIONATE, PRACTICAL SOLUTION | National Kidney Foundation

The mortality rate for persons receiving emergency dialysis is 14 times higher than standard care of thrice weekly hemodialysis (Cervantes, 2018b)

Appendix B – Illustration of investments by year and by City Council District

Number of Structures to be Hardened by Council District and Year




Number of Structures to be Hardened in Each District by Year (Excluding "All")
Project Start Year
2024
2025
2026
2027
2028
2029
2030
2031
2032
Total Structures to be Hardened
0
1000
2000
3000
4000
5000
6000
7000
8000
Council District A
Council District B
Council District C
Council District D
Council District E
Council District