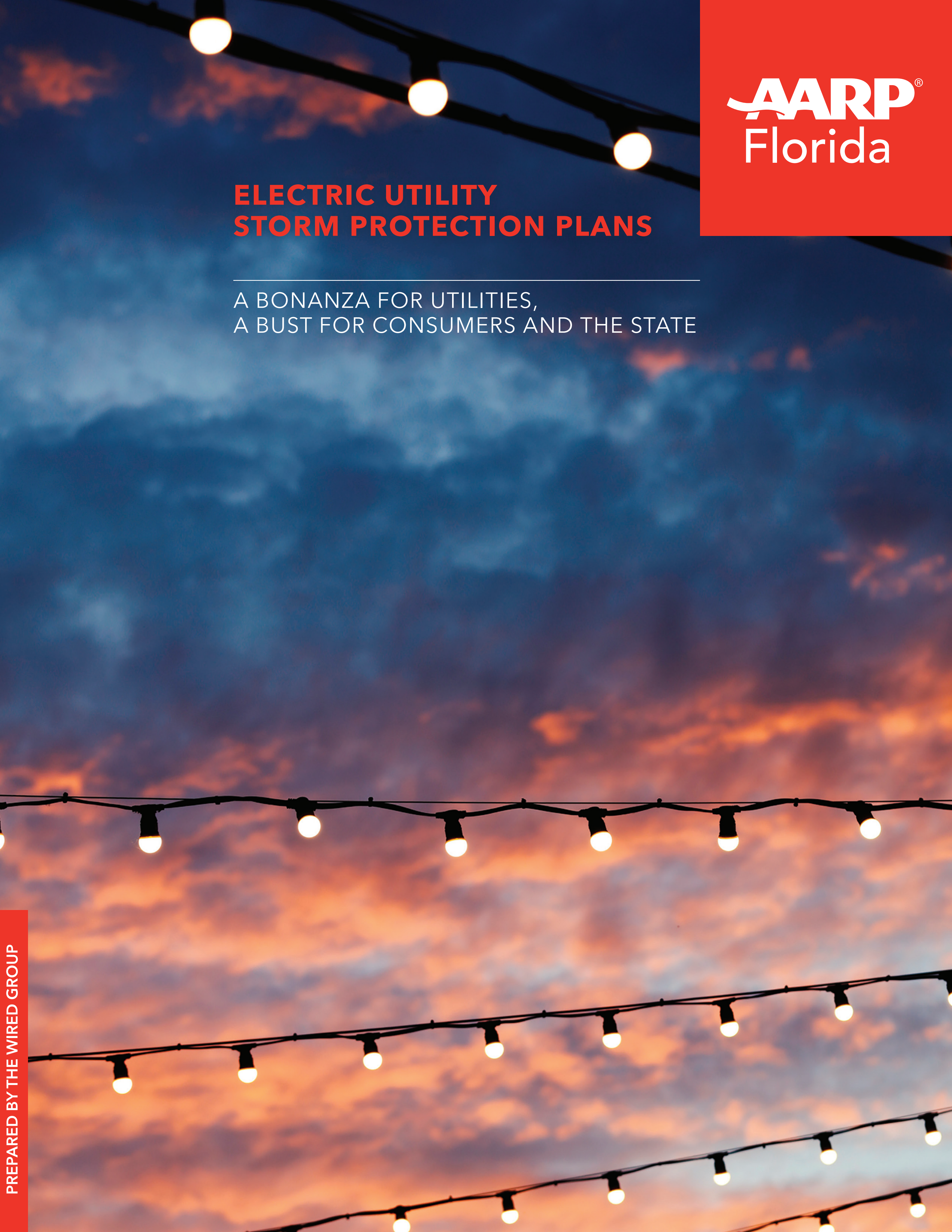

AARP Florida

ELECTRIC UTILITY STORM PROTECTION PLANS

A BONANZA FOR UTILITIES, A BUST FOR CONSUMERS AND THE STATE

PREPARED BY THE WIRED GROUP

ABOUT AARP

AARP is the nation's largest nonprofit, nonpartisan organization dedicated to empowering people to choose how they live as they age. With a nationwide presence and nearly 38 million members, AARP strengthens communities and advocates for what matters most to families: health security, financial stability and personal fulfillment. In Florida, AARP has 2.7 million members and over 3,000 volunteers. AARP offers news, information, research, and events to its Florida members, and advocates for Florida consumers' interests. This whitepaper is an example of such advocacy.

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TABLE OF CONTENTS

4 **EXECUTIVE SUMMARY**

6 **AARP RECOMMENDATIONS**

8 **THE ELECTRIC GRID: DESIGN, IMPLICATIONS, AND PERSPECTIVE**

8 THE GRID IS DESIGNED TO MAXIMIZE CENTRALIZED OPERATION EFFICIENCY

11 IMPLICATIONS: MITIGATING THE IMPACT OF MAJOR STORMS

15 PERSPECTIVE: STRIKING THE RIGHT BALANCE BETWEEN RELIABILITY AND AFFORDABILITY

19 **STORM PROTECTION PLANS: THE GOOD, THE BAD, AND THE UGLY**

19 FLORIDA'S STORM PROTECTION PLAN STATUTE AND ASSOCIATED PSC RULES

19 UNINTENDED CONSEQUENCES OF THE STATUTE AND ASSOCIATED PSC RULES

23 **DEFICIENCIES COMMON TO THE UTILITIES' STORM PROTECTION PLANS**

24 UNDERGROUNDING IS INTUITIVELY APPEALING BUT INFEASIBLE, UNREASONABLE, AND IMPRACTICAL

27 ASSET REPLACEMENTS TAKE ADVANTAGE OF CUSTOMERS VIA THE STORM PROTECTION PLANS

28 UTILITIES ESCAPE ALL ACCOUNTABILITY BY AVOIDING PSC TECHNICAL REQUIREMENTS

28 HOW TO OBJECTIVELY ESTIMATE SPP PROGRAM COSTS AND BENEFITS TO CUSTOMERS

31 **OBSERVATIONS, RECOMMENDATIONS, AND CONCLUSION**

34 **APPENDIX: STORM PROTECTION PLAN REVIEWS**

34 FLORIDA POWER & LIGHT

36 DUKE ENERGY FLORIDA

39 TAMPA ELECTRIC COMPANY

41 GULF POWER COMPANY

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9 **FIGURE 1: How Electricity Is Delivered**

10 **FIGURE 2: Typical "Percent Restored by Day" Curve**

12 **FIGURE 3: Incremental Percentage of Customers Undergrounded in 10-Year Plans**

14 **FIGURE 4: Distribution Assets, Florida Utilities**

18 **FIGURE 5: The Reliability vs. Affordability Curve**

20 **FIGURE 6: Utility Profit Percentages, 2010–2018**

30 **FIGURE 7: Sample Calculation Estimating the Future Economic Benefit from a Plan, Project, or Program**

24 **TABLE 1: Key Cost Statistics from Florida Utilities' Storm Protection Plans**

28 **TABLE 2: PSC Rule 25-6-030 Requirements Missing from the Utilities' SPPs**

ACRONYMS

DEF	Duke Energy Florida
FPL	Florida Power and Light
GPC	Gulf Power Company
IOU	Investor-owned utility
kWh	Kilowatt hour (a measure of electricity usage)
PSC	(Florida) Public Service Commission
SPP	Storm Protection Plan (Plan)
TECO	Tampa Electric Company

EXECUTIVE **SUMMARY**

Everyone wants power to return after an outage caused by a storm. Yet the size and power of hurricanes can damage large portions of the electricity distribution grid, which takes time to repair.

In April, Florida's four largest investor-owned utilities submitted initial Storm Protection Plans to the Florida Public Service Commission (PSC) as required by new legislation (FS366.96) that was signed into law in 2019. The law also provides increased profit opportunities to the utilities to invest more capital in their electric distribution grids, over and above the ample profit mechanisms already available to them.

The PSC recently approved the Storm Protection Plans from all four utilities – Florida Power & Light (FPL), Duke Energy Florida (DEF), Tampa Electric Company (TECO), and Gulf Power Company (GPC) – with no objections. The Plans include massive spending, much of which is inappropriate and not cost-effective.

Hardening the electric grid against storm damage is not new. Florida utilities have been making extra investments to do so since Hurricanes Ivan and Wilma in 2004 and 2005. But informed stakeholders understand that the profits of investor-owned utilities (IOUs) grow when they spend more on assets such as grid equipment. This profit mechanism provides IOUs with an incentive to invest more money into their grid rather than less.

The incentive to spend more exists whether or not the increased spending effectively accomplishes its objectives. Unfortunately, with proposed spending of a massive $18.9 billion over 10 years, the Storm Protection Plans show clear evidence of the skewed incentive that utilities maintain to spend more and more money. As is clear in the SPPs, the utilities' spending proposals seem to have more to do with increasing profits than cost-effectively reducing post-storm service restoration time.

To gain a sense of the massive size of the proposed spending increase, our analysis indicates that the capital spending portion of the Plans – $16.9 billion over 10 years – amounts to 62% of the utilities' current distribution grid investments, which includes all substations, towers, power lines, poles, trucks, and software operating today.

If the SPPs are implemented as proposed, consumers' monthly electric bills will rise dramatically. The average electric customer will pay an additional $18 to $29 per month for the utilities' Plans by 2029. AARP estimates that by the time Florida customers finish paying for the Plans in about 2059, they will have paid an extra $40 billion, including almost $12 billion in profits for the utilities.

Of course, if the Plans reduced storm restoration times for large numbers of customers, the benefits could be worth the costs. Unfortunately, all the Plans suffer from multiple deficiencies that make this reduction unlikely.

- **The Plans flout critical requirements established by the Florida PSC to ensure the Plans' cost-effectiveness and accountability.** For example, no utility presents benefit-cost analysis by SPP program or possible alternatives to Plan spending.

- **No Plan provides an estimate of how effectively it will reduce post-storm restoration time,** as required by PSC Rule. In other words, the utilities are asking for massive increases in spending – and large rate increases to pay for them – with no way to measure the success of their Plans in improving storm restoration performance.
- One important example of questionable spending is the utilities' preference for "undergrounding," or placing electrical distribution lines underground. Owing to extreme costs, undergrounding is the least effective way to reduce storm restoration time per dollar.
- **The cost for undergrounding amounts to an average $13,000 to $26,000 per home.**
- Despite the costs, undergrounding is the focus of most SPPs, as it is a simple rationale for spending a lot of capital and generating a lot of profit. FPL dedicates half its Plan's spending – more than $5.1 billion, or $1,000 for each FPL customer – to undergrounding lines that serve just 4% of customer premises.
- There are other undergrounding drawbacks besides cost. Underground lines are subject to outages from digging and can be incapacitated by flooding – an obvious problem during hurricanes. Underground lines last less than half as long as overhead lines and cost two to three times as much to replace. Faults on underground lines also take more time to locate and repair than those overhead.

The Storm Protection Plans raise additional issues beyond regulatory violations, lack of utility performance accountability, cost, and effectiveness. Neither the Plans, nor the PSC, nor the Florida legislature have asked the critical questions raised by such an enormous increase in spending on the traditional electric grid:

- **Do Florida utilities' Storm Protection Plans, legislation, and regulation look to the future or commit to maintaining the 20th-century status quo?** Solar, distributed generation, microgrids, and energy storage: these are likely to be future growth industries that will prompt innovation and job growth. The Storm Protection Plans represent a massive investment in the "old grid," not the grid that Florida will need in the future.
- **What is the vision for electricity distribution in Florida?** Given that the Plans propose to dramatically increase investment in the 20th-century electric grid model, strategic thinking about the future of electricity distribution is imperative. By investing such huge amounts on questionable investments such as undergrounding, the SPPs are in effect prolonging the life of the "old grid."
- **What is the optimum size of a Storm Protection Plan?** It is quite possible that 80% or more of projected Plan benefits could be secured for 50% of Plan costs or less. There is a balance between storm resilience and affordability, but the Public Service Commission has not determined that balance or even raises the issue, let alone establishes a target.
- **To what degree should the many subsidize the few?** Given the extreme preference of the utilities' Plans to spending capital on undergrounding and the tiny percentage of customers who will benefit, the question becomes: Is socialization of costs fair?
- **What alternatives to excess utility investment and rate increases have been examined?** It may simply be unrealistic to expect minimal service impact in the face of a hurricane. Where does the customer-paid responsibility to insure against 1 in 10-, 20-, or 30-year outage risk end?

AARP RECOMMENDATIONS

1. **AARP recommends the Public Service Commission modify all four Storm Protection Plans** due to their failure to meet key provisions of PSC Rule 25-6-030 as well as other issues cited in this paper. Despite the deficiencies, the PSC approved all four utilities' initial Plans. The opportunity for the PSC to modify Plans is now limited to annual rate increase requests and the utilities' Plan updates (required every three years). The PSC Commissioners must be held accountable for this critical responsibility.

2. **Three research projects are urgently needed to inform Plan modifications.** These projects would secure the information needed for proper Plan modification and performance evaluation, including:

   - **Impact:** A study that examines how programs common to all Plans compare on storm restoration improvement, for how many customers, and per dollar of rate increase.
   - **Value:** A study that calculates the economic value per measurable unit of storm restoration improvement by customer type – residential, commercial, and industrial – and for a community overall.
   - **Price:** A study that quantifies the impact of significant rate increases on Florida's consumers, businesses, communities and economy.

3. **AARP recommends the PSC initiate a proceeding to establish policy positions on critical questions** prompted by the utilities' Plans. The PSC should develop policy positions based on deliberate, informed decision making. Policy positions should answer questions such as:

   - How should the state balance affordability versus storm resilience?
   - What are reasonable expectations for post-storm service restoration?
   - What is the appropriate extent and character of storm protection subsidies from some customers to others?
   - What mechanisms – such as on-bill financing and utility rebate programs – can help customers at higher risk for lengthy outages protect themselves without incurring massive rate increases for all?
   - What is the likely future of Florida's electric grid?
   - How can the state seize the economic development opportunities available in growing energy industries to stimulate innovation and job growth while reducing hurricane impact?

4. **AARP recommends that utilities do a better job of helping customers manage lengthy post-storm restoration times** and the risk of such events through two initiatives. AARP believes that the PSC is in the best position to shepherd both initiatives.

   - Improve the way utilities estimate and communicate approximate post-storm restoration to customers. More specific outage restoration estimates, and more communications avenues, would go a long way to reducing customer frustration and aid in customer decision-making.

   - Create a risk-rating system to help customers understand their risk of lengthy post-storm outages based on their premises' grid location and geography. Armed with this information, customers can make better decisions about whether to insure against lengthy outages (by using backups such as solar, batteries, and generators, for example); take more appropriate action as storms approach; and make more realistic assessments about service restoration times after a storm.

5. **A standardized approach to evaluating utilities' post-storm service restoration is essential.** Currently, it is impossible to objectively evaluate utilities' storm restoration performance or to hold them accountable for any amount of storm restoration improvement per dollar of rate increase. A PSC proceeding is needed to develop standardized approaches, metrics, and measures to enable post-storm grading of utilities' storm performance. A standardized approach would also provide a basis for SPP performance accountability.

Florida is at a crossroads concerning grid and utility performance in severe storm conditions as well as its future electric system. The state can choose to become a global leader on issues of critical importance to its future, taking a rational and strategic approach to addressing the fundamental questions prompted by the utilities' Plans.

Or, the utilities can implement the Storm Protection Plans in their current form with PSC acquiescence, thereby requiring customers to pay tens of billions of dollars over decades to invest in 20th-century technology through plans designed to generate the most profit for utilities.

The PSC must challenge and shape the SPPs before real damage is done to the Florida economy and the state misses long-term economic development opportunities that may be unavailable in the future.

THE ELECTRIC GRID: DESIGN, IMPLICATIONS, AND PERSPECTIVE

Before diving into the details of the Florida utilities' Storm Protection Plans, let's briefly examine the basics of grid design and storm repair, and offer perspectives on striking the right balance between grid reliability and electricity affordability.

THE GRID IS DESIGNED TO MAXIMIZE CENTRALIZED OPERATION EFFICIENCY

In the earliest days of electricity, each building or factory had its own generator, which produced direct current electricity. The problem with direct current electricity is that energy dissipates quickly the farther it travels from a generator. With the advent of alternating current electricity, which retains energy better over distances, the concept of a centralized electric grid was born.

The advantage of a centralized electric grid is cost efficiency. Large generating plants have historically enjoyed economies of scale over small generators, and high-voltage power lines efficiently distribute energy. Over time, a reliable grid design emerged as we know it today. This grid is presented as a tree in Figure 1.

The high-voltage transmission network connects generating plants to each other and to substations. Substations are those barbed-wire enclosed, gravel-lined equipment yards with which everyone is familiar. Huge customers, such as military bases, industrial sites, and universities, often have their own dedicated substations.

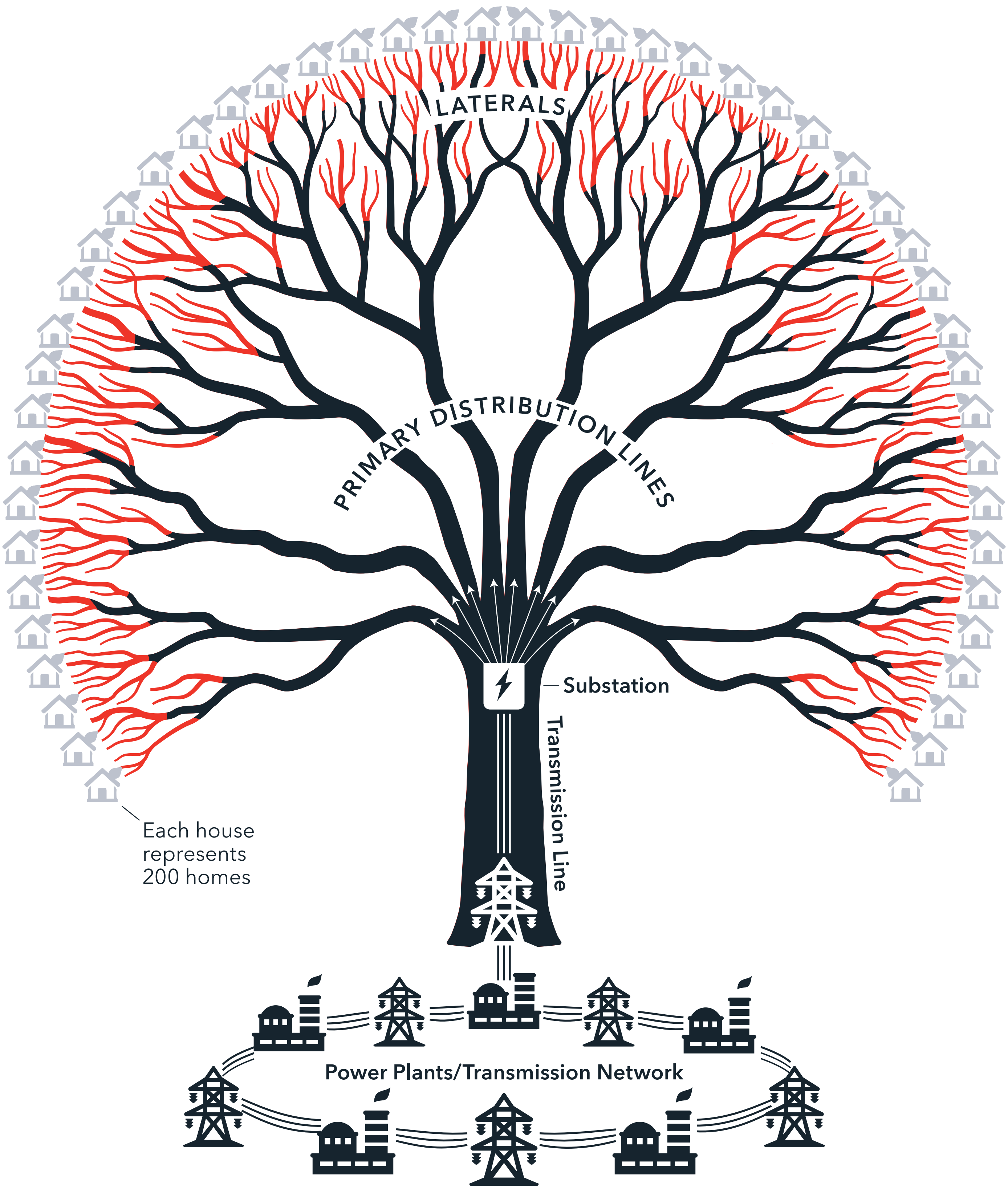
From a substation, which might serve a town-sized geography, electric power is split into primary distribution lines – the large tree branches in the graphic. Primary distribution lines generally serve larger buildings, such as office buildings, apartment buildings, hospitals, nursing homes, government buildings, shopping centers, and light industry. A substation commonly delivers energy to 8 primary feeders, though anywhere from 4 to 16 feeders is not unusual.

Finally, laterals – shown as twigs – tap into the primary distribution lines, delivering power to individual residences and sometimes small schools or small stand-alone stores. Most laterals serve between 10 and 40 homes. Residences resemble the leaves of the tree.

This simplified explanation of electricity distribution can help us better understand utilities' post-storm restoration priorities and challenges. As is clear from the graphic, repairing a transmission line – the trunk – is priority number one after a storm due to the large numbers of customers it serves.

The large branches – the primary distribution lines – serve the next greatest number of customers each, and they are priority number two. The twigs – the laterals – that each serve a small number of homes are the last priority in post-storm restoration.

FIGURE 1. **How Electricity Is Delivered**



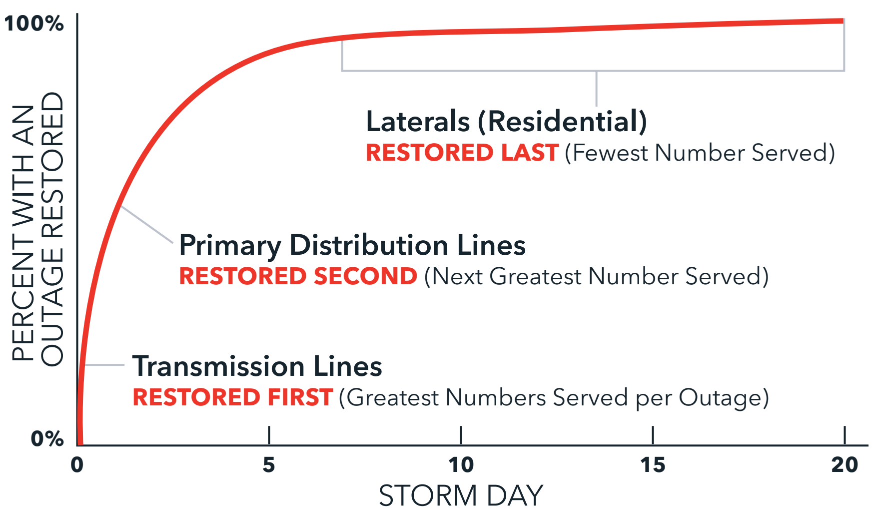
This prioritization makes sense and restores power to the greatest number of customers the most quickly. It is also why some residential customers won't see power restored for a week or more after the most severe hurricanes. Location is also a factor, as there are fewer customers per line mile in less densely populated areas. Rural locations constitute a lower priority during restoration.

Figure 2 indicates the practical realities of storm restoration priorities. In the immediate aftermath of a storm, the restoration of service to large numbers of customers proceeds quickly, as transmission lines and primary distribution lines are restored first. As restoration proceeds, reaching more customers becomes more difficult, as fewer and fewer customers are restored with each successive repair.

At Hurricane Irma's peak, 73% of FPL's customers – 3.6 million – had no power. Yet within two days of the storm's end, almost 50% of customers who had lost power had service restored. The next 40% of restorations required three more days' effort. Service to the final 10%, likely all residential customers served by laterals, required five more days to restore.[1]

FIGURE 2. **Typical "Percent Restored by Day" Curve**

Even after major storms, only a minority of customers experience outages longer than two or three days



Understanding utilities' storm restoration priorities is important because the utilities are proposing to spend billions of dollars to underground lateral lines that each serve the fewest number of customers.

According to the utilities' Plans, only a few percent of the utilities' total customers will have their lines undergrounded, at a cost of billions of dollars. On top of that concern, only a few percent of customers' outages last more than a couple of days, even after storm damage as serious as that created by Hurricane Irma.

Add these facts together, and it is clear that the number of customers who will actually experience shorter storm response from undergrounding is very small, despite billions of dollars spent. What's more, the number of hours and days saved are unknown and highly variable, as the lines leading to the underground laterals remain overhead, exposed to wind.

Consider a hypothetical example. Assume the chance of a customer experiencing an extended service outage (more than three days) due to a hurricane is about 1% per year (100% over 100 years). A utility proposes an undergrounding program that would move just 5% of its customers' lines underground. This means that in a given year there only 5 chances in 10,000 that a customer of that utility will both incur a lengthy storm outage and actually experience faster restoration from undergrounding, despite billions of dollars spent.[2] Even over 100 years, the likelihood that a customer of that utility will experience faster power restoration from undergrounding is just 5%.

IMPLICATIONS:
MITIGATING THE IMPACT OF MAJOR STORMS

With an understanding of grid design and outage restoration along with a primer on undergrounding's high cost and minimal risk reduction, the reader is ready to consider three primary choices available to mitigate the impacts of major storm damage to the grid:

1. Harden primary transmission and distribution lines (trunks and branches)
2. Underground distribution lines currently overhead
3. Reduce dependence on the grid

1. Hardening Trunks (transmission lines) and Branches (distribution lines)
One of the best things a utility can do to reduce hurricane damage is to improve the ability of overhead towers, poles, and lines to withstand high winds. Further, it is sensible to complete this "hardening" on the facilities serving the greatest number of customers first. In fact, Florida utilities have been hardening since Hurricane Wilma in 2005, particularly Florida Power & Light.

Hardening is generally accomplished by replacing utility poles and transmission towers with stronger ones and increasing the frequency of their inspection. More frequent "vegetation management" (tree trimming) is also a good hardening tactic. All Storm Protection Plans recently submitted by Florida's investor-owned utilities include maintenance and/or expansion of these activities.

Some utilities include "grid reconfiguration" as a grid hardening strategy. This involves building more ties between different distribution lines so that when one line is taken out, power can be rerouted to the area over other lines still in operation. The damaged section of distribution line is isolated in this process, meaning that the customers closest to the outage will remain out of power. However, rerouting does help reduce the number of customers impacted by a damaged line, and it makes economic sense to pursue in many instances.

In fact, all utilities already have this reconfiguration capability and employ it today. However, the utilities' SPPs generally request a significant expansion of these capabilities. In addition to increased reconfiguration options, the Plans also seek remote reconfiguration capabilities.

As with most reliability-related investments, grid reconfiguration is not a silver bullet solution. In the most severe storm situations, there may be no circuits or ties in operation over which to reroute power. Ties connecting feeders also cost a lot to build. Ties connecting rural feeders are longer, which cost more and benefit fewer customers. So, there is a limit to the cost-effectiveness of grid reconfiguration. Lack of reconfiguration options is another reason why rural customers' reliability is not as good as that of customers in more densely populated areas.

At some point, the benefits from each dollar spent fail to cover costs. Known as the law of diminishing returns, the concept applies to almost all reliability and storm hardening efforts.

2. Avoiding Wind and Blown Debris: Undergrounding of Overhead Lines. Avoiding the wind and blown debris from a storm entirely by burying distribution lines appears to many customers appears to many customer to be the optimal solution, a "no brainer."

Yet there are significant negative consequences to underground lines, and the cost of undergrounding lines that are already overhead is prohibitive. Such costs are so high, in fact, that the cost of undergrounding lines that are already overhead far exceeds the economic benefit of undergrounding them.

The cost to underground distribution lines is about $.5 to $1 million per mile – and much more in urban areas. As the average U.S. investor-owned utility serves 38.9 customers per distribution line mile, undergrounding generally costs $12,800 to $25,600 per premise.[3]

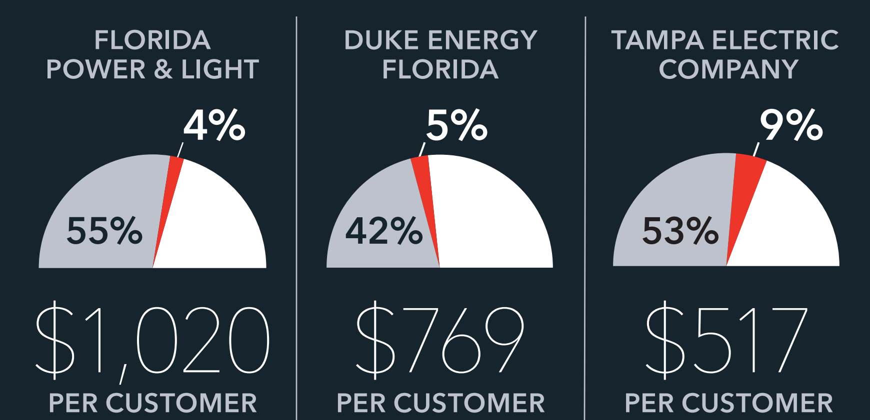
Undergrounding's benefit-to-cost ratio is highly problematic. Figure 3 indicates the ratio of underground lines to overhead lines today for Florida's three largest utilities. It also makes clear the very small increase in undergrounding achieved in the utilities' very expensive Storm Protection Plans and the high costs to be paid by every single utility customer for that undergrounding. Gulf Power's Plan did not include sufficient information to complete this analysis.

The SPPs propose to underground very few premises at extremely high costs – paid by all consumers.

In light of the high costs of undergrounding to all customers over decades for very few homes served, it makes sense to consider individual backup alternatives to the socialized costs of utility-funded undergrounding.

FIGURE 3. **Incremental Percentage of Customers Undergrounded in 10-Year Plans**

Despite massive spending, the Storm Protection Plans underground lines to a very small percentage of customers



- Power lines already underground
- Maximum customers to be undergrounded by a Storm Protection Plan
- Power lines to be undergrounded in the future

Gulf Power's Plan did not include sufficient information to complete this analysis

Alternatives exist. For example, the installed cost of a residential natural gas– or propane-fueled backup generator is only about $6,000 — in stark contrast to undergrounding's $12,800 to $25,600 cost per home.

A residential solar system may cost $10,000 to $20,000, and a solar system with batteries (such as Tesla's Powerwall) may currently cost $30,000 to $40,000, but both offer the added bonus of virtually eliminating utility bills for at least 20 years for many customers in addition to providing power during a lengthy outage. (Solar systems must be appropriately designed and built, incurring extra costs, if they are to function independently from the grid during outages.)

COST OF UNDERGROUNDING VERSUS ALTERNATIVES, PER PREMISE

Undergrounding Costs	$12,800–$25,700
Natural Gas- or Propane-Fueled Backup Generator	$6,000
Residential Solar System	$10,000–$20,000
Solar System with Batteries	$30,000–$40,000

From the perspective of the customer base as a whole, the benefit to these backup solutions is that customers who use them are making their own decisions to reduce their risk. This customer-driven approach is in contrast to reliance on utility choices which result in rate increases for all, subsidies of the few by the many, and large profits for utilities.

Under the SPPs, over 90% of customers are asked to subsidize power outage risk reductions of a minority of customers — less than 10%. Utilities increase their profits when spending money on capital assets, such as undergrounding.

Good options are available for low- and fixed-income customers who wish to invest in backup generation, solar systems, or solar-plus-battery systems. Utilities could offer rebate programs for such equipment, as is currently available for energy efficiency upgrades, at a fraction of undergrounding's cost to the customer base as a whole. On-bill financing for such investments also merits consideration.

To summarize, in addition to being infeasible and impractical, undergrounding costs — as well as available alternatives with subsidy options — appear to make undergrounding an unreasonable approach to reducing the risk of lengthy outages.

3. An Option with Vision: Reduce Dependence on the Centralized Grid Model. Florida can strengthen its grid against hurricanes. It can also underground its grid to avoid hurricane-force winds. Alternately, the state can reduce its dependence on the 20th-century centralized grid model, which is especially vulnerable to hurricanes.

The utilities' Storm Protection Plans propose a combined capital investment of $16.9 billion. These are massive costs to consumers. This huge sum represents a 62%

increase over the combined costs of all the utilities' distribution assets currently in operation – that is, an increase by 62% of the value of these utilities' substations, towers, poles, lines, trucks, software, and other assets used to distribute electricity.

Investments of this magnitude should be about more than a plan to reduce the restoration time for a fraction of a utility's customers from 10 days to 8 days after a hurricane, for example. Such an enormous investment offers an opportunity to reconsider the state's dependence on the 20th-century electricity distribution model. In effect, the SPPs represent an unprecedented investment in the "old grid" model.

A decision about such enormous utility investments – all paid by customers through rate increases – should offer a turning point: a critical moment to reconsider the type of grid that will serve Floridians over the next decades.

FIGURE 4. **Distribution Assets, Florida Utilities**

Storm protection capital represents a 62% increase in the utilities' total distribution assets

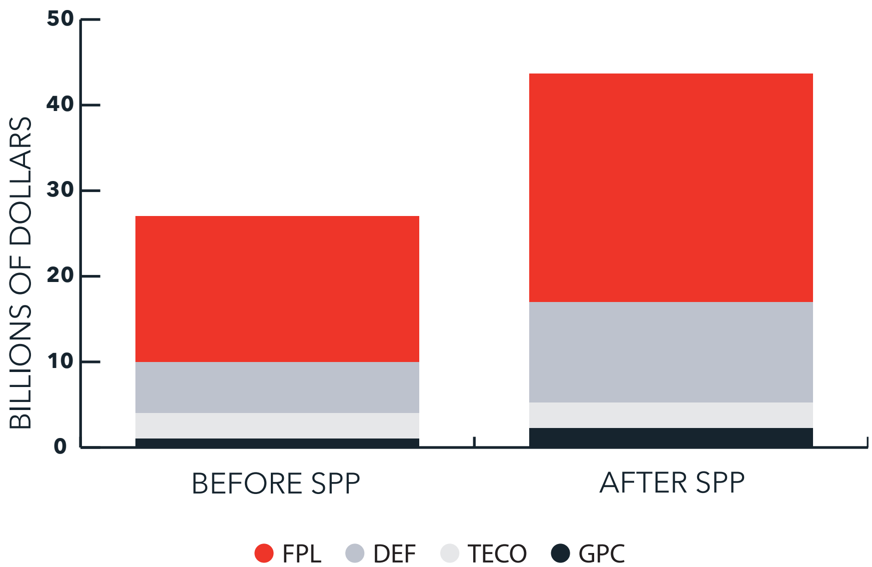


Figure 4 illustrates clearly the disproportionate size of the utilities' proposed investments versus their current spending. The huge increase in assets proposed by the utilities' SPPs will not eliminate storm damage or repair costs customers will be asked to pay – and the Plans don't even estimate how much faster service will be restored or for how many customers.

Nevertheless, these increased costs will be fully borne by all customers for decades.

The precedents set now may be difficult to reverse. After the completion of the current Plans (unless modified by the PSC), the utilities will propose more investments to be paid by customers. A significant percentage of distribution lines will still remain available for undergrounding when the SPPs are completed in 2029 (38% to 53%, depending on the utility).

Note that the "After SPP" distribution asset dollars in Figure 4 do not include routine investments made between now and 2029, such as accommodating growth in electric loads, or growth in distributed generation, or for storm-related repairs. These needs will prompt additional investment and rate increases above and beyond SPP investments and rate increases.

The state of Florida, blessed with solar resources and highly exposed to disruption from climate change, should consider thinking strategically, not tactically, before investing tens of billions in the old grid. The Public Service Commission is the only entity in a position to drive longer-term strategies that will reduce our current dependence on the 20th-century electricity distribution model.

PERSPECTIVE: STRIKING THE RIGHT BALANCE BETWEEN RELIABILITY AND AFFORDABILITY

With an understanding of grid design and storm restoration as well as available alternatives to reducing the impact of storms, we now turn to more complex issues. Inconvenient truths and challenging questions related to striking the right balance between storm resilience and electricity affordability are presented next.

Electricity Is Essential in Florida, Making Rate Increases a Burden on Consumers. Access to affordable electricity is essential to public health and safety. For some customers, including seniors on fixed incomes and low-income customers, rate increases mean foregone food or medicine. Therefore, rate increases should never be authorized without very careful consideration, and post-storm restoration improvements should not be pursued at any cost.

As one consumer advocate who has long been fighting utility rate increases in Florida recently said, "Reliability is priceless. Until we see the price."

Large Rate Increases Tax Florida's Economy, but the Total Impact Is Unknown. It stands to reason that large, long-term rate increases are bad for a state's economy, and SPP rate increases could certainly be classified as both large – around 10% to 15% for most customers each month – and long term. However, little is known about the total impact of such rate increases on Florida's economy.

Rate increases for most grid investments persist for 30 to 40 years. Rate increases that don't deliver benefits in excess of costs act as a drain on the state's economy. Rate increases require consumers to reduce discretionary spending, prompt businesses to look elsewhere for expansion, and cause governments to raise taxes and/or reduce services. Policymakers should always examine grid investment proposals and the likely – not exaggerated – benefits in the context of the economic impact of customer rate increases.

Today, We Cannot Objectively Measure Storm Recovery Performance. As any grid operator will tell you, each hurricane is different. Characteristics such as wind speed, storm speed, rainfall, storm surge, storm path, and storm direction all impact the amount of grid damage from a storm.

Because each storm is different, it is very difficult to quantify storm recovery performance or to compare storm recovery performance before and after grid investments are made. Although the difficulty of measuring utilities' storm recovery performance is acknowledged, it does not justify the utilities' or the PSC's failure to attempt an objective storm recovery performance methodology.

In other words, as the utilities ask for unprecedented sums to reduce post-storm electricity disruptions, there is currently no way to measure their performance.

Today, We Cannot Quantify the Economic Benefits of Faster Storm Recovery. Assuming the challenge of measuring storm recovery performance can be satisfactorily addressed, anticipated reductions in storm recovery time resulting from

THE FATAL FLAWS OF THE INTERRUPTION COST ESTIMATOR

Measuring the economic benefits of faster storm recovery is critical to judging the SPPs' investment proposals. Further, PSC Rule 25-6-030 requires that SPPs estimate the economic benefits of reductions in outage times to customers.

As of now, there are no reliable methods to measure the economic costs of lengthy outages.

A commonly used tool is the U.S. Department of Energy's online "Interruption Cost Estimator" (ICE). Many IOUs use the tool or the outage cost assumptions behind it, including TECO. Unfortunately, the ICE tool and and its assumptions are fatally flawed.

The authors believe the tool dramatically exaggerates the value of reductions in outage durations to customers due to a number of irregularities, particularly in commercial and industrial customer outage cost assumptions.

The ICE tool was not designed to address the impacts of outages lasting longer than 16 hours, which is clearly the intention of Storm Protection Plan legislation. Further, the ICE tool was not designed to estimate community-wide economic benefits of reduced outage durations. Instead, it simply aggregates the costs to individual customers, Because some businesses (those with power) experience revenue increases after a storm, such offsets should be taken into account when estimating the community-wide costs of lengthy interruptions.

As a result of many deficiencies in the ICE tool and its outage cost assumptions, any economic benefit estimates associated with reductions in multi-day outages based on the tool or its assumptions should be considered completely unreliable.

SPPs must still be translated into customer and community-wide economic benefits for proper comparison to costs. The ability to compare the economic benefits of faster storm recovery to SPP costs is critical to determining SPP value to customers and communities. Unfortunately, there is no reliable methodology available to do so.

With almost $19 billion dollars at stake in the next 10 years alone, it makes sense for the PSC to spend some of Florida's regulatory resources on rigorous analysis and research up front to determine the storm restoration time reductions various Plan programs are likely to deliver, and a methodology to translate those reductions into customer and community economic benefits.

Storm Recovery Investments Are Subject to the Law of Diminishing Returns. The law of diminishing returns is a well-established economic concept that describes a process that many of us are familiar with: on some projects, each dollar spent brings less benefit than the previous dollar spent. As more and more dollars are spent, fewer and fewer benefits are received for each successive dollar.

Utility spending on reliability and storm resilience is an excellent example of the law of diminishing returns. The law of diminishing returns can be observed by comparing storm recovery data for Hurricane Wilma in 2005 and Hurricane Irma in 2017. After Hurricane Wilma, 100% of customers were restored within 18 days. Between 2005 and 2017, FPL spent $3 billion hardening its grids.[4]

After Hurricane Irma in 2017, 100% of customers were restored within just 10 days – even though hundreds of thousands more customers lost power at storm peak than during Wilma.[5] Although this decrease in outage time appears to be solid performance improvement per dollar, FPL's Plan proposes to invest an additional $9.5 billion, which customers will pay for (with interest and utility profits), to make small improvements on the new 10-day benchmark established during Hurricane Irma.

This discrepancy – between the increasing amounts spent and the fewer benefits likely to be received – is direct evidence of the law of diminishing returns. Nothing close to the eight-day improvement FPL achieved for $3 billion will be duplicated for an additional investment more than three times larger than the first. This discrepancy prompts a question: At what point are the benefits associated with smaller and smaller improvements in storm restoration exceeded by the increased costs of those improvements?

Storm Recovery Dissatisfaction Is about More Than Restoration Time. In reviewing customer complaints to the PSC in the wake of Hurricane Irma, one theme rises to the surface: customer dissatisfaction is about much more than the time required to restore service.

Although customers understandably want service to be restored quickly, what customers facing lengthy periods with no electricity suggested they most needed was information. Customers managing a storm's impact on their lives are faced with many decisions. To make these decisions, customers need information.

The old adage to "underpromise and overdeliver" is particularly important during lengthy outages in electric service. A utility's reluctance to tell a customer that it expects service to be out for 10 days is understandable. However, such information is far more preferable to that customer than repeated statements such as "we're getting to everyone as quickly as we can."

Customer satisfaction can therefore be enhanced almost as much through setting approximately accurate restoration expectations as by shortening duration times. This aspect of storm recovery – customers' need for information before, during, and after a storm – receives no attention in any utility's Storm Protection Plan. A cynic might suggest that the utilities want customers to complain so as to better justify storm-related investments and accelerated cost recovery that boosts utility profits.

There Is a Balance to Find between Storm Resilience and Rate Increases. It is clear that reducing the duration of storm-related outages will be extremely costly. The information in Figure 5 is intended to prompt debate between customers, utilities,

BALANCING STORM RESILIENCE AND AFFORDABILITY: KEY QUESTIONS

Florida is not alone in its struggle to strike the most appropriate balance between storm resilience and affordability. Before considering $18.9 billion in spending for storm resilience over the next 10 years, the PSC should reflect on the following challenging questions all states wrestle with:

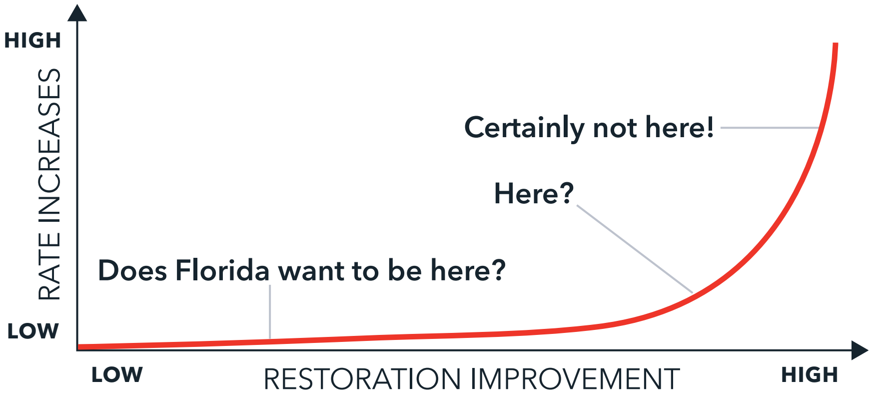
- **What level of storm resilience and reliability is most appropriate for Florida utilities to deliver?** It may simply be unrealistic to expect minimal service impact in the face of a hurricane. Where does the customer-paid responsibility to insure against 1 in 10-, 20-, or 30-year outage risk end?
- **How should storm resilience spending options be evaluated, prioritized, and selected?** In simple terms, what economic benefits do Florida and its citizens receive for a given improvement in storm resilience, and which spending delivers best reductions in storm restoration time per ratepayer dollar?
- **How should storm recovery performance be judged?** Shouldn't there some way to grade utility performance, perhaps indexed by storm severity and characteristics?
- **How does the value of storm resilience compare to the value of other outcomes of interest to Florida customers and citizens,** from electricity affordability and the economic competitiveness of Florida businesses to beneficial electrification and the accommodation of distributed solar resources at high adoption rates?
- **What role should stakeholders and customers play in answering these questions?**

regulators, and other stakeholders about reliability versus affordability. The chart highlights the nature of the law of diminishing returns, and it is based on a chart provided by TECO in its Storm Protection Plan.[6]

Figure 5 illustrates the challenging question the PSC must ultimately answer: "Where should Florida's grid lie on the resilience versus affordability curve?" There is a trade-off that must be considered. Florida's grid could be designed so that there would never be any power outages, but the cost of doing so would be so high that most Floridians could no longer afford their electric bills.

FIGURE 5. **The Reliability vs. Affordability Curve**

For each incremental dollar of rate increase, the incremental benefits fall



Where Is Florida today?

Further, the law of diminishing returns begs the question: "If Storm Protection Plan spending could be reduced by 50% while still delivering 80% of the benefits, why wouldn't we reduce that spending?" Reducing the size of the plans could not only reduce SPP-related rate increases, it could preserve utility funds better spent on other valuable pursuits, such as grid accommodations for higher levels of rooftop solar or electric vehicles.

STORM PROTECTION PLANS: THE GOOD, THE BAD, AND THE UGLY

Hurricanes Irma in 2017 and Michael in 2018 created unprecedented damage to large portions of Florida's electric grid, resulting in long service restoration times for many customers as well as large repair costs. These two storms were the most significant hurricanes to hit Florida since Ivan and Wilma in 2004 and 2005.

In response, the Florida legislature developed a bill intended to reduce the impact of lengthy hurricane-related electric service outages and grid repair costs on the state's economy. The bill was passed on June 28, 2019 and signed promptly into law by Governor Ron DeSantis as Florida Statue 366.96.

FLORIDA'S STORM PROTECTION PLAN STATUTE AND ASSOCIATED PSC RULES

Florida Statue 366.96 requires the state's four largest investor-owned monopoly utilities to submit 10-year Storm Protection Plans (SPPs, or Plans) every three years to Florida's Public Service Commission (PSC). To encourage greater SPP spending, the legislation specifies that the utilities are to receive accelerated recovery of SPP costs – through charges to customers – without having to go through the Commission's usual, lengthy rate increase review process.

Accelerated cost recovery is very important to investor-owned utilities, as it increases the utilities' profitability. This accelerated cost recovery will appear on customers' bills as the Storm Protection Plan Cost Recovery Clause, and it is authorized only on SPP spending approved in advance by the PSC.

The PSC passed more detailed rules to administer FS 366.96, including Rule 25-6-030, regarding requirements for the Plans the Florida utilities were to submit.

The law limited the length of PSC Plan review proceedings to just 180 days. Within 180 days of a Plan's filing by a utility, the PSC is required to establish Plan review proceedings, review the Plan, admit stakeholders to Plan review proceedings, conduct the Plan review proceedings, and either approve the utility's Plan, approve it with modifications, or reject it.

In August 2020, the PSC approved all four utilities' initial Storm Protection Plans almost two months faster than required without any objections or conditions.

UNINTENDED CONSEQUENCES OF THE STATUTE AND ASSOCIATED PSC RULES

Legislation that states pass to encourage their investor-owned utilities via rate increases to invest more in their electric grids is typically well-intended. Unfortunately, most legislators do not understand investor-owned monopoly utility ratemaking because it creates perverse incentives that are completely foreign to most people.

The Statute and Rules Encourage Overinvestment, Increasing Rates. The more capital that utilities spend, the more profits they generate. Investor-owned monopoly utilities are thus subject to capital bias. While businesses in competitive market-driven industries strive to conserve capital, investor-owned monopoly utilities strive to spend as much money as they can justify to state commissions.

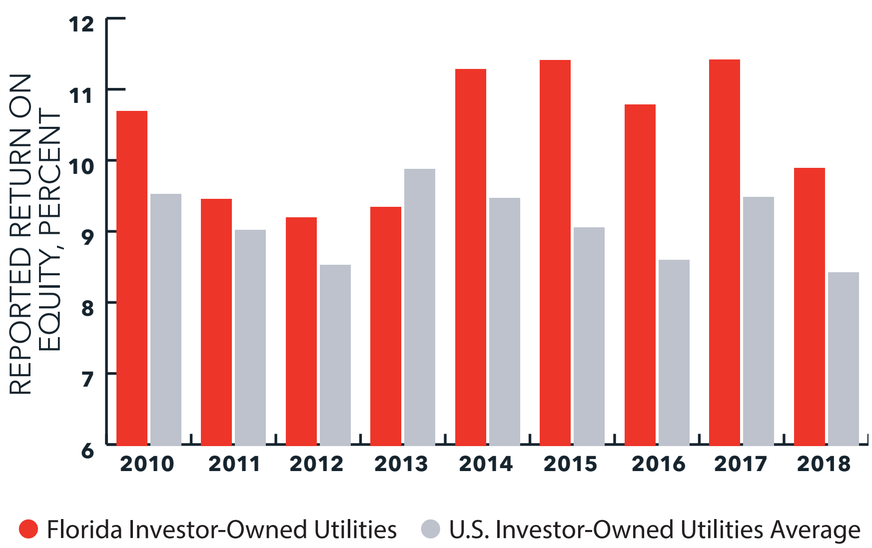
By providing increased profit opportunities, FS 366.96 only increases investor-owned utilities' already significant rewards for investment while also providing a ready-made rationalization to overinvest in storm protection – with no accountability.

Florida's utilities are already generating profits above the U.S. average. As seen in Figure 6, Florida's investor-owned utilities' profitability was higher than the U.S. average in eight of the last nine years, is 13% higher on average, and was a whopping 23% higher than the U.S. average in 2016.

If electricity distribution were a truly competitive industry, the utilities would be trying to determine how the grid could be made as storm-ready as possible for the least amount of money. At some point, when the benefit from capital investments no longer exceeds the cost of those investments – the point of diminishing returns – the competitive business ceases to invest.

FIGURE 6. **Utility Profit Percentages, 2010–2018**

Florida utilities secure much higher profitability than the average investor-owned utility



Source: Federal Energy Regulatory Commission Form 1

However, investor-owned monopoly utilities do not follow the laws of competitive industry. Instead, the investor-owned monopoly keeps investing past the point of diminishing returns due to increased profits that come with continued spending – as long as it can convince regulators the investments are worthwhile.

Cost-effectiveness is not necessarily an issue an investor-owned monopoly considers when making investments. This is particularly true in instances such as storm recovery, where there is currently no objective method to measure performance.

The language in FS 366.96 places responsibility to ensure SPP cost-effectiveness on the PSC. However, the PSC approved all four utilities' SPPs without objection or conditions, allowing the utilities to invest more than is cost-effective, driving up the utilities' profits, and passing the costs on to consumers.

THE TRACK RECORD OF UTILITY LEGISLATION'S BENEFITS TO CONSUMERS IS NOT GOOD

Florida's Storm Protection Plan legislation includes a provision which is relatively new in the 100-year history of for-profit utility regulation in the U.S., but disturbingly common in Southeastern states, and in Florida. The provision strongly favors the utilities, but to understand why requires a little background.

To increase rates, utilities must typically request approval from state utility regulators (like Florida's PSC) in formal legal proceedings called rate cases. These rate cases are an opportunity for consumer advocates to question utility spending.

The recovery of utility spending from customers through rate increases can be disallowed if the utility spending is deemed "imprudent", or not necessary, for safe, reliable power delivery. The threat of not recovering money a utility has already spent acts as a strong deterrent to utility over-spending, and is fundamental to both consumer protection and smart spending decisions by utilities.

The problematic Florida SPP legislation provision prohibits the PSC from disallowing cost recovery for spending related to a Plan approved by the PSC. Thus, the deterrent to utility over-spending is removed, and utilities are more apt to make poor spending decisions. Not only is there no penalty for making poor spending decisions, the utility can make profits on them.

Not surprisingly, this leads to poor and ineffective utility spending choices as described in this paper. Once the deterrent to utility over-spending is removed, the risk for poor and ineffective utility spending choices essentially shifts from utilities to customers.

Unfortunately, Florida utility customers have paid dearly for this problematic provision in the past. In 2006, Florida legislators passed a law removing the cost recovery disallowance threat, in that instance for nuclear plant construction. Florida utilities immediately moved ahead with risky nuclear expansion plans, none of which panned out.

Duke Energy's Florida predecessor, Progress Energy, botched one nuclear expansion project so badly that the plant (Crystal River) was irreparably damaged and abandoned at a huge cost to customers. Duke Energy also incurred costs of $871 million pursuing plans to build a new nuclear plant in Levy County which were later abandoned. Duke Energy Florida customers are still paying for most of these costs in their bills today.

These risky plans and activities were encouraged by the removal of the cost disallowance threat, which South Carolina and Georgia subsequently copied. In 2013 the Florida legislature revised the 2006 nuclear law to reinstate the cost disallowance threat. In response, the Florida utilities abandoned their nuclear ambitions, limiting further rate increases.

In South Carolina, the experiment in risk transfer from utilities to customers ended badly. Nuclear plant construction was abandoned at a late stage, with costs amounting to $6,200 per customer,[21] avoided only through the acquisition of the principal utility (which cost many shareholders dearly).

The experiment will also turn out poorly in Georgia. Nuclear plant expansion there is billions of dollars over budget and at least 5 years behind schedule, and the principal utility (Southern Company) is selling assets to boost cash flow (as evidenced by the sale of Gulf Power Company to Florida Power and Light).

Like legislation to encourage risky and ineffective nuclear spending, Florida's SPP legislation removes the cost disallowance threat and transfers the risk of poor SPP spending choices from utilities to customers. There are two lessons to be learned. First, the cost disallowance threat is good for consumers, and its removal results in higher rates than necessary. Second, legislative involvement in complex matters better suited for PSC expertise rarely if ever benefits consumers, and should be avoided whenever possible.

Perhaps worse, the legislation prohibits the PSC from questioning or ordering refunds for customers related to any amounts spent on the Plans. This “pre-approval” clause has no precedent in the regulated utility industry, and it transfers all risk related to potentially poor spending choices by utilities to customers. Once the Plans are approved, consumer advocates such as AARP will have little to no way to control associated rate increases. At that point, the PSC will be responsible for shaping Plan implementation in ways that maximize storm protection benefits for the least cost.

The Statute and Rules Eliminate Cost Reduction Incentives, Further Increasing Rates. Another important issue raised by FS 366.96 is operations and maintenance cost control. While capital spending relates to the purchase of assets such as wires, poles, and trucks, operations and maintenance spending relates to the purchase of services, generally labor.

Traditionally, investor-owned utility rates are set in regulatory proceedings called “rate cases,” usually held once every four years in Florida. During a rate case, the utility presents its costs and requests approval for rate increases to the PSC. Other stakeholders can present their own evidence regarding the need for rate increases (or lack thereof). The PSC then decides whether to approve the utility’s rate increase request and for what amount.

To simplify, utility rates are set based on utility costs — that is, operations and maintenance, mostly related to labor costs. Once rates are set by a rate case, they remain in place until the next rate case. This process provides utilities with a built-in incentive to control and reduce operations and maintenance spending, because cost increases eat into profits, cost reductions increase profits, and the utilities cannot increase their rates until the next rate case. This situation persists until the next rate case, when the rate increase request review process is repeated.

By authorizing annual SPP-related rate increases without a rate case, FS 366.96 eliminates the built-in incentive for utilities to control costs. Utilities are apt to spend ever-more to improve reliability regardless of cost effectiveness — say by increasing vegetation management and equipment inspections — as there is no consequence to utilities for increasing their costs.

Although this increase in labor-related spending is an intended outcome of FS 366.96, the unintended consequence is the removal of built-in spending controls and, as with capital spending, no consideration for the law of diminishing returns or the cost-effectiveness of any particular spending increase.

In addition, rate cases provide consumer advocates and the public with opportunities to review utility performance, adjust authorized profit levels in recognition of economic conditions, and review the appropriateness of utility spending. The Florida legislation removes all of these checks on SPP spending and rate increases.

Now that the PSC has approved the utilities’ initial Storm Protection Plans, stakeholders must pressure the PSC to modify the Plans in customers’ interests. The opportunities to do so will arise once annually, when the PSC examines the utilities’ requests to increase SPP rate riders. There will also be a more significant opportunity to modify utility Plans every three years, when updates to Storm Protection Plans are required.

DEFICIENCIES COMMON TO THE UTILITIES' STORM PROTECTION PLANS

Four Florida investor-owned utilities — Florida Power & Light (FPL), Duke Energy Florida (DEF), Tampa Electric Company (TECO), and Gulf Power Company (GPC) — submitted SPPs in early April 2020. These four utilities provide service to about 75% of Florida electric customers.

Combined, the utilities' proposals amount to $18.9 billion in spending from 2020 to 2029. Though the utilities do a good job of hiding the true costs to customers in their Plans, the SPPs are likely to cost their electric customers and the Florida economy more than $1.9 billion annually by 2029.

These rate increases will extend for 20 to 30 years beyond 2029, as Florida electric customers pay off SPP investments — including interest on utility loans, profits to utility shareholders, and utility income taxes on profits, collectively known as "carrying charges" — over time. These carrying charges are likely to increase the ultimate cost of the SPPs to customers to more than $40 billion over 30 years. AARP estimates that investor-owned utility profits will amount to almost $12 billion of this amount.

Key Statistics: Comparing the Utilities' Storm Protection Plans. The table below provides key statistics on the utilities' SPPs. Due to undergrounding programs' exorbitant costs and relatively tiny value, statistics on these programs are broken out separately. Costs indicated do not include estimated carrying charges.

TABLE 1: Key Cost Statistics from Florida Utilities' Storm Protection Plans.

The massive SPPs over-rely on undergrounding and pass on exorbitant costs to consumers.

	FPL	DEF	TECO	GPC
SPP spending, 2020–2029	$10,250,000,000	$6,650,000,000	$970,000,000	$1,000,000,000
SPP spending, dollar cost per customer	$2,050	$3,694	$1,270	$2,134
Estimated charges per customer in 2029	$230*	$351	$229	$212
Undergrounding costs	$5,100,000,000	$1,385,000,000*	$396,000,000	$45,000,000
Undergrounding costs per customer	$1,020	$769*	$517	$96
Percentage of customers undergrounded	4%*	5%*	9%*	Insufficient information provided

1) * Identifies estimates made by the authors based on SPP data and national averages.

2) "Per customer" values are based on total customer counts (i.e., an "average" customer). No attempt was made to adjust "estimated charges" by customer type. Residential customers will therefore pay a bit less than the amounts indicated.

3) Some amount of SPP spending is paid by customers in today's rates, estimated by the authors to be about 10%–15% of proposed SPP spending for the average utility. "Annual charges" are therefore not 100% incremental to today's rates. Offsetting this is the fact that SPP spending can be up to 10%–15% over budget without consequences to utilities.

THE HIGH COSTS OF UNDERGROUNDING: THE VIEW FROM OTHER HURRICANE STATES

Florida is not the only state that has grappled with the high costs of undergrounding.

In a study examining the costs of undergrounding in the hurricane-prone state of Texas, a researcher from Lawrence Berkeley National Laboratory concluded that customers received only $0.30 in benefits for every $1 spent on undergrounding.[7]

In Virginia, the State Corporation Commission rejected the undergrounding proposals of the investor-owned utility Dominion several times for lack of cost-effectiveness. The legislature, many of whose members receive contributions from the utility industry, eventually stepped in to force the Commission to accept the proposals via legislation. (In AARP's experience, legislation intended to influence investor-owned monopoly regulation rarely ends well for consumers.)

In North Carolina, in the wake of a statewide ice storm in December 2002, the North Carolina Utilities Commission and the electric utilities explored the feasibility of burying the state's distribution lines. They concluded that the project would take 25 years to complete and increase electricity rates by 125 percent.[8] The idea was abandoned.

UNDERGROUNDING IS INTUITIVELY APPEALING BUT INFEASIBLE, UNREASONABLE, AND IMPRACTICAL

Due to exorbitant costs, undergrounding is by far the least cost-effective way to reduce post-storm restoration time. As such, undergrounding should represent a tiny portion of utility SPP spending, if any.

Unfortunately, most utilities' SPPs dedicate a huge percentage of SPP spending to undergrounding residential lateral service lines.

- Florida Power & Light SPP: 50% of capital spending
- Tampa Electric Company SPP: 41% of capital spending
- Duke Energy Florida SPP: 21% of capital spending
- Gulf Power Company SPP: 5% of capital spending

As a result, undergrounding merits special attention in this paper and by the PSC. All evidence points to the reality that the benefits of undergrounding residential lateral service lines do not outweigh their exorbitant costs.

IF UNDERGROUNDING IS SO GREAT, WHY ISN'T EVERYBODY DOING IT?

Of the hundreds of municipalities that Florida Power & Light serves, only one has taken advantage of the utility's offer to subsidize undergrounding cost by 25%.[11]

FPL offers the subsidy through its "Government Adjustment Factor Waiver," or GAF, tariff. Yet the municipalities apparently do not find enough value in undergrounding to fund it, even at a 25% discount.

All FPL customers share in the cost of GAF subsidies, just as with the cost of all other undergrounding. The average FPL customer will share in the cost of the SPP undergrounding of $1,020, not including carrying charges over 30 to 40 years – even though only 4% of customer premises will be undergrounded. (See Table 1.)

Undergrounding will cost the average DEF customer $769, plus carrying charges over 30 to 40 years – even though only 5% of customer premises will be undergrounded in its plan. As yet more evidence, AARP notes that Florida's nonprofit utilities are not undergrounding lines to any significant extent.

Undergrounding is intuitively appealing. In addition to reducing exposure to airborne debris in a hurricane, it is aesthetically preferable and reduces vegetation management costs as well as post-storm repair costs.

However, underground lines also have serious drawbacks. Underground lines must be replaced more frequently than overhead lines and at a much greater cost per mile. Faults on underground lines take more time to locate and repair and are therefore more costly to repair than faults on overhead lines. Although underground lines are protected from wind, they are susceptible to outages from digging. Undergrounding also increases electrocution risk from stray voltage.

Perhaps worst of all, underground lines are not immune to hurricane damage, as uprooted trees can tear underground lines and flooding can render them inoperable. The Florida legislature and PSC have ignored these drawbacks to date. What's more, the lateral lines serving residences – the focus of the utilities' undergrounding proposals – tap into primary distribution lines (recall Figure 1), which are overwhelmingly overhead and will remain exposed to hurricane wind damage.

Florida Power & Light has estimated the cost to underground all the utility's overhead lines at $25 billion to $35 billion, which would take 30 years to complete.[9] For context, the value of all of FPL's distribution equipment – including all its substations, towers, poles, trucks, and software – is only $17.15 billion today.[10]

Other evidence indicates that undergrounding costs exceed benefits. Nonprofit municipal and cooperative utilities, which are not subject to capital bias, are not spending significant amounts to underground overhead lines. **These data points all indicate that undergrounding is infeasible, unreasonable, and impractical.**

STORM PROTECTION PLANS AND THE TRAGEDY AT THE REHABILITATION CENTER AT HOLLYWOOD HILLS

While many aspects of Hurricane Irma and its aftermath prompted Florida legislators to pass Storm Protection Plan legislation, no event was more tragic than the death of 12 residents at the Rehabilitation Center at Hollywood Hills due to lack of air conditioning.

Although the lawsuits and finger-pointing continue, these facts are clear:

- The Rehabilitation Center at Hollywood Hills and surrounding neighborhoods were without power for several days following Hurricane Irma.
- The Center had a back-up generator, but it was not sufficiently sized to power the Center's air-conditioning system.

In response to the tragedy, the state updated its assisted living facility rules in 2018 to require such facilities to maintain adequate backup power supplies to keep ambient air temperature below 81 degrees Fahrenheit for a minimum of 96 hours following the loss of electric service.

This rule appears to accept several realities regarding the risk of lengthy post-storm power service interruption:

- Power service interruptions during major storms are inevitable, and after the largest storms these interruptions are likely to last several days.
- Electricity customers facing high costs and/or health and safety risks in the event of lengthy post-storm power service interruptions bear some responsibility for insuring against such costs and risks.

Finally, none of the utilities' Storm Protection Plans will ensure that similar tragedies do not occur in the future. The Rehabilitation Center at Hollywood Hills is served by a primary distribution line, as are virtually all nursing homes, hospitals, first-responder facilities, office buildings, apartment buildings, and other large premises. Primary distribution lines are overwhelmingly overhead – not underground – and remain exposed to hurricane winds. This was the case for the line serving the rehabilitation center.

Although the Storm Protection Plans all include extensive spending on primary distribution line hardening against the wind, such hardening will be far from universal. No utility Storm Protection Plan proposes undergrounding primary distribution lines that are currently overhead. Instead, the Plans propose to underground small lateral lines, which typically each serve only a few dozen homes. No amount of lateral line undergrounding of the type proposed in the Plans will result in faster post-storm service restoration for premises served by primary distribution lines.

ASSET REPLACEMENTS TAKE ADVANTAGE OF CUSTOMERS VIA THE STORM PROTECTION PLANS

The Florida Storm Protection Plan legislation offers the utilities "accelerated cost recovery" for SPP spending, creating an even greater incentive to spend more capital than necessary relative to traditional cost recovery approaches. Accelerated cost recovery encourages the utilities to classify as many investments as possible as related to storm protection, because such cost recovery allows greater profits on such investments than others.

DUKE'S ASSET REPLACEMENT PROGRAM: THE CURIOUS CASE OF THE OIL-FILLED CIRCUIT BREAKER

Duke Energy Florida's Storm Protection Plan tries very hard to take advantage of the accelerated cost recovery provision of Florida legislation – in which any utility's spending on investments connected to storm recovery can be recouped more quickly than typical capital investments.

Consider the example of oil-filled circuit breakers, which DEF proposes to replace with more modern versions as part of its SPP. Oil-filled circuit breakers are an older but still serviceable technology, and there is no need to replace them in their entirety. Tens of thousands of these circuit breakers currently operate safely and reliably in substations across the U.S.

Duke Energy says that newer circuit breakers improve grid monitoring capabilities. Yet line sensors and circuit breaker retrofit kits are available to carry out this function at a fraction of the cost of oil-filled circuit breaker replacement.

Some investor-owned utilities are justifying oil-filled circuit breaker replacement by saying they are old and at greater risk of failure. Yet oil-filled circuit breakers are built like tanks and can reliably operate for 60 years or longer. Further, all utilities test substation circuit breakers on a specific, periodic basis, identifying in advance those that must be replaced before they fail and cause an outage.

Interestingly, Duke Energy Florida's SPP proposes asset replacements – including of oil-filled circuit breakers – that are remarkably similar to those recently proposed by Duke Energy's Carolinas subsidiary.[12] That subsidiary operates a service territory 150 miles away from the Atlantic Ocean. It is not at high risk for hurricane damage.

Duke Energy Florida's push to replace oil-filled circuit breakers via their SPP is a clear example of capital bias – the incentive to spend capital to generate greater profits – with the added incentive of the state's accelerated cost recovery provision.

In the utilities' SPPs, it is often difficult to distinguish between asset replacements that will specifically enhance storm resilience and recovery and other asset investments that are shoe-horned into SPPs to take advantage of accelerated cost recovery. The limited scope of the authors' SPP review prevented them from identifying every instance of asset replacement not related to storm protection, which probably exists to some extent in every utility's SPP.

However, the Duke Energy Florida SPP appears to offer the clearest and largest dollar examples of asset replacement unrelated or only tangentially related to storm restoration, which is likely why the DEF Plan is the highest-cost of the four utilities' Plans. In the authors' estimation, DEF proposes to spend more than $1 billion replacing assets that have little or nothing to do with storm restoration. (See "Duke's Asset Replacement Program: The Curious Case of the Oil-Filled Circuit Breaker.")

The authors believe capital bias – the incentive to spend capital to generate greater profits – is clearly evident in Duke Energy's SPP. The incentive rewards expensive investments that market-driven industries would never make, all funded by customer dollars. The accelerated cost recovery provision of FS 366.96 exacerbates the already skewed incentives created by capital bias to reward investor-owned utilities such as DEF to replace assets prematurely.

Why do utilities want to replace old assets working safely and reliably? Most utilities depreciate distribution equipment such as circuit breakers over 30 years. Once an asset is fully depreciated, it no longer has any book value, which means that no utility capital is needed to finance the asset and an investor-owned utility no longer earns any profit from it. Replacing such assets with new ones replenishes the book value, enabling utilities to earn profits on them once more.

UTILITIES ESCAPE ALL ACCOUNTABILITY BY AVOIDING PSC TECHNICAL REQUIREMENTS

Florida legislators and the Public Service Commission clearly intended that the SPPs strive for cost-effectiveness and provide performance accountability opportunities. The PSC enacted several rules pertaining to SPPs and FS 366.96 in order to do so.

The PSC rules are essential to maximize the cost-effectiveness of the SPPs and hold the utilities accountable for performance. However, none of the four utilities' SPPs meets these essential requirements. PSC Rule 25-6-030 specifically addresses issues of SPPs' cost-effectiveness and accountability. A sample of Rule 25-6-030 requirements, along with descriptions of each requirement's importance and the associated violations in the utilities' SPPs, can be found in Table 2 on page 29.

As none of the SPPs fulfills these critical requirements of the PSC's Rule 25-6-030, AARP believes the PSC should have rejected all four utilities' Storm Protection Plans.

HOW TO OBJECTIVELY ESTIMATE SPP PROGRAM COSTS AND BENEFITS TO CUSTOMERS

It is important to estimate the costs and benefits of each program a utility proposes in its SPP so that programs that are not cost-effective can be identified and rejected. However, developing quantified estimates of SPP program costs to customers and communities is difficult, and developing quantified estimates of customer benefits is even harder.

After a brief discussion on how to properly estimate customer and community costs, this section focuses on the challenges of estimating customer benefits. AARP proposes a rational approach to customer benefit estimation that the PSC could use to determine compliance with the SPP rules requiring utilities to provide program-specific benefit-cost analyses. Note that the recommendations on benefit estimation methodology apply to individual SPP programs, which can then be added together to estimate overall SPP benefits relative to costs.

Customer Costs (Rate Increases) Are Relatively Easy to Estimate, but the Community- and Statewide Costs of Rate Increases Are More Challenging to Quantify. All the utilities but FPL estimated the rate increases associated with their SPPs over 10 years. These rate increases are only part of the costs to communities and the state, however. As described earlier, electric rate increases act as a tax on economic development.

Florida regulators and legislators appear to be interested in the benefits to communities and the state of faster service restoration after storms. To properly evaluate those benefits, however, an understanding of the costs to communities and the state of higher electric rates is needed. Using customer rate increases as a starting point, an economist's help would be needed to estimate the community- and statewide impact of SPP rate increases on economic development.

TABLE 2: PSC Rule 25-6-030 Requirements Missing from the Utilities' SPPs

These requirements are specifically designed to evaluate SPP program benefits relative to costs — and hold the utilities accountable for their performance.

Paragraph	SPP Requirement	Value	SPP Violations
25-6-030(3)(d)1	For each program, "an estimate of resulting reductions in outage times and restoration costs due to extreme weather conditions."	Estimates of reductions in outage times and restoration costs are essential to calculating economic customer benefits. They are also essential to holding utilities accountable for future performance.	Although most utilities provided estimates of post-storm repair cost reductions (GPC did not), no utility provided an estimate of reductions in outage duration. DEF and TECO provided estimates of reductions in customer minutes interrupted (CMI), but CMI is a volume measure, not a duration measure. For example: 7,200 minutes of CMI could be one customer for five days, or 720 customers for 10 minutes. FPL provided no outage duration reduction estimate at all.
25-6-030(3)(d)4	For each program, "a comparison of the costs … and the benefits."	Program-specific, quantified (in dollars) benefit-to-cost comparisons are essential to optimizing the cost-effectiveness of an SPP. Without these comparisons, it is impossible to know if shifting spending from one program to another, or eliminating some spending altogether would improve overall SPP cost-effectiveness for customers.	Only TECO attempted to estimate the economic benefits of reductions in outage times to customers. However, it did not do so by program, making it impossible to identify programs of weaker or negative benefit-to-cost ratios. TECO's consultant employed the fundamentally flawed U.S. Department of Energy "Interruption Cost Estimator" (or the flawed assumptions behind it) to estimate economic benefits. For more information, see the review of TECO's SPP in the Appendix as well as "The Fatal Flaws of the Interruption Cost Estimator" sidebar on page 16.
25-6-030(3)(e)1.d	"A description of the criteria used to select and prioritize proposed storm protection programs."	Clear decision support criteria are evidence of critical thinking and informed choices. Without this information on criteria, there is no support behind utility decisions to select some programs over others, or to spend more on some programs than others.	Although all the utilities but GPC provided rationale for project selection within proposed programs, no utility provided a rationale for the prioritization in dollars between programs. Program-specific benefit-to-cost comparisons are an important part of program prioritization, and are also missing from all Plans. However, there are also other variables to be considered, such as project execution risk, potential variations in effectiveness, drivers of such variations, and lack of viable alternatives. The utilities seem to believe that all their ideas have merit, that all programs should be part of their Plans, and that no spending opportunities should be rejected or reduced. The SPPs thus provide no documentation that overall spending as proposed is optimal.
25-6-030(3)(i)	For each program, "A description of any implementation alternatives that could mitigate the resulting rate impact … of the proposed Storm Protection Plan."	This requirement, properly fulfilled, ensures that a utility selects least-cost approaches to problems identified for correction. This requirement recognizes that a suite of alternatives is likely available to address any problem, each with its own pros and cons.	None of the utilities provided any alternatives to proposed spending. There are therefore no assurances that the portfolio of programs described in any SPP represent the lowest-cost portfolio available. Multiple alternatives exist to address the economic consequences of prolonged service outages, including: • Alternatives to utilities' proposed programs • Alternative spending priorities among proposed programs • Alternatives to utility capital investment • Alternatives to asset replacement

None of the utilities' SPPs makes any effort to calculate the economic benefits of SPP programs as required by PSC Rule 25-6-030.

Lack of this information leaves consumers and regulators in the dark about the Plans' effectiveness and true cost.

FIGURE 7. Sample Calculation

Estimating the Future Economic Benefit From a Plan, Project, or Program

Annual Economic Benefits to Customers ($15,000) = Annual Risk of an Extended Outage (ie., once in 10 years) X Reduction in Restoration Time (ie., two days) X Dollar Value per Unit of Restoration Time Reduction (ie., $250 per day) X Number of Customers Benefiting from Project (ie., 300)

SPP Program Benefits to Customers Can Be Objectively Estimated. Four factors impact the economic benefits to customers and communities from reductions in outage restoration time:

- The likelihood (risk) of a prolonged outage (i.e., more than 2 to 3 days) in a given year
- The reduction in outage duration resulting from the program
- The number of customers by type (residential, commercial, or industrial) for which outage time is reduced by the program
- The economic value (dollars) per unit of reduction in outage duration by customer type.

A simplified calculation for estimating economic benefits from SPP program investments is shown in Figure 7.

Unfortunately, none of the utilities provided anything remotely like this methodology to calculate the costs and benefits of SPP programs. Further, there are no agreed-upon determinations for any of the individual components of the benefit calculation.

None of the four utilities' SPPs include:

- Estimates of risk for a prolonged outage by geography or grid location
- Estimates of the reduction in length of a prolonged outage by the SPP (let alone for each individual SPP program, as required by PSC 25-6-030)
- Counts of customers whose potential outage time will be reduced from the SPP
- Estimates of the value to customers or communities for a given reduction in outage restoration time

OBSERVATIONS, RECOMMENDATIONS, AND CONCLUSION

OBSERVATIONS

None of the SPPs comply with PSC Rule 25-6-030, as shown in Table 2 on page 29. The deficiencies are not minor. The missing information is critical to the evaluation of SPP program benefits and costs as specified by FS 366.96.

Neither legislators nor the PSC have actively decided where Florida should be on the reliability versus affordability curve. The PSC is in the best position to drive such decision making.

Neither legislators nor the PSC have actively decided how much the average customer should subsidize the reliability of customers at highest risk of lengthy storm service interruptions. The PSC is in the best position to drive such decision making.

Critically, neither legislators nor the PSC have established a vision of what Florida's grid should look like in the future. Before making investments that will increase the size of distribution assets by almost two-thirds via massive customer-paid investments, the State should establish that vision and consider implications for grid investment. Failing to make strategic decisions before committing to such unprecedented investments in the 20th-century electricity distribution grid is illogical, at best. The PSC is in the best position to drive such thinking and take appropriate actions.

The four utilities' Storm Protection Plans do not consider lower-cost alternatives to massive grid investment. Backup generation and solar systems are available to customers interested in reducing their risk of lengthy post-storm outage durations. Reasonable options are available to make such purchases more manageable for customers, from on-bill financing to utility rebate programs.

Reducing dependence on the centralized grid model offers a strategic and multifaceted benefit stream which also merits consideration. Incentives inherent in investor-owned monopoly ratemaking do not permit the utilities to objectively consider any such alternatives. The PSC is in the best position to consider alternatives to massive utility investment and take appropriate actions.

Although consumers have made clear that lack of reliable information after a hurricane is a significant and recurring problem, the Storm Protection Plans make no effort to improve the way utilities relay reasonably accurate restoration estimates to customers.

More broadly, the utilities provide no information to customers that would help them understand the likelihood of a lengthy outage by their geographic and grid location. This information would be extremely helpful to customer decision making, both in the long term (such as whether to invest in backup generation) and the short term (as hurricanes approach and post-storm).

Performance measurement is another critically significant issue whose importance is difficult to overstate. There is currently no objective method to measure post-storm restoration performance and therefore no way to measure the results of Storm Protection Plan investments.

Also missing is a valuation that translates an anticipated improvement in storm restoration time into economic benefits to customers or communities, as well as a way to estimate the impact of rate increases on the Florida economy.

AARP RECOMMENDATIONS

1. **AARP recommends the Public Service Commission modify all four Storm Protection Plans** due to their failure to meet key provisions of PSC Rule 25-6-030 as well as other issues cited in this paper. Despite the deficiencies, the PSC approved all four utilities' initial Plans. The opportunity for the PSC to modify Plans is now limited to annual rate increase requests and the utilities' Plan updates (required every three years). The PSC Commissioners must be held accountable for this critical responsibility.

2. **Three research projects are urgently needed to inform Plan modifications.** These projects would secure the information needed for proper Plan modification and performance evaluation, including:

   - **Impact:** A study that examines how programs common to all Plans compare on storm restoration improvement, for how many customers, and per dollar of rate increase.
   - **Value:** A study that calculates the economic value per measurable unit of storm restoration improvement by customer type – residential, commercial, and industrial – and for a community overall.
   - **Price:** A study that quantifies the impact of significant rate increases on Florida's consumers, businesses, communities and economy.

3. **AARP recommends the PSC initiate a proceeding to establish policy positions on critical questions** prompted by the utilities' Plans. The PSC should develop policy positions based on deliberate, informed decision making. Policy positions should answer questions such as:

   - How should the state balance affordability versus storm resilience?
   - What are reasonable expectations for post-storm service restoration?
   - What is the appropriate extent and character of storm protection subsidies from some customers to others?
   - What mechanisms – such as on-bill financing and utility rebate programs – can help customers at higher risk for lengthy outages protect themselves without incurring massive rate increases for all?
   - What is the likely future of Florida's electric grid?
   - How can the state seize the economic development opportunities available in growing energy industries to stimulate innovation and job growth while reducing hurricane impact?

4. **AARP recommends that utilities do a better job of helping customers manage lengthy post-storm restoration times** and the risk of such events through two initiatives. AARP believes that the PSC is in the best position to shepherd both initiatives.

   - Improve the way utilities estimate and communicate approximate post-storm restoration to customers. More specific outage restoration estimates, and more communications avenues, would go a long way to reducing customer frustration and aid in customer decision-making.

   - Create a risk-rating system to help customers understand their risk of lengthy post-storm outages based on their premises' grid location and geography. Armed with this information, customers can make better decisions about whether to insure against lengthy outages (by using backups such as solar, batteries, and generators, for example); take more appropriate action as storms approach; and make more realistic assessments about service restoration times after a storm.

5. **A standardized approach to evaluating utilities' post-storm service restoration is essential.** Currently, it is impossible to objectively evaluate utilities' storm restoration performance or to hold them accountable for any amount of storm restoration improvement per dollar of rate increase. A PSC proceeding is needed to develop standardized approaches, metrics, and measures to enable post-storm grading of utilities' storm performance. A standardized approach would also provide a basis for SPP performance accountability.

CONCLUSION

Florida is at a crossroads concerning grid and utility performance in severe storm conditions as well as its future electric system. While the pursuit of better grid reliability is a worthwhile goal, there are limits to what Floridians can afford and limits to what utility spending can accomplish.

The State can choose to become a global leader on issues of critical importance to its future. It can take rational, strategic approaches to resolving fundamental questions regarding the reliability-affordability balance, subsidies of some customers by other customers, and the electric grid Florida wants in the future.

Or the utilities can implement the Storm Protection Plans in their current form, with PSC acquiescence, thereby requiring customers to pay tens of billions of dollars over decades to invest in 20th-century technology, for assets which may become obsolete long before they wear out, in plans designed to generate the most profit for utilities.

The PSC must stand up and take charge of this process. Issues that may seem obscure to some people will have profound consequences on Florida's electric distribution system and its customers for decades to come. The PSC must challenge and shape the SPPs before real damage is done to the Florida economy and the state misses long-term economic development opportunities that may not be available in the future.

APPENDIX: STORM PROTECTION PLAN REVIEWS

The commonality of SPP deficiencies described above appears to indicate that the four Florida utilities coordinated the development of their Plans to some degree. However, there are differences in Plan programs, priorities, and development approaches (to the extent this information is available in the SPPs).

The four individual utilities and their Storm Protection Plans are reviewed below.

$230

ESTIMATED RATE INCREASE PER CUSTOMER PER YEAR BY 2029

FLORIDA POWER & LIGHT

Florida Power & Light (FPL) is one of the largest investor-owned utilities in the U.S. FPL has extensive post-hurricane service restoration experience.

FPL is a sound distribution grid and business operator. It consistently ranks among the best U.S. investor-owned utilities in customer satisfaction and reliability. However, this performance comes at a price. As with all investor-owned utilities, FPL is subject to capital bias, which puts its economic incentives at odds with customers' incentives and the public interest.

Despite its "Sunshine State" service territory, FPL routinely pursues policies to hobble customer- and third party–owned solar systems. FPL lobbies heavily to secure favorable legislation in Tallahassee, and it contributed over $8 million to Florida political campaigns in the 2018 election alone.[13]

Overview of FPL's Storm Protection Plan

FPL's Plan is the only one of the four Plans that does not provide an estimate of Plan rate increases by year, which is a violation of the PSC's SPP rules. However, based on Plan details, AARP conservatively estimates the annual cost of the FPL Plan to be between $1.1 billion and $1.2 billion annually by year 10, or about $230 per year for the average FPL customer.

FPL's Storm Protection Plan is typical of the other utilities' Plans in many ways. It is dominated by capital investments. It is careful not to provide any information that stakeholders could use to hold FPL accountable for future storm restoration performance improvements. In addition to failing to estimate rate increases the FPL Plan violates other PSC requirements for SPPs, including:

- Missing estimate of the reductions in outage times due to storm by Plan program (or even in total)
- Missing quantified comparison of Plan costs to economic benefits. (FPL estimates storm restoration cost reductions but not the economic benefits of faster restoration).
- Missing description of the criteria used to select and prioritize Plan programs
- Missing description of alternatives that could mitigate the rate impacts of the Plan's first three years

All but two programs proposed in the FPL Plan are expansions of storm programs that the PSC has already approved. One exception is the substation flood mitigation program, which is both a small and reasonable Plan component. The second is the Storm Secure Undergrounding Program (SSUP) Pilot.

The SSUP Pilot, which has only been approved by the PSC as a pilot, has not been completed. No results have been published nor have stakeholders had a chance to analyze results. Yet the lack of evidence that this pilot program is cost effective has not dissuaded FPL from making undergrounding the $5.1 billion centerpiece of its Storm Protection Plan.

FPL Plan Redeeming Qualities
FPL's Plan does have a few redeeming qualities. Its Plan does include details on storm hardening and vegetation management programs that could possibly deliver reasonable customer benefits relative to customer costs. Storm hardening designs are calibrated to anticipated extreme wind speeds by geography, which is likely to improve the cost-benefit ratio of those particular storm hardening programs.

FPL also makes a modest attempt to estimate future restoration cost savings available from its Plan. These estimates range from a low of $400 million in savings over 40 years, assuming a typical hurricane such as Matthew every 5 years, to a high of $3 billion in savings over 40 years, assuming a devastating hurricane such as Irma every 3 years.[14]

Unfortunately, both these benefit ranges pale in comparison to the $10 billion cost of the FPL Plan, which is actually likely to cost its customers closer to $20 billion once 30 years of carrying charges are added.

FPL Plan Busts
The drawback of FPL's Plan is the $5.1 billion undergrounding program, with a cost of at least $1,000 per FPL customer even before 30 years of carrying charges are added in. As described earlier, the undergrounding of residential service laterals that are currently overhead is the least effective way to speed post-storm service restoration per dollar for the greatest number of customers.

The high cost of FPL's undergrounding program that serves few customers are obvious in program details. These details indicate that FPL will underground 500 laterals annually from 2021 to 2023, and 800 to 900 laterals annually from 2024 to 2029, or around 7,100 laterals in total for $5.1 billion by 2029.

Undergrounding delivers inadequate benefits relative to costs due to both extremely high costs ($.5 to $1 million per mile and up) and the small number of residences served by any given lateral.

FPL reports that when Hurricane Irma hit in 2017, it was operating 187,958 laterals.[15] FPL reports that each lateral serves about 30 residences, or a total of 213,000 residences for which overhead laterals will be undergrounded (7,100 x 30) in the SPP.[16] There is no rational explanation for why each of FPL's 5 million customers should pay at least $1,000 to underground the overhead lines of just 4% of customers at a cost of almost $24,000 per residence ($5.1 billion divided by 213,000 residences).

As indicated earlier, it would be far less costly to simply purchase a backup generation system or solar system for each customer at risk for a lengthy outage.

$351

ESTIMATED RATE INCREASE PER CUSTOMER PER YEAR BY 2029

DUKE ENERGY FLORIDA

Unlike other Florida investor-owned utilities, which operate only in Florida, Duke Energy Florida (DEF) is a subsidiary of a massive company with utilities operating in multiple states. Duke Energy distributes electricity to over 7.7 million customers in 6 states, including 1.8 million in Florida. Like FPL, DEF contributes millions of dollars to legislators' campaign funds each election cycle.

As a multistate utility, Duke Energy's executives have options. These executives ask, "Which state offers us the highest percentage return on our capital?" The state which offers the best return will receive the greatest share of Duke Energy's capital, along with the highest rate increases, irrespective of the Florida grid's need for such investment (or lack thereof).

In a recent presentation to shareholders, the state that best motivated Duke Energy to spend its capital was Florida, where Duke estimates it will earn an 11% return on equity capital in 2020.[17]

Duke Energy's high rate of return on equity in Florida – a full 230 basis points over Duke Energy's overall corporate average, and a full 100 basis points over the next highest state in which Duke Energy operates – is courtesy of the PSC. Not only has the PSC authorized a relatively high level of profits for DEF in its rates, the PSC has approved multiple avenues for Duke to increase rates – and profits – between rate cases.

The high returns on equity have prompted Duke to invest more in Florida than any other state. Unfortunately DEF's $6 billion Storm Protection Plan, which Duke presents proudly in investor presentations, does not demonstrate a wise use of that capital. Customer benefits appear highly unlikely to exceed customer costs.

Overview of DEF's Storm Protection Plan

DEF estimates its Plan will cost its customers $632 million annually by year 10, or $351 per year for the average customer.

DEF's SPP demonstrates Duke Energy's extensive experience with utility commissions in multiple states. Similar to Florida Power & Light's SPP, the DEF Plan is capital intensive. In fact, the DEF Plan is the most capital intensive of the four Plans, at a capital cost of almost $3,300 per customer.

As with the FPL Plan, the DEF Plan offers no information stakeholders could use to hold it accountable for future storm restoration performance. Finally, the DEF Plan fails to fulfill multiple requirements of the PSC's SPP Rule 25-6-030, including:

- Missing estimate of the reductions in outage times due to storms by Plan program. Instead, DEF uses "reduction in customer minutes interrupted," which is not a measure of outage duration.
- Missing quantified comparison of Plan costs to economic benefits. DEF instead estimates storm restoration cost reductions but not the economic benefits of faster restoration.
- Missing description of the criteria used to select and prioritize Plan programs. Instead, DEF prioritizes the geographies to which proposed spending should first be applied.
- Missing description of alternatives that could mitigate the rate impacts of the Plan's first three years.

DEF Plan Redeeming Qualities

Some DEF Plan programs, such as feeder hardening and vegetation management, could quite possibly deliver reasonable customer benefits relative to customer costs. The approach DEF took to prioritizing investments geographically based on risk is also commendable and likely improves "bang for the buck" in storm restoration time and cost reductions.

However, without more details, it is impossible to know where the point of diminishing returns falls for each program.

For example, DEF's existing storm hardening plan replaces about 2,700 wooden poles annually, while the SPP replaces just 1,700 wooden poles annually (based on 2022 data available in the DEF Plan). Without full program-specific benefit-cost information and geographic prioritization modeling details, it is impossible to know if the point of diminishing returns is 2,700 poles annually, 1,700 poles annually, or something less.

DEF Plan Busts

The DEF Plan is by far the most costly of the four, at a whopping $351 per year for a DEF customer on average by year 10. Although high cost does not necessarily mean a utility SPP should be rejected, multiple programs which are part of the DEF SPP are problematic.

An example of a recommended reduction in scale is the self-optimizing grid program, which DEF proposes for 80% of feeders by 2027. Like all reliability-related investments, self-optimizing grid spending is subject to the law of diminishing returns.

Designed to increase the flexibility of the grid by expanding power routing options, the self-optimizing grid program is a reasonable approach to improving reliability not related to storms. However, some feeders serve fewer customers than others, and some feeder ties and capacity upgrades are more costly to execute than others, indicating that the program is likely to reach peak cost-effectiveness well before the 80% target is reached.

The incremental value of automation is also variable. Today, utilities routinely reconfigure grids around outages by sending linemen in trucks to throw switches. Remote control of switches offers some value, but DEF does not quantify how much.

Finally, though grid reconfiguration is reasonably valuable in most storm situations, as the severity of a storm grows and the scale of the damage grows, the number of grid reconfiguration options available falls. As a result, grid reconfiguration is least valuable in precisely the severe storm situations SPPs are supposed to address.

The DEF Plan includes the replacement of perfectly sound assets, a strategy that is deeply suspect. Replacing older wires with more modern designs is of extremely little hardening value: a tree limb flying through the air at 120 miles per hour is 95% as likely to tear through new wires as old wires. Replacing hydraulic reclosers with newer electronic ones deliver similarly low incremental value and are only tangentially related to severe storm restoration time reduction. The same is true for replacing oil circuit breakers with gas circuit breakers, replacing electromechanical relays with digital relays, and replacing mechanical switches with remote control switches.

Further, the remote control and grid state monitoring capabilities DEF would gain through these replacements are readily available through retrofit kits and line sensors at a much lower cost. The authors estimate these extremely low-value asset replacements could amount to a billion dollars or more in the DEF Plan.

As indicated earlier, residential lateral hardening activities in general and undergrounding of overhead laterals in particular are the least cost-effective actions a utility can take to speed storm restoration due to the tiny percentage of customers who will benefit.

DEF proposes to underground just 5% of distribution line miles, and harden residential laterals amounting to just 5% more miles, at a cost of $2.2 billion, or at least $1,200 per DEF customer before carrying charges.

DEF indicates that its 2020 program already underway will underground 45 miles of overhead lateral lines serving 1,765 customers at a cost of $42.5 million.[18] As with FPL's lateral undergrounding program, the cost is astronomical at almost $24,000 per residence.

Lastly, the DEF Plan appears to capitalize $108 million in transmission vegetation management costs with no explanation.[19] The capitalization of an operations and maintenance expense such as vegetation management is highly irregular, has no precedent, and represents an egregious overreach.

IOUs have never been allowed to earn profits on operations and maintenance expenses, which are historically passed along to customers at cost with no markup.

$229

ESTIMATED RATE INCREASE PER CUSTOMER PER YEAR BY 2029

TAMPA ELECTRIC COMPANY

Tampa Electric Company (TECO) is owned by Emera, a Canadian company with electric and gas distribution operations in Canada, the U.S., and the Caribbean. TECO provides electricity to almost 765,000 customers in Hillsborough County and parts of surrounding counties.

Overview of TECO's Storm Protection Plan

TECO estimates its Plan will increase rates by $175 million annually by year 10, or about $229 per average customer per year.

As with the other Plans, the TECO Plan is essentially a significant expansion of programs the PSC has already approved. Also similar to the other Plans, the TECO Plan offers no information stakeholders could use to hold it accountable for future storm restoration performance.

TECO's Plan is somewhat more compliant with PSC requirements than the other utilities' Plans, but significant deficiencies still exist:

- Missing estimate of the reductions in outage times due to storm by Plan program. Instead, TECO uses "reduction in customer minutes interrupted," which is not a measure of outage duration.
- Missing description of the criteria used to select and prioritize Plan programs. Instead, TECO's consultant only presented the benefit impact associated with changes to the total level of SPP spending.
- Missing description of alternatives that could mitigate the rate impacts of the Plan's first three years.

TECO Plan Redeeming Qualities

Like the other utilities' Plans, the TECO Plan does include some rational transmission, feeder, and substation hardening and substation flood mitigation investments. These investments could potentially deliver reasonable customer benefits relative to customer costs. Unfortunately, these programs represent only about one-third of the capital investments TECO proposes in its Plan.

The TECO Plan also features increases in vegetation management spending, specifically to include targeted mid-cycle inspections. It will be interesting to compare the costs of incremental vegetation management spending to the improvements in SAIDI (a measure of outage duration) and SAIFI (a measure of outage frequency) in future years to see if the benefits of incremental vegetation management spending are worth the costs.

Finally, TECO was the only IOU which attempted to quantify the economic benefits to customers of reduced storm restoration times. While this is admirable, the attempt appears to have been bungled; see below for more information.

TECO Plan Busts

The TECO Plan dedicates a greater proportion of spending to the undergrounding of overhead lines than any other utility's Plan – 62% of Plan capital.

Due to the terribly high costs of undergrounding and the low numbers of customers for which reliability will improve, this is a mistake. TECO proposes to underground about 9% of its 9,450 distribution line miles at a cost of $396 million, or about $500,000 per mile.

This relatively low cost estimate per mile (about half of the FPL and DEF undergrounding programs per mile) also prompts concerns about the likelihood of cost overruns – with costs that would later be passed on to consumers.

TECO's Plan is unique in that it attempts to quantify the economic benefits associated with faster storm restoration. However, TECO's consultant used the U.S. Department of Energy's online "Interruption Cost Estimator" tool, or underlying assumptions, to translate reductions in Customer Minutes Interrupted (which is not a measure of outage duration) into economic benefits.[20] Unfortunately, this tool is fundamentally flawed, and any economic benefit estimates associated with reductions in multiday outages based on the tool should be considered completely unreliable. (For more information, see "The Fatal Flaws of the Interruption Cost Estimator" on page 16.)

HIGHLY PAID INDUSTRY CONSULTANTS RARELY BITE THE HAND THAT FEEDS THEM

The PSC and stakeholders should be aware of the systemic bias in the IOU industry owing to the symbiotic relationship between consultants and IOUs.

Top technical, engineering, and management consultants – such as Accenture, Guidehouse (formerly Navigant), Black & Veatch, Burns & McDonnell, and Quanta Services – annually bill hundreds of millions of dollars to investor-owned utilities. Any publication of findings contrary to IOU industry interests would present a significant risk to the consultants' revenues. These consultants cannot be objective about matters that impact their own interests.

Further, technical consultants are routinely engaged to opine on utility proposals that would provide specific project opportunities in the consultants' domains. Infrastructure design, software integration, outsourced projects, and post-deployment evaluations are only a few examples of consultant revenue opportunities associated with SPP approval. These opportunities for large consulting projects are evident in the four Florida utilities' SPPs.

The TECO Plan features consulting support from Black & Veatch on Plan benefit-cost analysis and optimum SPP spending levels, and from Accenture to help design vegetation management program enhancements. Indeed, the U.S. Department of Energy "Interruption Cost Estimator" tool that Black & Veatch and most investor-owned utilities use was developed by Navigant.

$212

ESTIMATED RATE INCREASE PER CUSTOMER PER YEAR BY 2029

GULF POWER COMPANY

Gulf Power Company (GPC) serves about 468,000 customers in Florida's panhandle. GPC is now a sister of FPL after acquisition by FPL's parent (Next Era Energy) from Southern Company. The acquisition is an intriguing sidebar in its own right and a lesson in the perils of legislative involvement in a complex industry of regulated monopolies where unintended consequences lie around every corner. (See "The Track Record of Utility Legislations' Benefits to Consumers is Not Good" on page 22.) Apparently, Southern Company is selling assets to raise cash for its nuclear plant expansion, which is billions of dollars over budget and years behind schedule.

Overview of GPC's Storm Protection Plan

GPC estimates its Plan will cost customers $99 million annually by year 10, or $212 per year for an average customer. Like the other Plans, the GPC Plan is essentially a significant expansion of programs the PSC has already approved. Also similar to the other Plans, the GPC Plan offers no information stakeholders could use to hold it accountable for future storm restoration performance. GPC's Plan is no more compliant with PSC SPP requirements than the other three Plans:

- Missing estimate of the reductions in outage times due to storm by Plan program
- Missing quantified comparison of Plan costs to economic benefits
- Missing description of the criteria used to select and prioritize Plan programs

GPC Plan Redeeming Qualities

The best thing about the GPC Plan is that allocates 95% of capital spending to transmission, substation, and feeder hardening. As these structures serve the greatest numbers of customers, the sound focus of GPC Plan investments is likely to deliver the best customer benefit-to-cost ratio of the four utility Plans. The GPC Plan allocates just 5% of capital spending to undergrounding, which is dramatically less than the other utilities (25% for DEF, 50% for FPL, and 62% for TECO).

GPC Plan Busts

GPC makes no attempt to quantify any benefits of its Plan, from reductions in storm restoration time and associated economic benefits to reductions in post-storm repair costs. Without program-specific comparisons of benefits to costs, stakeholders have no way of knowing the relative cost-effectiveness of various SPP programs, no way to tell if spending should be shifted from one program to another, and no way of holding GPC accountable for performance.

Accountability is also lacking for GPC's $45 million undergrounding program, as the Plan fails to indicate the number of line miles or customers to be undergrounded for that budget. While the GPC Plan is likely to deliver more benefits per dollar than the other utilities' Plans, stakeholders are no more able to determine whether GPC's Plan will deliver benefits in excess of costs than they are for the other Plans.

ENDNOTES

1 Florida PSC Docket No. 20170215-EU. "Review of Florida's Electric Utility Hurricane Preparedness and Restoration Actions 2018." Report by PSC Staff. July 2018. Figure 4-1, p. 22.

2 A 1% chance that a customer will experience a lengthy storm-related outage in a given year, multiplied by a 5% chance that a customer's home will be underground, equals 0.0005, or 5 chances in 10,000.

3 Cost information provided by Duke Energy Florida and Florida Power & Light in their SPPs validate these cost estimates.

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6 Florida PSC 202000067. "SPP Assessment & Benefits Report." Tampa Electric Company. Figure 6-1, "Budget Optimization Results," p. 62.

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11 Florida PSC Docket No. 20200000. "Florida Power & Light Company's 2020 Status/Update Report of Storm Hardening/Preparedness and Distribution Reliability." February 28, 2020. Page 4.

12 North Carolina Utilities Commission Docket No. E-7, Sub 1214. Direct Testimony of Jay W. Oliver on behalf of Duke Energy Carolinas. Exhibit 4, "North Carolina Improvement Plan Program Summaries." September 30, 2019.

13 "How Electric Utilities and Their Executives Contributed in Nine Governor Races." The Energy and Policy Institute, San Francisco. November 2, 2018. Accessed on July 21, 2020 at https://www.energyandpolicy.org/utilities-governor-races/

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15 Ibid, Exh. MJ-1, p. 28.

16 Miranda, M. "Florida Power & Light SSUP Pilot." PSC Presentation August 7, 2018. Slide 5.

17 "Duke Energy 2019 Earnings Review & Business Update." Investor presentation, Slide 33. Feb. 13, 2020.

18 Florida PSC 20200069-EI. Direct Testimony of Jay W. Oliver. Exh. JWO-1, pp, 5–10. April 14, 2020.

19 Ibid, Exh. JWO-2, p. 39.

20 Available at https://icecalculator.com/home.

21 Moore, T. "Failed Nuclear Project to Cost Typical Ratepayer $6,200." *The Post and Courier.* August 1, 2018.

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