Energy Exchange℠

Better Buildings® SUMMIT

AUGUST 21-23, 2018 • CLEVELAND, OHIO

Promising Practices in Energy Resilience

Thursday, August 23rd

2:00 PM – 3:30 PM

Energy Exchange | Better Buildings SUMMIT

Panelists:

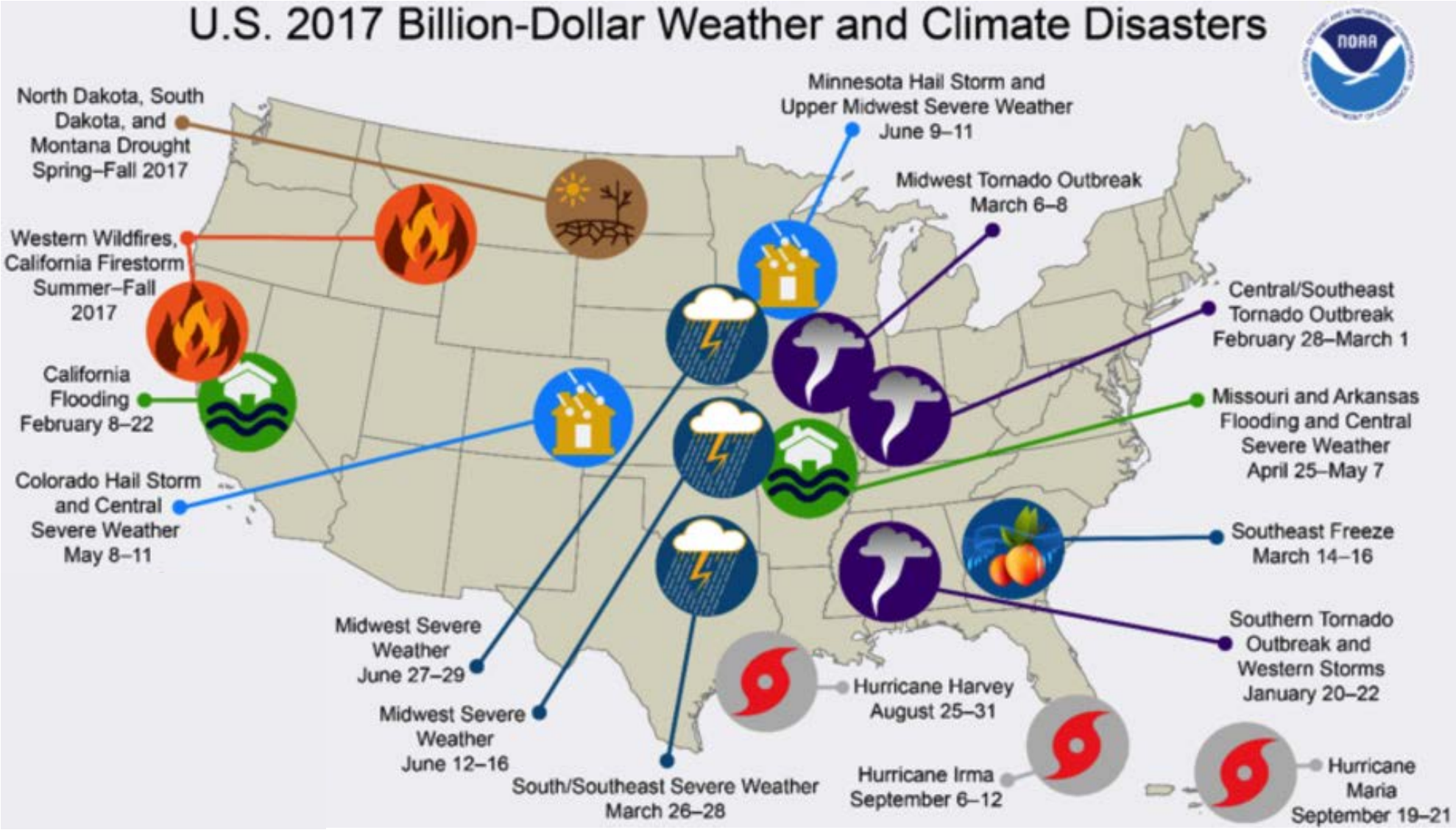
- John Agan, DOE (Moderator)
- Camille Pollan, New Orleans, LA
- Jeremy Sharp, Norfolk, VA
- Theresa Spurling-Wood, Alachua County Public Schools, FL

Resilience Defined

Resilience is "the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.“

- Presidential Policy Directive - 21

Natural Disasters



$306 billion in damages

Resource Highlights

Resilience through Residential Energy Efficiency

NASEO: Disaster Mitigation and Residential Rebuilding Strategies for & by State Energy Offices

Resilience Planning Process

NREL Resilience Roadmap

FEMP Resilience Planning Map (*2019*)

Electricity Resilience Planning Assistance

DOE Electricity Policy Technical Assistance Program

Financing for Resilience Investments

Better Buildings Financing Navigator

C-PACE for Resiliency Resources

Estimating Costs of Electricity Interruptions

LBNL Interruption Cost Estimate (ICE) Calculator

Community Microgrid Learning Academy

Microgrid Planning Academy (NJ)

Green Infrastructure for Resilience

EPA Green Infrastructure Resources

Better Buildings CHP for Resiliency Accelerator

Distributed Generation for Resilience Planning Guide

Other Questions? *stateandlocal@ee.doe.gov*

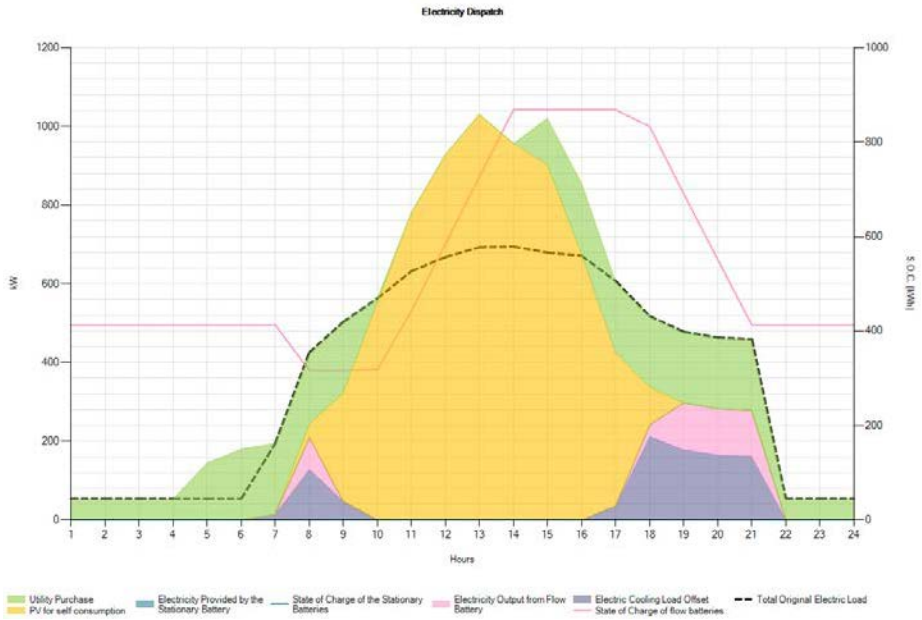
Resources – Continuing Operations with Onsite Generation

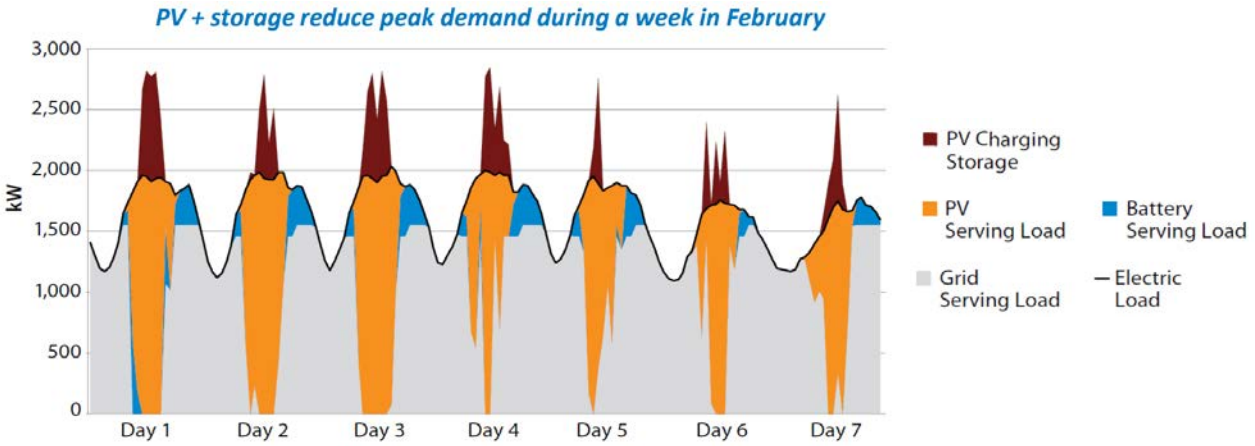
DER-CAM+ DECISION SUPPORT TOOL FOR DECENTRALIZED ENERGY SYSTEMS
TOPOLOGY | ANALYTICS | PLANNING | OPERATIONS

BERKELEY LAB
Lawrence Berkeley National Laboratory

REopt Lite

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

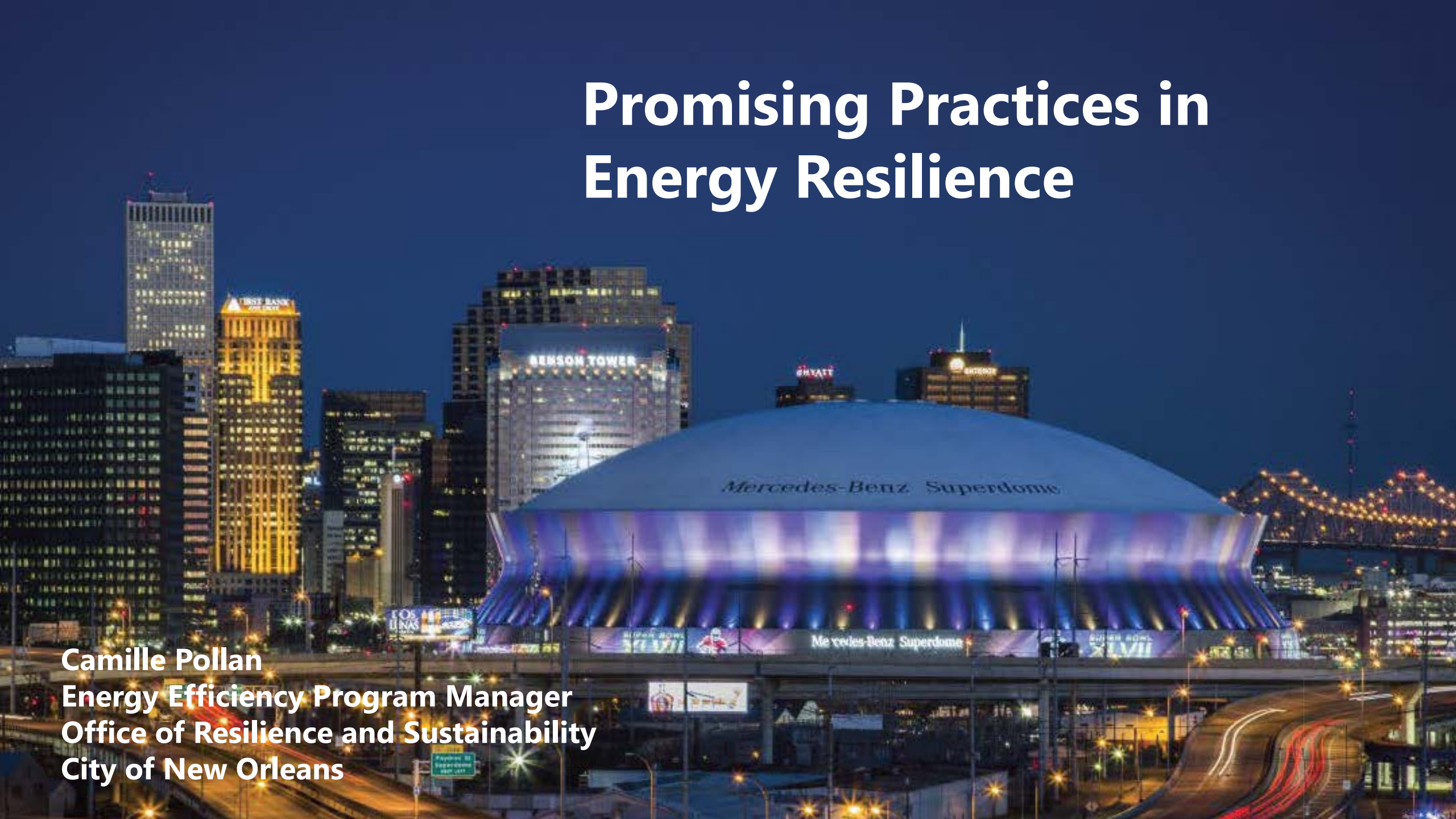




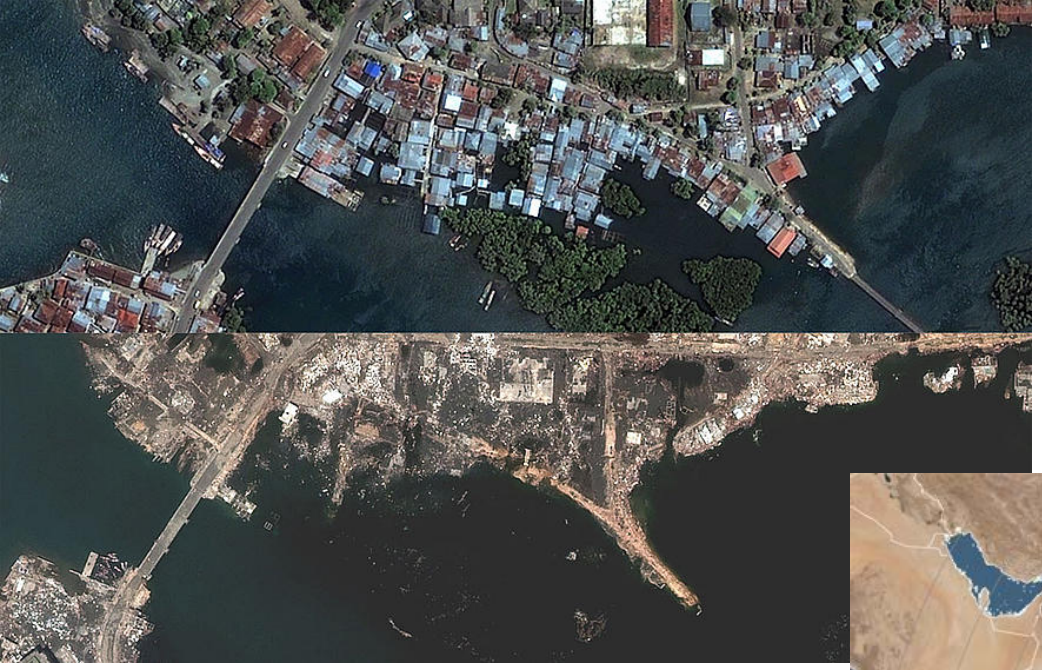
Let’s hear from the experts!

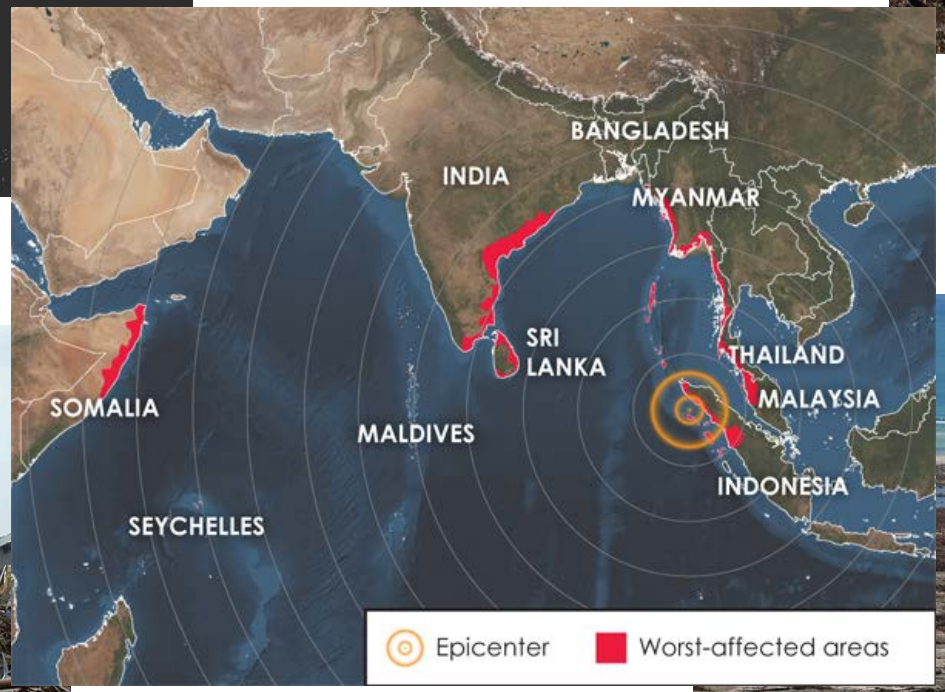
Other Questions? *stateandlocal@ee.doe.gov*

Promising Practices in Energy Resilience

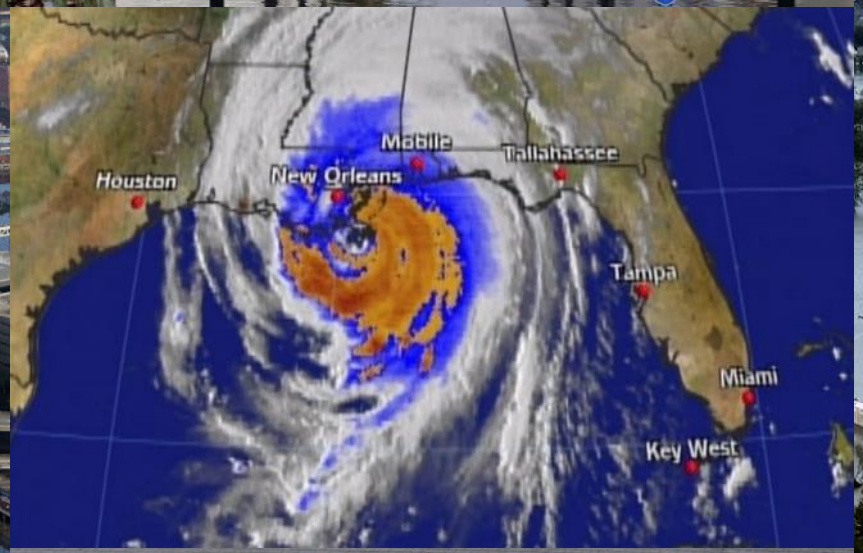


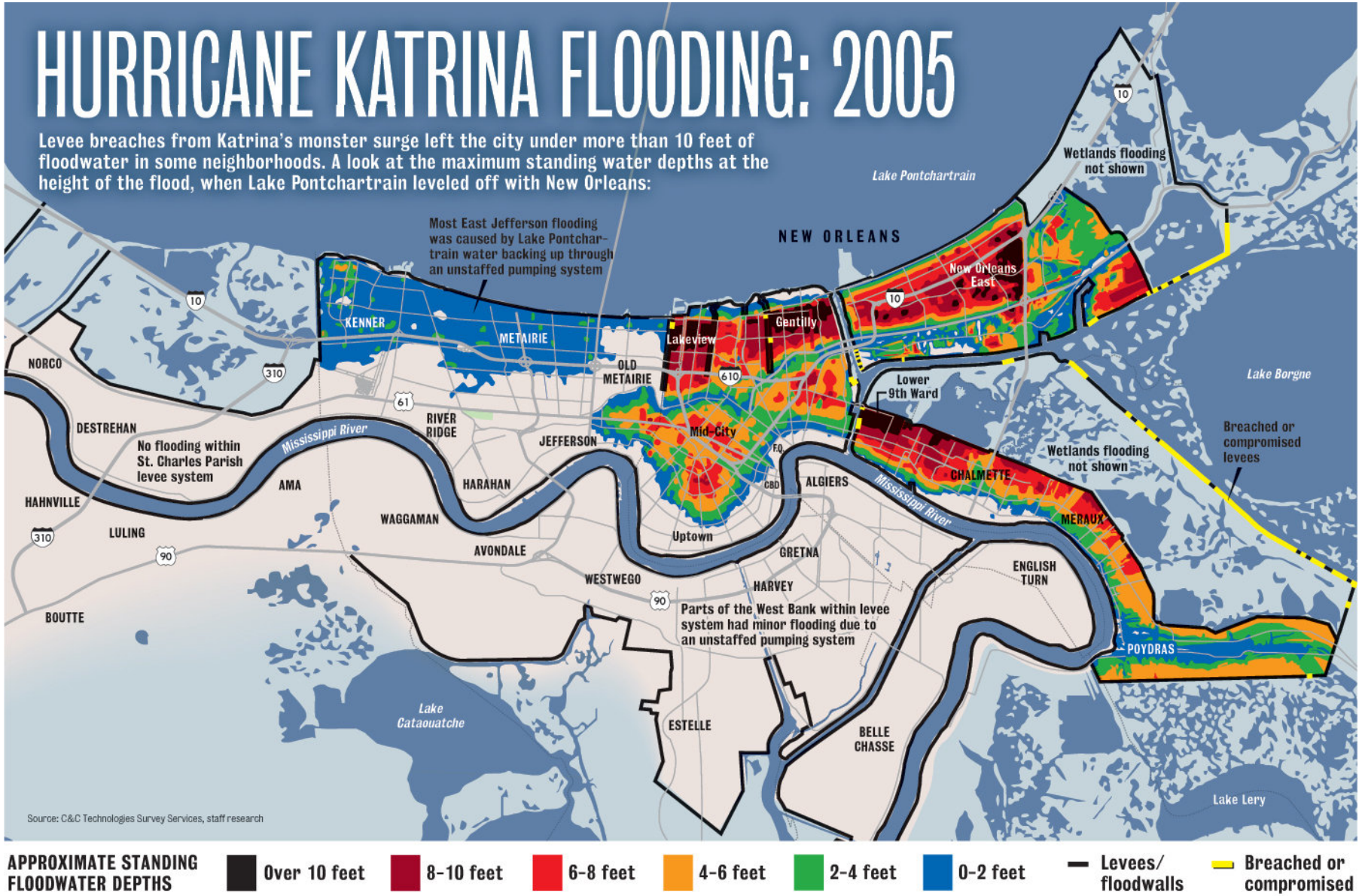
Camille Pollan
Energy Efficiency Program Manager
Office of Resilience and Sustainability
City of New Orleans




BANGLADESH
INDIA
MYANMAR
SRI LANKA
THAILAND
MALAYSIA
SOMALIA
MALDIVES
INDONESIA
SEYCHELLES
Epicenter
Worst-affected areas

TO
EAST
10


Mobile
Tallahassee
Houston
New Orleans
Tampa
Miami
Key West



- Cat5 → Mandatory evacuation
- Cat3 → Levee failures
- 80% of city flooded
- 1800 lives lost
- 1M w/o power out for 42 days

Recovery

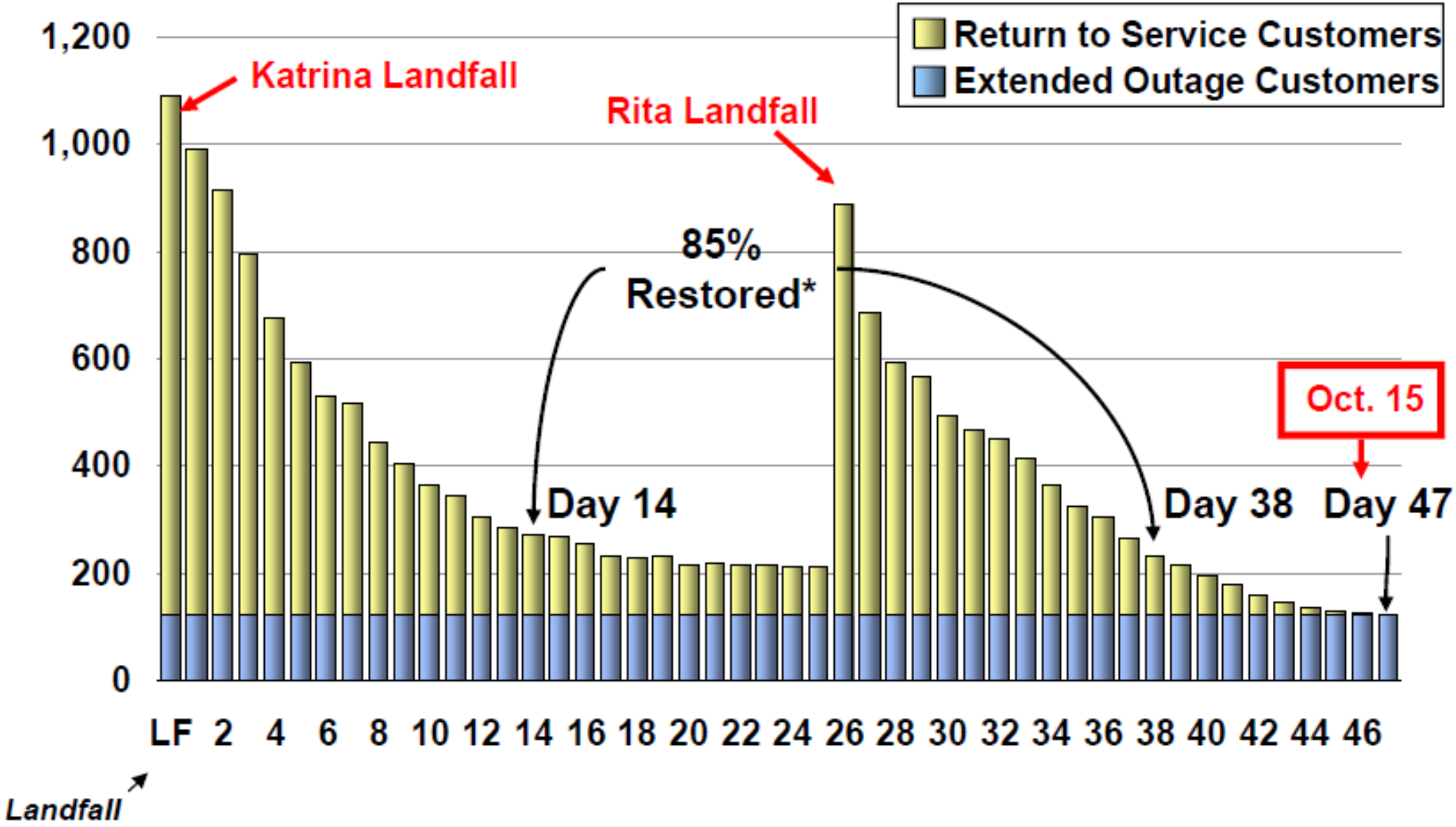
Resilient
NEW ORLEANS

First Priorities

- How will we get people back?
- Will we have an economy?
- When will the power be on?
- Where will the money come from?
- Who will rebuild our housing stock?

Hurricanes Katrina and Rita Restorations

Outage Profile by Restoration Days; thousands



Federal Aid

FEMA

NATIONAL FLOOD INSURANCE PROGRAM

U.S. Department of Transportation

U.S. Small Business Administration
SBA
Your Small Business Resource

HMA
Hazard Mitigation Assistance

Energy Infrastructure

Entergy
THE POWER OF PEOPLE®
Entergy New Orleans, Inc.

- Filed Chapter 11 bankruptcy
- Federal Community Block Grants helped pay for repairs
- City Council (which regulates utility) issued storm recovery bonds

Long Term Recovery

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NEW ORLEANS

Corporation for National & Community Service

HandsOn New Orleans

Rebuilding Together

Samaritan's Purse International Relief

Points of Light

The Salvation Army

Catholic Charities

Mennonite Disaster Service

Peace Corps

Volunteers of America

Islamic Relief USA

a powerful force for GOOD.

LANO Louisiana Association of Nonprofit Organizations

AVODAH The Jewish Service Corps

Lutheran Disaster Response

UMCOR United Methodist Committee On Relief

Episcopal Relief & Development Healing a hurting world

Habitat for Humanity

Louisiana Voluntary Organizations Active in Disaster

COOPERATION | COMMUNICATION | COORDINATION | COLLABORATION

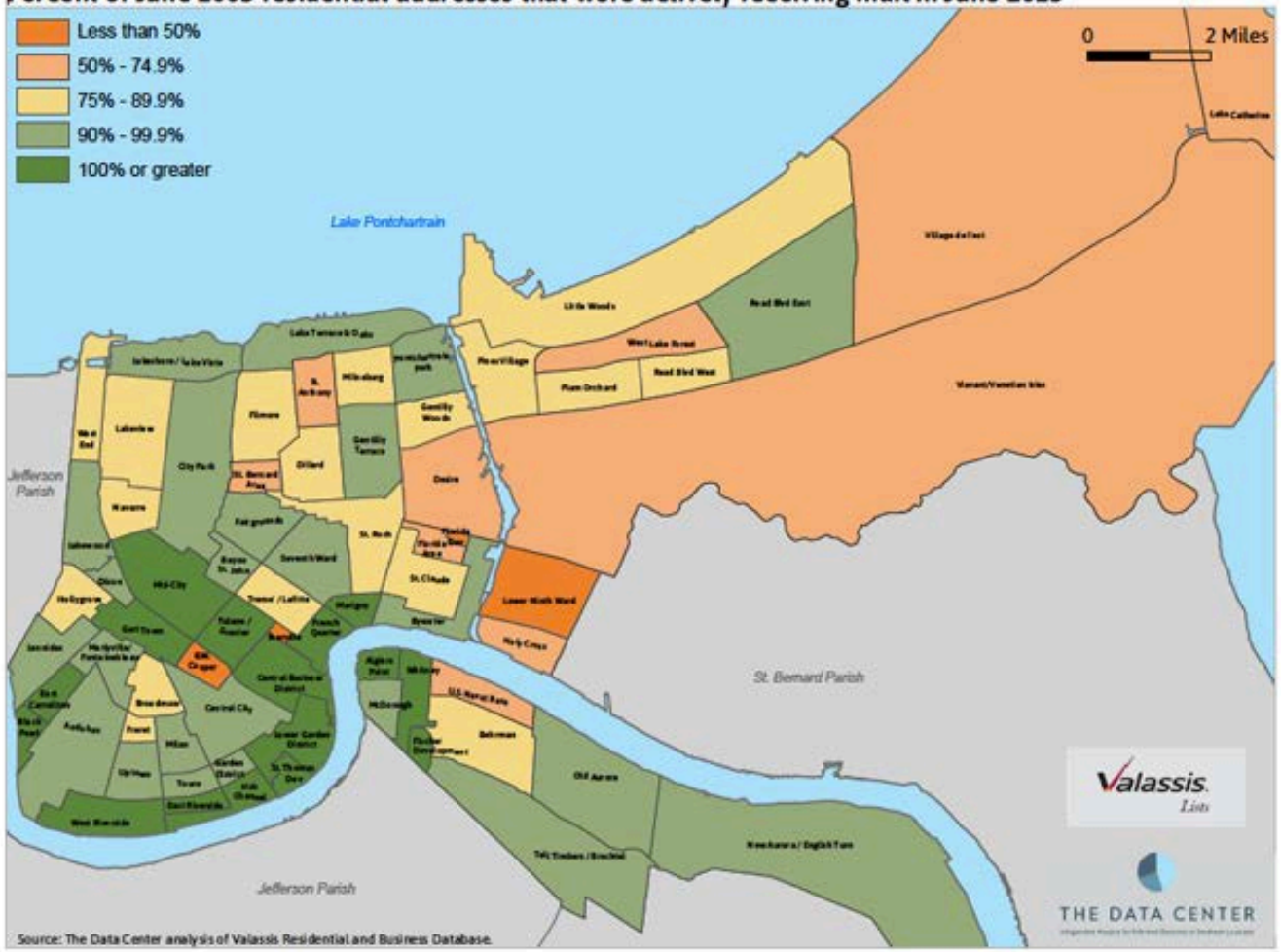
Louisiana is experiencing the highest rate of relative sea level rise in the world:

4.3 ft (1.3 m) by 2100.

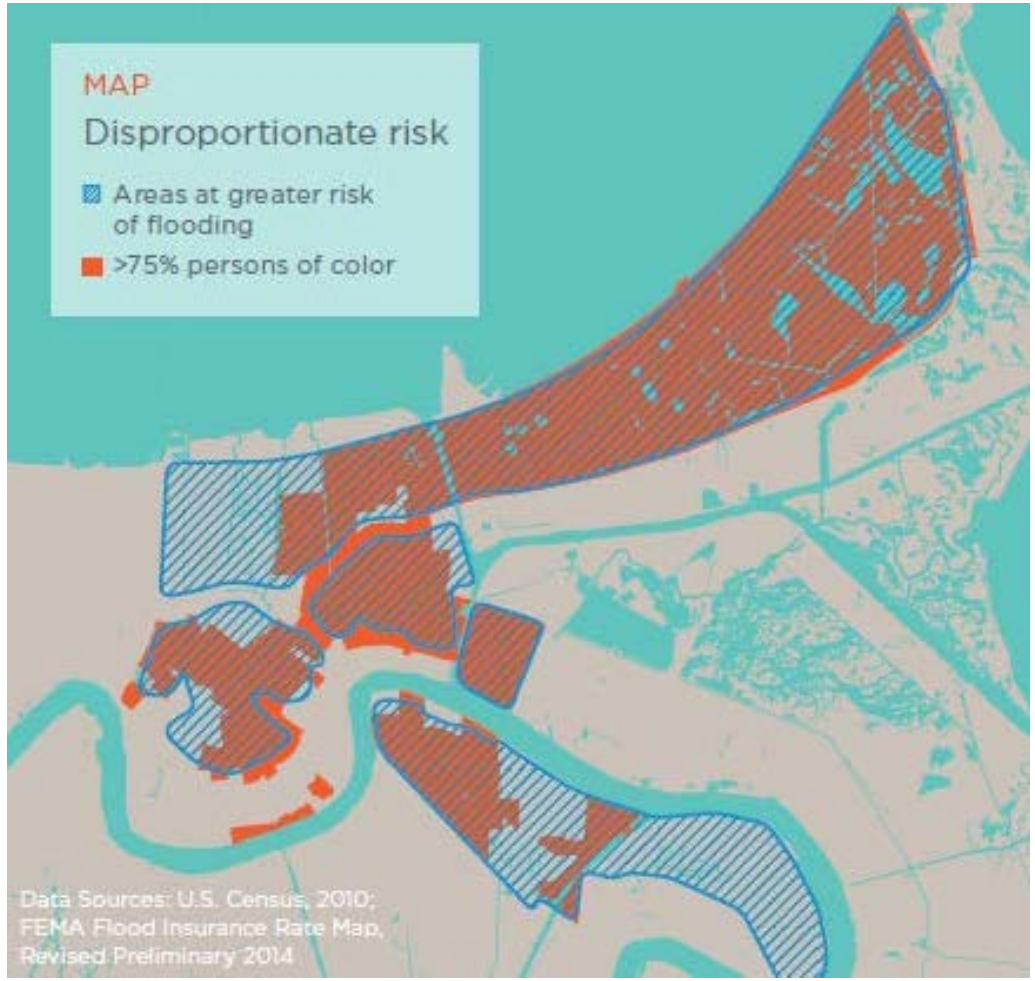
By 2050, Louisiana will likely experience temperatures

above 95°F (35°C) **on 80+** days per year.

Percent of June 2005 residential addresses that were actively receiving mail in June 2015



Source: The Data Center analysis of Valassis Residential and Business Database.



Data Sources: U.S. Census, 2010; FEMA Flood Insurance Rate Map, Revised Preliminary 2014

Challenges

Resilient
NEW ORLEANS

FEMA

- Didn't immediately waive the Stafford Act (requiring localities to contribute 10% of the cost of disaster recovery), even though it was quickly waived after Sept. 11th & Hurricane Andrew.*
- Didn't allow for Energy Efficiency upgrades, only restoration of structures to their pre-disaster state*
- Had no sustainable protocols for dealing with waste / debris

Residents

- Defended their right to have things like they were before, not better
- Weren't concerned at first about long term resilience because of other imminent crises such as
  - Healthcare
  - Education
  - Food access
  - Crime

**** Policies changed post-Katrina***

Utility

- Didn't bury power lines when they had the chance
- Passed on much of recovery costs to rate-payers

Sustainability: What's Changed?

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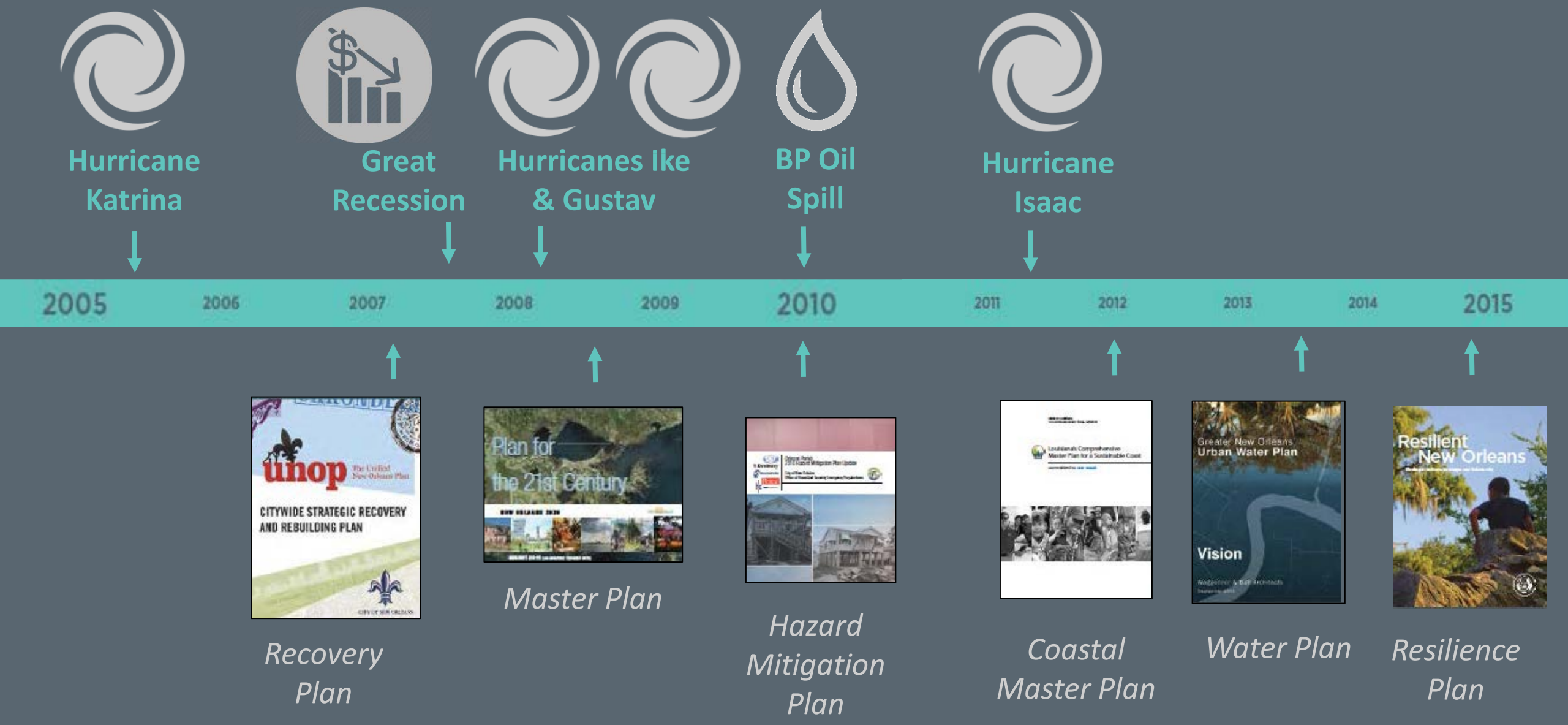
From Recovery to Resilience

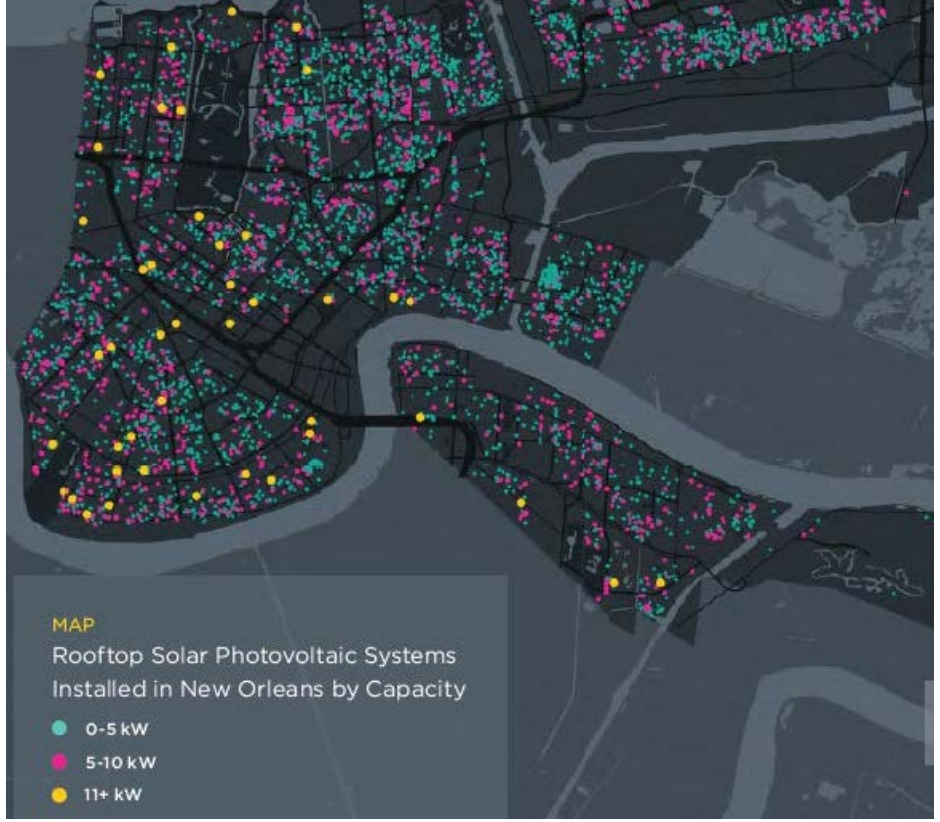


2006: School Facilities Master Plan

- Incorporating sustainability into renovation and construction of public schools
- 85 properties to LEED Silver standards
- Community-led efforts

2007: State Solar Tax Incentives

- 50% of cost covered
- $12,5000 cap
- Coupled with federal tax credits
- Funds exhausted in 2017
- Revised historic district guidelines to allow for solar panels
- Solar lease program brought resilient technologies to low income families



ARRA

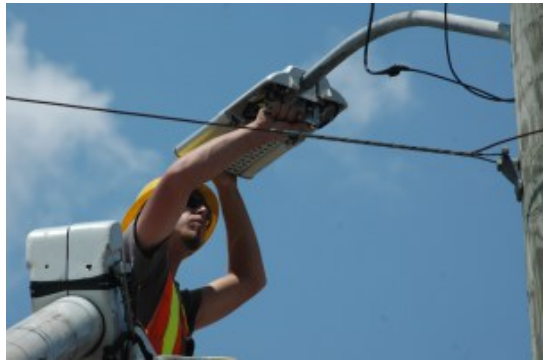
American Recovery and Reinvestment Act of 2009

EnergySmart

A New Orleans Program

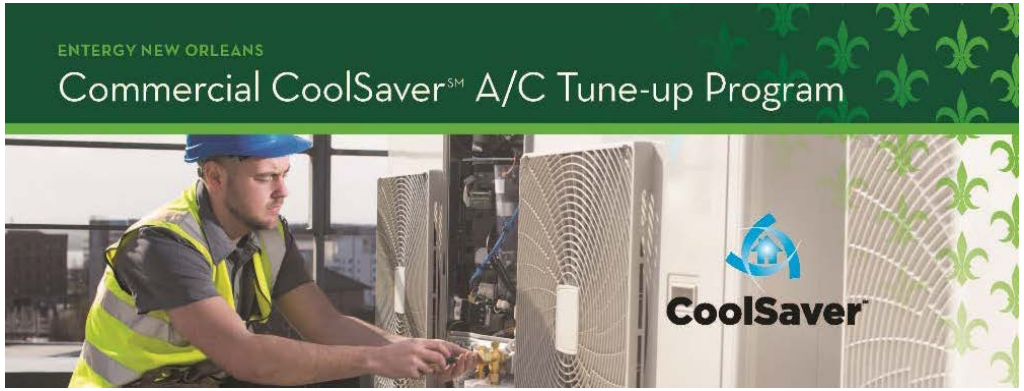
2007: $1.7M for Energy Efficiency

- Department of Public Works streetlight upgrades
- EE upgrades
- 4 libraries retrofitted
- Low income EE install programs



2010: Utility Incentive Program

- City Council directed Entergy New Orleans to launch 3 year $11M plan for energy efficiency
- Now in year 8
- Residential, commercial & multifamily upgrades
- Working with local trade allies



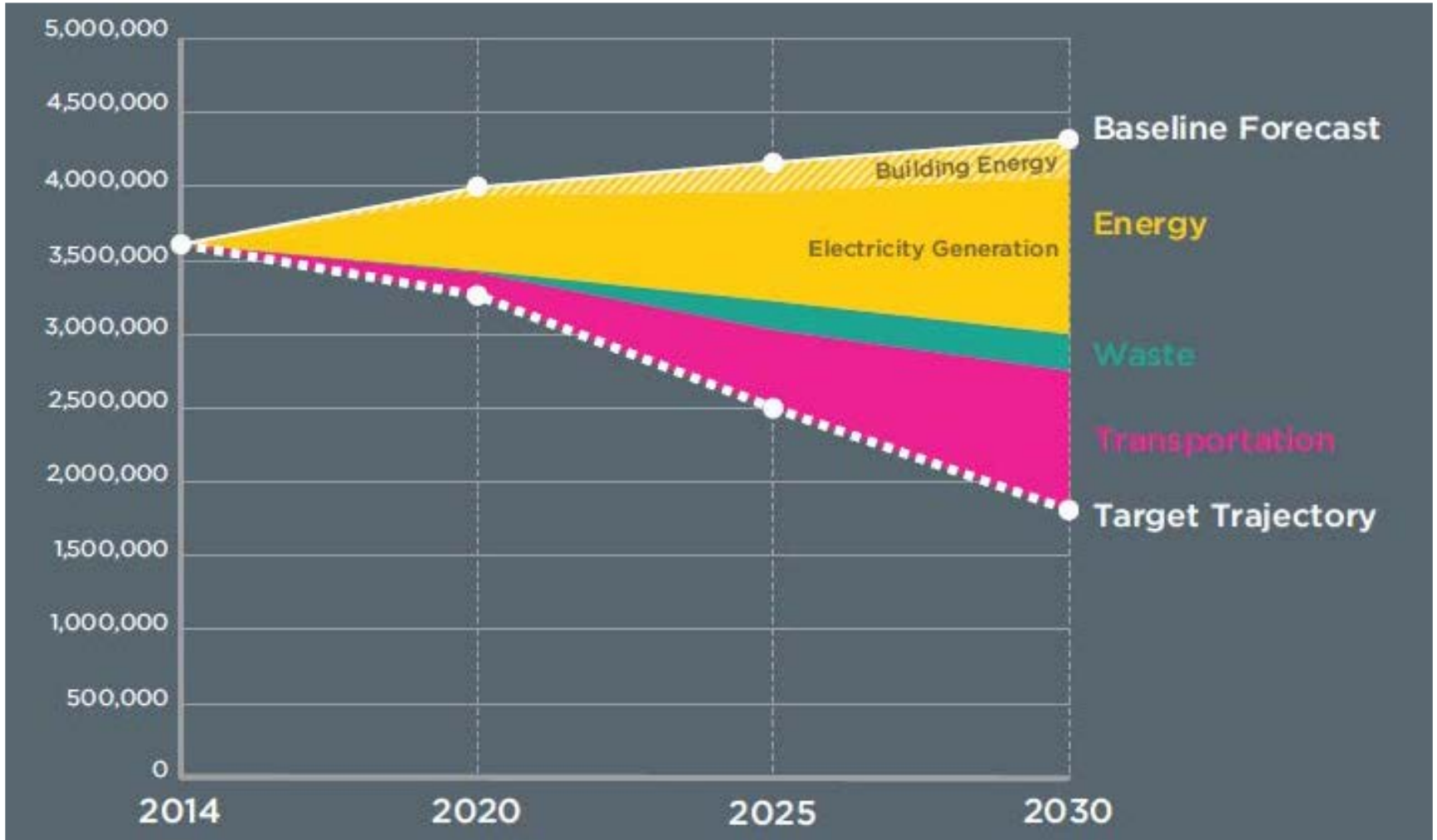
2016: Office of Resilience and Sustainability

- Policy innovation
- Microgrid Development
- Gentilly Resilience District
- Stormwater Management (Article 23)
- National Disaster Resilience Competition
- 10 full time staff

2017: Climate Action Strategy

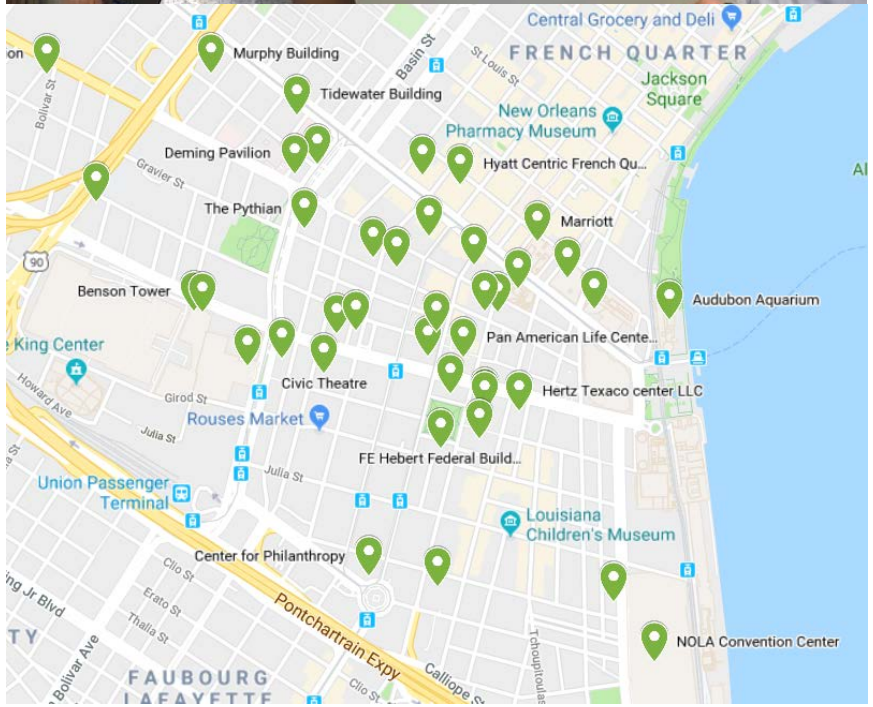
50% reduction of GHG by 2030

- Bike Share Program
- Green Infrastructure
- Energy efficiency in municipal buildings
- Exploring solar farm options on environmentally mitigated landfills and municipal rooftops
- Partnering with utility on helping them achieve solar goals



2017: City Energy Project

- Working with 20 peer cities to boost local economy and reduce pollution through
  - Energy efficiency policies
  - Programs to support growth of energy efficiency private sector
  - Partnering with utilities on sustainability initiatives
  - Engaging the community on optimizing operations in large buildings
- Downtown NOLA Energy Challenge
  - Voluntary energy benchmarking



CITY ENERGY
A JOINT PROJECT of NRDC + IMT

Lessons Learned

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NEW ORLEANS

- Collaboration across sectors (nonprofit / gov’t / private / academic)
- Neighborhood / community engagement essential
- Political will and leadership needed to implement change
- Use the crisis as an opportunity to push for new modes of thinking
- Invest in more resilient infrastructure while it’s not needed
- Innovation in the wake of disaster has to be teed up beforehand
- Have climate action strategy and resilience developed in advance

Mayor
Cantrell
CITY OF NEW ORLEANS
LOUISIANA

Thank You!

City of New Orleans
Office of Resilience and Sustainability
NOLA.gov/resilience
Camille Pollan
cpollan@nola.gov

ResilientNOLA.org
NOLA.gov/ClimateAction

Planning for Resilience in Norfolk

Jeremy E. Sharp, AICP
Principal Planner, City of Norfolk

Norfolk, Virginia

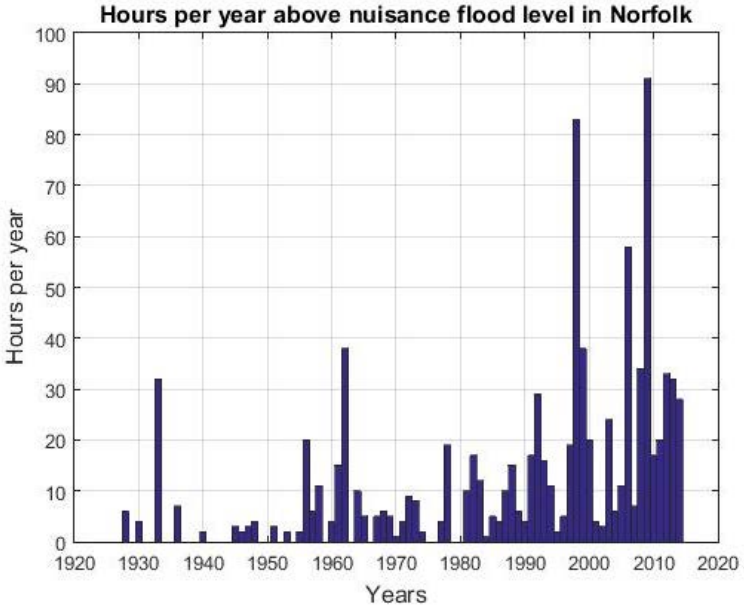
- Independent city of 246,000 (2nd largest in Virginia)
- 54 square miles, 144 miles of coastline, 97% developed
- World's largest Naval Station and Port of Virginia (3rd busiest on east coast)

A City Defined By Water…

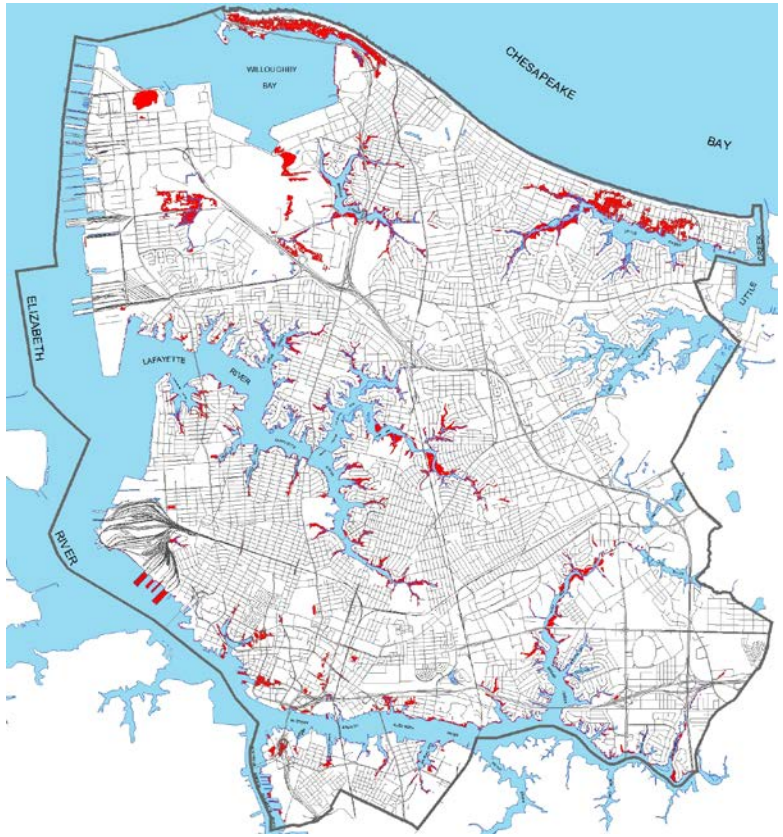
With a Long History of Flooding

With a Long History of Flooding

And Flooding is Only Getting More Common



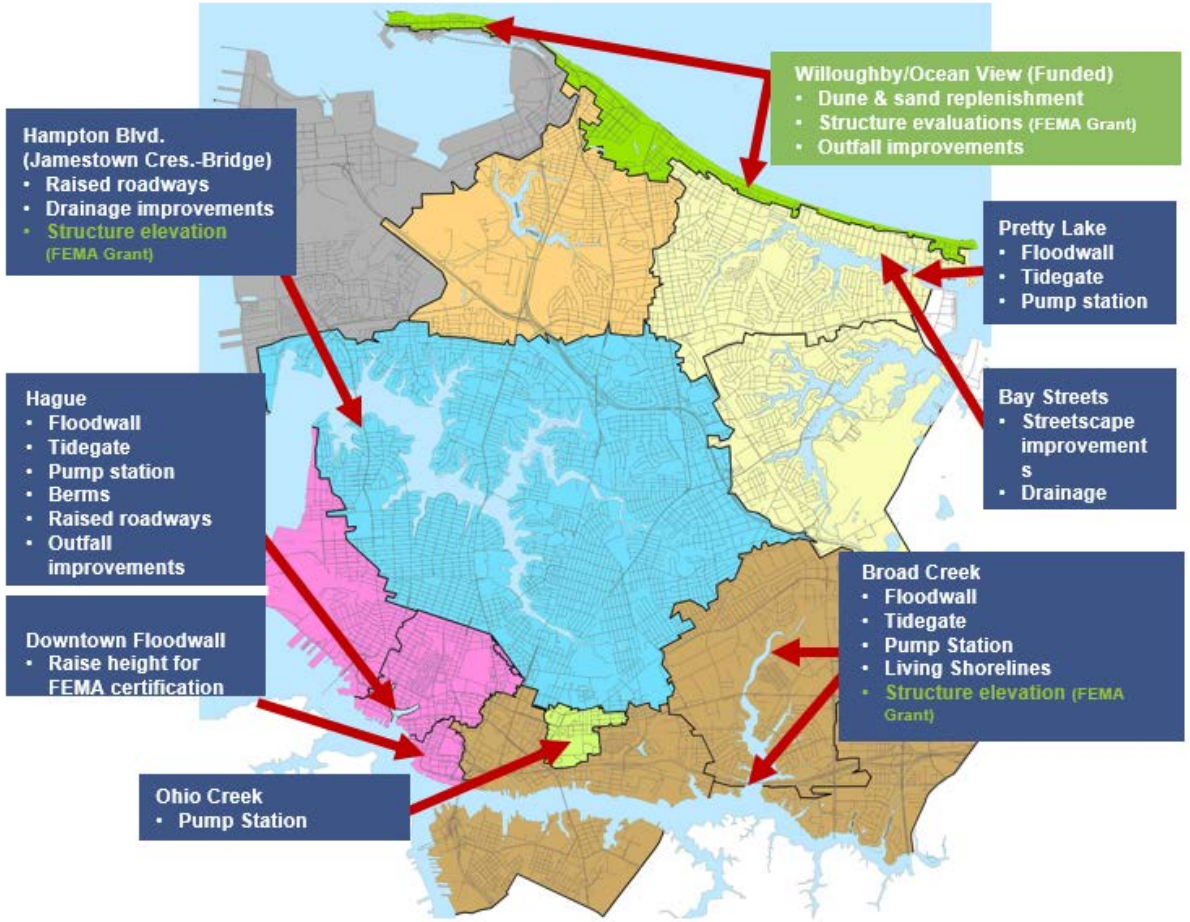
Increasing Sea Level Rise and Flood Risk



Sea levels with 2-3 feet of (relative) water rise

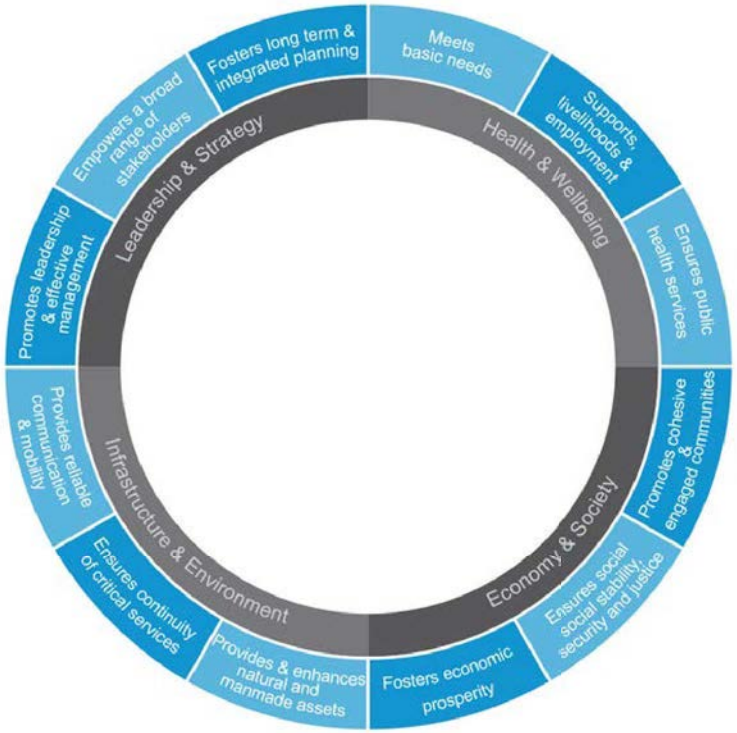
Flood zones with 2-3 feet of (relative) water rise

The Traditional Approach – Stop Flooding



100 Resilient Cities

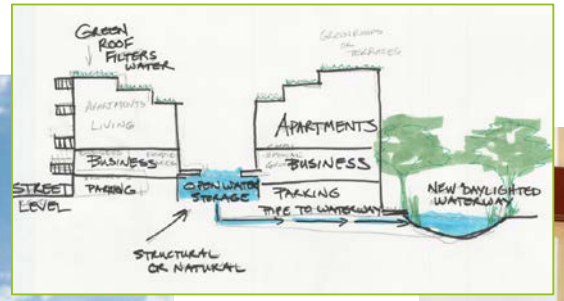
- Norfolk became one of the Rockefeller Foundation's 100 Resilient Cities in 2013
  - International network of cities dedicated to becoming more resilient to the physical, social, and economic challenges that are a growing part of the 21st century
  - RC100 defines resilience as the capacity of individuals, communities, and systems to survive, adapt, and grow in the face of stress and shocks

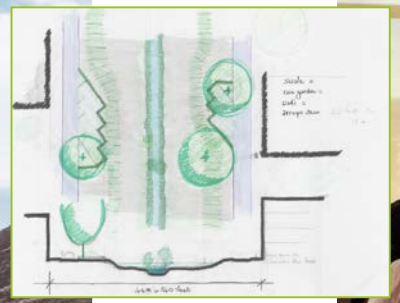


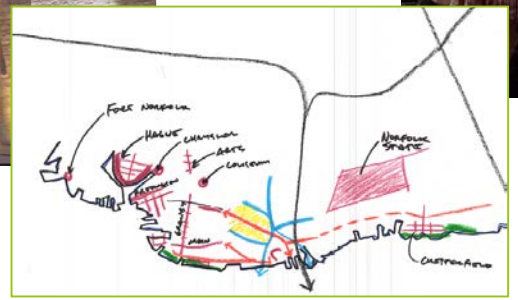
PIONEERED BY THE ROCKEFELLER FOUNDATION
100 RESILIENT CITIES

THE CITY OF NORFOLK

Dutch Dialogues Norfolk (2015)





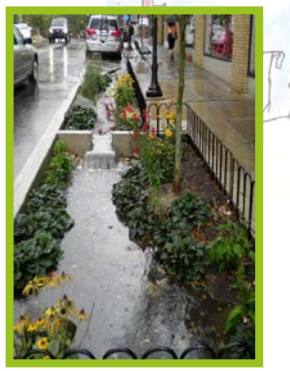


A Comprehensive Set of Solutions

Waterfront Parks

Retention Ponds

Rain Gardens



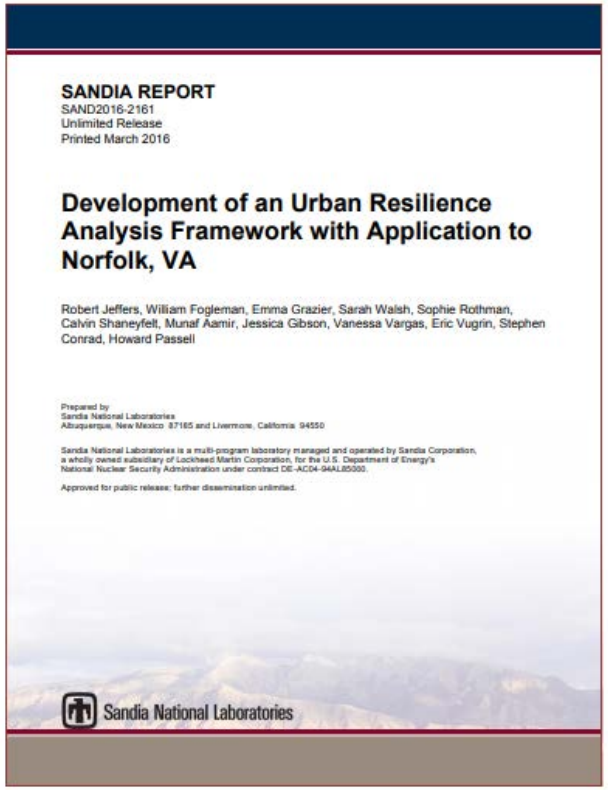
Constructed Wetlands

Protected Coastal Wetlands

Permeable Parking Lanes

Sandia Report (2016)

- Attempts to develop a process to analyze urban resilience
  - Uses Norfolk as a model
  - Includes a thorough analysis of the impact sea level rise will have on Norfolk's critical infrastructure



SANDIA REPORT
SAND2016-2161
Unlimited Release
Printed March 2016

Development of an Urban Resilience Analysis Framework with Application to Norfolk, VA

Robert Jeffers, William Fogleman, Emma Grazier, Sarah Walsh, Sophie Rothman, Calvin Shaneyfelt, Munaf Aamir, Jessica Gibson, Vanessa Vargas, Eric Vugrin, Stephen Conrad, Howard Passell

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550

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Approved for public release; further dissemination unlimited.

Sandia National Laboratories

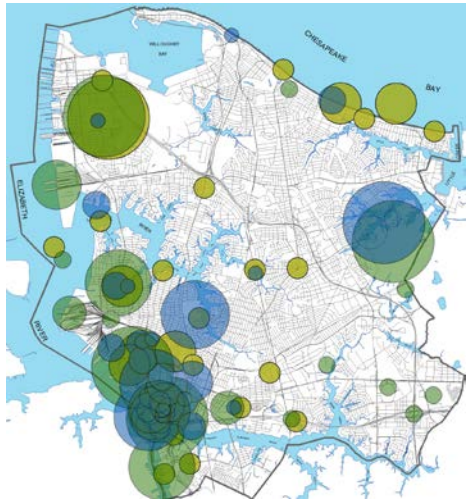
Table 1. Substations under more than 1ft of maximum flood inundation in the +3ft scenario, with depths of greater than 2 ft. highlighted in **bold**.

Substation Name	City/County	Max depth +0ft – (ft)	Max depth +1.5ft – (ft)	Max depth +3ft – (ft)
Berkley	Chesapeake, VA	0.53	**2.03**	**3.53**
Chesapeake	Chesapeake, VA	1.32	**2.82**	**4.32**
Cradock	Chesapeake, VA	0.78	**2.28**	**3.78**
Dozier	Chesapeake, VA	**2.88**	**4.38**	**5.88**
Elizabeth River NUG	Chesapeake, VA	0.00	0.00	1.40
Gosport	Chesapeake, VA	0.45	1.95	**3.45**
Greenwich	Chesapeake, VA	0.00	1.18	**2.68**
Huntsman Chemical	Chesapeake, VA	0.85	**2.35**	**3.85**
Tap 5369va115	Chesapeake, VA	0.00	0.79	**2.29**
Bloxoms Corner	Hampton, VA	**3.17**	**4.67**	**6.17**
Navy North	Hampton, VA	0.24	1.74	**3.24**
Shellbank	Hampton, VA	**2.67**	**4.17**	**5.67**
Industrial Park	Norfolk, VA	0.00	**2.52**	**4.02**
McLaughlin	Norfolk, VA	0.00	0.00	1.05
Reeves Avenue	Norfolk, VA	1.69	**3.19**	**4.69**

Vision 2100 (2016)

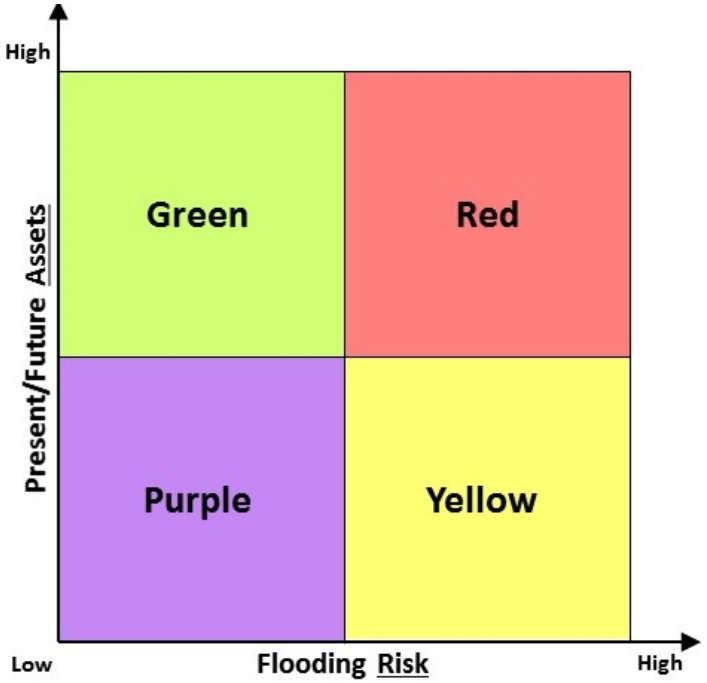
- Strategy for addressing sea level rise in long-term future
  - In the past, the focus was on the challenges
  - In the future, those challenges will give rise to opportunities
- Opportunity to bring visionary long-term thinking into Norfolk's Comprehensive Plan

Vision Development



Assets

Risk



Vision Areas

NORFOLKVISION2100

Vision Areas

Adapting to Rising Waters

Yellow areas are established neighborhoods that experience more frequent flooding. The City should explore new and innovative technologies to help reduce flood risk and focus on investments on extending the resilience of key infrastructure.

Designing New Urban Centers

Green areas are at low-risk of coastal flooding and have great potential for high density, mixed-use and mixed income development. These areas are prime opportunities for creating walkable, bikeable, transit-rich communities. The City should encourage transformational development in these areas.

Establishing Neighborhoods of the Future

Purple areas are established neighborhoods at less-risk of coastal flooding. The City should make investments that improve connections between these areas and key economic assets to ensure that these neighborhoods continue to thrive.

Enhancing Economic Engines

Red areas are home to key economic assets that are essential to the city's future. Land use policy and infrastructure investments to protect these areas should encourage additional dense mixed-use development in these areas.

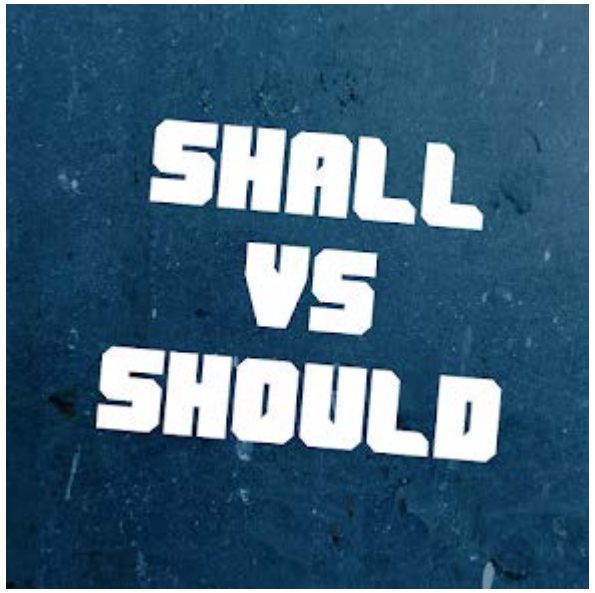
Vision 2100—Implementation Strategy

Four Approaches to Resilience

	Lower-risk areas:	Higher-risk areas:
Higher-asset areas:	▪ Model development ▪ Heavy infrastructure investment (transit, utilities) ▪ Higher-density, mixed-use ▪ Hold out for best possible uses/ densities **Green**	▪ Investments to protect our economic engines ▪ Flood protection ▪ Higher-density, mixed-use ▪ Diversified housing options/ economic opportunities **Red**
Lower-asset areas:	**Purple** ▪ Neighborhood stabilization ▪ Limited redevelopment (commercial, multifamily) ▪ Improved connections (roads, transit) ▪ Investments to enhance attractiveness	**Yellow** ▪ Innovative interventions to reduce risk ▪ Preserving historic districts ▪ Limited redevelopment (only that which will extend resilience) ▪ Education on flood risk ▪ Mechanisms to recoup lost value

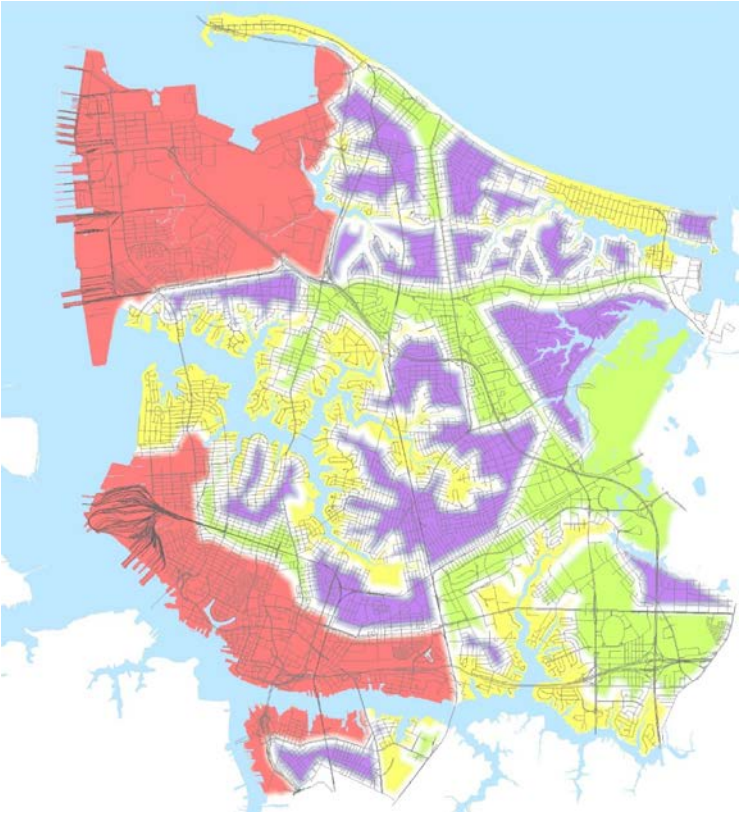
The Power of Zoning to Require Resilience

- Norfolk's resilience planning efforts are just visions
  - While vital, they lack the "teeth" required to lead to real change
- Zoning is law
  - By their nature, zoning requirements have the "teeth" necessary to bring about the change proposed in your resilience vision
- Zoning provisions are vital tools for <u>requiring</u> resilience in new development



Citywide Resilience Zoning Strategy

How do we increase resilience in a city that is 97% developed…



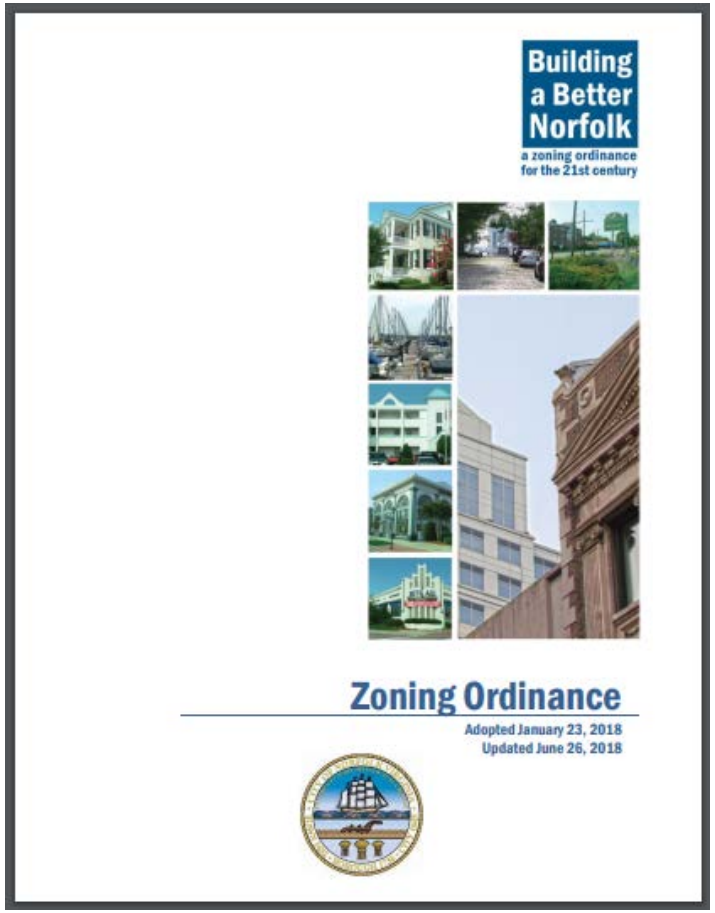
…with a middling construction market?

ZoneNorfolk (2018)

Norfolk's New Zoning Ordinance

- Previous ordinance was adopted in 1992
- New ordinance adopted in January and went live in March

Building a Better Norfolk
a zoning ordinance for the 21st century



THE CITY OF NORFOLK

Resilience Through Zoning

- Norfolk adopted the most stringent freeboard (elevation above flood level) requirement in Virginia in 2013:
  - 3 feet in high-risk flood zone
  - 18" in moderate-risk flood zone
- New ordinance requires 16"-24" above grade elsewhere in City
- Applies to HVAC equipment as well as livable space

Resilience Quotient

- Encouraging the use of resilient technologies
  - Stormwater management
  - Risk mitigation
  - Energy resilience
- Required of new development

C. ALTERNATIVE MINIMUM REQUI

Any multiple dwelling unit residential develop
resilience quotient standards for residential d
of the portion of the site plan review process
Compliance with Resilience Quotient Standar
provides options within each of three compor
achieve a minimum number of points from th
5.12.6, Resilient Point System for Residential Development, based on the number of dwelling units within the development as shown below.

(1) 1 to 5 units: 4 points total, no less than 1 point per component.

(2) 6 to 29 units: 5 points total, no less than 1.5 points per component.

(3) 30 to 89 units: 6 points total, no less than 1.5 points per component.

(4) 90 to 199 units: 8 points total, no less than 2 points per component.

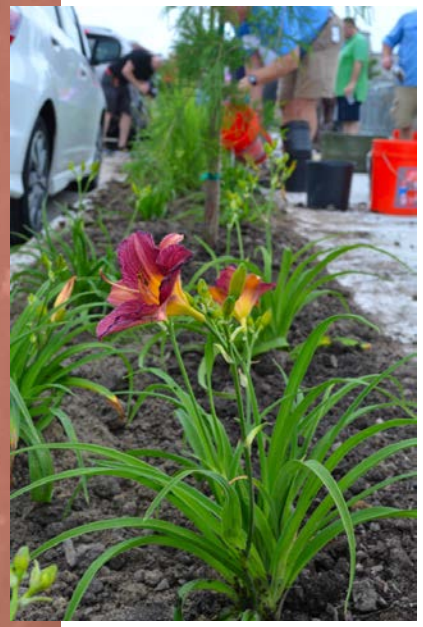
(5) 200 or more units: 10 points total, no less than 2 points per component.

TABLE 5.12.6: RESILIENT POINT SYSTEM FOR RESIDENTIAL DEVELOPMENT

Resilient Development Activity	Points Earned
Component 1: Risk Reduction	
Construct building to meet 110-mile wind load design requirements of the VUSBC	2.00
Elevate the ground story finished floor and all significant electrical and mechanical equipment no less than 3 feet above highest adjacent grade	1.00, plus 0.50 per ft. above 3 ft.
Construct an impact-resistant (hail, tree damage) roof	0.50
Install impact (hurricane or wind) resistant windows	0.50
Install operable storm shutters	0.50
Establish operating procedures for how the project will handle loss of off-site or grid power, transition to a backup source of power, and transition back to normal operation	0.50
Component 2: Stormwater Management	
Install a "green roof" on at least 50 percent of the total roof area (25 percent for renovated buildings) and only plant materials permitted in Section 5.2, Landscaping Standards	2.00
Install a "green roof" on at least 25 percent of the total roof area and only plant materials permitted in Section 5.2, Landscaping Standards	1.00

Resilience Quotient

- Single family homes
  - 200 gallons of stormwater storage (rain barrels, cisterns, etc.)
  - 16-inch elevation
  - Pre-wiring for generators, solar, wind, etc.
- Required of new development



Resilience Quotient

Operational Standards

- Several uses required to maintain power through generators
  - Assisted housing
  - Nursing home
  - Bank
  - Convenience store
  - Grocery store
  - Pharmacy
  - Gas station

Lessons Learned in Resiliency Planning

- Building a community resilience vision is vital
  - Focus on local threats/common areas of interest, not national/international trends
  - Work with all stakeholders, including those who may not agree with your direction
- Visions are great, but use all your tools to implement them
  - Zoning can be a powerful tool to shift burden for improvements from government to private sector

For More Information

Jeremy E. Sharp, AICP

Principal Planner

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https://www.norfolk.gov/planning

https://www.norfolk.gov/zoning

Questions

RESILIENCY PLANNING - CHALLENGES FOR K12 SHELTERS

Alachua County Public Schools
Theresa A. Spurling-Wood,CEM,CIE,GGP,LEED AP
Director, Energy Systems

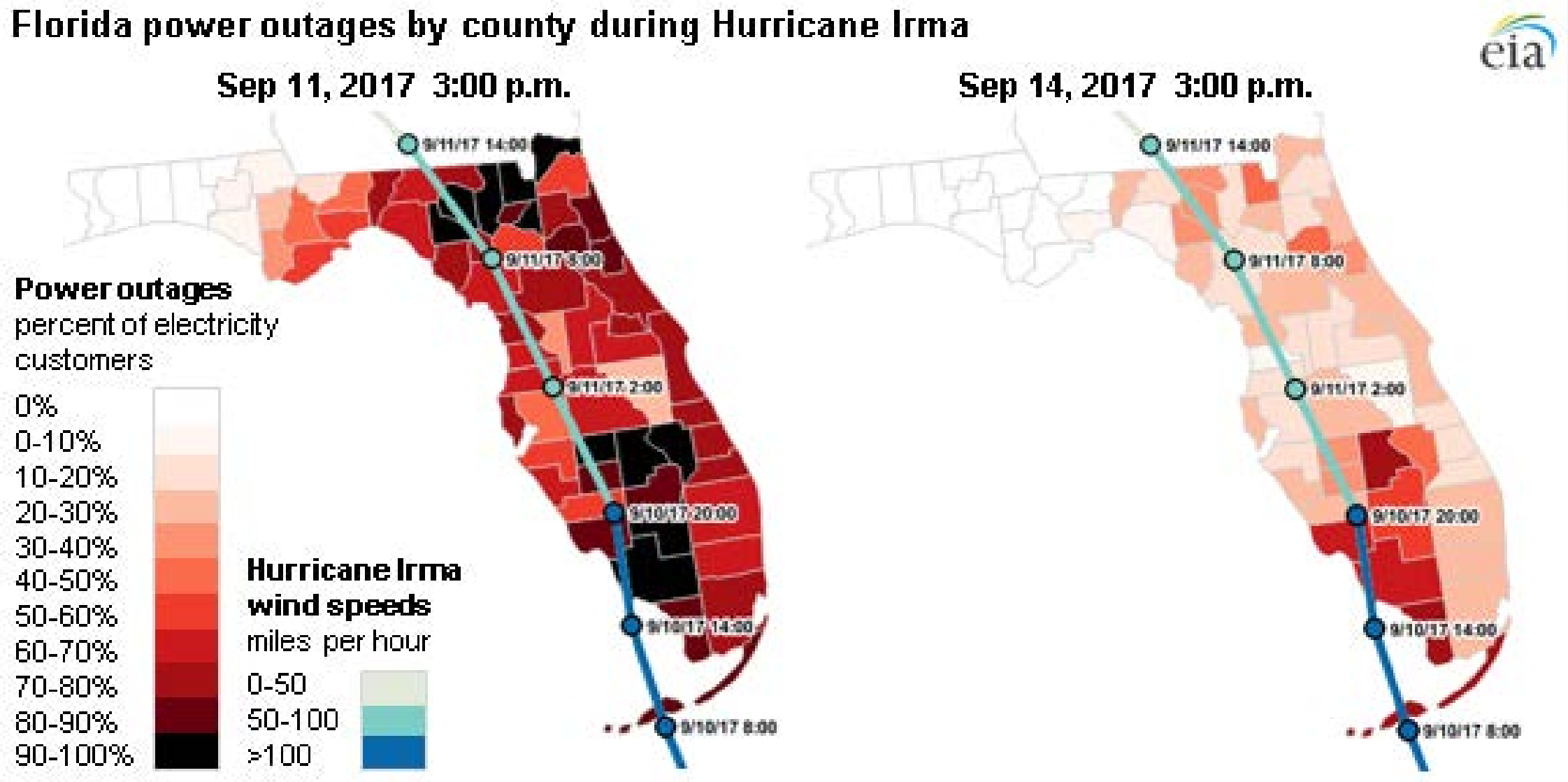
HURRICANE IRMA

HAD THE ENTIRE STATE OF FLORIDA EVACUATING AT THE SAME TIME

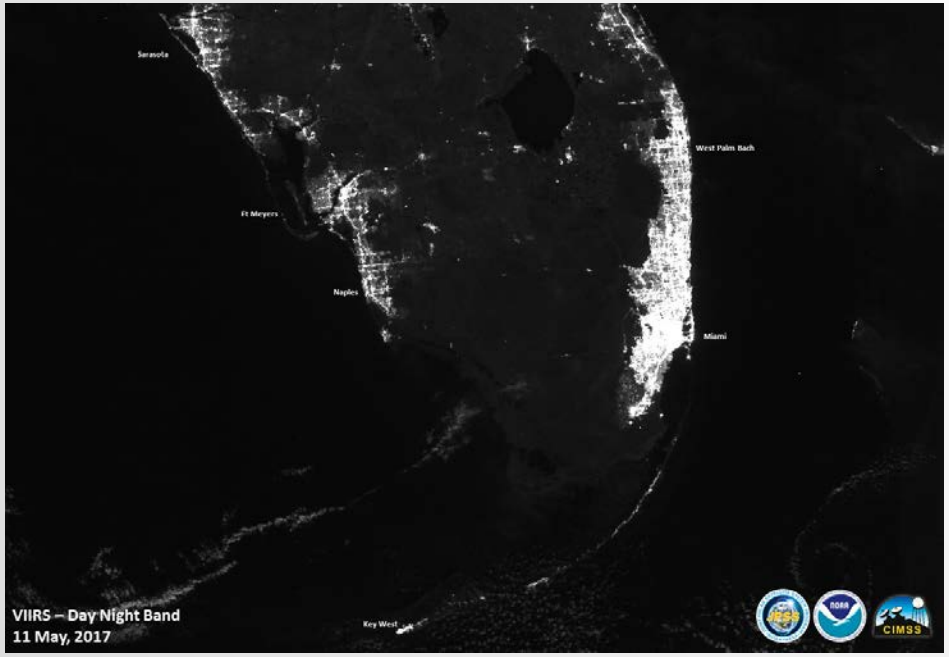
- 67 counties affecting more than **6 million** people
- Coastline is **1,197 miles** per Florida Public Service Commission
- **700** shelters were opened across the state
- **200,000** citizens were sheltered for 2 to 5 days
- When evacuees do not shelter locally, they will travel to your shelter(s) and may not be allowed to return to their homes
- Gas stations ran out of fuel for evacuees – caused mayhem

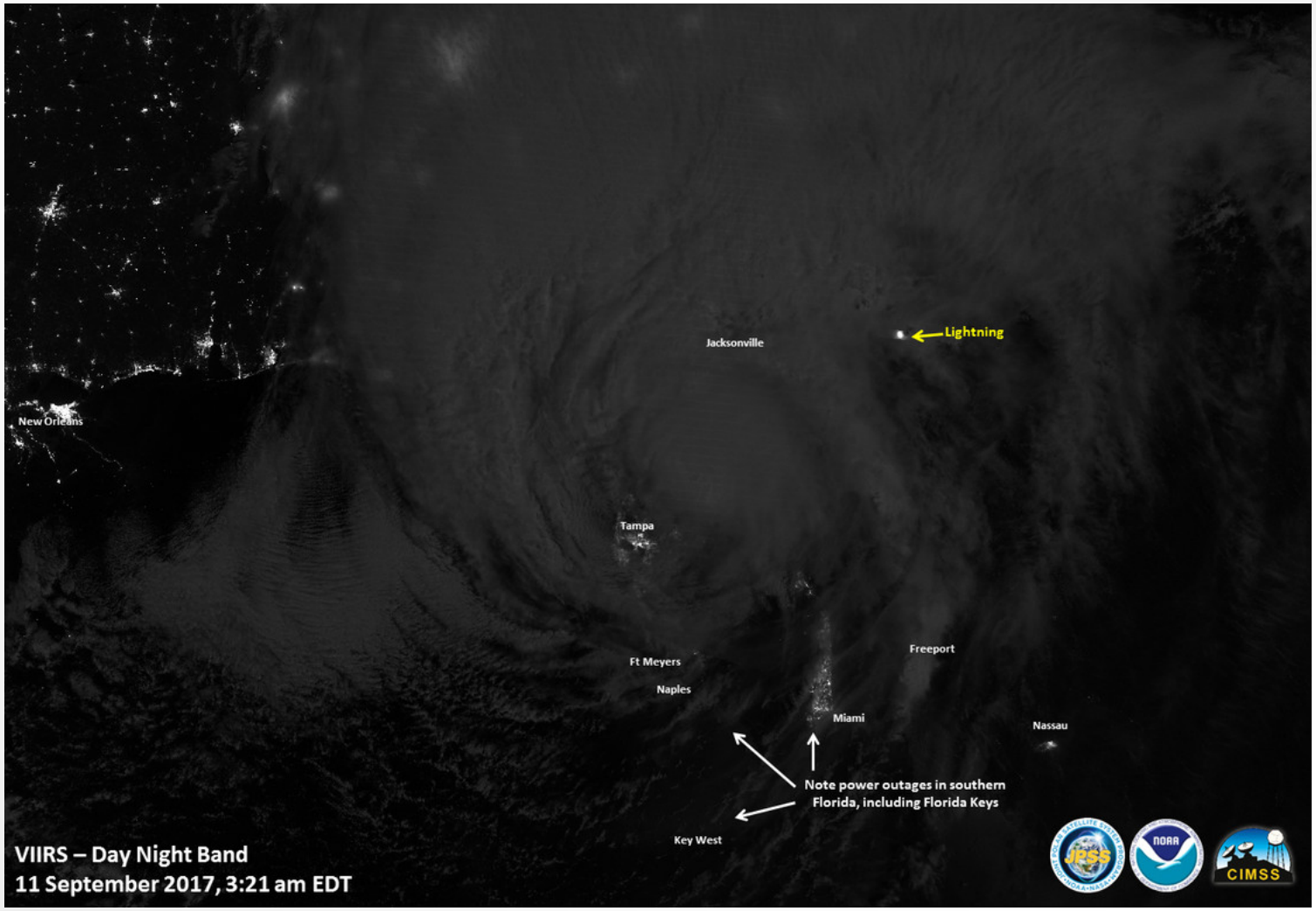
6.7 MILLION ELECTRICITY ACCOUNTS WITHOUT POWER

US ENERGY INFORMATION ADMINISTRATION & FLORIDA DIVISION OF EMERGENCY MANAGEMENT



FLORIDA – THAT NIGHT





MAKING HISTORY – AGAIN

IRMA

- A record **6.5 million Floridians** evacuated - making it the largest evacuation in the state's history.
- Major traffic congestion due to the entire Florida peninsula being within the cone of uncertainty days prior to the storm.
  - Use of the left shoulder was allowed on northbound Interstate.
  - Tolls were suspended.
- Fuel shortages throughout the state the week before
- Irma's arrival = hours-long lines at fuel stations and police escorts of fuel supply trucks.
- More than **60% of Floridians** (12 million people) lost power.
- Continued post-Irma outages prevented residents from pumping fuel for their home generators.
- Source: Wikipedia

GENERATORS FOR SCHOOL SHELTERS

- Site generator is hard wired – run under FULL load annually
  There is the possibility of an expensive repair if breakers fail to reset - but this is essential.
- Know the type of fuel for generator
  No fuel delivery after sustained winds of 39 mph
- Continuous fuel supply vs refillable tank
  Document the number of run hours per tank
- Generators consume oil
  Need to add engine oil after x# of hours running or it will SHUT DOWN on low oil safety lockout.
  Recommend on site supply of engine oil, antifreeze, spare belt(s) and hoses
- Typically generators are inadequately sized due to restricted funding so there is no mechanical ventilation or air conditioning
- Heat stress/exhaustion makes various vulnerable evacuees sick

Recommended mechanical ventilation rate minimum is 2 cfm per square foot of floor area

TEMPORARY POWER

REQUIRES PREPLANNING

- Portable generators on trailers ready to roll out
- Prewired generator access points on designated building(s)
- Consider food service areas for main connection point
- Walk-in refrigerators and freezers
- Ice machines
- Main gas valve for cooking and reheating food
- Dedicated electric outlets for phone chargers and radios

OUR NEXT ASSIGNMENTS

SOLAR ARRAYS VS FUEL GENERATED POWER

- Actual performance vs shelter expectations – managing the energy loads
- Rain and cloud coverage after a storm
- Battery storage capacity vs time of use loads
- Planning - why NetZero Energy schools?
  Schools consume 17% of non-residential energy in US
- $2 billion can be saved by improving energy strategies in schools U.S.DOE (2006)
- Florida new construction EHPA's:
  - Typically built to withstand 186 mph winds
  - Self contained with onsite generated power, potable water and sewer system
  - Have dedicated ventilation systems

CURRENT PV ON SCHOOL SITES

School	Phase 1	Phase 2	Phase 3	Total kW Installed
Buchholz High School	156	52	104	313
Duval			54	54
Eastside High School		26	78	104
Ft. Clarke Middle School	156		52	208
GlenSprings Elementary School		79		79
Howard Bishop			31	31
Kanapaha Middle School	52	157		209
Lincoln Middle School	52	53		105
Littlewood Elementary School		57		57
Loften High School	105			105
Meadowbrook Elementary School			183	183
Sidney Lanier Center	52			52
Terwilliger Elementary School			103	103
Westwood Middle School	126			126
Wiles Elementary School			52	52
Williams Elementary School	50	104		155
Gainesville High School			52	52
Lake Forest Elementary School			26	26
Hawthorne HS				5
High Springs Community				10
Waldo Community				5
Total	**750**	**528**	**736**	**2,034**

2014/2015 data

- No installation or maintenance cost
- Provides roof rental income for 20 years
- Feed in Tariff program Gainesville Regional Utilities
- When 20 year roof lease expires - turned over to ACPS
- Some roofing manufacturers required additional protection from PV array installations

WESTWOOD MIDDLE

FLAT ROOF - BALLASTED

MEADOWBROOK ELEMENTARY

METAL ROOF - MECHANICALLY ANCHORED

SUNSMART E-SHELTER PROGRAM

HIGH SPRINGS COMMUNITY SCHOOL

Sun Smart E-Shelter

SunSmart Schools Emergency Shelters

Supported by the U.S. Department of Energy and the Florida Department of Agriculture and Consumer Services under the American Recovery and Reinvestment Act, and executed by the University of Central Florida's Florida Solar Energy Center, 2010-2012.

www.fsec.ucf.edu/go/sunsmart

UCF Stands For Opportunity

FSEC

10kW bimodal photovoltaic arrays with battery back-up

Installed at 118 school sites (total 132)

Shelter locations reviewed annually

sunsmart@fsec.ucf.edu

FLORIDA'S SUNSMART SYSTEMS ACTIVATED

IRMA

Florida Solar Energy Center and the Florida Department of Agriculture & Consumer Services are evaluating the performance of SunSmart Schools after Hurricane Irma.

Preliminary Irma statistics:

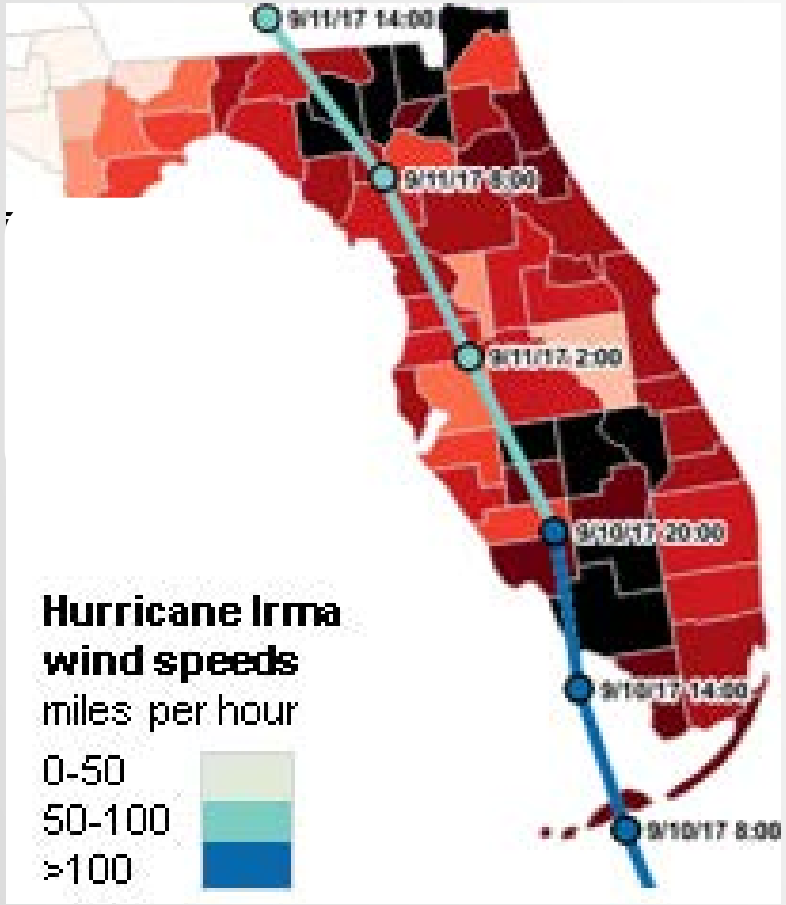
- 32 of the 40 open shelters lost power from the electric grid and utilized solar for backup power
- 9 of those shelters were without grid power for 10+ hours
- 31 solar systems worked as designed and provided power to critical loads

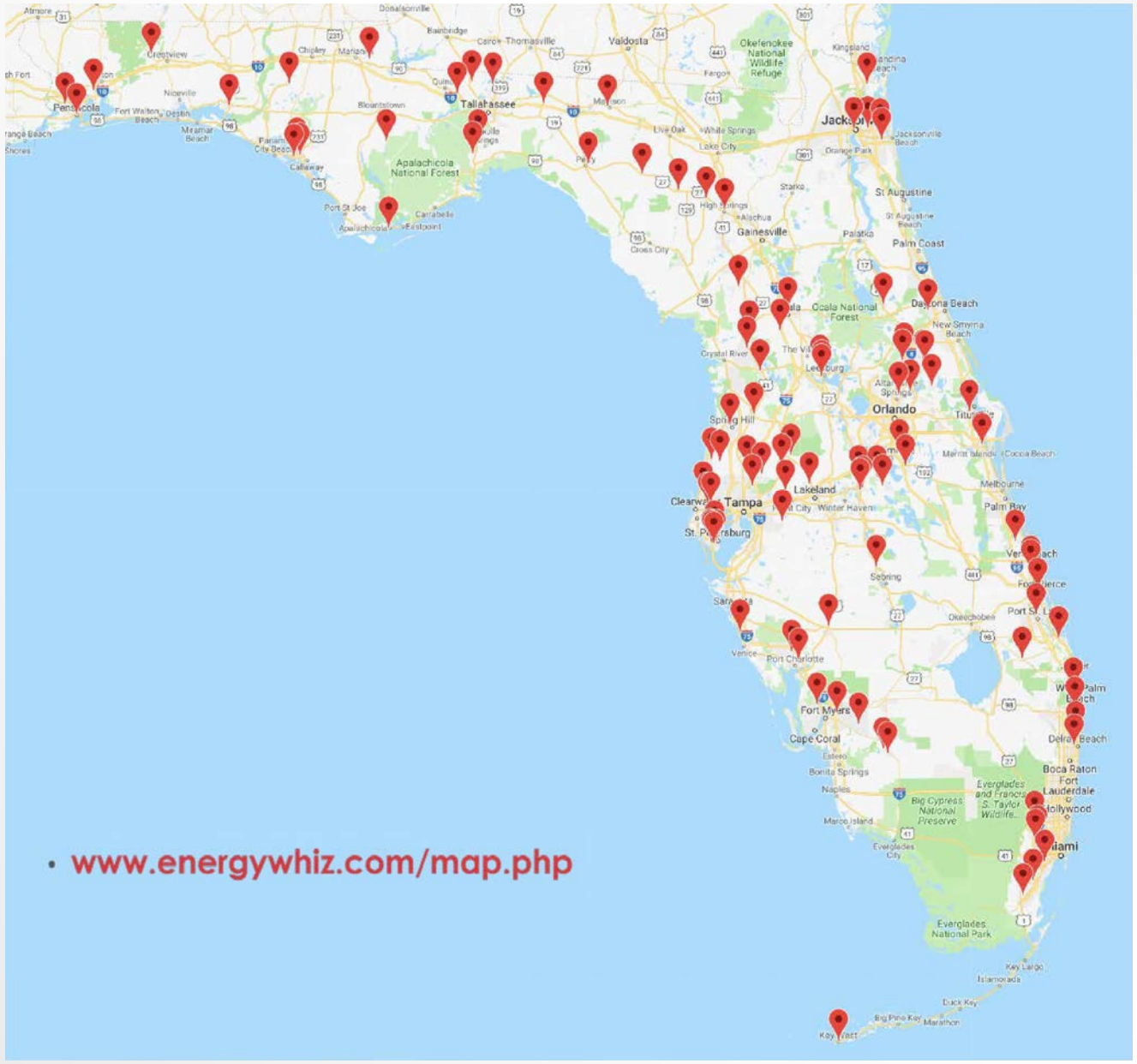
Successes:

- 1 school used solar power to operate a nebulizer, HAM radio, coffee maker, and charge electronic devices.
- 1 school operated a generator until it ran out of gas and then the solar took over. The school shelter had no utility provided electricity for 2 days.

John Leeds, Senior Management Analyst, Office of Energy, Florida Department of Agriculture & Consumer Services

SUNSMART SYSTEM LOCATIONS
OPERATED AS DESIGNED DURING IRMA





WHAT REALLY HAPPENS TO YOUR PLAN

SURVIVAL IN A SHELTER ENVIRONMENT

- Potential number of days shelter will be operational - 72+ hours
- General population GP or SpNS (medical) or pet friendly
- Stuff people bring – messaging: limit 20 square foot per person
- Typical shelter design criteria is 1 toilet & 1 hand wash sink per 40 occupants
- Getting MSW dumpsters emptied – plan for before & after event

Consider supplying:

- plungers, disinfectant (biohazards)
- disposable gloves/masks, hand sanitizer
- additional waste containers, mops & buckets,
- hand augers, and a pick up “yucky stuff” tool.

LESSONS LEARNED

- Communication devices can be an issue
- Medical supplies need refrigeration which adds additional energy loads
- Require designated receptacles for radio/cell phone chargers, recharge station portable defibrillators, breathing machines ie asthma.
- Mobile power center with one large dedicated electrical outlet inside shelter to energize. This can provide multiple receptacles in conjunction with multiple length heavy gauge extension cords to reach around room.
- Suggest extension cords with lighted cord caps and duct tape to secure cord and prevent trip hazards.

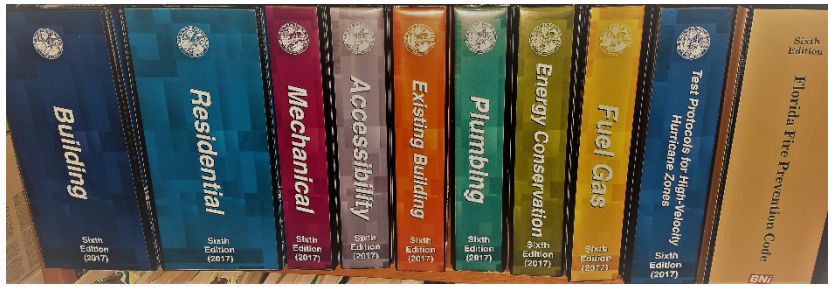
Consider a supply of disposable earplugs because people cannot sleep w/shelter noises, trauma of storm noises, and/or animals barking and barking and barking . . .

STAFFING CONSIDERATIONS

- Multiple location disasters means RED CROSS may not be available
  National Guard may be activated to assist
- Institute 8 hour shifts – it is very demanding and be mindful of curfews
- Principal and AP's/Dean's have school keys and site knowledge
- Food Service staff – must serve 3 meals a day
- Custodial staff – minimum 2
  Replenishing bathroom supplies, regular toilet backups, evacuees bathing w/paper towels in sinks
- Consider having a designated movie/play area
  For children as well as adult evacuees

GUIDELINES

- Florida Department of Education – State Requirements for Educational Facilities (SREF)
- American Red Cross' Mass Care – Preparedness and Operations (ARC 3031, superseded by ARC 3041)
- American Red Cross' Guidelines for Hurricane Evacuation Shelter Selection (ARC 4496)
- US Department of Energy's Standard Natural Phenomena Hazards Design and Evaluation Criteria (DOE-STD-1020)
- 2017 Florida Building (6th Edition)Code Chapters 423 and 453.25
- International Code Council's Standard on the Design and Construction of Storm Shelters (ICC 500)
- Chapter 27, NFPA 70 Articles 700, 701, and/or 702
- FEMA 424 Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds
- FEMA P-361
- ASCE Flood Resistant Design and Construction (ASCE 24)(2007)
- US Department of Justice Checklist for Emergency Shelters
- ADA Checklist for Existing Facilities (2016)
- 28 C.F.R. $35.13



LINKS FOR INFORMATION

- www.FloridaDiaster.org
- http://www.arrl.org/ares
- https://new.usgbc.org/center-for-resilence
- www.ada.gov/pcatoolkit/chap7shelterchk.htm.
- www.fsec.ucf.edu/en/education/sunsmart/index.html
- http://www.fema.gov/media-library/assets/documents/5264
- http://www.fema.gov/safe-room-resources/fema-p-361-design-and-construction-guidance-community-safe-rooms

- **Email questions to:**
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SPECIAL THANKS

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