
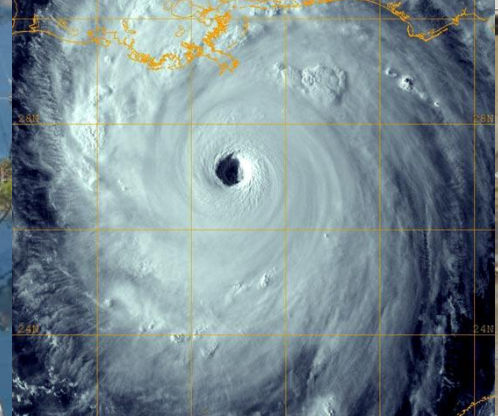


The U.S. Gulf Coast: Risk and Adaptation

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Entergy

International Energy Agency
Experts' Group on R&D Priority Setting and Evaluation
November 13-14, 2013

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Risk and Adaptation

- Brief Introduction to the Adaptation Study
  - Risk Assessment
  - Adaptation Supply Curve
- Adaptation initiatives
  - “Blue Ribbon Resiliency Communities”
  - Entergy asset resiliency

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Project objective and approach

Objective: Develop a comprehensive, objective, consistent fact base to quantify climate risks in the U.S. Gulf Coast and inform economically sensible approaches for addressing this risk

First comprehensive analysis of climate risks and adaptation economics along the U.S. Gulf Coast

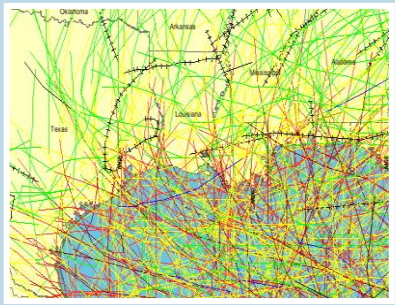
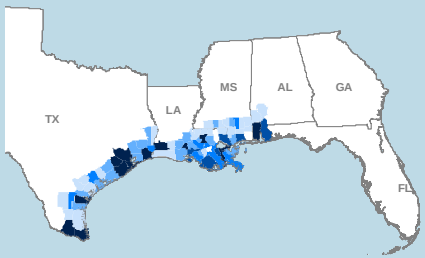


Illustration of hurricane paths/ intensities

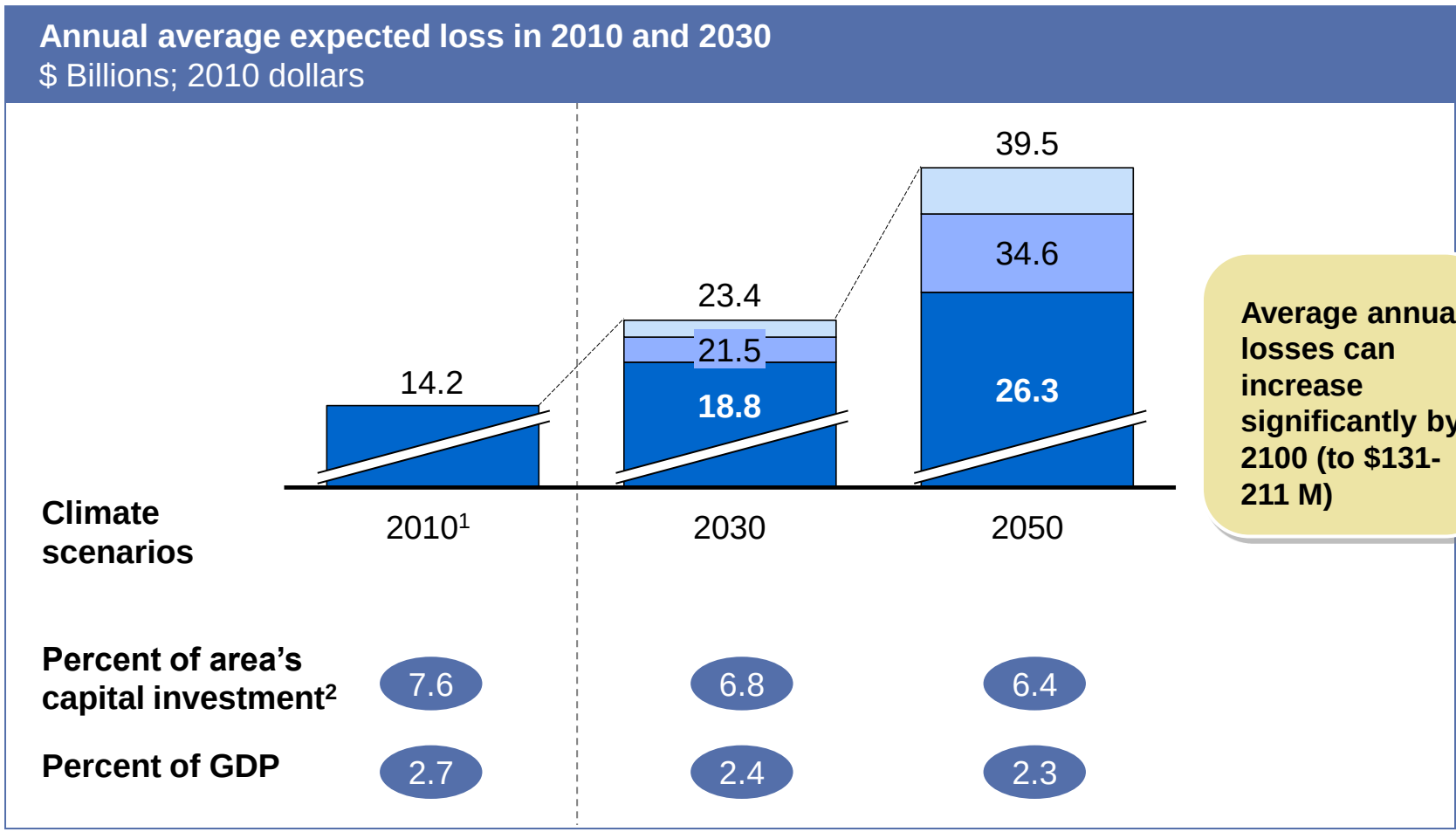
- **Granular, "bottom-up" analysis using a risk framework**:
  - Modeled **23** asset classes across residential, commercial, infrastructure, oil, gas and utility
  - Modeled **800** zip codes across **77** counties
  - Simulated ~**10,000** hurricane "years" across multiple climate scenarios
  - Modeled over **50** adaptation measures



Engaged with experts across the Gulf Coast

- **First time broad range of Gulf Coast stakeholders and experts** engaged
  - **Discussed with over 100** global, regional academics, government officials, industry experts and NGOs
  - **Used credible, publicly available sources** (e.g., IPCC climate scenarios, FEMA, BEA, DOE EIA, MMS, Energy Velocity,)

Climate change is expected to increase loss over time



1 No climate change; includes impact of subsidence
2 Based on BEA historical average of capital investment (private and total government expenditures) as a percentage of GDP

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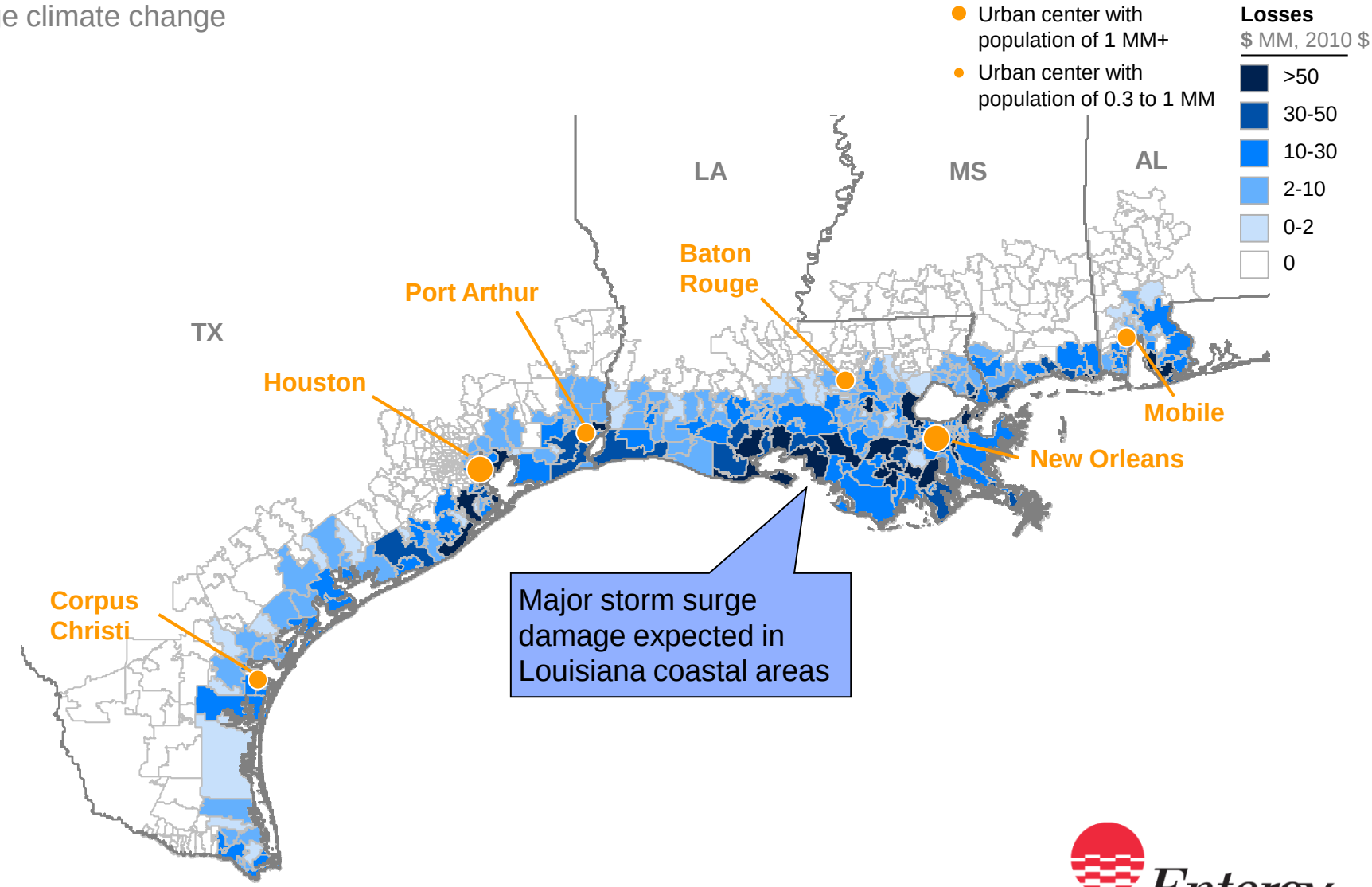
Damage from storm surge/relative SLR primarily occurs in Louisiana

Storm surge expected average losses across the U.S. Gulf Coast 2030

Average climate change

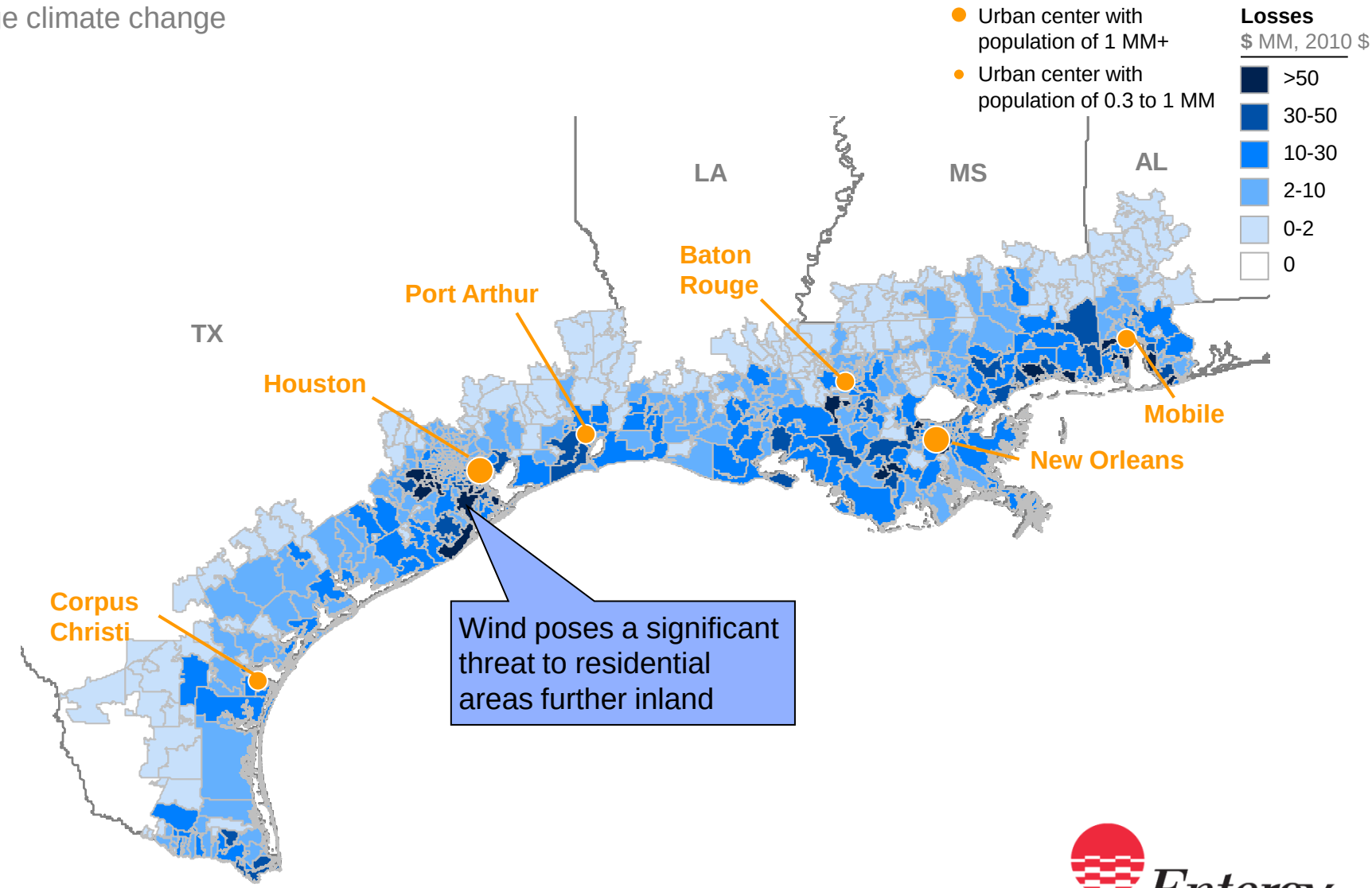


SOURCE: Swiss Re

Strong annual expected wind loss may also occur in TX

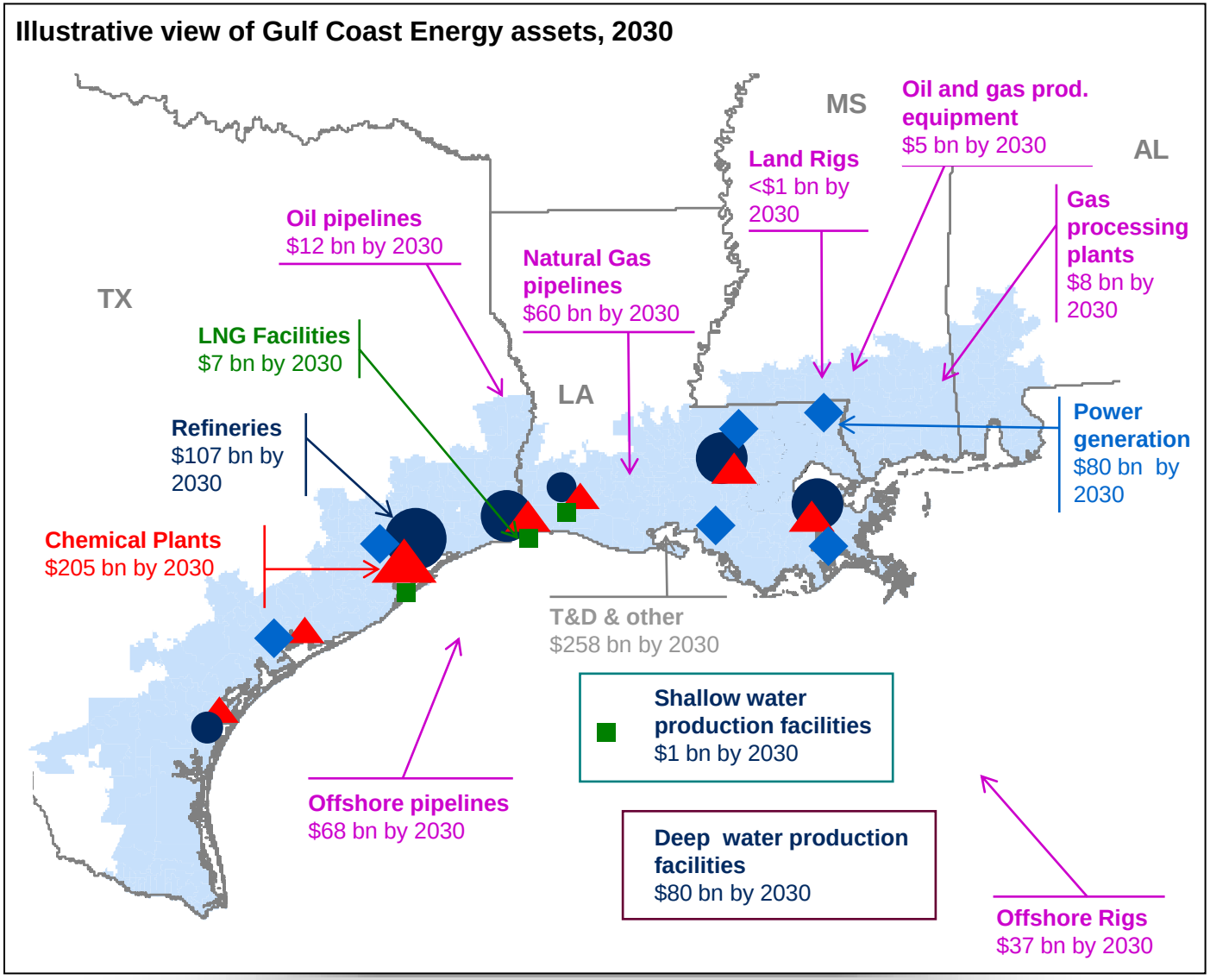
Wind expected average losses across the U.S. Gulf Coast 2030

Average climate change



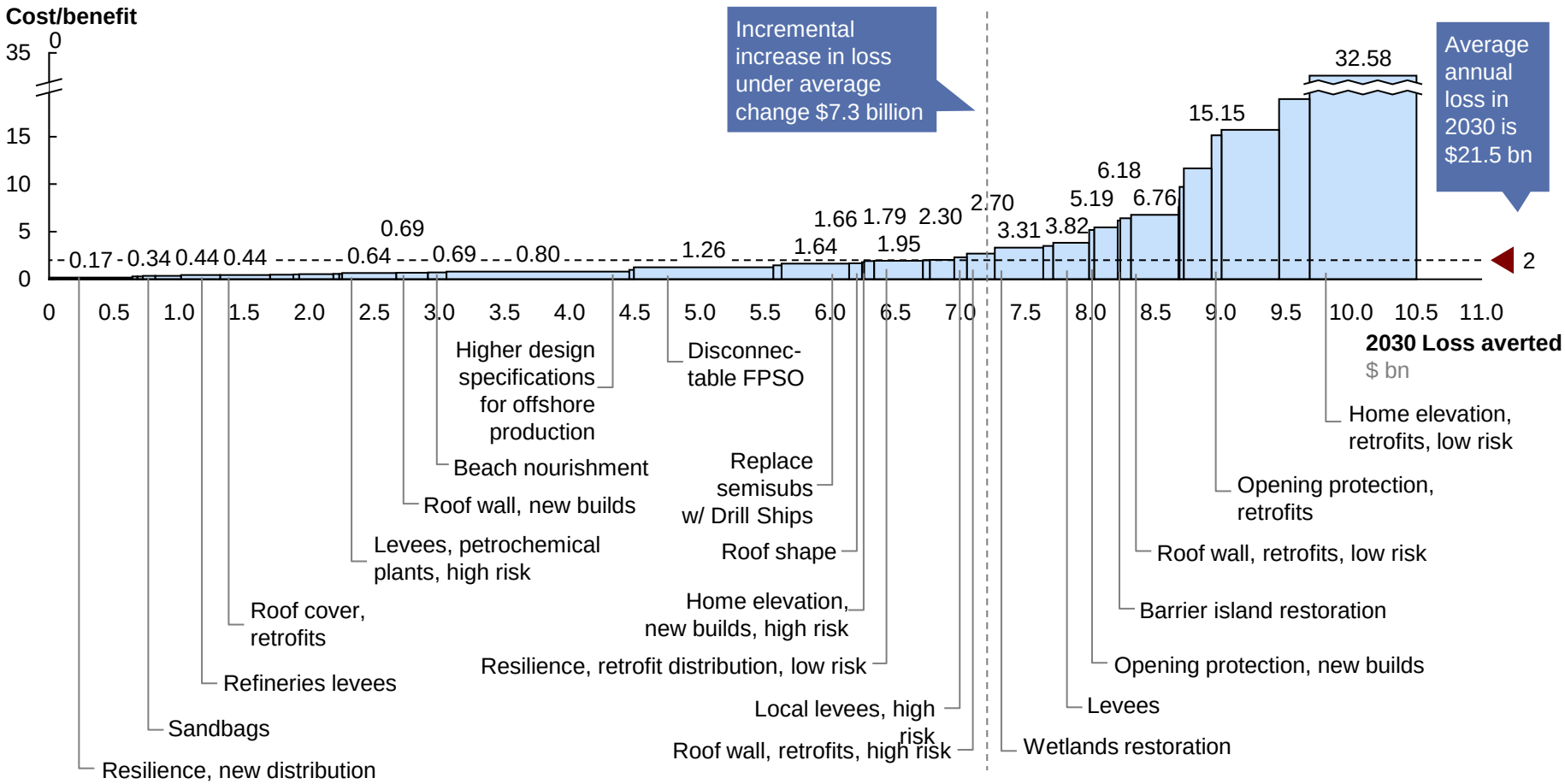
SOURCE: Swiss Re

We are considering a range of energy assets in this analysis



- We have taken a **granular view of energy assets**
- **Generated bottoms up replacement valuation and geospatial distribution** of assets

Potentially attractive measures can address the increase in annual loss between today and 2030 and keep the risk profile of the region constant



Blue Ribbon Resilient Communities - BRRC

- Entergy and America's Wetland Foundation (AWF)
  - Entergy and AWF co-sponsors of the BRRC
  - Leadership and participation
  - Leverage existing relationships in the communities
  - Expansion to include broader group of stakeholders
    - Industry
    - Other utilities
    - Expand to other states

- Blue Ribbon Resilient Communities: Envisioning the Future of America's Energy Coast
  - Co-Chairs – Louisiana Lt. Governor Jay Dardenne; Texas TCEQ - Buddy Garcia
  - Membership – state officials from Texas, Mississippi, Alabama

- BRRC as a vehicle to assess the resiliency of coast communities
  - Example assessment tool
  - BRRC schedule

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Resilient Communities BRRC

- Event Schedule

2011

February
Press Conference – Belle Chasse, LA

March
Calcasieu Parish – Lake Charles, LA

May
Plaquemines Parish, LA

June
Harris/Montgomery/Ft. Bend Counties, TX

September
Terrebonne/Lafourche Parishes, LA

October
Harrison/Hancock Counties, MS

November
Galveston County, TX

2012

January
Mobile County, AL

March
South Padre, TX

March
Baldwin County, AL

April
Iberia/St. Mary Parishes, LA

May
New Orleans, LA

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Resilient Communities BRRC Meeting Locations

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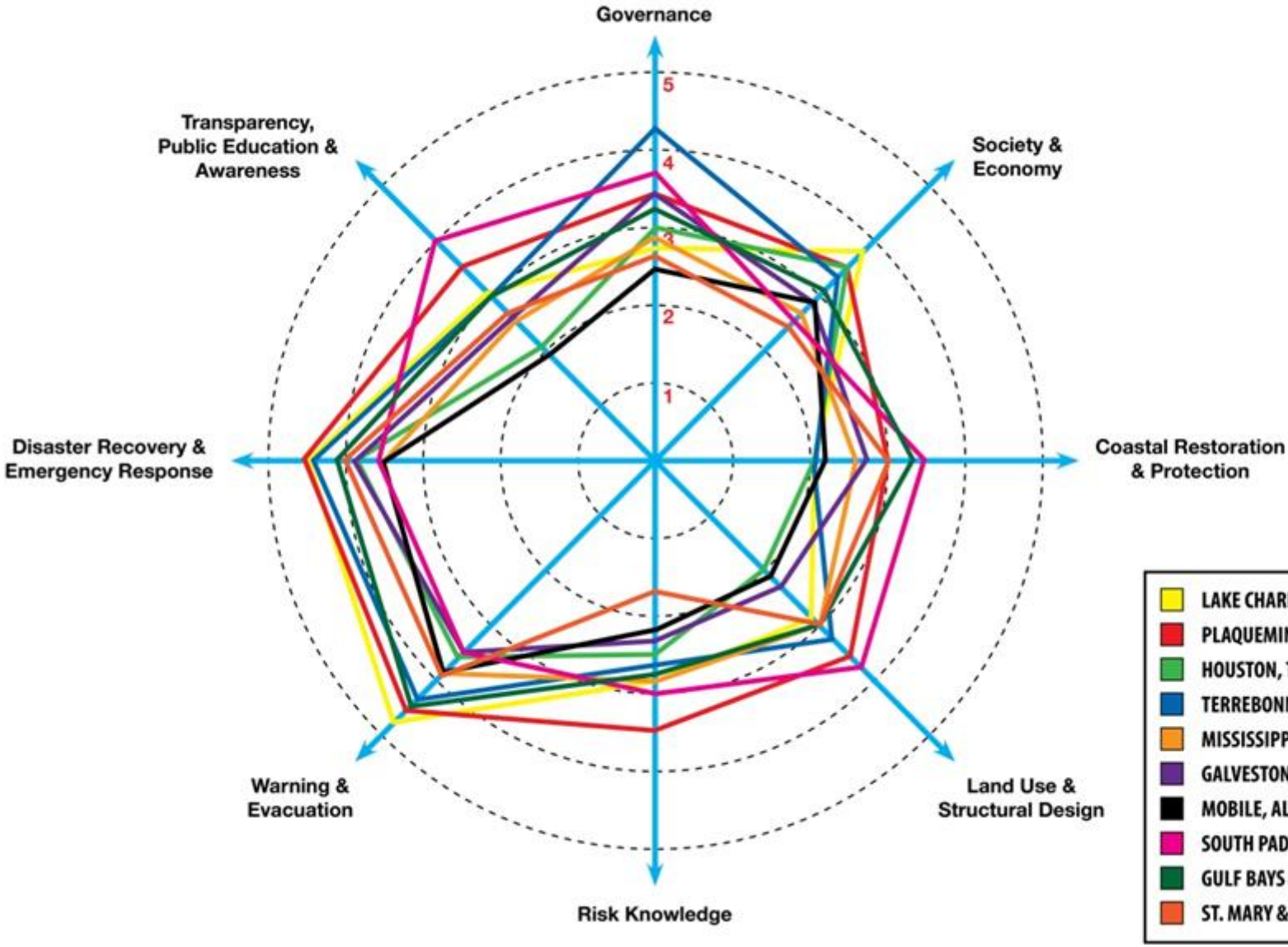
Resiliency modeling approach and benchmarking – graphic representation

* "How Resilient is your Coastal Community – USAID, NOAA, 2007

Resiliency modeling approach and benchmarking – BRRC Results



Entergy Asset Resiliency

- Utility Operations
- Focus on resiliency of Entergy assets
  - T&D
  - Generation
  - Vegetation Management
- Expansion to include other utilities
- Technical Conferences set for Texas and Louisiana
  - Lamar University Beaumont April 12, 2012
  - Louisiana State University Baton Rouge May 17, 2012

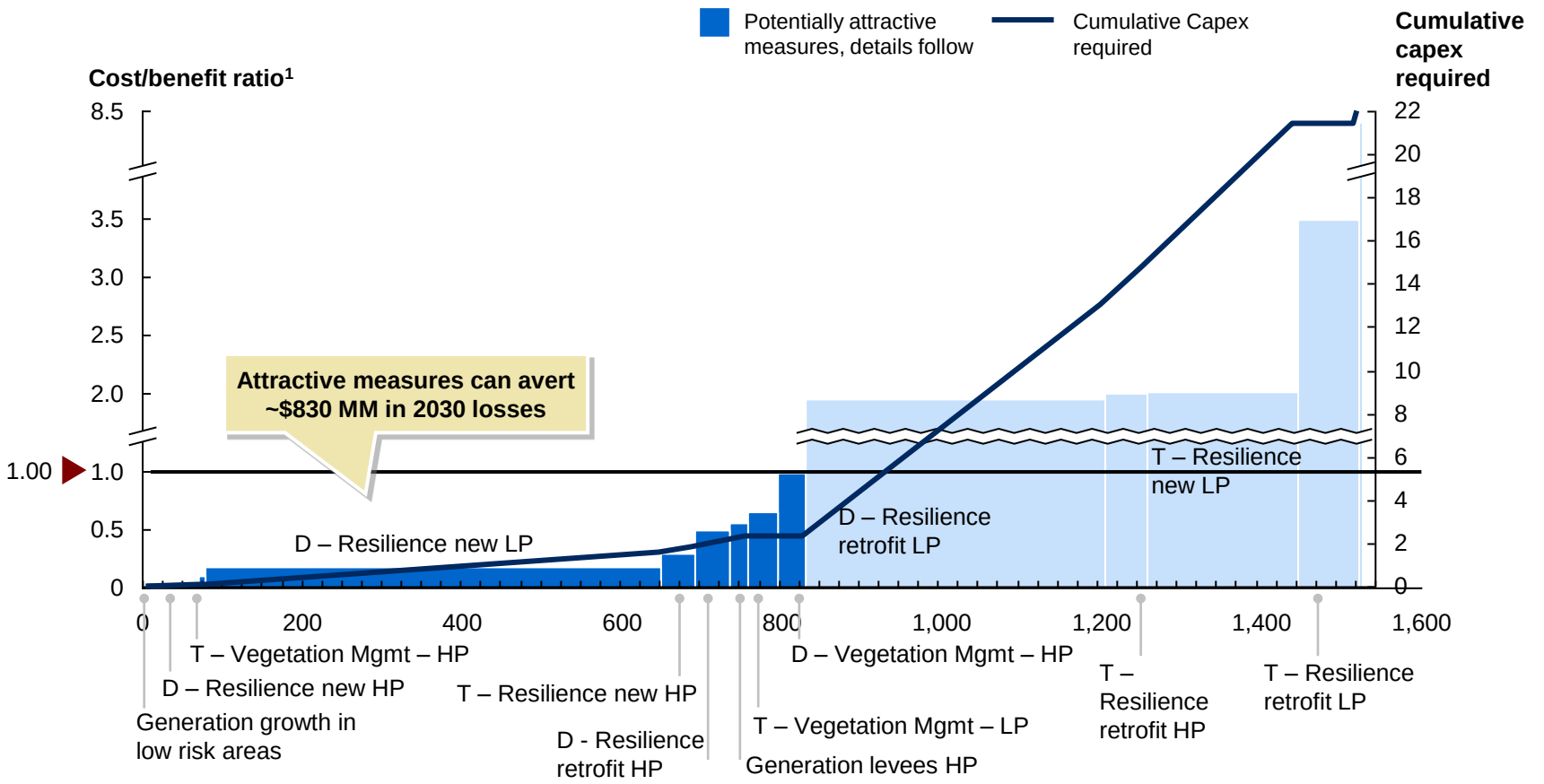
Entergy Asset Resiliency

We have developed a set of 27 utility measures across 3 key categories

"Out of the money" measures
Attractive measures
PRELIMINARY

Category	Type of measures	Total 2030 loss averted $ MM
Transmission & Distribution 	▪ Resilience ▪ Vegetation management ▪ Undergrounding	856 / 1,004 / 1,860
Substations 	▪ Elevation of substations	7
Generation 	▪ Build levees protecting power plants ▪ Build new power plants in low risk areas	27 / 31 / 4

Entergy Asset Resiliency



- Resilient distribution lines (both new builds and retrofits) are key actions
- Vegetation management has potential to reduce losses at C/B < 1
- Transmission resilience efforts tend to be attractive only in high risk areas

Note: HP refers to High Priority areas (zip codes with high average losses) ; LP refers to Low Priority areas (zip codes low average losses)
1 Benefits include utility property damage + utility business interruption + commercial and non-energy industrial business interruption aversion

Risk and Adaptation

- Summary
  - Risk Assessment - $14 billion/yr in 2010
  - Cumulative losses of $350 billion by 2030
  - Adaptation Supply Curve – can help reduce growth in loss
- Adaptation initiatives
  - “Blue Ribbon Resiliency Communities”
  - Entergy asset resiliency

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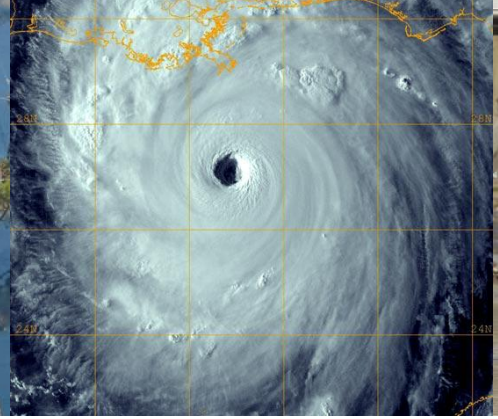


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Questions

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