The Role and the Future of Public-Private Collaborations in Gulf-wide Monitoring

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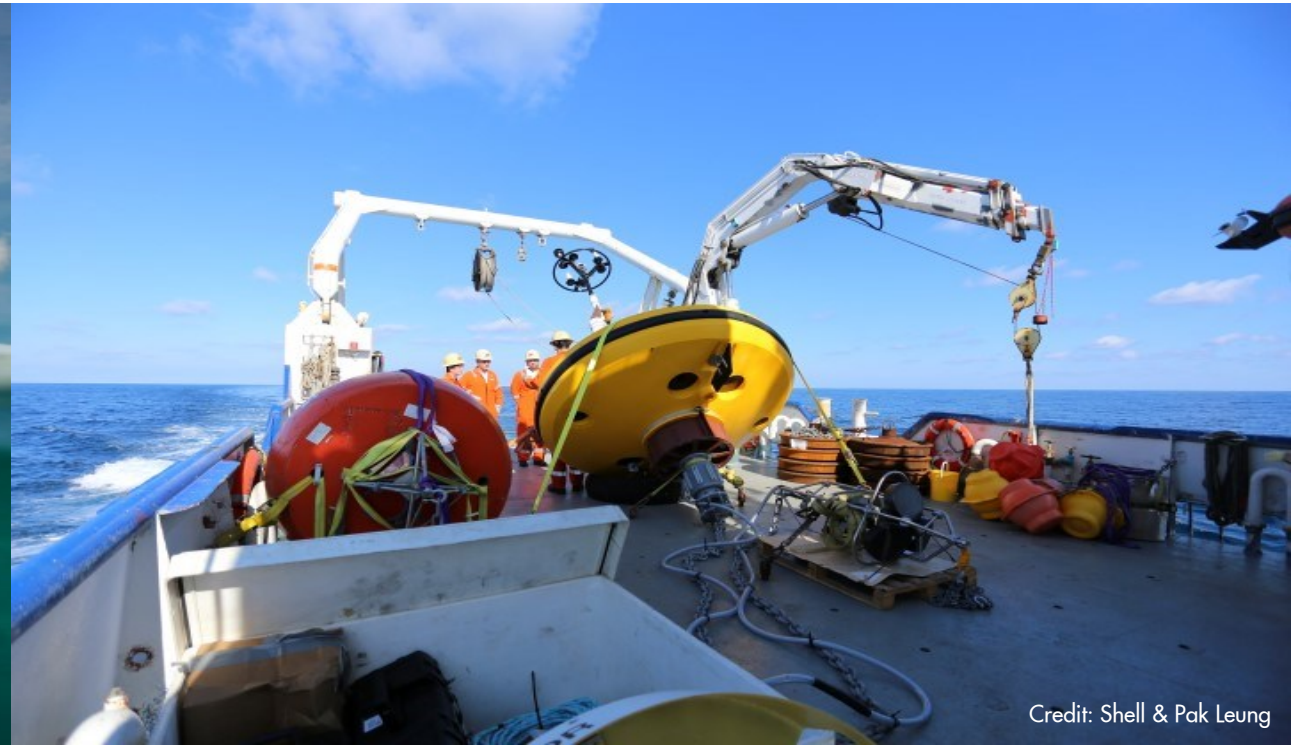

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Reserves: Our use of the term "reserves" in this presentation means SEC proved oil and gas reserves.

Resources: Our use of the term "resources" in this presentation includes quantities of oil and gas not yet classified as SEC proved oil and gas reserves. Resources are consistent with the Society of Petroleum Engineers (SPE) 2P + 2C definitions.

Discovered and prospective resources: Our use of the term "discovered and prospective resources" are consistent with SPE 2P + 2C + 2U definitions.

Organic: Our use of the term Organic includes SEC proved oil and gas reserves excluding changes resulting from acquisitions, divestments and year-average pricing impact.

Shales: Our use of the term 'shales' refers to tight, shale and coal bed methane oil and gas acreage.

Underlying operating cost is defined as operating cost less identified items. A reconciliation can be found in the quarterly results announcement.

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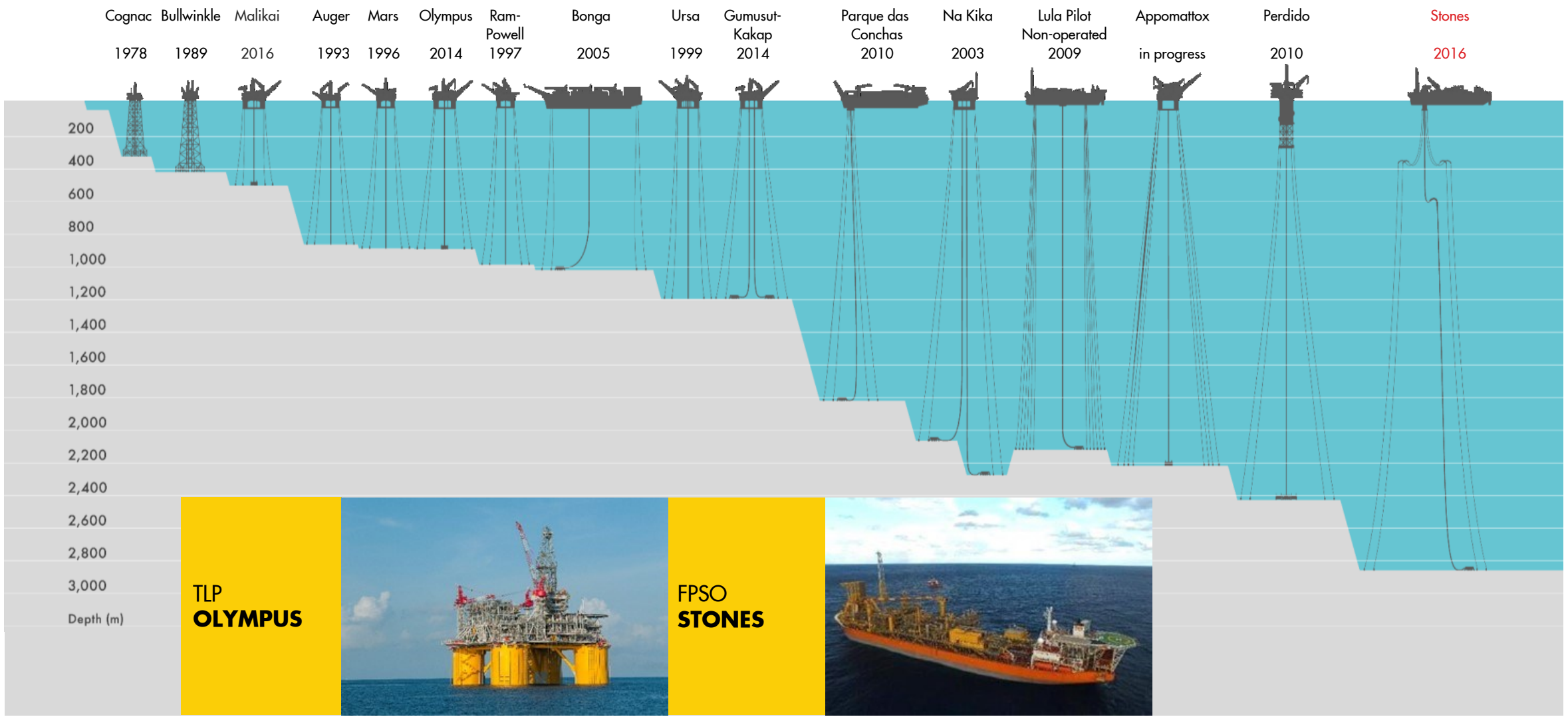
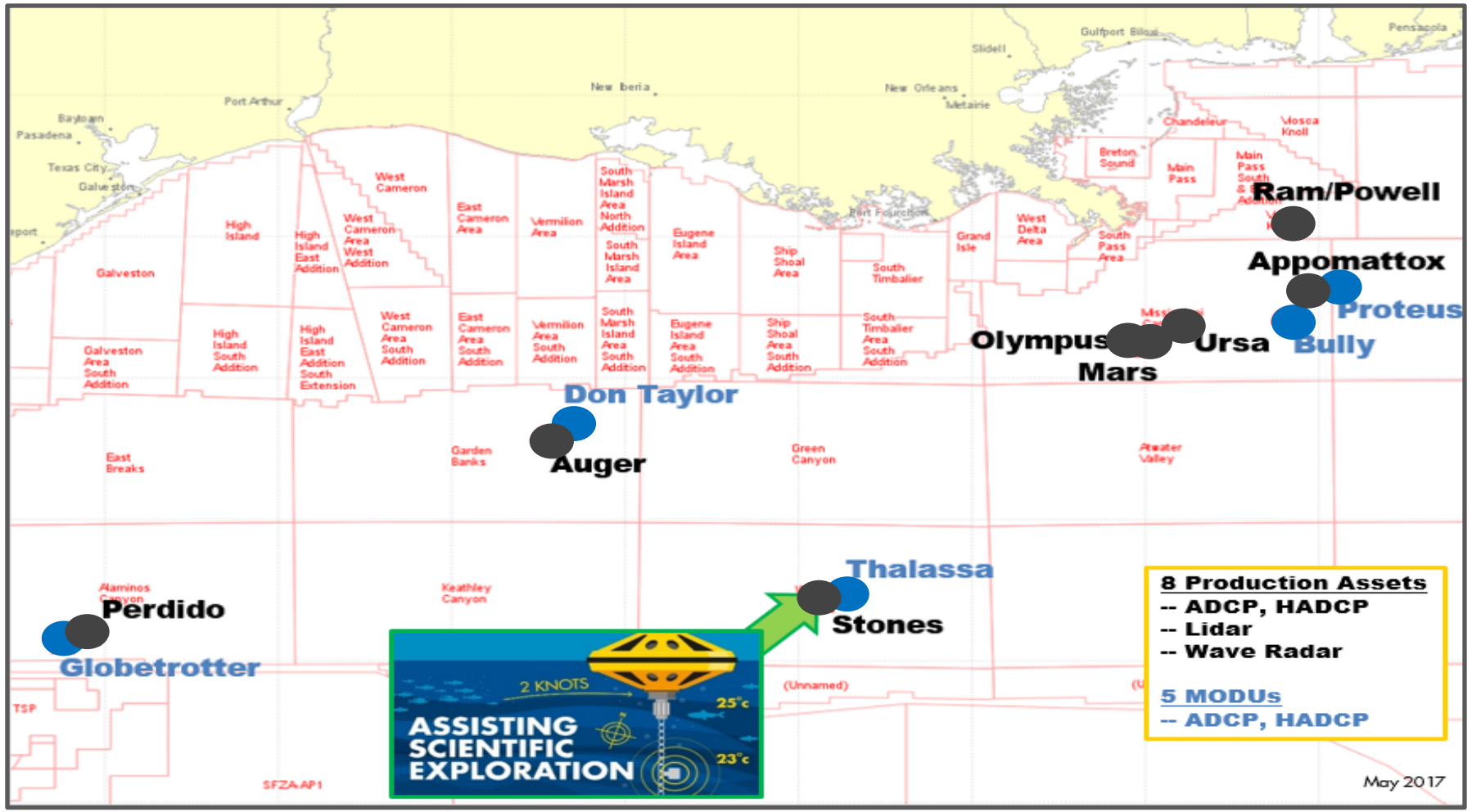
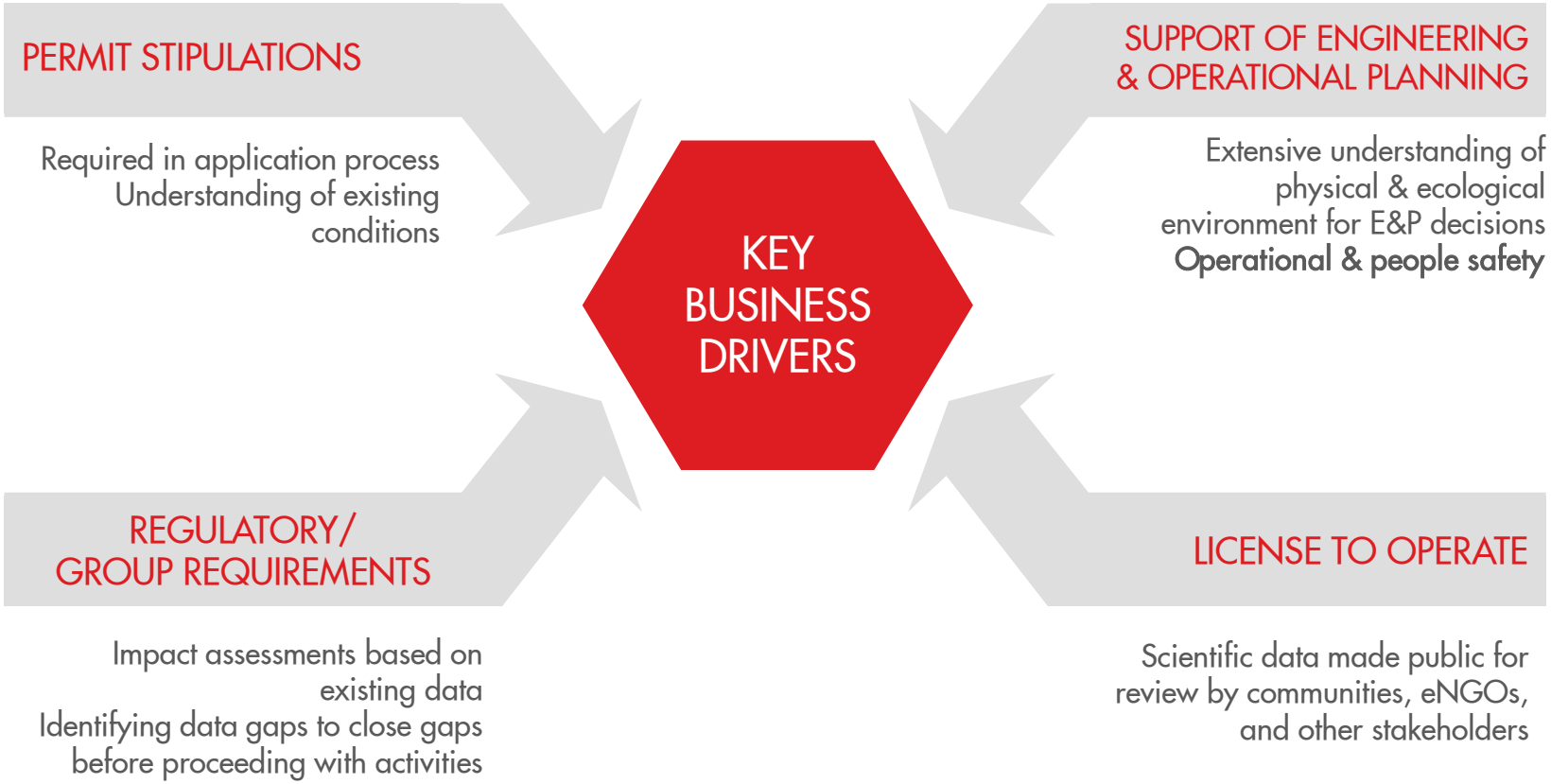
Shell's Deepwater Evolution



Shell's Gulf of Mexico Regional Footprint



Shell Drivers for Implementing Environmental Monitoring



Never complacent, always improving
Can achieve business needs & add value through public-private collaborations

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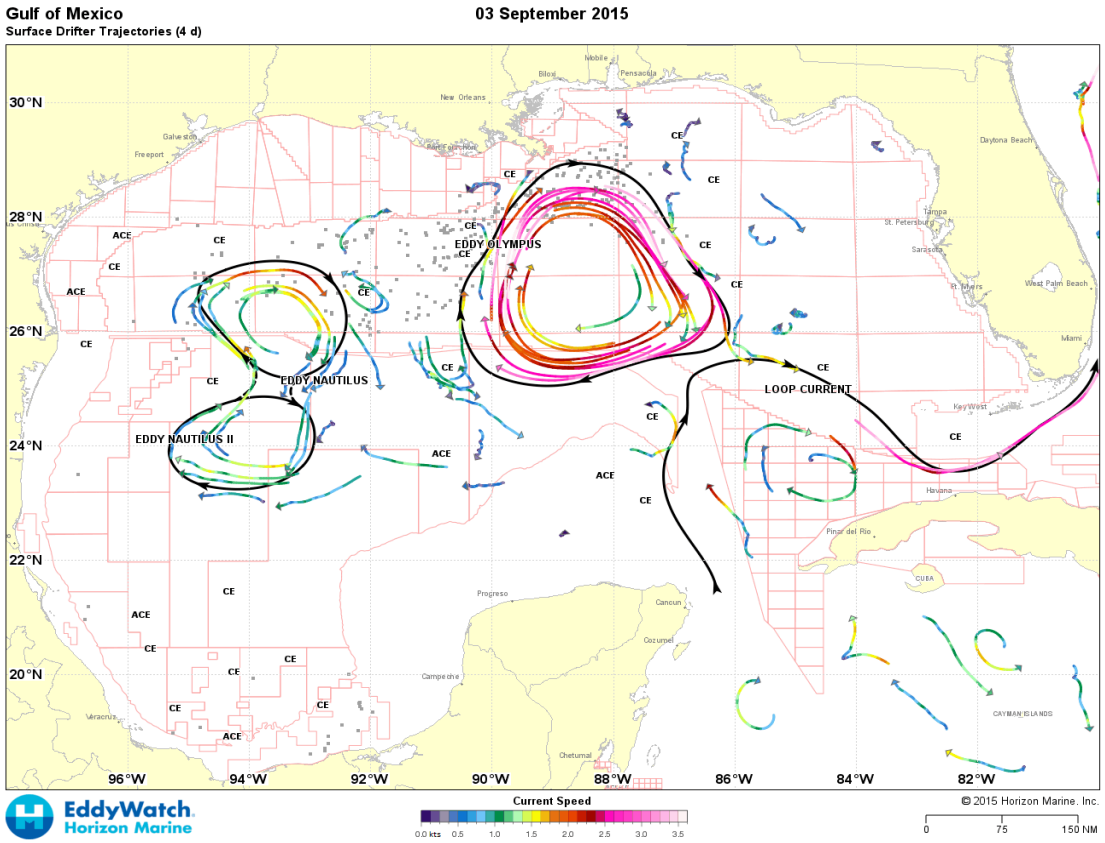
CO-EXISTING WITH THE ENVIRONMENT

UNDERSTANDING & RESPECTING

Credit: NOAA Flower Garden Banks NMS

And the Gulf is a Dynamic Environment

2015



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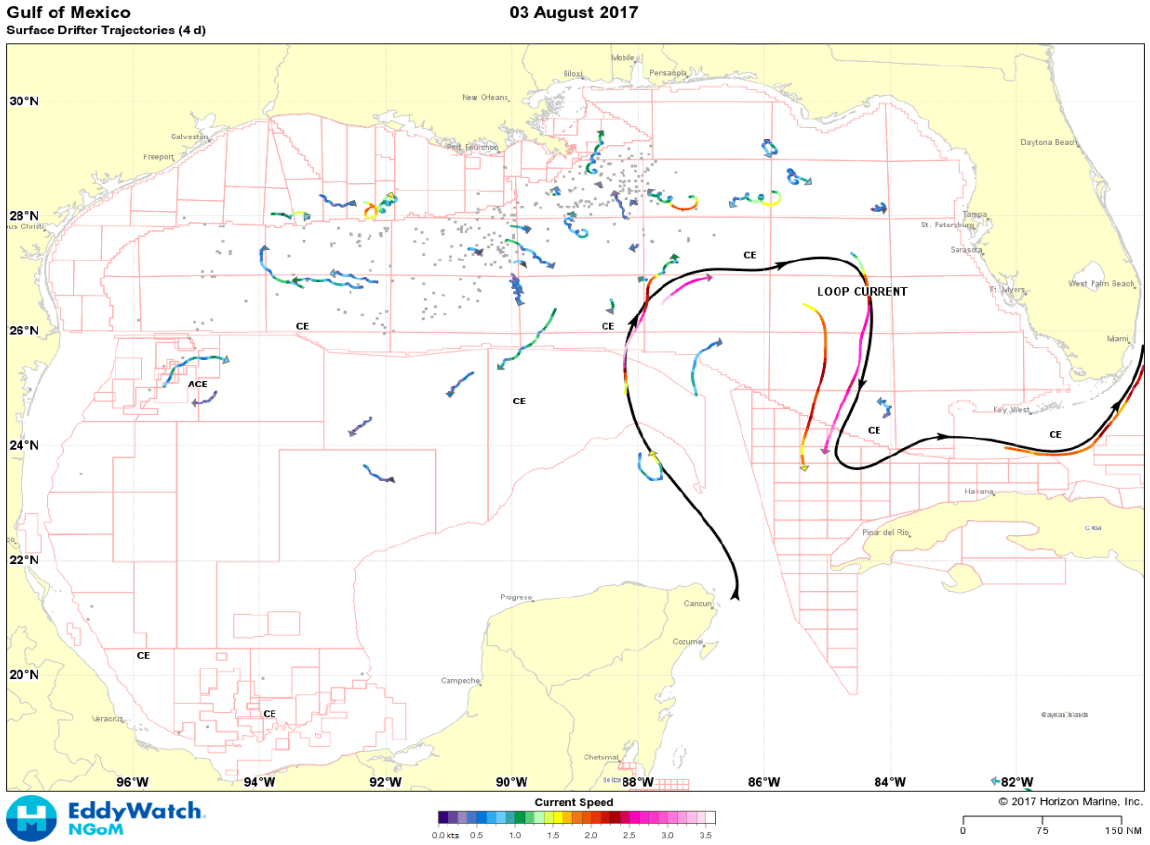
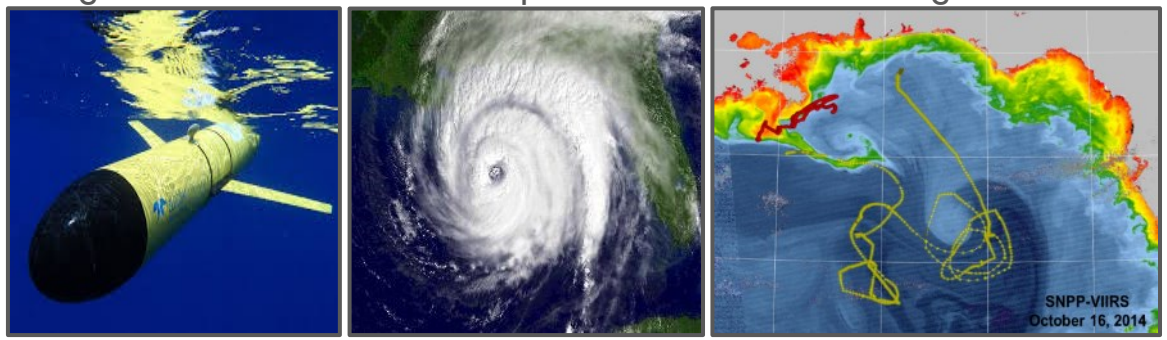


Figures courtesy of Horizon Marine, Inc.

How Shell is Collaborating to Monitor the Gulf of Mexico

Advancing ocean technology & capability

Using autonomous vehicles to improve hurricane forecasting



Providing offshore data to GOM communities

Working with NOAA to share real-time ocean data

Exploring & monitoring the deep GOM

Using industry ROVs to study deep sea biodiversity

Supporting the next generation

Sponsoring educational outreach, research, & competitions

Source: NOAA, Teledyne Webb Research, Louisiana State University, University of Southern Mississippi, Consortium for Ocean Leadership

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Offshore collaborators are Gulf-wide and cross all sectors

STATE

GOVERNMENT

BOEM Bureau of Ocean Energy Management

BSEE Bureau of Safety and Environmental Enforcement

GCOOS Gulf of Mexico Coastal Ocean Observing System

NOAA

ACADEMIC

The University of Southern Mississippi

Texas A&M University Corpus Christi | HARTE Research Institute for Gulf of Mexico Studies

PUBLIC & PRIVATE

Horizon Marine

Gulf of Mexico Alliance

The Nature Conservancy
Protecting nature. Preserving life.

Monitoring the Flower Garden Banks

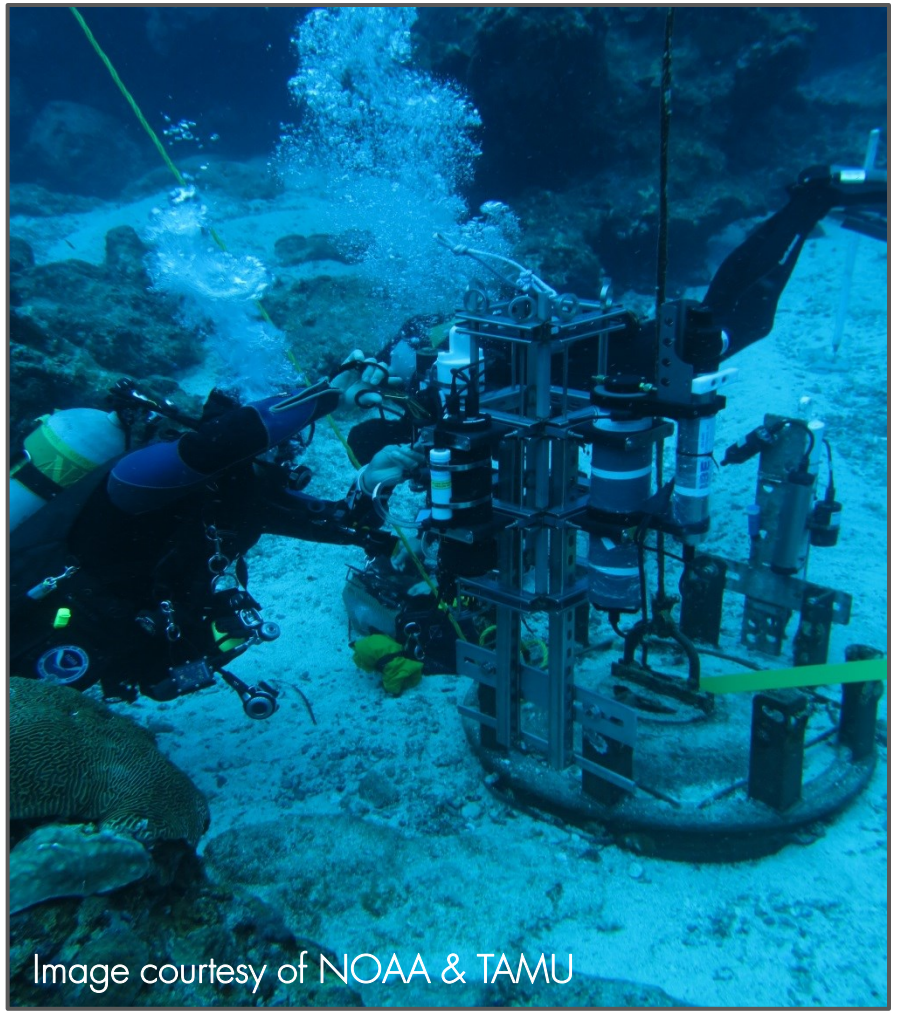
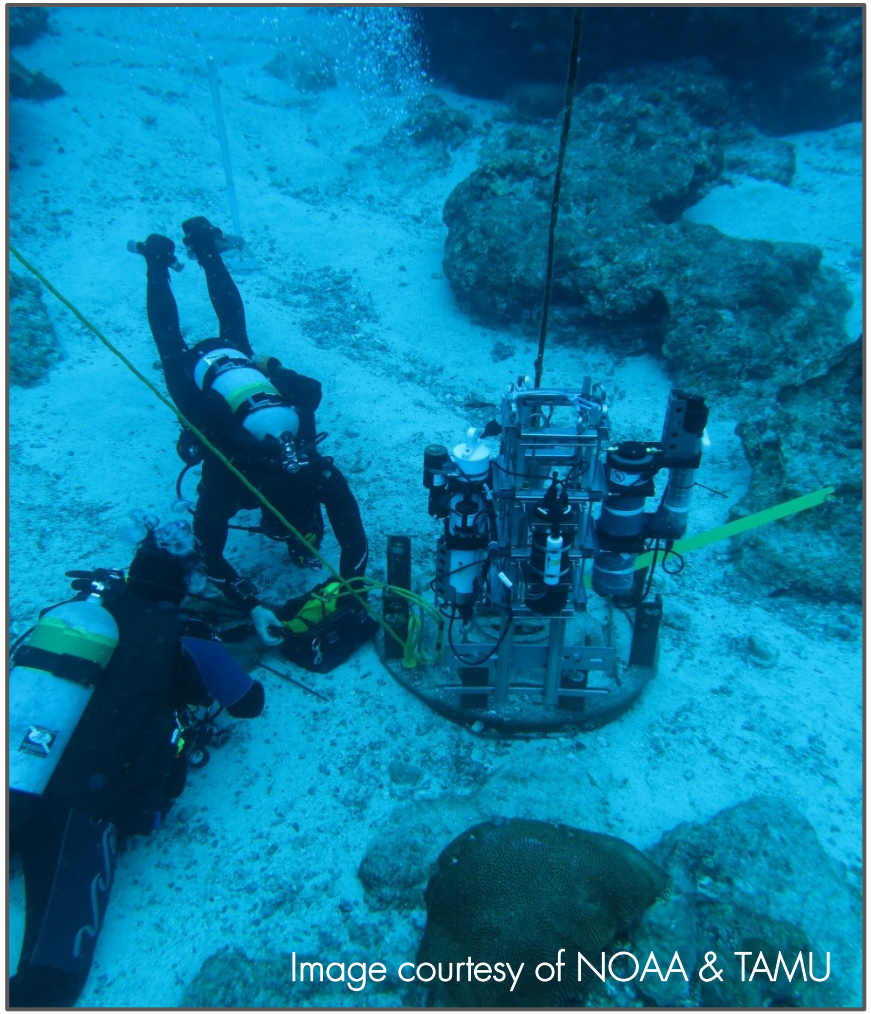


Image courtesy of NOAA & TAMU



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The Newest Collaboration – Stones Metocean Observing Station

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Stones Metocean Observing Station

- Monitoring ocean currents is important to safe operations & is required by the U.S. government (BSEE NTL 2009-G02)
  - Continuous real-time monitoring from 30 – 1000m
- Shell's first standalone and deepest mooring
- Designed to collect data for lifetime of Stones FPSO
- Current data collected includes:
  - Wind
  - Waves
  - Ocean currents (down to 1000m)
- The data supports operations & is sent to NOAA (http://www.ndbc.noaa.gov/station_page.php?station=42395)

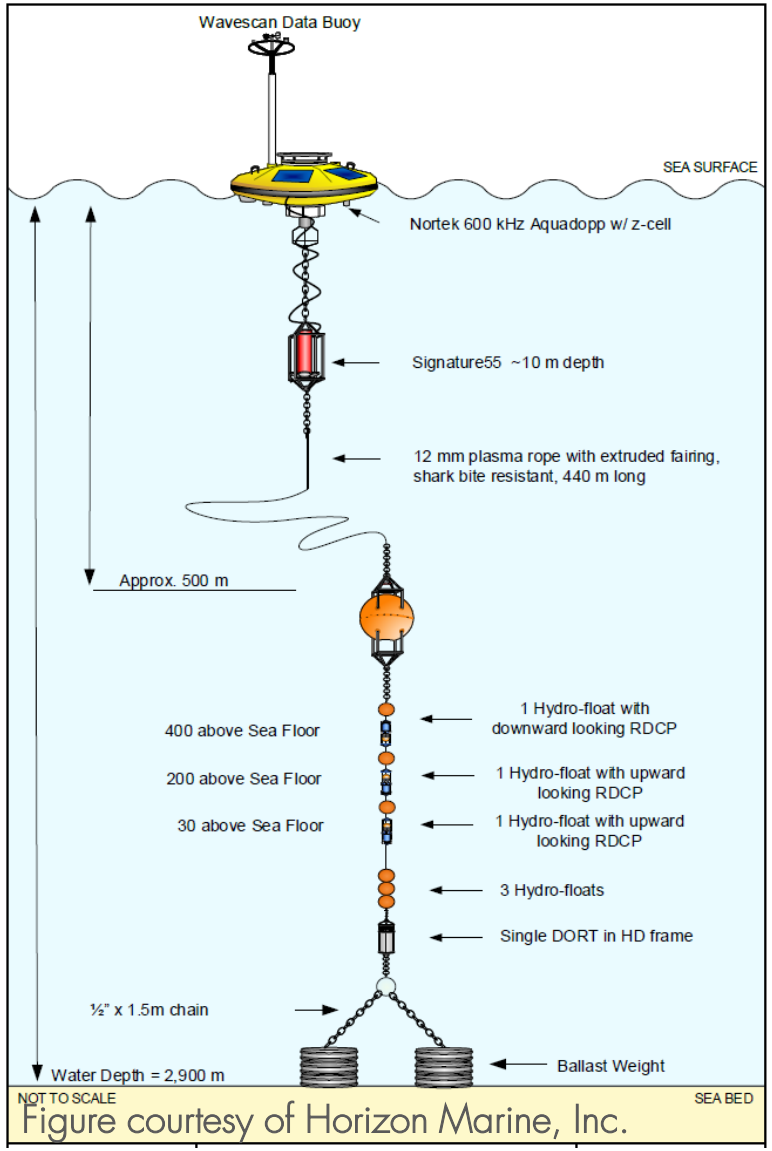

Figure courtesy of Horizon Marine, Inc.

Building the Collaboration for the Stones Metocean Mooring

- Start by expanding existing ocean observations collaborations
  - Shell is currently working with University of Southern Mississippi, NOAA, Horizon Marine Inc. and NAVO to deploy and operate gliders to monitor the Loop Current
  - Opportunity to include Texas A&M University and to involve other future collaborators
- Academic institutions provide additional sensors, research capacity, and the next generation of scientists and metocean engineers
  - Added current meters and thermistors to measure full water column
  - Student opportunity to learn marine operations and take deep sea water samples during service visit
- Shell and Fugro provide access to the mooring and location twice a year
- All collaborators are working together to transform Stones metocean mooring into a **deep Gulf of Mexico sentinel observatory**

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Benefits of Collaborating

- Connect people, science, technology, and resources to improve accessibility to broader Gulf of Mexico
- Effective mechanism to sustain long-term observations & establish sentinel sites
- Shift to integration and synthesis across disciplines
- Broaden data collection and dissemination
- Shape future policy and decision-making of ocean uses and resources

Credit: NOAA

The Future of Monitoring Collaborations

- **Transformative**
  - Fill gaps, establish baselines, synthesize data, sustain observations
  - Expand coastal and shelf monitoring into the blue and deep waters of the Gulf of Mexico
  - Shift from a localized approach to a regional Gulf-wide approach
  - Integrate and synthesize existing observing and data platforms and uptake these into decision-making
- **Innovative**
  - Incorporate new technology in observing (shift to autonomy)
  - New approaches to traditional observing campaigns and common phenomena (e.g. Loop Current)
  - Link disciplines and data to shift into new dimension (4-D) of monitoring

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