BULLETIN

Corpus Christi Geological Society

and

Coastal Bend Geophysical Society

April
2023
ISSN 0739 5620

Table of Contents

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P.O. BOX 1068* C.C.TX. 78403
2022-2023
www.ccgeo.org

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P.O. BOX 2741*C.C. TX. 78403
2022-2023

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Visit the geological web site at www.ccgeo.org

CCGS/CBGS JOINT MEETING SCHEDULE 2022-2023

September 2022

S	M	T	W	Th	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
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October 2022

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30	31					

November 2022

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27	28	29	30			

2022-23 Membership Kickoff—Nueces Brewing Co. Downtown
Thursday, Sept. 8, 2022
5:00p.m.-til 8:00p.m.

Oct 19 meeting at Crawdaddy's Downtown. 11:00 Bar, 11:45 lunch, 12:00 speaker
Presenter: Richard S. Bishop. "Orgins and Habitats of Super-Giant Fields."

Nov. 16 meeting at Joe's Crab Shack Downtown. 11:00 Bar, 11:45 lunch, 12:00 Speaker
Presenter: Mohamed Ahmed-Texas A&M Univ. Corpus Christi. "Vulnerability of Coastal Systems to Natural and Anthropogenic Interventions.

December 2022

S	M	T	W	Th	F	S
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January 2023

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29	30	31				

February 2023

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26	27	28				

Jan. 18 meeting at Joe's Crab Shack
Presenters: Bill Maxwell & Steve Emerson
"A Follow-up, The Great Texas Freezeout."

Feb. 15 meeting at Joe's Crab Shack
Presenters: Steve Pattee Senior Vice Pres. At Lonquist & Co. LLC & LLC Lonquist Sequestration, LLC. Emily Olson Senior Geologist at Lonquist & Co. LLC.
"CO2 Storage"

CCGS/CBGS Joint Meeting Schedule 2022-2023

March 2023						
S	M	T	W	Th	F	S
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April 2023						
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May 2023						
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21	22	23	24	25	26	27
28	29	30	31			

April 19 meeting at Joe's Crab Shack
Presenter: John Rotzien,
"Deep Water Sedimentation."
Presentation of Scholarships

May 17 meeting at Joe's Crab Shack
Presenter: Amer A Shehata,
"Integration of multiscale datasets for reservoir characterization: Implementation for improving prediction processes and development strategies

Calendar Of Meetings and Events

Corpus Christi Geological/Geophysical Society..... Third Wed.—11:30a.m.
SIPES Corpus Christi Luncheons..... Last Tues.—11:30a.m.
South Texas Geological Society Luncheons..... Second Wed—noon San Antonio
San Antonio Geophysical Society Meetings..... Fourth Tuesday
Austin Geological Society..... First Monday
Houston Geological Society Luncheons..... Last Wednesday
Central Texas Section of Society of Mining, Metalllurgy & Exp..... 2nd Tues every other month in San Antonio

SPONSORS

President's Letter

Spring is around the corner!

As I write this, our big event of the year has recently passed for us, in a business sense. NAPE had below-normal attendance on Thursday due to the ice storm in central Texas, but almost everyone I've talked to said that it was successful either by selling or making contacts for follow-up negotiations. Most people I knew there were happy.

We look forward to a spring of possibilities. Things look up for our industry, and I hope that things really turn around this year. First up: A very timely topic for us here in south Texas – is the April Technical Luncheon! Jon Rotzien will present a talk entitled "Are Mixed Deepwater Systems Part of The Next Oil and Gas Revolution?" Very topical for our society and its members. Also, note that our student scholarship event will be held during our April lunch. Be sure to come and support the next generation of geoscientists!

Please remember that our society's headquarters and storage facility for the society has been moved. It is now in the Wilson building downtown. If you need to get something from there, please contact Sebastian Wiedmann.

Daylight Savings time has arrived! Enjoy the spring weather, and please put April's lunch on your schedule. See you there!

Robert Schneider--President

CBGS President's Letter

CBGS Board 2022-2023

President- Dr. Subbarao Yelisetti
Vice President- Dr. Mohammed Ahmed
Secretary/ Treasurer-Charles Benson

CBGS Scholarships

The Coastal Bend Geophysical Society (CBGS) has donated $10,000 to the Department of Physics and Geosciences, Texas A&M University-Kingsville in support of the multidisciplinary Petrophysics Graduate Program that has been requested. These funds will be used as scholarships in attracting quality graduate students.

The board awarded three scholarships of $2,000 each to undergraduate geophysics majors from Texas A&M University-College Station, University of Houston and Texas A&M University-Kingsville. We will be awarding the scholarships again this year.

Scholarship Requirements

Criteria for awarding the Scholarship from Coastal Bend Geophysical Society of Corpus Christi, Texas:

1. Scholarships are open to undergraduate or graduate students.
2. Must have declared major in Geophysics, or Geology with a concentration in Geophysics or Petrophysics.
3. Preference is given to students attending Coastal Bend schools (TAMU-K, TAMU-CC and Del Mar College), then to Coastal Bend natives attending other universities.
4. Must have a GPA of at least 3.0 and be in good standing with the school.
5. Must make effort to attend a Coastal Bend Geophysical Society Meeting in Corpus Christi Texas after being awarded a scholarship to be recognized by the society.

News

- According to Baker Hughes Co, the oil and gas rig count is 749 in the week of March 3, 2023, which is the lowest since June 2022, and is 15% higher than the rig count at this time last year.
- According to the U.S. Energy Information Administration (EIA) forecasts, U.S. crude output is expected to increase from 11.9 million bpd in 2022 to 12.5 million bpd in 2023 and 12.7 million bpd in 2024.
- According to the U.S. EIA forecasts, U.S. gas output is expected to increase from 98.09 bcfd in 2022 to 100.27 bcfd in 2023 and 101.68 bcfd in 2024.
- As of March 9, the U.S. crude futures were trading at ~$81.59 a barrel, as reported by Scott DiSavino on reuters.com.

CBGS Business

CBGS currently has 43 active members, 4 honorary members, and 40 student members. Raised $1,450 towards student scholarships through membership revenue this past year.

CBGS workshops/talks

CBGS hosted two luncheon meetings in February and April, 2022 featuring international speakers, Dr. Rajesh Vayavur, Canada and Dr. Snons Cheong, South Korea, respectively.

CBGS also hosted the luncheon meeting in November, 2022 featuring speaker, Dr. Mohammed Ahmed. The title of this talk was "Vulnerability of coastal systems to natural and anthropogenic interventions".

CBGS will be hosting the luncheon meeting in May 2023 featuring speaker, Dr. Amer Shehata. The title of this talk is "Integration of multiscale datasets for reservoir characterization: Implementation for improving prediction processes and development strategies".

CBGS is looking forward to offer workshops/talks in the future. Topic/speaker suggestions are welcome. Email your suggestions to Subbarao.Yelisetti@tamuk.edu

New Degree Tracks at TAMUK and Graduate Scholarships

- Texas A&M University-Kingsville (TAMUK) started its first cohort of MS Petrophysics program in Fall 2018. If you are interested in joining this program in Spring 2023, please contact the graduate coordinator for MS in Petrophysics, Dr. Subbarao Yelisetti at Subbarao.Yelisetti@tamuk.edu.
- The Department of Physics and Geosciences at TAMUK is offering competitive scholarships for MS Petrophysics students. For additional details about the program and scholarships, please visit the website:

  https://www.tamuk.edu/artsci/departments/phge/phys/academics/gp.html
- **BS degree in Geophysics, Minor in Geophysics and Certification in Geophysics** offered at Texas A&M University-Kingsville since Fall 2017. Interested students can contact Dr. Subbarao Yelisetti (Subbarao.Yelisetti@tamuk.edu) for additional information.

Education/Events

-SEG

SEG 2023 annual meeting will be held in Houston, TX from August 27 – September 1. See https://seg.org/Events/Upcoming-SEG-Annual-Meetings for additional details.

See https://seg.org/Education/Lectures/Distinguished-Lectures for information about upcoming SEG distinguished lecture in Houston and other locations.

See https://seg.org/Education/Lectures/Honorary-Lectures for SEG honorary lecture locations in Texas.

-AGU

2023 Fall AGU annual meeting will be held in San Francisco, CA from December 11-15th, 2023. https://www.agu.org/Fall-Meeting

Monthly Saying

"During the desperate depression of the 1980s, there were no oil and gas companies without net operating losses."- George Kaiser

Monthly Summary

Texas Oil and Gas Info	Current Month	Last Month	Difference	
Texas Production	**MMBO/BCF**	**MMBO/BCF**	**MMBO/BCF**	
Oil	139.6	148.4	-8.8	November
Condensate	20.4	22.4	-2.0	November
Gas	903.1	959.1	-56	November
	Current Month	**Yr to date - 2023**	**Yr to date - 2022**	
Texas Drilling Permits	700	1656	11024	February
Oil wells	151	371	2447	February
Gas wells	44	104	1067	February
Oil and Gas wells	472	1103	6987	February
Other	3	10	98	February
Total Completions	1188	3069	17917	February
Oil Completions	939	2358	14384	February
Gas Completions	249	711	3533	February
New Field Discoveries	0	0	21	February
Other	420	1099	8124	February

Subbarao Yelisetti
President, CBGS

Sponsors

EARLY REGISTRATION ENDS MARCH 17

GEOGULF23

HOUSTON

Be There! **APRIL 23-25, 2023**

NORRIS CONFERENCE CENTER

AAPG Gulf Coast Section Conference Houston, Texas Register NOW

https://Pheedloop.com/Geogulf23/site/home/

Info at www.geogulf2023.org

Welcome to an Immersive Gulf Coast Geoscience Conference!
Theme: "United We Explore the Gulf Coast and Beyond"
Charles A. Sternbach, General Chair

- 100 Technical Talks on the Gulf of Mexico
- Three Concurrent Sessions, two full days
- 50 Professional/Student Posters, Exhibits
- Three short courses, four field trips
- Exhibitions, Book Signings, Icebreaker
- Receptions, Networking, Social Events
- HGS Host Society 100th Anniversary
- Sponsorship Opportunities

Don't Miss the
All-Convention Luncheon
Monday, April 24 at the Norris Center

Harrison "Jack" Schmitt, Apollo 17 moonwalker, passes the rock hammer to Jessica Watkins, NASA Space Station Astronaut, in person.

Education Opportunities with Globally Renowned Experts

Short Courses!

Salt Tectonics of the Gulf of Mexico
Instructor: Mark Rowan, Two Day Class
Saturday and Sunday, April 22-23, 2023

Gulf of Mexico Sedimentary Basin: Depositional Evolution and Petroleum Applications
Instructor: Dr. John W Snedden
All Day Saturday, April 22, 2023

Structural, Tectonic, Paleogeographic Evolution of the GOM, Caribbean, and North S. America
Instructor: Dr. Jim Pindell, Tectonic Analysis, Rice U.
All day Sunday, April 23, 2023

Convention Registration is Required to Sign Up for Short Courses- Signup on the Pheedloop site.

Field Trips! Signup at www.geogulf23.org

NASA Space Center Houston with Apollo 17 Moonwalker Harrison "Jack" Schmitt and James F Reilly, Jr NASA retired astronaut
All Day: Saturday, April 22, 2023

Historic Spindletop Museum in Beaumont, TX: Guided Tour of Museum and Geology
All Day: Wednesday, April 26, 2023
Field Trip Leader: Rosemary Laidacker

Texas Coastal Processes Brazos River Delta to Galveston Island
All Day Wednesday, April 26, 2023
Field Trip Leader: Erik Scott, Rice

Texas Hill Country: Greatest Hits of TX Early Paleozoic Rocks and Structure
Three Days: Thursday, April 27 to Sunday, April 30.
Field Trip Leaders: Andy Roark and Sean Romito

Technical Program (in-person)

Monday Morning, April 24

Opening Keynote:
Conventional GOM Giant Oil and Gas Fields, Lessons to Find More
Charles Sternbach and Dick Bishop

Advantaged Basins: Economic and Future Driven
Session Chair: Robert Fryklund, S&P Global
- Fryklund, Bob, S&P Global: Advantaged Basins: Robust Oil and Gas Fields and CCUS Management
- Panel Presentations with Industry Experts in Oil and Gas and CCUS

GOM Tectonics I: Regional Setting of the Gulf of Mexico and Guyana South America
Session Chairs: James Pindell et al
- Horn, Brian: Exploration Perspective of the GoM
- Ott, Bryan: Guyana Basin --Erlich, Robert: Timing of Igneous Activity During Triassic-Jurassic Rifting
- Afifi, Ahmed: Mesozoic Rafting, Sureste Basin, GoM

Geoscience Advances in CCUS, Energy Storage, Wind Energy
Session chair: Allen Bertagne
- Rogers, Harold: Salt Cavern Storage GOM –
- Bertagne, Allen: Subsurface CO2 Storage N. GOM
- Holmes, Gordon: Time Lapse Seismic for CCS Reservoir Monitoring
- Bain, Graham: CO2 Storage Potential in Louisiana
- Hill, Andy W: Offshore Wind: Geosciences Role

Jurassic Smackover Reservoirs, Norphlet Sands
Session Chair: Ted Godo
- The Smackover- Norphlet Petroleum System: Comparisons of US Gulf Coast and Deepwater with Mexico's Sureste Basin
- Walkinshaw, Steven: Low-Resistivity Oil, Gas and Carbon Dioxide In The MAFLA Region GOM
- Erlich, Robert: Norphlet Formation and the Louann Salt in Southwest Texas: Regional Implications for the GoM

GOM Tectonics 2: Dynamic Rift and Salt Deposition Models GOM and Mexico
Session Chairs: James Pindell et al
- Pindell, James; Heyn, Teuni: Reconstructing Syn-Rift, Sag, and Salt Paleogeography, and the Role of Syn-Rift Dynamic Elevation and Dissipation, Gulf of Mexico—
- How Deep Was the Pre-Salt Depositional Depression in the Gulf of Mexico, and What Are the Implications
- Pindell, James: Late Cretaceous–Cenozoic Evolution of the North America–Caribbean Plate Boundary

Geoscientists Will Be Exploring the Moon and Mars in the Next Decade
Session Chairs: Bill Ambrose et al
- Ambrose, Bill: Water-Ice Resources on the Moon
- Reilly, Jr, James F.; The Martian Field Geologist
- Cook, Doug; The Search for Life on Mars
- Wyatt, Doug, NASA, Exploring for Lunar Volatiles

Networking Social Event "United We Celebrate!"

Moran Hotel, Mon. 6:00-8:00 PM
Fireside Bar, outside patio, Texas stars!
Co-Hosted with SIPES Houston Chapter. Meet Successful Entrepreneurs, Independents, Young Professionals

An Immersive Conference Taking Gulf Coast Geoscience to Greater Heights

Monday Afternoon April 24

Eagle Ford: Texas' Biggest Shale Asset- Mature and Moving Forward
Session Chair: Marianne Rauch
- DeMis, Bill: How the Austin Chalk Play of Grimes County, Texas Initiated the Eagle Ford Shale Play
- Donovan, Art: Unraveling "Eaglebine" Secrets
- Donohue, Catherine: Eagle Ford: Additional Oil Opportunity in East Texas
- Savvaidis, Alexandros: Seismicity Site Characterization for Geo-Energy Related Projects

Late Cretaceous-Paleogene Hinterland Tectonics and Clastic Deposition Trends
Session Chairs: James Pindell, et al
- Heyn, Teunis :Dynamic Topographic Events o GoM
- Cossey, Stephen: The Paleogene Water-level Drawdown Hypothesis, Gulf Of Mexico
- Gray, Gary; Geodynamics Mexican Orogen And Foreland Basin System Nuevo Leon Mexico

The Continuing Austin Chalk Resurgence
Session Chair: Tom Bowman
- Von Bassenheim, Daniela: Webb County "Chalkstars": Activity Trends
- Bowman, Tom-The Austin Chalk Resurgence
- Mire, Kurt-Austin Chalk Economics: Understanding Decline Curves
- Griffith, Christine: Regional Sequence Stratigraphy, Biostratigraphy Austin Chalk In South, Central Texas

The Haynesville Shale: LNG, Natural Gas Boomtime
Session Chair: Bill DeMis
- Williams, Matt; Tellurian Inc,: Haynesville Shale Assets
- Kimiagar, Sean: The Haynesville: An Activity Update
- Hammes, Ursula: Comparison of Texas Shale Plays – Eagle Ford/Tuscaloosa, Haynesville/Bossier
- DeMis, Bill: The Coming Commodity Super Cycle

Exploring the Mexico Sureste Basin and Beyond
Session Chairs: James Pindell et al.
- Heyn, Teunis: Tectonic Significance of the Middle Miocene Unconformity- Campeche Salt Gulf of Mexico
- Snedden, John: Zama Field, Mexico Deepwater: Upper Miocene Slope to Basin Paleo-Transport
- Lawton, Timothy: Sandstone Petrography and U-Pb Zircon Provenance, Sureste Basin, Mexico
- Steffenson, Carl: Recent Drilling History and Play Types, Campeche Area, Southern Gulf of Mexico
- Shann, Mark: A Deliberate Search for Disruptive Oil & Gas Discoveries, Clues Along the Way

72nd Annual GCAGS Celebrating Past, Present, and Future Explorers!

Onshore Gulf Coast Exploration Analogs, Lessons
Session Chairs: Steve Getz and Bob Wiener
- Getz, Steven: Petroleum Plays Associated with Shelf Margin Submarine Slides-Niger Delta Analog
- Wiener, Bob: Petroleum Salt-Related Shelf Margin Slides: Upper Texas and S. Louisiana
- Hardy, Rogers: The Quest from the Marsh Out onto the Shelf and Beyond: Offshore Exploration Journey
- Rava, Barry: Subtle-Fault Prospects, Onshore Gulf Coast
- Hughes, Simon: Real Time XRF Chemostratigraphy

Tuesday Morning April 25

Petroleum Systems I: Discovery Thinking
Session Chairs: Andrew Pepper
- Andy Pepper, Fresh Ideas for Exploration, Development, and Production
- Pindell, James: Rotation Poles And Spreading Isochrons For Gulf Of Mexico Opening
- Bugti, Nawaz Md: Gulf of Mexico Oxfordian Source Rock UEP Basin Center Oceanic Crust Age
- Laigle, Jean-Marie: Interactive Prospect Volume Assessment in the Gulf Coast

Texas Rocks and Reservoirs
Session Chair: Kelly Hattori
- Schneider, Robert: Channel Delineation in Lower Wilcox, SE Texas: Integrated Seismic and Well Logs
- Hattori, Kelly: Reservoir Quality And Production Trends In The Carbonate Pettet Formation, Rusk County, E. T
- Loucks, Robert: U. Cretaceous Del Rio-Buda, S. Texas
- Flaig, Peter: Outcrops of the Upper Simsboro to Lower Calvert Bluff Formations, Wilcox Group
- Cox, Katrina: Petrophysical Low Resistivity Sands

Petroleum Systems 2: Discovery Thinking
Session Chair: Andrew Pepper
- Pascoe, Rob: Middle And Lower Miocene Middle Slope Systems Of The Outer West Louisiana Shelf: An Unexplored Play Between Historical Paradigms
- Shann, Mark: Key Differences in Petroleum Systems Across the Greater GOM, Potential for Two New Unexplored Oil Provinces
- Hasan, Md Nahidul: Estimates of Thermal Stress and Expelled Petroleum from Mesozoic-Cenozoic Potential Source Rocks, Southern Gulf of Mexico
- Cendano, Andres: Petroleum Systems Of The Carbonate Platform Areas Of The Southern GOM: South Florida, The Greater Peten Basin Of Guatemala-Belize, And The Yucatán And Chiapas Areas Of Mexico

Deepwater Business Panel: Re-Shaping Energy Strategies, the Next 50 Years
Session Chair: Mark Leonard
- Sears, Richard: The Economics of Deepwater: Myths and Realities Through the Decades;
- Chisholm, Tim: Deepwater Independent's View-
- Yeilding, Cindy: 100 More Years of Deepwater

Deepwater Symposium 1: Understanding Deepwater Sediments and Patterns
Session Chairs, Jon Rotzein, et al
- Downard, Ali: Quantitative Evaluation of Deepwater Fan Hierarchy: Insights from Full Physics-Based Forward Stratigraphic Models
- Fedele, Juan: Gravity Flow Bedforms and Associated Sedimentary Structures
- Gan, Yuqian: Shelf to Slope to Basin Floor Clinoform Outcrop Exposed at La Jardinera, Jurassic Neuquén Basin, Argentina
- Hester, Lara: Quantitative Models to Predict Fluid Properties (GOR) Mud Gas Compositional Data

Jurassic, Cretaceous Rocks and Reservoirs in TX, AL
Session Chairs: Bob Loucks and Robert Reed
- Reed, Robert: Textures, Mineralogy, and Reservoir Properties of an Altered Mafic Tuff Core Upper Cretaceous of Central Texas
- Loucks, Robert: Volcanic Origin of Grains in the Upper Cretaceous Austin Chalk
- Cherepon, Alan: Recent Rock Discoveries at Pilot Knob, Austin,
- Maende, Albert: Identification Of Producible And Bypassed Pay Oil Zones In The Smackover Fm

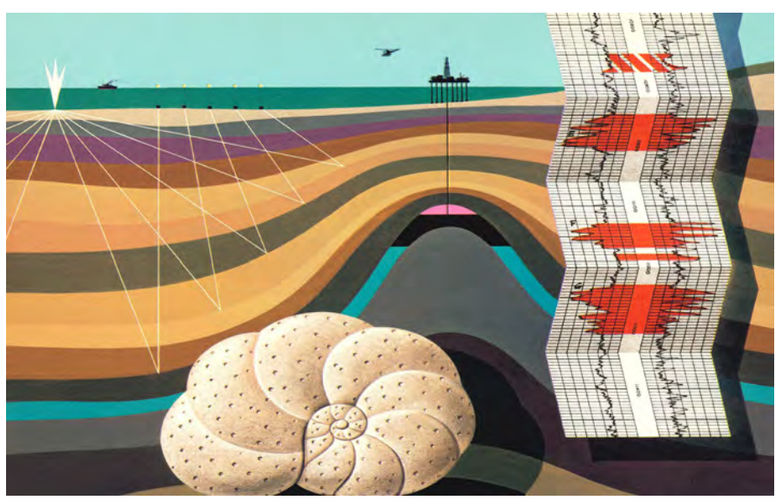
Tuesday Afternoon April 25

Innovation in GOM Salt Tectonics
Session Chairs: David Lankford-Bravo et al
- Rowan, Mark: The Triggers And Evolution of Mesozoic Salt-Related Deformation In The GoM
- Bloxton, Julie: Geochemical Data Calibrating XRF in the Louann Salt Variations in the Puma Diapir
- Cornelius, Sharon: Comparison of the Salt in Offshore Brazil, with the GoM Louann Salt

Entrepreneurship: Transitions and Strategies
Session Chair: Bill Fairhurst
- Light, Walter: From Inception to Self-Sustaining E&P Company in Forty-Two Years **(HGS Presidential Address)**
- Rava, Barry: The Business Cycle And Prospecting
- Fairhurst, Bill: Entrepreneurship: Transitions & Strategies
- Pommer, Laura: Disrupting The Oil And Gas Investment Paradigm
- Burdick, Don: Private Equity Firm to a Direct Private Equity: The Olifant Energy II Story

Deepwater Symposium 2: Geo-Seismic Technology and Scientific Breakthroughs
Session Chairs, Jon Rotzein, et al
- Kirkland, Benjamin: Geochemists need Supervision: Expanding the Use of Supervised Machine Learning
- Sweet, Michael: How Fast Can a Submarine Canyon Form? Evolution of Mississippi Canyon
- Woodruff, Diane: Gulf of Mexico's Horn Mountain Field: Exploration Success Below a Mature Field
- Mullin, Peter: An Emerging Cretaceous Play in the Eastern Gulf of Mexico Shelf
- Joshi, Nikhil: Gulf Coast CO2 Storage - a Techno-Commercial Perspective
- Verna, Sumit: Seismic Attributes for Deep Water Depositional Systems

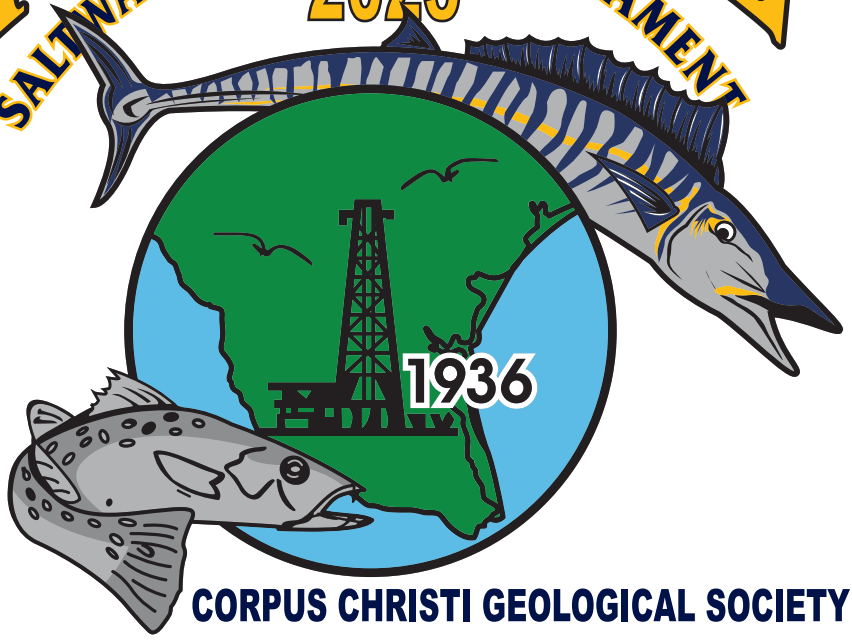
Technology Tuesday Networking Luncheons
- Jeff Nealon, Chevron Geophysical Manager "Refocusing On The Gulf: How New Seismic Methods Drive New Investments."
- Daniel Minisini, Minigeology YouTube Videographer, "Wise Words from Celebrated Geologists. Should We Listen to Them?" Hosted by GCSSEPM



13th ANNUAL

SALTWATER FISHING TOURNAMENT

2023



CORPUS CHRISTI GEOLOGICAL SOCIETY

Thursday, July 27th

Treasure Island

@ 5:00 PM

Registration : 5:00 - 7:00 PM

Captains Meeting : 7:15 PM

Dinner, Drinks, Door Prizes !!

Friday, July 28th

Roberts Point Pavillion

Bay Weigh-in : 2:00 - 5:00 PM

Offshore Weigh-in : 4:00 - 7:00 PM

Trophy Presentation !!

Come and Join Us !!

PORT ARANSAS, TX

ldevine@suemaur.com @cc15_geo @ ccgeologicalsociety

Lets talk about insurance based financial planning

Tools

S&P 500 Indexed Universal Life –
Long Term Care - Medicare Supplement –
Life Insurance - Disability income – Annuities –
Cancer, Heart Attack & Stroke -
Small Business Solutions: Business valuation,
Health, Vision & Dental

Jason Downing

361-742-9252

Insurance Representative/Former O&G Professional

https://tanconnects.com/jasondowning

CORPUS CHRISTI GEOLOGICAL SOCIETY
COASTAL BEND GEOPHYSICAL SOCIETY

LUNCHEON MEETING ANNOUNCEMENT

April 19, 2023

Location:	**Joe's Crab Shack, 444 N. Shoreline Blvd. (downtown)**
Student Sponsor:	**Viper Exploration, Panex Operating LLC, Imagine Resources. Thank you!**
Time:	**11:30 AM Bar, Lunch follows at 11:45 AM, Speaker at 12:00 PM**
Cost:	**$35.00 (additional $10.00 surcharge without reservation: NO SHOW may be billed.)**
Reservations:	**Please RSVP by 11:00 AM on Monday, April 17th before the meeting!**
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CCGS /CBGS LUNCHEON PRESENTATION – Wednesday, April 19, 2023

Are Mixed Deepwater Systems Part of The Next Oil and Gas Revolution?

J. R. Rotzien
President of Basin Dynamics and Adjunct Professor at the University of Houston

Niger Delta. West of Shetland. Campos and Santos basins. Gulf of Mexico. All testing grounds for our understanding of deepwater sedimentary systems. High risk. High pressure. High temperature. High rates. Decades of high production. Low maintenance. Low environmental and carbon footprint. The discoveries in these offshore regions around the 1980s prompted explorers to think: "Where else in the world can large oil fields with high-quality turbidite reservoirs be found?" In this way, *deepwater* became a target to pursue on a global scale (Fremin *et al*., 2022; Sears *et al*., 2022).

Recent, large discoveries in frontier settings have bolstered a positive trajectory for the deepwater creaming curve (Fig. 1 – Minken *et al*., 2022). The industry is in a deepwater renaissance, with the curve not showing signs of flattening. Not only have these discoveries increased the deepwater resource base, but they have also called into question the turbidite paradigm that persisted in exploration workflows since the final third of the 20th century.

Before the large discoveries in mixed deepwater systems in the early 21st century, the search for conventional turbidite reservoirs promoted a singular focus on deepwater sediment transport and depositional models dominated by downslope processes. Turbidites, debrites and transitional flow deposits were interpreted to be responsible for diverse submarine fan depositional systems comprised of elegantly interconnected canyon, channel, levee, splay and overbank environments. Today, along-slope as well as downslope (i.e., turbidity current) processes are interpreted to sculpt the modern seafloor (Fig. 2 – Rotzien *et al*., 2022; Hernández-Molina *et al*., 2022). Ancient stratigraphic successions in revered outcrops such as the Annot Sandstone (Grès d'Annot) in France also reveal evidence of along-slope sediment transport and deposition. In response, wildcatters and academic researchers alike have refreshed interpretations and depositional models to communicate new observations on mixed deepwater sedimentary systems to scientific and industry communities as crude oil prices remain attractive in the near term.

This presentation focuses on deepwater sedimentary processes and deposits, their predictive attributes and their 3D heterogeneity. While much of the global knowledge on deepwater has been generated through decades of oil and gas drilling, a firm understanding of deepwater sedimentary processes is essential for many offshore endeavors that take place in the water column, at the seabed, and into the subsurface, as well as onshore projects that involve deepwater sedimentary intervals. Professionals and students in the fields of oil and gas exploration and production, carbon capture, use

and sequestration, geothermal, wind, solar, aquaculture, mining, military, insurance and government are invited to attend this discussion on the past, present and future of *deepwater*.

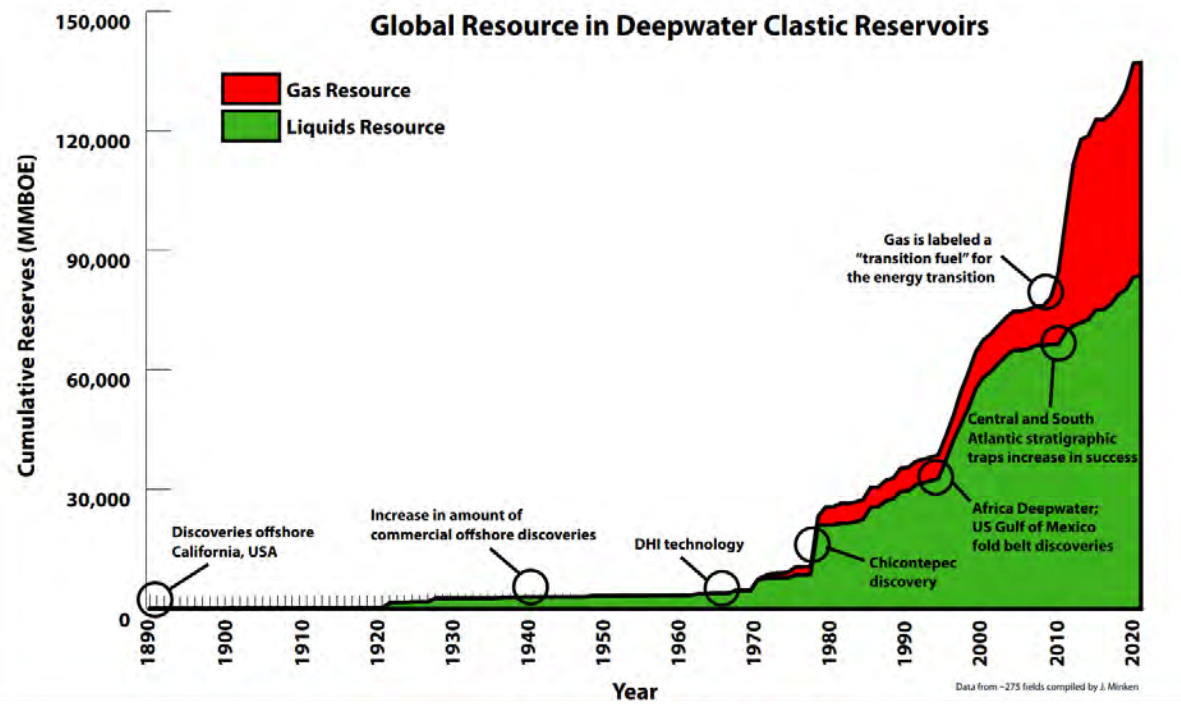

Figure 1. Global resource curve for deepwater siliciclastic reservoirs. Modified from Minken *et al.* (2022).

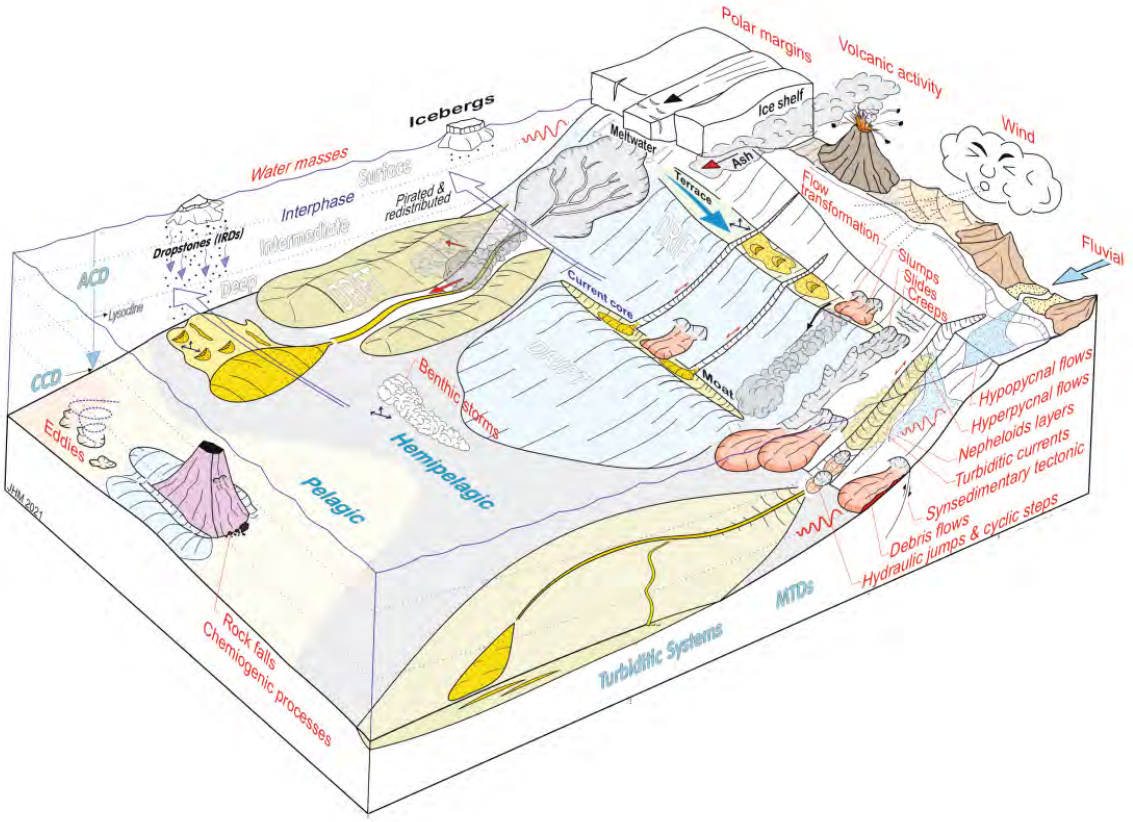

Figure 2. Marine and deep marine processes and deposits drawn by F. J. Hernández-Molina in Rotzien *et al.* (2022).

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Sears, R. A., M. Leonard, T. Chisholm, B. Langin, and C. A. Yeilding, 2022, The Business of Deepwater: Past, Present, and Future: Strategic Panel for the International Meeting of Applied Geoscience and Energy (IMAGE '22), Houston, Texas, 30 Aug.

Biography

Jon Rotzien is a contemporary scientist and business owner and has led deep-water stratigraphy and reservoir characterization consulting and technical competency training on most oil-producing continents. Rotzien previously served BP, Devon, Shell and Hess in a variety of roles primarily in offshore, deep-water oil and gas exploration, appraisal and research.

Rotzien received a BA degree in Geology, cum laude, from Colorado College in Colorado Springs. As a National Science Foundation Graduate Research Fellow, he studied sedimentary geology in the Stanford Project on Deep-Water Depositional Systems (SPODDS) research group at Stanford University in Stanford, California, where he earned a PhD in Geological and Environmental Sciences in 2013.

As a business owner and scientist, Rotzien has participated in oil and gas exploratory to development drilling, mapping expeditions, technical competency training and consulting on most oil-producing continents and served as lead geologist in about one-third of those ventures. He specializes in mapping sedimentary environments and the practical applications to sedimentary basin analysis, working with diverse industry teams on many aspects of source-to-sink sediment transport and deposition. His publications have ranged from studies of volcanism and rifting in the southwestern United States to petroleum reservoir quality risk in the Gulf of Mexico to integrated provenance and depositional architecture analyses of deep-water stratigraphic successions in the Americas, Europe and Asia-Pacific. Some of his most recent publications include the broad topics of (i) leadership in the energy industry and (ii) the logistical calculations of how to conduct field-based education during the COVID-19 pandemic. In 2020-2022, he served as lead editor for the development and delivery of the modern treatise *Deepwater Sedimentary Systems*.

Rotzien has taught classroom, webinar, field geology and business seminars at universities and institutions including University of Toronto, South Dakota School of Mines and Technology, University of Houston, Royal Holloway University of London, University of Texas Permian Basin, University of Texas at Austin, Baylor University, University of Miami, University of Malaya, China University of Petroleum (East China), Mexican Institute of Petroleum, University of Louisiana and Texas A&M University. He has served annually as Assistant Professor, Adjunct Professor, Guest Lecturer, Instructor and Consultant at several universities and institutions since 2014.

Rotzien's honors and awards include the Distinguished Service Award (2018) from the Gulf Coast Section of SEPM, as well as numerous research grants including the Siemon "Si" W. Muller Memorial Fellowship, Chevron Grant, AAPG Foundation John E. Kilkenny Memorial Grant, A. I. Levorsen Research Grant and Estwing Award. He has served on several evaluation, advisory, investment, editorial and technical conference boards for institutions including the

Houston Explorers Club, Stanford University, Colorado College, Bulletin of Canadian Petroleum Geology, Gulf Coast Association of Geological Societies and the American Association of Petroleum Geologists. He is an Eagle Scout and former age group national champion in sprint distance triathlon and former course record holder, having competed in multiple national championships. He competed for the Varsity and Club cross country, swimming, triathlon and cycling teams while at Colorado College and Stanford University. Recently, he has taken up sport again and finished 20th in the 2021 Xterra off-road triathlon World Championships amateur division (5th in 35-39 age group; 40th including the professional division).

Rotzien currently resides in Conroe, Texas and is a native of Indiana.

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LUNCHEON MEETING ANNOUNCEMENT

May 17th, 2023

Location:	**Joe's Crab Shack, 444 North Shoreline Dr., Corpus Christi, TX 78401**
Student Sponsor:	**Viper Exploration, Nye Exploration, Imagine Resources. Thank you!**
Time:	**11:30 AM Bar, Lunch follows at 11:45 AM, Speaker at 12:00 PM**
Cost:	**$35.00 (additional $10.00 surcharge without reservation: NO SHOW may be billed.)**
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Luncheon Presentation – Wednesday, May 17, 2023

Integration of multiscale datasets for reservoir characterization: Implementation for improving prediction processes and development strategies

Amer A. Shehata, Ph.D.

- Assistant Professor, Faculty of Science, Port Said University, Egypt
- Fulbright Scholar and Research Associate, Center for Water Supply Studies, Department of physical and Environmental sciences, Texas A&M University-Corpus Christi

Abstract

Integration of multiscale geological and geophysical datasets coupled with the applications of machine learning techniques provides a precise picture about reservoir characterization which has a crucial impact on the development plans and exploration strategies. Examples of these datasets include outcrops, seismic, core, and well logs. The use of the machine learning is effective in the prediction processes of the reservoir properties and structural elements in areas poor seismic resolution. In this talk, I'm summarizing the integration results for two main basins in Egypt, the Beni Suef basin, and Gulf of Suez basin (GOS). Over these areas, interpretations of seismic data included defining the different seismic facies, seismic reflection terminations, depositional interpretation, sequence stratigraphy, structural elements, and mapping of different elements and closure-types/entrapments styles. Facies analysis depends on both field and core data to extract composition, depositional processes, environment(s), and evolution in addition to the pore/porosity types and diagenetic history of the different rock units. On the other hand, sequence/seismic stratigraphic components and framework were used to define the systems tracts, spatial distribution, and hydrocarbon potentialities (e.g., the lowstand and highstand systems tracts are considered good reservoirs and the transgressive systems tracts have the potential to be a good source rock). Petrophysical interpretation/evaluation for the Cretaceous reservoirs in both basins were divided into qualitative (e.g., HC bearing zones) and quantitative (e.g., reservoir properties, rock typing). Reservoir rock typing (RTT) subdivided the rocks with the same composition, environmental conditions and petrophysical behavior (porosity-permeability relationships, pore size distributions, and reservoir quality). RTTs are constructed using the core datasets by using

different methodologies such as porosity-permeability plot, RQI-FZI plot and discrete rock type technique (DRT). Lithofacies and permeability prediction are obtained using the machine learning techniques. Future research will focus on the use of more machine learning techniques for the prediction of lithofacies and permeability.

Biography

Amer A. Shehata is an assistant professor at Port Said University, Egypt and currently is a Fulbright scholar and research associate at the Center for Water Supply Studies, Department of Physical and Environmental Sciences, College of Science, Texas A&M University-Corpus Christi, USA. He applies integrated (**seismic, sedimentology, sequence stratigraphy, petrophysics, machine learning**) approaches to investigate the subsurface geology, sequence stratigraphy, structural framework and reservoir properties, architecture, quality and characterization and their prediction.

He received his B.Sc. (2009) from Suez Canal University, Egypt, and M.Sc. (2014) degree from Port Said University, Egypt in Geology and then was awarded a Ph.D. from Chiba University, Japan – Port Said University, Egypt (2019). He worked as an assistant professor at Cairo University (2019–Now). In 2022, he was awarded a 9 months Fulbright scholarship at Texas A&M University-Corpus Christi and will finish by July 2023. Dr. Shehata teaches courses subsurface geology, petroleum geology, basin analysis, hydrocarbon exploration, sequence/seismic sequence stratigraphy and sedimentary geology for undergrads and postgrads.

THE GREAT TEXAS FREEZE OF 2021

Steven D. Emerson
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Corpus Christi, TX
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Corpus Christi, TX

The original paper was published in the proceedings of the ***24th Annual MKOPSC International Process Safety Symposium***, October 20, 2021.

MKOPSC stands for *Mary Kay O'Connor Process Safety Center*. It is within the Chemical Engineering Department at Texas A&M University, College Station, TX.

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Co-Author E-mail: RWMaxwell@suemaur.com

Abstract

Early in the morning of Monday, February 15, 2021, lights went out for millions of Texans. Without electricity, furnaces ceased while temperatures plunged to new lows and winds made the cold even more threatening. People were to die of hypothermia. Industry suffered at the same time. Refineries and chemical plants across the state were immediately forced into hazardous emergency shutdowns. Insured losses are predicted to exceed $18 billion. Historically, Texas has relied on ERCOT (Electrical Reliability Council of Texas) to power almost the entire state, with market-driven incentives for thermal power stations fuelled with coal, natural gas and nuclear fission, and for subsidized windmills and solar photovoltaics. ERCOT has minimal ties to out-of-state grids, evidently to stay outside federal FERC regulation. Generally, the isolated electrical grid worked well, with base loads coming from the nuclear, coal and natural gas combined cycle plants, along with prioritized input from highly-variable wind and solar operations. Lastly, natural gas-fired peaking plants flexibly made-up shortfalls. It worked well, that is until it didn't. During the great freeze, one by one, electricity generators dropped off leading to grid frequency destabilization, and for a brief period the grid came dangerously close to 100% failure across Texas. This paper will examine the structures of the Texas electrical supply, both managerial oversight and physical plant. It will offer insight into the complicated causes of the catastrophic failure, and it will provide guidance on future risk to the Texas chemical and fuels industries due to unexpected power loss.

Keywords: Case histories, reliability, risk from power loss, emergency shutdown, ERCOT, electrical grid.

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INTRODUCTION

The Great Texas Freeze of 2021, dubbed Polar Vortex Uri, was the winter storm of the century. The US national weather service described it as an unprecedented, historical, eight-day period of winter weather extending from February 10th through the 18th. At that time, temperatures over much of the central U.S. were approximately 30°F below average (Figure 1). Not since 1899 had the entire state of Texas been below freezing for multiple days. Above all else it was the duration, intensity and statewide extent that made this most-extraordinary storm such a paralyzing event.

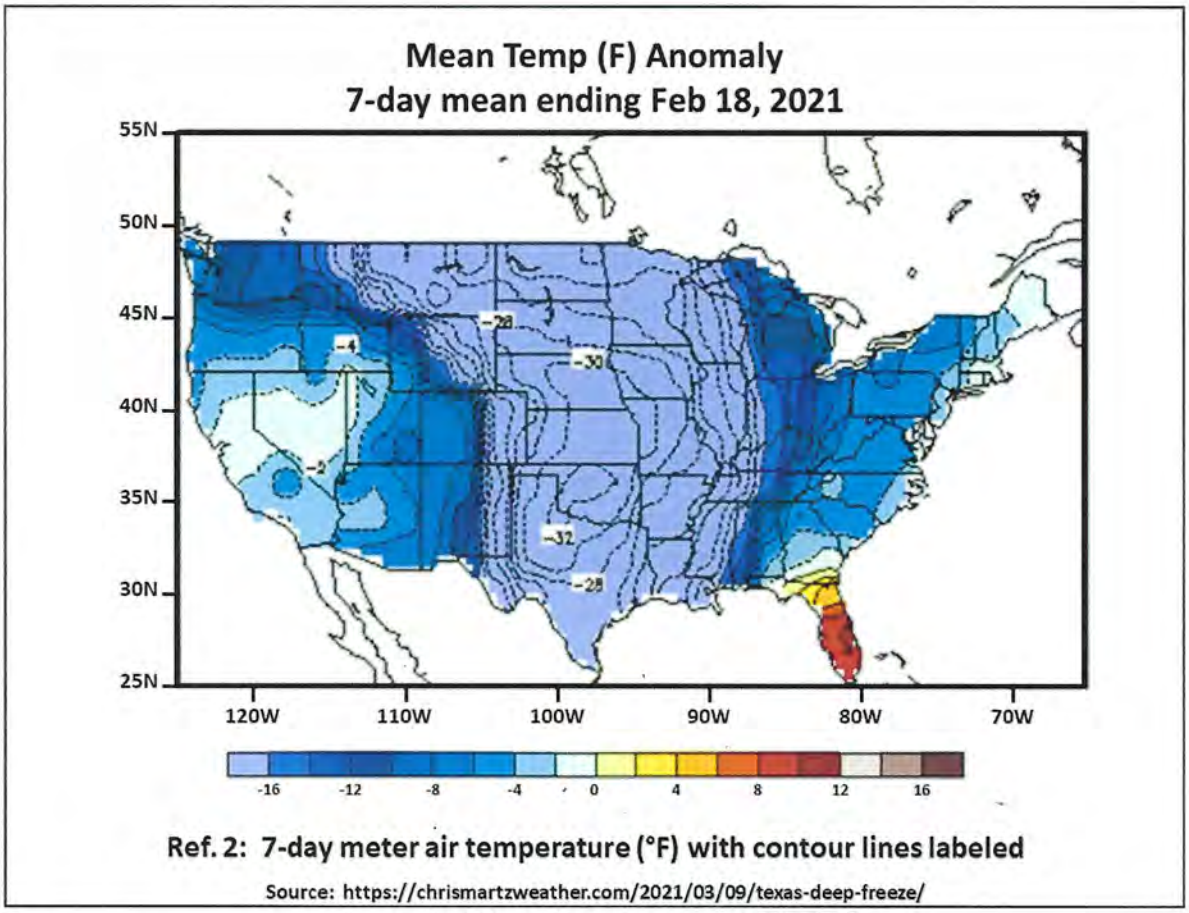

Figure 1: Mean Temperatures in the U.S.

Virtually all petrochemical and refining operations in the state were shut down for over a month[1,2]. Approximately 90% of the nation's polypropylene capacity went offline, along with 67% of ethylene capacity, and myriad other chemicals vital to worldwide business. Afterward, across Texas supply disruptions took several additional months to recover, as water lines had frozen and split open, cooling towers had frozen solid, and process equipment was extensively damaged. Logistics networks were severely disrupted and global market prices for certain petrochemicals skyrocketed. Estimates of financial losses in Texas alone range from 80 to130 billion.

The more tragic consequence of the storm was the human toll. As electric power was peremptorily shutdown across the state, an estimated 210 people lost their lives[3] due primarily to hypothermia, carbon monoxide poisoning, or icy roads.

Circumstances and policies that contributed to the erratic electric power outages were many, including administrative, regulatory, operational, and political.

INITIAL LOSS OF RENEWABLE ELECTRICAL POWER

As arctic air began enveloping the U.S. heartland, the first "dominoes" to fall in the cascade of energy losses were *renewables*. Wind and solar generation began dropping precipitously in the "epicenter" of the major West Texas wind farms on February 8th, two full days before the first traces of freezing precipitation on February 10th (Figure 2 is exemplar data for West Texas).

NATIONAL WEATHER SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

West Central Texas Climate Data

Abilene, TX

Date	High	Low	Avg	Dprtr	Rain	Snow	Dir	Max Speed
2021-02-01	63°	28°	45.5°	0°	0.0	0.0	SSE	12 mph
2021-02-02	71°	42°	56.5°	11°	0.0	0.0	S	24 mph
2021-02-03	80°	52°	66.5°	21°	0.0	0.0	SSW	25 mph
2021-02-04	65°	40°	52.5°	7°	0.0	0.0	NNW	33 mph
2021-02-05	63°	32°	47.5°	1°	0.0	0.0	SSE	21 mph
2021-02-06	63°	40°	51.5°	5°	0.0	0.0	NNW	26 mph
2021-02-07	73°	37°	55.5°	8°	0.0	0.0	SSW	26 mph
2021-02-08	59°	33°	46.0°	-1°	0.0	0.0	S	21 mph
2021-02-09	33°	26°	29.5°	-17°	0.0	0.0	N	14 mph
2021-02-10	30°	24°	27.0°	-21°	T	0.0	N	16 mph
2021-02-11	28°	21°	24.5°	-23°	T	0.0	N	22 mph
2021-02-12	24°	20°	22.0°	-26°	T	0.0	N	18 mph
2021-02-13	23°	16°	19.5°	-28°	T	0.0	N	17 mph
2021-02-14	22°	5°	13.5°	-34°	0.24	14.8	N	26 mph
2021-02-15	13°	-2°	5.5°	-42°	T	0.0	N	29 mph
2021-02-16	23°	-4°	9.5°	-39°	0.07	0.3	SE	24 mph
2021-02-17	21°	17°	19.0°	-30°	0.0	0.0	N	15 mph
2021-02-18	25°	12°	18.5°	-30°	T	0.0	N	21 mph
2021-02-19	40°	5°	22.5°	-26°	0.0	0.0	SSW	16 mph
2021-02-20	64°	35°	49.5°	0°	0.0	0.0	S	28 mph

First trace precipitation

Source: https://chrismartzweather.com/2021/03/09/texas-deep-freeze/

Figure 2: Abilene Texas Climate Data

Instead of icing, the variable and declining wind velocities and lack of sunshine were responsible for the initial loss of renewables. During the first week of February, wind and solar generation averaged 13.7 GWh/day, but dropped to 4.6 GWh/day during rolling blackouts, a 66% decrease. See Figure 3 below.

A number of commentators have pointed to lack of de-icing systems for wind turbines in Texas as a cause of the decrease. However current systems have not functioned well in regions where

freezing precipitation is the norm, unlike Texas. A year before the storm, Nergica (a Canadian non-profit institute focused on renewable energy research) presented results from a global survey[4] on efficacy of ice protection systems for wind turbines. Overwhelmingly (73%), users of ice protecting systems reported dissatisfaction. A number of reasons were cited including long standstill losses in low winds, and failure to de-ice entire blades, causing unreliable, expensive, and lower year-round generation. Given these results, it is little wonder that Texas wind farm operators are not using IPS.

Wind turbines convert kinetic energy into mechanical power according to the approximate formula: $\mathbf{P = \frac{1}{2} \rho A V^3}$ where P = power, ρ = air density, A = area swept by wind blade πr^2, V = wind velocity. Note that delivered power varies to the 3rd power of wind velocity.

Typical West Texas wind turbines are rated at 600-700 KW, with larger machines reporting nameplate capacities of 2-3 MW. These machines require an electrical "bump" from the grid to begin turning at minimum speeds around 7 to 9 mph, however power is not generated until reaching "cut-in" speeds usually above 10 mph. Furling or maximum wind speeds for power generation are reported to be 50 to 55 mph.

Wind capacity is one thing, but actual power delivered is another. Efficiency factors during operation of wind turbines (*instantaneous power output/ maximum power capability*) are typically 32 to 35% due to mechanical inefficiencies, variable wind speeds, and other physical factors.

Further, as of late-2020, ERCOT had almost 24 GW of installed wind and solar capacity, however the grid's forecast peak winter capacity availability[5] (*actual power delivered on demand/ maximum power capability*) was just 4%. Thus, in winter 96% of renewable capacity will be assumed idle when called upon to actually deliver their share of electrical power for peak demand. Likewise, ERCOT's forecast peak summer wind and solar capacity availability is typically $\pm$9%.

DISPATCHABLE vs NON-DISPATCHABLE ELECTRICAL POWER

Grid-scale electricity is an *instantaneous* commodity. Presently it cannot be stored in utility-scale quantities, so supply must be continuously adjusted to meet demands. A crucial distinction when considering electrical power sources is the concept of "dispatchable" power[6], a term to describe power generation that can be switched on or off as needed. Thermal power sources that generate heat, boil water to steam, and turn turbine generators are considered dispatchable power sources. These thermal units include natural gas fired combined cycle systems, coal fired power plants, and nuclear power plants.

On the other hand, wind and solar systems are non-dispatchable, simply because they do not generate electricity when the wind is not blowing or when the sun is not shining. Weather conditions are outside the control of the electrical grid operator.

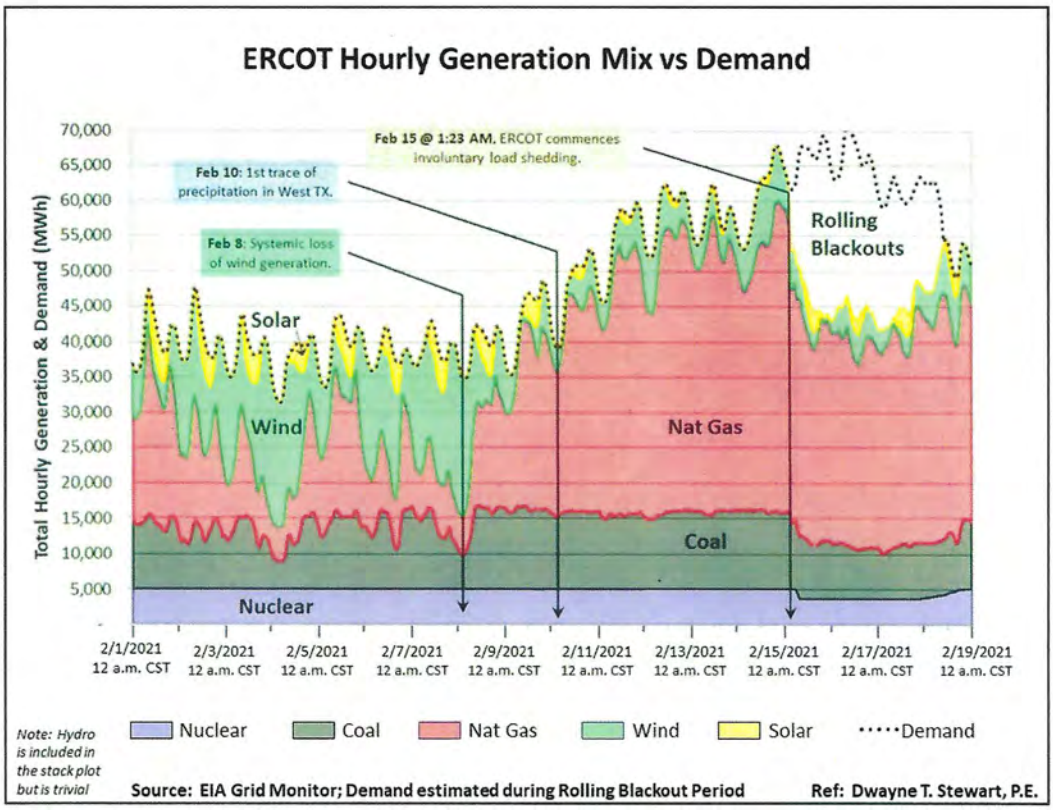

Figure 3: ERCOT Hourly Generation Mix vs Demand

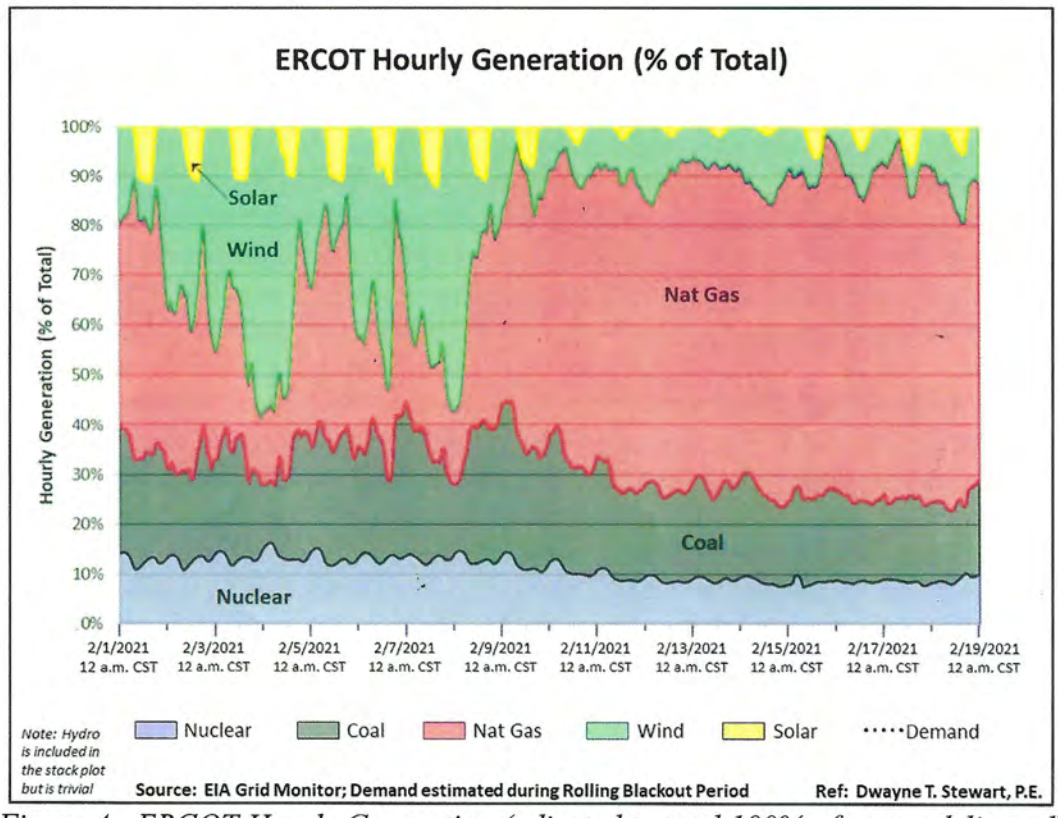

Figure 4: ERCOT Hourly Generation (adjusted to total 100% of power delivered)

THERMAL POWER SOURCES

Power plants fueled with natural gas or coal provided[7] an average of 20.5 GWh/day during the first week in February, and increased to an average 38.5 GWh/day immediately before the blackouts. As illustrated in Figures 3 and 4 above, dispatchable fossil fuel generation increased substantially in the period leading up to the forced load shedding (+88%), while non-dispatchable renewables declined (-66%).

At the start of forced blackouts, one of four nuclear power plants on the ERCOT grid (one of two 1.4 GW reactors at the South Texas Project) tripped offline. A single, faulty pressure signal on secondary cooling water from the nearby river was blamed. The unit safely resumed full operation three days later.

ELECTRICAL POWER GENERATION FROM NATURAL GAS

Currently natural gas is the largest single fuel source in the ERCOT service area, with sufficient delivery to power stations to potentially generate over 40 gigawatts. However, during the rolling blackouts of the Great Texas Freeze, natural gas deliveries were not able to keep up to capacity, with ERCOT reporting 38 out of 146 natural gas power plants offline after losing fuel supply.

According to the U.S. Energy Information Administration, under normal conditions Texas' average February daily gas production is 25.8 billion cubic feet per day (BCF/d). However, from February 8th to the 17th, average daily production declined by 10 BCF/d. While slightly less than 20% of the state's daily gas production is needed for residential consumption and gas-fired power plants, there was still more than adequate potential for these critical needs.

As ERCOT began massive involuntary load shedding early on February 15th, many pipeline compressors lost power and line pressures dropped, reducing natural gas deliveries to electric power generating stations. An after-incident report[8] concluded that nearly half the production losses from the huge Permian Shale Basin were caused by power loss to electrically-driven compressors at natural gas wellheads, gas processing plants, and pipelines. Ironically in 2015 under the Clean Air Act, EPA began requiring replacement of compressors driven by natural gas with electrically-driven compressors. Had the compressors been fueled by natural gas from their pressurized pipelines, substantial gas deliveries would have continued when most needed.

Lack of winterization leading to freeze-offs at wellheads and midstream facilities has been cited by others as the primary cause for loss of natural gas deliveries. However as reported on the RBN Blog[9], a consensus appears emerging that a 20-25% drop in natural gas production occurred *before* the forced power outages. In itself, this effect was swamped by the plummeting gas supply that followed the electrical blackouts.

A lesser contributing cause was failure of many natural gas facility operators to submit an ERCOT form for critical power exemption from outages during forced load shedding. Consequently, these facilities lost total power at precisely the wrong time.

Additionally in other cases, downed transmission and distribution power lines made delivering electricity to municipalities, homes, and businesses impossible even when power was available.

ERCOT CHALLENGES

Soon after the storm abated, ERCOT revealed[10] that the entire grid serving over 90% of the state came perilously close to total blackout. Figure 5 illustrates the moment-by-moment graph of grid frequency from 1:23 AM to 2:00 AM on February 15th. Frequency dropped below the critical threshold of 59.4 Hz for 4 minutes, 23 seconds. Had the drop continued for ~4 more minutes, generator safeguards would have protected grid equipment by tripping virtually all generation.

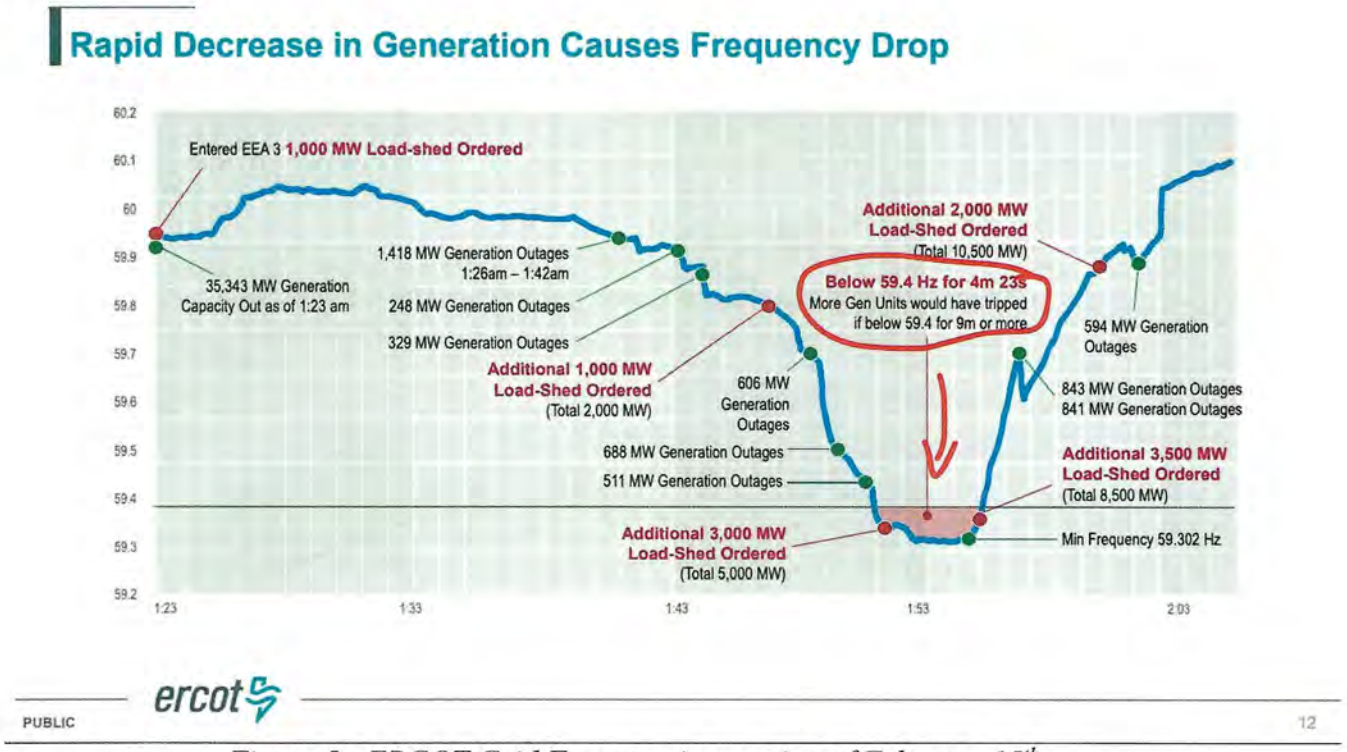

Figure 5: ERCOT Grid Frequncy in morning of February 15th

One feature of wind and solar power is their "asynchronous"[11] electrical generation. ERCOT's grid must maintain alternating-current frequency close to 60 Hz, but frequency does vary in response to load changes over the normal course of a day. Instantaneous frequency control is typically provided by the inertia of "synchronous" generators connected to massive spinning turbines in thermal power stations. On the other hand, the 66% reduction in renewable power heading into the rolling blackouts may have contributed to grid frequency instability.

Of ERCOT's problems, the state's electric grid independence was not one of them. Since Uri was a major regional storm system that plunged much of the central part of the U.S. into subfreezing temperatures for multiple days, the bordering states of Louisiana, Oklahoma, and New Mexico suffered from power shortages as well. The Southwest Power Pool and Midwest Power Grid, which are also heavily dependent on wind generation, were forced to cope with power outages of their own.

FUTURE TEXAS ELECTRICAL POWER SUPPLIES

ERCOT's Generation Interconnection Status (GIS) looks forward to plans for future generation. Their latest projection[12] does not anticipate any new nuclear power plants coming on stream. ERCOT does however expect the addition of 93 GW solar capacity, 23 GW from wind, 36 GW battery storage, but only 8 GW of additional gas-fired generation. This might be just enough to offset coal-fired generation slated to go offline.

Going forward, the trend line for baseload power from fossil fuels is sure to decline in favor of renewables which enjoy preferential access to the electrical grid. ERCOT's current total capacity includes ~35% variable, interruptible and non-dispatchable wind and solar. As witnessed during Uri, increased dependence on renewables will decrease the reliability and resiliency from dispatchable electric power, thereby incrementally raising the risk of price increases, future brownouts and rolling blackouts across the state[13]. (Figure 6).

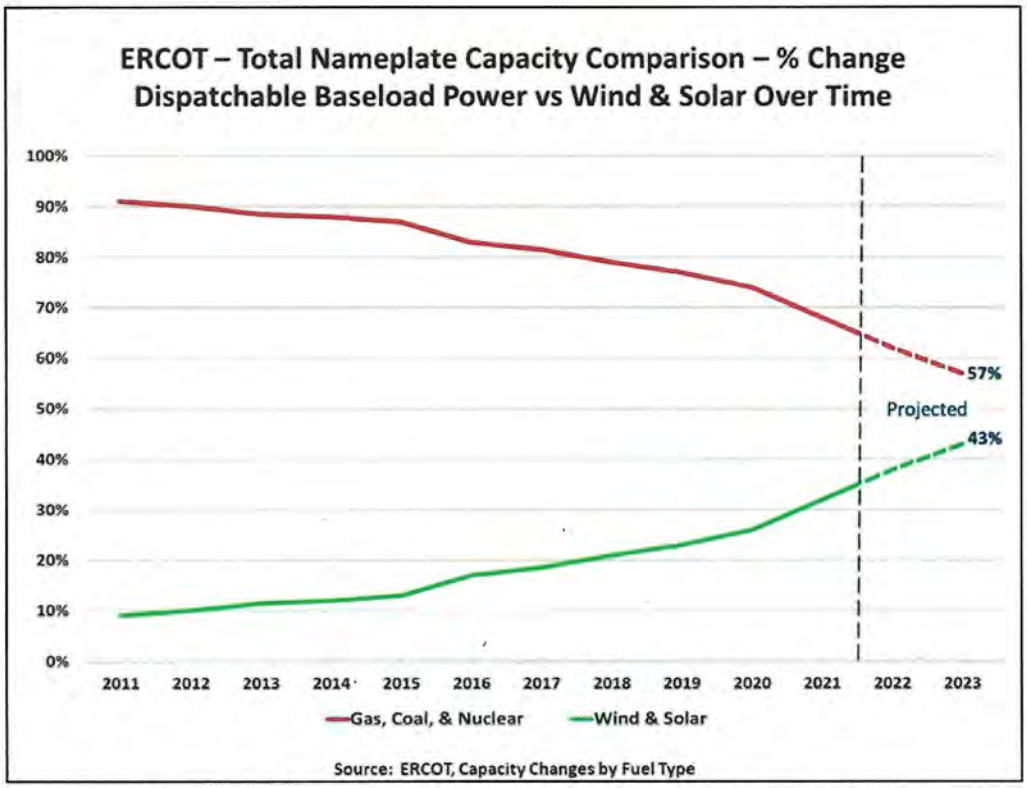

Figure 6: ERCOT Total Nameplate Capacity Comparison

Professor Ben Heard summarized[14] the issue with renewables:

> *"The chaotic nature of renewable energy supply, particularly from wind and solar, is an enormous challenge because it's the opposite of what we're trying to provide. We don't try to create something chaotic. We're trying to create something stable, predictable that can give people what they want when they want it... at a low cost. Preferably you wouldn't do that with something that was driven by weather."*

It seems to be no coincidence that the two states -- California and Texas -- that have done the most to embrace renewables are the states suffering wide-ranging price spikes and blackouts.

Recently the same story seems to be playing out in Europe. According to an article in the Wall Street Journal[15], a fall-off of wind this summer in the North Sea forced natural gas and coal-fired electrical generators to make up the shortfall. Quoting the story:

> *Natural gas prices, already boosted by the pandemic recovery and lack of fuel in storage caverns and tanks, hit all-time highs Thermal coal, long shunned for its carbon emissions, has emerged from a long price slump as utilities are forced to turn on backup power supplies.*

As show in figure 7, electricity prices jumped due to surging natural gas demand, rewarding both Russia and US companies that export natural gas to Europe.

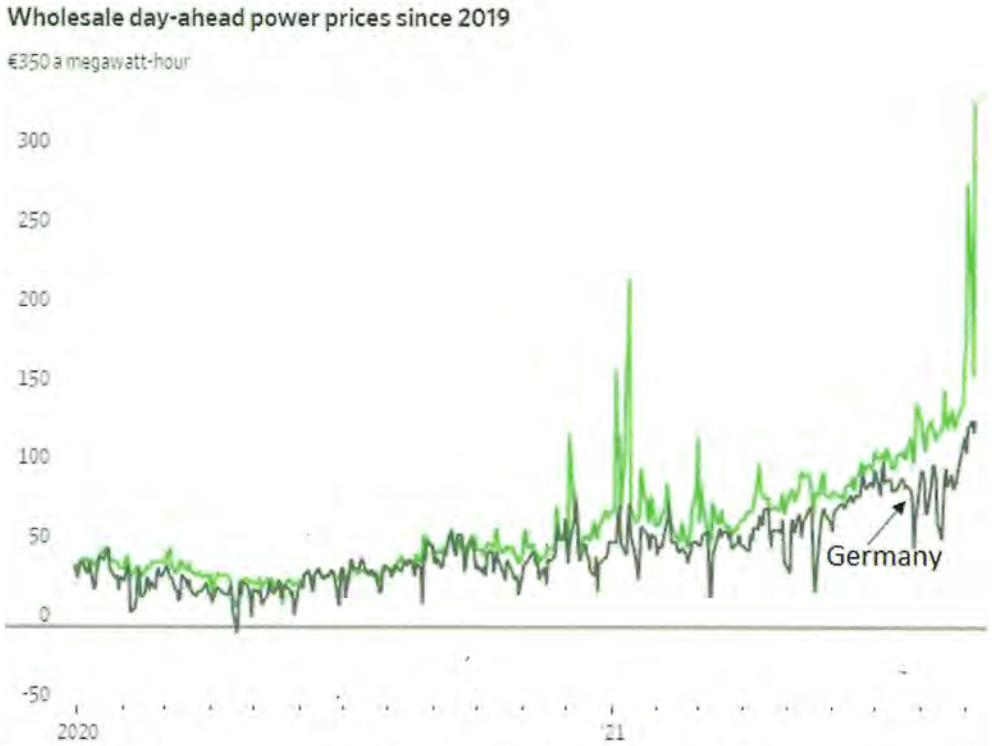

Figure 7. Wholesale electrical prices for the UK (in green) and Germany (black) since 2019.

ERCOT'S IMPACT ON PROCESS INDUSTRIES IN TEXAS

Understandably since February, the vast majority of Texas' effort and response has been directed at fixing what went wrong with ERCOT. Somewhat overlooked is what could have happened to the state's massive chemical, petrochemical and refining industries following ERCOT's involuntary load shedding on February 15th.

Fortuitously, Texas process operations, especially those along the Gulf Coast are experienced in dealing with events such as hurricanes that generate advance warning. That same preparedness served those process industries well in mid-February when the widely-anticipated freezing

weather seized Texas. Extensive flaring and emergency operations were implemented, but no serious upsets were reported.

In south Texas a number of facilities track electrical costs on a minute-by-minute basis. They witnessed extreme hikes in electrical costs shortly before forced shutdowns began on the morning of February 15th. Obviously, operations would prefer to run during freezing temperatures simply to maintain production and support utilities, but in response to very high pricing signals certain units began orderly shutdown.

Shutdowns, particularly unexpected shutdowns, in the chemical process industries are never without risk. Things seldom go wrong when operations are lined-out and running smoothly, but non-steady state operations raise the potential for mishap. A recent example was the tragic acetic acid release in LaPorte, TX which occurred immediately after shutdown for maintenance.

CONCLUSION

it is imperative that our electrical grid provide robust, dependable power at competitive prices for all Texas. This is a certain duty we owe the next generation of Texans.

---

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Rockport, West
St. Charles
Tally Island
Tract 831-G.O.M. (offshore)
Virginia

BEE COUNTY
Caesar
Mosca
Nomanna
Orangedale(2)
Ray-Wilcox
San Domingo
Tulsita Wilcox
Strauch_Wilcox

BROOKS COUNTY
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Boedecker
Cage Ranch
Encintas
ERF
Gyp Hill
Gyp Hill West
Loma Blanca
Mariposa
Mills Bennett
Pita
Tio Ayola
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CALHOUN COUNTY
Appling
Coloma Creek, North
Heyser
Lavaca Bay
Long Mott
Magnolia Beach
Mosquito Point
Olivia
Panther Reef
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Webb Point
S.E. Zoller

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Luttes
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Good Friday
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Terrell Point

HIDALGO COUNTY
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Donna
Edinburg, West
Flores-Jeffress
Foy
Hidalgo
LA Blanca
McAllen& Pharr
McAllen Ranch
Mercedes
Monte Christo, North
Penitas
San Fordyce
San Carlos
San Salvador
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Shary
Tabasco
Weslaco, North
Weslaco, South

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Francitas
Ganado & Ganado Deep
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Arnold-David, North
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Calallen
Chapman Ranch
Corpus Christi, N.W.
Corpus Christi West C.C.
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Flour Bluff/Flour Bluff, East
GOM St 9045(offshore)
Indian Point
Mustang Island
Mustang Island, West
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Nueces Bay/Nueces Bay West
Perro Rojo
Pita Island
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Saxet
Shield
Stedman Island
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Greta
La Rosa
Lake Pasture
Refugio, New
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Commonwealth
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Enos Cooper
Geronimo
Harvey
Hiberia
Hodges
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McCampbell Deep/Aransas Pass
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Midway, North
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Plymouth
Portilla (2)
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Taft, East
White Point, East

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Rincon
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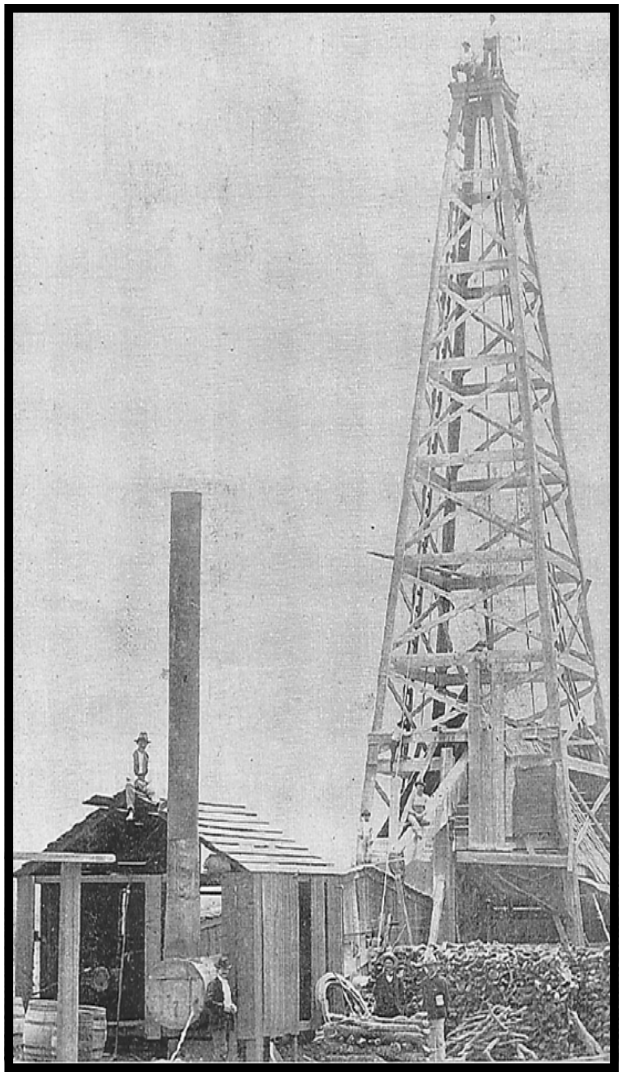

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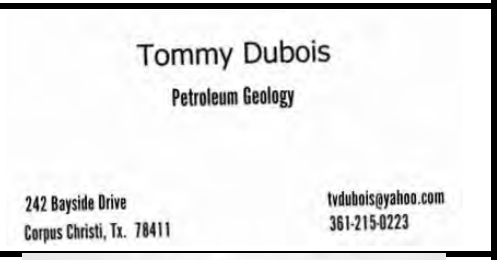

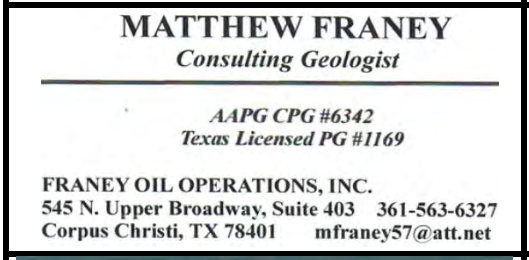

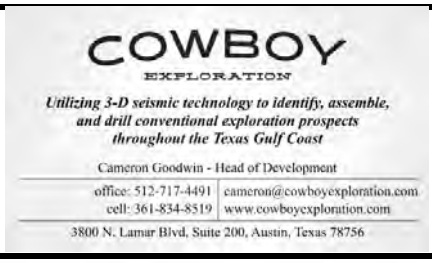

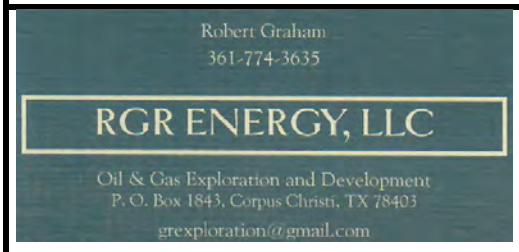

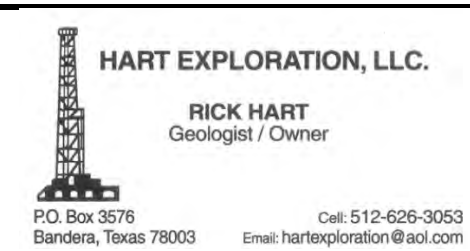

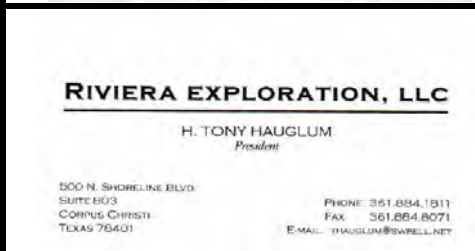

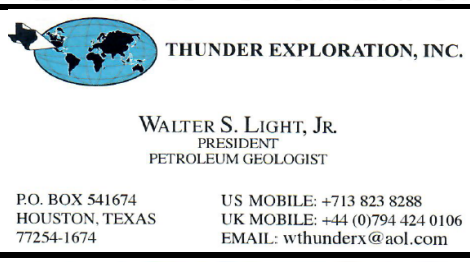

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