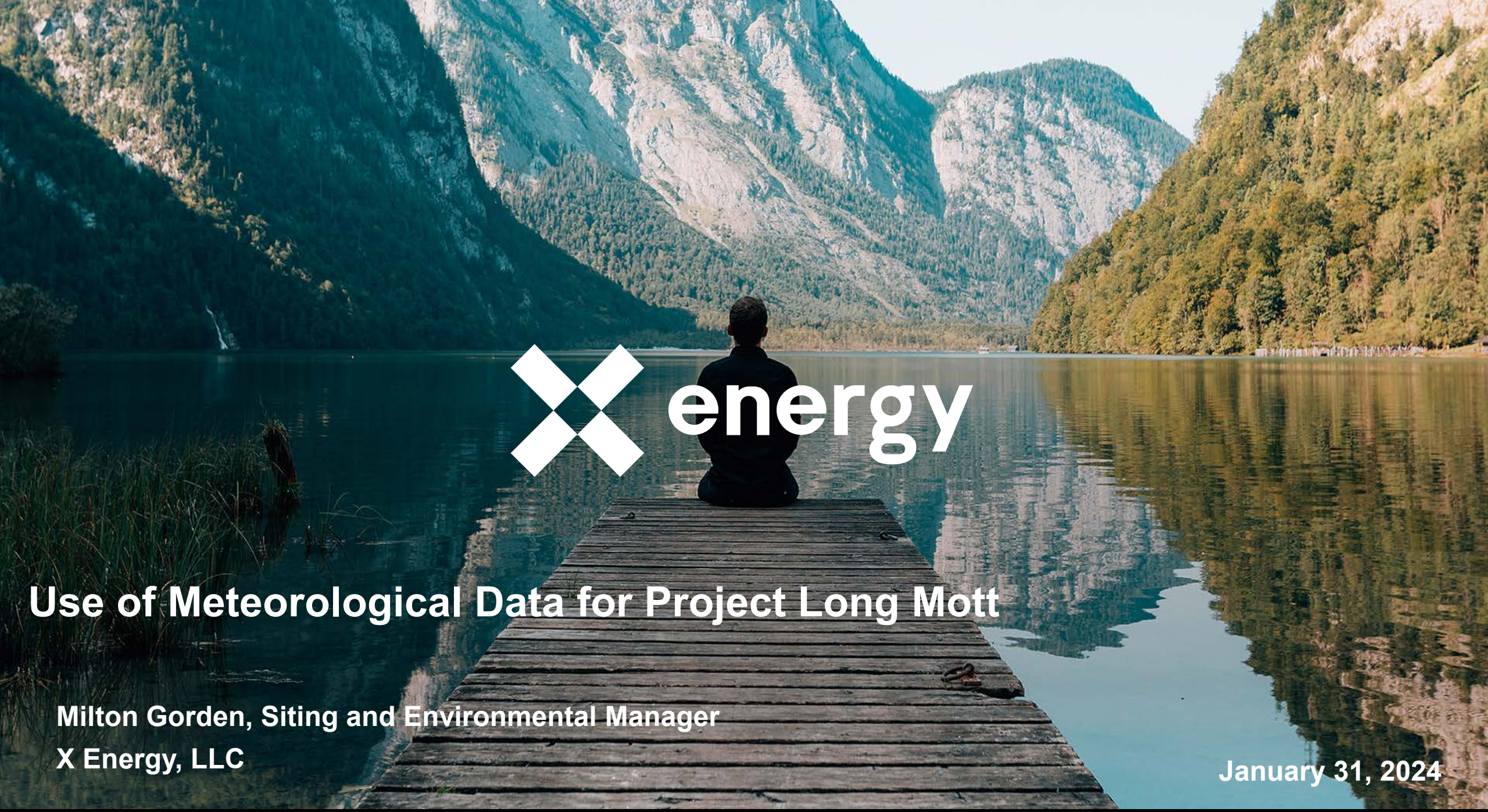

Use of Meteorological Data for Project Long Mott

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Agenda & Objectives

Agenda:

- Purpose of Meeting
- Current Use of Met Data for the Construction Permit Application (CPA)
- Regulatory/Guidance Review in Light of Xe-100 Technology
- Role of NOAA and Their Technologies
- Proposed Alternative to Collecting and Using Met Data Obtained from an Onsite Tower

Objectives:

- Obtain NRC Staff feedback on an alternative approach to obtaining and using meteorological data and models to support safety-related licensing activities

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Introduction & Background

Discuss alternative sources and methods for incorporating meteorological (met) data into environmental impact analyses, determining safety findings, and supporting normal and accident operation conditions

- **Why**

➢ The Xe-100 technology: an inherently-safe system with small impacts even under accident conditions, primarily because of the fuel design, thereby reducing or eliminating the need for extensive meteorological data

➢ Advances in met data collection and modeling

➢ Modern-day project requirements

  - Project timeline is now 7 to 10 years (non-traditional nuclear power clients)
  - Limited funding and rising costs for initial stages of project development

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Current Use of Met Data for the Construction Permit Application

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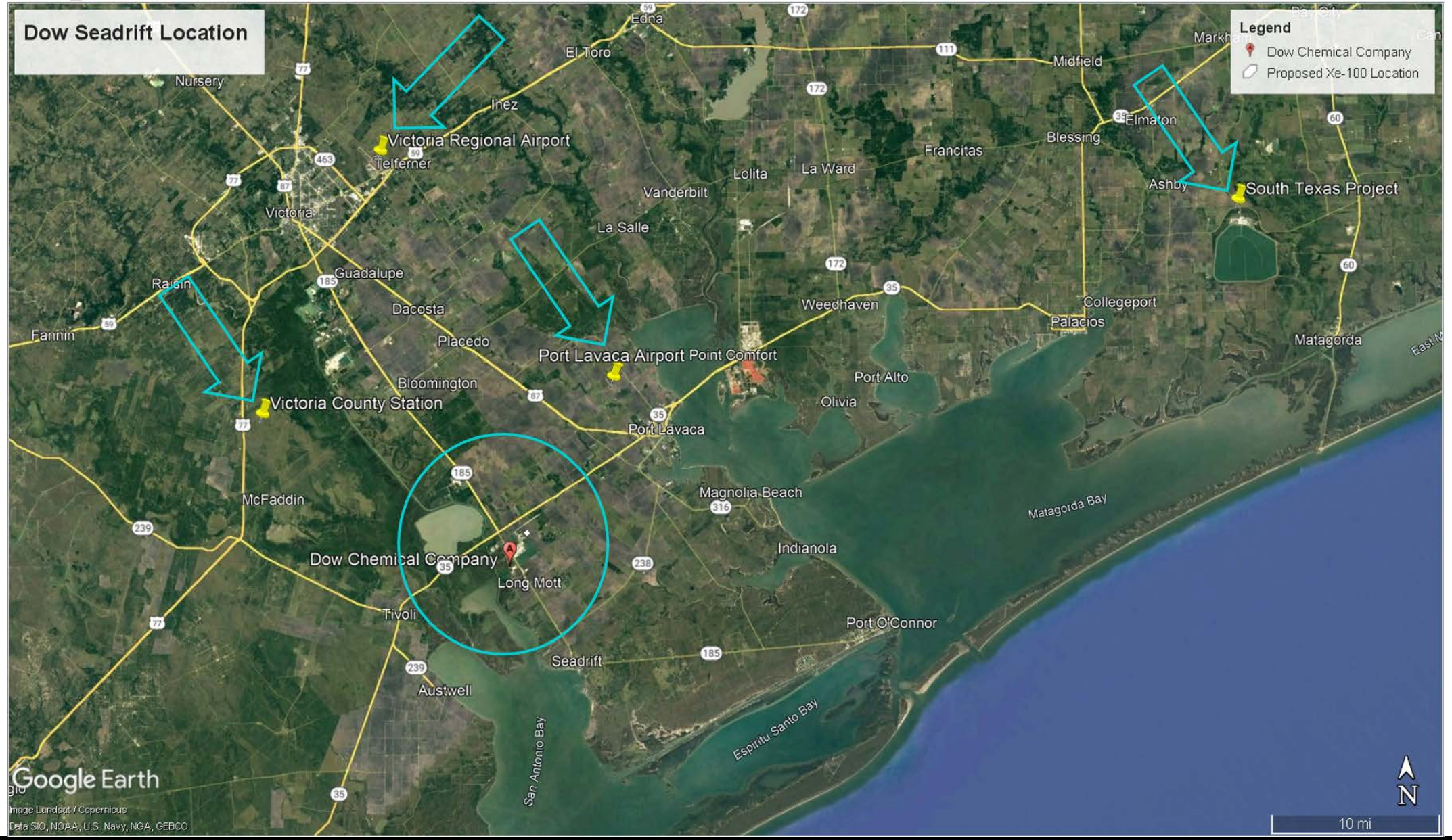
Dow Seadrift Location



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Meteorological Data Support for the Environmental Report (ER)

- Meteorological data obtained from:
  - Cooperative (COOP) weather monitoring stations
  - Automated Surface Observing Stations (ASOS)
  - Local climatological data (LCD) summaries from the National Centers for Environmental Information (NCEI)
  - American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
  - American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI)
  - U.S. Department of Commerce (DOC) 100-year return-interval two-day liquid equivalent precipitation for the state of Texas
  - NCEI online storm events database
  - U.S. EPA air quality summaries and monitor data for Calhoun County, TX
  - Data from the South Texas Project (STP) Nuclear Generating Station (NGS), Victoria National Weather Service (NWS) Station (KVCT), Calhoun County- Port Lavaca Airport (KPKV), and Palacios-R.B. Trull Municipal Airport (KPSX)

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Meteorological Data Support for the Environmental Report (ER) (Cont'd)

- The analysis included the county of the Long Mott Project Site, Calhoun County, as well as the surrounding counties which are Victoria County, Refugio County, Aransas County, and Jackson County, TX
- Regulations and guidance include 10 CFR 20, 10 CFR 50 Appendix E Section IV.E.2, 10 CFR 50 Appendix I, 10 CFR 50.47(b), 10 CFR 50.34(a), 10 CFR 100.20(c)(2), 10 CFR 100.21(d), ARCAP 2.4, NRC Regulatory Guides (RG) 1.76, 1.27, 1.221, 1.23
- Meteorological data from the STP NGS Tower includes:
  - Measurements taken at 10 meters (m) (32.8 feet [ft.]) and 60 m (196.9 ft.) above ground level (AGL)
  - Measurements of wind speed, wind direction, temperature, relative humidity, air pressure, and precipitation
- Short and long term atmospheric and meteorological sections of the ER will use South Texas Project (STP) NGS Tower and Victoria NWS Station (KVCT) data

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Meteorological Data Support the PSAR

- Meteorological data obtained from same sources as ER
- Regulations and guidance include 10 CFR 20, 10 CFR 50 Appendix E Section IV.E.2, 10 CFR 50 Appendix I, 10 CFR 50.47(b), 10 CFR 50.34(a), 10 CFR 100.20(c)(2), 10 CFR 100.21(d), ARCAP 2.4, NRC Regulatory Guides (RG) 1.76, 1.27, 1.221, 1.23
- Meteorological data from the STP NGS Tower includes:
  - Measurements taken at 10 meters (m) (32.8 feet [ft.]) and 60 m (196.9 ft.) above ground level (AGL)
  - Measurements of wind speed, wind direction, temperature, relative humidity, air pressure, and precipitation
- Short and long term atmospheric and meteorological sections of the PSAR will use STP NGS Tower and Victoria NWS Station (KVCT) data

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Data Use in CPA

South Texas Project (STP):

- Raw hourly meteorological data are not publicly available
- Seasonal joint wind direction/speed/Pasquill stability joint frequency distributions (JFDs) are publicly available in effluent release reports provided to the NRC
- Seasonal JFDs are compiled into annual JFDs for input into dose calculations requiring JFDs

Victoria Regional Airport (KVCT):

- Raw meteorological data are publicly available
- Pasquill stability classes are estimated from hourly wind speed, cloud height, cloud cover, and time of day using the Turner method
- The Turner method was developed in the mid-1960s. Analyses using the Turner method have been previously submitted to and accepted by the NRC
- Resulting hourly data with Pasquill stability classifications can be used in short-term dose calculations requiring hourly input data

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Regulatory/Guidance Review in Light of Xe-100 Technology

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Regulatory Requirements

- Title 10, Section 100.10(c)(2): A conservative assessment … of the potential dispersion of radioactive material from, and the radiological consequences of, design-basis accidents to aid in evaluating the acceptability of a site and the adequacy of engineered safety features … in accordance with 10 CFR Part 100 criteria
  - **Surrounding data and modeled data is available and can be used using accepted approaches. Discussed in later slides.**
- 10 CFR 100.11(a): Meteorological conditions pertinent to the site should be used, along with an assumed fission product release from the core and the expected containment leak rate, to ensure that prescribed dose limits for the exclusion area and low-population zone, as defined in 10 CFR 50.2, “Definitions” (Ref. 2), are met
  - **The design criteria for the Xe-100 EAB and LPZ is 400m. Dose limits at that boundary should be well-bounded by that distance. A met tower will not provide value in determining impacts at Project Long Mott because there are no populations in this distance. EPZ methodology will be submitted in a Licensing Topical Report that allows X-energy to determine EPZ sizing to meet 10 CFR 50.160. Will show no exceedance of 1 rem/96 hours, so therefore the EAB/LPZ will be bounded by the EPZ.**

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Regulatory Requirements (Cont'd.)

- 10 CFR 100.20(c)(2): Requires consideration of the meteorological characteristics of the site that are necessary for safety analysis or that may have an impact upon plant design in determining the acceptability of a site for a nuclear power plant
  - **Alternative: NOAA data would be supplemented with onsite data from alternative instruments (i.e., sonic anemometer(s)) that measure parameters related to performance of safety related systems for measuring wind speed and tracking the duration of periods of elevated wind speed. Sonic anemometers are relatively inexpensive**
- 10 CFR 100.21(c): requires the evaluation of site atmospheric dispersion characteristics and the establishment of dispersion parameters such that (1) radiological effluent release limits associated with normal operation from the type of facility proposed to be located at the site can be met for any individual located off site, and (2) radiological dose consequences of postulated accidents meet the prescribed dose limits at the exclusion area and low population zone distances set forth in 10 CFR 50.34(a)(1)
  - **The Xe-100 EAB and LPZ are at 400m with no population**

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Regulatory Requirements (Cont'd.)

- General Design Criteria [GDC] 19: Requires that a control room be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions. Adequate radiation protection must be provided to permit access to and occupancy of the control room for the duration of accident conditions. For plants that use alternate source terms, 10 CFR 50.67(b)(2)(iii) provides similar criteria. Atmospheric dispersion estimates are significant inputs in assessments performed to demonstrate compliance with this requirement. Meteorological conditions pertinent to the site should be used…
  - **Xe-100 is designed to shut down without manual actions and will remain habitable during normal events, anticipated operational occurrence, and design basis events. Reference NEI 21-07 and Principal Design Criteria 19 (Principal Design Criteria Licensing Topical Report, doc. # 004799, Rev. 3), and Regulatory Guide 1.232. Current design of the control room provides adequate radiation protection without personnel receiving more than 5 rem during these events.**

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Regulatory Requirements (Cont'd.)

- 10 CFR Part 50 (Ref. 2), Paragraphs 50.47(b)(4), 50.47(b)(8), and 50.47(b)(9), Section IV.E.2 of Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," require each applicant for an operating license or combined license to describe its plans for coping with radiological emergencies. These plans must include provisions for equipment for determining the magnitude and continuously assessing the impact of the release of radioactive materials to the environment.
  - **Results from weather forecast models are available from public and private sources. Model results that focus on particular parameters related to performance of safety related systems (thinking here about periods of elevated wind speeds such as those associated with tropical weather systems in southeastern Texas) could be identified and tracked for contingency planning purposes. Weather forecasting models generally perform better for prediction weather systems that are relatively large in space and time, such as tropical weather systems.**

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Role of NOAA and Their Technologies

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Meteorological Data Sources for Modeling and Forecasting

- NOAA – National Weather Service (www.weather.gov)
  - Point-specific hourly forecasts of wind, temperature, cloud cover, mixing height and precipitation out to seven days
  - Traditional real-time hourly weather observations from airports
    - Victoria Airport and Port Lavaca
- NOAA – National Hurricane Center (www.nhc.noaa.gov)
  - Publicly available storm track predictions
  - Point-specific wind and storm intensity forecasts
  - Storm surge and rainfall forecasts
- Dow Emergency Operations Center (EOC) Weather Station
  - Back-up local meteorological data source

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Air Dispersion Modeling

- Meteorological data sources provide input for air dispersion models used for emergency response and planning
- Meteorological input data requirements depend on the complexity of the model
- Examples of air dispersion models used in emergency response include:
  - U.S. EPA: ALOHA/CAMEO (https://www.epa.gov/cameo/aloha-software)
  - U.S. EPA: DEGADIS (https://www.epa.gov/scram/air-quality-dispersion-modeling-alternative-models)
  - NOAA – Air Resources Laboratory: HYSPLIT (https://www.arl.noaa.gov/hysplit/)

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Proposed Meteorological Data Sources

- Primary data source:
  - Point-specific hourly forecasts of wind, temperature, cloud cover and other parameters from NOAA-NWS
- Back-up data sources:
  - Hourly weather observations from nearby airports from NOAA
  - Dow EOC Weather Station

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Point Forecast for Project Long Mott Site (public consumer-grade example of available data)

Tabular Format

Hourly Tabular Forecast for 28.53

https://forecast.weather.gov/MapClick.php?w0=t&w1=td&w2=wc&w3=sfcw...

weather.gov

National Weather Service Forecast Office

Corpus Christi, TX

Home | News | Organization | Search for: NWS All NOAA Go

Point Forecast: 4 Miles NNE Long Mott TX
28.53N 96.74W

Last Update: 4:37 pm CST Jan 16, 2024

Tabular Forecast

[show menu] XML

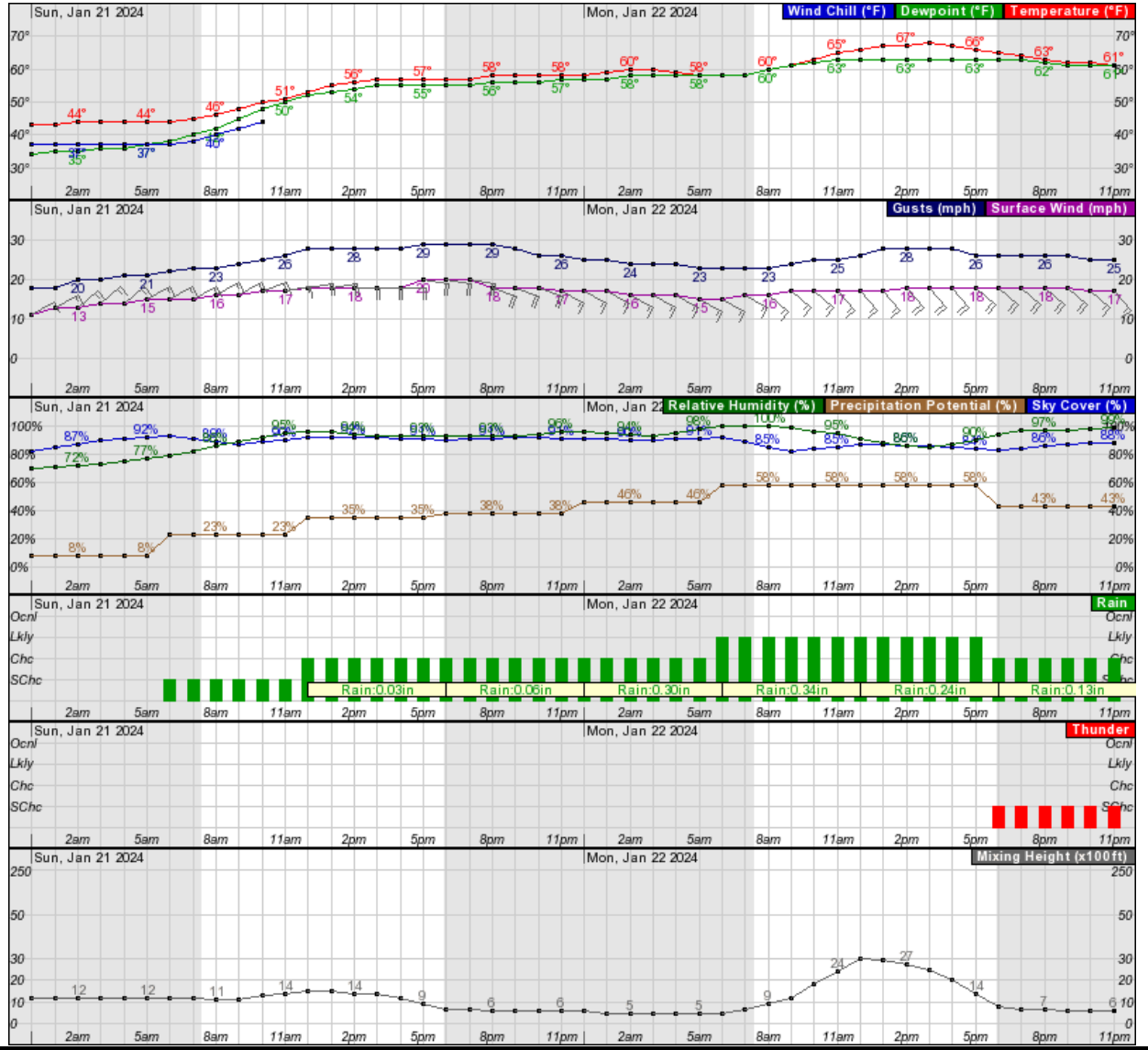
Date	01/21																						
Hour (CST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temperature (°F)	43	43	44	44	44	44	44	45	46	48	50	51	53	55	56	57	57	57	57	57	58	58	58	58
Dewpoint (°F)	34	35	35	36	36	37	38	40	42	45	48	50	52	53	54	55	55	55	55	55	56	56	56	57
Wind Chill (°F)	37	37	37	37	37	37	37	38	40	42	44													
Surface Wind (mph)	11	13	13	14	14	15	15	15	16	16	17	17	18	18	18	18	18	20	20	20	18	18	18	17
Wind Dir	ENE	ENE	NE	NE	NE	ENE	ENE	ENE	ENE	ENE	ENE	E	E	E	E	E	E	E	E	E	ESE	ESE	ESE	ESE
Gust	18	18	20	20	21	21	22	23	23	24	25	26	28	28	28	28	28	29	29	29	29	28	26	26
Sky Cover (%)	82	85	87	90	91	92	93	91	89	87	89	90	92	92	92	92	91	91	90	91	91	92	92	91
Precipitation Potential (%)	8	8	8	8	8	8	23	23	23	23	23	23	35	35	35	35	35	35	38	38	38	38	38	38
Relative Humidity (%)	70	71	72	73	75	77	79	82	86	89	92	95	96	96	94	93	93	93	93	93	93	93	94	96
Rain	--	--	--	--	--	--	SChc	SChc	SChc	SChc	SChc	SChc	Chc	Chc	Chc	Chc	Chc	Chc	Chc	Chc	Chc	Chc	Chc	Chc
Thunder	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mixing Height (x100ft)	12	12	12	12	12	12	12	12	11	11	13	14	15	15	14	14	12	9	7	7	6	6	6	6

Date	01/22																							
Hour (CST)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temperature (°F)	58	59	60	60	59	58	58	58	60	61	63	65	66	67	67	68	67	66	65	64	63	62	62	61
Dewpoint (°F)	57	57	58	58	58	58	58	58	60	61	62	63	63	63	63	63	63	63	63	63	62	61	61	61
Wind Chill (°F)																								
Surface Wind (mph)	17	17	16	16	16	15	15	16	16	17	17	17	17	17	18	18	18	18	18	18	18	18	17	17
Wind Dir	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Gust	25	25	24	24	24	23	23	23	23	24	25	25	26	28	28	28	28	26	26	26	26	26	25	25
Sky Cover (%)	91	91	90	90	91	91	92	89	85	82	84	85	87	87	86	86	85	84	83	84	86	87	88	88
Precipitation Potential (%)	46	46	46	46	46	46	58	58	58	58	58	58	58	58	58	58	58	58	43	43	43	43	43	43
Relative Humidity (%)	96	95	94	93	95	98	100	100	100	99	96	95	91	88	86	85	87	90	94	97	97	97	98	99
Rain	Chc	Chc	Chc	Chc	Chc	Chc	Lkly	Lkly	Lkly	Lkly	Lkly	Lkly	Lkly	Lkly	Lkly	Lkly	Lkly	Lkly	Chc	Chc	Chc	Chc	Chc	Chc
Thunder	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SChc	SChc	SChc	SChc	SChc	SChc
Mixing Height (x100ft)	6	5	5	5	5	5	5	7	9	12	18	24	30	29	27	25	20	14	8	7	7	6	6	6

Additional Forecasts & Information

International System of Units Forecast Discussion	
7-Day Forecast	Hourly Weather Graph
South Texas Climate Data	Marine Weather
Tropical Weather	Aviation Weather
Fire Weather	Current Texas Weather
Current Weather Map	Forecast Weather Maps

Graphical Format



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Proposed Alternative to Collecting and Using Met Data Obtained from an Onsite Tower

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Proposed Alternative Approach

- Existing public and non-public data sources can be shown to be of sufficient quality and of site-specificity to support safety findings to support application approval and issuance of permits and licenses

- NOAA data would be supplemented with onsite data from more cost-effective alternative instruments (i.e., sonic anemometer(s)) that measure parameters related to performance of safety related systems by measuring wind speed and tracking the duration of periods of elevated wind speed

- NOAA data/forecast models would inform Emergency Plans and actions in place of onsite meteorological tower data

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