



# Forecasting the Future: Takeaways From the 2024 Annual Conference

CDRE, Millersville University of Pennsylvania, Millersville, PA 17551



Paige E. Scott  
Competitive – Undergraduate

## Introduction

The National Weather Service is implementing a new form of forecasting for weather. The shift from deterministic forecasting to probabilistic forecasting will allow meteorologists, emergency managers, and others to more accurately predict and view weather, while allowing them a better chance at making the correct decisions. In the presentation, *“A 50% Chance of a Good Session – Understanding Probabilistic Information for Weather Decisions”* forecasters from the NWS introduced the concept. The difference between each type of forecast is helping emergency management to prepare for a wide range of outcomes as opposed to focusing on one end of the spectrum. Emergency management often depends on weather forecasts to aid in time-sensitive decisions such as evacuations. Traditional deterministic forecasting presents only a single outcome which can lead to overconfidence in forecasts that may not capture the bigger picture. Probabilistic forecasting acknowledges that uncertainty exists and offers multiple potential outcomes and the likelihood of each occurring. The insights from the presentation as well as supplemental research enforce the idea that probabilistic forecasting can improve risk communication and decision making, all while enhancing community preparedness.

## EM Application

- ❑ Enhanced Decision-Making
  - ❑ Provides a wide range of outcomes, allowing emergency managers to prepare for a wide range of scenarios
- ❑ Disaster Risk Assessment
  - ❑ Probabilistic models enable estimation of hazard frequencies and potential damages
- ❑ Improved Resource Allocation
  - ❑ Enables a more efficient distribution of resources by giving meteorologists, Ems, and other decision makers the ability to see where impacts may be felt
  - ❑ Better Risk Communication
    - ❑ Facilitates clearer communication between officials and the public by conveying the likelihood of certain events
- ❑ Increased Resilience
  - ❑ Allows communities to prepare for potential scenarios ahead of time

## Methods

- ❑ Research and Observation
  - ❑ Online research for more in-depth information regarding the change in forecast type and impact on the emergency management field
  - ❑ 2024 IAEM Annual Conference in Colorado Springs, CO attendance

## Takeaways & Examples

- ❑ During the conference session, meteorologists from 3 NWS offices had attendees play a game; we were given a job as snow plow drivers and were then responsible for decision making for how to treat the roads. Should we use a salt brine or beet juice?
  - ❑ Salt Brine
    - ❑ Cheapest options (\$500 per application)
    - ❑ Only worked at temperatures greater than 25 degrees Fahrenheit
  - ❑ Beet Juice
    - ❑ Extremely expensive (\$8,000) per application
    - ❑ Works at any temperature
  - ❑ Game Structure and Outcome
    - ❑ If salt brine fails, additional costs are incurred
    - ❑ Track the budget of \$100,000 after each decision
    - ❑ Given a deterministic and probabilistic forecast, whichever team had the most money left at the end won
  - ❑ Learning Outcomes
    - ❑ Demonstrated real-world decision making using each form of forecast
    - ❑ Highlights how probabilistic forecasts allow for better risk-informed decisions, ultimately reducing unnecessary cost and increasing preparedness
- ❑ A study from 2023 examined the effectiveness of embedding probabilistic hazard information into emergency alert messages or Wireless Emergency Alerts (WEAs)
  - ❑ The research focuses on how the information influences public perception of risk and their actions relating to that risk
- ❑ Key Findings
  - ❑ Enhanced Public Understanding
    - ❑ By incorporating information into alerts, meteorologists and emergency managers can help the public to better grasp the uncertainty of weather forecasts
  - ❑ Improved Risk Assessment & Communication
    - ❑ Including probabilistic information allows emergency managers to determine the likelihood of scenarios, ultimately aiding in more effective risk assessment and communication
  - ❑ Increased Positive Behavior and Perception of Risk
    - ❑ Study found when individuals received alerts that include the probabilistic information, they were more likely to take protective actions such as evacuating or seeking shelter in a tornado warning

## Conclusion

The National Weather Service is moving from “the weather is going to do this” to “here’s a list of possibilities that might happen” by changing from deterministic to probabilistic forecasting. While deterministic forecasts are easy to read, they make us confident in situations like when we believe a snowstorm will magically stop in our driveway. Probabilistic forecasts are helping us to embrace uncertainty by showing multiple scenarios and the chance of each happening. This is helping meteorologists, emergency managers, and people such as snowplow drivers to make smarter, risk-focused decisions. Exercises like the game played in the conference session *“A 50% Chance of a Good Session – Understanding Probabilistic Information for Weather Decisions”* demonstrate that planning while including the probabilistic forecasts reduce unnecessary costs in many forms, including the cost of people's lives. Research also shows that including information given in probabilistic forecasts when sending alerts to the public help them to better comprehend risk, take protective actions, and to stop blaming meteorologists when the weather doesn’t do what they’d like it do so. The insights given during the conference session and the research reinforce the concept that probabilistic forecasting is the way of the future. It’s not just a fancy upgrade, it’s a practical tool that will save peoples lives.

## References

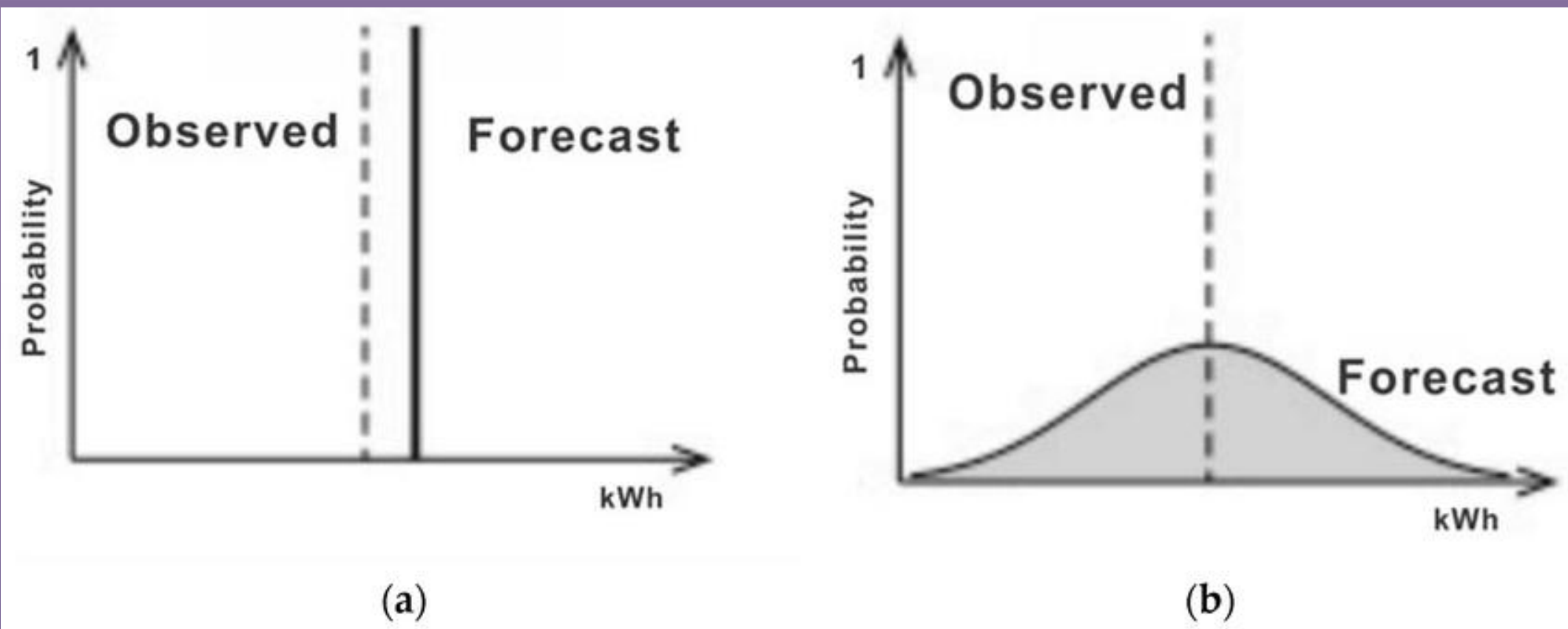


Figure 1. Graphs illustrating how deterministic forecasts provide a single, predicted outcome while probabilistic forecasts offer a range of possible outcomes with associated chances of each occurring