Northwest
Power and
Conservation
Council

October 1, 2013

MEMORANDUM

TO: Power Committee

FROM: Charlie Black, Power Planning Division Director

SUBJECT: Shortcomings of Relying on Forecasts for Planning

Kenneth Arrow was a renowned economist who jointly won the 1972 Nobel Prize in Economics for his work on neo-classical economic theory. During World War II, Arrow led a forecasting group in the U.S. Army Air Corps responsible for predicting weather conditions a month in advance. His team performed a rigorous statistical analysis of the performance of their forecasts and found that they were no more accurate than random guesses. This caused them to recommend the long range weather forecasting group be disbanded and the personnel reassigned to other activities. After six months, they received the following response:

"The Commanding General is well aware that the forecasts are no good. However, they are needed for planning purposes."

This story highlights both the inherent limitations of long-term forecasts and their necessity for planning. At the meeting on October 8, staff will engage the Power Committee in a discussion about the use of forecasts in planning. Topics will include identification of key forecasts that are needed for the Council's Northwest power plans, the nature of the factors being forecasted, the fallacy of attempting to rely on uncertain forecasts, and methods we use to deal with forecast uncertainty. We will also learn why, when it comes to forecasting, foxes do better than hedgehogs.

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

Forecasts in Planning: Recognizing and Dealing with Imperfect Foresight

Power Committee Meeting

Charlie Black

October 8, 2012

What Ever Happened to the Jetsons?

First Reality: The Future is Uncertain

- The only thing that we really know about virtually any forecast is that actual events are likely to turn out differently, perhaps dramatically so

- The world is complex – numerous forces with varying types of influence, unpredictable (often random) events, obscured linkages

- Perfect foresight is not possible (even imperfect foresight is a stretch)

Examples of Past Forecasts and Actual Outcomes/Consequences

- 'Regional demand for electricity will continue to grow at a rate of 7 percent per year.' – WPPSS nuclear fiasco of the late 1970s

- 'We can rely on deregulated power markets to ensure new resources will be built to meet demands.' – West Coast energy crisis of 2001

- 'Further depletion of finite reserves will continue to push natural gas prices above their current levels of $8 to $10 per MMBtu.' – hydraulic fracturing has boosted reserves, cut prices below $4 per MMBtu, and is helping make coal-fired generation uncompetitive

Power Forecasts are Especially Tough

- Forecasts of demand, wholesale power prices, etc. depend on forecasts of other factors that are difficult to predict (uncertain inputs mean uncertain results)

- Technological advances, legislative/regulatory actions, and other events also tend to be highly 'choppy'

- As a result, actual outcomes are often characterized by shifts and shocks, rather than the smooth trends often implied by forecasts

Second Reality: Forecasts are Necessary for Power Planning

- **The Council's Power Plan defines a resource strategy to assure an adequate, efficient, economic and reliable regional power system**

- **This requires various forecasts, including:**
  - Demand for electricity (specifically listed in NW Power Act)
  - Capabilities and performance of existing resources
  - Characteristics and availability of new resources
  - Legislative, regulatory and other policies
  - Market and industry structure, practices, prices (including fuels)
  - Etc.

So how can we reconcile the uncertainty inherent in forecasting with the necessity to use forecasts for planning?

Advice from Dirty Harry

A man's got to know his limitations.
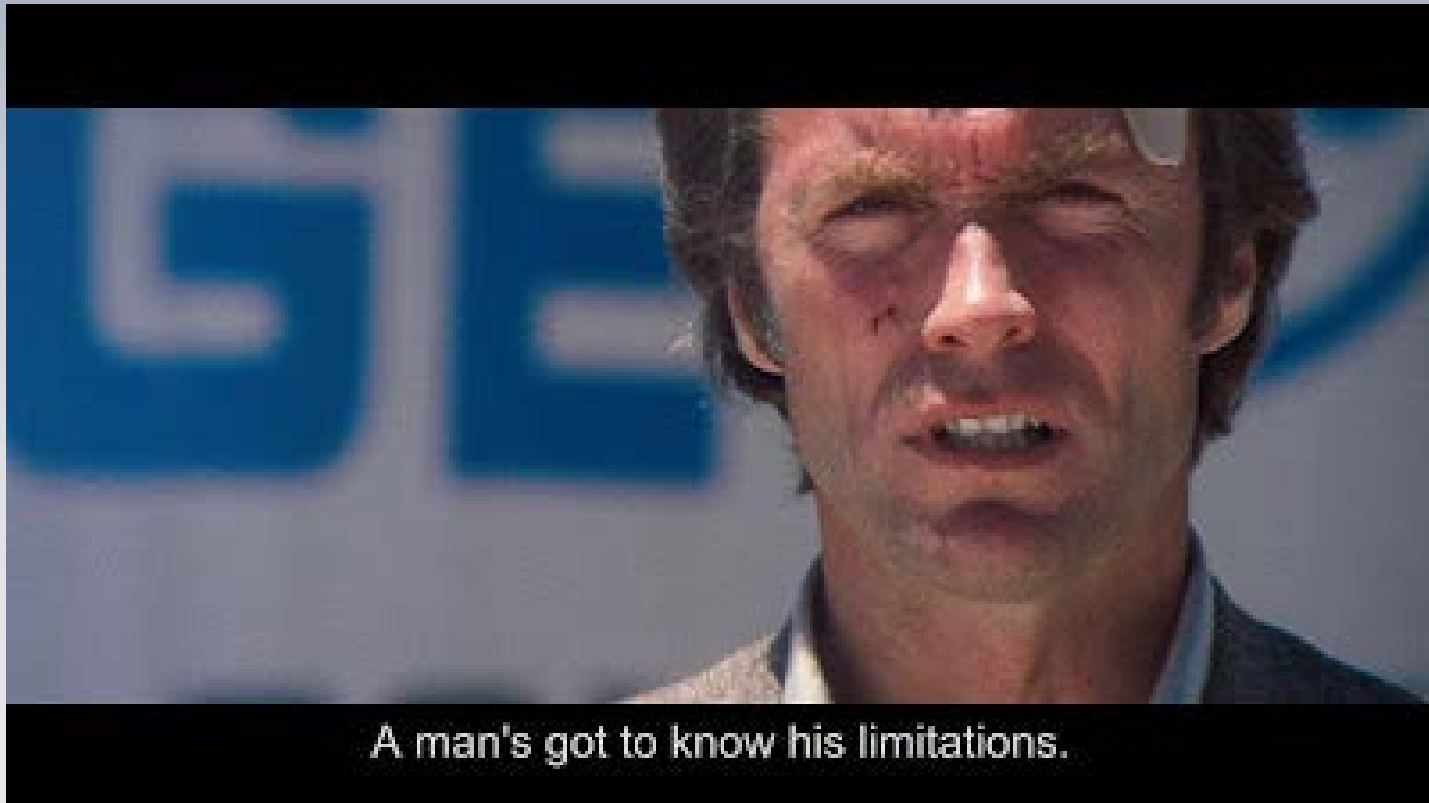
Scenario Planning Approach

- Simple version: prepare multiple forecast cases for each item being forecasted (avoid odd number of cases)

- More sophisticated version: develop scenarios, or 'stories from the future'
  - Build scenarios that describe the power system holistically
  - Identify key underlying forces that have potential to drive changes (e.g., demographics, broad social trends)
  - Consider potential shocks that could disrupt the status quo
  - Examine linkages, interrelationships
  - Look for strategies that are 'robust', i.e., work across a range of futures

Risk Analysis Approach

- **Typically involves simulations using numerous forecast cases**
  - Assign probability distributions to key input variables (e.g., demands, fuel prices)
  - Simulate system outcomes for each combination of input variables
  - Capture results to examine how different strategies affect tradeoffs (e.g., expected cost versus variability in cost)

Some Additional Observations About Forecasts and Their Use

- **Maintain healthy skepticism that any forecast can be 'accurate'**
  - Avoid the tendency and danger of locking in on a forecast that reflects an 'official future'
- **Identify which inputs have the greatest influence on results**
  - Focus attention on the forecasts that matter the most
- **For inputs that are highly uncertain or subject to large disagreement, tipping point analysis can be helpful**
- **A strategy that works reasonably well across a broader range of futures is superior to one that depends on a forecast being accurate**

"The fox knows many things, but the hedgehog knows one big thing." Archilochus

- Hedgehogs: Relate everything to a single unifying vision that they believe determines significance.
- Foxes: Combine a wide variety of experiences and information from multiple sources.
- Philip Tetlock used this definition to group 280 political experts and economists for a 20-year study, and concluded that the foxes made better forecasters than the hedgehogs.
- "The better forecasters were eclectic thinkers who were willing to update their beliefs when faced with contrary evidence, were doubtful of grand schemes and were rather modest about their predictive ability."