# Electricity Market Design for High Renewable Levels

Michael Goggin

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AWEA AMERICAN WIND ENERGY ASSOCIATION

## Overview

- The role of markets, and transmission, in renewable generation siting decisions
- Reforming energy and ancillary services markets for high renewables
- Making sure market price=cost
- Recognizing inherent preferences for conventional generation in current market designs

## The role of markets, and transmission, in driving renewable build

- Market price signals should ensure developers build in locations that optimize system value, not just energy production
  - Moving from production-based incentives to carbon pricing will help
  - Utility and corporate buyers are becoming more savvy in buying for market value, not just Annual Energy Production
  - Market price signals are more efficient than policy intervention

- However, transmission planning can help drive renewable deployment to locations with high system value
  - As a public good, transmission must be centrally planned and paid for
  - Market signals like transmission congestion should more directly drive transmission development
  - Societal value (production cost savings) is the metric used to evaluate transmission plans, which at higher penetrations must account for renewable output profile (capacity value, geographic diversity of output, forecast error, correlation with load)
  - New transmission increases geographic diversity

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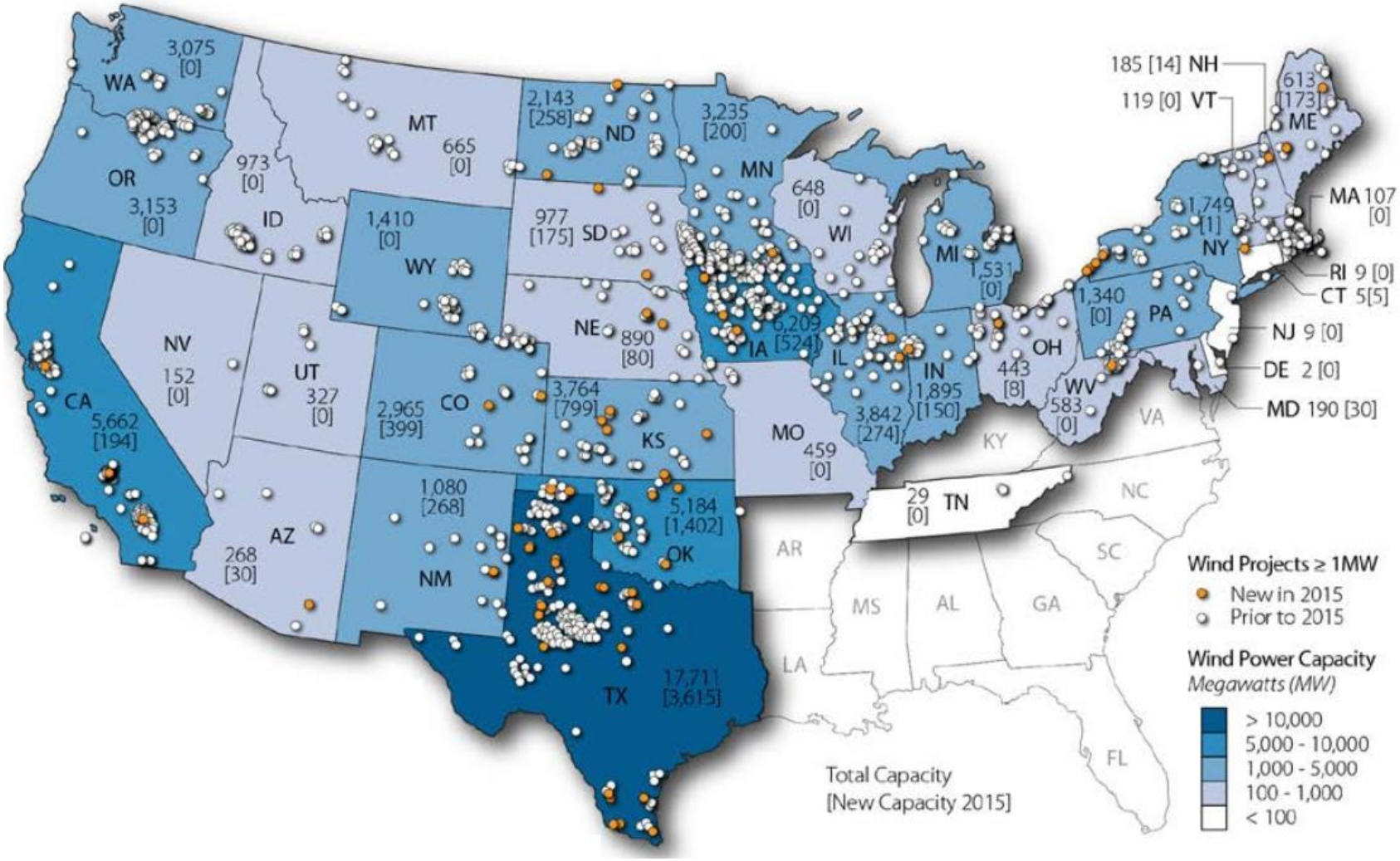
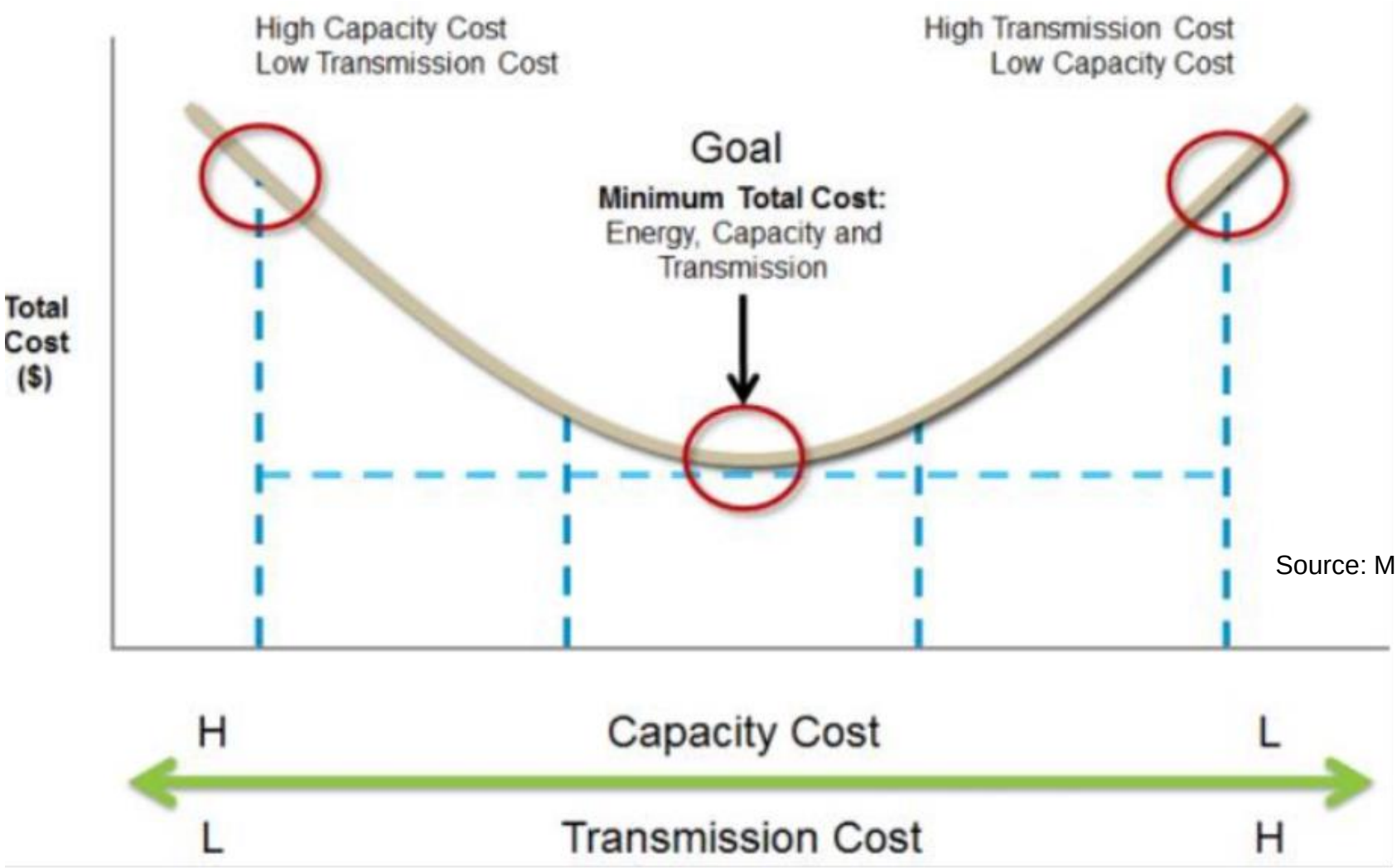
# Lack of transmission causes lack of wind plant geographic diversity



# Minimizing System Costs through Transmission Planning




Source: MISO

## Reforming energy and ancillary services markets for high renewables

- Carbon price and effective transmission policy most important for ensuring generation is properly valued, revenue sufficiency
  - Pricing externalities in energy markets rewards efficient generators, drives out inefficient generators
  - Transmission enables efficient generators to reach customers, revenue sufficiency
- Other reforms to ancillary services markets
  - Market for primary frequency response, with premium for fast and accurate
  - Standardize reactive power compensation
- Other reforms to energy markets
  - Bring self-scheduled resources into energy markets
  - To the extent possible, bring commitment costs and other non-convex into energy market offers
  - Ensure load sees real-time price signals, whether through state real-time retail prices or FERC moving DER/DR into wholesale markets

## Making sure market price = cost

- Load must see price signal for real-time system cost
  - Volumetric rates ignore that cost/value varies drastically depending on time of consumption/production, even though smart meter technology allows real-time pricing
  - Demand charges are poor proxy for system capacity costs as they are non-coincident
  - Many system costs (capacity, T&D) can be incorporated as a simple multiplier to energy market prices

- Wholesale markets should incentivize efficient scheduling and dispatch of generators
  - Imbalance charges and cost-of-service rates are poor proxy for system costs
  - Energy markets generally factor in system costs, but more commitment costs should be brought into energy markets

## Recognizing preferences for conventional generators in current markets

- In non-market areas, renewable generators should not be penalized for costs caused by lack of market. EIM and FERC Order 764 helping.

- Many “integration costs” are caused by inflexibility of current fleet

- As a thought experiment, a power system with 100% flexible, non-fueled resources would not need day-ahead commitment or day-ahead markets

- Inflexible conventional generators can impose cycling costs on other resources, bringing commitment costs into energy market should address that

- Cost of large conventional generator outages socialized to load and other generators through contingency reserve costs, primary frequency response obligations