

# Renewables and Gas-Fired Generation: A Good Match or Relationship in Need of Therapy?

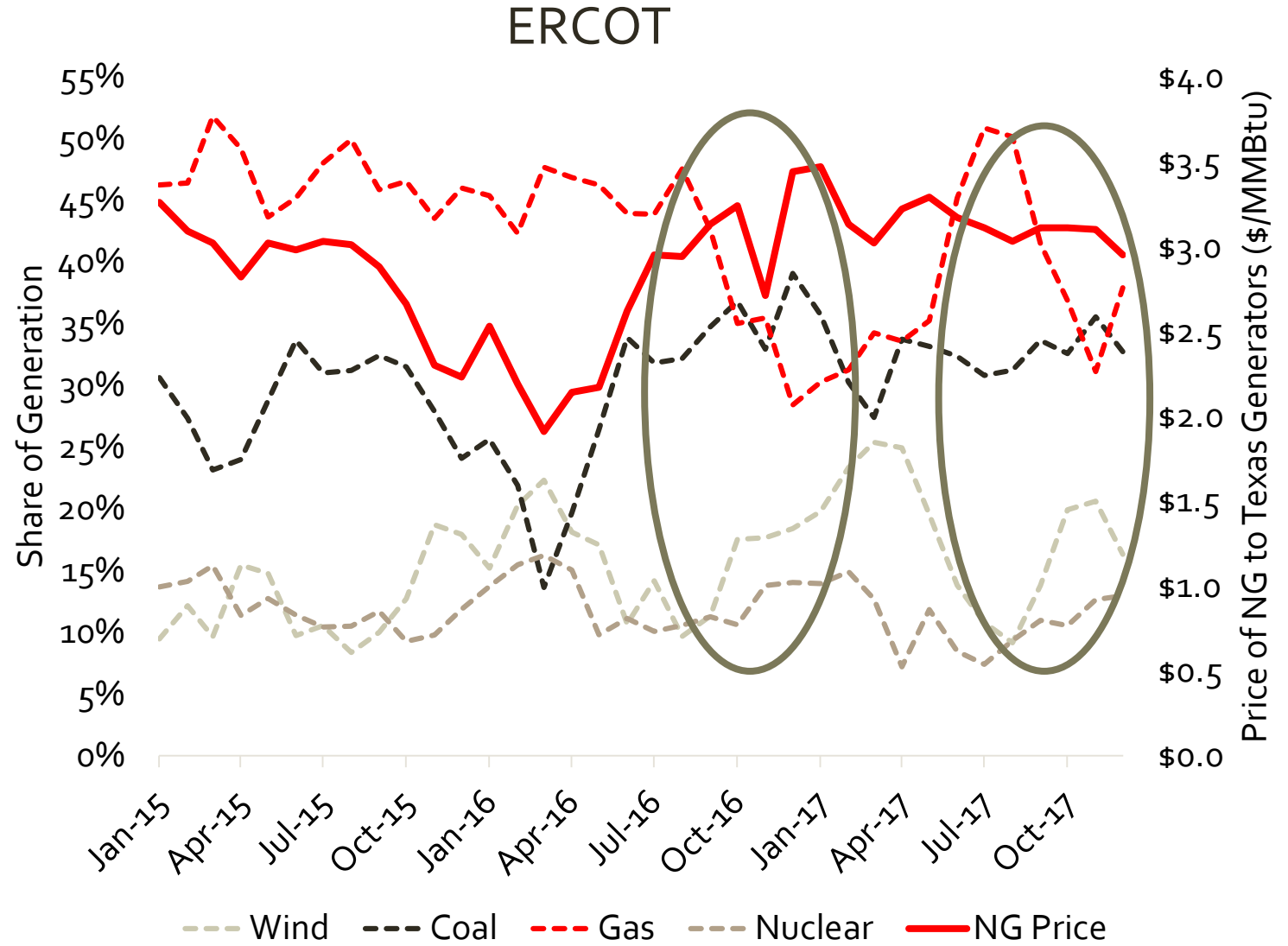
Gas/Electric Partnership

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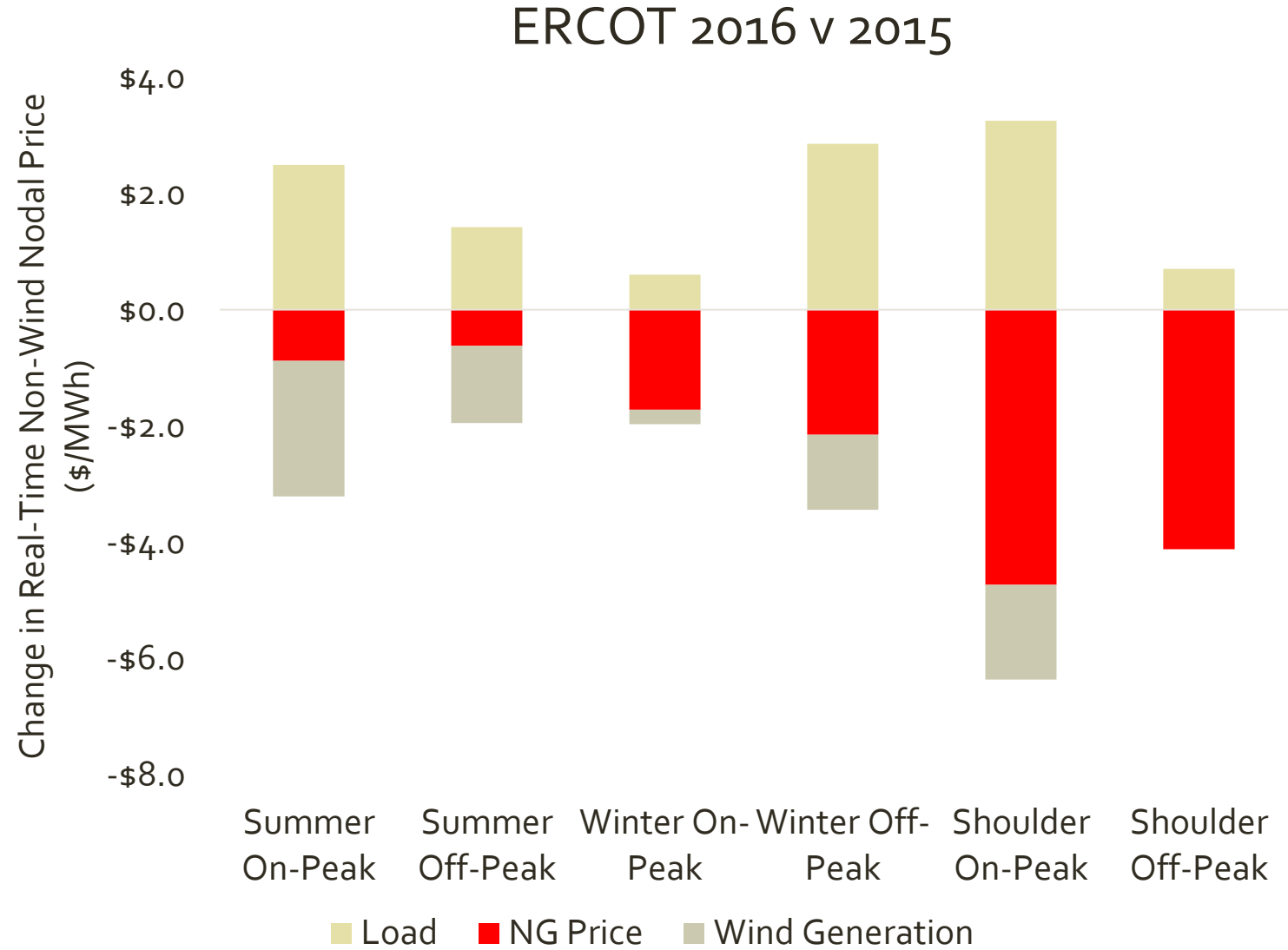
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# Renewables Displace Thermal Generation



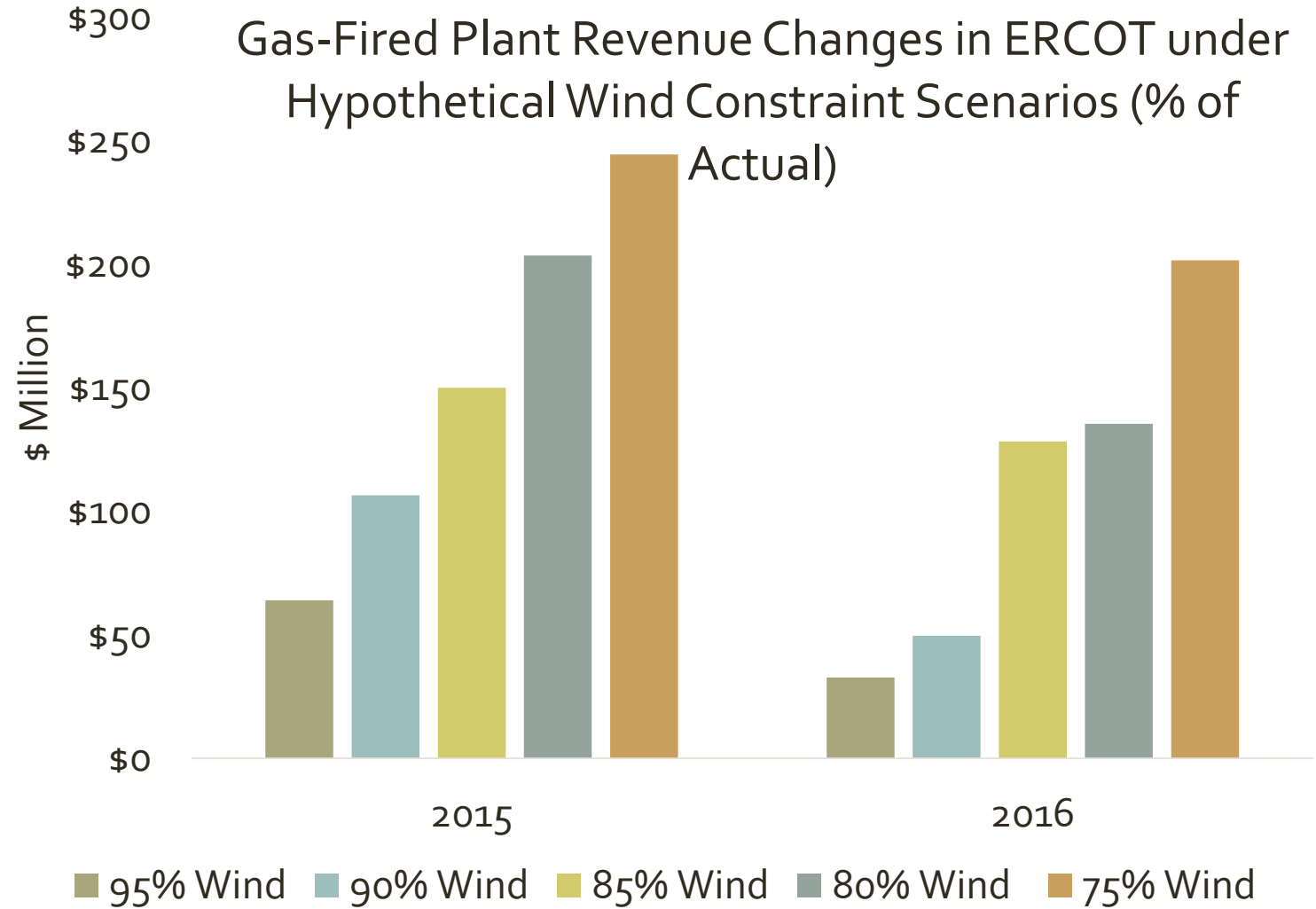
For detailed discussion, see upcoming book by Michot Foss: *Wellhead to Burnertip – Monetizing Natural Gas in the New, "New" Economy*

Cheap NG Is  
the Main  
Driver but  
Renewables  
Also Reduce  
Electricity  
Prices



*Calculated based on the econometric analysis of ERCOT data by Tsai and Eryilmaz (Effect of wind generation on ERCOT nodal prices, Energy Economics, Volume 76, 2018, Pages 21-33).*

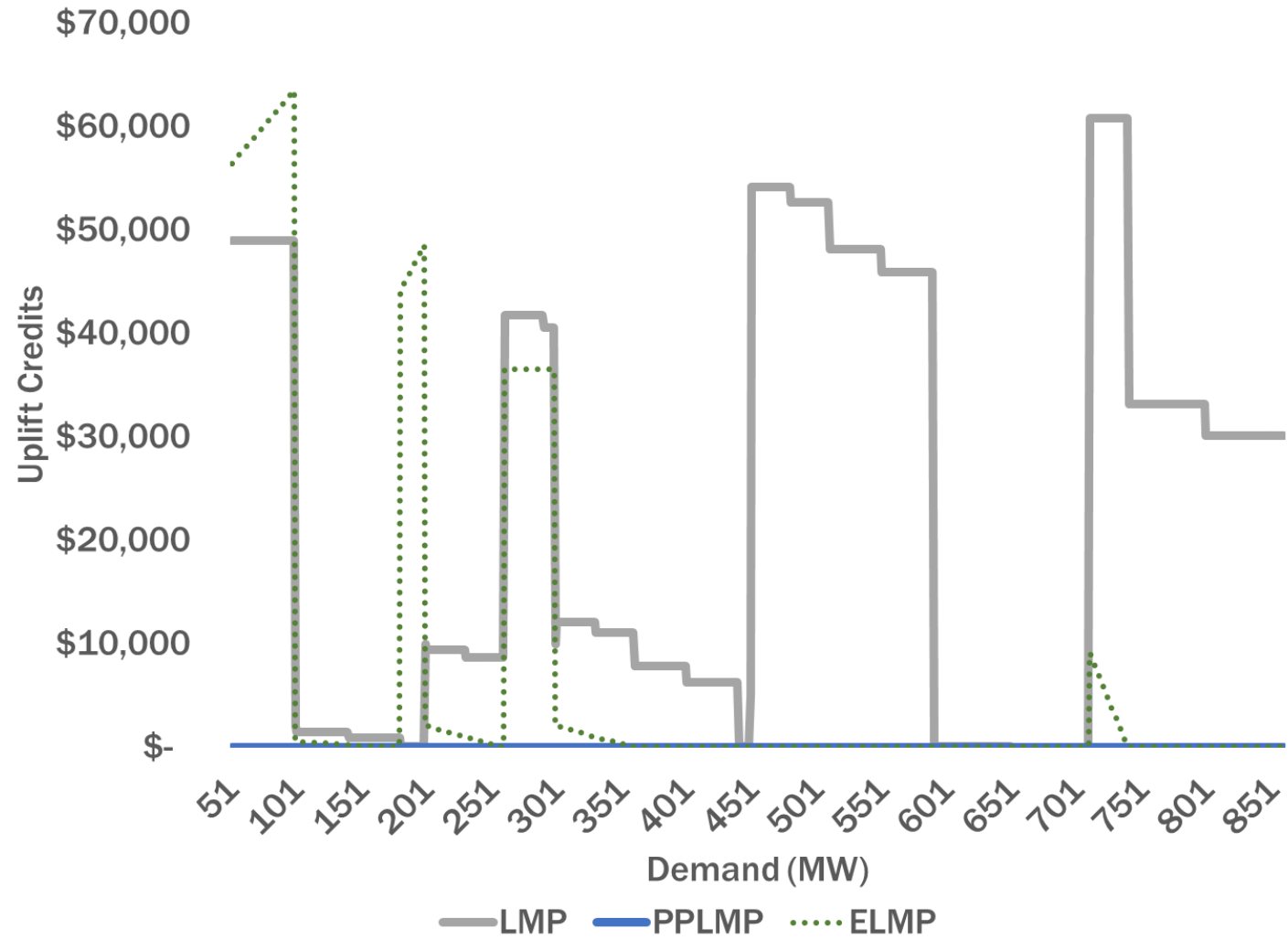
Less  
Generation +  
Lower Prices =  
Lower  
Revenues



# Battery Storage Will Displace Gas Peakers if Scaled Up. Already Happening in CA.

- About 1,200 MW power, 1,500 MWh energy capacity installed
  - In contrast, 1,100,000 MW of installed net summer generation capacity of all types
- Assuming charge-discharge once a day, batteries could meet 0.007 percent of total consumption nationwide
- But, mandates encourage more: 10,000 MWh by 2024 is likely
  - Still, 0.09 percent of total consumption
- However, 35,000 MW of utility-scale storage capacity is in interconnection queues, ~25,000 MW in CA, many solar+storage projects

# Renewables Increase Ramping Needs & Complicate Market-Based Pricing



Hypothetical Comparison of Out-of-Market Uplift Payments Under Various Price Formation Formulas in 'Micro' System