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ENERGY STORAGE
& GRID SERVICES L.P.

Impact of CAES on Wind in TX, OK, NM

EESAT 2005

October 17-19, 2005

ACKNOWLEDGMENTS

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- Funded in part by the Energy Storage Systems Program of the U.S. Department Of Energy (DOE/ESS) through Sandia National Laboratories (SNL).

Goals for Today

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- Inform community about CAES/wind study
- Share selected results from wind analysis

About The Study

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- Economic value analysis of using CAES to integrate wind in the SPS control area
  - Eastern plains of NM to the panhandle areas of TX and OK
- Sponsored by DOE State Energy Program and the Texas State Energy Conservation Office

Team

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- Industry
  - Ridge Energy Storage & Grid Services
  - Xcel Energy
  - RnR Engineering
- Academia
  - Alternative Energy Institute
  - Oklahoma Wind Power Initiative
- State Energy Offices
  - Texas
  - New Mexico
  - Oklahoma

Study Objectives

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- Assess the ability of energy storage to positively affect dispatch of renewable resources
- Assess and quantify economic benefits of using energy storage to improve grid stability issues and congestion associated with renewable energy
- Determine the economic advantage of using storage to firm and shape renewable energy sales
- Determine institutional barriers and opportunities for energy storage combined with renewable energy facilities.

How CAES Works

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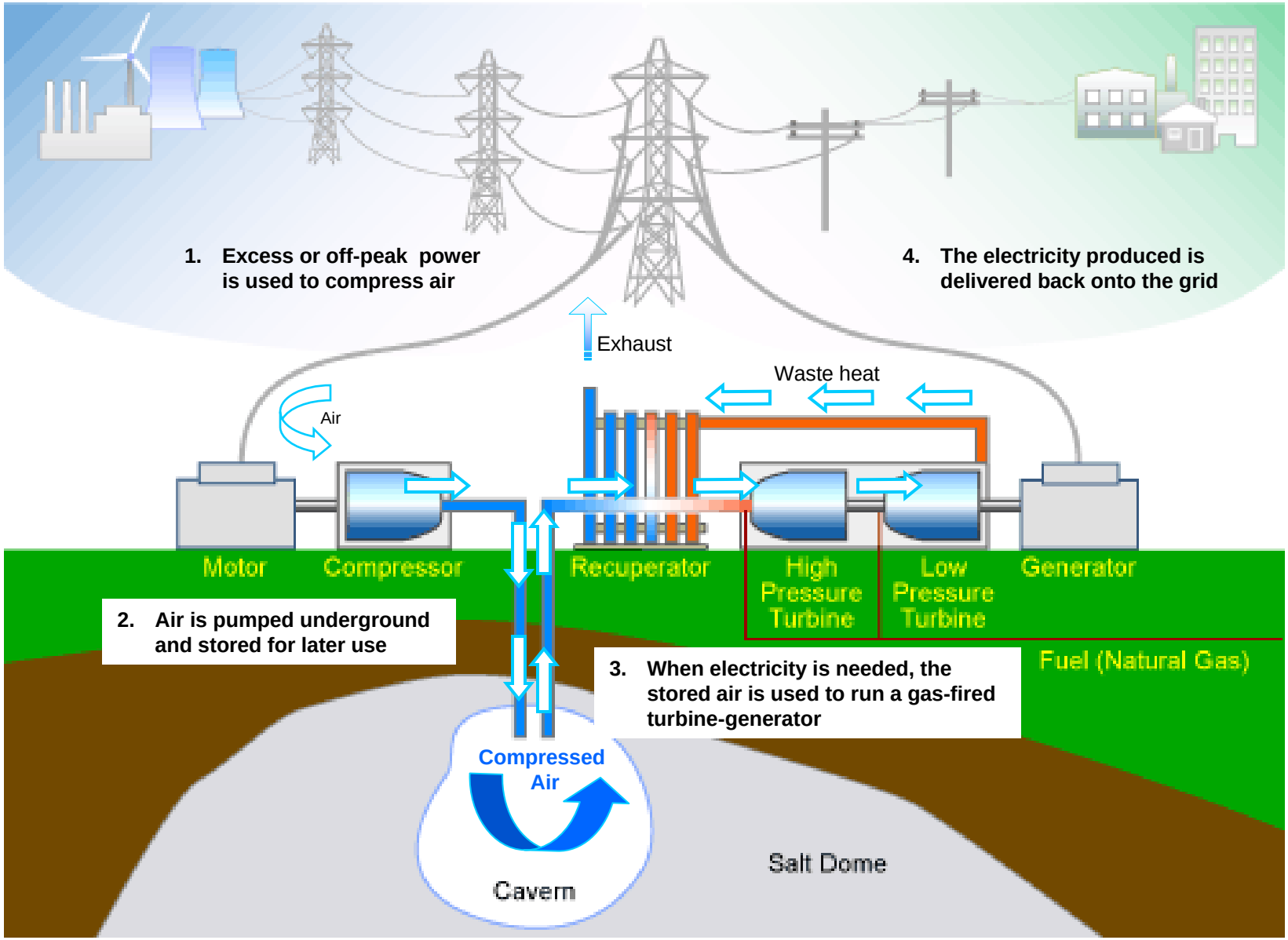

Modeling Locations

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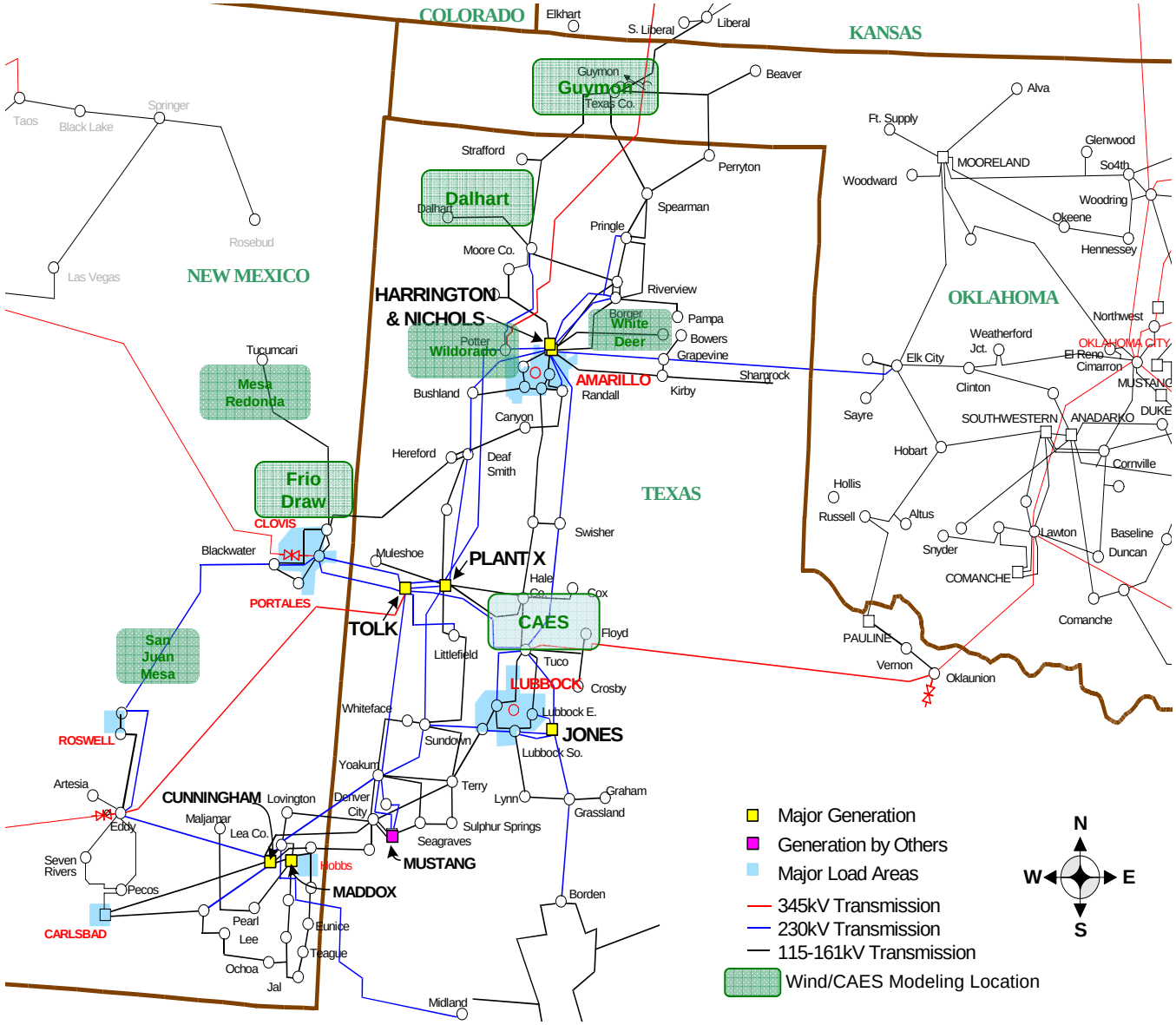
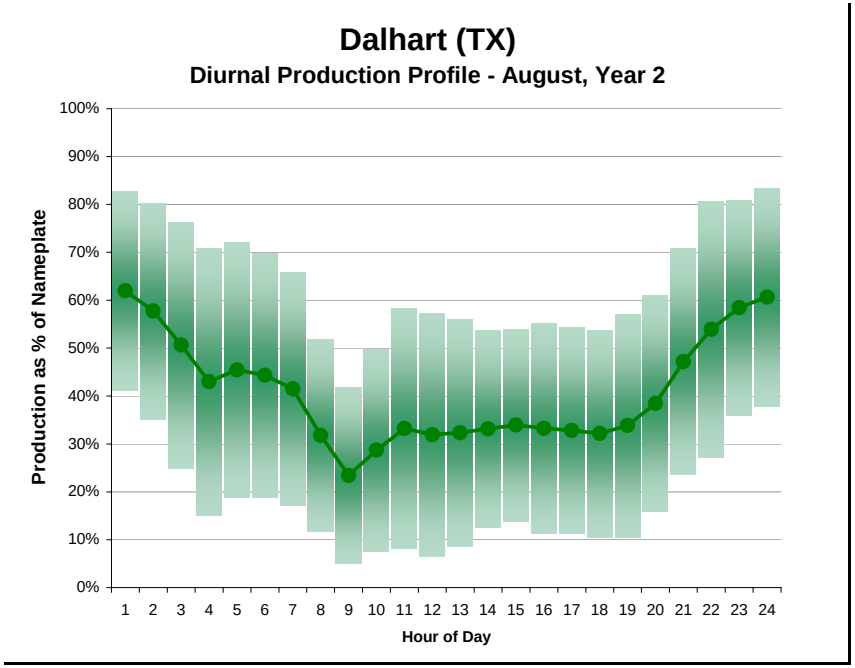
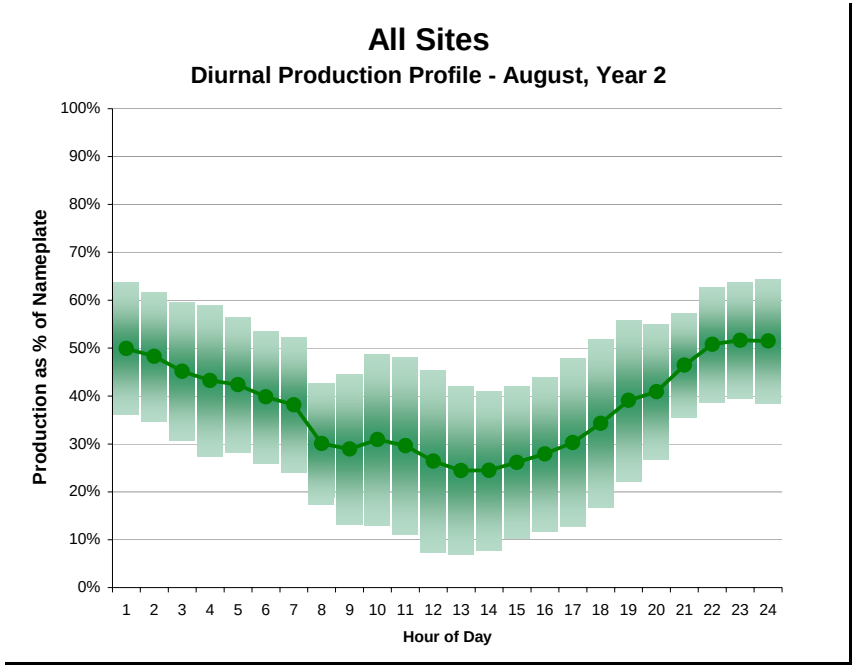


Volatility Reduced With Multiple Sites





Wind and Load Profile Contrast

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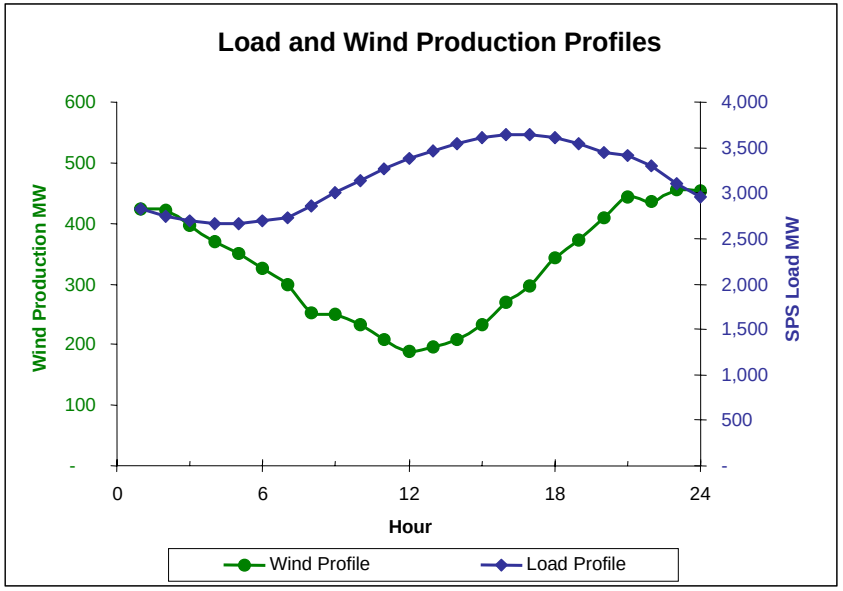
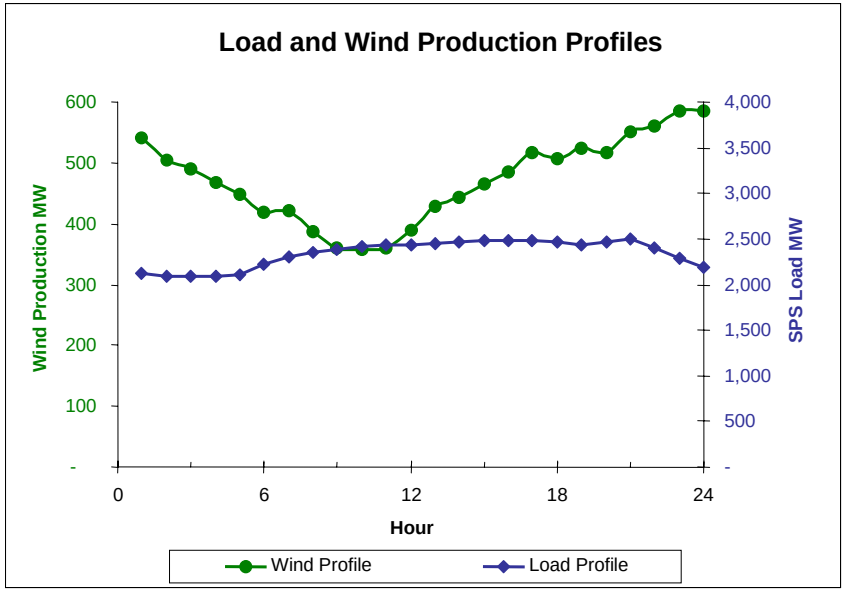
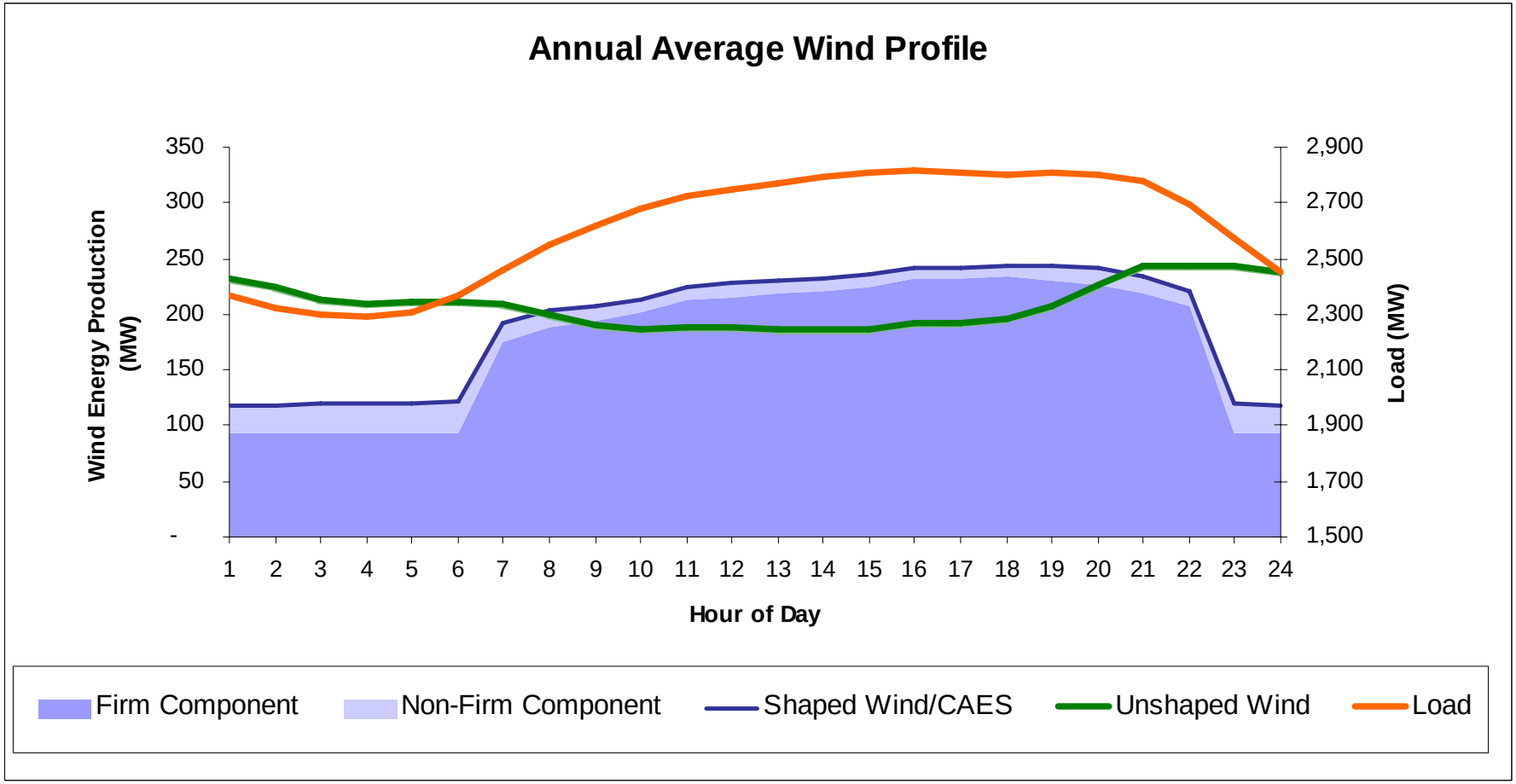
July 2000



April 2001



Dispatch Results



Economic Summary

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- Value created by a CAES plant:
  - shaping services
  - firming services
  - long term capacity benefits
  - improved transmission flows

Economic Summary

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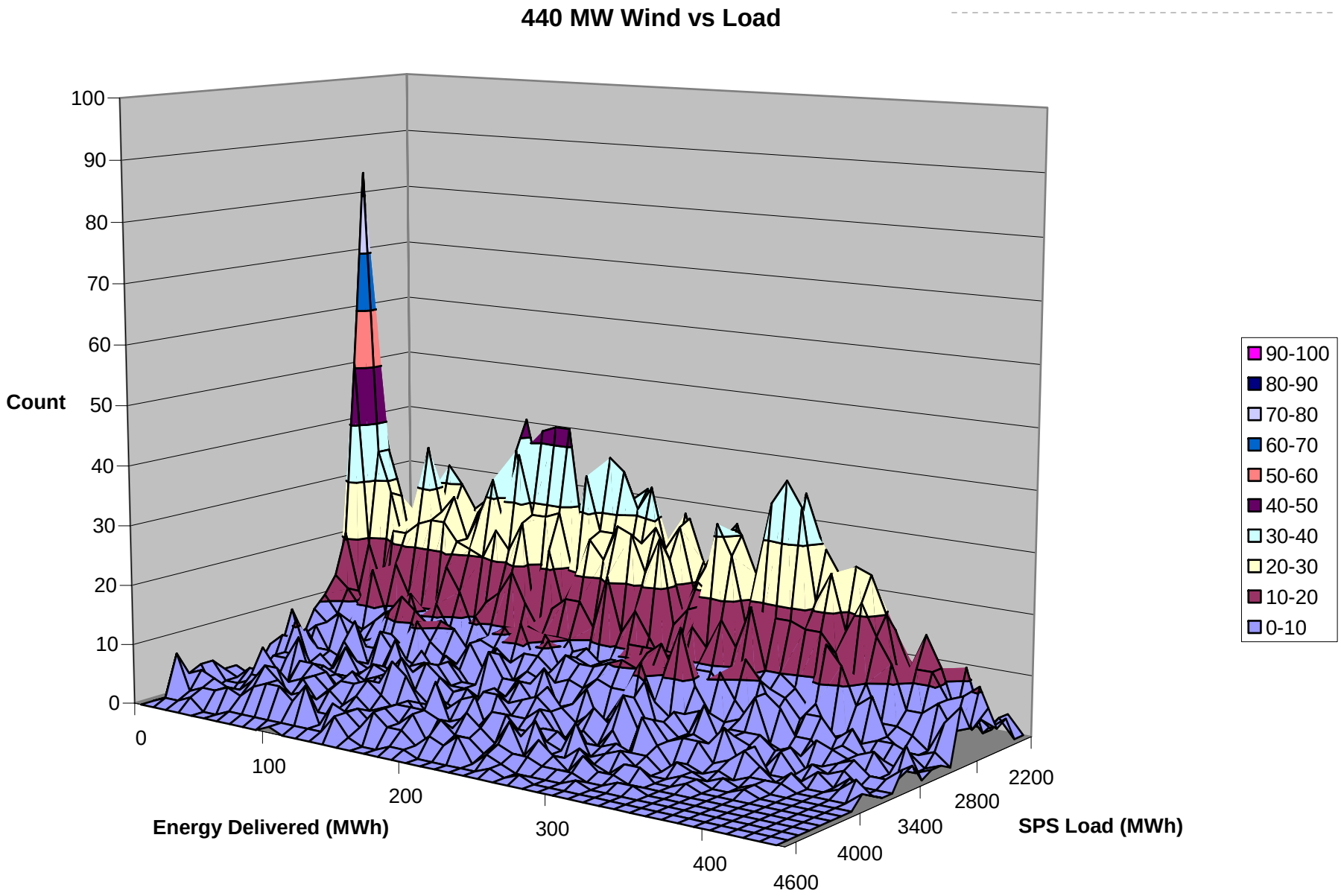
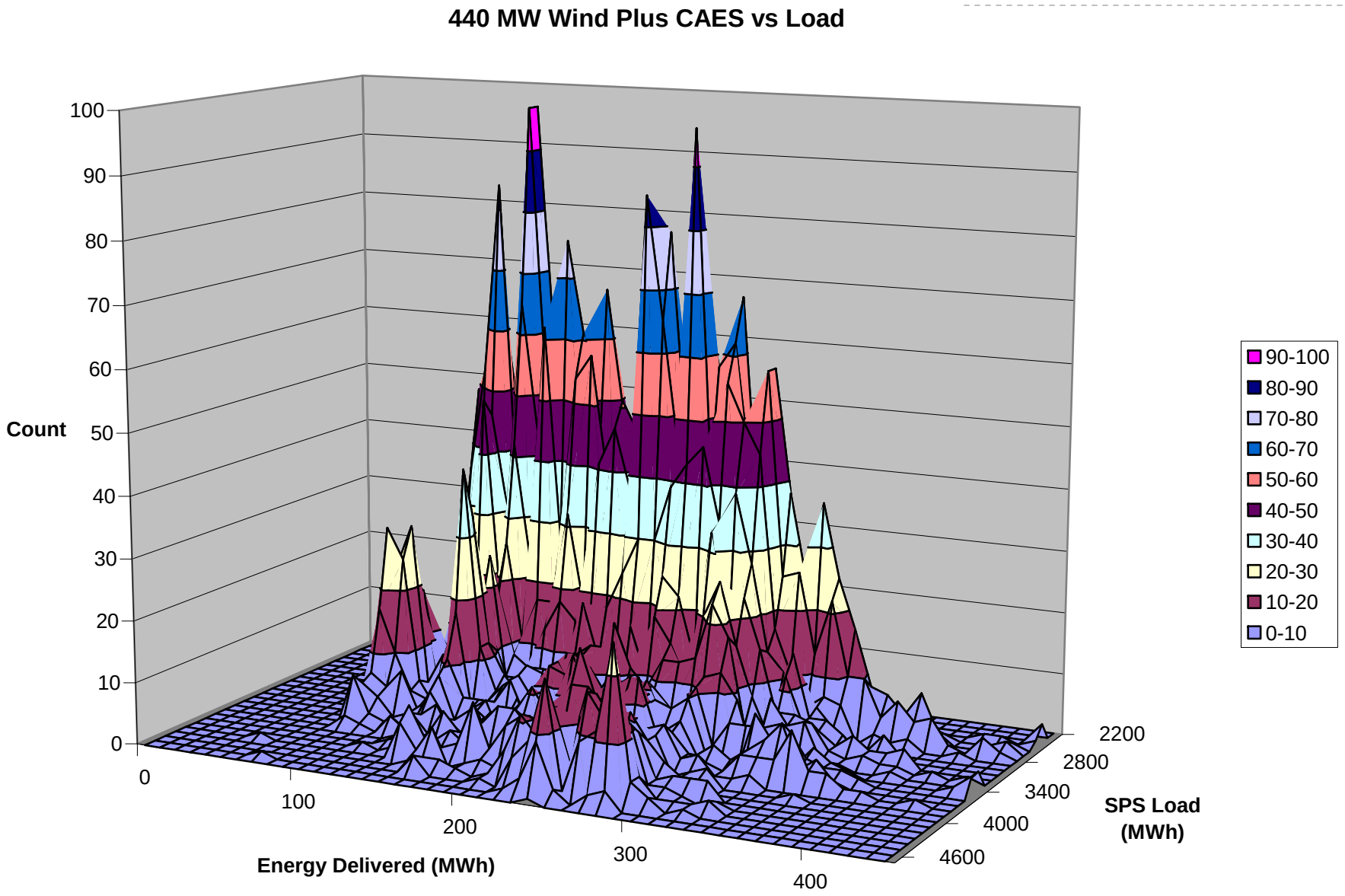
($000)	Base Wind Scenario	Study Wind Scenario
Net Shaping Value	($283)	$10,918
Firming Value	$3,222	$3,552
Capacity Value	$20,507	$20,507
Additional Imports	$5,778	$4,282
New Transformer	($490)	($490)
Total Annual Value	$28,734	$38,769
Annual CAES Capacity Cost (SPS ownership structure)	($28,472)	($28,472)
Net CAES Value /year	$262	$10,297

Wind vs. Load (without CAES)



Wind/CAES vs. Load



Conclusion

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- CAES provides benefits in integrating large quantities of wind energy into the grid
- CAES adds value to wind energy:
  - Delivery profile
  - System ramping
  - Transmission
  - Economics
- Final report is located at: www.seco.cpa.state.tx.us/re_wind.htm