

*DOE FOA-9 Wind Integration
“Integrating Midwest Wind Energy
into Southeast Electricity Markets”*

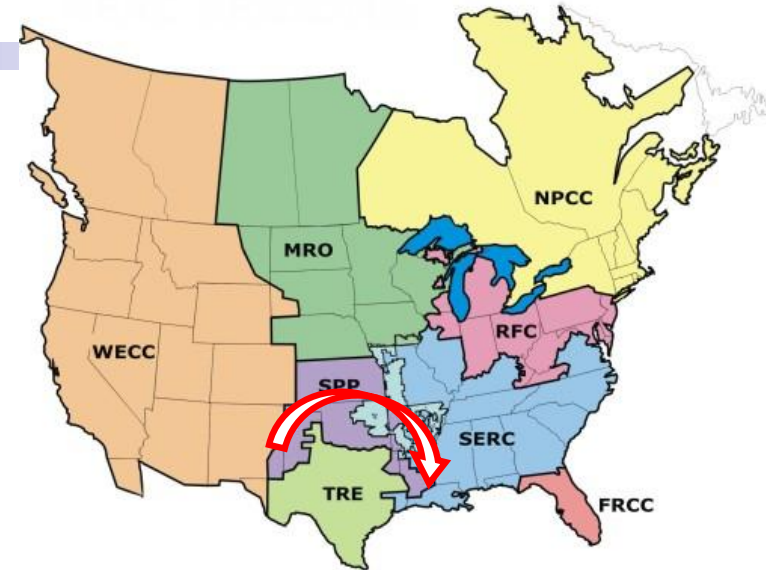
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IIT Wind Consortium Meeting

July 20, 2011

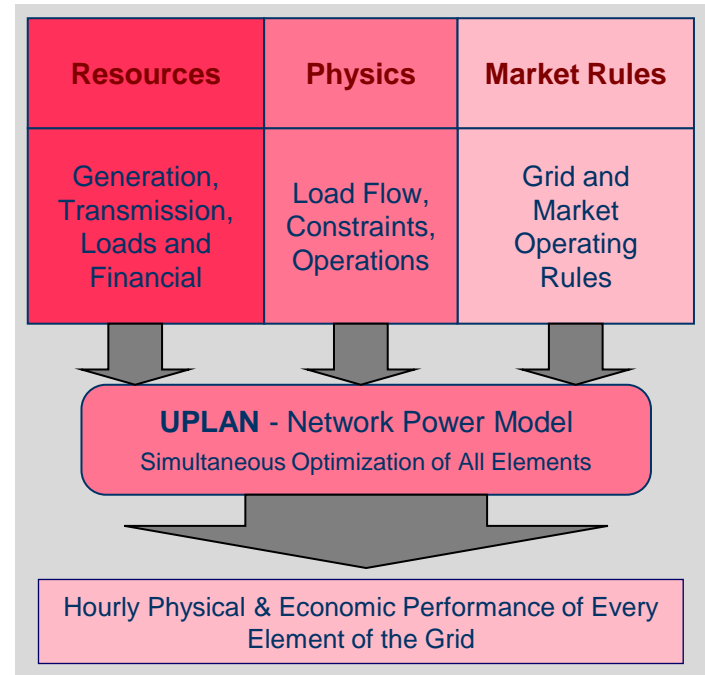
Project Background

- 2009 DOE FOA 09
 - 5 utility co-respondents
- Objective: Evaluate operating cost benefits of coord. scheduling/balancing for SPP wind transfers to SERC BAs
- Scope of Work
 - Develop Y2022 SPP/SERC Non-RES SCUC/SCED model
 - Evaluate SPP wind transfer potential w/existing Trans
 - Develop Y2022 SPP/SERC High-Wind Transfer SCUC/SCED
 - Evaluate scheduling/balancing challenges
 - Evaluate benefits of collaboration in scheduling/balancing
 - 4 collaboration scenarios defined for evaluation
- Report due end August 2011
 - Initial results shown here



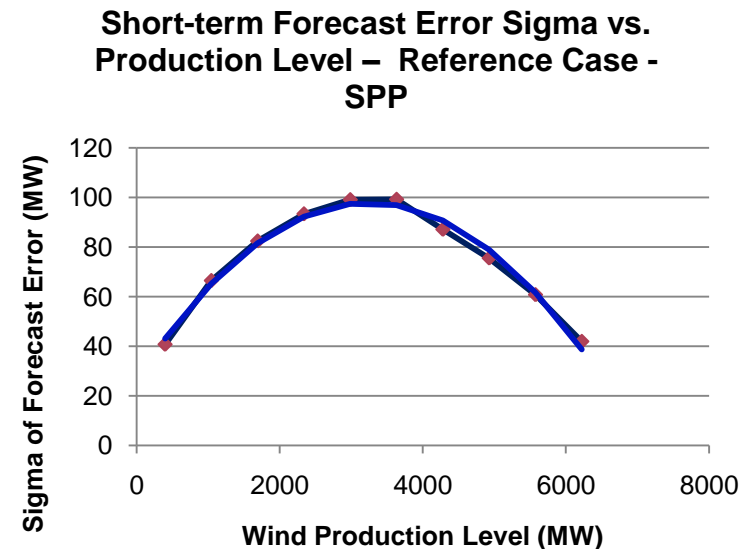
Balancing Scenarios for Evaluation

1. Hourly Scheduling
 - SPP deals with all intra-hour variability
 - Wind delivered to each SERC BA in flat hourly blocks set 30 minutes before the hour
 2. Dynamically schedule wind to SERC BAs
 - **intra-hour** variability/uncertainty borne by each SERC BA not SPP
 3. Full SPP/SERC cooperation
 - Joint load balancing with 5-min transactions across SPP & SEC
 4. Full SPP/SERC cooperation, with no intra-BA hurdle rates
- *Assumes adequate transmission – transportation model analysis*
 - Development of actual transmission plan beyond scope of project
 - Wind data taken from NREL dataset
 - UPLAN production cost model used

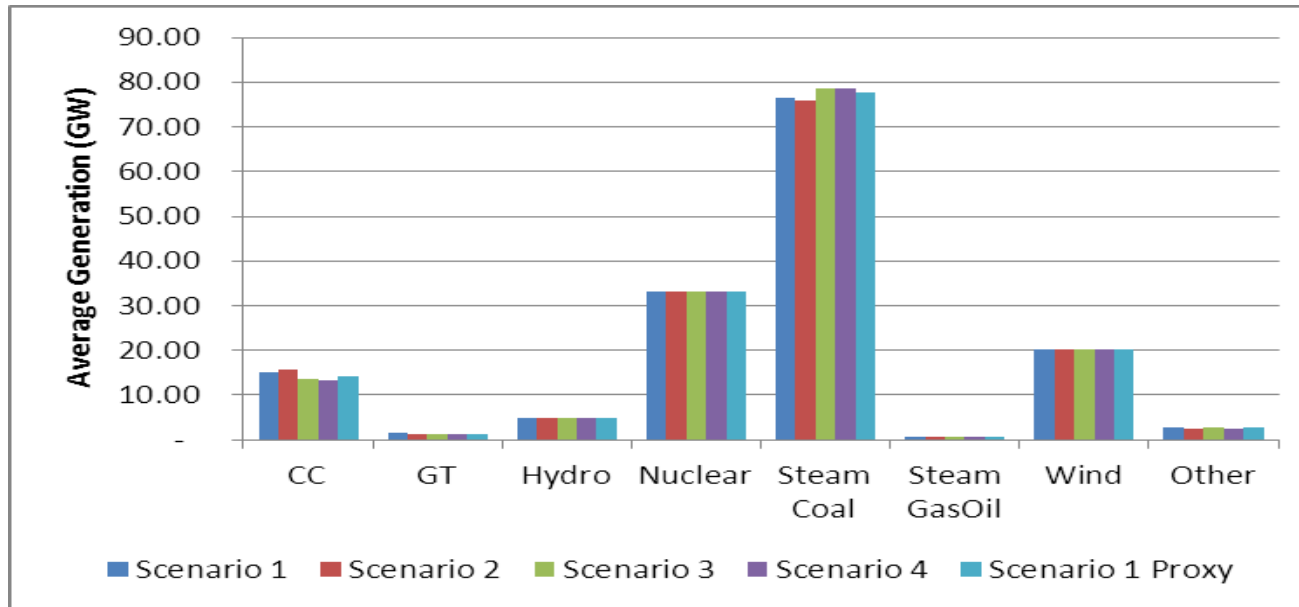


Calculation of Reserves

- Load regulation at 1.5% of hourly load
- Wind short-term forecast error component - Regulation
 - Based on 10 minute advance error
 - Function of wind production level
 - Calculated for each area
- Load and wind regulation non-correlated
 - Combine as root-sum-squares to form total regulation
- Spin and supplemental (non-spin)
 - Hour ahead error
 - Function of production level
- Additional spin and supplemental components for contingency supplied by participants



Initial Study Results



- Average hourly generation by type shown across entire study footprint for 4 scenarios plus 'proxy'/integration cost scenario
- CC and coal most affected, as expected
- Individual regions also examined in detail in report

Initial Study Results

Change in GW	EES	TVA	SBA	SPP	SERC West	SERC East	Total
CC	0.03	(1.00)	(1.41)	(0.03)	0.00	0.05	(2.37)
GT	0.00	(0.26)	(0.03)	(0.02)	0.09	0.07	(0.15)
Hydro	-	-	-	-	-	-	-
Nuclear	0.00	-	-	0.00	-	(0.00)	0.00
Coal	0.03	0.50	0.47	0.62	0.50	0.32	2.45
Gasoil	(0.06)	-	(0.00)	(0.00)	-	0.00	(0.06)
Wind	-	-	-	-	-	-	-
Other	0.01	0.01	0.05	0.02	(0.01)	0.04	0.12
Total	0.01	(0.75)	(0.93)	0.60	0.58	0.48	(0.00)

- Change in average hourly generation for scenario 3 vs. scenario 2
- Positive shows increase for Scenario 2
- Shows difference when reserve requirements are shared throughout footprint
 - Coal used more due to relative differences in cost in modeling

Together...Shaping the Future of Electricity