



# Integration of Solar Resources in Southern Nevada



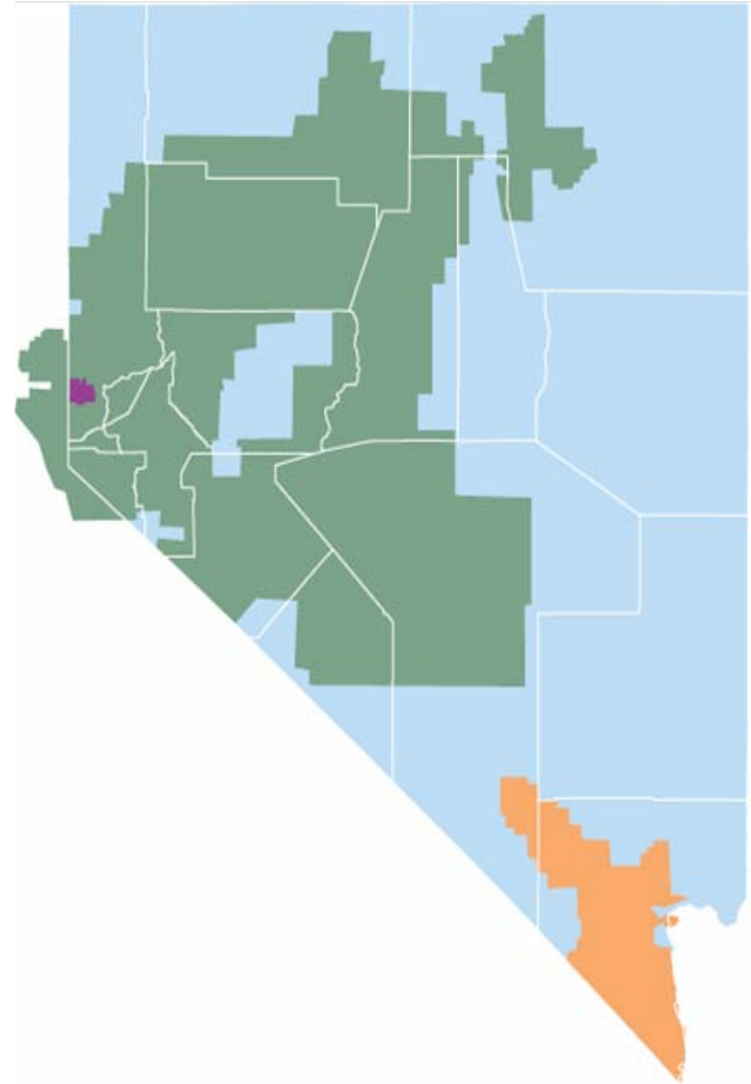
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October 15, 2010

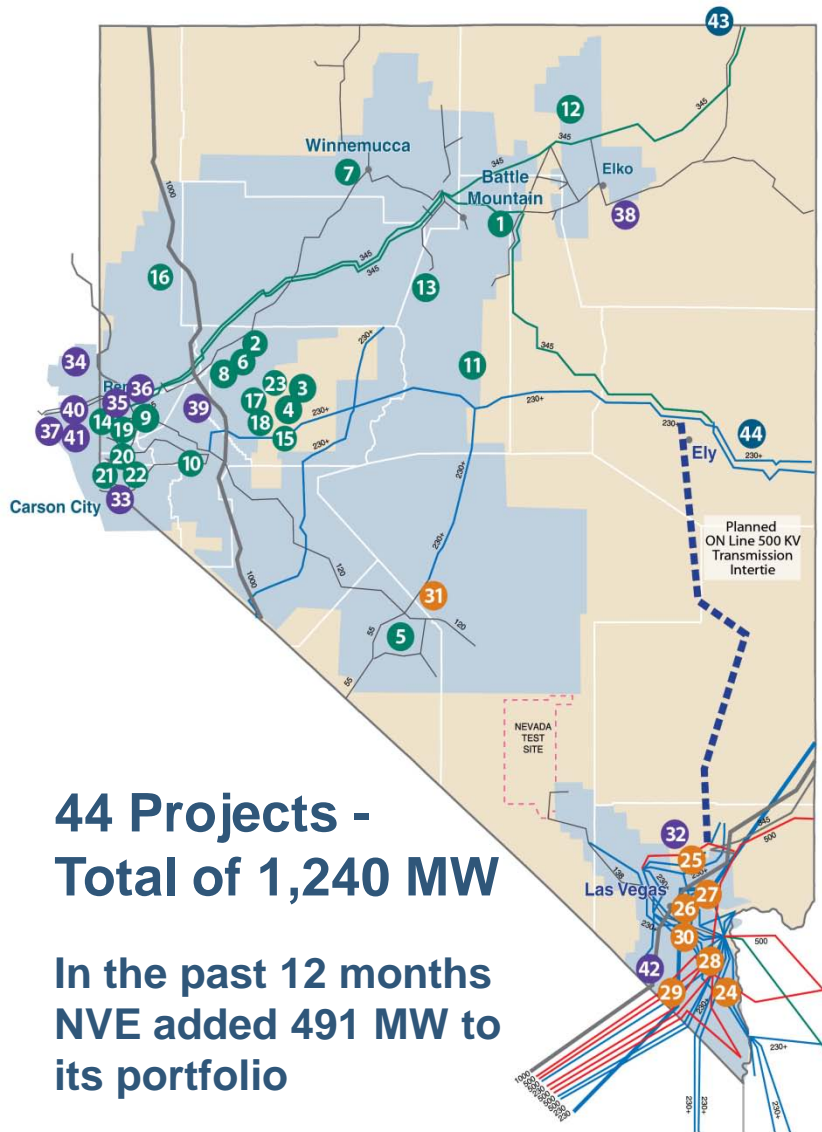
# NV Energy

- ❖ **Serves 2.4 million Nevadans**
- ❖ **5,550 MW load in South**
- ❖ **1,800 MW load in North**



# NVE Renewables Portfolio

● In Development



**44 Projects -  
Total of 1,240 MW**

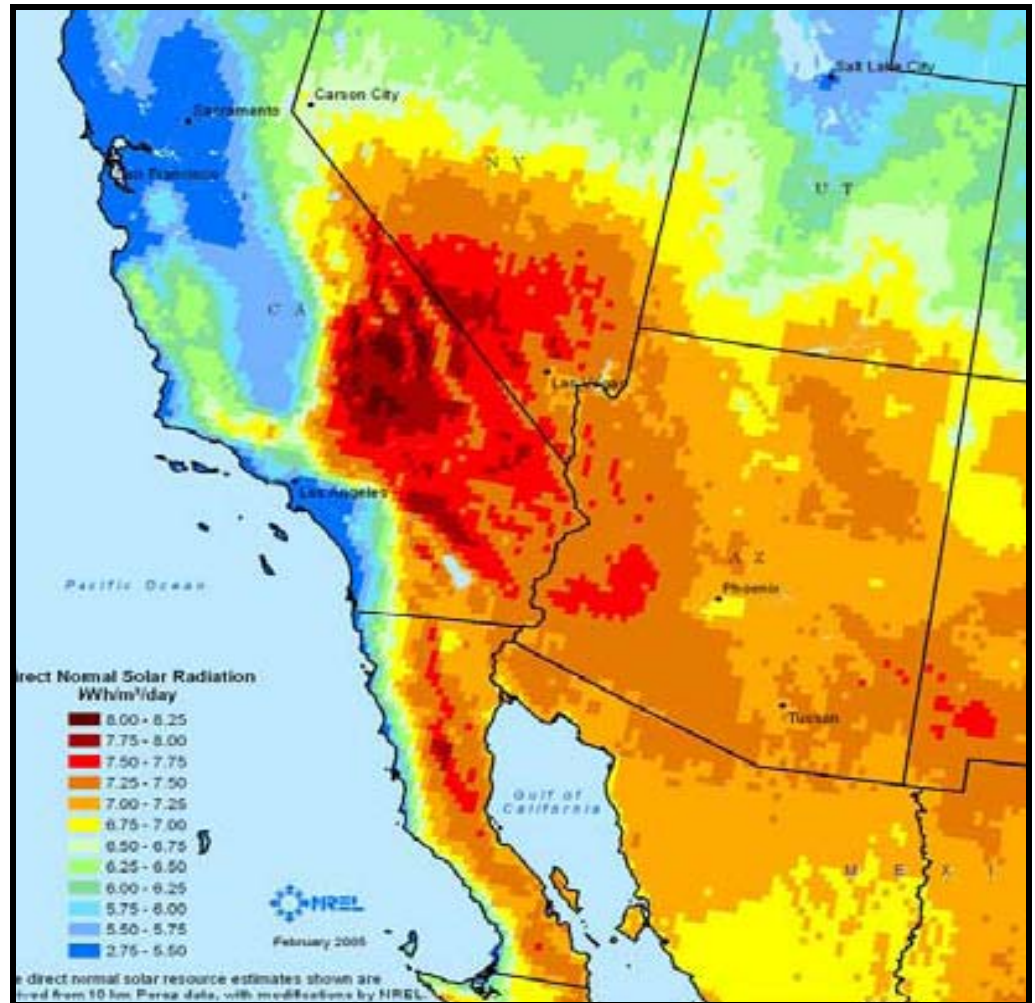
**In the past 12 months  
NVE added 491 MW to  
its portfolio**

Category	Project Name	Capacity (MW)	Status	
GEOTHERMAL	1 Beowawe	17.7	Operational	
	2 Brady Geothermal Project	21.5	Operational	
	3 Carson Lake Basin	62	In Development	
	4 Carson Lake Geothermal Project	31.5	In Development	
	5 Clayton Valley	53.5	In Development	
	6 Desert Peak Geothermal Project #2	19	Operational	
	7 Faulkner 1	49.5	Operational	
GEOTHERMAL	8 Galena 2	13	Operational	
	9 Galena 3	26.5	Operational	
	10 Homestretch	2.1	Operational	
	11 McGinness Hills	51	In Development	
	12 Hot Sulfur Springs 2	25	Operational	
	13 Jersey Valley Geothermal Project	31.5	In Development	
	14 Richard Burdette Generation Facility	26	Operational	
GEOTHERMAL	15 Salt Wells	23.6	Operational	
	16 San Emidio	3.8	Operational	
	17 Soda Lake I	3.6	Operational	
	18 Soda Lake II	19.5	Operational	
	19 Steamboat Hills	13.2	Operational	
	20 Steamboat IA	2	Operational	
	21 Steamboat II	13.4	Operational	
SOLAR	22 Steamboat III	13.4	Operational	
	23 Stillwater 2	47.2	Operational	
	24 American Capital Energy - Searchlight Solar LLC	17.5	In Development	
	25 Fotowatio	20.5	In Development	
	26 Las Vegas Valley Water District (Six Projects)	3.1	In Development	
	27 Nellis AFB	12	Operational	
	28 Nevada Solar One	64	Operational	
SOLAR	29 Next Light/Silver State	50	In Development	
	30 Procaps Laboratory	0.2	Operational	
	31 SolarReserve Tonopah Solar Energy Facility	110	In Development	
BIOMASS	32 CC Landfill LLC	10.7	In Development	
	33 Renewable Energy Ctr. @ N NV Corr. Ctr.	1	Operational	
	34 Sierra Pacific Industries	10	Operational	
	35 Truckee Meadows Water Reclamation Facility	1.4	Operational	
	36 Waste Management Renewable Energy	3.2	In Development	
	HYDRO	37 Fleish	2.3	Operational
		38 Hooper	0.8	Operational
39 Truckee Carson Irrigation District		4	Operational	
40 Verdi		2.2	Operational	
WASTE HEAT	41 Washoe	2.2	Operational	
	42 Goodsprings	5.8	In Development	
WIND	43 China Mountain	200	In Development	
	44 Spring Valley	150	In Development	



# Solar Resources

**Mojave Desert, centered in S. CA and extending into S. NV is the U.S.' prime solar resource**



# Solar Projects in So. Nevada

## ❖ PV – ground and roof-mounted

- 20 MW in operation
- Total of 104 MW under PPAs

## ❖ Concentrating PV

- Amonix at Clark Station
- Amonix manufacturing facility announced

## ❖ Solar thermal (parabolic trough)

- 64 MW Nevada Solar One

## ❖ Solar thermal with storage

- 100 MW Solar Reserve



# Solar Challenges

## ❖ Intermittency

- Day/Night
- Clouds

## ❖ Load profile

- Peak demand at 6:00 PM, output near 0

## ❖ Solar thermal (parabolic trough)

- Better at dealing with intermittency, still “runs with the sun”



# Solar Challenges

- ❖ NVE has recently received interconnection requests for utility-scale PV projects, ranging from 20MW to as much as 300 MW in size.
- ❖ NVE is concerned that the impact of intermittency on the output of these PV facilities (typically associated with the passage of cloud shadows over the array) will potentially put strains on the ability of the NVE system to “follow” these intermittent recourses with existing dispatchable generators.



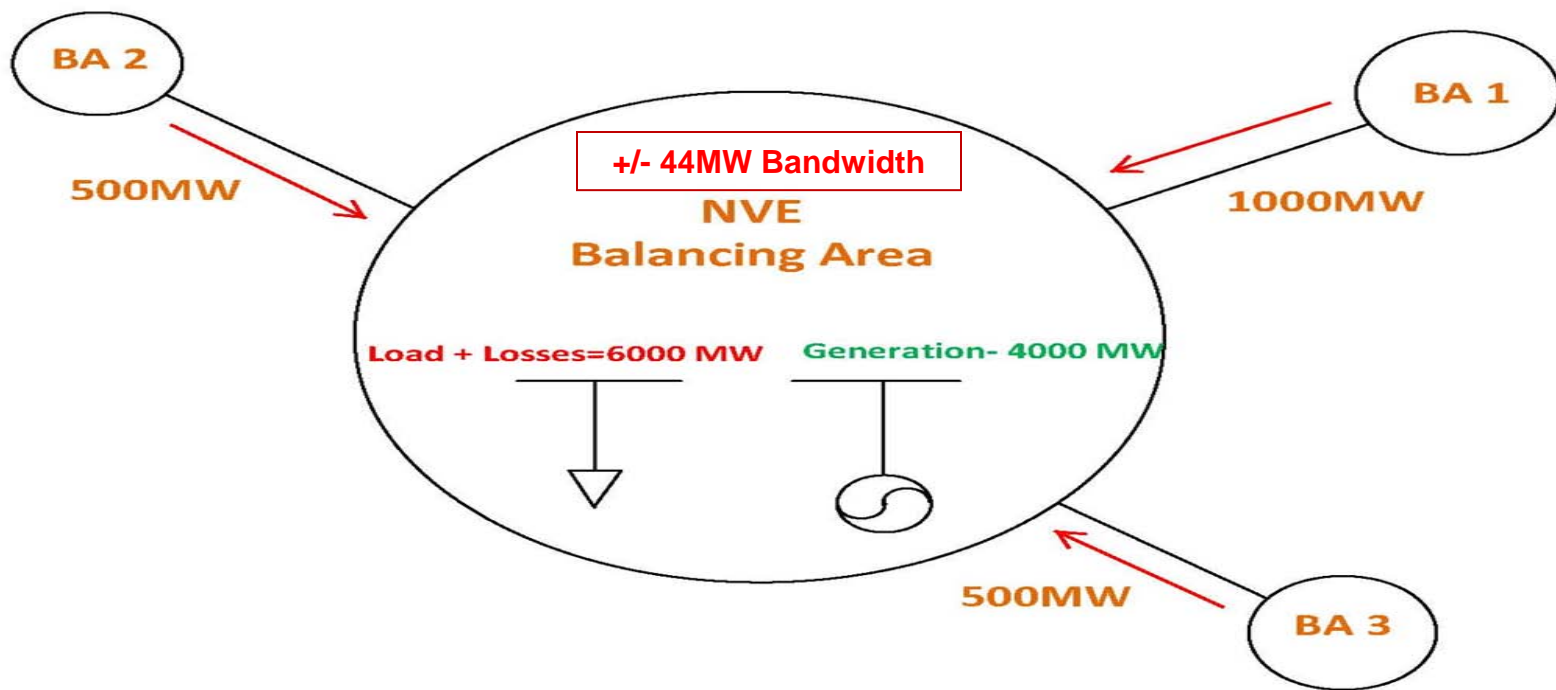
**NVE's 2009 Integrated Resource Plan included approval of a study to examine impact of solar PV on NVE's transmission and distribution grids, and integration into NVE balancing area.**



# Balancing Authority Operations

Generation + Imports = Load + Losses

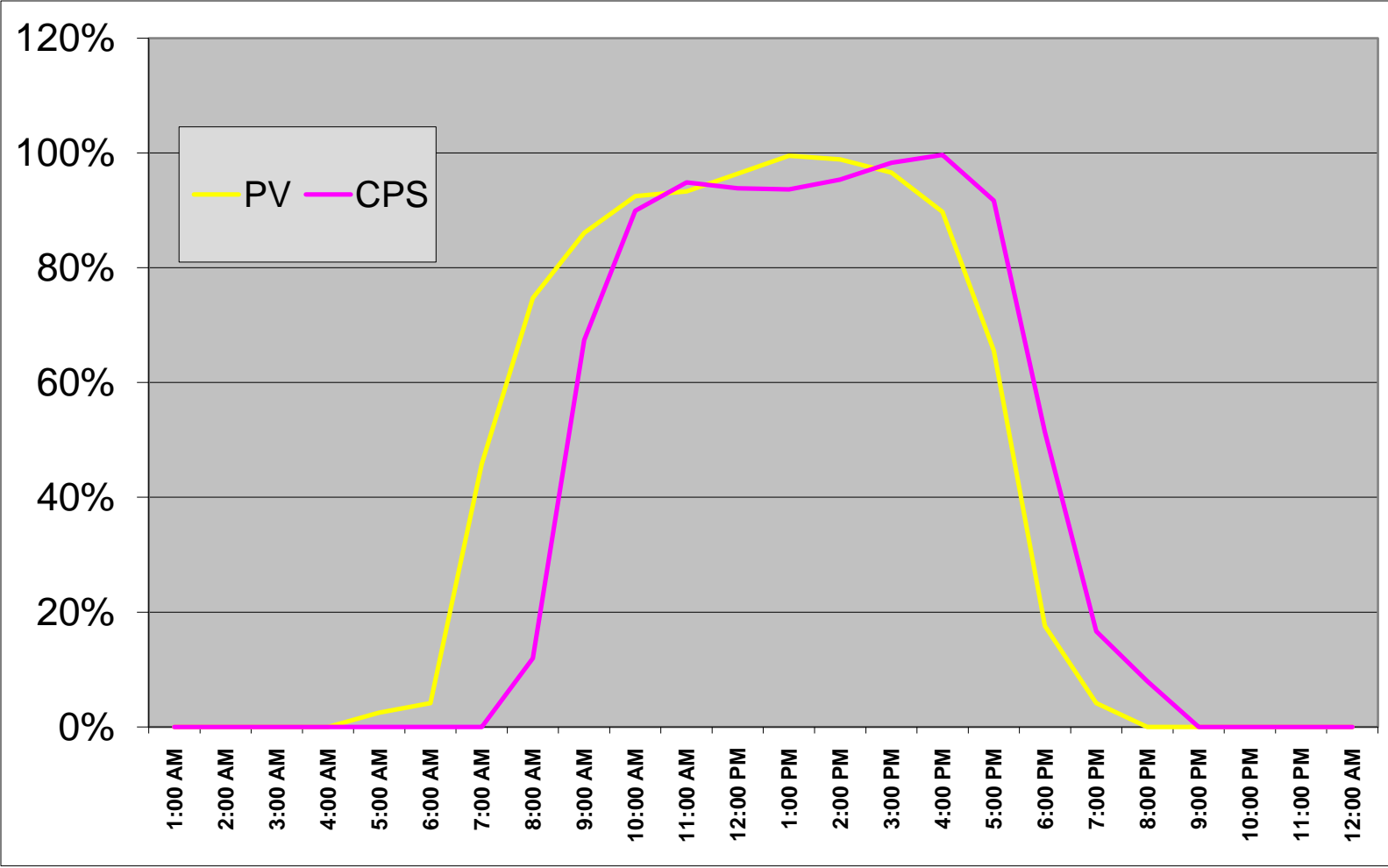
Must maintain regulating and contingency reserves to meet control performance and reliability standards



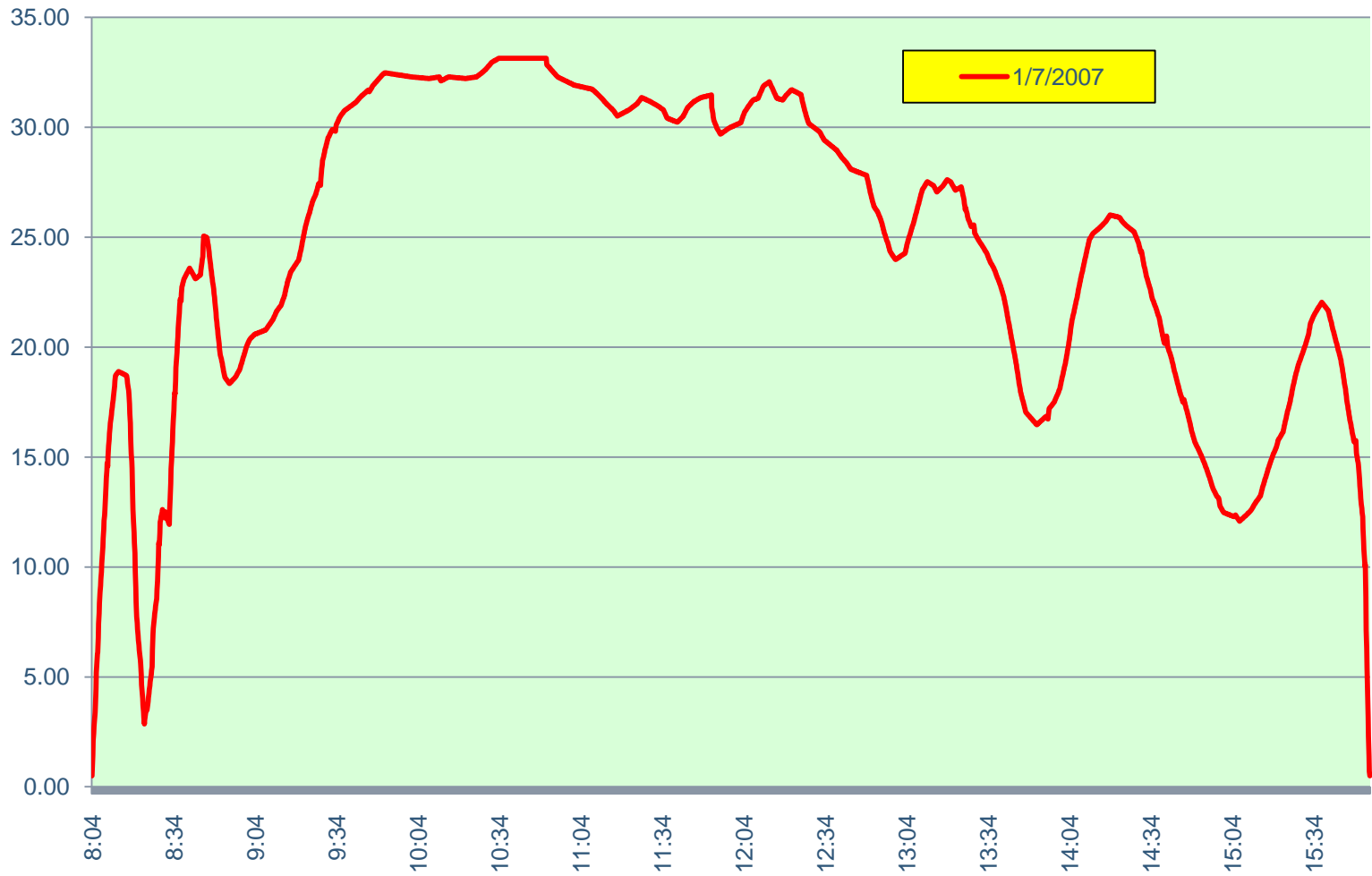
The difference between the planned and actual balance is called the Area Control Error (ACE)

# NVE South BA solar project

## May 17, 2008 output

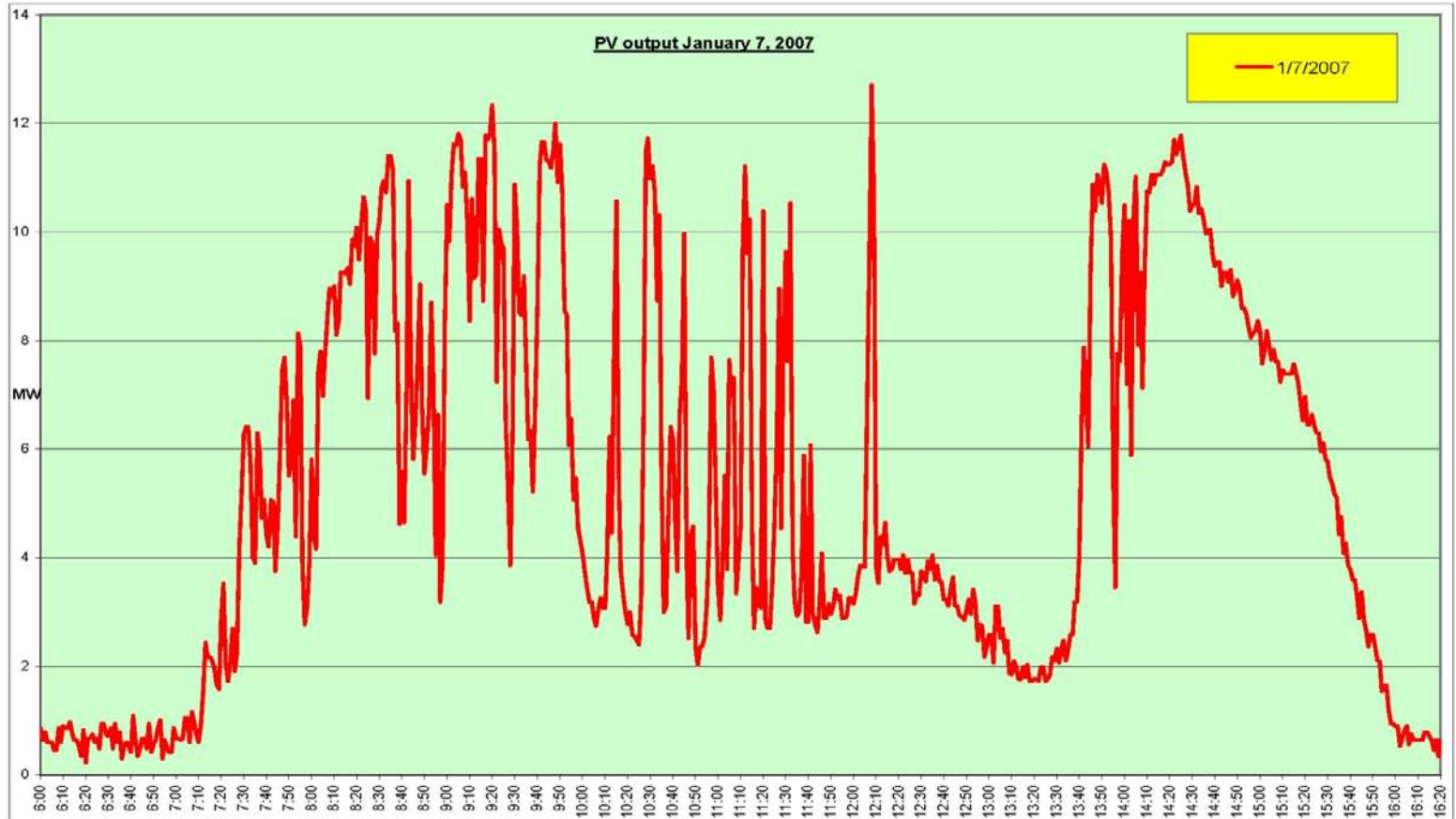
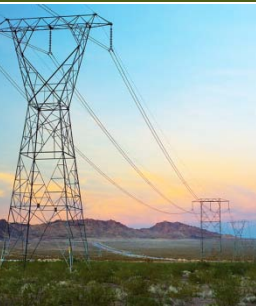


# NVE CSP solar project January 1, 2007 output

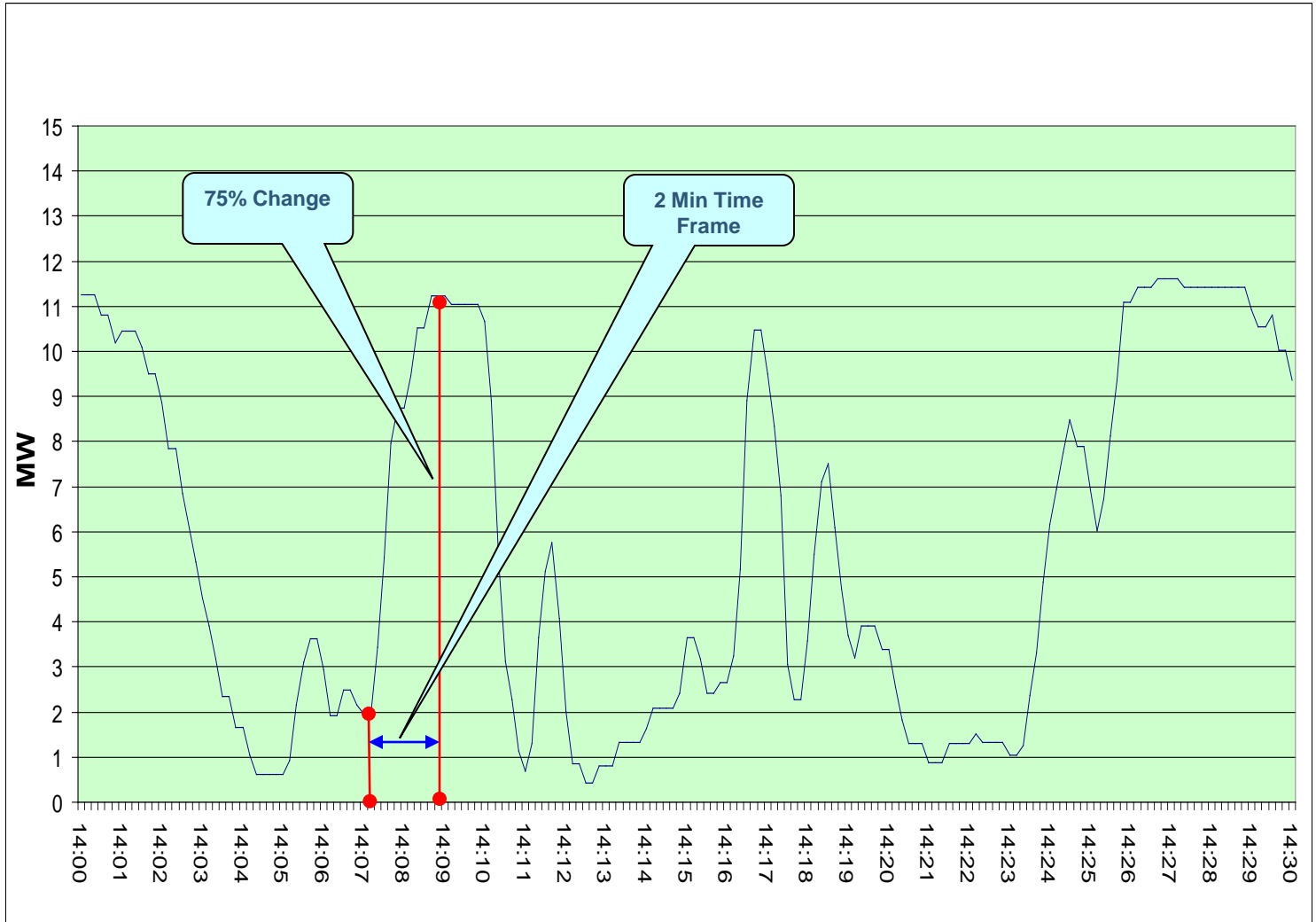


# Characteristics of Solar PV Resource

Clouds can produce dramatic changes (ramps) in solar plant output over a very short period



# High Resolution PV output



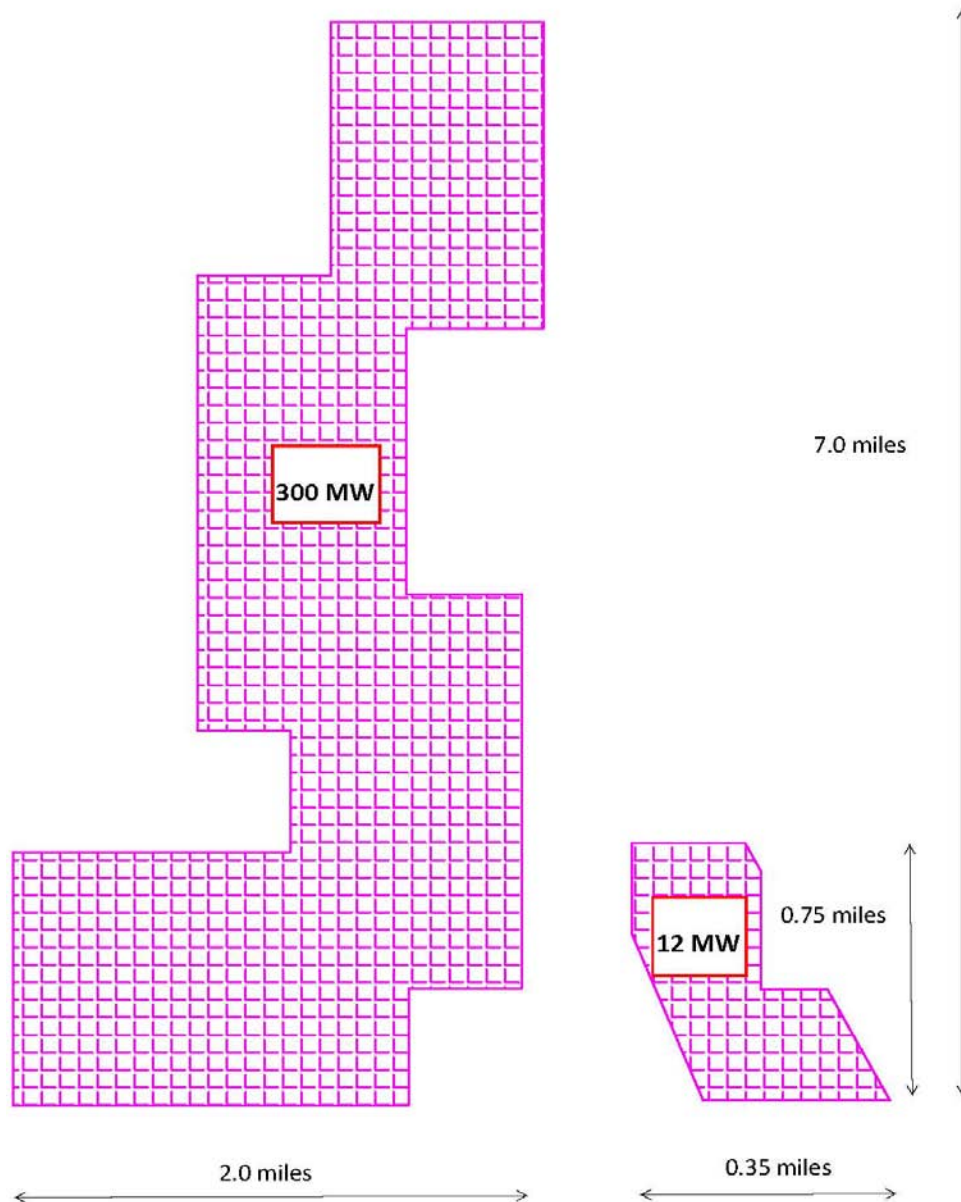
**Output characteristics will depend on plan size, tracking technology, cloud size, speed and plan layout**

**We don't know how much... yet!**

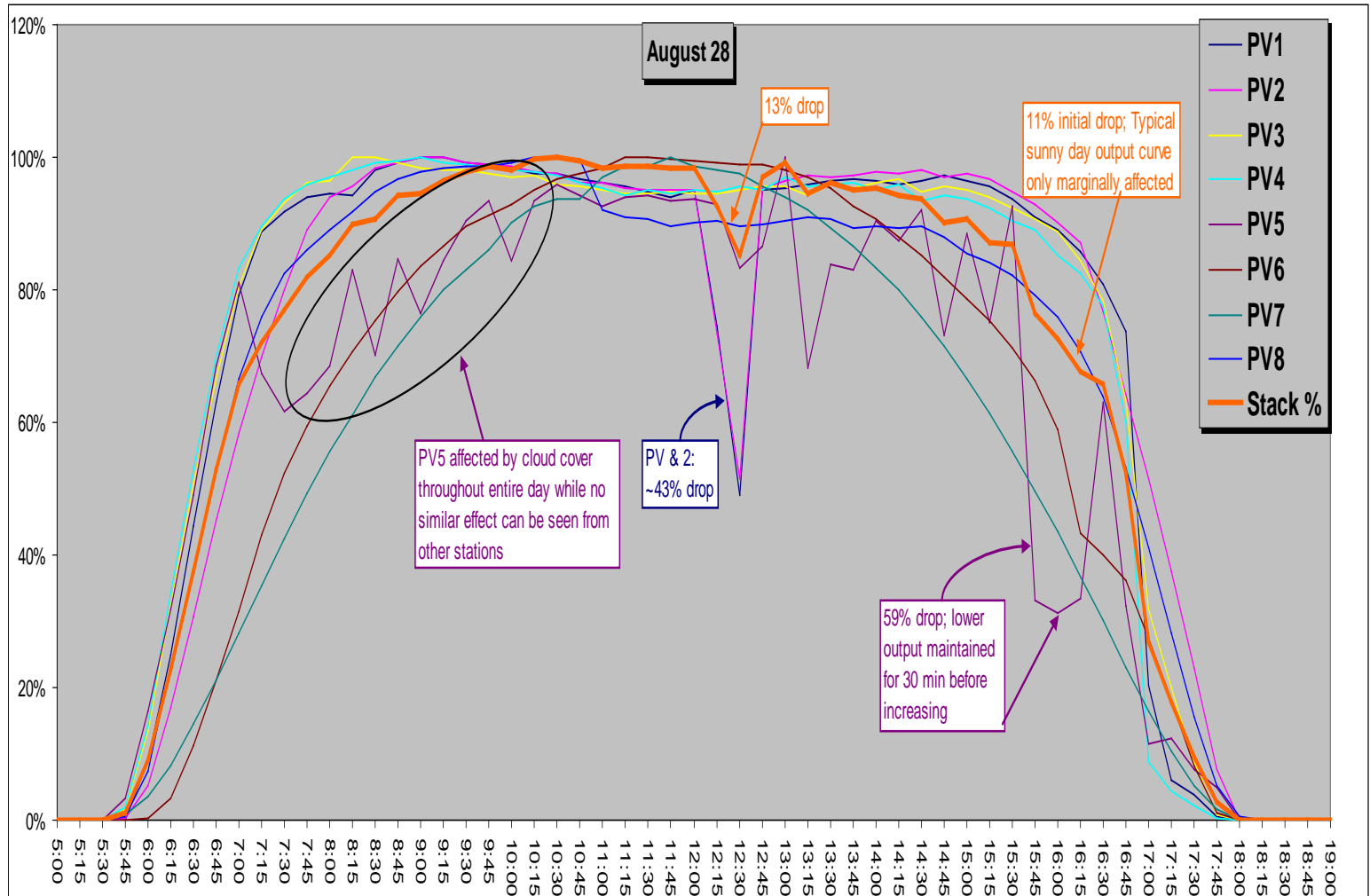




# Small solar PV project layout vs. Large solar PV project layout



# Diversity within a control area or region will significantly smooth rapid ramps



# Lessons Learned from existing solar PV project in Las Vegas Valley

## ❖ Higher solar PV Integration can be achieved by...

- Geographic diversity
- Larger pool of generation resources
- More maneuverable units
- Storage



# Goals for Solar Distribution Generation Study

**The Distribution system study will address several integration issues:**

- ❖ Evaluating the impact of PV on feeder regulation, protection and operational performance;
- ❖ Determination of maximum PV penetration for 25kV and 12.47kV distribution feeders
- ❖ Evaluating the operational impact of feeder operating events, including re-closer operations.
- ❖ O&M and administrative expenses resulting from the deployment of additional PV at the distribution level.



# Goals for Solar Integration Study

**The proposed study will address several integration issues:**

- ❖ **Quantify the likely generation profile of variable resources**
- ❖ **Estimate integration cost under different assumptions (penetration level, PV technology, plant location and size)**
- ❖ **Estimate the impact on spinning reserve levels**
- ❖ **Identify alternative strategies to manage variability and uncertainty more efficiently (real-time operations and scheduling time frames)**



# Goals for Solar Integration Study (Cont'd)



- ❖ **Quantify the ancillary service requirements needed to accommodate this energy**
- ❖ **Evaluate the impact of these resource additions on the Company's economic dispatch**
- ❖ **Estimate the potential O&M impact on existing generation units**
- ❖ **Identify impacts on the ability to comply with NERC control performance standards**



**NV**Energy™

**Thank You**