



Interconnection Standards review for Renewable Integration

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First Stakeholder Call: February 19, 2010

Outline

- Explain why existing Interconnection Standards must be reviewed
- Discuss how the Interconnection Standards enhancements will be developed and implemented
 - ✓ Co-ordination with NERC/WECC, PTO & neighboring BAA staff
 - ✓ ISO stakeholders review, Board approval, FERC filing
- Identify key areas for Interconnection Standards review
- Discuss project milestones

Why review existing Interconnection Standards?

- Reliably integrate renewable generation to increase feasible penetration levels and ensure RPS success
- Existing interconnection standards fail to address some reliability concerns triggered by renewable generation
- NERC/WECC standard development processes timeline incompatible with ISO needs
- Standards enhancements should be applied consistently to all generation technologies whenever feasible
- Standards enhancements phased in over a reasonable timeframe will provide clarity to equipment vendors and generation developers

Approach for this initiative

- Form a study group comprising of staff from PTOs, neighboring BAAs & other technical experts to discuss areas for Interconnection Standards review
- Prepare a list of high priority issues that need to be addressed for this initiative
- Research existing standards (& standards development activities) at other BAAs within & outside US
- Co-ordinate this effort with NERC & WECC variable generation task forces
- Prepare standards enhancement recommendations, seek stakeholder review, ISO board approval & file with FERC for Tariff and LGIA/SGIA changes, if necessary

Characteristics of variable generation

Inadequate Characteristics

- Non-dispatchable supply
- Non-regulating supply
- Non-frequency responsive supply
- Significant uncontrolled ramp rates
- Could trip off-line for faults

Required Characteristics

- Dispatchable supply – respond to dispatch commands
- Has the potential to supply regulation
- Frequency responsive supply – inherent or linked with energy storage
- Ramp rate control mechanism
- Voltage & Frequency ride-through

Key Areas for Interconnection Standards review

- Active power control
 - MW control
 - Frequency response
 - Ramp rate control
- Reactive power control
 - Power factor requirements
 - Voltage control
- Voltage ride-through requirements
- Frequency ride-through requirements
- Power Quality
- User-defined study models

Active Power Control – Issues/Draft Recommendations

ISSUES

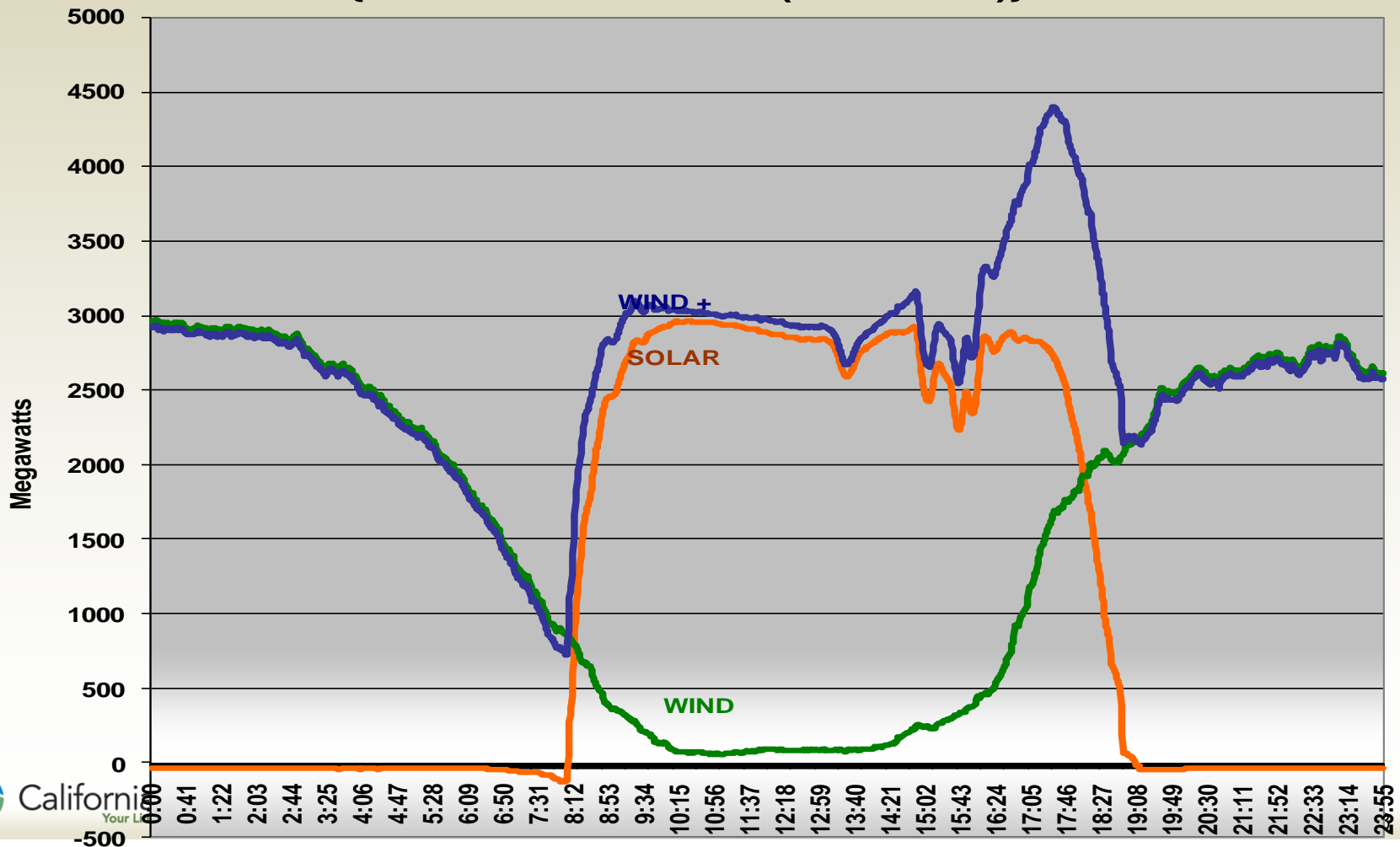
- Inability to control the MW output of the renewable generation
- Inability to control the ramp rate of the plant (both while ramping up and down)
- Inability to obtain frequency response (automatically adjust MW output in response to grid over/under frequency conditions)

DRAFT RECOMMENDATIONS

- Add a requirement to existing Interconnection Standards that requires renewable generators to install a “Control” package so that active power control issues can be resolved
 - Recognizes need to review market mechanisms and rules
 - Foundation for contractual provisions

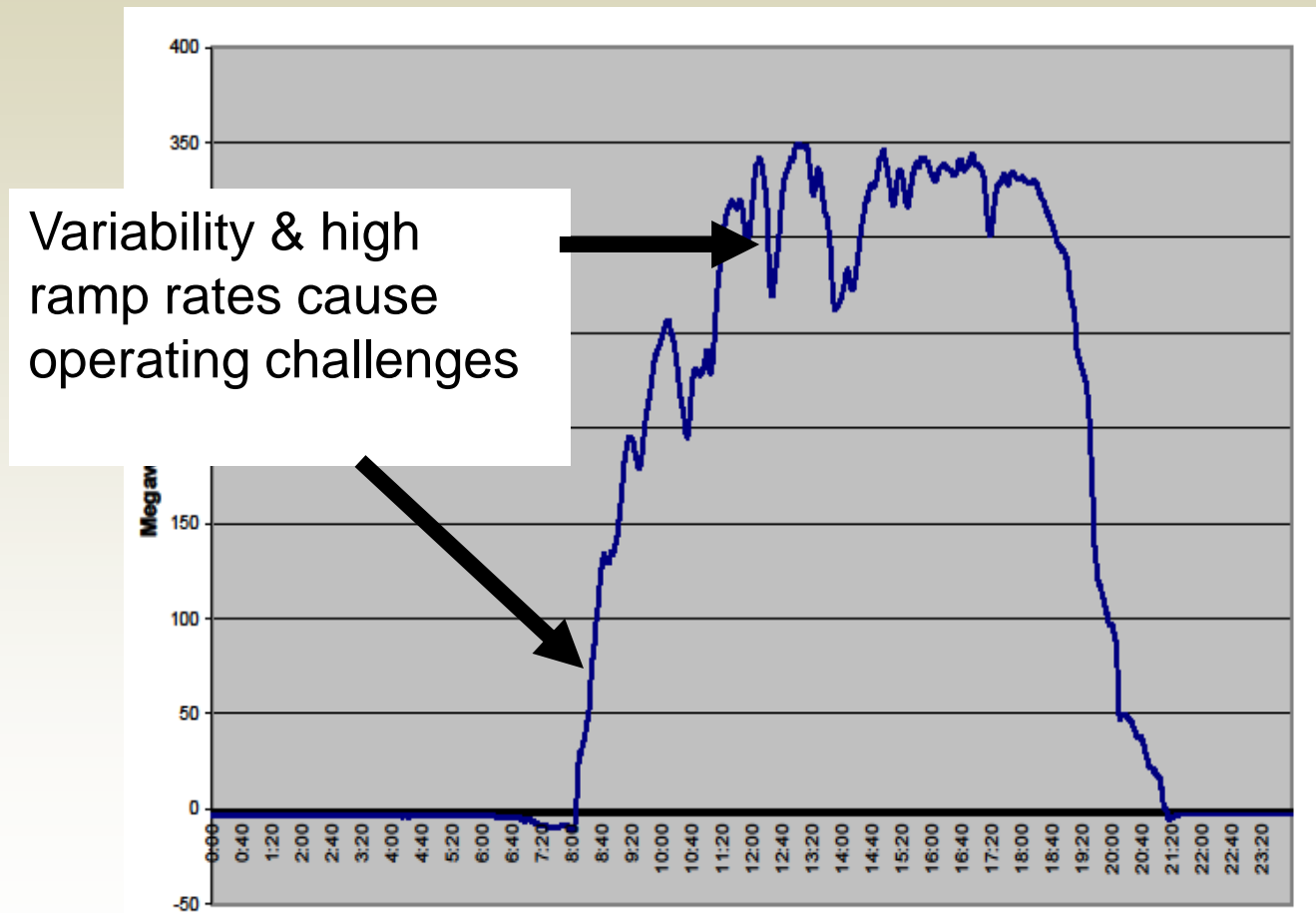
Active Power Control Issues – Illustration (Solar & Wind ramp rate challenges)

Active Power Control Issues - Illustration
{2013 - Wind + Solar (20% RPS)}



Active Power Control Issues – Illustration

(High Ramp Rate & Variable Energy Production)



Reactive Power Control – Issues/Draft Recommendations

ISSUES

- Power factor requirements
 - Wind (0.95 lag/lead), all other generation (0.9 lag/0.95 lead)
- Voltage control mode
 - AVR requirement
- Static vs. Dynamic voltage support

DRAFT RECOMMENDATIONS

- Reconcile the power factor requirement discrepancy for renewable technology generators
- Conduct additional studies to evaluate & recommend power factor requirements for all generator types
- Make recommendations to add to scope of new generator interconnection studies, if necessary

Voltage & Frequency ride-through capabilities – Issues/Recommendations

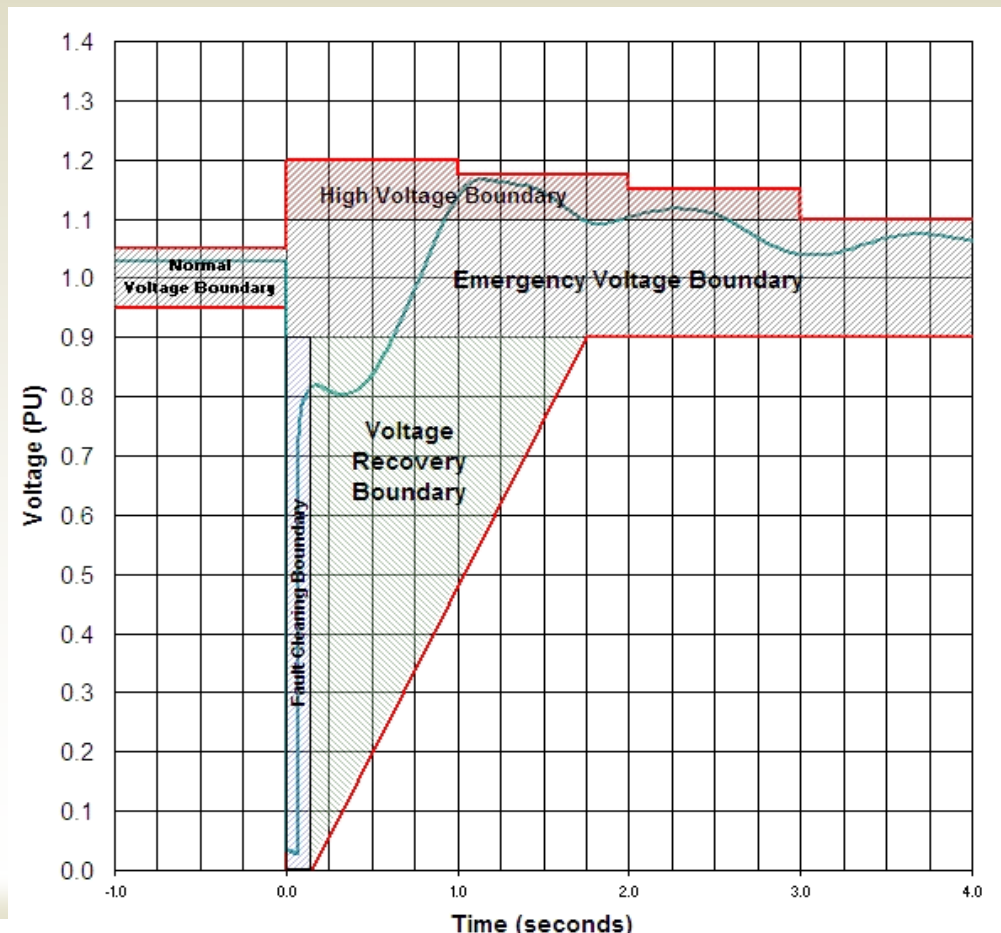
ISSUES

- Voltage & Frequency ride-through capabilities are needed so that generators stay online for certain transient frequency & voltage conditions – these standards currently do not exist for some renewable technology generators
- Currently the following standards exist, but have contradicting requirements:
 - WECC voltage ride-through standard for generators
 - FERC Order 661-A for wind generators
- Following standards are (were) under development, but will take a long time to be effective
 - New WECC LVRT criteria - PRC-024-WECC-1-CR (Withdrawn)
 - NERC Voltage & Frequency ride-through standard - NERC PRC-024-1
http://www.nerc.com/docs/standards/sar/PRC-024-1_Draft1_2009Feb17.pdf

New WECC VRT Criteria (PRC-024-WECC-1-CR)

Details on this criteria are at:

<http://www.wecc.biz/Standards/Development/WECC-60/default.aspx>



Voltage & Frequency ride-through capabilities – Draft Recommendations

- ISO & PTOs to evaluate whether WECC's new LVRT criteria should be applied to all new generators that interconnect to ISO controlled grid
- ISO & PTOs to engage with NERC task force on development of NERC Voltage & Frequency ride-through standard
- Once the new NERC Voltage and Frequency ride-through standard becomes available, evaluate if this can be adopted as is for ISO interconnections
- Evaluate whether new NERC standard should be retroactively enforced on new generators that are under construction or have signed LGIAs

Other Issues/Recommendations

ISSUES

- Power Quality
 - Inverter based generation can potentially introduce new Power Quality issues – harmonics, voltage flicker.
- Study models – Standard vs. User-defined
 - Risks associated with User-defined study models

DRAFT RECOMMENDATIONS

- Co-ordinate with IEEE & ANSI to identify whether current Power Quality standards are adequate to address any new concerns
- Develop mitigation process to address any reliability issues that could potentially surface once standard models become available.

Project Milestones

- First stakeholder call – Feb. 19, 2010
- Stakeholder meeting (to present Standards Enhancement proposal) – March end/early April 2010
- Second stakeholder call – late April 2010
- CAISO Board approval – May 2010
- Tariff stakeholder Meeting
- FERC filing – June 2010

Comments

Thanks for participating!

Please send your comments by COB, Feb 26, 2010

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