

## 2009–2011 Work Plan

1. **Power system planners must consider the impacts of variable generation in power system planning and design and develop the necessary practices and methods to maintain long-term bulk power system reliability:** *The goal of this effort is to identify what bulk power system planners must do to accommodate large amounts of variable generation and provide more consistency in reporting regional resource reliability assessment results, including but not limited to methods to calculate energy and capacity, probabilistic analysis, coordinated generation/transmission planning approaches, study of distributed resources, impacts of integrating large amounts of storage and demand response, and wind plant modeling.*

### 2009 Action Plan

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.1	<p>Standard, valid, generic, non-confidential, and public power flow and stability models (variable generation) are needed and must be developed, enabling planners to maintain bulk power system reliability.</p> <p><b><u>Next Call, Nov. 16 11AM EDT</u></b></p>	<p>Valid, generic, non-confidential, and public standard power flow and stability (positive-sequence) models for variable generation technologies are needed. Such models should be readily validated and publicly available to power utilities and all other industry stakeholders. Model parameters should be provided by variable generation manufacturers and a common model validation standard across all technologies should be adopted. The NERC Planning Committee should undertake a review of the appropriate Modeling, Data and Analysis (MOD) Standards to ensure high levels of variable generation can be simulated. Feedback to the group working on NERC Standards' Project 2007-09 will be provided.</p> <p><b><u>Additional topic:</u></b> To address the ff. points and provide:</p> <ul style="list-style-type: none"> <li>Roadmap for development of valid, generic, non-confidential, and public standard power flow and stability (positive-sequence) models for variable generation technologies. Namely, what is available at present and what is the path forward to developing and deploying such models.</li> <li>The NERC standards implications and feedback on what further NERC action items may be needed, if any, to address model application and validation as it relates to variable generation.</li> </ul>	<p><i>Ad Hoc</i> group: Members from IVGTF – Planning</p> <p><u>Daniel Brooks &amp; Pouyan Pourbeik</u></p>	<p>Make recommendations and identify changes needed to NERC's MOD Standards,</p> <p><b><u>Update: Distributed the outline on 10/1/09 entitled “Standard Models for Variable Generation”.</u></b></p>	<ul style="list-style-type: none"> <li><b>Draft report ready by March 2010 PC meeting</b></li> <li><b>Final report sent with recommendations to PC for approval in June 2010</b></li> <li>Develop SAR with Standards Committee if required.</li> </ul>

Item	Proposed	Abstract	Lead	Deliverables	Milestones
1.2	<p>Consistent and accurate methods are needed to calculate capacity values attributable to variable generation.</p> <p><b><u>Previous call on Nov. 6 the chapter outline, next meeting on 11/06</u></b> Including techniques: LOLE, LOLP, &amp; ELCC. Discuss the traditional vs. current methods</p>	<p>Consistent methods are required to represent capacity values of variable generation suitable for NERC reliability assessments.</p> <p>The NERC Planning Committee should direct the Reliability Assessment Subcommittee to collect the capacity value of variable generation based on their contribution to system capacity during high-risk hours, when performing its seasonal and long-term reliability assessments. As additional data becomes available (i.e. involving multiple years of hourly-resolution variable generation output data from specific geographic locations and time-synchronized with system demand), NERC should consider adopting the Effective Load Carrying Capability (ELCC) approach.<sup>1</sup></p>	<p>Resource Issues Subcommittee</p> <p>Liaison with IVGTF <b>O'Malley, &amp; Milligan</b></p>	<p>Report covering the result of an investigation of approaches for calculating capacity associated with variable generation for the following methods:</p> <ul style="list-style-type: none"> <li>• Effective Load Carrying Capability (ELCC) approach</li> <li>• Contribution of variable generation to system capacity during high-risk hours, estimating resource contribution with historical data</li> <li>• Correlation between resource contribution and the resource mix by system (e.g. what is appropriate on a hydro based system).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Draft report by mid May 2010</b></li> <li>• <b>Endorsement by September 2010 for PC</b></li> </ul>

<sup>1</sup> To support this action, NERC's Generation Availability Data System (GADS), which is a voluntary data collection system, can be a source of some of the data, though other sources may also be available.

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.3	<p>Interconnection procedures and standards should be enhanced to address voltage and frequency ride-through, reactive and real power control, frequency and inertial response and must be applied in a consistent manner to all generation technologies.</p> <p><b><u>Status: No Change</u></b></p> <p><b><u>No Meeting Date Established</u></b></p> <p><b><u>Sent an email on 11.10 on task force and coordination</u></b></p>	<p>Interconnection procedures and standards should recognize the unique characteristics of various generation technologies but focus on the overall bulk power system performance rather than the performance of an individual generator. A uniform set of interconnection procedures and standards, phased in over a reasonable timeframe will provide clarity to equipment vendors and generation developers for product design requirements and ensure efficient and economic manufacturing and installation/interconnection of new generation resources.</p> <p>The NERC Planning Committee should compile all existing interconnection requirements that Transmission Owners have under FAC-001 and evaluate them for uniformity. If they are inadequate, action should be initiated to remedy the situation (e.g. a Standard Authorization Request).</p> <p><b><u>Additional Specific Tasks:</u></b></p> <ul style="list-style-type: none"> <li>• Review all existing standards to find items that would affect interconnection requirements of variable generators (primarily wind and solar)</li> <li>• Review state-of-the-art industry practices, experience and trends in wind/solar power plant integration</li> <li>• Develop team consensus recommendation for NERC standards and practices for integration of wind and solar power plants</li> <li>• Include recommendations from Task 1.7, Reconciliation of IEEE Std. 1547</li> <li>• Include recommendations from Task 2.2, Balancing Area Communications</li> </ul>	<p><i>Ad Hoc</i> joint group: Members from both the IVGTF – Operations and Planning</p> <p><b><u>Lead Dick Piwko</u></b></p>	<p>Review of NERC's Facilities Design, Connections and Maintenance, (FAC) Standard FAC-001-0 to ensure that the following are addressed</p> <ul style="list-style-type: none"> <li>• Establish appropriate interconnection procedures and standards</li> <li>• Ensure adequate communications considering COM-002-2 and registry Criteria</li> </ul>	<ul style="list-style-type: none"> <li>• Industry survey of current interconnection standards by PC's December - March 2009</li> <li>• Draft recommendations to the PC by <b>mid May for PC's June 2010</b></li> <li>• <b>Endorsement for PC on September 2010</b></li> <li>• Develop SAR with Standards Committee if required.</li> <li>• Create a shared repository of all standards documents that is accessible to all members of the task team - perhaps a web page set up by NERC</li> <li>• Compile "industry survey" table or report summarizing existing standards, practices, and evolving industry trends (Completed by <b>March 2010</b>)</li> <li>• Narrow the list to only those items that directly or indirectly affect power system reliability and are relevant to this task</li> <li>• Prepare draft task report with specific recommendations</li> <li>• Review and revise as required to produce a final task report (Completed by June 2010)</li> </ul> <p><b><u>Dick P. will send an updated version 11.17</u></b></p>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.4	<p>Resource adequacy and transmission planning approaches must consider needed system flexibility to accommodate the characteristics of variable resources as part of bulk power system design.</p> <p><b><u>Status: December 8, next meeting</u></b></p>	<p>Resource planning processes should be adjusted to ensure that the designed system includes resources that provide the desired flexibility.</p> <p>The NERC Planning Committee's Resource Issues Subcommittee should study changes required to account for large-scale variable generation integration. Considerations should include ramping requirements, minimum generation levels, required shorter scheduling intervals, transmission interconnections, etc.</p> <p><b><u>Additional Tasks:</u></b></p> <ul style="list-style-type: none"> <li>The group decided to produce a set of metrics based on the functions of the tasks on resource adequacy and transmission planning approach (must consider needed system flexibility to accommodate the characteristics of variable resources as part of bulk power system design).</li> </ul>	<p>Resource Issues Subcommittee</p> <p>Liaison from IVGTF (GE)</p> <p><b><u>Mark O' Malley &amp; John Adams</u></b></p>	<p>A report defining how to include variable generation into resource and transmission planning. Data needs identified/and recommendations responsible NERC entities</p>	<ul style="list-style-type: none"> <li>Draft report ready by <b>February 2010</b> PC meeting</li> <li>Review by <b>March 2010</b></li> <li>Final sent to PC for endorsement in <b>June 2010</b></li> <li>Based on report results, develop Data Authorization Request in 2010.</li> </ul>

1.5	<p>Integration of large amounts of plug-in hybrid electric vehicles, storage and demand response programs may provide additional resource flexibility and influence bulk power system reliability and should be considered in planning studies</p> <p><b><u>Next meeting: Nov. 6 10AM</u></b>  <b><u>Drafted an outline sent to the group on 10/14</u></b>  <b><u>Next meeting is Nov. 4 at 2PM EDT</u></b></p> <p><b><u>January mid. For meeting</u></b>  <b><u>Team is aware of the deadline, scheduled incoming deadlines and meetings up to end of May 2010</u></b></p>	<p>Developments in electric vehicles, storage and demand response may provide characteristics which will help accommodate high levels of variable generation.<sup>2</sup> NERC Planning Committee should assess the influence on reliability of accommodating large energy storage capability both stationary and mobile (such as Plug-in Hybrid Electric Vehicles), along with large amounts of demand response.</p>	<p><i>Ad Hoc</i> group: Members from IVGTF – Planning</p> <p><b><u>Daniel Brooks</u></b></p>	<p>Report reviewing the impact on bulk power system reliability of integrating large amounts of distributed stationary and mobile storage. Order of magnitude impacts, timing, gaps and next steps identified.</p>	<ul style="list-style-type: none"> <li>Draft report ready by February 2010 PC meeting</li> <li>March 15 &amp; 16 PC presentation and endorsement</li> <li>Draft report by mid May 2010</li> <li>Final sent to PC for endorsement in June 2010</li> </ul> <p><b><u>Status: No change</u></b></p>
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1.6	Probabilistic planning techniques and approaches are needed to ensure that system designs maintain bulk power system reliability.	New tools and techniques for system planning are needed to accommodate the increased resource uncertainty and variability to complement existing deterministic approaches. Additional data will be required to support these new planning processes. The NERC Planning Committee should identify necessary data requirements to conduct planning studies and recommend that Planning Authorities and Reliability Coordinators collect and retain such data. This action should identify how probabilistic approaches for transmission planning may go beyond current generally accepted industry approaches (for example, FERC Order 890 <sup>3</sup> ) as well as consider the NERC TPL Standard (Project 2006-02) drafting activities. <sup>4</sup>	<i>Ad Hoc</i> group: Members from IVGTF – Planning  <b><u>Michael Milligan &amp; Dariush</u></b>	A guidebook on study criteria, data requirements and methods will be produced.	<ul style="list-style-type: none"> <li>● <b>Draft guidebook ready by June 2010 PC meeting</b></li> <li>● <b>Final sent to PC for endorsement in September 2011</b></li> </ul>
1.7	Existing bulk power system voltage ride-through performance requirements and distribution system anti-islanding voltage drop-out requirements of IEEE Standard 1547 must be reconciled <b><u>Sent an email on 11.10 to update the team lead and the tasks</u></b>	Engage the IEEE Standards coordinating Committee # 21 (SCC21) on Fuel Cells, Photovoltaics, Dispersed Generation and Energy Storage to reconcile voltage ride-through requirements of distributed generation and the IEEE Standard 1547.  <b>Recommend requirements needed for low voltage and high voltage to IEEE.</b>	<i>Ad Hoc</i> group: Members from IVGTF – Planning  <b>Mahendra Patel</b>	Engage IEEE Standards Coordinating Committee (SCC21) to reconcile voltage ride-through requirements for distributed resources and IEEE Standard 1547	<ul style="list-style-type: none"> <li>● Status report for December 2009 PC meeting</li> <li>● <b>Recommendations by June 2010</b></li> <li>● <b>Balloting of IEEE Standard September 2011</b></li> <li>● <b>Final IEEE Standard 2012</b></li> <li>● Develop SAR with the Standards Committee if required in 2011</li> </ul>

## 2010 Action Plan

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.1	Standard, valid, generic, non-confidential, and public power flow and stability models (variable generation) are needed and must be developed, enabling planners to maintain bulk power system reliability	Valid, generic, non-confidential, and public standard power flow and stability (positive-sequence) models for variable generation technologies are needed. Such models should be readily validated and publicly available to power utilities and all other industry stakeholders. Model parameters should be provided by variable generation manufacturers and a common model validation standard across all technologies should be adopted. The NERC Planning Committee should undertake a review of the appropriate Modeling, Data and Analysis (MOD) Standards to ensure high levels of variable generation can be simulated. Feedback to the group working on NERC Standards' Project 2007-09 will be provided.	<i>Ad Hoc</i> group: Members from IVGTF - Planning	Make recommendations and identify changes needed to NERC's MOD Standards	<ul style="list-style-type: none"> <li>● <b>Draft report ready by March 2010 PC meeting</b></li> <li>● <b>Final report sent with recommendations to PC for approval in June 2010</b></li> <li>● Develop SAR with Standards Committee if required.</li> </ul>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.3	Interconnection procedures and standards should be enhanced to address voltage and frequency ride-through, reactive and real power control, frequency and inertial response and must be applied in a consistent manner to all generation technologies.	<p>Interconnection procedures and standards should recognize the unique characteristics of various generation technologies but focus on the overall bulk power system performance rather than the performance of an individual generator. A uniform set of interconnection procedures and standards, phased in over a reasonable timeframe will provide clarity to equipment vendors and generation developers for product design requirements and ensure efficient and economic manufacturing and installation/interconnection of new generation resources.</p> <p>The NERC Planning Committee should compile all existing interconnection requirements that Transmission Owners have under FAC-001 and evaluate them for uniformity. If they are inadequate, action should be initiated to remedy the situation (e.g. a Standard Authorization Request).</p>	<p><i>Ad Hoc</i> joint group: Members from both the IVGTF – Operations and Planning</p>	<p>Review of NERC’s Facilities Design, Connections and Maintenance, (FAC) Standard FAC-001-0 to ensure that the following are addressed</p> <ul style="list-style-type: none"> <li>● Establish appropriate interconnection procedures and standards</li> <li>● Ensure adequate communications considering COM-002-2 and registry Criteria</li> </ul>	<ul style="list-style-type: none"> <li>● Industry survey of current interconnection standards by PC’s December 2009</li> <li>● Draft recommendations to the PC by PC’s June 2010</li> <li>● Develop SAR with Standards Committee if required.</li> </ul> <p><b><u>Need Status</u></b></p>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.4	Resource adequacy and transmission planning approaches must consider needed system flexibility to accommodate the characteristics of variable resources as part of bulk power system design.	<p>Resource planning processes should be adjusted to ensure that the designed system includes resources that provide the desired flexibility.</p> <p>The NERC Planning Committee's Resource Issues Subcommittee should study changes required to current resource adequacy assessment processes to account for large-scale variable generation integration. Considerations should include ramping requirements, minimum generation levels, required shorter scheduling intervals, transmission interconnections, etc.</p>	<p>Resource Issues Subcommittee</p> <p><u>Mark O' Malley</u></p>	<p>A report defining how to include variable generation into resource and transmission planning. Data needs identified/and recommendations responsible NERC entities</p>	<ul style="list-style-type: none"> <li>● Draft report ready by December 2009 PC meeting</li> <li>● Final sent to PC for endorsement in February 2010</li> <li>● Based on report results, develop Data Authorization Request in 2010.</li> <li>● <b><u>Need Status</u></b></li> </ul>
1.5	<p>Integration of large amounts of plug-in hybrid electric vehicles, storage and demand response programs may provide additional resource flexibility and influence bulk power system reliability and should be considered in planning studies</p> <p><b><u>Next meeting is Nov. 4 at 2PM EDT</u></b></p> <p><b><u>January mid. For meeting</u></b></p> <p><b><u>Team is aware of the deadline, scheduled incoming deadlines and meetings up to end of May 2010</u></b></p>	<p>Developments in electric vehicles, storage and demand response may provide characteristics which will help accommodate high levels of variable generation.<sup>5</sup> NERC Planning Committee should assess the influence on reliability of accommodating large energy storage capability both stationary and mobile (such as Plug-in Hybrid Electric Vehicles), along with large amounts of demand response.</p>	<p><i>Ad Hoc</i> group: Members from IVGTF - Planning</p>	<p>Report reviewing the impact on bulk power system reliability of integrating large amounts of distributed stationary and mobile storage Order of magnitude impacts, timing, gaps and next steps identified.</p>	<ul style="list-style-type: none"> <li>● Draft report ready by February 2010 PC meeting</li> <li>● Final sent to PC for endorsement in June 2010</li> </ul> <p><b><u>Will provide a brief update of the group in the PC meeting.</u></b></p>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.6	<p>Probabilistic planning techniques and approaches are needed to ensure that system designs maintain bulk power system reliability.</p> <p><u>No Meeting Dates scheduled</u></p>	<p>New tools and techniques for system planning are needed to accommodate the increased resource uncertainty and variability to complement existing deterministic approaches. Additional data will be required to support these new planning processes. The NERC Planning Committee should identify necessary data requirements to conduct planning studies and recommend that Planning Authorities and Reliability Coordinators collect and retain such data. This action should identify how probabilistic approaches for transmission planning may go beyond current generally accepted industry approaches (for example, FERC Order 890<sup>6</sup>) as well as consider the NERC TPL Standard (Project 2006-02) drafting activities.<sup>7</sup></p>	<p><i>Ad Hoc</i> group: Members from IVGTF – Planning</p> <p><u>Michael Milligan</u></p>	<p>A guidebook on study criteria, data requirements and methods will be produced.</p>	<ul style="list-style-type: none"> <li>● Draft guidebook ready by June 2010 PC meeting</li> <li>● Final sent to PC for endorsement in September 2010</li> </ul> <p><b><u>Need Status</u></b></p>
1.7	<p>Existing bulk power system voltage ride-through performance requirements and distribution system anti-islanding voltage drop-out requirements of IEEE Standard 1547 must be reconciled</p> <p><b><u>Sent a follow- up on 10/26</u></b></p> <p><b><u>No meeting scheduled.</u></b></p>	<p>Engage the IEEE Standards coordinating Committee # 21 (SCC21) on Fuel Cells, Photovoltaics, Dispersed Generation and Energy Storage to reconcile voltage ride-through requirements of distributed generation and the IEEE Standard 1547.</p>	<p><i>Ad Hoc</i> group: Members from IVGTF – Planning</p> <p>Mahendra Patel</p>	<p>Engage IEEE Standards Coordinating Committee (SCC21) to reconcile voltage ride-through requirements for distributed resources and IEEE Standard 1547</p>	<ul style="list-style-type: none"> <li>● Status report for December 2009 PC meeting</li> <li>● <b>Recommendations by June 2010</b></li> <li>● <b>Balloting of IEEE Standard September 2011</b></li> <li>● <b>Final IEEE Standard 2012</b></li> <li>● Develop SAR with the Standards Committee if required in 2011</li> </ul> <p><b><u>Status changed see new dates bolded</u></b></p>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.8	<p>Variable distributed resources can have a significant impact on system operation and must be considered and included in power system planning studies.</p> <p><b>Coordinate with 1.7 Mahendra P.</b></p>	<p>Distributed variable generators, individually or in aggregate (e.g. small scale photovoltaic), can impact the bulk power system and need to be treated, where appropriate, in a similar manner to transmission connected variable generation. High levels of distributed generation may require new network design. Further, distributed variable generation units may fall below the MW size requirements which might require a Generation Owner or Generator Operator to register and therefore to be held to NERC's standards. The NERC registry criteria<sup>8</sup> may need to be broadened to include smaller generators not covered by the current registry criteria. The NERC Planning Committee should review and study the impact of distributed generation on bulk power system reliability, and the possible need to recognize owners and operators of such distributed generation in the NERC registry criteria.</p>	<p><i>Ad Hoc</i> group: Members from IVGTF – Planning</p> <p><b><u>Daniel Brooks,</u></b> <b><u>Team Lead</u></b></p>	<ul style="list-style-type: none"> <li>• Report on impacts of distributed generation on reliability and recommendations for <i>NERC's Functional Model</i>.</li> <li>• NERC stakeholder engagement to reconcile IEEE &amp; NERC standards. Identify any gaps in NERC Standards</li> </ul>	<ul style="list-style-type: none"> <li>• <b><u>Provide a draft by early August 2010</u></b></li> <li>• Draft report ready by September 2010 PC meeting</li> <li>• Final sent to PC for endorsement in December 7- 8 2010</li> </ul> <p><b><u>Status On Time</u></b></p>

## 2011 Action Plan

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
1.7	Existing bulk power system voltage ride-through performance requirements and distribution system anti-islanding voltage drop-out requirements of IEEE Standard 1547 must be reconciled	Engage the IEEE Standards coordinating Committee # 21 (SCC21) on Fuel Cells, Photovoltaics, Dispersed Generation and Energy Storage to reconcile voltage ride-through requirements of distributed generation and the IEEE Standard 1547.	<i>Ad Hoc</i> group: Members from IVGTF - Planning	Engage IEEE Standards Coordinating Committee (SCC21) to reconcile voltage ride-through requirements for distributed resources and IEEE Standard 1547	<ul style="list-style-type: none"> <li>• Status report for December 2009 PC meeting</li> <li>• <b>Recommendations by June 2010</b></li> <li>• <b>Balloting of IEEE Standard September 2011</b></li> <li>• <b>Final IEEE Standard 2012</b></li> <li>• Develop SAR with the Standards Committee if required in 2011</li> </ul>
1.8	Variable distributed resources can have a significant impact on system operation and must be considered and included in power system planning studies.	Distributed variable generators, individually or in aggregate (e.g. small scale photovoltaic), can impact the bulk power system and need to be treated, where appropriate, in a similar manner to transmission connected variable generation. High levels of distributed generation may require new network design. Further, distributed variable generation units may fall below the MW size requirements which might require a Generation Owner or Generator Operator to register and therefore to be held to NERC's standards. The NERC registry criteria <sup>9</sup> may need to be broadened to include smaller generators not covered by the current registry criteria. The NERC Planning Committee should review and study the impact of distributed generation on bulk power system reliability, and the possible need to recognize owners and operators of such distributed generation in the NERC registry criteria.	<i>Ad Hoc</i> group: Members from IVGTF - Planning	<ul style="list-style-type: none"> <li>• Report on impacts of distributed generation on reliability and recommendations for <i>NERC's Functional Model</i>.</li> <li>• NERC stakeholder engagement to reconcile IEEE &amp; NERC standards. Identify any gaps in NERC Standards</li> </ul>	<ul style="list-style-type: none"> <li>• <b><u>Provide a draft by early August 2010</u></b></li> <li>• Draft report ready by September 2010 PC meeting</li> <li>• Final sent to PC for endorsement in December 7- 8 2010</li> <li>• <b><u>Status On Time</u></b></li> </ul>

2. **Operators will require new tools and practices, including enhanced NERC Standards to maintain bulk power system reliability:** *The goal of this effort is to identify gaps and solutions required by operators to accommodate large amounts of variable generation. The primary goal is to study operator tool enhancements, balancing area capability/size, and Standards/Criteria required by system operators to maintain bulk power system reliability.*

## 2009 Action Plan

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
2.1	<p>Forecasting techniques must be incorporated into day-to-day operational planning and real-time operations routines/practices including unit commitment and dispatch</p> <p><b><u>Next Meeting: November 12</u></b></p>	<p>Study variable resource-forecast tool requirements suitable for large amounts of variable generation and identify any gaps.</p> <p>Update: Distributed an outline on 9/22/09 – No concrete title yet, labeled as a <b><u>“Working Draft”</u></b></p>	<p><i>Ad Hoc</i> group: Members from IVGTF – Operations</p> <p><b><u>Mark Ahlstrom</u></b></p>	<p>Report outlining the requirements of variable fuel (wind, solar, etc.) forecasting needed to maintain bulk power system reliability. In addition, the report will investigate current state-of-the-art forecasting tools and, thereby, identify gaps between the requirements and the current available technology.</p>	<ul style="list-style-type: none"> <li>● Draft report ready by February 2010 OC meeting</li> <li>● March 16- 17 2010 presentation to OC and endorsement</li> <li>● Final sent to OC for endorsement in June 2010</li> </ul> <p><b><u>No Change</u></b></p>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
2.2	<p>Balancing Areas must have sufficient communications for monitoring and sending dispatch instructions to variable resources.</p> <p><b><u>Last meeting on 9/14, Sent a follow up on 10/28.</u></b></p> <p><b><u>Status: No change on scope</u></b></p>	<p>Adequate communication of data from variable generation is not only a vital reliability requirement, but also such communications are necessary to support the data analysis posed by other recommended actions. The NERC Operating Committee should undertake a review of COM-002, FAC-001 and registry criteria to ensure adequate communications are in place. Further, as NERC Standards' Project 2006-06 is reviewing COM-002, input to this review should be provided. If these standards are found to be inadequate, action should be initiated to remedy the situation (e.g. a SAR).</p>	<p><i>Ad Hoc</i> group: Members from IVGTF – Operations</p> <p><b><u>Bill Grant</u></b></p>	<p>Review of NERC's Facilities Design, Connections and Maintenance, (FAC) Standard FAC-001-0 to ensure that the following are addressed</p> <ul style="list-style-type: none"> <li>Establish appropriate interconnection procedures and standards</li> </ul> <p>Ensure adequate communications considering COM-002-2 and registry Criteria.</p>	<ul style="list-style-type: none"> <li>Draft report ready by <b>December 2009</b></li> <li><b>Report sent to OC for review by March 2010</b></li> <li>Final sent to OC for endorsement in <b>June 2010</b></li> </ul> <p><b><u>Need Status</u></b></p>
2.3	<p>Impact of securing ancillary services through larger balancing areas or participation in wider-area balancing management on bulk power system reliability must be investigated.</p> <p><b><u>Next Meeting Oct. 29 4PM</u></b></p> <p><b><u>Distributed a Matrix to capture regional diversity on the requirements, methods, and contingency reserve. Drafted of outline is expected prior to the meeting.</u></b></p>	<p>With adequate bulk power transmission variable generation plants aggregated across larger Balancing Areas or participation in wider-area balancing management may significantly reduce variability (both of variable generation and demand), increase predictability and therefore reduce the need for additional flexible resources. With adequate available transmission capacity larger Balancing Areas and more frequent scheduling within and between areas provide more sources of flexibility.</p> <p>The NERC Operating Committee should review and study the consequences of larger Balancing Areas or participation in wider-area balancing management like provisions of ancillary services from other jurisdictions, ACE sharing, and/or shorter scheduling intervals within and between Balancing Areas to effectively manage variability of generation resources over a larger footprint. In addition, existing and proposed BAL Standards should be reviewed to determine their sufficiency.</p>	<p><i>Ad Hoc</i> joint group: Members from both the IVGTF – Operations and Planning</p> <p><b><u>Team Lead Jay Caspary</u></b></p>	<p>Report reviewing the impacts and benefits of balancing area enlargement, participation in wider-area balancing management, and shorter scheduling intervals. Further the report should evaluate existing and proposed standards (i.e. BAL), to determine their sufficiency.</p>	<ul style="list-style-type: none"> <li><b>Draft recommendations to the OC by OC's June 2010</b></li> <li><b>OC Endorsement by September 2010</b></li> <li>Develop SAR with Standards Committee if required.</li> </ul>

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## 2010 Action Plan

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
2.1	Forecasting techniques must be incorporated into day-to-day operational planning and real-time operations routines/practices including unit commitment and dispatch	Study variable resource-forecast tool requirements suitable for large amounts of variable generation and identify any gaps.	<i>Ad Hoc</i> group: Members from IVGTF - Operations	Report outlining the requirements of variable fuel (wind, solar, etc.) forecasting needed to maintain bulk power system reliability. In addition, the report will investigate current state-of-the-art forecasting tools and, thereby, identify gaps between the requirements and the current available technology.	<ul style="list-style-type: none"> <li>● Draft report ready by February 2010 OC meeting</li> <li>● March 16- 17 2010 presentation to OC and endorsement</li> <li>● Final sent to OC for endorsement in June 2010</li> </ul> <ul style="list-style-type: none"> <li>● <b><u>No Change</u></b></li> </ul>
2.2	Balancing Areas must have sufficient communications for monitoring and sending dispatch instructions to variable resources.	Adequate communication of data from variable generation is not only a vital reliability requirement, but also such communications are necessary to support the data analysis posed by other recommended actions. The NERC Operating Committee should undertake a review of COM-002, FAC-001 and registry criteria to ensure adequate communications are in place. Further, as NERC Standards' Project 2006-06 is reviewing COM-002, input to this review should be provided. If these standards are found to be inadequate, action should be initiated to remedy the situation (e.g. a SAR).	<i>Ad Hoc</i> group: Members from IVGTF - Operations	Review of NERC's Facilities Design, Connections and Maintenance, (FAC) Standard FAC-001-0 to ensure that the following are addressed <ul style="list-style-type: none"> <li>● Establish appropriate interconnection procedures and standards</li> </ul> Ensure adequate communications considering COM-002-2 and registry Criteria.	<ul style="list-style-type: none"> <li>● Draft report ready by December 2009 OC meeting</li> <li>● Final sent to OC for endorsement in February 2010</li> </ul> <p><b><u>Update: No change</u></b></p>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
2.3	Impact of securing ancillary services through larger balancing areas or participation in wider-area balancing management on bulk power system reliability must be investigated.	<p>With adequate bulk power transmission variable generation plants aggregated across larger Balancing Areas or participation in wider-area balancing management may significantly reduce variability (both of variable generation and demand), increase predictability and therefore reduce the need for additional flexible resources. With adequate available transmission capacity larger Balancing Areas and more frequent scheduling within and between areas provide more sources of flexibility.</p> <p>The NERC Operating Committee should review and study the consequences of larger Balancing Areas or participation in wider-area balancing management like provisions of ancillary services from other jurisdictions, ACE sharing, and/or shorter scheduling intervals within and between Balancing Areas to effectively manage variability of generation resources over a larger footprint. In addition, existing and proposed BAL Standards should be reviewed to determine their sufficiency.</p>	<p><i>Ad Hoc</i> joint group: Members from both the IVGTF – Operations and Planning</p> <p><b><u>Team Lead Jay Caspary</u></b></p>	<p>Report reviewing the impacts and benefits of balancing area enlargement, participation in wider-area balancing management, and shorter scheduling intervals. Further the report should evaluate existing and proposed standards (i.e. BAL), to determine their sufficiency.</p>	<ul style="list-style-type: none"> <li>● Industry survey of current interconnection standards by OC's December 2009</li> <li>● Draft recommendations to the OC by OC's June 2010</li> <li>● Develop SAR with Standards Committee if required.</li> </ul>

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
2.4	<p>Operating practices, procedures and tools will need to be enhanced and modified.</p> <p><b>Next meeting: Dec. 4, 2PM</b></p>	<p>With high levels of variable generation, existing operating practices in unit commitment and/or dispatch along with reserve management will need to change in order to maintain bulk power system reliability. For example, probabilistic methods may be needed to forecast uncertainty in wind plant output and included in the operations planning process. The Committee should, further, increase the awareness of these needs through established NERC programs and/or initiatives.</p>	<p><i>Ad Hoc</i> group: Members from IVGTF - Operations</p> <p><b>Team Lead: Brendan Kirby</b></p>	<p>Report outlining the impacts on commitment and/or dispatch along with reserve management practices and review of NERC standards, along with next steps.</p> <p>Include evaluation of variable generation integration topics in disturbance analysis and operator awareness and training programs. Action to remedy to gaps in the NERC Standards</p>	<p>Draft report ready by December 2010 OC meeting</p> <ul style="list-style-type: none"> <li>• Final sent to OC for endorsement in February 2011</li> <li>• Develop SAR with the Standards Committee by December.</li> </ul> <p><b>Rhaiza will put all received templates into one spreadsheet for all to review and fill in.</b></p> <p><b>So far we have data on: PJM, MISO, BPA, SPP, AESO &amp; ISO-NE, NYISO, IESO, and ERCOT</b></p> <p><b><u>Status No Change</u></b></p>

## 2011 Action Plan

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
2.4	Operating practices, procedures and tools will need to be enhanced and modified.	With high levels of variable generation, existing operating practices in unit commitment and/or dispatch along with reserve management will need to change in order to maintain bulk power system reliability. For example, probabilistic methods may be needed to forecast uncertainty in wind plant output and included in the operations planning process. The Committee should, further, increase the awareness of these needs through established NERC programs and/or initiatives.	<p><i>Ad Hoc</i> group: Members from IVGTF - Operations</p> <p><b>Team Lead:</b> <b>Brendan Kirby</b></p>	<p>Report outlining the impacts on commitment and/or dispatch along with reserve management practices and review of NERC standards, along with next steps.</p> <p>Include variable evaluation of generation integration topics in disturbance analysis and operator awareness and training programs. Action to remedy to gaps in the NERC Standards</p>	<p>Draft report ready by December 2010 OC meeting</p> <ul style="list-style-type: none"> <li>• Final sent to OC for endorsement in February 2011</li> <li>• Develop SAR with the Standards Committee by December.</li> </ul> <p><b>Rhaiza will put all received templates into one spreadsheet for all to review and fill in.</b></p> <p><b>So far we have data on:</b> <b>PJM, MISO, BPA, SPP, AESO &amp; ISO-NE, NYISO, IESO, and ERCOT</b></p> <ul style="list-style-type: none"> <li>• <b><u>Status No Change</u></b></li> </ul>

3. **Planners and operators would benefit from a reference manual which describes the changes required to plan and operate the bulk power and distribution systems to accommodate large amounts of variable generation:** *The goal of this effort is write a reference guide outlining the planning, design and operating considerations needed to integrate large amounts of variable generation.*

## 2009 Action Plan

Item #	Proposed Improvement	Abstract	Lead	Deliverables	Milestones
3.1	A reference manual to support the changes required to plan and operate a bulk power and distribution system accommodating large amounts of variable generation is essential for planners and operators	Bulk power and distribution system planners and operators need to change how they consider reliability considerations. Planners and operators would benefit from one or more reference manuals which describe the evolving changes required to plan and operate a bulk power and distribution systems accommodating large amounts of variable generation.	Members from IVGTF	Reference Manual to include considerations of bulk and distribution systems need to maintain reliability. The reference manual should address: <ul style="list-style-type: none"> <li>• Planning</li> <li>• Operations</li> </ul>	Completed by February OC/PC meeting 2010.  <b><u>Status Needed</u></b>