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| **SO-25 Generator Governor Response for Wind-powered Generators:** When system frequency deviates from the planned frequency of 60 Hz, then conventional, synchronous generators and loads automatically respond. If frequency goes up motors run faster so load goes up. When frequency goes up, all generators tend to speed up so their governors act to slow them down reducing their output. Both of these automatic actions have the effect of reducing the high frequency and getting the system headed back to 60 Hz. The opposite occurs when frequency goes below 60 Hz. These automatic responses to frequency are called primary frequency response. Sufficient primary frequency response is needed to keep the ERCOT system stable, especially when generators or loads trip off suddenly.  WGRs are not synchronously connected to the transmission system. There is no automatic response to frequency unless it is created artificially. For some WGR turbine technologies, there is no way to create a response to frequency at all (except tripping them off line). As the installed capacity of WGRs grows above 15,000 MW there will be many hours when a substantial amount of the generation on line will be WGRs. At these times, it will be efficient for WGRs to provide a portion of the needed primary frequency response. If the WGRs do not provide the needed response, then WGRs may have their production curtailed to allow more conventional units to be on line or to increase their output in order to insure the response is available. A process has been completed to require all new WGRs to provide primary frequency response which culminated in the adoption of Protocol Revision Request 824. The newer technology WGRs can modify their control systems to provide what is expected to be excellent primary frequency response. On a going forward basis, the cost and commercial issues are quite manageable and no study is needed to justify the change in requirements. | |
| **Priority** | High. |
| **Considerations** | Policy: No policy issue is raised on establishing a new requirement for new WGRs. An issue does arise if a new requirement is placed upon existing WGRs. What is the standard of need that must be demonstrated in order to require existing entities to install new software and/or equipment? |
| Reliability: Reliability could be an issue, but it is really an efficiency issue. ERCOT is expected to have sufficient conventional capacity available to allow it to curtail WGRs if needed to provide sufficient primary frequency response capability on the system. Such a process may provide the needed reliability, but at a huge cost to society. |
| Technical: For the newest WGR technologies primary frequency response capability can be provided for a very reasonable cost. For existing WGRs the answer ranges from no conversion capability, to impractical conversion capability, to difficult conversion capability, to conversion capability similar to new WGRs. |
| Market: A small capital cost increase for new WGRs and a range of possible capital costs for existing WGRs. On a relative basis the actual provision of the service could be much more costly than providing it from conventional generators, and the absolute cost of lost production is expected to be less than 1%. |
| Performance/Compliance: New performance standards and compliance metrics will be required. |
| Cost Allocation: None, the costs will be borne by the WGRs. |
| **Strategy** | Maximize WGR production by providing needed system reliability services from WGRs when possible and reasonable.  Recommendation: Establish a new requirement for new WGRs to provide primary frequency response similar to conventional generator “governor response”. |
| **Activities** | ERCOT (E X): Participate in developing the new requirement and performance standards. |
| Market Participants (MP X):  WGRs and all market participants assist in developing the new requirement and performance standards. Comply with the new standards as they are adopted. |
| **Follow-Up** | Monitor system performance and WGR performance to frequency deviations. |
| **Schedule** | December 2009 -Adopted Protocol revision 824 establishing new primary frequency response requirements for new WGRs  Operating Guide revisions to establish performance requirements are in the approval process  Protocol revision 833 establishing new primary frequency response requirements for existing WGRs is in the approval process. |