1. **What are the assumptions in PJM’s System Restoration Plan (i.e. what is the starting point for the system at the time of restoration)?**

   **Response:** PJM’s assumes the following in their System Restoration Plan:
   - Total system blackout with no outside assistance available,
   - Normal weather pattern,
   - Intermediate to peak load levels,
   - Minimal generation or transmission equipment damage
   - Sufficient availability of personnel.

   While PJM recognizes that an actual system blackout may or may not meet these assumptions, the possible scenarios are limitless, rendering it impossible to plan for all scenarios.

2. **Storms in the summer of 2012 caused long restoration times. Doesn’t this make the argument for additional Black Start generation?**

   **Response:** No. Outages caused by infrastructure damage are unrelated to a System Restoration plan. Black Start generation is not utilized for restoration of load due to storm damage.

3. **What are the assumptions that are utilized in the EPRI Restoration Study?**

   **Response:** The EPRI Restoration Study is an initial assessment of EPRI’s Restoration Tool that is still under development. The purpose of this tool is to:
   - Develop a computational method for development and evaluation of system restoration strategy options
   - Develop analytical techniques to estimate the time to restore service
   - Simulate the proposed restoration strategy with realistic system models

   PJM’s role in this initial study will be to provide EPRI a test case (network model inclusive of black start units that will be available in 2015) so that they can test the software and determine if it can provide promising results. PJM will also provide feedback on the tool through this testing process.

   As a result of this study, PJM will get an indication of whether or not there is sufficient black start capability as well as a potential restoration time. EPRI will send a draft report to PJM and will welcome feedback and clarification, which EPRI will take under consideration. PJM is welcome to reach out to its membership for additional feedback.
As per EPRI, this specific effort is to test the validity of the software tool, which is expected to be complete by the end of 2012. There may indeed be additional value in a follow on effort to customize the tool for added functionality specifically for the PJM and its members. Further, there can be value garnered by running more detailed case studies using more detailed information from the PJM membership. This potential work would come at a later phase.

The assumptions for this study are:
- Node-branch model is used for the study.
- The time needed to energize the transmission line/crank generator are known/given.
- The investigation objective of the site and size of the BS units is to maximize the BS capability and shorten restoration time. Secondary objective is not included at this stage (such as close to the nuclear, etc.)
- Load balance is not considered at this stage.

4. Will PJM be performing the EPRI analysis? Are TO’s expected to use this tool?

Response: This would be a PJM function if the EPRI software provides promising results to meet PJM’s needs. TO’s would not be expected to use the tool.

5. Will PJM determine what plants are critical steam plants? The TO may not easily be able to get accurate information to determine this.

Response: In the current proposal, PJM would determine these critical steam plants. PJM already has this information internally. PJM would likely include the TO in this process for concurrence.

6. Should stage 2 (or stage 1) loads include Control Center loads. Even though these loads may seem small, it is a priority of the TO to restore service to its control center. This may involve energizing a circuit with other loads that cannot be easily disconnected.

Response: PJM agrees that Control Center loads should be considered priority load in the TO restoration plan. At the RTO restoration level, however, only the loads critical for RTO restoration (currently and proposed: critical steam, nuclear safe shutdown, and gas infrastructure) are the loads used to identify the Black Start generation requirement.

Control center loads should be included early on in the TO restoration plan but do not need to be supplied by Black Start generation or within 4 hours.

7. If a zone has priority (stage 2) loads that cannot be served from generation in its zone within 4 hours, will PJM (possibly with TO assistance) acquire generation, either Tier 1, Tier 2, or other generation to meet the stage 2 load requirement?

Response: Yes. The proposed plan also allows for supply of these loads from outside the TO zone or aggregation of Black Start between multiple zones if required.

8. If a zone does not have enough generation within its zone to meet the 24-48 hour restoration time, will PJM (possibly with TO assistance) acquire the generation to meet the goal?
Response: No. The proposed 48 hour restoration target time is for restoration of the BES transmission system. Complete restoration of load will be dependent on generation availability and load level at the time of the blackout.

9. Why do nuclear owners need off-site power within 4 hours?

Response: While there is no specific requirement for the 4 hour restoration of off-site power, nuclear owners require power to be restored to their facility as a priority to maintain safe shutdown and serve as a backup for their on-site diesel generation. The proposal maintains this 4 hour restoration target.

10. When will nuclear units be available to generate during a system restoration?

Response: Nuclear units are assumed to be unavailable for at least 48-72 hours following a system blackout and are generally not counted on in the System Restoration plans.

11. What startup time will be used for units during restoration?

Response: PJM would utilize the time to start as Hot Startup Time based on the information submitted by the Generation Owner in eMKT. An assumption in the PJM Restoration plan is intermediate to peak load levels where most marginal generation would likely be running.

12. What is meant by “Target time for restoration”.

Response: The target time for restoration is the time when all available transmission has been energized and is capable of carrying load. It does not include all load restoration. The time for load restoration may be impacted by the availability of generation (i.e. nuclear generation) and overall system load level. These times are targets, not requirements. Actual restoration times may be sooner or longer depending on a wide variety of factors such as infrastructure damage, weather, load levels, generation availability, fuel availability, interchange availability and equipment status.

13. In reviewing the matrix, I believe the matrix column titled “NERC Standards” should be revised to include NERC Standard NUC-001. Requirement R9.3.5 of NUC-001 states that the agreements between the Transmission Entities (e.g. PJM, TO’s) and the Nuclear Plant Generator Operator should have “provision for considering, within the restoration process, the requirements and urgency of a nuclear plant that has lost all off-site and on-site AC power”. Basically what this means is that if following a system blackout the nuclear plant’s internal diesel generators do not start, the nuclear plant will contact the Transmission Operator/Owner and request that restoration of that plant’s offsite power be given priority and restored as soon as possible. The expectation would be much less than the “four hour goal” and in this case the Nuclear Plant would want to get back on the grid (for safe shutdown power) as soon as it was available. The restoration plan needs to have a process for acting on this request from the nuclear plant.

My thought is that some flexibility and margin needs to be built into the Tier 1 black start capability to allow PJM and the TOs to respond to this potential request.
Response: There is margin built into the Tier 1 requirement in the current proposal. This margin, coupled with reprioritizing of the available Black start generation in this situation, should cover this requirement. Essentially, in this unlikely scenario, Black start generation that might otherwise have been used to start critical steam units would have to be diverted for use by the crippled nuclear unit. This might be an issue to highlight in PJM/TO restoration plans.

I feel this requirement speaks more to storm related issues (i.e. transmission damage at or near nuclear station).

14. What is the origin of the 24 hour System Restoration target?

Response: This value is a legacy value used as a target for System Restoration time. There is no requirement or expectation that this value will be achievable in all scenarios. The value is a goal or a target that was established by the System Operations Subcommittee years ago. PJM does not acquire Black Start generation in order to meet this target time.

15. If the TO acquires additional Black Start above the PJM base values, and one of the PJM Black Start units retire, would PJM utilize the TO acquired Black Start?

Response: PJM would utilize any Black Start (PJM or TO acquired) in Restoration Planning. PJM would not utilize TO-acquired Black Start to meet its base requirements. PJM would acquire enough Black Start to meet base requirements and the PJM acquired Black Start would be compensated through the PJM Tariff.

16. Please define the proposed “Stage A Critical Load - Cranking Power to Critical Generation”.

Response: This defines the auxiliary power requirements to generation that has a time to start (Hot Startup Time) of 8 hours or less. This primarily includes steam units (fossil, combined cycle), but may also include simple cycle combustion turbine or hydro units (although the aux power requirements for these units should be minimal). The 8 hour time to start parameter is used to capture units that can start fairly quickly to assist in getting generation attached to the system quickly in order to accelerate the restoration process. This Stage A Critical Load will define the Tier 1 Black Start generation requirement in the proposed solution.

17. The PJM proposal allows for nuclear safe shutdown load to be supplied by Tier 2 Black Start units. These units have a requirement to start in 4 hours or less, but the nuclear safe shutdown load is required to be restored in 4 hours. This allows no time for establishing a transmission path from the Tier 2 Black Start unit to the nuclear plant.

Response: If PJM analysis indicates that it is not possible to restore the nuclear safe shutdown load within 4 hours from a Tier 2 Black Start unit, alternate methods of restoring this load in a more timely manner would be investigated.

18. Does a “Restoration Target Time” matter to PJM?

Response: Restoration target time following a blackout is always “As soon as possible”. Complete restoration of load from a blackout will depend on a wide variety of variables. Trying
to predict an exact, accurate, complete load restoration time without knowing the situation or status of the system when the blackout occurs is a near impossible task. That being said, if many assumptions are made about the status of the grid during a blackout, ranges of estimates can be made of when generation will become available and when the transmission system might become energized. Given a set of assumptions, PJM believes energization of the transmission BES facilities could be achieved within 48 hours. Load restoration will depend on availability of generation and load level at the time of the blackout.

PJM feels that Black Start generation requirements should be based on a critical load definition with the objective of restoring generation as quickly as possible. If these critical load requirements cannot be met, additional Black Start generation procurement may be necessary. Also, based on PJM analysis, if situations exist where procuring additional Black Start generation above critical load requirements can significantly reduce restoration time estimates, PJM feels that these additional procurements should be considered.