



Modernization Action Plan

Attachment 1: Smart Grid Test Bed Plan 2012 -2022

March 2, 2012

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Executive Summary

Ameren Illinois Company (“Ameren Illinois”) submits the following Smart Grid Test Bed plan in accordance with the Public Utilities Act, as amended by the Energy Infrastructure Modernization Act, 220 ILCS 5/16-101 et seq. (“the Act”). While this plan is preliminary, and subject to change as Ameren Illinois gains additional experience and information, including input from the yet-to-be appointed Smart Grid Advisory Council, this plan marks the next step in Ameren Illinois’ commitment to its Modernization Action Plan (“MAP”) and identifies the objectives, benefits, locations, estimated costs/timeline and qualifying process for Ameren Illinois’ Smart Grid Test Bed.¹

Summary of Objectives

As required by Section 5/16-108.5(c) of the Act, this Smart Grid Test Bed plan addresses:

- (1) how Ameren Illinois will meet the objectives for the Smart Grid Test Bed (“Test Bed”) set forth in the Act;
- (2) the proposed locations of the Test Bed facilities;
- (3) the application process by which businesses and individuals (collectively “Applicants”) can apply and qualify to use the Test Bed, including the qualifying criteria;
- (4) the engineering and operational support that Ameren Illinois plans to provide to Test Bed users; and
- (5) the estimated costs related to establishing, administering and promoting the availability of the Test Bed.

The Test Bed will be established and administered at two, separate locations within the Ameren Illinois service territory. The “main” location of the Test Bed (“Test Bed 1”) will provide the appropriate on-grid testing infrastructure in a controlled environment while also allowing for the collaboration with the University of Illinois at Urbana Champaign (“UIUC” or “University”) on testing and validation procedures, data management and analysis and test plan development. Test Bed 1 will also serve as a complement to UIUC’s off-grid testing and simulation capabilities. The “secondary” location (“Test Bed 2”) will provide Applicants an alternative Test Bed environment, which would include access to certain existing infrastructure and facilities not available at Test Bed 1. Together, these locations will establish the infrastructure and resources to meet the Act’s Smart Grid Test Bed objectives, which are to:

- (1) provide an open unbiased opportunity for testing programs, technologies, business models, and other Smart Grid-related activities;
- (2) provide on-grid locations for the testing of potentially innovative Smart Grid-related technologies and services.....;
- (3) facilitate testing of business models or services that help integrate Smart Grid-related technologies into the electric grid, especially those business models that may help to promote new products and services for retail customers; [and]
- (4) offer opportunities to test and showcase Smart Grid technologies and services, especially those likely to support the economic development goals of the State of Illinois.

As more fully explained throughout this plan, the Test Bed will meet the objectives set forth above by providing qualified Applicants an opportunity to test and showcase innovative, though established, Smart Grid related equipment, services and business models within a utility scale environment. Specifically, successful Applicants will be allowed to have their equipment and systems connect to the utility grid for the purpose of:

¹ Capitalized terms not otherwise defined have the same meaning as set forth in the Act.

- (1) evaluating and demonstrating that the equipment or systems function on the Smart Grid, as designed;
- (2) validating Applicant sponsored business models or services by testing the functional aspects of specific equipment; and/or
- (3) verifying that business models or services will provide the Applicant's intended results, if provided to the Smart Grid based upon the Applicants' proposals.

Additionally, the Smart Grid Test Bed program will establish the necessary infrastructure for qualified Applicants, as well as Ameren Illinois, to test and evaluate new products and services to determine acceptability for use within Ameren Illinois' electric distribution systems. Finally, as part of the anticipated implementation of this Test Bed plan, Ameren Illinois will continue to pursue, identify and incorporate, to the extent feasible, ways to further develop the Test Bed to facilitate further development and evaluation of established technologies, if appropriate, as well as to conduct testing and research activities at system voltage.

Summary of Benefits

Development and implementation of this Test Bed plan serves as a critical step in Ameren Illinois' commitment to its MAP, as it is anticipated that establishment of the Test Bed will provide many benefits, including:

- the means to fulfill the Act's intent to facilitate the development of new Smart Grid technologies through on-grid application and testing of established equipment, systems and business models in order to help promote new products and services for eligible retail customers;
- the added benefit of providing Ameren Illinois with the infrastructure and resources to test, document and analyze how new distribution equipment and systems function, including an opportunity to determine whether new equipment or system(s) should be considered for future application throughout the Ameren Illinois' electric distribution system; and
- establishment of the main Test Bed site provides Ameren Illinois with a unique opportunity to partner with UIUC. This partnership will provide Ameren Illinois with access to the University's Smart Grid data assessment capabilities, as well as their off-grid laboratory infrastructure. Ameren Illinois' Smart Grid Test Bed facility will also provide the University with access to utility level infrastructure where the University can test equipment and systems while securely connected to the grid.

Designation of Locations²

The Smart Grid Test Bed will comprise at least two facilities where a variety of testing and analysis of equipment, systems and business models can be performed:

- Test Bed 1, the "main" Smart Grid Test Bed location, will be adjacent to the University of Illinois on Ameren Illinois property located just north of the Champaign SW Campus Substation. (See Appendix 3.)
- Test Bed 2, the "secondary" Smart Grid Test Bed location, will be located in Decatur Illinois. This facility includes distribution automation equipment that is presently served from Ameren Illinois' Baltimore Ave., Mt. Zion 121, and Decatur Rt. 51 substations. (See Appendix 4.)

Additional facilities or infrastructure will be assessed, and included in the Test Bed, solely at the discretion of Ameren Illinois and only at an Applicant's request, which will be reviewed on a case-by-case basis.

² Ameren Illinois notes that this plan also serves to "designate" its Smart Grid Test Bed, as called for in Section 16-108.8 of the Act.

Estimated Costs / Timeline

Provided below are cost estimates for the Test Bed, which are preliminary in nature and subject to change in accordance with the actual implementation of the plan.

The estimated capital cost to develop and construct Test Bed 1 amounts to approximately \$2,000,000. No capital costs are expected for development of the Test Bed 2 site because it will be located at an existing Ameren Illinois substation site that will be made available to successful Applicants who would be expected to pay for utilization of the site.

The annual costs associated with administering both locations of the Test Bed are estimated to be \$438,000 thousand dollars in 2012 and \$865,000 per year in years 2013 through 2021. Again, while preliminary in nature, these cost estimates incorporate estimated administration, engineering services, and operation & maintenance costs associated with the Smart Grid Test Bed program.

The costs associated with promoting the availability of the plan are estimated at \$30,000 plus other to-be-defined costs associated with the appropriate mode of communicating with Applicants, including a permanent website dedicated to the Test Bed.

Finally, the estimated timeline for implementing the plan, including obtaining the necessary permits, building materials, construction and related regulatory matters, is approximately first quarter of 2013.

Test Bed Plan Development

In preparation of the filing of this plan, members of the Ameren Illinois' development and design team met with several institutions and utilities with existing Smart Grid technologies. These meetings included visits to the following entities:

- Electric Power Research Institute (EPRI)
- Illinois Institute of Technology (IIT)
- S&C Electric Company
- University of Illinois at Urbana-Champaign (UIUC)
- American Electric Power (AEP)

The Smart Grid Test Bed team reviewed the information learned from the above site visits and added that knowledge to that gained from various vendors, other utility visits, as well as internal discussions in order to determine what capabilities the Test Bed design should incorporate. These discussions yielded a conclusion that the Test Bed should include the ability to test Smart Grid-related technologies/services/business models as well as other distribution equipment/services, as defined by Ameren Illinois engineering and operating groups, in an on-grid environment. Also, the Smart Grid Test Bed team concluded that more than one location would be required to execute the desired testing activities. Those two locations are identified as follows:

Smart Grid "Test Bed 1"

Ameren Illinois selected the location for Test Bed 1, as well as plan for the installation of equipment at the location, in order to further the statutory objectives of providing opportunities and locations for testing new and existing programs, technologies, business models and other Smart Grid-related activities.

Location: Property just north of the Champaign SW Campus Substation (See Appendix 3.)

Ameren Illinois's reasons for choosing this site location included:

- owned by Ameren Illinois and located in the Ameren Illinois' service territory;

- provides partnership opportunity with UIUC, which will allow cross-utilization of data management and network communications assets and expertise;
- located in close proximity to UIUC's campus;
- located in close proximity to a small number of customers who could play a role in fulfilling the purpose of the Test Bed facility;
- has sufficient room for growth opportunities for development and testing, including a possible development of a future Microgrid Test Bed development; and
- provides additional facilities and infrastructure to the SW Campus distribution substation.

Description of Equipment to be Installed:

A line will be routed from 69KV Line 6665, which is just outside the existing SW Campus substation, to the new Test Bed substation location. Additionally, at least the following equipment will be installed, subject to changes, as appropriate, during implementation of the plan:

- A 69/12Kv substation will be constructed that will include the following equipment:
 - 69/12KV 5.25MVA substation transformer;
 - 69KV steel structure with the necessary electrical busses, fuses, insulators and switches;
 - 12KV steel structure with the associated electrical busses, fuses, instrument transformers, insulators, and switches;
 - G&W Viper recloser³ and SEL relays⁴ for protection of circuit position that will exit Test Bed site;
 - G&W Viper recloser and SEL control relays for protection of internal Test Bed circuit position;
 - Necessary fencing and grounding to insure security and safety within the substation perimeter; and
 - Control building to house communications and control infrastructure, including incorporation of a future Home Area Network ("HAN") where Ameren Illinois intends to install appliances with smart chips for testing opportunities via its AMI network communications infrastructure.
- An Intelliteam system including intellirupters, sensors, communications and controls for protection of external customers from onsite Test Bed failures.
- An overhead 12KV distribution system for Smart Grid-related and Ameren Illinois equipment testing.
- An underground 12KV distribution system for Smart Grid-related and Ameren Illinois equipment testing, including one pad mount transformer that will be utilized to provide electric service to the control building for future HAN development utilizing smart meters. This capability will be dependent on the creation of the Ameren Illinois AMI Network communications infrastructure.
- A communications infrastructure capable of receiving live MISO signals.

³ A "Recloser" is an automatic switching device that allows for the isolation and restoration of electric circuit loads based on control signal circuitry.

⁴ A "relay" is a device that provides the control signal, based on measured electrical data, to control an electric system protective device to safely and reliably operate an electric distribution system.

Test Bed 1 Capabilities

The planned capabilities for Test Bed 1 would include:

- energize equipment/sensors at voltage levels up to and including 69,000 volts;
- communicate to distribution equipment and Applicant sensors utilizing Test Bed communications infrastructure;
- ability to verify the proper operation of system protection/control, system optimization or system sensory equipment installed as a part of the Test Bed facilities;
- ability to perform pre-energization, as well as energized testing of Ameren Illinois identified equipment to determine acceptability of equipment prior to widespread acceptance onto Ameren Illinois Distribution systems;
- ability to review & assess the ease of constructability of distribution equipment/systems as well as Smart Grid-related components; and
- communications infrastructure necessary to receive live MISO signals.

The anticipated future capabilities for Test Bed 1 could include the ability to:

- communicate to Test Bed-located HAN appliances utilizing Ameren Illinois AMI network communications infrastructure;
- communicate to customers that have been identified, and have agreed to such communications; and
- perform other Smart Grid-related testing via Ameren Illinois AMI network communications infrastructure.

Smart Grid Test Bed 2

Ameren Illinois selected the location for Test Bed 2 in an effort to also provide alternative opportunities for testing new and existing programs, technologies, business models and other Smart Grid-related activities.

Location: Ameren Illinois' Existing Distribution Automation circuits fed from the Rt. 51, Baltimore Ave. and Mt. Zion 121 substations (See Appendix 4.)

Ameren Illinois's reasons for choosing this site location included that the site:

- already includes Distribution Automation equipment as part of an Ameren Illinois Distribution Automation network program;
- is located in close proximity to the Decatur Dispatch Center;
- contains an adequate number of customers to obtain utility scale information as a part of the Test Bed processes;
- has opportunities to install additional Distribution Automation or Volt/Var Optimization/Control equipment; and
- is one of the locations for Ameren Illinois' Volt/Var Optimization Pilot Demand Response Program.

Description of Equipment:

- Seven existing intellirupters are presently deployed along the circuits fed out of the above referenced substations;
- thirty-six existing S&C Electric Speednet radios, in a mesh network, are deployed to provide the Intelliteam communication network;
- four existing G&W Vipers along with SEL control relays that are deployed within the above referenced Substations;
- a planned, centralized Volt/Var optimization controller on Circuit 173 out of the Mt. Zion 121 Substation, which engineering is presently underway; and
- four existing Intelliteam systems that are presently being used in an intelligent switching network.

Test Bed 2 Capabilities

The planned capabilities for Test Bed 2 would include:⁵

- Deployment of Applicant provided Distribution Automation equipment for testing of Applicant devices/systems;;
- deployment of Applicant provided Volt/Var optimization controllers/equipment for testing of Applicant devices/systems;
- deployment of Applicant supplied Master SCADA controller for testing of Applicant Volt/Var equipment/controllers;
- energize equipment/sensors at voltage levels up to and including 12,000 volts; and
- communication to distribution equipment and Applicant sensors utilizing Test Bed communications infrastructure.

The anticipated future capabilities for Test Bed 1 could include the ability to:

- communications to customers identified for and have agreed to possible HAN testing; and
- perform other Smart Grid-related testing of Ameren Illinois AMI network communications infrastructure.

Additional Test Bed Infrastructure

While the Test Bed facilities identified above establish Ameren Illinois' commitment to its MAP and to meeting the objectives set forth in the Act, Ameren Illinois will accept and review other Applicant's request that would require additional or different infrastructure facilities upon which to test its equipment or business models. Ameren Illinois will make an independent, case-by-case determination based solely on its discretion of whether or not Ameren Illinois is willing to construct the necessary facilities or willing to provide access to existing facilities not presently part of the Test Bed locations. At the time of this review, Ameren Illinois anticipates providing a report documenting the requested analysis including the costs that will be applicable to the Applicant so that the Applicant can assess appropriate charges as part of the application process.

Estimated Costs/Timeline

The cost estimates for the Test Bed, which are preliminary in nature and subject to change in accordance with the actual implementation of the plan and further information as it becomes available, are set forth below.

Estimated Cost to Construct the Test Bed facilities

The estimated capital cost to develop and construct Test Bed 1 amounts to approximately \$2,000,000. No capital costs are expected for development of the Test Bed 2 site because it will be located at an existing Ameren Illinois substation site that will be made available to successful Applicants who would be expected to pay for utilization of the site.

Estimated Cost to Administer the Test Bed Facility

The annual costs associated with administering both locations of the Test Bed are estimated to be \$438,000 thousand dollars in 2012 and \$865,000 per year in years 2013 through 2021. Again, while preliminary in nature, these cost estimates incorporate estimated administration, engineering services, and operation & maintenance costs associated with the Smart Grid Test Bed program.

⁵ The extent of the capabilities of Test Bed 2 would be subject to an on-going assessment, performed solely at the discretion of Ameren Illinois, of the Applicants application proposal. Furthermore, as no capital costs have been included for this Test Bed location, in the event that an Applicant seeks to take advantage of this location, it is expected that the total costs for implementation of the Applicant's proposal would be charged to the Applicant.

Further, Ameren Illinois expects that interest in the Test Bed facility will generate increased Smart Grid industry interest. Thus, in 2016, the requirements for additional resources to perform on-grid testing may increase such that additional labor resources or facilities would be necessary.

Estimated Cost to Promote Availability of the Test Bed Facility

As an initial effort to promote the Test Bed, Ameren Illinois will integrate promotion of the Smart Grid Test Bed on its website, including a dedicated website to the Test Bed. This website will provide Smart Grid Test Bed Applicants the ability to download the Test Bed Application Form, Supplemental Information Form, and Grid Connection Criteria. Preliminary drafts of these forms are reflected in the Appendices. Moreover, the costs associated with the development and maintenance of this web page is not expected to be significant and will be updated as additional cost information becomes available.

Additionally, once the Smart Grid Test Bed has been constructed and is ready for Applicants, Ameren Illinois plans to inform the Smart Grid Industry through an announcement in an industry trade magazine. Preliminary cost estimates associated with this informational announcement is approximately \$30,000.

As Ameren Illinois implements the plan, the method of communication with potential and existing Applicants will be assessed and altered, as will the costs for doing so, as appropriate.

Estimated Timeline of Implementation of Plan

While also preliminary in nature, the estimated timeline for implementing the plan, including obtaining the necessary permits, building materials, construction and related regulatory matters, puts the estimated availability of the Test Bed to applicants to be approximately first quarter of 2013.

Test Bed Benefits

Ameren Illinois anticipates that the Test Bed infrastructure and resources set forth in this plan, including its unique collaboration with UIUC, will provide many benefits to utilities, Applicants and retail customers in Illinois, including:

- allowing Applicants to have an opportunity to connect their equipment to the grid at voltages up to and including 69,000 volts, which will provide Applicants the opportunity to test their Smart Grid devices, according to the test procedures written by the Applicant and agreed upon by Ameren Illinois;
- allow Applicants the opportunity to test their equipment and business model through connection of the equipment to the grid and then verification of the business model components according to the Applicant's information provided in the application and agreed upon by Ameren Illinois;
- provide Ameren Illinois a location from which to test new devices that are of interest to Ameren Illinois, which would allow Ameren Illinois to test and develop general acceptance of a device prior to its adoption and implementation on the broader electric distribution network;
- allow Ameren Illinois to install different Ameren Illinois sponsored devices with the goal to determine which Ameren Illinois provided equipment is easy to install and maintain;
- provide Ameren Illinois with the ability to test Ameren Illinois provided devices for the purpose of writing Ameren Illinois pre-standards that can then be approved, modified or rejected by the Ameren Illinois Standards Department, which would allow engineering & operations to work collaboratively on the development of Smart Grid equipment installation and operation standards; and
- provide Ameren Illinois with an opportunity to educate customers about Smart Grid benefits by publishing Test Bed reports; and
- Provide customers that are connected to the specific Test Bed locations the opportunities to interact with grid connected AMI equipment once the AMI network communications infrastructure has been developed.

Furthermore, as explained above, Ameren Illinois and UIUC have tentatively agreed to collaborate in the joint development of Test Bed 1, which will complement UIUC's existing Test Bed capabilities. The Illinois Center for a Smarter Electric Grid (ICSEG, sponsored by Illinois DCEO) and the Trustworthy Cyber Infrastructure for the Power Grid (TCIPG, sponsored by the US Department of Energy and Department of Homeland Security), both within the UIUC Information Trust Institute (ITI), will play an critical role in the implementation of Test Bed 1.

Specifically, under the proposed collaboration, UIUC would provide testing and validation guidance, data management and analysis, as well as test plan development. UIUC researchers would leverage the main Test Bed's on-grid facility through extensive data collection instrumentation that could support advanced experiments in Smart Grid technology. This capability augments the University's Trustworthy Cyber Infrastructure for the Power Grid (TCIPG) Test Bed capability, which is off-grid. Additionally, the Test Bed 1 location provides Ameren Illinois the opportunity to partner with UIUC's cyber-security processes/data management and assessment capabilities on Ameren Illinois' equipment and systems.

As part of the planning process, Ameren Illinois is working with UIUC to determine if there are specific projects or initiatives that can be jointly researched. If appropriate, UIUC may also be able to perform some laboratory testing of Applicant devices as part of pre-vetting process prior to connecting an Applicant device onto the grid.

Receiving, Reviewing and Qualifying Smart Grid Test Bed Proposals

Ameren Illinois is committed to an open, objective and reliable process to receive, review and qualify proposals for the Smart Grid Test Bed. To that end, while Ameren Illinois reserves its right to approve or reject an application based on its sole discretion, the Company provides the following objective process and criteria that will guide it while making its decisions.

Receiving Smart Grid Test Bed Proposals

Applicants desiring to have Smart Grid equipment, processes, systems or business models evaluated by Ameren Illinois will have to submit an application request to the Smart Grid Test Bed Staff. The application request form, of which a preliminary draft is provided as Appendix 5, will be made available for download from the Ameren website. The application request will identify the requested information, as well as provide the Applicant the opportunity to provide any other information necessary to adequately review and qualify the application. Such information could include identifying equipment, processes, or business models that an Applicant proposes to have tested/analyzed. The completed application request will have to be sent (email or fax) to the Smart Grid Test Bed Staff.

Reviewing Smart Grid Test Bed Proposals

The Smart Grid Test Bed Staff will review application forms for clarity and completeness, and adherence to the statutory and program requirements. If the application request is approved, the Smart Grid Test Bed Staff will then send an Applicant a Supplemental Information Request Form, of which a preliminary draft is provided as Appendix 6, to obtain additional information about the specific Applicant's request.

Once the Supplemental Information Form as well as any additional information requested by the Smart Grid Test Bed Staff is received, the Applicant's proposal will then be evaluated. This evaluation process will include, among other things, an assessment of whether the proposal meets the Criteria Required for Grid Connection of Applicant Equipment. If the Applicant's proposal does not meet the Criteria Required for Grid Connection of Applicant Equipment, the Smart Grid Test Bed Staff will evaluate which standards the technology does not meet and make a determination of whether or not the technology can be connected in the Smart Grid Test Bed.

As part of this process, Applicants may be asked to refer their products to third party entities like the University of Illinois- Urbana/Champaign, Underwriters Laboratories or EPRI to have their devices pre-vetted prior to Ameren Illinois agreeing to allow the device to be connected to the Smart Grid Test Bed facility. If it is the opinion of the Smart Grid Test Bed Staff, who will retain the sole discretion to approve or reject applications, the Applicant's device does not meet the Criteria Required for Grid Connection of Applicant Equipment; the application will be rejected along with a short explanation of a summary of reasons.

Qualifying Smart Grid Test Bed Proposals

Once the Smart Grid Test Bed Staff has determined that they have the necessary information to perform an adequate review of an Applicant's request, the Smart Grid Test Bed Staff will then evaluate the application against the technical capabilities of the Smart Grid Test Bed. The Smart Grid Test Bed Staff will develop a proposal that details any tests or analyses that Ameren Illinois could provide to meet the Applicant's request. This proposal will generally include a description of the facilities that could be used within the Test Bed, a list of the tests or analyses that could be performed within the Test Bed site, as well as the expected labor and material cost estimates to complete the requested tests or analysis. Once the Applicant and the Smart Grid Test Bed Staff agree on the tests or analysis that will be performed, the Smart Grid Test Bed Staff will provide a services contract for Applicant review and approval. All access to the Smart Grid Test Bed will require a signed contract that contains acceptable provisions agreed to by the Smart Grid Test Bed Staff, including provisions relating to the risk of defective equipment or equipment that does not work as intended.⁶ After receipt of a

⁶ Ameren Illinois also intends to exclude from its reliability metrics any outages or other service disruptions that are due to the testing or analysis of an Applicant's equipment or systems on the Smart Grid Test Bed.

signed contract, as well as payment for the services to be provided, the Smart Grid Test Bed Staff will work with the Applicant to perform the requested services.

The estimated administrative fees associated with the application process, which will be subject to change from time to time, include:

- A non-refundable \$50 fee will be provided with any Smart Grid Test Bed application form prior to work commencing on Applicants proposed project.
- An engineering assessment fee of \$400 will be required with the submittal of each Supplemental Information form to compensate Ameren Illinois for engineering resources to analyze the Applicant request. If Ameren Illinois' engineering assessment expense is less than \$400, the remaining fee dollars will be deducted from the cost estimate to perform the requested Applicant's testing and analysis.
- Labor rate for services provided by a Test Bed technician will be charged at \$108/hour straight time and \$127/hour overtime.
- Labor rate for services provided by a Test Bed engineer will be charged at \$119/hour.
- Fees and labor rates may be adjusted, as appropriate.
- Applicants requiring Test Bed site infrastructure improvements or additions will be charged the actual loaded costs, as appropriate in light of the proposed improvements, and in accordance with the law.

Criteria Required For Grid Connection of Applicant Equipment

All Applicants who submit applications will be subject to at least the following objective criteria:

- Confirmation that the proposed Smart Grid-related technology, business model or service does not appear to threaten the reliability, safety, security or operations of Ameren Illinois's network, employees or the public.
- To maintain the highest reliability to Ameren Illinois customers, all materials and equipment must conform to the applicable National Standards:
 - American National Standards Institute (ANSI);
 - American Society for Testing and Materials (ASTM);
 - Institute of Electrical and Electronics Engineers (IEEE);
 - American Wood Preservers' Association (AWPA);
 - National Electric Safety Code (NEC);
 - National Electrical Manufacturers Association (NEMA);
 - National Fire Protection Association (NFPA);
 - Occupational Safety and Health Administration (OSHA); and
 - Underwriters Laboratories (UL).
- All devices must provide safe operating clearances per the Outdoor Electrical Clearances listed in Appendix 1.
- The Smart Grid-related technology or service must comply with at least the following cyber-security statements:
 - Proof that the firmware that is in use is and always has been the same approved version;
 - Centralized authentication and authorization of field devices and users using third party methods (e.g. TACACS, RADIUS, etc.) for authentication;
 - Discrete and full separation of any networks (company/customer) at the meter;
 - Local tamper detection of field devices via FIPS 140-Level 2;
 - Ability to encrypt data in-flight or at rest as needed;
 - Centralized key and certificate management system;
 - Automated patch and firmware management system with ability to roll back to last patch or firmware level on failure;
 - Ability to provide non-repudiation for access to all components to the system;
 - System monitoring with ability to log security changes, use of access rights, system changes, system state and anomalous system behavior on all devices included in proposed solution;

- Ability to verify integrity of data used for automation of physical systems;
 - Ability to send all logs to syslog;
 - Secure/Encrypted management interface;
 - System has been developed using the Systems Development Lifecycle (SDLC) methodologies including regular auditable penetration testing by third party testers;
 - Support for Virus and Malware detection systems;
 - Ability to set a standard password policy across the system that matches Ameren Illinois password policy (password length, complexity and change frequency) with ability to disable accounts after set amount of invalid logins for set length of time;
 - Guaranteed confidentiality; and
 - Ability to encrypt data across all wireless methods included in system.
- All enclosed outdoor assemblies must provide a means to allow padlocking of the complete unit.
 - All outdoor assemblies shall be designed to resist corrosion, overheating, wildlife entry, and other threats as appropriate for the location of the equipment.
 - The Applicant shall provide, at a minimum, all final versions of installation and operation instructions and drawings for the device to be demonstrated on the grid before any device to be connected to the grid is activated or otherwise put into operation.
 - The device to be tested/analyzed on the grid must have clear and permanent markings on the exterior of the device with all required nameplate markings per the latest revision of ANSI/IEEE standards.

It is important to note that while all applicable criteria must be met, not all of the above criteria will be applicable to all projects. Therefore, each project will need to be assessed on a case-by-case basis to determine applicability of the above criteria. Additionally, Applicants desiring to connect Distributed Generation facilities into the Test Bed site will also need to satisfy Ameren Illinois' requirements as can be found at the following website: <http://www.AmerenIllinois.com/sites/aiu/MyBusiness/IIChoice/Pages/DistributedGeneration.aspx>. These criteria are subject to change at Ameren Illinois' sole discretion.

Engineering/Operations Support

The planned Engineering and Operations support activities that will be provided of the Smart Grid Test Bed department include:

- Preliminary engineering analysis of an Applicant proposal will commence after receipt of an application for services as well as receipt of the Supplemental Information Form information and any other required information provided by the Applicant.
- The Smart Grid Test Bed engineers will prepare a report outlining the following, as applicable:
 - Smart Grid Test Bed infrastructure necessary to perform the requested services;
 - Smart Grid Test Bed labor resources necessary to perform the requested services;
 - Additional infrastructure improvements necessary to perform the requested services, if required or desired;
 - Description of the test plan or analysis methodology necessary to perform the requested services, which will be based on Applicant information pertaining to what is to be tested/analyzed, as well as the Applicant's test plan or analysis methodology;
 - Cost estimate for additional infrastructure improvements, if required;
 - Cost estimate to perform the requested services;
 - Contract to establish agreement of terms and conditions for Ameren Illinois to perform requested services, which will be fully executed prior to Ameren Illinois commencing requested services; and
 - Creation of a specific project number related to a particular Applicant's request.
- Providing engineering design, acquisition of materials and construction of Test Bed infrastructure improvements necessitated within specific contracts, if required or desired.
- Performance of the testing/analysis as stipulated within specific contracts.
- Establishment and managing of a Test Bed schedule to manage the testing/analysis activities within the Test Bed sites.
- Testing or analysis reports depicting results of testing or analysis performed.

Data Security

Consistent with Ameren Illinois' commitment to data security, Ameren Illinois will continue to take pro-active steps to address cyber security compliance with the existing Ameren Illinois network infrastructure and security of sensitive customer data.

Cyber Security Compliance

- As listed above under the Criteria Required for Grid Connection of Applicant Equipment, Applicant proposals will be assessed on a case by case basis for compliance with statement number four (4).

Customer Data Privacy

- Ameren Illinois will not provide any specific customer identifiable information requested by an Applicant, unless a specific customer has indicated in writing to Ameren Illinois and independently verified by Ameren Illinois that such data can be provided to the Applicant.

Smart Grid Test Bed Plan Success

Ameren Illinois commitment to its MAP and successful implementation of this Smart Grid Test Bed plan is strong. However, as set forth above, Ameren Illinois must reserve the right to modify, amend or alter this plan, as necessary and consistent with the law, to meet the requirements and objectives of the Act. Additionally, Ameren Illinois reserves its right to terminate this plan in a manner consistent with the law.

APPENDIX

Appendix 1 – Outdoor Electrical Clearances

The below table indicates the normal operating voltages and the required minimum outdoor electrical clearances required for devices to be installed on the grid.

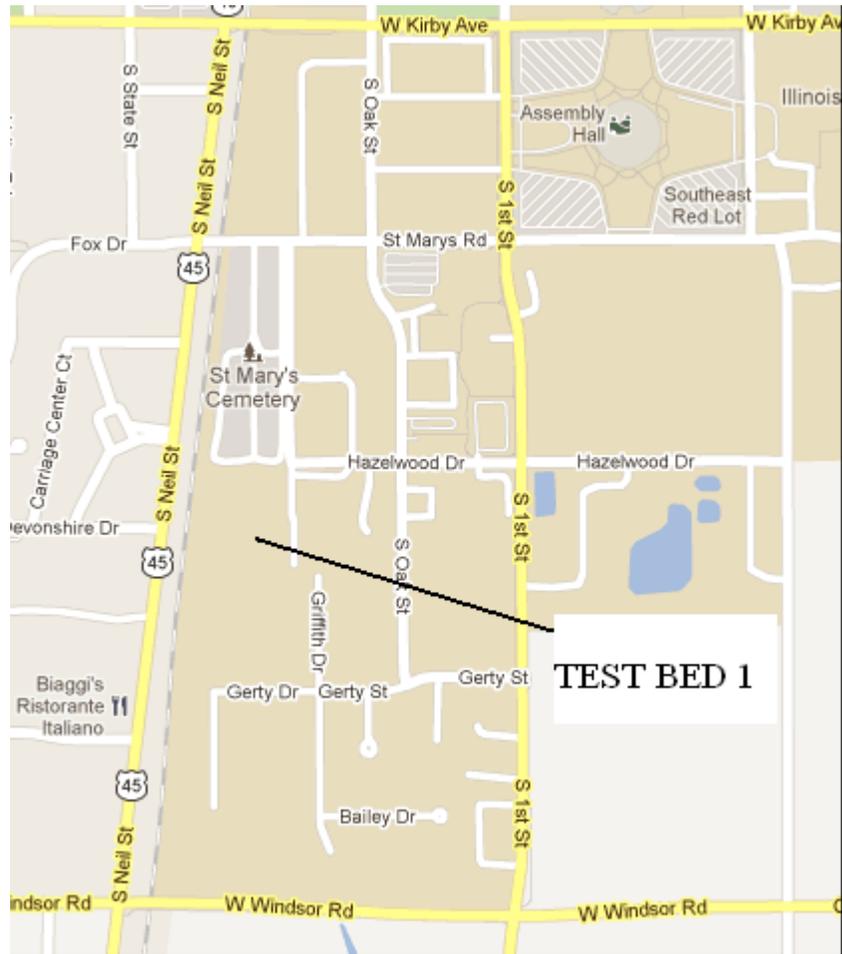
Operating Voltage (KV)	Minimum Metal to metal between phases (1)	Minimum phase to ground (2)	Overhead conductor to grade for personnel safety (3)	Vertical clearance of conductors above roadway (4)
7.2	7"	7.5"	8'-10"	18'-6"
14.4	12"	10"	9'-0"	18'-6"
34.5	18"	18"	9'-6"	18'-6"
69.0	31"	30"	10'-5"	19'-2"

1. Per NEMA STD. SG6-2000, Section 36, Article 36.13.3 and Table 36-2, Col.4
2. Height of stack of standard station post insulator.
3. Per NESC, C2-2002, Part 1, Section 12, Article 124 and Table 124-1.
4. Per NESC, C2-2002 Part 2, Section 23, Article 232 and Table 232-1.

Appendix 2 – Minimum Basic Impulse Level (BIL) Ratings based on Voltage Level

Operating Voltage (KV)	Minimum Basic Impulse Level (KV)
7.2	95
14.4	110
34.5	200
69.0	350

Appendix 3 – Test Bed 1 location



Appendix 4 – Test Bed 2 location





SMART GRID TEST BED INITIAL APPLICATION FORM

Date: _____

Section 1. Smart Grid Test Bed Applicants Contact Information:

Company Name: _____

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime) _____ Cellular: _____

Facsimile Number: _____ E-Mail Address: _____

Section 2. Type of Smart Grid program, technology, business model, or other innovative Smart Grid-related technology or service to be demonstrated in the Test Bed:

Section 3. Description of potential Testing required by Ameren Illinois:

Anticipated timeline that will be necessary to test Applicant’s Smart Grid program, technology, business model, or other Smart Grid-related technology or service:

Email this application to:
Smart Grid Test Bed Staff
Email: E44632@ameren.com

Or:

Fax to: 314-641-2527

AN APPLICATION FEE OF \$50 MUST BE SUBMITTED WITH THE APPLICATION

Mail Fee to: Ameren Illinois – Attention: Smart Grid Test Bed Staff
2701 N. Martin Luther King
Decatur, Illinois 62526

Applicant Signature

I hereby certify that to the best of my knowledge, all of the information provided in this application request form is complete and true.

Applicant Signature: _____

Title: _____ Date: _____

Appendix 6 – Detailed Information Request Form



SUPPLEMENT TO APPLICANT’S SMART GRID TEST BED INITIAL APPLICATION FORM

Applicant must submit this form after approval of the Initial Application and provide all detailed information requested by Ameren Illinois regarding the Applicant’s proposal. Please attach any information that you believe would assist with reviewing your application.

Supplemental Information Form

AN ENGINEERING ASSESSMENT FEE OF \$400 MUST BE SUBMITTED WITH THIS FORM BEFORE ANALYSIS OF APPLICANTS PROPOSAL CAN CONTINUE.

Applicant Contact Information

Company Name: _____
Name: _____
Mailing Address: _____
City: _____ State: _____ Zip Code: _____
Telephone (Daytime) _____ Cellular: _____
Facsimile Number: _____ E-Mail Address: _____

Alternate Applicant Contact Information

Company Name: _____
Name: _____
Mailing Address: _____
City: _____ State: _____ Zip Code: _____
Telephone (Daytime) _____ Cellular: _____
Facsimile Number: _____ E-Mail Address: _____

Description of Device/Service/Business Model to be tested/analyzed: _____

Test/Analysis Objectives: _____

Discrete and full separation of any networks (company/customer) at the meter. _____

Local tamper detection of field devices via FIPS 140-Level 2 _____

Ability to encrypt data in-flight or at rest as needed. _____

Centralized key and certificate management system _____

Automated patch and firmware management system with ability to roll back to last patch or firmware level on failure. _____

Ability to provide non-repudiation for access to all components to the system. _____

System monitoring with ability to log security changes, use of access rights, system changes, system state and anomalous system behavior on all devices included in proposed solution. _____

Ability to verify integrity of data used for automation of physical systems. _____

Ability to send all logs to syslog _____

Secure/Encrypted management interface _____

System has been developed using the Systems Development Lifecycle (SDLC) methodologies including regular auditable penetration testing by third party testers. _____

Support for Virus and Malware detection systems _____

Ability to set a standard password policy across the system that matches Ameren Illinois password policy (password length, complexity and change frequency) with ability to disable accounts after set amount of invalid logins for set length of time.

Guaranteed confidentiality _____

Ability to encrypt data across all wireless methods included in system. _____

What remote access need is required for the solution/technology being tested? _____

What are your requirements around data gathering for your tested solution technology?

Describe any unique requirements that may be desired for your solution's test environment.

Describe the level of maturity of the product/solution. Is it generally available in the market, only deployed in pilots, academic, or lab only?

Describe which interoperability and cyber security standards are incorporated into your solution. Has any third party testing in these areas been completed? Is your product certified against these standards?

Device/System/Program certification: (Please describe what entities have certified the technology – IEEE, ASTM, UL, etc.)

Are test procedures defined and written for each use case? If they are, please attach them to your application request form.

If not already described above, please list any Devices/Systems/Software/Sensors required to perform requested testing or analysis.

Client Proposed Project Timeline: (E.g., Gant chart depicting key activities) Attach document to the application form.