<u>Galvin Electricity Initiative</u>
Phase Two Work Plan

Phase Two of the Galvin Electricity Initiative will expand and refine the Phase One results into an implementation roadmap, systemic blueprints, quality management plans and commercial business models for achieving and maintaining unqualified perfection in 21st century electric energy supply and service. The following tasks are therefore designed to ensure that the Initiative develops the most technologically, operationally and commercially confident work plan for achieving successful system implementation.

<u>Task 1 — Optimum System Design</u>

The objective of Task 1 is to develop and apply comprehensive engineering criteria and methodology to each candidate system Configuration and its corresponding Innovation Nodes. This will, in effect, transform the system "architectural renderings," developed in Phase One, into confidently engineered designs. Quantifiable value metrics and criteria will be established for determining the "perfectibility" of each candidate system Configuration over its range of potential application situations. Criteria categories would include, for example: technology development risks and costs, implementation costs, reliability, immunity to natural and human incursions, and commercial/societal benefits and/or barriers.

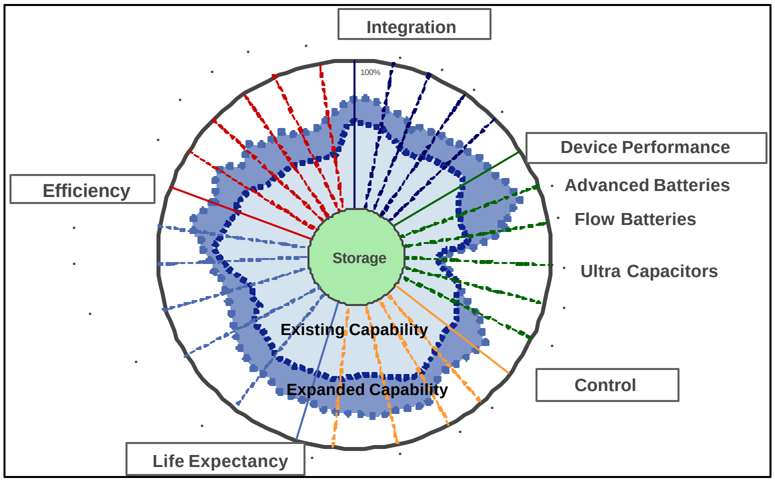
A system assessment procedure will be developed that incorporates these criteria and the analytical framework developed in Phase One. This framework was based on two principles: first, Perfect System Configurations create consumer value that is tangible and measurable; and second, the perfection of each contributing element in a Configuration can be measured by the degree to which it fulfills its functional requirements. A variety of assessment approaches will be considered incorporating the following two key elements:

- A method of assigning economic value to each of the assessment criteria as a common denominator for all system costs, risks and benefits

- Probability-based value assessment of expected costs, risks and benefits since many cannot be characterized by deterministic evaluations

Critical capability gaps will be identified by assessing and comparing the current state of contributing technologies to the required performance for a perfect system. These assessments are illustrated in Figure C-1.

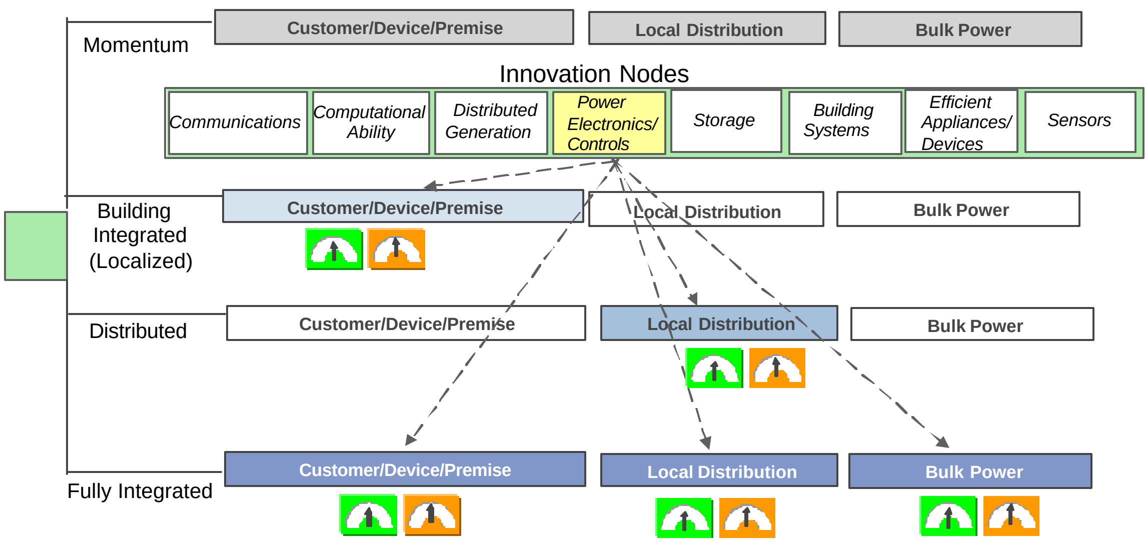
Figure C-1: Capability gap assessment



One hundred percent is defined as the point at which additional improvement efforts would not be worth their cost.

The current configuration of alternative system Configurations and contributing Innovation Nodes is depicted in Figure C-2.

Figure C-2: Alternative system architectures and Innovation Nodes



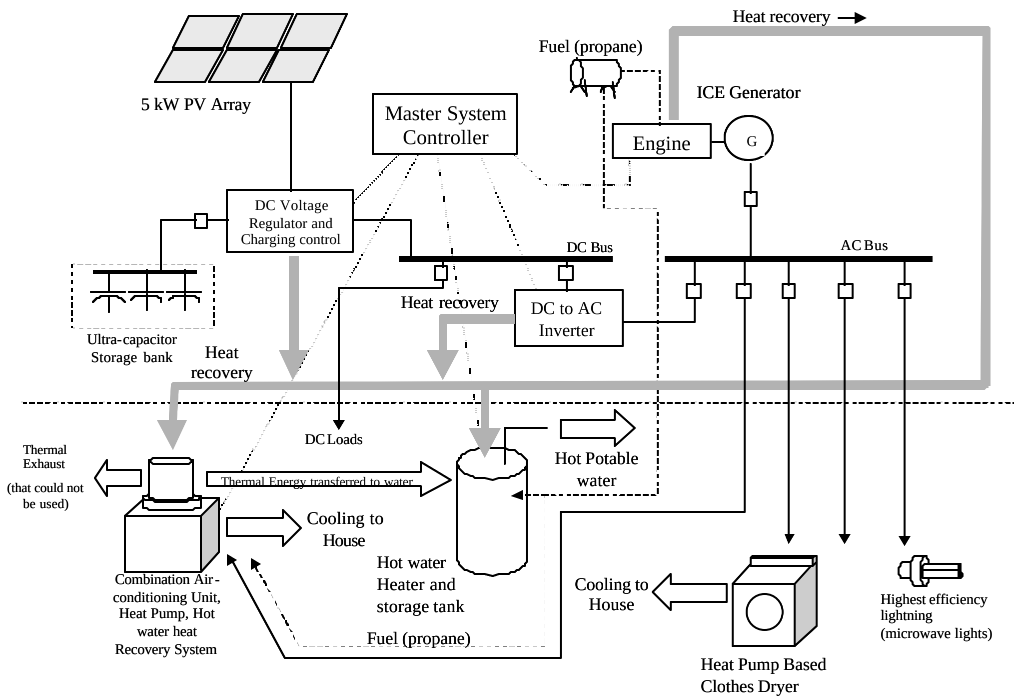
<u>Task 2 — Developing, Implementing and Operating the Perfect Power System</u>

The objective of Task 2 is to develop the essential system-level blueprint for implementing the four candidate Perfect Power System Configurations. This will characterize the migration path over the next decade from today's centralized commodity electric energy system to the consumer-focused Perfect Power System Configuration. This will reflect the process for assimilating the critical innovative technologies and quality management procedures into the power system infrastructure, together with resolving any key technical gaps. This process includes: development plans and critical path timelines; integration of system monitoring and control requirements; essential information systems and processes; and methods for continuous performance assessment and improvement.

Figure C-3 shows an example of a building-integrated (localized) power system. This system includes the following elements:

- On-site hybrid distributed generation (photovoltaic and propane-powered Internal Combustion Electricity (ICE) generator)
- Energy storage (ultracapacitors) that allows backup power and better balancing of combined heat power (CHP).
- Heat recovery from ICE generator, inverters and regulator
- Separate DC and AC buses (for powering loads with most suitable source)
- Energy-efficient lighting (fluorescent, gas discharge and microwave lighting)
- Energy-efficient building design (not shown in drawing; includes passive solar and other features)
- Heat-pump-based clothes dryer with air-conditioner recovery/rejection option for residence
- Combination heat pump, air-conditioner, water heating (via air-conditioning recovery)
- Use of propane fuel for lower emissions than diesel
- Propane backup for water heater and heating system

Figure C-3: Building-integrated power system



Preliminary engineering analyses of the four candidate Perfect Power System Configuration designs will be conducted. These analyses will identify critical system integration issues and provide guidance on the feasibility of near-term demonstration and deployment. Key issues to be considered include operating voltage types and capacity of generation, system reliability, power supply system protection or control, software requirements, and cost.

The implementation plan for the Perfect Power System must also define the array of processes associated with planning, installing, operating, managing and maintaining the system as well as the interactions among these processes and various supporting components. This complete process mapping provides the basis for continuous improvement using quality management principles. Examples of the processes involved include: load planning, risk design and management, equipment procurement and quality control, asset management, operational monitoring and control, information systems, and telecommunications.

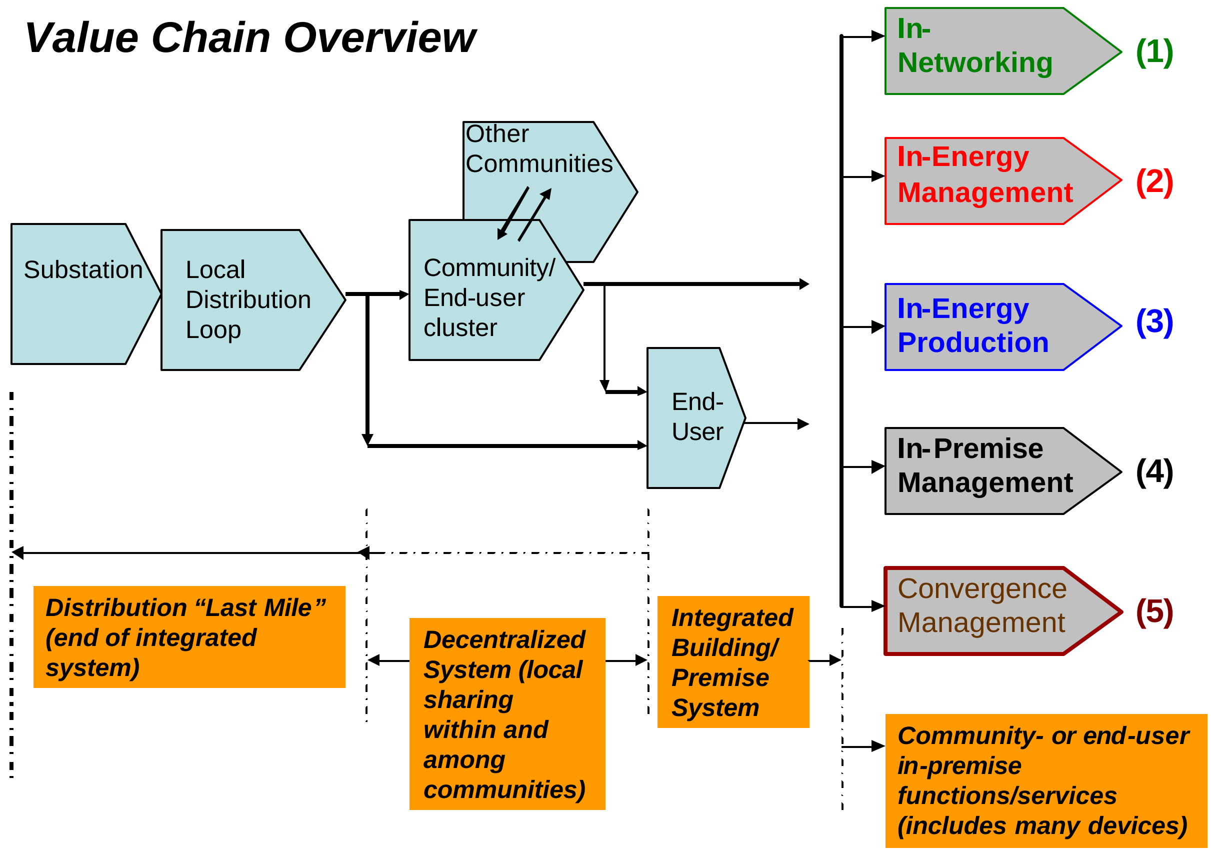
Metrics will be established for each process in order to monitor its performance against characterized indices. The results will be translated into a template for comprehensive quality management (e.g., six-sigma) tailored to all electric energy service functions, providers and support industries throughout the value chain.

Task 3 — Demand Guided Entrepreneurial Transformation

Task 3 focuses on evaluating and enabling new demand-side leadership opportunities for implementation of the Perfect Power System. Consumer-demand-focused leadership is both essential to prompt system performance transformation, and to the commercial application of many of the innovations on which perfection ultimately depends. The fundamental proposition here is that the various policy, regulatory and institutional barriers to entry can indeed be successfully overcome if business propositions are sound and aggressively pursued. It is also anticipated that potential new entrants will be attracted to participation in the Initiative since it provides an efficient learning curve and opportunity to build implementation networks with incumbents, etc.

Demand side business opportunity templates will develop a detailed demand-led value chain built on the system configurations and innovation opportunity results from Phase One. This would include, for example: decentralized methods to meter and dispatch energy; decentralized local distribution controls; distributed electric energy production and backup; and integrated consumer service management. Based on this demand-led value chain and technologies, a set of potential business opportunities will be derived and translated into individual opportunity templates. A taxonomy of relevant new entrants will also be developed for each template, together with an assessment of their business incentives and potential market interests. The opportunity templates will be refined using this assessment. A generic value chain is depicted in Figure C-4.

Figure C-4: Value Chain Overview



Factors considered for each business opportunity will include: cost of and barriers to entry; existing and potential remedies/incentives; timing on windows of opportunity; potential market transformation over time; and benefits to consumers, new entrants and other stakeholders.

A variety of the potential new entrants will be engaged who could facilitate the prompt entrepreneurial implementation of the Perfect Power System. This would involve a variety of individual interactions as well as possible workshops to test and refine the results. These efforts would also gauge the specific interests of potential new entrants, the incentives needed, and identify specific coalition opportunities focused on implementing early demonstrations of the Perfect Power System and its enabling technology innovations as business opportunities. This task would actively support and extend the extensive business networking experience and established relationships of the Galvin family. As a point of departure, the following are some categories (and examples) of potential new entrants:

- Electronic energy management (Elutions, Honeywell, WebGen Systems)
- Information management (Google, Yahoo)
- Distributed generation and combined heat & power (Capstone, Primary Energy, Ingersoll-Rand)

- Real-time system infrastructure (Verizon, Comcast)
- Wi-Fi real-time integrators (Cisco, HP, Juniper)
- Financial institutions
- Real estate and facility developers

A deployment blueprint will be developed that focuses on the most promising consumer-demand-focused business opportunities identified. This deployment blueprint would be generally structured as follows:

1. Path Overview for Each Candidate Perfect System Configuration
    - Taxonomy of potential new entrants and their roles
    - Ranking of demand-led opportunities and business propositions
    - Market potential and consumer benefits
    - Target deployment markets
    - Total resource required

2. Specific Opportunity Paths (for those selected from 1)
    - Action roadmap and timeline
    - New entrants to be targeted
    - Detailed, specific market potential
    - Financial/regulatory requirements, issues and incentives
    - Other resources/actions required
    - Follow-up initiatives needed for success