



Perfect Power Prototype for Illinois Institute of Technology

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Principal Investigator



Project Overview

- Funded by the U.S. Department of Energy
- \$12M (\$7M from DOE, \$5M Cost Share)
- 5 year project
- Located at Illinois Institute of Technology (IIT)
- Involves the entire campus
- Partners: IIT, Exelon, S&C, Schweitzer, Endurant



Project Uniqueness

- IIT is essentially a town in an urban setting
 - 120 Acres with public roads, streetlights, and public transportation
 - Owns its electric infrastructure with an 8MW gas turbine plant
 - 600 Residential units
 - 80 Commercial Tenants
 - Public buildings: admin/office spaces, auditorium spaces, Campus Centers (“Town Halls”), Libraries, Laboratory spaces



Vision for Perfect Power

“The perfect power system will ensure absolute and universal availability of energy in the quantity and quality necessary to meet every consumer’s needs. It is a system that never fails the consumer.”

Bob Galvin



Project Objectives

- 50% peak demand reduction
- 20% permanent demand reduction
- Demonstrate the value of Perfect Power
 - Cost avoidance and savings in outage costs
 - Deferral of planned substations
- New products and commercialization
- Replicable to larger cities
- Promotion of energy efficiency and cleaner cities



Project Challenges

- At least three power outages per year
 - Costs = up to \$500,000 annually in restoration costs, lost productivity and ruined experiments
- Electricity costs were doubled within the last decade
- Addition of two new resident halls require more power
- Campus electricity infrastructure would need to be upgraded
- Electricity demand is growing with increased student population
- Installation of additional building equipment adds to energy use
- Renegotiating electricity contract will allow real-time pricing

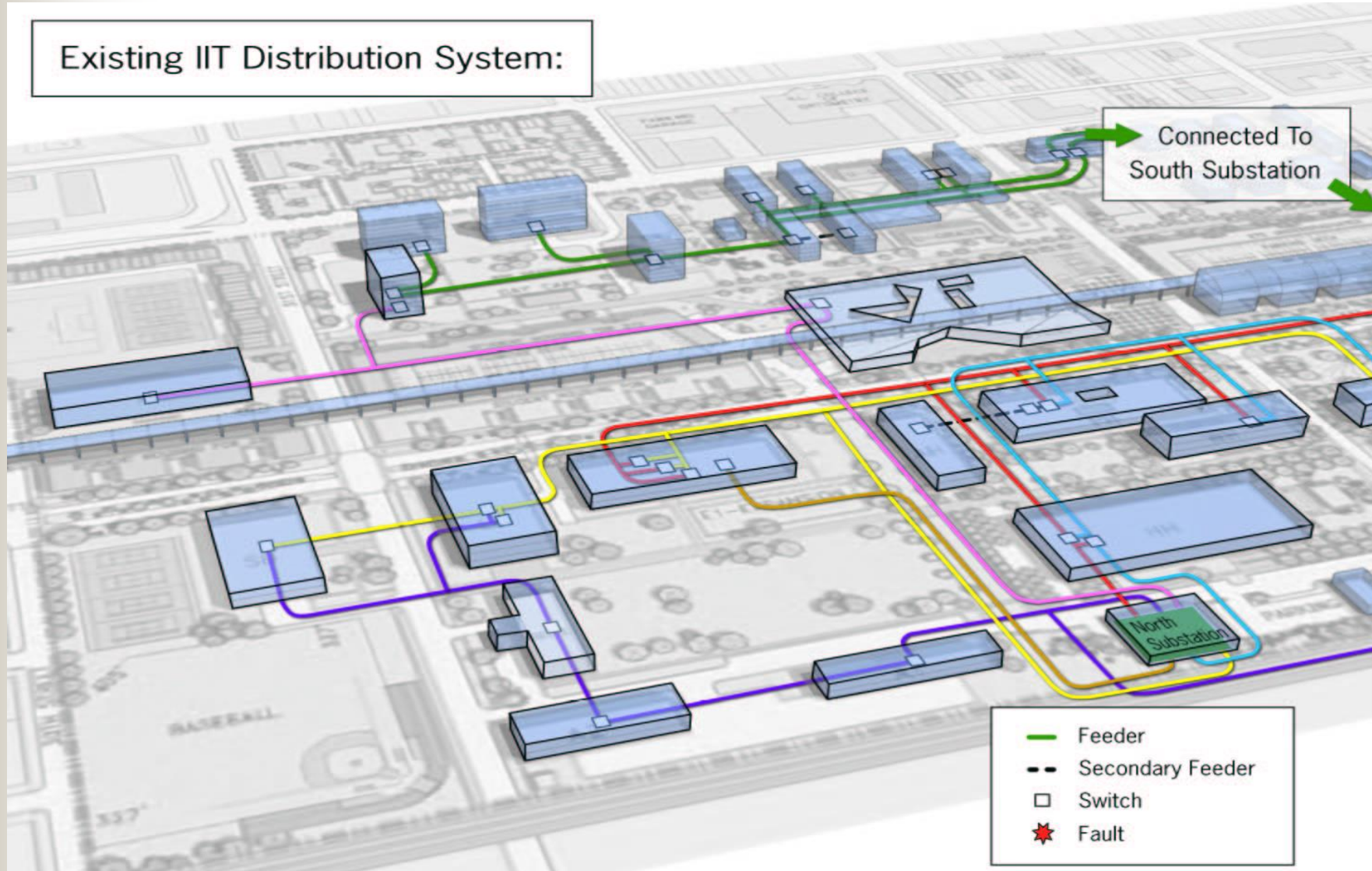


Proposed Solutions

- Self-sustaining infrastructure
- Intelligent distribution system
- On-site electricity production
- Demand response capability (A/C, lighting, major loads)
- Intelligent perfect power system controller
- Sustainable energy systems and green buildings
- Technology ready infrastructure



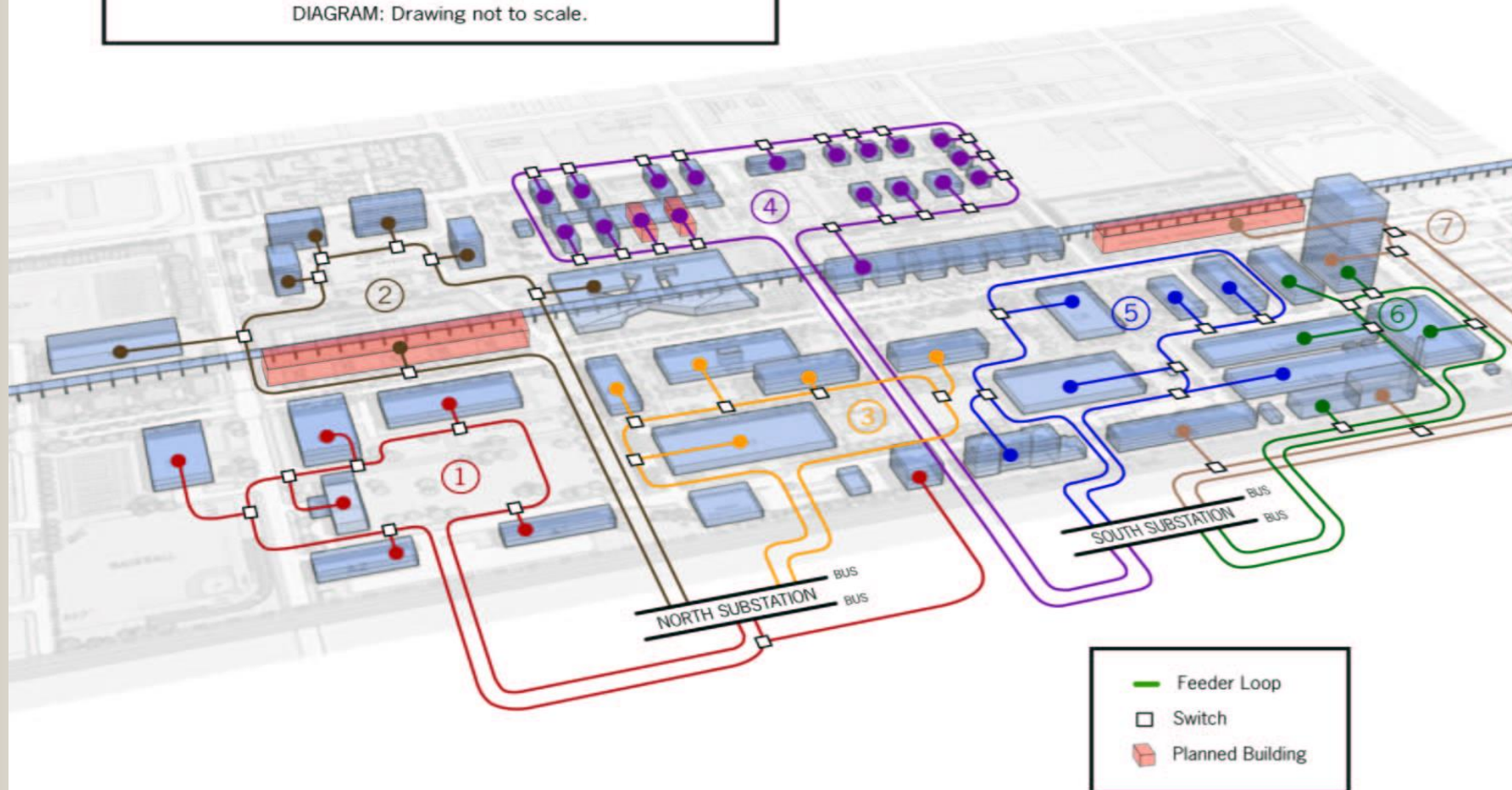
Existing IIT Distribution System:





High Reliability Distribution System:

DIAGRAM: Drawing not to scale.





Project Tasks

- Phase I is to establish the basis for Perfect Power
- Phase II is to address key technology gaps
 - Task 1.0 – Advanced Distribution Automation and Recovery System
 - Task 2.0 – Buried Cable Fault Detection and Mitigation
 - Task 3.0 – Intelligent Perfect Power System Controller
 - Task 4.0 – Advanced ZigBee-Based Wireless
- Phase III is to prepare IIT for real time pricing and ancillary markets
- Phase IV is to deploy the advanced campus distribution system
- Phase V is to deploy campus distribution level peak load reduction



Project Updates

- Completed the conceptual design for year one
- Initiated manufacturing of switchgear for High Reliability Distribution System
- Completed the cost estimating of installation projects
- Began underground location work and site coordination for the project installations
- Established autonomous agent-based perfect power controls and unbalanced three-phase distribution system simulator
- Designed the IPPSC for campus energy and control system
- Completed the design of ZigBee sensor controls and wireless communications for the building automation



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THE ISSUE

Built largely in the 1960s or before, our electric power system cannot reliably run the kinds of digital devices on which today's economy depends. The effects of this inefficient, unreliable, and outdated electricity system are acutely felt

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IIT to implement first-of-its-kind power grid
One university claims it's on the road to perfect power.

