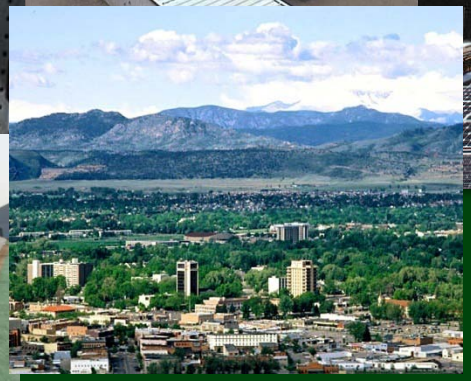
Colorado State University

CSU SMART GRID INTEGRATION LABORATORY

Peer Review 3 November 2010

Dr. Wade Troxell, Associate Dean of College of Engineering



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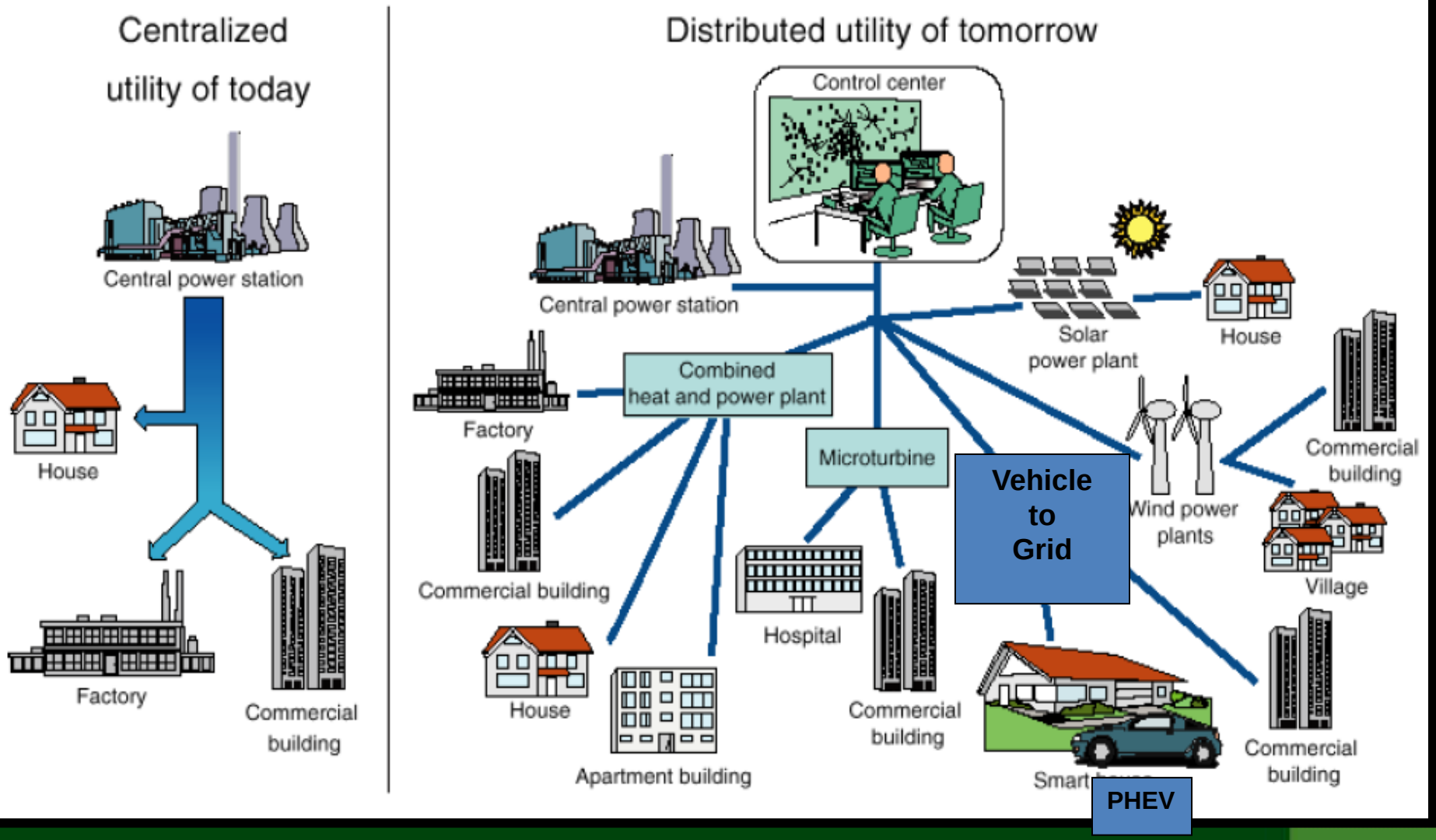

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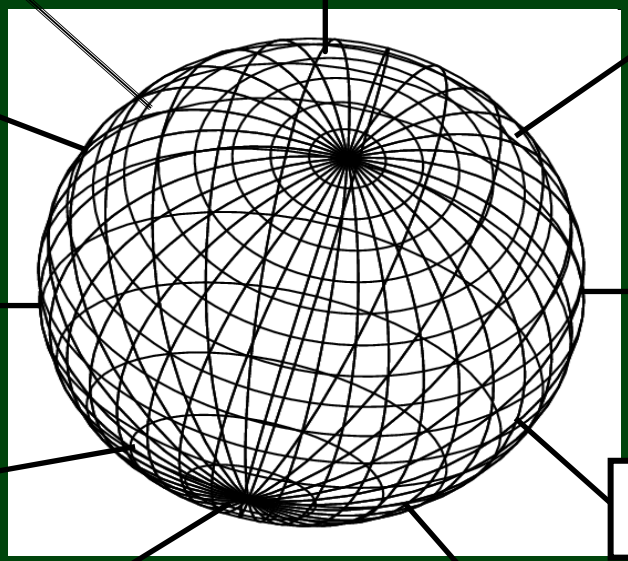
SMART GRID Perspectives



Innovation

Implementation

Customer as Consumer

Distribution Utility

Customer as Producer

Regulatory

Society

Public Policy

G & T

Others

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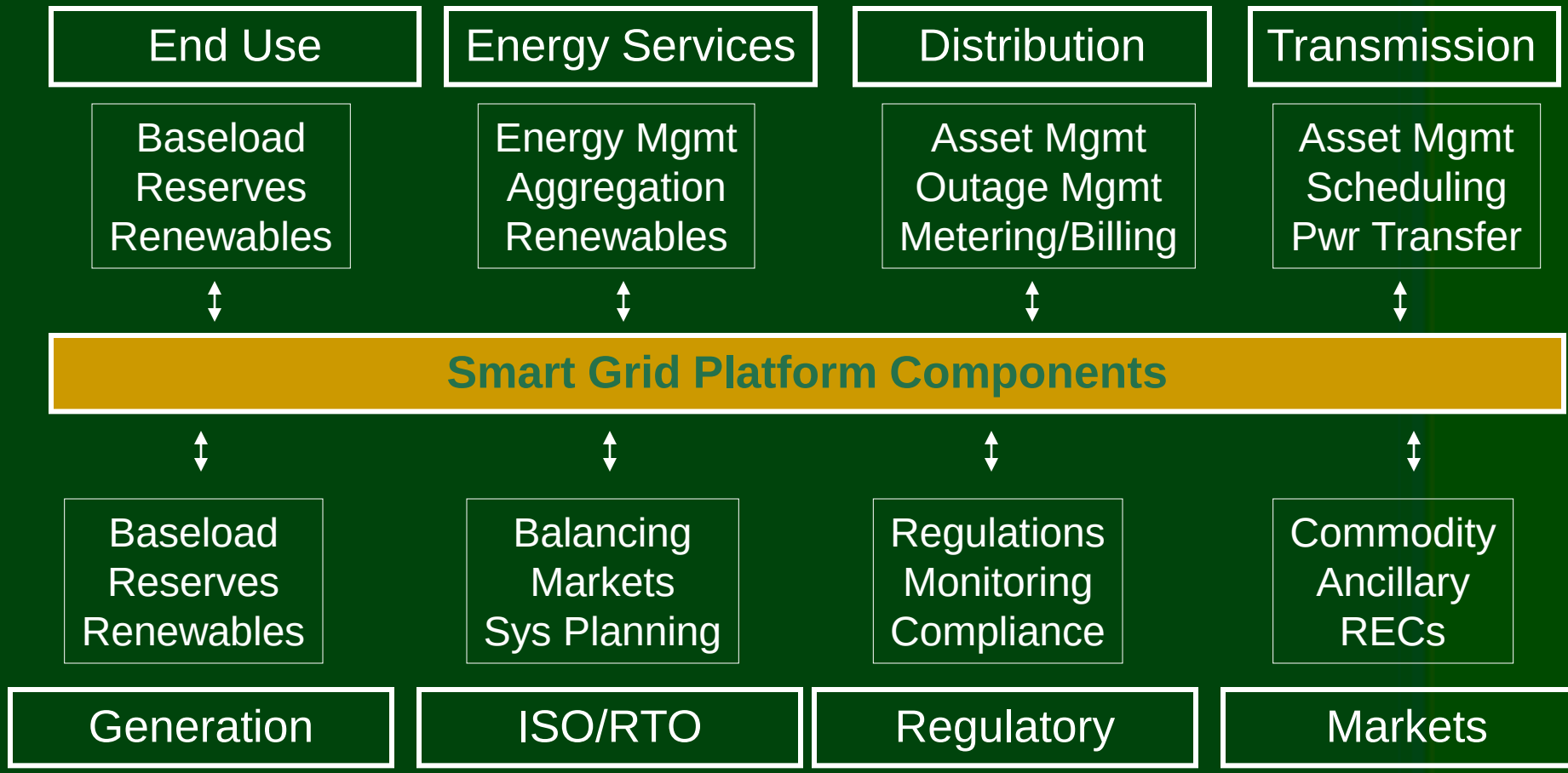
SMART GRID Energy Services Platform



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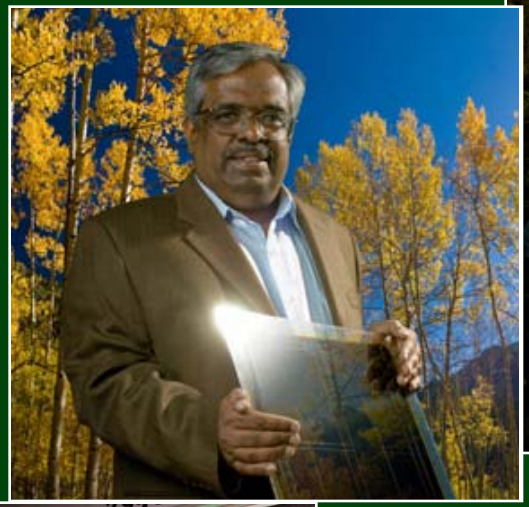

It starts with excellent faculty…

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Smart Grid Integration Laboratory Overview

Timeline

Budget

FY2009	$485 K	Funded
	$119K	Cost Share
FY2010	$875 K	Funded
FY2011	$1.35M	Unfunded

Barriers

- Finding and hiring experts in compressed time frame
- Salary competition
- Education freedom vs. standards
- Specialized Equipment

Collaborators

- Colorado Clean Energy Cluster
- DOE
  - PHEV Education
  - Fort ZED
- Spirae
- Telvent
- NREL

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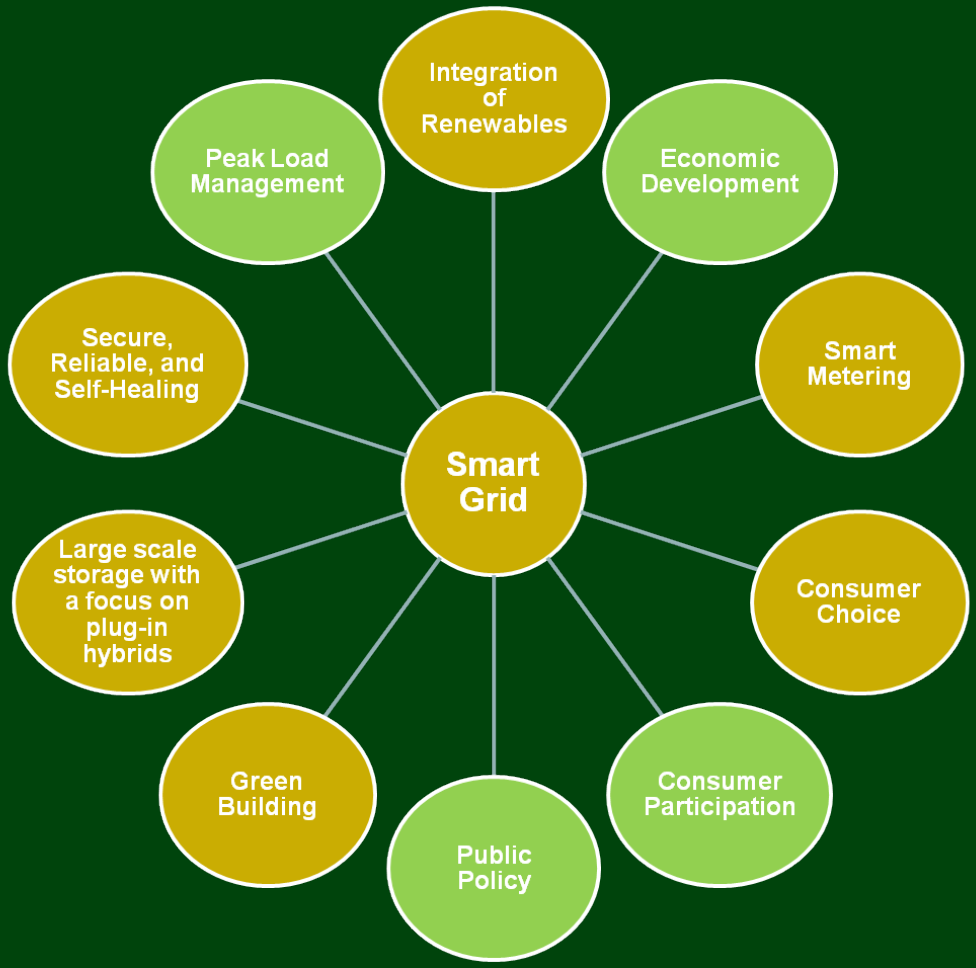
Relevance to DOE Mission



Purpose

- To reduce U.S. dependence on foreign oil, create jobs, and help U.S. industry compete successfully in global markets for clean energy technology

Vision

- Lead the U.S. transformation of the electric power grid to incorporate the integration of renewable power generation sources and providing the ability of active participation with the end users

Mission

- To train industry, educate the next generation smart grid systems engineers and scientists, and perform leading smart grid-related research leading to innovation of new technologies and services enabling high penetration of renewable energy

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Objectives

- Develop faculty leaders with the intellectual capacity to lead education and research towards a secure smart grid infrastructure
- Develop curriculum course work and teach graduate and undergraduate energy systems engineering courses using academic and practicing professionals
- Initiate and lead collaborative efforts towards smart grid innovations
- Conduct innovative externally sponsored research as a team member of Smart Grid Innovation Center and InteGrid Laboratory

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Approach

- Use a program management / systems engineering approach
- Define requirements needed by Industry
- Identify and hire faculty experts
- Build academic curriculum and courses to include systems engineering and actual experiences
- Apply recognized education standards to all course development
- Build short courses
- Research and integrate results into coursework
- Solicit student, industry evaluations
- Continuously improve based on evaluations

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Educational Matrix Framework

- Hands on
  - Smart Grid NOC
  - Distributed Management Systems
  - Micro-grid operations

- Smart Grid Integration
  - Distributed architectures
  - Physical infrastructure – EV inc
  - Home management systems
  - Carrier energy – storage
  - Security – physical and cyber

- Systems Engineering
  - Power
  - Controls and IT
  - Communications
  - Socio-economic

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Program Management

- Plan
  - Integrated Program Management Plan
    - Incorporating plans, schedule, budget, risk and opportunity management
    - Ancillary Plans
      - Faculty Hiring Plan
      - Educational Plan
      - Quality and Benefits Plan
- Results
  - Risk event materialized when no mechanical engineering faculty candidate was chosen from the 90 + applicants creating late schedule and under achieved expenditure rates
  - Money has been allocated appropriately moving ahead work on the professional track rather than academic
  - Requested and received a 1 year no-cost extension (mitigation)
  - Revised plans and schedule

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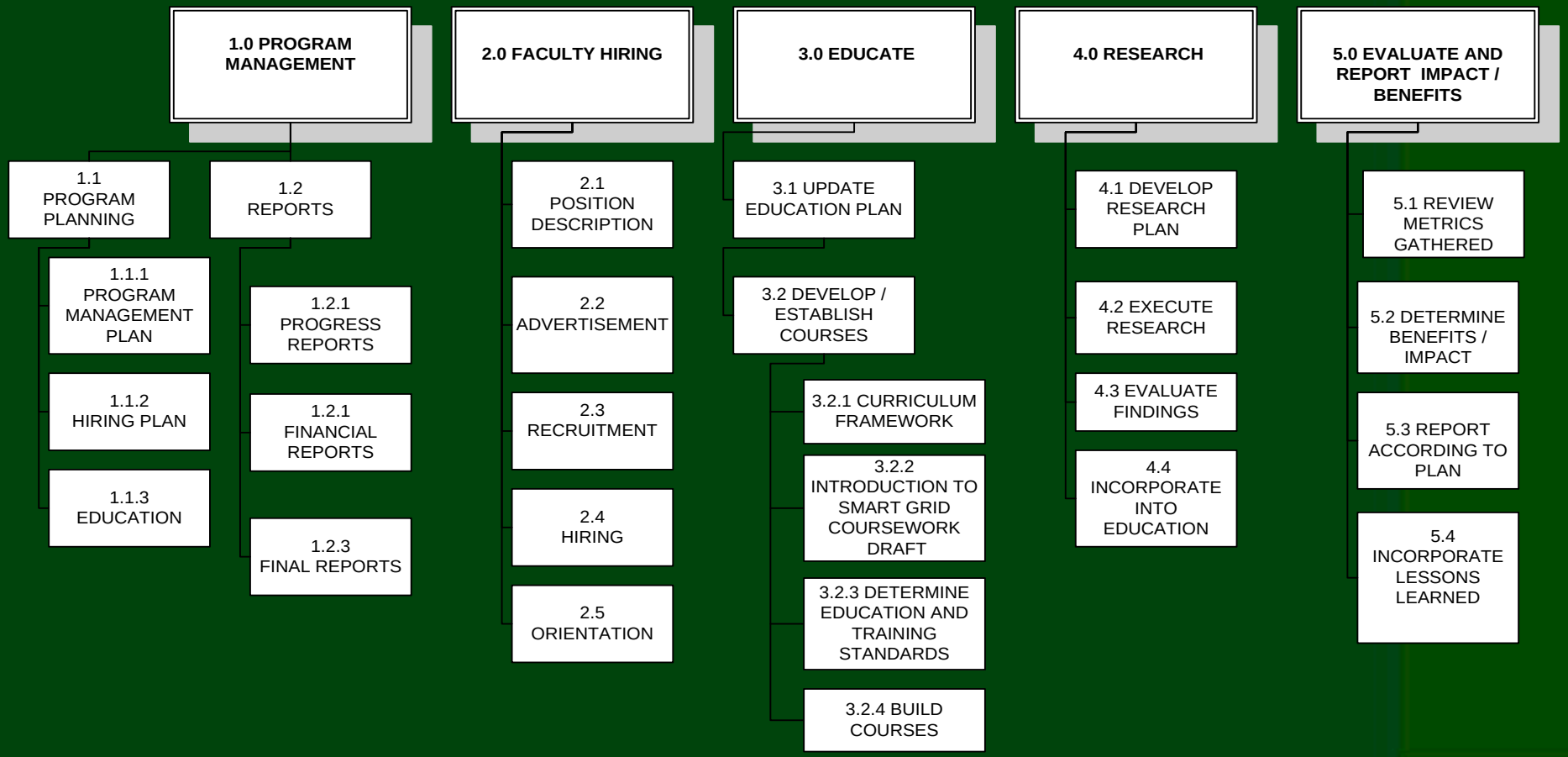
Work Breakdown Structure



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Risk Management

Risk	Probability	Impact	Mitigation
Lengthy Hiring cycle time could affect cost and schedule plan	H	H	Alternate schedule and plan based on hiring process and extension of contract period; re-allocate funding from hire to course development (Did occur)
Candidate search might have to re-open if no candidate is chosen	M	M	Use education committee to keep curriculum and course work going even if not all faculty hired at same time (Did occur)
Course work does not meet education and training requirements needed in industry	H	H	Use results of industry focused Smart Grid Education Workshop to guide course development; Employ standards for all courses developed to clarify and communicate knowledge and skills expected
Funding of 2011 tasks may not occur	M	H	Explore other sources of funding; take a current faculty line into the SGIL
Funding of 2012 equipment may not occur	M	H	Address equipment budget early in 2011 for planning purposes; Select critical vs. desired equipment; Find university or outside funding

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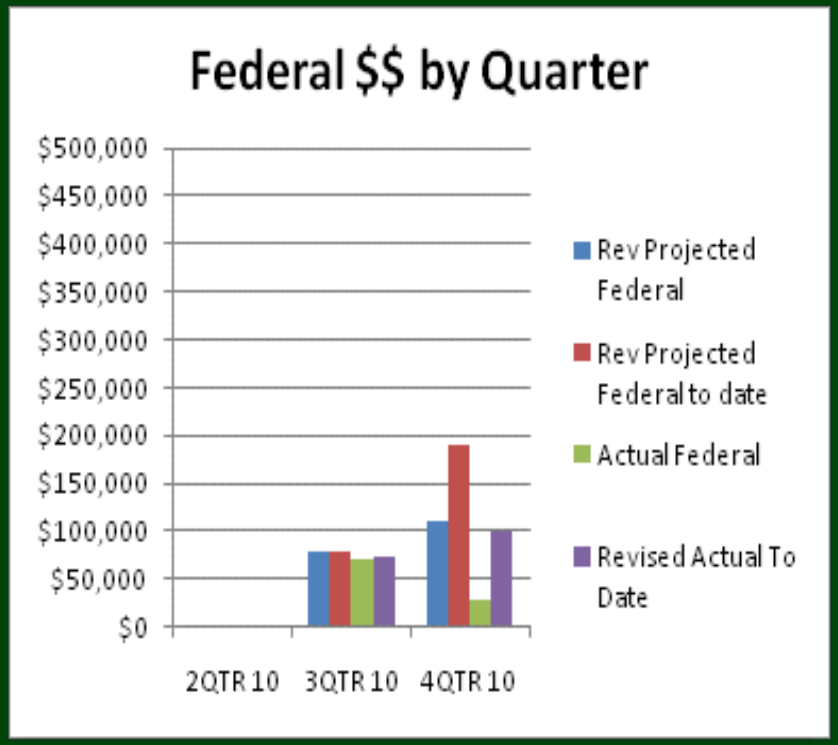
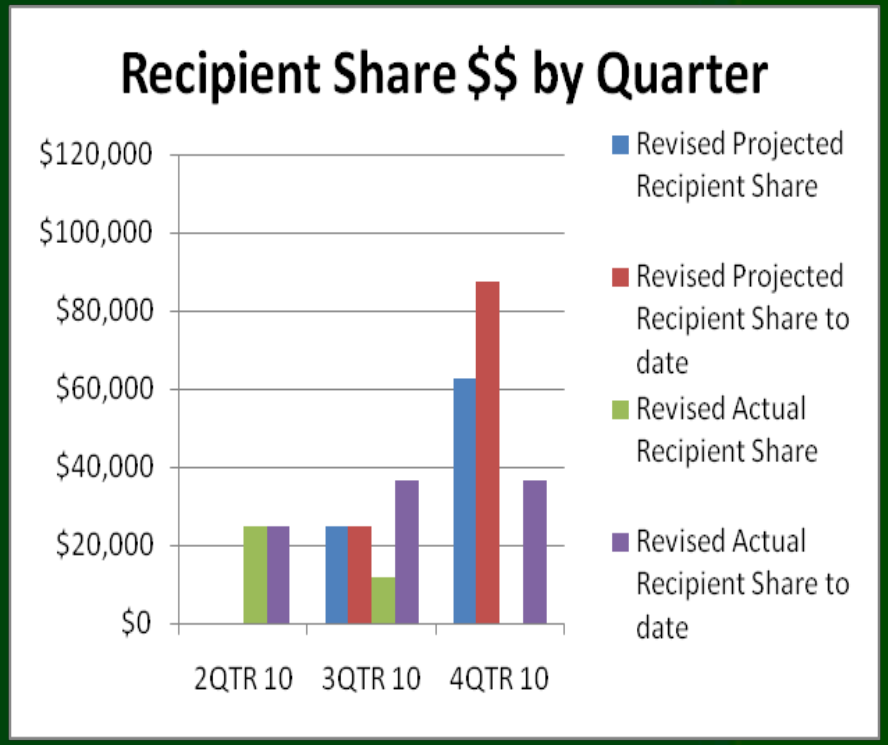
Financials





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Technical Accomplishments, Quality, and Productivity

- Developed an integrated project plan including ancillary plans (hiring, education, risk, benefits & benefits reporting plans, schedule) to manage project
- Initiated an Education Advisory Committee
- Filled 2 of 3 intended new faculty positions
- Created draft curriculum
- Created Introduction class – Microgrid as a Foundation for Smart Grid Education
- Approved Smart Grid Boot Camp development
- Recommended two courses to be included in SG education curriculum

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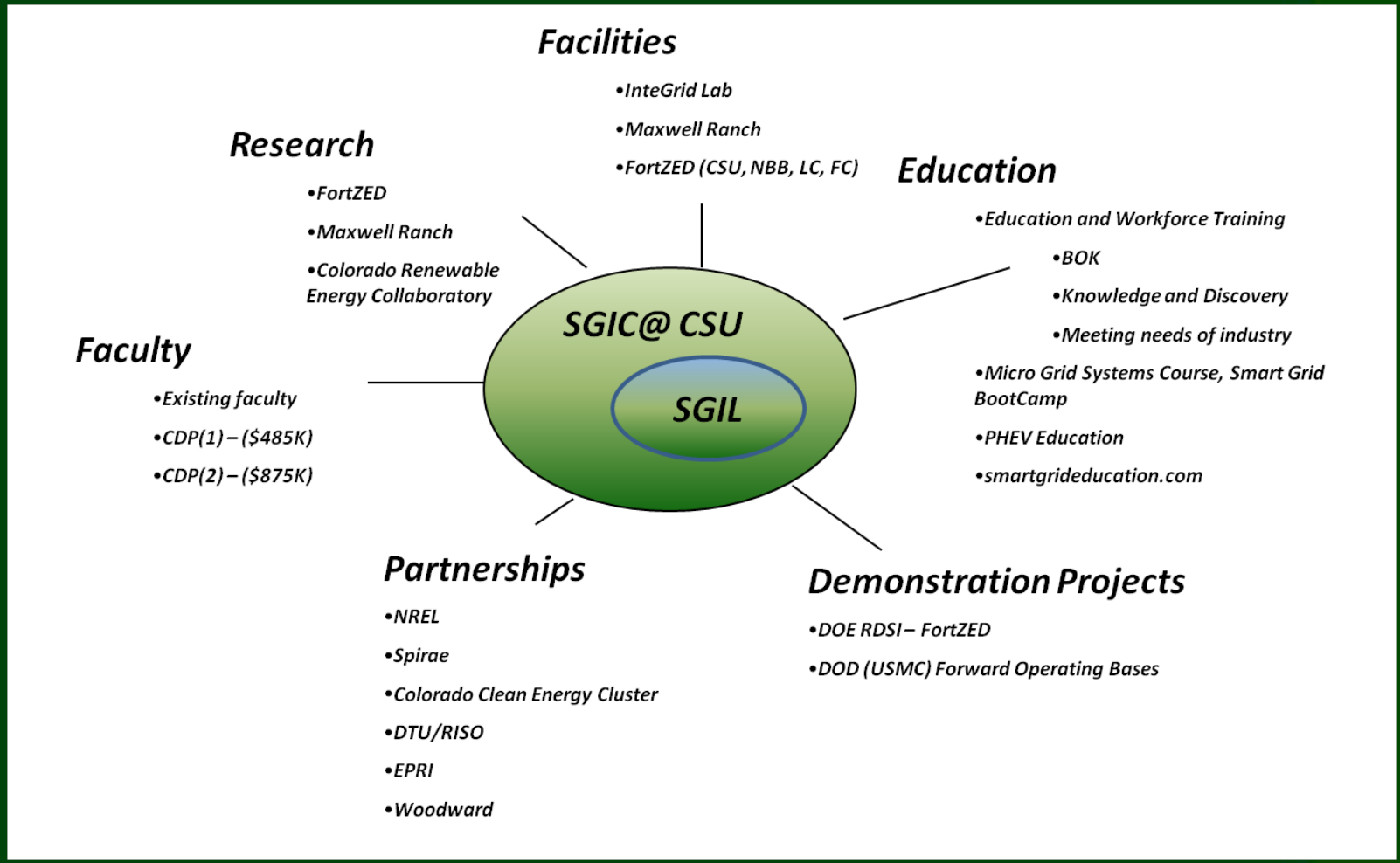
Technology Transfer, Collaborations, and Partnerships



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Plans FY2010

- Update Program Plan
- Hire remaining faculty
- Deliver 4 Smart Grid Systems Engineering Focused Courses
- Offer 2 Professional Courses
- Develop 2 Smart Grid Courses
- Execute Quality and Evaluation Plan
- Annual Review
- Annual Report

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Plans FY2011

- Update Program Plan
- Deliver courses 6 courses
- Procure specialized laboratory training equipment
- Annual Review
- Annual Report

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Summary

- Much accomplished for funding spent
- Behind on spend rate against original schedule – ahead on several tasks
- Executing against revised plan and schedule

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