Energy Systems Research Center
The Univ. of Texas at Arlington

http://www-ee.uta.edu/esrc
History

• Years of Existence
  – The Energy Systems Research Center (ESRC) was founded in 1968

• National and International Ratings
  – ESRC has been recognized worldwide as one of the most successful research centers in power.
  – An IEEE survey named ESRC at UTA as one of the Top Ten universities in power education (IEEE Spectrum, Dec. 1986).
Areas of Expertise

- Application of both optimal and conventional power flow analysis in system planning and operations,
- Reactive power flow analysis,
- Load-frequency control,
- Automatic generation control,
- Industrial short-circuit calculations for circuit breaker applications,
- Reliability methods in power system analysis, and
- Transmission pricing in deregulated power systems.

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• **Areas of Expertise**
  - Utility Deregulation,
  - Load Forecasting,
  - Power Quality,
  - Distribution Automation and Demand Side Management,
  - Power Systems Analysis,
  - On Line Health Monitoring System
  - Renewable Energy, and
  - Microcomputer Based Instrument for Power Systems Monitoring, Measurement, Control, and Protection
Faculty

• **Areas of Expertise**
  - Power electronics,
  - Space power applications,
  - High voltage techniques,
  - Conventional power system analysis,
  - Computer simulation of electrical components and systems

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• Areas of Expertise
  – Power system real time monitoring,
  – State estimation,
  – Power quality,
  – Power market operations,
  – Fuel Cell modeling and control and its applications in power systems,
  – Hydrogen station design, and
  – Power system reliability
• **Areas of Expertise**
  - Microscopic and Macroscopic Energy Conversion,
  - Power electronics,
  - Modeling and stability assessment of multi-converter systems.

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Areas of Expertise
- Power systems analysis and operation,
- Power plants and electric power generation,
- Reliability analysis,
- Application of fuzzy logic and control in electric power systems,
- Computer simulation of electric power systems,
- Load forecasting, and
- Electric power distribution system
Power Programs

- **Facility**
  - Power Systems Simulation Laboratory
Power Programs

- Facility
  - Power Electronics Laboratory – Fuel Cell
Power Programs

- Facility
  - Power Electronics Laboratory
Power Programs

• Facility
  – Power Electronics Laboratory
Power Programs

- Facility
  - Undergraduate Laboratory
Power Programs

- Facility
  - Undergraduate Laboratory
Power Programs

• Undergraduate Courses
  – Fundamental of Power System
  – Power System Analysis and Design
  – Power Electronics
  – Electric Drive
  – Power Capstone
Power Programs

• Graduate Courses
  - Power System Modeling and Analysis
  - Power System Planning, Operation, and Control in a Deregulated Environment
  - Congestion Management
  - Unbundling Services of a Deregulated Power System
  - Power System Protective Relaying
  - Power System Distribution
Power Programs

- Graduate Courses
  - Power System Reliability in Planning and Operation
  - Programmable Logic Controllers in Industrial Automation
  - Power Quality
  - High Voltage Engineering
  - Power Electronics
  - Electric Drive
Collaborations

- **Domestic**
  - National Science Foundation (NSF)
  - United States Agency of International Development (USAID)
  - Electric Power Research Institute (EPRI)
  - Public Utility Commission of Texas (PUCT)
  - Electric Reliability Council of Texas (ERCOT)
  - New York State Energy Research and Development Authority (NYSERDA)
  - Los Alamos National Laboratory
  - US Air Force
Collaborations

• **Domestic**
  - Consolidated Edison Company of New York (Con/Ed)
  - Southern California Edison (SCE)
  - TXU Energy
  - American Electric Power (AEP)
  - Central Southwest Power (CSW), Central Power & Light (CPL)
  - Reliant Energy (Former Houston Light & Power)
  - Texas Instruments (TI)
  - General Dynamics (GD)
  - City of Denton
Collaborations

• Domestic
  - Army Corp of Engineers
  - Western Farmer Electric Coop (WFEC)
  - Formosa Plastic Co. USA (FPC)
  - Alcorn State University
  - Prairie View A&M University
  - Calpine Corporation
  - Foster Miller Technology
  - Hughes Training Co.
  - AVO International
  - Frito Lay, Inc
Collaborations

• **International**
  - Central Research Institute of Electric Power Industry (CRIEPI)-Japan
  - Electric Power Research Institute (EPRI)-China
  - Saudi Electricity Company (SEC)
  - Federal Power Commission of Mexico
  - Taiwan Power Company (TPC)
  - Korea Electric Power Company (KEPCO)
  - Energy Policy and Planning Office of Thailand (EPPO)
  - Electric Generation and Transmission Company of Thailand (EGAT)
  - Provincial Electricity Authority (PEA) of Thailand
Experiences

- System Analysis (Partial list)
  - Transient/Dynamic Stability Analysis
    - ERCOT System (Formosa Plastic Co. and Dow Chemical)
    - SPP System (Impact Study of Wind Farm)
    - Taiwan Power System
    - Korea Electrical System
    - Thailand Power System
    - Formosa Plastic Co. (Taiwan) 4700 MW Co-Gen./IPP Project
Experiences

- **System Analysis (Partial list)**
  - **Voltage Stability Analysis and Reactive Resource Planning**
    - Synchronous Interconnection (SIC) of ERCOT and SPP
    - Taiwan Power System
    - Thailand Power System
  - **Utility Deregulation**
    - Taiwan Power System
    - Thailand Power System
    - Hernam Province, China
Experiences

- **System Analysis (Partial list)**
  - **Distribution System Analysis**
    - Three-Phase Distribution Load Flow/Short Circuit Analysis Software Development and System Analysis for Con/Ed
    - Open Main Detection and Arcing Fault Detection for Con/Ed
    - Arcing Fault Detection and Locating for NYSERDA
  - **Special Protection System**
    - Taiwan Power System
    - Thailand Power System
Experiences

• Hardware Development (Partial list)
  – Monitoring and Control
    • Individual Phase Controlled SVC for Negative Sequence Current Reduction (Generator Low Pressure Turbine Blades Protection)
    • Dynamic Performance Monitoring System and Demand Management System
    • Integrated Intelligent Tie for Distributed/Dispersed Generation System
    • Online Real Time Partial Discharge Corona Discharge Monitoring System
Experiences

• **Hardware Development (Partial list)**
  
  – **Protective Relay**
    
    • Multi-Processor Impedance Relay for 345 kV Underground Cable System (Con/Ed)
    
    • Capacitor Bank Early Warning System (Con/Ed)
    
    • Islanding Detection Relay (SCE)

  – **Flexible AC Transmission System**
    
    • Three-Phase Individual Controlled FC-TCR For Generator Negative Sequence Current Reduction
Current Research

- Multilayer Dynamic Equivalent System Stability and Security Analysis Package
Current Research

- **MicroGrids for Smart Grid**

![Diagram of MicroGrids for Smart Grid]

- Solid State Smart Switch
- Critical Load
- Distributed Generator
- Intelligent Tie Unit
- Local Node Controller
- Double Ring Local Node
- Single Ring Local Node
- Super Node
Current Research

- Multiple Function Customer Demand and Budget Management System
Current Research

- Multi-Area Economic Dispatch and Unit Commitment with Market Operation Components
Current Research

- Integrated High Speed Intelligent Utility Tie Unit for Disbursed/Renewable Generation Facilities

Residential or Vehicle Fuel Cell
Current Research

- Integrated High Speed Intelligent Utility Tie Unit for Disbursed/Renewable Generation Facilities

Phase Estimation
Current Research

• Neural Network On-Line Corona and Arcing Monitoring System
Current Research

- Neural Network On-Line Corona and Arcing Monitoring System
Current Research

• Neural Network On-Line Corona and Arcing Monitoring System
Current Research

- Web Based Dynamic Performance Monitoring System
Current Research

- Neural Network Wind Generation Capacity Forecasting
Current Research

- Neural Network Wind Generation Capacity Forecasting
Current Research

- Neural Network Based Demand Forecasting and Optimal Hydrogen Production Plan for a Hydrogen Filling Station
Current Research

- Protection System Design for a Hydroelectric Generation Facility
Current Research

- Protection System Design for a Hydroelectric Generation Facility
Current Research

- Real time control of radial and tangential Forces in permanent magnet synchronous motor drives
Current Research

- Development of ultra high speed motors for drilling applications

Switched reluctance motor for high speed operation

Eddy current distribution in stator pole
Have Question
or
Need More Information

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