

R&D Expenditures for 2011

Work Order	Corporate Total	KPCo Total	Project Title	Project Description
Work Order	Corporate Total	KPCo Total	WO Title	Description
RDCP570001	296,850	11,028	Corporat Tech Program Mgt	Coordinate Corporate Technology program. Support Corporate Technology Council
RDDA503201	25,000	1,146	Voltage Optimization Modeling	The Volt Var Control Technology offers significant benefits in reducing demand and energy in response to lower voltage levels. Several study projects are indicating an aggregated response of about 0.7% demand reduction for a 1% voltage reduction. This project will test equipment to validate the results on specific types of equipment and validate the contributions from various equipment types to the aggregate responses. The project will also measure the performance of the equipment at lowered voltage levels to provide a better understanding of why this technology can successfully lower demand and to understand the voltage limits that must be observed to avoid damaging or shortening the life of equipment.
RDDA503301	(848)	(39)	WiFi-HAN PreDemo Qualification	Create a credible WiFi based Home Area Network technology in preparation for a 2011 demonstration in AEP Ohio homes. Specify, install, and test an EMS-Centric WiFi Home Area Network. The EMS will communicate with an SSN meter using ZigBee with Smart Energy Profile v1.0. The EMS will then coordinate the attached HAN devices using WiFi/802.11g. Five parallel HAN networks will operate in close proximity at Dolan Lab. 30 days run time without intervention is required for acceptance. As part of this funded project, Vendor will work with AEP Marketing to develop an evaluation program to be used in a 200-home demonstration project to take place in 2011 (2011 work is funded separately by AEP Ohio).
RDDA513401	25,000	1,143	2011Ind.&Agri.CntrOfExcellence	EPRI's proposed Industrial Agricultural Center of Excellence will be established to encourage specific energy and technology related developments. Using EPRI, utility, and industry subject matter expertise the Center is expecting to support applications, demonstrations and commercialization of advanced efficient electric technologies and utilization methods. The Center of Excellence would additionally support members and their customers through testing, training, education, and outreach.
RDDA513501	40,295	1,838	GE-Develop&Test Meter Phase ID	Distribution data systems such as outage management, SCADA, and circuit modeling have increasing needs for accurate identification of the phase s that feed customer loads. Keeping the data systems in step with actual field conditions is challenging due to changes that occur in the field during routine and outage restoration work and the difficulties in communicating the changes to the data systems. Errors in meter associations with phases cause errors in outage prediction by the OMS system, require field checks to validate circuit models, and will have serious effects when SCADA systems are providing more automated control of system devices. This project is developing and testing a technology collaboratively with GE that will result in a product that will allow utilities to routinely update the accuracy of meter associations. AEP s participation is mostly consulting with GE on designs that will be acceptable to utilities and assisting with testing at Dolan Lab.
RDDA513601	21,000	956	InteroperabilityUseCasesUpdate	Project Purpose Update the published use cases from the AEP gridSmart project that reflect the actual situation that has developed at AEP since creating the use cases in 2010. The updated use cases will reflect a more accurate view of the business processes actually performed by an electric utility making this a critical addition to the original work. Publicize the newly acquired understanding of smart grid business processes and the resulting integration strategy. Project Benefit The work defined in this project helps provide the foundation for the deployment of the smart grid and can be a model for further roadmap development for the overall industry. The project is fundamental research on development of a migration path for implementation of the intelligent grid. The new knowledge gained by this project will be accessible to the public at no charge via the EPRI web site, the EPRI use case repository and by reference in a number of other locations. Actual implementation of technologies and systems at AEP is not part of this project.
RDDA560101	1,286	59	Dist EPRI Annual Research Port	Coordination of AEP's: 1) Corporate Technology program and 2) Support the Corporate Technology Council Replaces work order RDCP200301

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RDDA570101	791,068	36,018	Distribut EPRI Annual Portfol

Project Description

Program 1B - PQ Knowledge-Base Service: The overall objective of this project set is to implement monitoring system advancements that will not only enhance benchmarking and reporting functions of the monitoring systems, but also provide the basis for advanced applications that can actually improve equipment and system reliability. This project set has three integrated project areas that complement each other. P1.005 ü Integration of Data from Multiple Monitoring Systems: This project area helps increase the value of monitoring systems by integrating information from many different devices and equipment that may provide increased value to overall power quality data management and analysis applications. This can include a variety of IEDs that may be part of new system investments, as well as advanced metering systems that are used for many customers. Important topics to be addressed in the research include the following: Monitoring equipment considerations (accuracy, standards) Integration of data from different monitoring systems (relays, digital fault recorders, metering systems) PQDIF tools and support (PQDIF user group) PQDIF verification for monitoring systems COMTRADEücontributions to next version of COMTRADE to make it more compatible with PQDIF (IEEE Relay Committee) Communications issues and capabilities The research priorities for this project are developed each year by a project advisory group. Prioritization of the specific equipment and interfaces to be evaluated allows for the most timely and useful deliverables to be provided to the members. P1.006 ü Advanced Applications for Monitoring Systems: This project provides the technical basis for advanced applications that can be applied in monitoring systems to improve system reliability, equipment performance, and operations. The objective is to provide the basis for analyzing PQ trended data, transient disturbance data, fault data, and related system information to identify equipment and system problems that can be resolved in a more timely manner. Alarms and reports can then be integrated with system maintenance procedures and operations to more efficiently resolve problems and improve equipment reliability. The net effect can be a dramatic improvement in system reliability and a reduction in maintenance and operation expenses. Members will help prioritize important functions to be included in a power quality monitoring system that can provide operational and reliability improvement benefits. Important capabilities that are likely to be considered include the following: General processor for trended PQ data to identify abnormal conditions based on control chart theory, etc. Voltage regulator performance module Fault protection and coordination assessment module Automated power quality and reliability reporting methods Transformer loading and lifetime assessment, including harmonics Arrester performance for transient events Work will also begin on a database collection (library) of disturbance data for use in the development of advanced applications. P1.007 ü Monitoring System Development and Management: This is the project where the advanced capabilities actually get implemented in power quality monitoring management systems. Application in actual software systems, such as PQView, allows utilities to realize the benefits of the research in P1.005 and P1.006. In 2007-2008, the work in this project set is also being coordinated closely with a large DOE-funded research project on fault analysis and fault location technologies that will complement the EPRI research and provide substantial added value for the members in this project set. Program Set 1D - PQ Knowledge-Base Service: The Power Quality Knowledge-Based Services program comprises an array of resources and tools. At the core of the program is a customer hotline offering round-the-clock power quality technical support. Complementing the hotline are the following: Five electronically distributed newsletters which regularly provide the latest information on power quality business, technical trends, educational opportunities, and project updates A detailed EPRI PQ Encyclopedia, a definitive reference and training tool for power quality Continued enhancement of the highly valued PQ case study library to supply customers with an essential and productivity-improving resource Access to the PQ Hotline for best-in-class problem-solving resources The PQ Hotline Database, an unparalleled archive of a range of solutions and industry experience Additional resources for the Power Quality Online Resource Center to further enhance its value Complimentary registration for one Power Quality Interest Group meeting, along with a registration discount on all PQA Conferences Project 30.003 ü Manhole Event Risk Management Strategies: A number of utilities continue to experience gas-related explosions in underground structures such as manholes, service boxes, and vaults. Two root causes are needed for an event to occur: the buildup of explosive or combustible gases and the presence of an ignition source. These events can occur unexpectedly and can involve numerous explosions in adjacent structures. The financial and political consequences of such events can be significant. Explosions and related events in underground structures are rare, involving fewer than 1% of underground structures, and range from "smokers" with little effect, to "flyers" with very serious collateral damage, injury, and even death. Many causal factors are involved, and multiple events are possible. Predictability is very difficult. Damage can range from fire or smoke damage in "smokers" to collateral damage to external facilities or personal injury from flying manhole or vault covers in "flyers." In 1991, a utility experienced a fatal event. In 1995, Underwriters Laboratories (UL) issued a milestone report detailing the composition of evolved gases. A test facility was built in Lenox, Massachusetts, in 1994 with EPRI and Consolidated Edison (ConEd) co-funding. At some utilities approximately 1% of underground structures are involved in an event each year: with fewer than 0.01% involving collateral damage. During 1996-1998, milestone tests, funded by ConEd and EPRI, were conducted in Lenox involving "standard gas explosions" and mitigation approaches. Recently, many utilities have reported major events. No utility is immune from the prospect of underground explosions! EPRI's approach has taken several paths: research, construction of test facilities, and various workshops and rapid response meetings following manhole events. The research has been broad-based, involving full-scale tests, analytical studies, and computer modeling. Research topics have included: explosion characteristics, electrical (fault) vs. gas explosions, type and composition of gases involved, explosion mitigation, cover restraints, cover design, root causes, and environmental factors. EPRI has also tapped into information and technologies in other industries that operate underground systems and may experience similar problems. 1.008 System Compatibility Research: This research area involves characterizing compatibility issues between end use equipment, power conditioning technologies and power system performance. It includes establishing evaluation criteria (e.g., testing protocols), evaluating failure mechanisms, and identifying solutions.

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RDDA570201	102,409	4,670	CEA Membership & Projects	The CEA is a collaborative of companies that propose and fund research topics. These topics can range from asset management to automation. The purpose of this project is to allocate funding for topics of interest within the Distribution organization. Individual project descriptions will be presented in the comments area of this document when available. CEA = Canadian Electric Association Replaces work order RDDA570201
RDDA570401	192,691	8,778	NEETRAC Membership	The National Electric Energy, Testing, Research, and Applications Center (NEETRAC) was established in 1996 by the Georgia Tech Research Corporation (GTRC), a cooperative organization of the Georgia Institute of Technology. It is supported by a membership consisting of utility and industrial companies. The purpose of NEETRAC is research, development and testing in areas of interest to the membership and is funded by the Research and Development Baseline Budget from dues collected from that membership. The project selection generally is of a scope that is sufficiently broad as to be attractive to several Members, who are interested in sharing the resulting intellectual property. NEETRAC membership includes both collaborative and directed funding research. AEP's strategy is for NEETRAC to complement the Dolan Technology Center's (DTC) capabilities through research in such areas as cable life extension and other research or testing areas that the DTC is not directly involved in. AEP will be joining NEETRAC as a Corporate Charter Member with voting rights on the selection and prioritization of projects. NEETRAC is a non-profit corporation. Replaces work order RDDA560301
RDDA571101	115,598	5,277	Grid of the Future Test Bed	Develop a Grid of the Future test facility at Dolan Technology Center that will enable the evaluation of technologies that support AEP's vision of the next generation Distribution network. For 2007: installation of a WiMAX network, demonstration of WiMAX compatibility with standard utility protocols, integration of Advanced Metering Infrastructure components, Distribution Automation components, and Asset Monitoring and Control components. The test bed will include an IP-based control network that will facilitate AMI, DA, and Asset Monitoring and Control testing. For 2008, the test bed will be extended to include the evaluation of back office solutions (Yukon, Enmac, others), Home Area Networks (HAN), advanced DA and Asset Monitoring and Control, Distributed Energy Resources including Distributed Generation and Storage Technology. The information generated from these evaluations will be used to support decisions on vendor acquisitions, systems compatibility, and overall architecture & system design. Once the utility to HAN interface has been defined, communications into the customer premises will then be evaluated for DSM, DR, and metering applications like real-time pricing, tamper detection, remote connect/disconnect, and outage management. Equipment from multiple vendors will be accommodated.
RDDA571201	52,522	2,391	AMI Test Bed Development	Develop an Advanced Metering Equipment (AMI) test facility at AEP that creates the in-house capability to evaluate current and future AMI equipment and their supported Distribution applications. The information generated from these evaluations will be used to support decisions on AMI vendor selection and system design. Compatibility of AMI with Distribution Automation equipment will be explored, and Distributed Intelligent Monitoring, Communication, and Control evaluations will be supported. Communications into the customer premises will be evaluated for DSM, DR, and metering applications. Equipment from multiple vendors will be accommodated.
RDDA581701	2,237	103	GRDSMRT-SolarWindEnergyStorage	The primary purpose of the project is to test and compare Greenfield Steam & Electric's concentrated photovoltaic (PV) technology prior to any large-scale deployment. The testbed will allow the concentrated PV performance to be easily compared to the performance of a commercially available PV system. The testbed will also be used to model a typical residential-size distributed energy resource installation. The integrated test bed will allow AEP to study the effects of residential-size wind and solar on the grid, as well as the interface and controllability it may have with a Home Area Network (HAN) and Advanced Metering Infrastructure (AMI)
RDDA581901	180,530	8,275	EPRI Demo - Smart Grid	In addition to controls on emissions from power plants, significant reductions in emissions of carbon dioxide can be achieved through contributions from energy efficiency, plugin hybrid electric vehicles, and distributed energy resources. Integration of these resources through the electric distribution system will require new communications and control technologies. This project will conduct several regional demonstrations to integrate distributed power generation, storage, and demand response technology into a demand-side virtual power plant. The demonstrations will take advantage of infrastructure investments that are being made across the industry and illustrate ways in which distributed resources can be integrated with system operations.
RDDA582101	156,078	7,146	PHEV Technlgy FutureStrategies	The primary purpose of the project is to prepare our business for the mass deployment of PHEVS across AEP's regulatory jurisdictions. Develop a strategy (in conjunction with R&D) that will have a positive impact on revenue and that leverages the capacity of our existing infrastructure.
RDDA592201	238	10	Energy Efficiency Test Bed	Establish an Energy Efficiency Test Bed, located in the gridSMART Test area at the Dolan Technology Center, in conjunction with the installation of necessary equipment to test and evaluate the efficiency of various electrical devices currently planned, along with new devices being developed over the next few years. Electrical devices currently planned for energy efficiency evaluation include: LED lighting (i.e., exterior and indoor); Hybrid Air Conditioning System; LEED home versus conventional home; Hybrid Heat-Pump Water Heater; distribution transformers; Solar Heat Recovery; DTC Energy Management System, etc. A brief summary of energy efficiency plans are described below in Additional Information Section.
RDDR500301	33,720	1,545	ReXorce 250kW Heat Engine Test	Partner with ReXorce Thermionics, Inc. to confidentially test and evaluate their pre-commercial prototype, 250kW heat engine system, utilizing AEP's Walnut Test Site. Participation enables AEP to obtain hands-on technology intelligence; shape the grid of the future; and obtain preferential pricing and/or credits toward future purchase of commercial systems.

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RDDR560101	1,086	50	DR EPRI Annual Research Portfo	The Distributed Energy Resources (DR) EPRI Annual Research Portfolio includes: 1) Energy Storage Planning & Technology Assessment - Energy Storage has been recognized as a strategically important component of our future grid. Membership in EPRI 94.001 provides AEP with information on the state of utility-related energy storage technologies and their applications in the industry. 2) Strategic Planning for DER - AEP has just consolidated its distributed energy resources (DER) activities to better prepare its
RDDR560401	65	3	Rolls-Royce 1MW SOFC Test&Eval	Partner with Rolls Royce Fuel Cell Systems (RRFCS) to confidentially test and evaluate their pre-commercial, natural gas fueled, 1 MW SOFC system, utilizing our Walnut Test Facility. Participation provides hands-on experience with the technology. This enables AEP to proactively plan for the application and interconnection of the technology and its impact on the shaping the grid of the future.
RDDR570001	112,712	5,154	DER Program Mgmt	Provide program management for the Distributed Energy Resources (DER) program.
RDDR570101	52	2	DER 2007 EPRI Annual Portfolio	Energy Storage has been recognized as a strategically important component of our future grid. Membership in EPRI 94.001 provides AEP with information on the state of utility-related energy storage technologies and their applications in the industry Distributed Energy Resources (DER) program.
RDDR570201	1,487	68	Micro-grid Proj - Inverter Gen	To demonstrate, evaluate and document operation and performance of the CERTS Micro-grid Concept, which was successfully bench-tested on the University of Wisconsin's microgrid emulator. This is the first full-scale demonstration of an inverter-based microgrid, consisting of multiple generation sources and loads. During 2006, the CEC/CERTS Micro-grid Project Team constructed a microgrid test bed at AEP's Walnut Test Facility. CEC/CERTS arranged for three 60 kW generators with inverters from TeCogen Inc.; the University of Wisconsin designed the test bed and; Northern Power System (NPS) tested the protection strategy and delivered protection equipment, switchgear and load/fault cabinets to the test bed site which was assembled by AEP contractors according to the test bed design. This project continues in 2007 from work performed in 2006 and involves commissioning the inverter-based generators in the test bed, conducting a full-range of tests according to an approved test plan, analyzing test results and documenting the resultant tests in a Final Report.
RDDR570301	(95,805)	(4,324)	Micro-grid Test Bed/DOE Tests	To demonstrate, evaluate and document performance and protection measures designed in the CERTS Micro-grid Concept. During 2006, the CEC/CERTS Micro-grid Project Team constructed a microgrid test bed at AEP's Walnut Test Facility. This project continues in 2007 from work performed in 2006 and involves detailed protection tests on the CERTS Microgrid Test Bed, funded by Dept. of Energy (DOE) through a contract with the University of Wisconsin. In addition to conducting a full-range of detailed protection tests, according to an approved test plan, it involves analyzing protection test results and documenting the results in a Final Report.
RDES505201	10,000	441	Plant DecommissioningIntrstGrp	As older plants reach the end of their useful lives and the site is considered for repowering or other uses, demolition of the plant will be required. The project will provide guidance and checklists incorporating best practices for all steps in the plant closure, remediation, demolition, and redevelopment. It will also provide opportunities to exchange information with industry members and experts on related issues.
RDES505401	158,058	8,256	Vertical Flow Treatment Cells	Establish a pilot project at Quarrier landfill to determine the efficiency of in-ground stepped vertical flow treatment cells for removing trace metals from landfill leachate. The stepped design will allow for incorporation of these cells into difficult terrain situations. The project will test the effectiveness of yard waste compost in the vertical flow treatment cells and will test the effect of retention time on treatment. The development of low-cost biological treatment to meet NPDES limits can be a benefit to the electric utility industry. Information gained from the project could be used to design full-scale vertical flow treatment cells at other facilities.
RDES505701	175,000	8,641	Prism2.0-Enrgy Ecnmic ModelDev	In this project, EPRI will begin a multi-year effort to develop a new regional model to provide greater technical insights into how regional differences could impact electricity sector greenhouse gas emissions reductions. This new regional model will integrate and build upon the numerous technical insights from other EPRI research programs and projects.
RDES505901	6,000	296	PwrPlntParameterDerivationTool	The purpose of the software is to model the generator, excitation systems, and power system Stabilizers that will be required by NERC MOD-026.

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RDES506101	30,000	1,779	Digital Radiographic System	Detection of wall thickness degradation caused by FAC in power plant piping and components is of primary concern to utilities because of the extensive damage to plant equipment and potential for loss of life that can result from this damage mechanism. Because the large amount of piping that FAC can affect typically are insulated, conventional nondestructive evaluation (NDE) for FAC has been very costly and time consuming. The ability to detect FAC with a digital radiographic system without removing the insulation could be of very high value to operating plants, which currently have limited means of detecting such damage. Current NDE consists of either removing insulation to obtain detailed ultrasonic thickness measurements on a tight grid pattern throughout the length of susceptible piping, or obtaining an average thickness over a large area with pulsed eddy current technology through the insulation. Early detection of damage prior to failure will help to keep the operating plants safe and will reduce costs due to failure, including loss of equipment or injury to plant staff. This less-expensive screening method for FAC would result in safer power plants, reducing the cost of electricity generation. The cost of monitoring piping systems for FAC continues to be an important issue for utility staff. When not identified at an early stage, pipe wall thinning due to FAC has resulted in leaks and ruptures in primary and secondary piping systems. Ultrasonic examination methods historically have been used to detect and monitor FAC and typically involve a multi-step process: removal of insulation, layout of an inspection grid, acquisition of thickness measurements, and input of the data into an evaluation program. The elimination of removing insulation and/or of producing a grid on components prior to examining for FAC can reduce the cost of the inspection by more than 50%.
RDES506501	50,000	2,469	Corrosion in Wet FGD Systems	The purpose of this project is to collect data on FGD units experiencing problems to determine the root cause(s) of the corrosion. Information on fabrication techniques, construction QA/QC and operating environments (chemistry, scaling, etc.) will be gathered at as many sites as possible. These data will be used to identify gaps in knowledge. Based on this analysis, missing data will be generated using laboratory and/or field corrosion tests for alloy 2205, welds, and alternative materials/coating systems. Repair strategies and other mitigation strategies will also be explored and documented if proven and widely applicable.
RDES506601	16,000	533	SOAPP Software	State of the Art Power Plant Software provides technical and economic data and analysis to support over all Gas Turbine Combined Cycle plant life cycle development.
RDES510301	33,045	1,648	2011 CEATI Membership	The scope of the Strategic Options for Sustainable Power Generation Interest Group SOIG is to develop, evaluate and demonstrate sustainable power generation technologies that will result in an increase in power supply capacity and a reduction in greenhouse gas emissions. Includes distributed generation, distributed resources, fuel advancements and advanced generation cycles.
RDES510401	9,677	514	Energy Sustainability Int Grp	The ESIG has identified the following priorities for 2011 identifying common and best practices of sustainability leaders; case studies of best practices in sustainability; continued focus on supply chain operations/sustainability; the next generation of sustainability reporting; sustainable technology development. This group represents a collaborative effort within the electric utility industry to advance sustainability within the industry. It is the only electric utility-specific group of its kind at this time.
RDES510501	33,000	1,630	TAG Generation Planning Info.	The EPRI TAG provides performance and cost information about most commercial generating technologies. As well as, critical performance and cost information on various environmental technologies. The TAG-Web is a database of generation technologies that provides users with customized technology selection based on specific situations. The product also includes regional variations in Capital & O&M cost and is hosted on the EPRI website. The data from this program provides a credible and economical source of performance and cost inputs for company models used in generation planning and scenario analyses.
RDES510601	9,500	422	Selenium Working/Interest Grp	The purpose of this project is to participate in a technical working group that brings together environmental professionals from industry, academic, and regulatory agency sectors. In 2003 the North American Metals Council formed a Selenium Working Group which was formed to coordinate industry action concerning selenium regulatory activities in Canada and the United States. The Working Group has funded a series of technical publications concerning selenium toxicity and chemistry. Funding is being requested for preparation and finalization of a final technical document re: treatment of selenium in wastewater. The Working Group meets twice per year to discuss latest research findings and pending regulatory initiative.
RDES510701	60,000	3,558	Impct-Limestone TraitsOnGypsum	Provide an understanding of how various components major, minor, trace can affect gypsum formation and dewatering.
RDES510801	50,000	2,094	EMF Personal Monitor	To develop a working prototype of a personal electric and magnetic field exposure meter with software which will alarm wearers at a set level when fields are high enough to interfere with Implanted Medical Devices. This device will allow wearers of implanted medical devices or IMDs cardiac pacemakers and/or defibrillators to return to work in proximity to areas where fields may exceed the device recommendations. An alarm will notify the wearers they may be entering an area where the field could interfere with the IMD.
RDES510901	50,447	2,820	Static Liquefaction of CCP's	Study the effects of rapidly closing an ash pond and the potential for static liquefaction to occur, causing dam instability. The objective is to determine what a safe rate of closure is to allow gradual relief of pore pressure and to allow safe closure. Please see the end of this project charter for more detail.

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RDES511001	45,949	1,983	Mapping Ecosystem Svcs-Rockprt	EPRI will develop a GIS tool for the Rockport site that can be used for assessing current and future impacts to natural resources and associated ecosystem services. This approach will provide a strong scientific framework for optimizing AEP land management practices and help balance these decisions with other corporate priorities. The GIS tool will provide capability that will allow for a rapid, cost-effective, and comprehensive assessment of AEP land management decisions that will benefit/impact natural resources and associated ecosystem services wildlife, carbon storage, pollination, water purification, and others. Further investment in this approach will be subject to the success and value of this pilot application at Rockport. Part of this effort will include the development of instructional materials so that AEP staff can implement this approach on other properties.
RDES511101	37,500	2,224	PMscreenCapturParticulateMatter	Testing of the PMScreen to evaluate is fine particulate capture downstream of an existing ESP. Project Benefit: If successful would result in addition particulate capture the improved performance could be of value in permitting the addition of additives upstream of ESP.
RDES511301	15,000	890	Gr92 Steel Boiler&PipingCmpnts	Initial product testing has shown that very low ductility creep failure of base metal samples have occurred with significantly raises concerns over catastrophic fracture. Issues associated with creep failure of welds. It appears that creep failure can occur in the weld metal depending on the PWHT condition used. Project Benefit: Develop guidelines on how to ensure Gr.92 steel components are manufactured and welded to provide expected performance. Present a Life Management Strategy for Gr. 92 steel.
RDES511401	30,000	1,779	DetectHighTempDamage-CSEFSteel	Project will determine current industry NDE technology available to detect damage in CSEF materials. Due to the creep resistant nature of CSEF materials, thinner section components are fabricated resulting in less material and weight. These materials specifically Gr. 91 and 92 do not necessarily degrade with the same damage mechanisms as prior generation materials. Project Benefit: The target seeks to address the advantages and limitations of different NDE methods the expected sensitivity detection ability of the different methods; and which methods which should be applied, and when, for an effective plant program.
RDES511501	10,000	593	Weld Repair-Gr91Pipe&Cmpnents	Develop criteria to ensure that the repair methods used on CSEF components are selected based on accurate technical understanding. Project Benefit: Understand how to remove damaged material efficiently and without introducing additional problems which could influence future performance. Develop the ability to make repairs in Gr. 91 steel, which will provide the required service life. Develop follow-up inspection and assessment requirements consistent with safe and reliable operation.
RDES511601	20,929	893	Stator End-Winding Monitoring	To perform long-term technical evaluation of using a combination of on-line end winding vibration monitoring, partial discharge, and electromagnetic interference analysis EMI for condition assessment of air and hydrogen cooled generators with end winding problems. Project Benefit: It is expected that increasing level of end winding vibration will be detected in sufficient time to avoid in-service failure of 3000 3600 RPM machines that have high 5 mils end winding vibration.
RDES511701	20,000	853	Air Permitting Models	Project Purpose: This project is an effort to improve the existing USEPA Guideline Models for short term modeling AERMOD and CALPUFF, update SCICHEM for potential use as an alternative model for regulatory modeling activities, and develop better NO/NO2 ratio data for use in regulatory modeling of the one-hour NO2 Standard. Project Benefit: If these changes are accepted by USEPA, this will give us better tools to demonstrate compliance with various ambient air quality standards that may prove to be less conservative in their assumptions than are the current guideline requirements and models.
RDES511801	500,000	21,330	EPRI - Water Research Center	The facility's purpose will be to test and evaluate water treatment and conservation equipment for power plant applications, such as: -water treatment (FGD Treatment and low volume wastes), -advance cooling, -moisture (improved mist elimination, WESP, spray cooling, condensing heat exchangers), -Zero Liquid Discharge, -recycle/reuse, -water balance & tools. Project Benefit: Participation at oChampion Levelo will provide a voting seat on the Technology Advisor Group (TAG) which will determine the research path to be followed. In addition, the WRC will provide an infrastructure for testing tools and technologies for reducing water consumption and wastewater contaminants.
RDES511901	13,333	569	Evaluation - Acoustic Emission	The objectives of this project are to determine if acoustic emission can detect creep damage in low alloy piping materials, and at what stage of damage development any detection might occur. Project Benefit: The project seeks to address the advantages and limitations of acoustic emissions Detect creep damage in high energy piping systems Correlate damage accumulation with remaining life Estimate seam welded piping life Acoustic emission testing for creep
RDES512001	81,579	-	Gavin Hg Reduction: FGD Ponds	The purpose of this project is to evaluate the feasibility and cost-effectiveness of a treatment technology aimed to reduce the levels of mercury released from Gavin Plant s FGD landfill leachate ponds. Effluent limitations for mercury must be met at one of the ponds Pond 2 no later than 12 31 2012. The feasibility of using activated carbon and/or biochars to sequester mercury in pond sediments will be evaluated. Project Benefit: A successful demonstration of this treatment technology will provide greater certainty in achieving effluent limitations in a cost effective manner.

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RDES512101	16,274	694	SuprcriticalWaterwalOxideGrwth	Supercritical waterwall cracking is one of the boiler tube failure mechanisms for supercritical units that were driven by heavy ID deposition. The deposition was due to corrosion of the condensate and feedwater piping and subsequent depositing of this corrosion product on the ID of supercritical waterwall tubing. It was believed that with the conversion of supercritical units to oxygenated feedwater treatment OT which drastically reduces the corrosion product transport from the condensate and feedwater cycle that this tube failure mechanism would go away. Unfortunately this mechanism has returned. EPRI has been working on this failure mechanism for the last several years and have come up with several different causes. One thing that has not been investigated fully is the difference between supercritical waterwall oxides prior to oxygenated feedwater treatment and after oxygenated feedwater treatment. Fortunately AEP Gary Wood has a library of tube samples from various supercritical units over the years. In particular he has a sample of a pre OT unit with very heavy deposits, and a sample of a typical pre OT unit. Couple this with samples from post OT units we will have the ability to look closer at these oxides to see what differences exist. Something that will be done for the first time on this type of deposit is the use of an ion milling tool which will allow us to see the oxide much better.
RDES560101	1,007,887	42,462	EPRI Environmental Controls	Environmental Controls projects from the EPRI Annual Research Portfolio include: 1) Program 71 ü Combustion Performance and NOx Control - AEP buys two projects from this program. Project 71.001, Mitigation of Fireside Corrosion and Waterwall Wastage in Low-NOx Systems, takes a three-pronged approach to understanding and resolving the costly consequences of accelerated fireside corrosion exacerbated by low-NOX operation, looking at coal quality, boiler design, and materials-based solutions. Purchase of t
RDES560201	4,444,608	186,982	EPRI Environmental Science	Environmental Science projects from the EPRI Annual Research Portfolio include: 1) Air Quality Programs - By providing credible scientific information and state-of-the-art assessment and management tools, EPRI's air quality programs support the development of effective and protective policies, standards, implementation plans, and compliance strategies. Programs within the Air Quality area include 42 ü Air Toxics Health and Risk Assessment, 91 ü Assessment Tools for Ozone, Particulate Matter and Haze, an
RDES561101	9,001	421	General Mercury Science & Tech	To better prepare AEP for compliance with the Clean Air Mercury Rule and other regulations on emissions of mercury by characterizing mercury emissions from various configurations of plant equipment and coal types, examining the effect of environmental controls on mercury emissions, helping in the development of cost-effective mercury monitoring systems, testing various types of mercury sorbents, participating in tests of control technologies at a Texas lignite plant and at the Rockport plant, and traveling
RDES570301	647	31		This study will evaluate the compliance risk of AEP wastewater discharges being subject to U.S. EPA's forthcoming fish tissue water quality criterion for selenium. While the criterion is not expected to be finalized until 2008 or 2009, some states
RDES570401	4,000	190	MANAGES Forum	Proposed new federal guidelines for coal combustion byproduct disposal in landfills and impoundments will increase compliance requirements, including data management and reporting, groundwater assessment, and, in some cases, remediation. The MANAGES Forum will provide continuing high level support for compliance managers in the form of software, training, webcasts and workshops, and an online groundwater monitoring and assessment guidance manual.
RDES580601	103,689	9,561	OhioRiverEcologicalResearchPrg	The objectives of the project are to 1) provide information on the effects of fish impingement, thermal discharges, and other power plant wastewater processes on fish populations in the Ohio River; 2) provide information useful in commenting on proposed ORSANCO, federal, and state water quality standards for the Ohio River; and 3) update existing data and refine fish population estimates to address USEPA 316(b) concerns. Schedule will include winter sampling, which has only been done once in the history of the program.
RDES582101	(18,122)	(566)	FGD Lndfl Leachate Phytoremdtn	Establish a pilot project at Gavin to determine the efficiency of two types of biological (phytoremediation) treatment for removing trace elements from wastewater at three FGD leachate collection pond systems. Information gained from the project could be used at other AEP facilities where treated FGD leachate is discharged to a receiving stream. FGD=Flue gas desulphurization
RDES582201	5,168	302	Trona/FuelSwitchs-AshPonds	Trona is a naturally occurring mineral [Na3(CO3)(HCO3)*2H2O] that has been found to be successful in mitigating SO3 emissions (blue plume) from coal fired power plants. Unfortunately, it is not yet known what downstream effects Trona use will cause in sluiced ash or in ash ponds. Because of its potential to strongly increase the pH of the sluiced ash, it is possible that substances such as mercury, selenium, and arsenic, which normally are strongly adsorbed to ash particles, may become desorbed. Once such substances enter the dissolved phase, it is not likely that they will resorb to the settling ash, thus increasing the likelihood of permit violations at NPDES discharge points. Fuel switching can have similar effects. Rather than merely managing pH in the sluice lines, consideration is being given to managing the sluice lines as potential treatment systems.

R&D Expenditures for 2011

Work Order	Corporate Total	KPCo Total	Project Title	Project Description
RDES593101	52,251	3,080	Ohio River Basin Trading Prgrm	This project will design and implement a regional trading program in the Ohio River Basin for both water quality and greenhouse gas credits. Building on related EPRI work to quantify greenhouse gas (GHG) emission reductions for avoided fertilizer use, this project will develop an approach for creating GHG and water quality credits associated with reduced nitrogen fertilization on agricultural crop lands. This project also will build on EPRI's work to establish a WARMF watershed model of the entire Ohio River Basin. Properly designed and deployed, this trading program will reduce GHG emissions and nutrient discharges, such as nitrogen, and protect watersheds at lower overall costs. This project will be a first-of-its-kind regional trading program and represents a comprehensive approach to managing nitrogen, phosphorus and GHG emissions. This work is timely as existing challenges to meet nutrient discharge limits may be amplified by increased effluent discharges of nitrogen (due to operation of air pollution controls), coupled with more stringent water quality based limits for surface waters. In addition, the establishment of GHG credits due to avoided emissions improves AEP's ability to purchase local, ecologically defensible carbon offsets.
RDES593301	200,000	200,000	CarbonMgmt-UKResearchFndation	Per Kentucky Public Service Commission (KPSC) Order in Case No. 2008-00308, dated October 30, 2008, to establish a Regulatory Asset related to certain payments made to the Carbon Management Research Group (CMRP) and the Kentucky Consortium for Carbon Storage (KCCS) regarding the management of carbon and carbon dioxide associated with existing coal-fired electric generating facilities in Kentucky. Kentucky Power Company (KPCo) has agreed to provide up to 10 years of conditional funding of \$200,000 annually. Payments are made to The University of Kentucky Research Foundation. Regulatory asset account 1823188 has been established to capture these costs.
RDES593501	25,000	1,067	WaterAssessment-CumberlandSite	To understand the mechanisms leading to apparent increases in certain groundwater quality parameters at an existing structural fill project that uses Glen Lyn Plant flyash as fill material. Three hypotheses will be evaluated through a technical approach to determine which of the three best explain the observed data. Data will be collected to characterize groundwater flow and quality, the cause for changes in quality and the model RIVRISK employed to characterize the potential risk of groundwater discharge into the New River.
RDES593801	75,158	3,710	Advanced Cooling Technology	Accelerate industry activities aimed at developing advanced cooling technologies to reduce overall water use for power production. Projects will focus on technology development and testing, but will also provide information on performance optimization, risk management, and economic impacts. The work will include an investigation of geographic and power plant-specific considerations including: Power plant siting Meteorological impacts on air-cooled condensers Indirect dry cooling Hybrid cooling designs Water recovery options Wet surface air coolers Advanced bottoming cycles Preserving once-through cooling option
RDGA260001	150,956	3,366	Adv. Generation Prog. Mgmt	This line item is used for the Advanced Generation R&D Program (AG) pre-project R&D development efforts and to track and manage misc. AG R&D projects less than \$10K. The purpose of this charter is to document the scope, budget and costs (labor and non-labor) of those projects and efforts included in the Advanced Generation Management function. It is also used to track participation at general conferences and other trips associated with the Advanced Generation program. The scope of this charter includes:
RDGA260101	10,418	327	Adv Gen EPRI Annual Research	The Advanced Generation selection from the EPRI Annual Research Portfolio consists of Program 9: Technology-Based Business Planning Information & Services (aka Technology Assessment Guide, or TAG). The EPRI TAG provides performance and economic information about most generation technologies. The TAG-Supply« Database and Software currently covers 24 categoriesincluding all major fossil and nuclear plant types, several energy storage technologies, small-scale generation options, renewable resource techno
RDGA260201	40,000	1,523	Coal Utilization Research Council	The Coal Utilization Research Council (CURC) was formed in 1997 as an ad-hoc group to act as an industry voice for R&D needs associated with the role of coal as a sustainable energy source for electric power generation as well as the transportation and chemical industries. CURC members include utilities, equipment suppliers, coal companies, universities, and other energy-related companies and consortiums. The CURC provides its members with a respected, influential forum in which they work to ensure the c
RDGA260601	133,893	4,192	Technology Assessment Guide	The EPRI Technology-Based Business Planning Information & Services (aka Technology Assessment Guide, or TAG) provides performance and economic information about most generation technologies. The TAG-Supply« Database and Software currently covers 24 categoriesincluding all major fossil and nuclear plant types, several energy storage technologies, small-scale generation options, renewable resource technologies, and transmission and distribution facilitiesuwith nearly 100 distinct configurations of proce
RDGA260701	38,850	1,753	Geologic CO2 Sequestration P2	This is an on-going project (co-funded by the DOE and led by Battelle) that is investigating the feasibility of safely injecting and storing CO2 in deep salt water-laden rock formations. The project is located at AEPÆs Mountaineer plant in New Haven, WV.
RDGA260901	36,966	1,979	MIT Carbon Sequestration Init	The Carbon Sequestration Initiative (CSI) is an industrial consortium formed at MIT to investigate carbon management strategies and carbon sequestration technologies. The consortium currently has nine members: American Electric Power, ElectricitØ de France (EDF), EPRI, Exxon Mobil, Ford Motor Company, General Motors, Peabody Energy, ChevronTexaco, and Total FinaElf.

R&D Expenditures for 2011

Work Order	Corporate Total	KPCo Total	Project Title	Project Description
RDGA281801	2,516	111	EPRI Demo-IGCC w CO2 Cap Strge	Integrated Gasification / Combined Cycle technology has been identified as one possible route to the capture of the greenhouse gas carbon dioxide. The purpose of this project is to provide information about the design, integrated operation, reliability and safety of IGCC systems with capture of carbon dioxide (IGCC/CCS). The demonstration project will allow the industry to evaluate the role that IGCC/CCS will play in meeting possible future carbon constraints.
RDGA281901	3,031	155	EPRIDemo-IonTrnsprtMbrneOxyPrd	The ability to provide a low-cost stream of pure oxygen is an enabling technology for two different methods of separating carbon dioxide from flue gas, IGCC with CCS and oxy-combustion. Current cryogenic methods of oxygen production are very expensive in terms of capital, auxiliary power consumption, and water usage. Air Products and the United States Department of Energy have worked to develop methods of oxygen production involving transport of oxygen ions through a ceramic membrane, and the technology has progressed to a point where a demonstration unit is possible. EPRI's role in the project will be to provide an electric utility industry perspective to the project to ensure the ability to employ the technology in actual power plants.
RDGA282001	13,814	682	EPRIDemo-PostCmbstnCO2Cap&Strg	In order to gain public and regulatory acceptance of carbon capture and storage as a means of controlling the greenhouse gas carbon dioxide from coal-fired power plants, it is necessary to demonstrate that both capture and storage are feasible. This project will help to fund two large-scale demonstrations of carbon capture processes, one at AEP's Mountaineer Plant using the Chilled Ammonia technology, and the other at a plant in the Southeastern United States employing a different technology. Both projects will store the captured CO2 underground and monitor the results of that storage. Both projects will also demonstrate the ability to transport the separated CO2. EPRI's support will reduce AEP's funding of the Mountaineer project.
RDGA292101	1,012,053	49,974	IndustrialAdvisoryCmte-SthrnCo	AEP will participate in a partnership at the Carbon Research Center at Power Systems Development Facility (CRC at PSDF). The focus of the CRC is to conduct sufficient R&D to advance emerging CO2 control technologies to commercial scale for effective integration into either IGCC or advanced combustion processes. A primary objective of the CRC testing is to evaluate solvents, sorbents, membranes and other emerging technologies in various contacting devices at an appropriate scale with real syngas. As concepts proceed past the bench scale, a test under industrial conditions with real syngas is needed to provide a pathway to commercialization. For both new and existing power plants, post-combustion capture technology must be made more efficient and cost-effective. Many technologies are under consideration for post-combustion capture, but these technologies need to be proven and integrated in an actual power plant setting. A Flexible Pilot Test Unit test module will be designed and installed at an existing pulverized coal plant adjacent to the PSDF.
RDGA292201	45,360	2,462	SolidSorbentRetrofitTechCO2Cap	The overall objectives of the proposed project are to assess the viability and accelerate development of solid sorbent based CO2 capture technologies that can be retrofit to conventional coal-fired power plants. Technology issues and critical hurdles will be identified and addressed.
RDGA292301	6	-	CleanCoalPowerInitiativeRd3Ph1	Phase 1 is the FEED study to scope the Phase 2 project. It will include testing, characterization, design and estimating. The overall Phase 1 and 2 project is a demonstration the capture and sequestration of CO2 in geological formations at a commercial-scale using the Chilled Ammonia process. In conjunction with the sequestration of CO2, AEP will study and determine the application of a novel technology (Ramgen) for the compression of CO2. Additionally, technologies for monitoring the CO2 plume and the integrity of the geological formations storing the captured CO2 will be considered.
RDGA300001	80,564	2,662	Gen Asset Mgmt - Prog Mgmt	This line item is used for Generation Asset Management (GAM) pre-project R&D development efforts and to track and manage misc. GAM R D projects costing 10K. The purpose of this charter is to document the scope, budget and costs (labor and non-labor) of those projects and efforts included in the GAM function. It is also used to track participation at the general conferences associated with GAM especially EPRI conferences for the AEP EPRI Advisors.
RDGA300201	2,805	166	CycleBasedCorrosionFatigueInsp	AEP is requesting Intertek APTECH to develop a correction factor for the number, type, and severity of stop starts and then to review and critique AEP's equivalent damage fraction EDF algorithm and waterwall tube corrosion fatigue life management plan developed by AEP. These will be performed in a two-task, two-step sequence.
RDGA300301	37,500	-	CnsvillePlt-River Water Intake	AEP's Conesville Plant experiences issues with ice build-up on its cooling water intake on the Muskingum River. This problem is expected to get worse when the remaining once-through unit 3 is retired at the end of 2012, leaving three operating units totaling 1600MWs, all with cooling towers with no means to de-ice the intake area. A series of 3D numerical simulations will be conducted to evaluate the effect of shutting down the last unit using once-through cooling unit at Conesville Plant. Changes in the hydrodynamics in the Muskingum River near the plant and ice build-up at the intake structure will be analyzed.
RDGA300401	45,128	1,412	Optimum SMAW 91 Electrodes	Development of an optimized compositional range in grade 91 shielded metal arc welding SMAW electrodes based upon the phase transformational behavior, response to tempering and range of use. Development of predictive equations for the critical temperatures for the weld metal. Development of predictive charts for the response of grade 91 to tempering during postweld heat treatment.
RDGA300501	8,655	-	Testing-WP91 Fittings & Piping	There is a correlation between the creep life of P91 materials and hardness readings. The purpose of this task is to conduct accelerated creep tests on select samples of materials from the Dresden Plant.

R&D Expenditures for 2011

Work Order	Corporate Total	KPCo Total	Project Title	Project Description
RDGA310601	50,000	1,780	Stainless Steel Handbook	The objective of this research is, for the first time, to gather the dispersed information available on advanced stainless steels used for power steam boiler components, evaluate and synthesize the available data, and produce a pocket-size handbook. Project Benefit: The project will create new learning by comparing data from multiple manufacturers and research organizations providing the public with a non-biased evaluation of these alloys. The overall benefit to the public is a condensed report which allows quick and easy access to what is now a dispersed amount of data.
RDGA310701	200,000	8,532	MonitorngWeldsFabFromGr92Steel	The objective of this research is, for the first time, to gather the dispersed information available on CSEF steels Gr. 92 used for power steam boiler and piping components, evaluate and synthesize the available data, and produce a recommendation for safe operation of the Turk facility. Project Benefit The project will create a customized plan for operation of the Turk Gr. 92 components by comparing data from multiple manufacturers and research organizations providing AEP with a non-biased third party characterization of this alloy. The overall benefit to the company is a custom report which assesses risk and characterizes recommended operation to achieve the design life.
RDGA380101	1,129,731	50,718	EPRI Annual Portfolio	Program 63 - This program develops technology and guidance that allows participants to safely manage boiler component life for high reliability and reduced O&M costs. Technology development efforts will focus on advanced inspection techniques to identify component damage early and accurately; analysis tools to predict component remaining life and in-service failure risk; decision support tools that allow AEP to balance risk and economic benefits under a variety of plant operating scenarios and conditions; and repair techniques designed to maximize component economic life. (EPRI = Electric Power Research Institute) Program 64 - Participation in this program provides the opportunity to access the EPRI knowledge base across the wide breadth of this target. Program 87 - Acquire through EPRI membership in P87.001 and P87.002 the most current guides for material. Program 88 - The P88-HRSG Dependability program is to provide technology that will address chemical issue. Program 171 - Develop guidelines, materials, solutions and monitoring techniques in this Issue Program so.
RDGA380801	17,161	540	CreepStrength-G91FerriticSteel	The purpose of the project is to identify effective methods for locating and characterizing deficient G91and other Creep Strength Enhanced Ferritic(CSEF) steels; develop material specs and processing standards to assist utilities in procuring G91 and other CSEF steel components; assemble a guideline that provides the life assessment protocol for G91 and other CSEF steels.
RDGA390901	5,000	246	PRO User's Group	The Plant Reliability Optimization (PRO) User's Group will provide the opportunity to share information on PRO programs and practices. Additional benefits will be to develop members through technical workshops and identify and recommend solution paths for issues that need resolution.
RDLABACC01 RDNU560101	(647) 1,308,570	(21) -	Labor Accrual - R&D - EPRI Nuclear Annual Research	To record research and development portion of labor accruals. Collaborative R&D within the nuclear power industry ensures that nuclear power is an economically feasible option within the current and future generation mixes. To this end, EPRI develops cost-effective technology for safe and environmental friendly electricity generation that maximizes profitable utilization of existing nuclear assets and supports promotion and deployment of new nuclear technology. EPRI's Nuclear Power program centers on seven key business objectives.
RDRE510201	29,000	1,251	CEATI-EmergingEnergyTechnology	Obtain a comprehensive assessment of emerging energy technologies including technical, environmental, and market assessments of wind turbines, solar PV, solar thermal, nuclear, biomass/waste-to-energy, enhanced geothermal high level , small hydro, hydrokinetic turbines, ocean technologies, fuel cells, utility scale energy storage, hydrogen high level , Stirling Engine gensets, and gas electric engines.
RDRE570001	57,118	1,886	Renewable R&D ProgramMgmt	This is used for Renewable Energy Resources Initiative (RERI) pre-project R&D development efforts and to track and manage misc. RERI R&D projects costing less than \$10K. The purpose of this charter is to document the scope, budget, and costs (labor and non-labor) of those projects and efforts included in the Renewable Program Management function. It is also used to track participation at general conferences associated with Renewable Program Management, especially EPRI conferences in the AEP RERI area. Donald Hubschman stated that Cardinal SHOULD NOT be billed for these charges.
RDRE570101	289,445	9,587	EPRI Renewabl Annual Port	This project charter supports AEP/E's renewables involvement with EPRI, namely: PS 84.001 Renewable Energy TAG ù provides a basic reference for technical and economic assessment of renewable energy generation technologies PS 84 D Biomass Energy ù provides industry reference and contacts for renewable energy generation, most notably biomass co-firing Donald Hubschman stated that Cardinal SHOULD NOT be billed for these charges. EPRI = Electric Power Research Institute
RDRE590601	228	11		To investigate and document best management practices for handling and storing biomass materials using established data from the pulp and paper industry and existing biomass systems; use that information to help design add-on systems at coal plants
RDTA500301	7,976	293	HighEfficiencySubstatnTrnsfmr	This project is expected to provide relevant information and learning on the economic benefits from the use of energy efficient transformers. Benefits may include reduced lifecycle carbon footprint, reduced losses and improved utilization of transmission system (i.e., more power/energy delivered per unit of generated). It may help to support the industry to adopt new technologies to improve system efficiency and utilization.

R&D Expenditures for 2011

Work Order	Corporate Total	KPCo Total	Project Title	Project Description
RDTA500401	19,033	699	Evaluation - ACSR/TW Conductor	This project is expected to provide relevant information and learning on the economic benefits from the use of TW conductors over conventional round wire conductors. Benefits may include reduced lifecycle carbon footprint, reduced losses and improved utilization of transmission system (e.g., more power/energy delivered per unit of generated). It may help to support the industry to adopt new technologies to improve system efficiency and utilization.
RDTA500501	7,121	262	Evaluation-EHVTransmissionLine	The objective of this project is to peer-review the study conducted by the Utility to assess the benefits of overlaying the system with new EHV transmission lines for improving transmission system efficiency and reducing carbon emissions.
RDTA500601	14,586	536	Eval-Cycling NonessentialEquip	The objective of this project is to provide relevant information and learning on the economic benefits from Switching or Cycling of Nonessential Equipment. Benefits may include reduced lifecycle carbon footprint, reduced losses and improved utilization of transmission system. It may help to support the industry to adopt new technologies to improve system efficiency.
RDTA500701	10,911	401	Equip Health Info-CntrlRoomOpr	This project intends to first make broad brush health information (red, yellow, and green) available for operators based upon analyses of historical parameters of individual pieces of equipment and/or classes of equipment. This would then lay the groundwork for augmenting historical assessment with improved asset condition information from real time asset condition assessment applications. Ultimately, we envision real time and forward looking equipment failure predictability being integrated into operations and planning. The project will be coordinated with EPRI projects focused on asset condition assessment as well as substation monitoring and data integration projects. The new learning in this project is focused around presentation of asset condition information for system operations applications. This project intends to provide electrical utilities, Regional Transmission Organization (RTO) and Independent System Operator (ISO) with the transformer health visualization tools to: Improve situational awareness Avoid damaging and costly wide spread blackouts of transmission grids Develop and demonstrate new applications to improve operation awareness and to schedule maintenance based on the performance and conditions of the equipment in order to improve system reliability and to reduce the maintenance costs
RDTA500801	3,873	142	AdvSensr-765kVSub-DataIntegrtn	The overall project objective is to deploy, demonstrate and further research a suite of advanced sensors for AEP 765kV Substations. The objective of this specific charter is to demonstrate application of Wireless Mesh, Backscatter Sensor, On-line FRA, and On-Line Infrared Technologies to continuously monitor and detect abnormally high arrester leakage current, acoustic emission of partial discharge activity in station equipment, transformer internal winding movement, and thermal performance of station equipment in an AEP 765kV station. The proposed activity generates substantial new learning on Advanced Sensors through the deployment and research of these sensors in a 765 KV substation environment. This new learning will be ultimately incorporated into the appropriate EPRI R&D program (in this case P37). The results are ultimately made available to the public or used for the benefit of the public through the publishing of EPRI reports. There is significant public benefit derived from the new learning and this public benefit relies on the field tests performed in AEP Substations.
RDTA500901	50,483	1,856	765kV Bundle Optimization	To confirm an optimal 765 kV bundle configuration and sub-conductor size through corona cage performance testing. Standard corona cage testing will be performed at EPRI Lenox to determine corona discharge levels from 765 kV bundle configurations previously defined by AEP and EPRI acting as a consulting engineering firm to AEP. The parameters of the corona testing will be determined by AEP with EPRI support. The actual corona cage testing will be performed by EPRI.
RDTA501001	30,000	1,103	115 138kV NCI Tests	To determine the effectiveness of past and current manufacturer standard grading rings on limiting corona discharge damage to 115 138 kV NCI insulators. Field observations have indicated that some legacy grading ring designs are not as effective in limiting corona discharge on NCI insulators as previously believed. Results from this project will assist AEP in identifying poor performing grading ring designs and determining best corrective alternatives including doing nothing but better understanding the reduced service life of the insulator.
RDTA510301	57,060	-	Oklauion HVDC Converter Statn	A high level assessment of the Oklaunion HVDC converter station to determine and evaluate the remaining life expectancy of the major AC yard converter equipment and to increase the operational reliability of the existing HVDC installation. The objective of the project is to use the assessment data, decide on the scope of the refurbishment, and to issue the results, along with AEP HVDC specifications, to the vendors to solicit bids for Oklaunion HVDC refurbishment.

R&D Expenditures for 2011

Work Order	Corporate Total	KPCo Total	Project Title	Project Description
RDTA510401	26,261	964	GeoMagnetic Disturbance	Project Purpose Geomagnetic Disturbance GMD is not a new phenomenon, yet it is of rising concern to the North American electric power sector due to increasing awareness, grid complexity, understanding of intensity, location and orientation, and societal dependence on reliable electricity supply. GMD has the potential to cause system disturbances and equipment damage. In an extreme case, GMD may have the potential to cause wide spread electric disruption and destroy long-lead time equipment, such as transformers, vital to support the delivery of electricity. For the purposes of this project, an extreme event is characterized as being ten times 10X the magnitude of the solar storm that led to the collapse of the Hydro Quebec system in the early hours of March 13, 1989 centered at the 50th latitude, centered on at Fredericksburg, Virginia, and northward. Some scientists estimate that such an extreme event may result in a system collapse, hundreds of large autotransformers damaged or destroyed and an outage that will last for months rather than days. Other scientists anticipate that existing system protection schemes will adequately protect the system disconnecting transmission components with little or no equipment damage, and that after the storm, the system could be quickly restored. Specifically, this projects objective is to Determine the likely impact of an extreme event, as defined above, on the North American bulk power system, based on present system configuration, protection capability, and practices. Identify technologies available today (especially in operations), or in the near term, which can be used to mitigate equipment damage, reduce the extent of the interruption, and speed recovery. Identify technologies that can be developed to reduce the impact of the storm and at the same time lower the cost of protection. Project Benefit The understanding developed in this project is intended to help utilities prepare for large solar storms and to operate the grid through such events. This may improve bulk power system reliability by shortening customer interruptions as well as minimizing the risks of equipment damage. In addition it may identify gaps in forecasting and mitigation solutions, and give guidance on the economic feasibility of available mitigation technologies.
RDTA510501	85,000	3,120	CyberSecurity&PrivacyInitiatve	Project Purpose: 1. A continuous mapping of the smart grid cyber security and privacy activities landscape, which will inform research participants and provide a basis to develop the R D strategy for EPRI s 2012 Cyber Security Program. 2. Technical representation and updates on key industry and government working groups to identify cyber security and privacy issues and requirements for the electric grid. 3. Approaches to mitigating the cyber security risk associated with legacy systems to increase the security of the correct electric grid. 4. Technical results from strategic, short-term R D tasks designed to address gaps in current cyber security R&D work and work towards security the electric grid of the future.
RDTA510601	29,271	1,075	Eval-Emerging Line Survey Tech	To obtain a fundamental understanding of the identified emerging T-line surveying technologies and to understand their accuracy and limitations. This research will help with documenting the performance of emerging line surveying technologies and aid in the specification and procurement of line surveys. Project Benefit: This will enhance Transmission s understanding of how these new surveying technologies may be applied to assist in conductor ratings and the meeting our regulatory requirements NERC.
RDTA560001	7,666	282		The money allocated to this project will be used to fund new activities or projects that develop as the year 2006 progresses. This is to make sure that a lack of R&D funds would not stop valuable R&D activities that were not anticipated at the beginning
RDTA560101	940	35		Expense - Transmission related projects from the EPRI Annual Research Portfolio include: 1) Lightning Performance of Transmission Lines and Transmission Line Surge Arresters - seeks to increase the reliability of new and existing overhead transmission
RDTA561401	10,626	390		This project will develop a high temperature superconducting, three phase, triax cable and demonstrate its suitability for a high power substation underground retrofit application. AEP is hosting the demonstration at Columbus? Bixby Substation
RDTA561501	6,315	232		SuperPower is developing a High Temperature Superconducting Fault Current Limiter for a 138 kV application. Sporn 138 kV station, where 9 breakers are under-rated, has been selected as the likely demonstraion site.
RDTA570001	59,077	2,171	Transmission RD&D Program Mgmt	The money allocated to this project will be used to fund new activities or projects that develop as the year 2007 progresses. This is to make sure that a lack of R&D funds would not stop valuable R&D activities that were not anticipated at the beginning of the 2007 budget cycle.
RDTA570101	855,657	31,432	Trans EPRI Annual Portfol	Integrated Monitoring & Diagnostics (P37.007) - The purpose of this project is to examine techniques for monitoring as many different components in a substation with as few sensors as possible, which is complementary to the projects examining inspection tools for specific components such as transformers or circuit breakers. The target of this project is to optimize applications of the sensors in substation. The concept of station-wide monitoring is to provide the low-cost screening tool that will trigger more detailed inspections at the component level. The unique focus of this project is on inspection tools that cover an entire substation, rather than at an individual component level. Life Extension of Existing HVDC Systems (P162.001) - This project will address the life extension of HVDC systems in a systematic method. Sharing experience and practices across utilities provides one of the most cost effective ways of ensuring that best-of- class field practices permeate across the global industry. The final goal of the project is to prepare oLife Extension for HVDC System,ø which is expected to facillitate the process of refurbishing of existing HVDC equipment. Polymer and Composite Overhead Line Components (P35.010) - Extend polymer and composite component life expectancy and avoid outages due to premature failure through improved selection, application, and inspection. (Ongoing work - EPRI Base project P35.007)

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Work Order	Corporate Total	KPCo Total	Project Title	Project Description
RDTA570201	33,805	1,242	CEA LCMSEA	CEA LCMSEA- CEA Life Cycle Management of Station Equipment and Apparatus Interest Group. This on going interest group is a low overhead collaborative effort focused on member driven station equipment, maintenance, tools, asset management techniques, benchmarking, diagnostics, and life extension. Projects are defined and contract awards made to investigate and deliver solutions, knowledge, tools, evaluation and techniques for defined issues. Projects are usually completed within 1 year. CEA = Canadian Electric Association
RDTA570401	66,396	2,440	PSerc	PSerc (Power Systems Engineering Research Center) is an NSF sponsored university (13)industry (38 members) consortium. Participation in PSerc provides AEP access to experienced university researchers in leading electric power programs across the U.S., results of collaborative member defined and approved low overhead R&D projects, and access to leading students for both intern and permanent employment positions. Participation in PSerc is a valuable element of a balanced portfolio of AEP internal and external R&D plays
RDTA570601	1,154	42	IEC 61850 Testing	Communications to/from Substations using the International Standard IEC 61850. This is a continuation of the EPRI sponsored IEC 61850 Testing Project. The current testing procedures require expansion and specification addition. Additional capability to be added to the current testing tools at AEP/Dolan for IEC 61850. Develop, jointly with industry partners, tools and techniques to provide capability for IEC 61850 Interoperability Testing at AEP/Dolan Test Facility. Funding will also help with the development of users guides for the specification of IEC 61850 products in coordination with the UCA International Users Group. Currently AEP/Dolan is setup for the initial phases of conformance testing only. The goal is to develop capability for the industry to be able to test substation devices for conformance with IEC 61850 protocol. Dolan is providing third-party services to the industry by testing IEC 61850 devices.
RDTA570901	23,614	867	Phasor Tech: Plan & Ops Tools.	1) Develop tools and techniques to analyze data captured by AEP phasor monitoring units (PMUs) and apply the tools and techniques in planning (off-line) and operations (real time) environments. 2) Participate in the Eastern Interconnection Phasor Project (EIPP), which is facilitating development of a phasor data network in the Eastern Interconnection (EI). The vision of EIPP is to improve power system reliability through wide area measurement, monitoring and control.
RDTA571101	28,958	1,064	BPL Use for Data Transportatio	Explore the use of BPL (Broadband Power Line Carrier) technology for data transport to reduce the use of leased lines and associated O&M costs. Build on the knowledge gained from the 2006 BPL SCADA and Protective Relaying R&D project. Project elements likely will include: 1) further characterization of 46kV, 69kV and 138kV transmission lines as BPL communication channels; 2) performance comparison of single phase and multi-phase BPL coupling 3) optimization of Amperion's BPL system for internal utility data transfers to reduce cost and maximize distances between repeaters. 4) analysis of various options for powering BPL repeaters. 5) exploration of the use of BPL as a transmission line diagnostic tool. 6) through Amperion u Dolan Lab development and testing, qualify BPL components and system for 69kV and 138kV applications.
RDTA571301	256	9	Galloping Conductor Mitigation	Identify the possible use of Performed Air Flow Spoilers to limit/mitigate galloping on a selected 345kV span in Indiana. Summary of 2005/2006 Work: In 2005, two models (EHV and non-EHV) of the PLP (Preformed Line Products) Air Flow Spoilers were electrically tested at Dolan Technology Center for corona, audible noise and radio interference performance. Based on the test results, 25 units of non-EHV spoilers were installed on the bottom conductor of one of the double circuit Desoto Sorenson 345 kV circuits. Ground clearance of the conductor was measured and a stationary video camera was installed to record its motion as compared to that of the conductors with no spoilers installed. 2007 Project Scope: No galloping occurred in the fall of 2005 or on 2006 through December. Therefore, the project will extend into 2007 to monitor the galloping and mitigation results
RDTA571401	4,372	161	High Temp Superconduct Cable	This project has developed a high temperature superconducting, three phase, triax cable and is in the process of demonstrating its suitability for a high power substation underground retrofit application. AEP is hosting the demonstration at Columbus/E Bixby Substation as part of a \$9M DOE Superconducting Partnership Initiative project. If successful, it will further DOE's objectives to accelerate the introduction of HTS cables into the utility grid. The cable is currently operating in real life conditions as the primary source to the Bixby 13.2kV bus and distribution feeders supplying electricity to industrial and residential users. Both closed loop pulse tube and open loop cryogenic cooling will be demonstrated. The project will answer user's questions regarding long length application, the triax cable design, cryogenics cooling systems, system reliability and O&M costs. The cable and support systems will be removed and the station restored after the 1-2 year demonstration is completed. Replaces work order RDTA561401
RDTA571501	3,227	119	HTS Matrix Fault Current Limi	SuperPower was developing a high temperature superconducting (HTS) fault current limiter for application at an AEP 138 kV station. However, due to aging problems with the superconductor elements, the project was put on hold from mid-2005 to mid-2006. With the viability of the second generation superconductors, the development has restarted. Presently, the Tidd 138 kV station is selected as the likely demonstraion site. If this technology is developed and successfully field-demonstrated, it will provide an alternative to breaker replacement at Tidd and some other stations, depending on the MFCL cost. In addition, successful demonstraion of this technology will provide a giant step in the application of superconductivity technology and it will add to the understanding of the voltage insulation characteristics of liquid nitrogen. Replaces work order RDTA561501
RDTA590401	16,000	588	ArcFlashHazards-TrnsLns Substn	1) To perform a comprehensive study of thermal exposure from open air electric arcs on overhead transmission lines and in indoor transmission substations. 2) To develop an open source industry-accepted method to calculate high voltage arcs in a broad range of utility situations in open air.

R&D Expenditures for 2011

Work Order	Corporate Total	KPCo Total	Project Title	Project Description
RDTA590601	17,851	656	HighTemperatureConnectorSystems	This project will evaluate the performance of conductor splices and dead-ends under high temperature operations. Much work has been completed to verify that the conductors themselves are capable of high temperature operations but little, if any, work has been completed considering the total conductor system. This work will include industry standard conductors as well as the commercially available composite conductors. The conductor system testing will include thermal cycles and conductor tensions that are typical of in-service lines subjected to high temperature operations.
RDTA590701	48,480	1,798	InsulatorContaminationSeverity	The objectives and deliverables of this project are: 1) the revision of T-line and Station Insulator Specifications to support future capital projects of all transmission voltage classes located in known contaminated environments, 2) to purchase the necessary capital tools and equipment to collect insulator contamination data, and 3) to train AEP how to collect and interpret insulator contamination data to properly specify insulators for capital projects.
RDTA590801	50,000	1,838	DevSplice LeakageSensorSystems	As part of a supplemental effort EPRI has been developing a suite of transmission line sensors based on Radio Frequency (RF) technology. The objective of this projects is to a) extend the application of one of the existing prototype sensors to higher voltages, i.e. 765kV, b) develop two new sensor technologies, c) capture field experience which will improve future sensors designs, d) capture field data that will allow algorithms and thresholds to be developed to solve field issues.
RDWM201001	63,794	3,101	DTC Walnut Maintenance	The Walnut Test Facility is owned by Columbus Southern Power. The facility is used by the corporate Utilities R&D program. As such, the expenses and results of work done at the facility are done for the benefit of multiple operating companies. This project / work order will allow for a mechanism to capture the annual costs of maintaining the facility, future investments, and other related annual expenses (e.g., depreciation of the assets that were transferred in accordance with the dissolution of AEP EmTech, LLC, etc.) and expensing them to the appropriate benefiting locations.