

2011 FESC Annual Report

Research, Education and Outreach Progress Reports

FLORIDA AGRICULTURAL AND MECHANICAL UNIVERSITY.....	3
FUSION ENERGY SPHEROMAK TURBULENT PLASMA EXPERIMENT-STPX	3
FLORIDA ATLANTIC UNIVERSITY	4
SOUTHEAST NATIONAL MARINE RENEWABLE ENERGY CENTER (SNMREC)	4
FLORIDA STATE UNIVERSITY	13
BIOFUELS THROUGH THERMOCHEMICAL PROCESSES: APPROACH TO PRODUCE BIO-JET FUEL	13
CONSTRUCTUAL OPTIMIZATION OF SOLAR PHOTO-BIOREACTORS FOR ALGAE GROWTH.....	14
DEVELOPMENT OF A RENEWABLE ENERGY RESEARCH WEB PORTAL.....	15
ENERGY AND EFFICIENCY VIDEO PUBLIC SERVICE ANNOUNCEMENTS.....	16
ENERGY SUSTAINABLE FLORIDA COMMUNITIES.....	17
ENVIRONMENTAL IMPACTS OF ENERGY PRODUCTION SYSTEMS: ANALYSIS, EVALUATION, TRAINING, AND OUTREACH	18
ESTABLISHMENT OF THE CENTER FOR MARINE BIOENERGY RESEARCH: SYSTEMS APPROACH TO BIOENERGY RESEARCH (SABER)	19
EXPERIMENTAL INVESTIGATION OF ECONOMIC INCENTIVES OF POLICIES, INSTITUTIONS, AND R&D IN ENVIRONMENTAL CONSERVATION	20
INNOVATIVE PROTON CONDUCTING MEMBRANES FOR FUEL CELL APPLICATIONS	21
INVESTIGATING THE EFFECT OF APPLIANCE INTERFACE DESIGN ON ENERGY-USE BEHAVIOR	22
MARKETING STRATEGIES TO INCENTIVES ENTREPRENEURSHIP AND INNOVATION IN THE DEVELOPMENT OF SUSTAINABLE ENERGY	23
MICROGRIDS FOR A SUSTAINABLE ENERGY FUTURE	24
METEOROLOGICAL FACTORS AFFECTING SOLAR ENERGY EFFICIENCY IN THE TROPICS	25
MULTI-GENERATION CAPABLE SOLAR THERMAL TECHNOLOGIES	26
PLANNING GRANT: ADVANCING KNOWLEDGE OF NETWORK THEORY FOR ANALYSIS AND DESIGN OF SMART POWER GRIDS	27
PLANNING GRANT: CLIMATE MODELING AND OUTREACH ACTIVITIES.....	28
PLANNING GRANT: ENHANCED THERMAL PERFORMANCE AND MICROSTRUCTURE SIMULATION OF NUCLEAR FUELS	29
PLANNING GRANT: HIGH PERFORMANCE AND LOW COST FUEL CELLS FOR FUTURE VEHICLES.....	30
PLANNING GRANT: HYDROGEN STORAGE USING CARBON-BASED ADSORBENT MATERIALS	31
POLITICAL AND ECONOMIC INSTITUTIONS REGARDING SITING OF ENERGY FACILITIES.....	32
PROMOTING ENERGY AND LAND USE THROUGH LAND USE, TRANSPORTATION AND GREEN INFRASTRUCTURE POLICIES	33
REAL-TIME POWER QUALITY STUDY FOR SUSTAINABLE ENERGY SYSTEMS.....	34
REDUCING RESIDENTIAL CARBON EMISSION IN FLORIDA: OPTIONAL SCENARIOS BASED ON ENERGY CONSUMPTION, TRANSPORTATION, AND LAND USE	35
SUSTAINABLY INTEGRATED ADVANCED BUILDING SUBSYSTEMS (OGZEB).....	36
THE FUTURE FLORIDA GRID: ENSURING A RELIABLE AND RESILIENT ELECTRICAL ENERGY TRANSMISSION AND DELIVERY SYSTEM IN A CHANGING ENVIRONMENT	37
VISITING LAW PROFESSOR	39
UNIVERSITY OF CENTRAL FLORIDA.....	40
BUOY ARRAY FOR OCEAN WAVE POWER GENERATION	40
CONCENTRATING SOLAR POWER PROGRAM.....	51
DEVELOPMENT OF HIGH THROUGHPUT CIGS MANUFACTURING PROCESS.....	54
ENERGY EFFICIENT BUILDING TECHNOLOGIES AND ZERO ENERGY HOMES	57
ENHANCED AND EXPANDED PV SYSTEMS TESTING CAPABILITIES AT FSEC.....	60
ENHANCED AND EXPANDED SOLAR THERMAL TEST CAPABILITIES.....	63
FLORIDA OPPORTUNITIES FOR PV MANUFACTURING AND APPLICATION	69
INSIGHT INTO MEMBRANE DEGRADATION MECHANISMS THROUGH VERIFICATION OF CHEMICAL AND MECHANICAL DEGRADATION TEST CAPABILITIES.....	76
INTEGRATED FLORIDA BIO-ENERGY INDUSTRY	78
PV DEVICES RESEARCH AND DEVELOPMENT LABORATORY	84
PV ENERGY CONVERSION AND SYSTEM INTEGRATION	88
PV POWER GENERATION USING PLUG-IN HYBRID VEHICLES AS ENERGY STORAGE.....	91



Florida Energy Systems Consortium

RESEARCH TO IMPROVE PHOTOVOLTAIC (PV) CELL EFFICIENCY BY HYBRID COMBINATION OF PV AND THERMOELECTRIC CELL ELEMENTS	95
SOLAR SYSTEMS TESTING FACILITY	103
UNIVERSITY OF FLORIDA.....	106
AN INTEGRATED SUSTAINABLE TRANSPORTATION SYSTEM	106
BIOCATALYTIC LIGNIN MODIFICATION FOR CARBON SEQUESTRATION.....	108
COMBINED COOLING, HEAT, POWER, AND BIOFUEL FROM BIOMASS AND SOLID WASTE	113
DATABASE INFRASTRUCTURE FOR INTEGRATIVE CARBON SCIENCE RESEARCH	119
DEVELOPMENT OF BIOFUEL PRODUCTION PROCESSES FROM SYNTHETIC AND BIOMASS WASTES	126
DEVELOPMENT OF LOW-COST CIGS THIN FILM HOT CARRIER SOLAR CELLS.....	127
DEVELOPMENT OF NOVEL WATER SPLITTING CATALYSTS FOR THE PRODUCTION OF RENEWABLE HYDROGEN.....	130
ECONOMIC IMPACTS OF RENEWABLE ENERGY AND ENERGY EFFICIENCY POLICIES	131
ENERGY INTENSIVE CROP DEVELOPMENT.....	133
ENGINEERING BIOCATALYSTS FOR HEMICELLULOSES HYDROLYSIS AND FERMENTATION.....	138
FLORIDA ADVANCED TECHNOLOGICAL EDUCATION CENTER (FLATE)	140
INTEGRATED PV/STORAGE AND PV/STORAGE/LIGHTING SYSTEMS	144
JOINT OPTIMIZATION OF URBAN ENERGY-WATER SYSTEMS IN FLORIDA	151
LOW COST SOLAR DRIVEN DESALINATION.....	157
NON-CONTACT ENERGY DELIVERY FOR PV SYSTEM AND WIRELESS CHARGING APPLICATIONS	163
OPTIMIZATION OF ALGAE SPECIES FOR BIOFUELS PRODUCTION USING GENETIC ALTERATION	170
OPTIMIZATION, ROBUSTNESS AND EQUILIBRIUM MODELING FOR THE FLORIDA SMART GRID.....	172
OUTREACH ACTIVITIES FOR THE FLORIDA ENERGY SYSTEMS CONSORTIUM	176
SECURE ENERGY SYSTEMS	185
SOLAR FUELS FROM THERMOCHEMICAL CYCLES AT LOW PRESSURES	190
SOLAR THERMAL POWER FOR BULK POWER AND DISTRIBUTED GENERATION	195
THERMOPHILIC BIOCATALYSTS FOR THE CONVERSION OF CELLULOSIC SUBSTRATES TO FUELS AND CHEMICALS	203
UFTR DIGITAL CONTROL SYSTEM UPGRADE FOR EDUCATION AND TRAINING OF ENGINEERS AND OPERATORS	205
UNIFYING HOME ASSET & OPERATIONAL RATINGS: ADAPTIVE MANAGEMENT VIA OPEN DATA & PARTICIPATION	210
WATER-USE EFFICIENCY AND FEEDSTOCK COMPOSITION OF CANDIDATE BIOENERGY GRASSES IN FLORIDA	216
UNIVERSITY OF SOUTH FLORIDA.....	224
BEYOND PHOTOVOLTAICS - NANOSCALE RECTENNA FOR CONVERSION OF SOLAR AND THERMAL ENERGY TO ELECTRICITY	224
CLEAN DRINKING WATER USING ADVANCED SOLAR ENERGY TECHNOLOGIES.....	233
CREATION OF CARBON SEQUESTRATION DATA, TECHNOLOGIES AND PROFESSIONAL COHORTS FOR FLORIDA	239
DESIGN, CONSTRUCTION AND OPERATION OF CSP SOLAR THERMAL POWER PLANTS IN FLORIDA.....	245
ENERGY DELIVERY INFRASTRUCTURES	251
ENERGY EFFICIENT TECHNOLOGIES AND THE ZERO ENERGY HOME LEARNING CENTER	257
FEASIBILITY, SUSTAINABILITY AND ECONOMIC ANALYSIS OF SOLAR ASSISTED BIOMASS CONVERSION	265
POWER GENERATION EXPANSION PORTFOLIO PLANNING TO SATISFY FLORIDA'S GROWING ELECTRICITY DEMANDS	268
PRODUCTION OF LIQUID FUELS BIOMASS VIA THERMO-CHEMICAL CONVERSION PROCESSES	273
SOLAR PHOTOVOLTAIC MANUFACTURING FACILITY TO ENABLE A SIGNIFICANT MANUFACTURING ENTERPRISE WITHIN THE STATE AND PROVIDE CLEAN RENEWABLE ENERGY.....	280
FESC PHASE 2 TECHNOLOGY COMMERCIALIZATION	286
DEVELOPMENT OF A LOW COST CONCENTRATING SOLAR ENERGY SYSTEM USING SOLAR SAUSAGES.....	286
STRESS EVOLUTION IN SOLID STATE Li ION BATTERY MATERIALS	289
SWNT BASED AIR CATHODES FOR FUEL CELLS & METAL AIR BATTERIES.....	292
UNI-DIRECTIONAL IMPULSE TURBINE FOR THE POWERING OF OFFSHORE MONITORING SYSTEMS.....	294