



Research Orientation Booklet

Second Edition

Office of Research and Graduate Studies
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المقيدة
FAITH

العمل
PERFORMANCE

المال
KNOWLEDGE

ur Vision

The Office of Research and Graduate Studies facilitates research and graduate studies at Alfaisal University enabling it to be a leading regional institution that benefits society and that helps to sustain a knowledge-based economy.

ur Mission

Our mission is to support multi-disciplinary research and graduate studies programs of faculty and students by enhancing the environment for creative scholarly work with the highest levels of quality and integrity, and that stimulate the development of a knowledge-based society.

*I*ntroduction

The Office of Research and Graduate Studies extends its welcome to all new faculty. This booklet will introduce you to Alfaisal University's research priorities, support, and types of funding. It provides information pertaining to start-up funding, facilities, laboratories, and affiliate institutes where collaborative research can take place. The Office team is available to assist you at anytime (research@alfaisal.edu). Further information and downloadable documents can be accessed from the Office of Research and Graduate Studies webpage: http://www.alfaisal.edu/research/off_research.htm

The Office of Research and Graduate Studies (ORG) is responsible for the coordination, supervision, and securing of funds for research in the University and with collaborative partners in the local and global environment with the purpose of supporting the University's strategic plan.

The University seeks to maintain and upgrade space and to institute new facilities for on-campus research so as to provide a vibrant academic environment conducive to investigation. Facilities include laboratories, space for testing and experimental work, computing facilities, and funds for consumable and expendable items.

The University provides support for research in the areas of science, engineering, medicine, and business with the aim of promoting productive investigation and creative scholarship. Guidelines which describe the application process and pre and post phases of an award, types of funding available, including guidelines for writing proposals and relevant downloadable forms are available at the following link: http://www.alfaisal.edu/research/off_research.htm

*R*esearch priority areas

Research Priorities Areas Guidelines (RPAG09) was created to provide assistance to Faculty, Deans, Department Heads and Administrators in development of research proposals that are relevant the strategic goals of the country as well as Alfaisal University.

Procedure Employed in Developing Research Priority Areas

A dynamic set of research priorities was developed based on KACST's National Policy for Science and Technology, KSA's 8th National Development Plan and Vision 2020. In addition, input was also received from members of the University's Advisory Research Committee as well as College Dean's and Faculty members who are experts in their fields.

KACST's National Policy for Science and Technology: The policy was approved in 2002. Accordingly, KACST developed five year strategic and implementation plans for eleven strategic technologies identified in the National Plan:

- Water
- Oil & Gas
- Petrochemicals
- Nanotechnology
- Biotechnology
- Information Technology
- Electronics, Communication, & Photonics
- Space and Aeronautics
- Energy
- Environment
- Advanced Materials

KSA's 8th National Development Plan and Vision 2020: The Kingdom's National Development Plans are guided by the National 2020 Vision which outlines the National Development Strategies up to the year 2020 developed by the Ministry of Economy in collaboration with other Ministries and Public Authorities. The strategies were organized along distinct themes:

- Shift from excessive reliance on natural resource endowments to master over knowledge-based technologies for the next 15 years to achieve long-term economic security
- Build industrial competitiveness to international standards in a number of select sectors
- Manufacturing capability development e.g., deploy new technologies and raise innovation and enhance exports

- Build economically significant human resources via select set of National Industrial clusters at internationally competitive levels
- Enterprise Competitiveness
- Build supply of skills, finance, and technology support
- Set up effective national innovation system via R&D activity in universities and other research institutions and firms
- Strengthen KSA's educational system and shift emphasis to science and technology
- Develop technical and vocational training and employee training within firms

The list of research priority fields and areas for Alfaisal University is shown in Table 1.

The research priorities outlined in the Research Priority Areas Guidelines document (RPAG09) are dynamic in nature. They are based on the needs of the Kingdom and the region as well as the niche areas that need strengthening, as identified by the Committee.

It is anticipated that the Research Priority Guidelines will help to increase the critical mass for research in the Kingdom by taking advantage of current partnerships. By allowing Alfaisal's incoming faculty to collaborate in priority areas of mutual interest, it is hoped that real breakthroughs will be achieved in solving regional problems, in human capacity building and in promoting economic development and diversification.

Table 1. Research Priority Areas for Alfaisal University

SCIENCE & TECHNOLOGY

Water

- Desalination
 - Thermal
 - Sea Water Reverse Osmosis
- Corrosion of Materials in Seawater
- Water Resources & Transportation
- Water Recycling, Treatment & Cons.

Energy

- Renewable Energy
 - Solar thermal energy
 - Solar photovoltaic
 - Storage and transport of energy
- Power Generation
 - Fossil fuel
 - Fuel cells
- Energy Storage, Conversion & Effic.

Oil & Petrochemicals

- Oil Processing & Catalysts
- Petrochemicals

Information Technology

- Software Engineering Systems
 - Arabisation (local content)
 - Security
 - Speech
 - Self-adaptation

Aerospace

- Advanced Aerospace Computing
 - Embedded Computing
 - Remote Sensing & GIS
- Materials
- Aerospace Systems and Applications
 - Advanced electro-optics systems
 - Aerospace Dyn. Determin. & Control
 - Aerospace communications
 - Nanomaterials & Device Applications

Mining & Metals

Environment & Natural Resources

- Air Pollution
- Environment and Marine Biology
 - Kinetics and conversion of biomass

- Reduction of bio-fouling in desalination & power plants
- Interaction between desalination plants & coastal marine environment

HEALTH, BIOMEDICINE & PHARMACEUTICALS

Diseases

- Diabetes
- Asthma
- Cancer and Viral Infections
- Cardiovascular
- Obesity
- Neuropathology
- Communicable Diseases
- Epidemiology

Surgery

- Healing
- Nerve-repair
- Cytokines

Gerontology

Genetics

Biotechnology & Biomaterials

- Biopharmaceuticals
- Disease Detection
- Artificial Organs & Drug Delivery Systems

Comparative Effectiveness

Translational Research

BUSINESS

Diversification of Economic Base

Domestic & Foreign Investment

- Foreign Direct Investment
- National Competitiveness

Economic, Social, Environmental & Cultural Impact of Globalization

- Capital Market Contemporary Issues
- Micro & Macro Economic Issues
- Environmental Issues

Balanced Regional Development

E-Business & E-Government



Student participation in research

Capacity Building

One of Alfaisal's priorities is competence building by, for example, helping to develop a student's intellectual abilities. Student involvement in focused research that addresses real community problems links academic programs to the actual work place through partnerships with the public/private sectors. This will help to equip students with critical thinking and problem solving skills and thus allow them to better meet the needs of the workplace and the community.

Undergraduate students can participate in faculty research projects during the summer. In addition, internships are available with local companies and institutes.

Protection of Students

It is the responsibility of the Primary Investigator (PI) to ensure that students who participate in research are made aware of the ethical policies and procedures and that compliance must be maintained. An account of student involvement must be detailed in the research protocol to ensure that all safety measures and necessary precautions have been taken. Endorsement forms for participation of students in research must be signed by the PI and student(s) involved.

Recognition

Principal Investigators must acknowledge the contribution of students to their scholarship and research in all forms including Intellectual Works, Property, and Patents (see Intellectual Property section in Policies, Procedures and Guidelines)

Graduate Research

Alfaisal University will ensure its position as a research-based university by promoting the involvement of graduate students. Building a strong graduate program will be essential for the development of successful research programs in strategic areas. Alfaisal will provide opportunities for the very best students to pursue advanced degrees in, for example, biomedical sciences, and radiology in the College of Medicine as well as the Executive MBA programs in the College of Business. In addition, there will also be graduate programs in the College of Engineering and the College of Science & General Studies. For more information please visit each respective college/department or program web site (www.alfaisal.edu). The University may cover full or partial tuition for Research Assistants during the course of their assistantships and in accordance with the stipulated tuition fee. In addition, Research Assistants may receive an annual living stipend and medical coverage.

Funding

There are several ways to fund research projects either through the University's internal budget or through externally funded programs.

Research is supported internally in the form of start up funds for new faculty. Funding is based on areas of focus stipulated by the University in addition to criteria set forth by each College (see Research Priority Areas Guidelines RPAG09)

Start-up Funding

Alfaisal University aims to facilitate and foster research and has created a set of guidelines to achieve this goal with respect to start-up packages. Requests for start-up funds for new faculty must be part of the negotiations and should be incorporated in the job offer and employment contract.

Start-up funding is a one time event that is designed to help new faculty to initiate their research programs. It is an Alfaisal University requirement that start-up funding results in research proposals submitted to outside research funding agencies and, ultimately, successful external funding of the faculty members research activities. Start-up funding may come from a number of internal budget centers including the Office of Research & Graduate Studies (ORG), the Provost's Office, the prospective faculty member's College or the prospective faculty member's academic department.

As part of the application process, prospective faculty members must submit a description of their proposed research at Alfaisal University. This description should include a list of equipment necessary to initiate and carry out this research, as well as a budget for other research-related needs such as supplies and technical help (to be used over a maximum of three years). A special form (SUFR08) is available for this purpose but is not obligatory as long as the information requested on that form is provided. Evaluation of the scientific or scholarly quality of the research project, its feasibility and its relevance to the Kingdom's and Alfaisal's research priorities will be part of the interview and faculty recruitment process. Submission of the research proposal and details of the budget should not be requested until it is clear that the candidate is a finalist. The department head will forward his evaluation and recommendation to the relevant college dean who, in turn, will forward the evaluation and recommendation to the Vice President for Research & Graduate Studies and the Provost. In addition to the credentials of the candidate and the quality of the research proposal, criteria for the commitment of funds for start-up will include research priorities of the University and the Kingdom, potential for getting external research support and availability of university funding.

Sponsored Research

Funded research is supported by grants received from a sponsoring agency through submission and acceptance of research proposals (Table 2). Several types of research grants are available, all of which are distributed on the basis of the merits of the submitted proposals. All proposals for funded research must be routed through ORG to assure compliance with University and funding agency regulations, and to assess University commitments of funds and space.

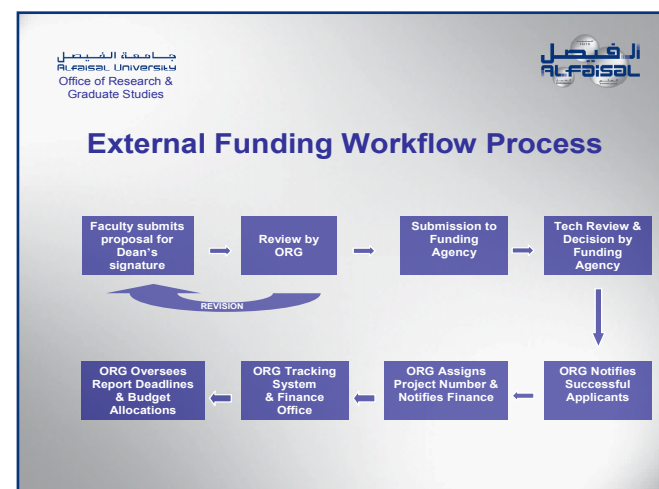
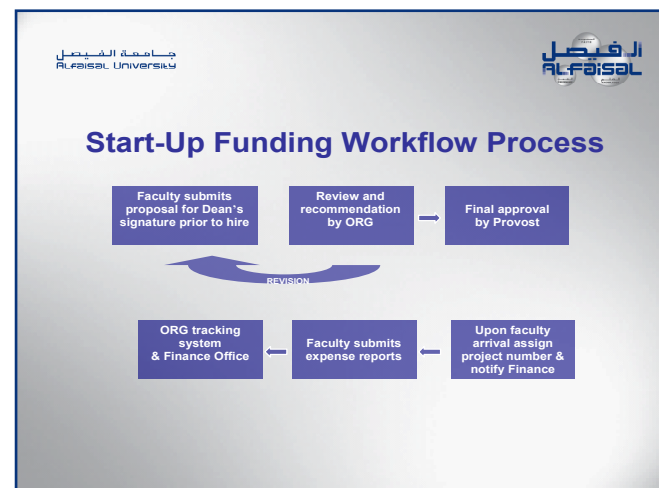
The Office of Research & Graduate Studies encourages and supports faculty to submit proposals to granting and funding agencies such as the King Abdulaziz City for Science and Technology (KACST) and King Saud University (KSU).

Procedures for Sponsored Research Applications:

- Office of Research and Graduate Studies (ORG) works with faculty to identify areas of research and opportunities for potential grants or funding.
- Faculty members develop proposals in accordance with funding agency requirements and on designated forms.
- All official correspondence between faculty and funding agencies must be made through the ORG.
- Final drafts of proposals, including all attachments and required forms, must be signed and then submitted to ORG at least seven working days prior to funding agency deadline to allow time for review and endorsement.
- ORG submits the signed proposal to the funding agency and keeps a copy of the final proposal in a central file.
- The Principal Investigator/Project Manager and the College Dean will be notified once a decision has been received from the funding agency.
- If an award is granted, the ORG will work with the Principal Investigator/Project Manager on account activation and post-award account management.

Table 2. External Funding Sources for Alfaisal Faculty

Deadlines	Funding Agency	Grant Type	Research Areas	Notes
None	Prince Salman Center for Disability Research (PSCDR) www.pscdr.org.sa	External	Disability research	Research Grant Application Kit (on file in ORG)
None	King Abdulaziz for Science and Technology (KACST) www.kacst.edu.sa	KACST Internal External	KACST research priorities; negotiation with KACST institutes/centers	The Project Manager should be from KACST. Pre-proposal Form 11 (on file in ORG)
30 March 30 Sept	King Abdulaziz for Science and Technology (KACST) www.kacst.edu.sa	External	The first five year science, technology and innovation plan	CNPSTI – Form RE-D1 (on file in ORG)
15 Feb	Center of Excellence for Research in Engineering Materials (CEREM) http://www.ksu.edu.sa/sites/Coleges/Engineering/cerem/Pages/aboutcerem.aspx	External	Metals and alloys, polymer composites and smart composites	Alfaisal signed MOU with CEREM. Proposal Form (on file in ORG)
None	Center of Research Excellence in Refining and Petrochemicals http://core-prp.kfupm.edu.sa/petrochemicals.htm	External	Refining and petrochemicals areas	Research Grant Application (on file in ORG)
25 Feb.	Center of Excellence in Corrosion www.kfupm.edu.sa/ir/core-c	External	Corrosion areas	Pre-proposal Form (on file in ORG)
25 April	Arab Science and Technology Foundation www.astf.net	Abdulatif Jameel	Medical, engineering, applied sciences and other sciences	Letter of Intent and Proposal Form (on file in ORG). Citizen of Arab country should be PI
-	-	-	-	-
-	Qatar National Research Fund www.qnrf.org	-	-	Need Qatar collaborator
-	Kuwait Foundation for the Advancement of Science www.kfas.com	-	-	Need Kuwait collaborator
-	Ford Motor Company www.ford-environmentalgrants.com	Conservation & Environmental	-	-
-	Saudi Basic Industries (SABIC) http://www.sabic.com/corporate/en/ourcompany/researchandtechnology/	-	-	-
-	ARAMCO http://www.saudiaramco.com/irj/portal/anonymous	-	-	-



Research partnerships

The Office of Research & Graduate Studies fosters research collaboration and transfers of technology, striving for rapid commercialization of research results for the public benefit. Research plays an important role in linking faculty and new technology with other institutes and companies that can collaborate in both the further development of new inventions and the commercialization of research results.

King Abdulaziz City for Science and Technology (KACST)

Alfaisal University has signed an MOU with King Abdulaziz City for Science and Technology (KACST) with the following aims:

- Developing cooperation mechanisms for scientific research and technological development.
- Cooperating on collaboration with faculty of world class universities like Massachusetts Institute of Technology (MIT).
- Creating the appropriate environment for joint technological research and technological development at levels of excellence that are recognized internationally.
- Providing access for both parties' students to use the information systems, databases and libraries of the other, and reciprocal access to facilities.
- Studying the construction of a technology incubator.
- Cooperation in other areas that are mutually beneficial.

Alfaisal University has developed trilateral research collaborations with MIT faculty, and KACST in the field of technology. Collaborative research contracts have been conducted for four nano-technology research projects:

- Nanopatterning for Fuel-Cell Electrodes
- Mid-Infrared Lasers for Sensing Applications
- Photonics for the Petrochemical Industry
- Enhancement of Transport Phenomena in Nanofluids

KACST's vision is to be a world-class research organization that is vital to Saudi Arabia's future and an essential source of Science & Technology for the nation's mission which combines technology with human development.

KACST is the primary research funding authority in the Kingdom of Saudi Arabia. It provides financial support for all universities along with their 175 affiliated Research & Development

(R&D) centers. Expenditure on R&D during the Kingdom's Seventh Development plan was 0.3% of the GDP (Gross Domestic Product). This has been significantly increased to 1.6% of the GDP, more than a factor of five, in line with the strategic objectives of the Eight National Development Plan. The total budget allocation under the Plan for the next five years is SR 8 billion (i.e USD 2 billion). For that reason, KACST was given the responsibility for developing a National Strategy for Science and Technology which places the spotlight on supporting and encouraging scientific research in both public and private universities and institutions.

The main focus of KACST's strategy is to increase R&D allocations to universities, to enhance utilization of available capacity of KACST institutes and National Research Centers, and to attract additional distinguished manpower from inside and outside the Kingdom to work in the R&D centers. In order to accomplish this, KACST needs to double in size, and to offer the private sector incentives to undertake R&D.

Primary funding routes provided by KACST consist of internal, external, and cooperative support from national and international sources. Internal funding is conducted in its facilities. KACST also has an arrangement to allow the PI to be from other national institutions with a project manager from KACST. On the other hand, external funding is open to all public and private universities in the Kingdom and is granted on a competitive basis with the research being done at the institution receiving the funding.

KACST has two principal mechanisms for financial support. As a result of cooperation between KACST and Alfaisal University, faculty members may team up with researchers from the former to submit internal proposals to KACST. In this case, the Principal Investigator/Project Manager will be from KACST. Proposals are evaluated by the Internal Research Funding Unit at KACST. Consequently, only proposals which focus on areas of mutual interest will be considered. External research funding is subject to competition among all universities in the Kingdom of Saudi Arabia. Alfaisal applicants should use KACST designated forms available at the following web link: <http://www.kacst.edu.sa/depts/grants/ads.php>.

King Faisal Specialist Hospital and Research Center (KFSH&RC)

The University has signed an MOU with King Faisal Specialist Hospital and Research Centre (KFSHRC) to establish a joint team to develop and conduct research projects, as well as to secure collaborative research and development with organizations in Saudi Arabia and other countries. The University's faculty and students will closely associate with this hospital and its highly qualified staff.

The KFSH Research Centre has several centres and units dedicated for research; the following is a description of each including primary areas of research:

Saudi Diagnostic Labs (SDL): The SDL is a successful spin-off from the Research Center. The Lab's research activities are translational in nature and aim at understanding the molecular basis of disease, identifying underlying mutations, providing diagnostic options and facilitating prevention through screening and counseling.

Biological and Medical Research Department: Research activities cover virtually all major disciplines within the biomedical sciences. Activities focus Thromboembolic Disorders, Saudi Diabetes Registry, and National Genetic and Birth Defects Registry. for diagnosis and therapy of cancer and other diseases. on major disease states (Cardiovascular Diseases, Infectious Diseases, Diabetes and Cancer) and on basic medial research (Molecular Medicine, Apoptosis, Immunology, Pharmacology and Molecular Microbiology). The Department consists of fourteen research sections and two core facilities for Flow Cytometry and Confocal Microscopy.

Biomedical Physics Department: The Department focuses on services. It does the treatment planning of cancer patients and the commissioning of new radiation emitting equipment. The latter is used nationally as fee for service. Studies conducted in the Department include: inter comparison on measurements of the quantity persona dose equivalent (Hp10) in photon fields in the West Asia Region; comparing radiosensitivity, DNA repair, misrepair, and alterations in protein expression between fibroblasts devised from patients having different normal tissue reactions to radiotherapy: potential for a predictive assay; investigating the role of mitochondrial DNA variations in the expression of late normal tissue complications following radiotherapy; investigating the relationship between gene mutation and protein stabilization of TP53 in non-Hodgkin's Lymphoma.

Biostatistics, Epidemiology and Scientific Computing: Research is conducted in subjects pertaining to epidemiological issues that affect the health of the institution's patients as well as the population of the Kingdom at large, and the development of new methodologies for the analysis of biomedical data. The Department handles hospital-

based and national and Kingdom-wide; registries, including Congenital Heart Defects, Epilepsy, Neuromuscular Diseases, Cleft Lip-Palate and Craniofacial Anomalies, Familial Thrombophilia, Thromboembolic Disorders, Saudi Diabetes Registry, and National Genetics and Birth Defects Registry.

The Centre for Clinical Research (CCR): Areas of expertise in Bioavailability/Bioequivalence studies include the CCR Biostatistics Laboratory wherein sophisticated statistical analysis for bioequivalence studies including sample size determination, ANOVA, k two one-sided t tests, and bioequivalence confidence intervals are conducted. The Center has state-of-the-art technology including a Bioanalytical Laboratory currently equipped with: four Waters Alliance HPLC systems; one Varian GC unit; one Hanson SR8Plus Dissolution Test System; one PE Sciex LC-MS system and two other HPLC systems.

Comparative Medicine Department: Current research activities conducted by staff include heatstroke, infectious diseases, cardiovascular, neurodegenerative disorders and cancer. In addition, the Department offers courses and participates in the teaching of microsurgical techniques with other Departments (neurosciences, cardiovascular and urology). Expertise areas include technical service in veterinary care for a large variety of animal species; the expansion of the service to non-human primates and transgenic animals.

Cyclotron and Radiopharmaceuticals Department: The Department produces radioisotopes in its cyclotron, followed by manufacturing a variety of radiopharmaceuticals for diagnosis and for therapy. The Department consists of five sections and is a combination of advanced technology and specialty professionals engaged in manufacturing and radioisotopes research. Apart from the manufacturing activities, the C&R scientists are engaged in research activities with an aim to develop new radiotracers for diagnosis and therapy of cancer and other diseases.

Experimental Molecular Pathology (Research Center at KFNC&R): The Department was established to perform high quality translational research to an international standard. Its main mission is to systematically focus on diagnostic treatment issues that are specifically relevant to non-western populations. Areas of expertise focus on the Translational Oncology Program that will involve epigenomics, functional genomics and expression analysis, genomics and proteomics and molecular therapeutics.

This is the sole center in the Middle East and the first to acquire state of the art technology like the Affymetrix DNA array instrument. DNA microarray technology is utilized to

identify molecular signatures/molecular pathways of Saudi cancers, which in turn will pave the way for developing proper clinical management of cancer patients.

Genetics Department: The Department pursues basic research relevant to genetic problems in the Kingdom. Its main goal is designing programs for preventive genetics. In this context it designs research projects for polygenic diseases, novel technologies for screening susceptibility to cardiac disease, optic nerve diseases and autism and aims to provide education in modern genetics to young Saudi scientists.

Molecular Oncology Department: The focus is on translational studies in hematological malignancies with a long-term goal of developing diagnostic or therapeutic strategies to improve the management of cancer, specifically as they relate to malignancies outside the Western countries, and providing unprecedented tools for translational research in the region. Expertise includes state-of-the-art techniques, such as Real Time PCR, SNP analysis, profiling of gene expression, proteomics, and detection of molecular translocation in ALL. In addition MSP approaches to study gene silencing are utilized.

Bio Molecular Research Program: Although the Program in BioMolecular Research is one of the smallest departments/sections in the Research Center, it has gained both national and international recognition. The program focuses on a medically important family of genes that code for what are called AU-rich messenger RNAs (mRNAs). These code for proteins that are critical in maintaining healthy transient reactions during body responses such as immune response and cellular growth. Disturbances in these transient processes may lead to unwanted prolonged responses and thus diseases, such as chronic inflammation and cancer. Thus, the program implements laboratory studies of this area in different disease conditions and pinpoints pathways that can be targeted for therapy.

The research program employs the fields of functional genomics, functional proteomics, and molecular therapeutics to achieve its aim by narrowing the human transcriptome and proteome to early and transient response players.

Annual Report: The Hospital produces an annual report that is an important resource for obtaining updated information on its research activities (<http://bportal.kfshrc.edu.sa/wps/portal/bportal/RC>).

Saline Water Conversion Corporation (SWCC)

An MOU was signed between the Saline Water Conversion Corporation (SWCC) and Alfaisal University in 2008. The long term objective of the bi-lateral collaboration is to assist the SWCC in its training programs for nationals and to help indigenize desalination technologies through research and university curriculum development.

The Saline Water Conversion Corporation (SWCC) is a Saudi government corporation that is responsible for desalinating sea water, in order to supplement the supply of potable water to arid coastal and inland cities in the Kingdom. Out of a total 30 plants the SWCC operates, 6 are located on the east coast (Gulf Coast), while 24 plants are located on the west coast along the Red sea. The amount of desalinated water produced by SWCC in 2007 was 1,066 million cubic meters. The Corporation is also the second largest electrical power producer in the Kingdom.

The SWCC has continued to provide training to its staff so as to ensure development of its employees, particularly nationals. The SWCC is in the midst of a privatization and restructuring program. To achieve human resources development goals, SWCC strives to qualify and provide professional training to different levels of its national employees.

Center of Excellence for Research in Engineering Materials (CEREM)

A Memorandum of Understanding was signed between the Center of Excellence for Research in Engineering Materials, located at King Saud University, and Alfaisal University in 2009. Under this agreement both parties will facilitate the development of collaborative research projects, allow for utilization of research related equipment in each other's facilities, collaborate in student-related research, and assist in developing and running of workshops.

The Center was established for innovative research in the area of "Engineering Materials" in order to develop engineering solutions to important problems through characterizing the pertinent properties of advanced materials. In this regard, CEREM coordinates, administers, and supports materials processing and characterization facilities to develop research capabilities. The Center also organizes professional activities in addition to offering technical assistance, research facilities and expertise to the local industry. In order to promote and encourage innovative research, CEREM offers a comprehensive grants program for applied research in engineering materials.

BOEING

Boeing is one of the co-founders of Alfaisal University. From a Global Citizenship perspective, Boeing undertakes various activities in serving the global community; which includes focus areas such as education, environment, health, and research. Boeing and Alfaisal enjoy shared values of commitment to both community and environment with the aim of benefiting the Kingdom of Saudi Arabia, region, and the world. This commitment includes access and development of education for students to be responsible and productive leaders as well as building and serving the community. Mechanisms for collaboration that are being considered include Scholarships and Research Grants, Interaction with Industry and ABET Accreditation, Establishment of Developmental Programs, and Sponsored Programs.

As the world's leading aerospace companies and the largest manufacturer of commercial jetliners and military aircraft combined, Boeing designs and manufactures rotorcraft, electronic and defense systems, missiles, satellites, launch vehicles and advanced information and communication systems. It is also the major service provider to NASA, and jointly operates the Space Shuttle and International Space Station. In addition, Boeing provides numerous military and commercial airline support services.

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