هيئة تنمية البحث
والتطوير والابتكار
Research Development
and Innovation Authority

Saudi Applied Research & Technology Initiative

Project-level Funding

Technology Breakthrough Grant (TBG)

Guidelines

Stable and Sustainable R&D Funding

Table of Contents

Introduction

The Research, Development, and Innovation Authority (RDIA) in the KSA is committed to promoting scientific research and innovation to drive economic growth and improve the quality of life. The RDIA seeks to provide researchers in the KSA with the necessary resources and support to conduct cutting-edge research that addresses the four national aspirations and priorities for RDI: Health and Wellness, Sustainability and Essential Needs, Energy and Industrials, and Economies of the Future.

The RDIA's grants offer benefits that extend beyond the scientific community in the KSA. By supporting R&D, RDIA has the potential to drive economic growth and create new industries, while also addressing crucial societal challenges such as healthcare, energy, and food security. The RDIA's investment in human capital and infrastructure is building a highly skilled workforce and the resources needed to support cutting-edge research. This investment in R&D can lead to game-changing breakthroughs and scientific advancements that can transform industries and create value for society. The RDIA's funding initiatives are designed to promote intellectual property development, technology transfer, and commercialization, driving the growth of the innovation-based economy in the KSA. By fostering a culture of entrepreneurship and innovation, the RDIA is positioning the KSA as a global leader in innovation and contributing to the advancement of scientific knowledge and technological innovation worldwide.

RDIA's unwavering commitment to R&D is aligned with the national mission to build a sustainable future, achieve Vision 2030 goals, and position the KSA as a leader in scientific innovation and technological advancement, which will pave the way for the country to become a hub for cutting-edge R&D.

RDIA drives the KSA's transformation toward an innovation-based economy by supporting R&D and fostering innovation.

The Saudi Applied Research & Technology (SART) Initiative

Initiative Overview

Saudi Applied Research and Technology (SART) Initiative is a project-level funding offered by RDIA. The Initiative supports applied science and technology development research in the KSA with a focus on RDI toward the national aspirations and priorities, namely, Health and Wellness, Sustainability and Essential Needs, Energy and Industrials, and Economies of the Future. The focus areas were identified to help guide RDI efforts across the Kingdom to address short-, medium-, and long-term needs and challenges.

This Initiative enables KSA researchers to convert their scientific activities and ideas in the discovery stage at the technology readiness level (i.e., TRL1-TRL3) into the development stage (i.e., TRL4-TRL7) with the possibility of market testing and commercialization. Research institutions and researchers within the Kingdom will partner with private, public, or not-for-profit organizations while also encouraging collaboration between universities.

This important opportunity allows the development and strengthening of research links and collaborations between different institutions and/or partners, where they have the common goal of creating economic, social, and/or environmental benefits while contributing to the research ecosystem continuum.

The Initiative is divided into three tracks: Baseload Applied Grant (BAG), Technology Development Grant (TDG), and **Technology Breakthrough Grant (TBG)**. This document focuses only on the TBG.

Initiative Objectives

- **Developing** innovative technologies, solutions, and interventions to address KSA challenges
- **Advancing** sustainable technologies to support the KSA's goals and global indicators
- **Developing** and commercializing innovative technologies to support economic diversification
- **Supporting** the Kingdom's economy through emerging technologies and their application to various industries
- **Fostering** entrepreneurship and innovation through investment in R&D, technology transfer, and commercialization of research outcomes to support the development of an innovation-based economy
- **Achieving** the goals of the country's 2030 vision by stimulating researchers to discover and develop new technologies, accelerating efforts toward prototyping or product development, and building the necessary scientific skills and foundations

Initiative Research Focus

The initiative aims to promote cutting-edge scientific research spanning the four national aspirations and priorities for RDI and their goals.

1) Health & Wellness

- Solve the KSA's prevalent medical and behavioral health challenges
- Achieve early prevention of diseases through personalized wellness and healthcare services
- Disrupt digital healthcare to ensure health equity across the Kingdom
- Supply cutting-edge pharmaceutical and medical technology as well as biotech-based solutions and practices worldwide

2) Sustainability and Essential Needs

- Sustainably secure water, food and power supplies for the nation and industry
- Become a global exporter of advanced water and food technologies (e.g., water desalination)
- Establish the KSA as a global paradigm on environmental conservation
- Position the Kingdom as a regional supplier of sustainable and low-cost electricity
- Minimize local emissions by adopting the circular carbon economy (CCE) framework
- Increase KSA's sustainability footprint

3) Energy and Industrials

- Maintain & extend the KSA's global leadership position in energy supply
- Emerge as a leading nation in the supply of alternative energy
- Establish the KSA as a regional hub for specialty chemical derivatives
- Ensure hydrocarbon demand sustainability through advanced non-metallic products, blue hydrogen, and crude oil-to-chemicals (COTC)
- Transform the KSA's industrial sector toward high-value on-demand manufacturing
- Establish competitive and sustainable mining as the third industrial pillar

4) Economies of the Future

- Reimagine the future of urban living in zero-carbon, zero-car, and hyper-connected cognitive cities
- Become a global space champion, creating economic value from RDI spillover effects and galvanizing the nation around futuristic ambitious goals
- Unlock the unexplored deep sea for scientific and entrepreneurial usage
- Foster digital technology frontiers in priority sectors to build a regional/global edge

Initiative Core Activities (Develop Stage)

The main purpose of this Initiative is to enable KSA researchers to pursue applied research activities from the development stage to the next level, where they can exploit all possible scientific resources for technological development and deployment to solve national challenges and needs. The development stage is critical for generating new technologies and lays the foundation for future innovation and development. Therefore, proposals must show the ability to conduct rigorous research, experimental or simulation activities, and data analysis, and generate new insights that can inform future R&D activities. Successful proposals should demonstrate knowledge of the processes involved in conducting applied research activities:

- Planning and managing research
- Identifying ideas and knowledge gaps
- Managing intellectual property
- Collaborating and partnering with public/private sectors, nonprofit organizations, and universities
- Leading or co-leading successful projects

Additionally, the proposal should clearly illustrate how issues are being addressed and understood by articulating one or more of the following approaches:

1. Identify basic and applied principles and scientific observations.
2. Formulate technological concepts and envision useful applications of the identified principles.
3. Conduct experiments to validate the concept through analytical and experimental processes of critical functions and/or characteristic proof of concept.
4. Use one or a combination of scientific tools (e.g., labs, computer simulations, and data mining) to further enhance and comprehend the science of the subject under investigation.

5. Validate the technology in a laboratory setting and relevant environment (i.e., through experiments, simulations, or tests).
6. Explain the preliminary concepts of the methods implemented to demonstrate the working prototype in a relevant environment.
7. Present a plan for technology that is ready for commercialization or testing in a full-scale operational environment.
8. Utilize the resources needed to conduct a successful applied research project (i.e., labs, equipment, and partnerships)

Technology Breakthrough Grant (TBG)

Grant Overview

This grant emphasizes the development of novel techniques for achieving breakthroughs. The grant is designed for researchers in the KSA with working experience on cutting-edge technology development or currently working on similar projects that have the potential to transform the industry or address significant national challenges. Applicants must propose projects with a high potential for breakthrough, and have a clear plan for technology development and commercialization.

Researchers must quantify and apply the knowledge accumulated from applied research activities to further advance the development of the technology under investigation and solve existing problems at the national or global level. Researchers are encouraged to work on technology models/prototypes, MVPs, and demonstration pilot settings in relevant environments by designing, implementing, and testing them for breakthrough potential. The starting position of the proposal should be at Technology Readiness Level (TRL) 3-4. This means that prior to the project award, the technology will have undergone significant lab testing, feasibility analysis, validated proof of concepts, patent applications, and subscale prototyping. Evidence of the current TRL level is expected to be provided in the application. The project should aim to mature the technology such that, at the completion of the project, the TRL is between TRL6 and TRL7. That is, the system should be developed and tested using a full-scale prototype in an operational environment.

This grant is not designed to carry out basic or early stages of applied research activities and requires at least two partners to apply jointly, with at least one private/public sector applicant. The track is designed only for projects with the possibility of technological advancement and breakthroughs in cutting-edge scientific activities. The starting point is “prototyping and MVP” stage, where prototype testing is one of the required undertaken to analyze the viability of a project/product. The project must provide all the details and steps required to create novel technological advancements and breakthroughs. The project should identify gaps by testing, demonstration, and knowledge of a technology’s current readiness level, and the way forward and validation of the predictions of the technology under investigation in a relevant environment is required.

Grant Objectives

- **Quantifying and Applying** knowledge accumulated from applied research to solve existing problems at the national/global level
- **Utilizing** early applied research activities (i.e., proof of concept, patents, feasibility analysis, and laboratory-scale testing) to further advance the development of the technology under investigation
- **Developing** scientific talent and skills of scholars
- **Promoting technology advancement and breakthrough** in cutting-edge scientific activities
- **Assisting** the career development of researchers
- **Translating** research into practical applications via local/international partnerships

Summary of the track's input and the expected outcomes

Grant	Objective	Expected Outcomes
Technology Breakthrough Grants	• Aim: novel technology advancement • Input: Proof of concept, publications, patents, concepts and innovative ideas, feasibility analysis, laboratory-scale testing, proof of cutting-edge scientific activities.	• Cutting-edge science or technology: ○ Models, prototype, and demonstration pilot settings. ○ Minimum viable product (MVP).

Grant Budget and Duration

The general guideline to formulate proposals is to maintain short- to medium-term targets. **The grant provides grants ranging up to SAR 20,000,000, and urges applicants to create proposals that can be implemented within five years from the date of receiving the award.** The budget requested by applicants must be fully justifiable. The following timeline will be strictly followed for this round.

Grant Announcement	30-Aug-2023
Deadline to Submit the Proposal	30-Sep-2023
To submit your application, please visit the link: https://rdia.gov.sa/grants	

Eligibility & Admissibility

Eligible Participants

The grant will support proposals for project-based funding in basic scientific research, with a focus on the four national aspirations and priorities for the RDI sector. Successful applicants should meet the following criteria:

- Joint applications from at least two different institutions (mix of non-profit and for-profit institutions)
- The application must clearly assign a Primary Principle Investigator (PPI) and Secondary Principle Investigators (SPI) after obtaining the necessary approvals
- The applicant must be affiliated with a Saudi-based institution
- The applicant can be PhD holders, engineers and specialists in technology development (i.e. applicants with experience in the pathway towards technology development and commercialization).
- The PPI and SPI must be affiliated with an institution, such as a university, a research center, a ministry, a corporation, or a company
- The applicants should be able to understand and distinguish between the different stages of the TRL
- Past involvement of the applicants in a national- or global-level research project or with the industry is favorable

Eligible Projects

- Be STEM-based in the aforementioned research topics
- Consider the applicability of the output
- Contribute to the R&D ecosystem within the Kingdom
- Be aligned with national objectives and Vision 2030 and RDI sector
- Contribute to knowledge and practice

Research Ethics

It is required that the research is designed and conducted in such a way that it meets specific ethical principles and is subject to appropriate professional and institutional oversight in terms of research governance. Please refer to the following principles:

- The research should aim to maximize benefit for individuals and minimize risk and harm
- The rights and dignity of individuals and groups should be respected
- Wherever possible, participation should be voluntary and appropriately informed
- Research should be conducted with integrity and transparency
- Lines of responsibility and accountability should be clearly defined

- Independence in the research should be maintained, and where conflicts of interest cannot be avoided, they should be made explicit
- All necessary ethical approvals and permissions must be taken prior to the commencement of the project

RDIA will:

- Only fund research that has an adequate and appropriate ethics statement, which takes the ethical dimensions of the research seriously
- Consider reviewer or panel member disagreement with the suggested project approach to ethics as either grounds for a conditional grant or rejection of the proposal (where it calls into question the researcher's competence or the feasibility or validity of a proposal)
- Consider the suspension of payments and grant termination if the review shows that a project requires major changes that will alter it to the extent that it can no longer retain RDIA support
- Only fund research organizations that have processes in place to follow the guidance in this framework and comply with the grant conditions and RDIA's policy and guidelines
- Hold the PPI and researchers involved in any allegations of research misconduct and breach of compliance accountable with the grant conditions; this can result in the immediate suspension of the individual project and other projects

Expectation of Successful Applicants

- Demonstrate awareness of the wider environment and context in which their research takes place
- Demonstrate awareness of the industry impact of their research beyond the usual research considerations
- Active engagement with the public at both the local and national levels regarding their research and its broader implications
- Identify potential benefits and beneficiaries from the beginning and throughout the life cycle of the project(s)
- Maintain professional networks that extend beyond their own discipline and research community
- Widely publish results, consider academic; user; and public audiences for research outcomes
- Exploit results where appropriate to secure economic impact for the Kingdom
- Professionally manage collaborations to secure maximum impact and sustain long-term partnerships
- Ensure that the research staff and students who are part of the research team develop research, vocational, and entrepreneurial skills that match the demands of their future career paths
- Take responsibility for the curation, management, and exploitation of the data for future use

Communication and Acknowledgment

Effective communication and acknowledgement policies are integral to maximizing the impact of quality research. The RDIA's communication policy aims to enhance the communication of RDIA-funded research with potential users and beneficiaries of the research. Compliance with this policy is mandatory for receiving funds from an RDIA research grant. The communication policy includes the following obligations:

- Provide initial publicity for the grant with the host research organization(s)
- Acknowledge RDIA support to the extent possible, including all external communication, such as press releases, PowerPoint presentations, and papers
- Give advance notice of press releases at least two working days before they are distributed and, where possible, advance notice of likely newspaper articles or media appearances to RDIA
- Communicate the research findings through publications, seminars, conferences, electronic outlets, and the media to both academic and non-academic audiences, potential users, and beneficiaries (especially businesses, governments, volunteer organizations, community groups, and the public)
- Submit details of outcomes from the grant for up to five years after the end of the grant period
- Successful applicants should extend their appreciation to RDIA for all scientific outputs of the project by acknowledging it (for example, **The authors acknowledge funding from the Research, Development, and Innovation Authority (RDIA), Saudi Arabia, Riyadh, Saudi Applied Research and Technology Initiative - Technology Breakthrough Grants (TBG), number XXXX**)

Prior permission must be sought before the RDIA's name can be used in connection with the title of any unit, center, or department that it supports, either wholly or in part. The words "RDIA project" may not be used as a title in correspondence, reports, or questionnaires.

Use of Funds

Funding received from the initiative may be used for the following categories:

- Salary and incentives for researchers.
- Equipment purchase, maintenance, and upgrades.
- Software purchase, maintenance, and upgrades.
- Materials and supplies.
- Prototyping and pilot setup demonstration.
- Domestic and international travel expenses (separate categories).
- Fees for IP management and publication.
- Legal and professional services, including consulting fees.
- Research personnel and staff training.

- Other supporting services, such as feasibility studies.

Although the above expense categories are used to provide applicants with high-level guidance, the grant does not set any limits or stringent criteria on how the funding can be efficiently utilized to achieve the intended goals. Rather, it offers them reasonable degrees of freedom to submit high-quality proposals with a cap limit on expenses.

Terms & Conditions for Submitting the Proposal

Applicants

1) The grant accepts joint applications only from at least two different institutions (mix of non-profit and for-profit institutions) with at least one Saudi-based institution
2) Applicants must ensure that their research proposal is submitted within the specified timeline
3) Applicants should carefully read all the grant documents prior to the proposal preparation
4) The similarity report of the submitted proposal must be at most 10%
5) Applicants must ensure that their proposal adheres to RDIA's policies and guidelines
6) All applicants are required to submit their proposals through the grant portal and upload a separate PDF or Word file to the portal according to the proposal template's descriptions
7) The research team must clearly assign a Primary Principle Investigator (PPI) and Secondary Principle Investigator (SPI) after obtaining the necessary approvals
8) The PPI must be from a Saudi-based institution and will be responsible for submitting the proposal application through the PPI's Science and Technology Unit (STU)
9) The PPI and SPI are responsible for directing the research and comply to terms and conditions
10) The PPI, SPI and named research staff must adhere to the time commitment to the project, as stated in the proposal

Science and Technology Unit (STU)

The STU of the PPI's institution will:

1) Receive the proposal and review them for compliance with the RDIA's guidelines and policies, and notify the PPI.
2) Verify all documents for research integrity and ethics
3) Check all documents for similarity (maintain a record of the similarity report)
4) Support applicants in preparing their proposals, submitting it, and receiving funding
5) Monitor progress against the given timeline
6) Receive and review all required project reports and submit them to RDIA
7) Manage the grant cycle and any request from RDIA

RDIA

1) RDIA will review and verify the proposals
2) RDIA will carefully examine the proposed research projects to confirm that they meet all the submission requirements
3) Once this review is completed, RDIA will provide recommendations for each proposal
4) RDIA will verify that the research proposals adhere to the submission guidelines and standards prior to the evaluation

5) RDIA will notify the STUs of the research proposals submitted for evaluation and those that have not been sent due to noncompliance with the submission guidelines and standards
6) The scientific evaluation results of research proposals will be presented to the RDIA for approval
7) RDIA will issue funding decisions for the research projects
8) RDIA will only sign a project implementation contract with the PIs through their respective STUs after the necessary funds for the project have been secured
9) Take responsibility for the curation, management, and exploitation of data for future use

Important Documents

The following documentation will be required throughout the grant:

Pre-award:

a. Comprehensive research proposal, see the grant proposal template document
b. CVs of the PI and Co-PI
c. Ethical approvals, if needed
d. Letter of intent from a consultant or external researchers (if applicable)

Post-award:

a. Semi-annual Reports
b. Annual Reports
c. Final Project Report

Table 1: Summary of the important documents

Document	Requirements
Comprehensive Research Proposal (Please see the proposal template document)	Comprehensive Research Proposal should contain the full details of the following information: • The research topic for the proposed research • Roles and responsibilities of each member • Summary knowledge in the field of research • Scientific methodology to be used throughout the research • Expected outcomes of the research • Expected benefits to the Kingdom (societal, economic) • Plans for involving and disseminating results to potential users (e.g., policymakers) • Potential contribution to scientific knowledge and practice • Compliance measures throughout the initiative cycle
Periodic Reports	Provide an update on ongoing outputs, impacts, and outcomes as the grant cycle progresses
Final Project Report	Provide a final statement on outputs, impacts, and outcomes at the conclusion of the grant cycle

Administrative, Technical, and Financial Guidelines

General Disbursement Guidelines

The disbursement responsibility for the supported research projects will be assigned to the authorized person in accordance with the following regulations:

- The budget for the following year of the project will be released upon submission and approval of the annual technical and financial reports.
- Approval of the annual and final technical and financial reports is required to disburse the allowance to the research team, participants, and project manager
- The allowance for the research team will not be not paid during project extension periods
- No participant in the research team can receive two allowances for the same project
- The total allowance received by any member of the research team (PPI, SPI, Co-PI, or project manager) should not exceed the allowances for three projects per month
- The consultant's allowance will be approved after a comprehensive report from the PPI to the STU on what was accomplished during the consultation is submitted and accepted by the STU
- The budget for the project should not include expenses related to purchasing a car
- Renting a car from the project budget is allowed only for specific tasks approved in the project's work plan
- The total budget of international partner must not exceed 40% of the total budget of the project

Disbursement Authorities

The determination of the disbursement authorities, check signing, proposal approval, contract signing, and vendor accreditation should align with the national laws and regulations.

Providing Equipment and Supplies

1. Equipment and supplies approved in the project budget should be provided in accordance with the guidelines applicable to the entity.
2. If the project requires equipment or supplies other than those proposed in the research project, the PPI must follow the following procedure:
    - Submit a request to the STU for the required change, including justifications and detailed information on alternative equipment or supplies
    - If the STU approves a change request, the guidelines for providing the equipment or supplies should be followed, provided that the request does not result in a change in the approved budget for the overall project equipment category.

Allowances of the Project Team

1. This article applies to individuals working on research projects supported by RDIA's grant funding, including the following categories:
    - Faculty members, research faculty, postdocs, graduate students, and those in similar positions
    - Researchers, their assistants, technicians, administrators, and accountants
    - Project managers and their assistants
    - Consultants, referees, and individuals providing expertise relevant to the project
2. Salaries and allowances will be disbursed based on the approved budget for a three-year project in accordance with Table 2. In case of longer project, any subsequent years will follow a similar pattern.

Table 2: Salaries and allowances disbursement guidelines.

Year	Payment	Description	Disbursement date
First	**First**	Salaries and allowances to the project staff for the first half of the first year, except researchers	After the contract is signed, implementation plan is approved, and the periodic technical report #1 for the project is submitted
	Second	Salaries and allowances to the project staff for the second half of the first year, except researchers	After the annual technical #1 and financial report #1 is submitted
	Third	Researcher allowances for the first year will be disbursed	After the annual technical #1 and financial report #1 is approved
Second	**Fourth**	Salaries and allowances to the project staff for the first half of the second year, except researchers	After the contract is signed, implementation plan is approved, and the periodic technical report #2 for the project is submitted
	Fifth	Salaries and allowances to the project staff for the second half of the second year, except researchers	After the annual technical #2 and financial report #2 is submitted
	Sixth	Researcher allowances for the second year will be disbursed	After the annual technical #2 and financial report #2 is approved
Third	**Seventh**	Salaries and allowances to the project staff for the first half of the third year, except researchers	After the contract is signed, implementation plan is approved, and the periodic technical report #3 for the project is submitted
	Eighth	Salaries and allowances to the project staff for the second half of the third year, except researchers	After the annual technical #3 and financial report #3 is submitted
	Ninth	Researcher allowances for the third year will be disbursed	After the final technical and financial report is approved, along with an electronic copy of all scientific outputs for the project

3. Project-related allowances received by any member of the research team, including the PPI, SPI, co-PI, and project manager, should not exceed the amount received for three projects per month.
4. Before disbursing allowances to the research team, technical reports must be approved as specified in the contract.
5. It is not permissible to combine two allowances for any member of the project team.
6. Allowances will not be disbursed until the project has commenced.
7. Project funds will not be disbursed until the contract has been signed.
8. Work on the project will not commence until the entity's account has received the funding.
9. Allowances will only be disbursed for research projects that have been approved as specified in the project budget. Participants will receive allowances based on the completion of their assigned tasks and roles, and the amount of allowances will be determined by the STU and based on the RDIA's regulations and policies.
10. Table 3 outlines the guidelines and spending limits for the human resources budget for the research project. Table 4 outlines the guidelines and spending limits for consultants in the research project.

Table 3: Guidelines and limits for expenditure on the human resources item in the research project

Member	Maximum Allowance (SAR)	Yearly Allowance (Months)	Total (SAR)
Researchers			
Principal Investigator[1]	6,000	10	60,000
Co-Principal Investigator	5,000	10	50,000
Assistants – Part time			
Project Manager	3,000	10	30,000
Masters / PhD holders	3,000	10	30,000
Assistants – Full time (Salaries Exclusively for Project Contracts)[2]			
PhD Holder[2]	12,000	12	144,000
Master[2]	9,000	12	108,000
Bachelors[2]	7,000	12	84,000
Technicians and Administrators			
Technicians	2,800	10	28,000
Administrators	2,400	10	24,000
Professionals (Skillful Labors)			
Staff/Workers and the like	1,600	12	19,200

[1] This Principle investigator allowance is designated for the PPI and SPI
[2] These are salaries that are exclusively allocated to full-time individuals contracted for the designated project.

Table 4: Guidelines and limits for expenditure on the consultants in the research project.

Item	Allowance Including Per Diem Allowance (SAR/Day)	Maximum Consultation Duration (In Days)	Maximum Visits During The Project Period	Providing Tickets	Total	The Total Including The Tickets
Within the administrative region for research implementation	1,000	15	unlimited	X	15,000	15,000
Outside the administrative region for research implementation	2,000	10	2	√	20,000	25,000
Outside the Kingdom	3,000	10	1	√	30,000	50,000

Transfer between Budget Items

The PPI is permitted to modify or transfer certain approved budget items of the project as per RDIA's guidelines and regulations, provided that the following conditions are met:

- Budget adjustments may be made only twice during the project period, in accordance with the guidelines mentioned above.
- The STU is responsible for transferring funds between the approved budget items of the project and must inform the RDIA of any decisions made and the reasons behind them.
- Approval of the STU for the request must be obtained.
- Final approval must be obtained from the STU, and RDIA must be notified.

Table 5: Transfer guidelines between items of the research project budget.

Budget Items	Human Resources	Equipment and Devices	Materials and Chemicals	Travel and Trips	Others
Human Resources	√	√	X	X	X
Equipment and Devices	X	√	X	X	X
Materials and Chemicals	X	√	√	X	X
Travel and Trips	X	√	X	√	X
Others	X	√	X	X	√

Application and Proposal Selection Process

Evaluation

Submitted proposals will be evaluated based on the following criteria:

- **Relevance**: Relevance to the targeted area of the RDI sector and Vision 2030 goals
- **Applicability**: The potential applicability of the results
- **Potential Impact**: Potential benefits to academia, industry, and the KSA's R&D ecosystem in its entirety
- **Technical Merit**: Scientific and intellectual rigor, potential to create new and important knowledge, and appropriateness of the research design
- **Partnership Building**: Potential to catalyze the development of domestic university industry partnerships
- **Quality of the Research Team**: Capabilities and track record of the proposed research team
- **Execution**: Coherence in the proposed execution plans, feasibility of carrying out the research (e.g., data accessibility) within the given timeframe, and cost effectiveness
- **Novelty** of the work or how well the competitive landscape has been explored or described, if relevant
- **Quality and Clarity** of the research/project plan with associated milestones
- **Benefits** to the KSA and society
- **Accurate Assessment** of the existing TRL position and setting a realistic TRL goal in the project

The grant's Key Performance Indicators:

- Knowledge generation (publications, patents, proof of concept)
- Career advancement (awards, training)
- Public engagement (conferences, symposia, events)
- Socioeconomic benefits (royalty fees generated by the research, IP licensing, change of policies, and development of services)
- Number of partnerships and scientific collaborations that attracted funds (public sector, private sector, nonprofit organizations, and universities)

Project Quality

Based on the RDIA's system, funding allocations will be performance-based. When applying for grants, it is important for researchers to be aware of the requirements for grant closure to ensure successful completion of the project and proper use of grant funds. These requirements may vary depending on the specific grant but typically include completion of all project activities, submission of all required reports, compliance with RDIA's policies and regulations, and preparation and submission of closeout documentation.

It is important for applicants to include the expected outcomes of the proposed project in the grant application. These outcomes may include various forms of scientific output (e.g., publications, patents, prototypes, and other acceptable results, depending on the type of fund). By including these expected outcomes in the grant application, the applicant is providing a clear indication of the potential impact and significance of the proposed research. This information is important for the RDIA in evaluating the feasibility and potential success of the proposed research project. Additionally, by setting clear expectations for the research outcomes, applicants can better track and document their progress throughout the project, which is critical for a successful grant closure.

Application Process

The grant solicits applications in a pre-designed format to facilitate comparable, consistent, and expedited reviews. The portal is available to applicants through the RDIA website (https://rdia.gov.sa/grants) after registration and account activation. The applicant must read and understand the guidelines under each section of the application form before completing the full application. No other means of submission is acceptable. All the applications must be submitted no later than the deadline stipulated in the Call for Proposals.

Review Process

This grant adheres to the global best practices in initiative management to ensure the highest degree of objectivity and quality. A qualified Scientific Review Committee appointed by the Oversight Committee will monitor, guide, and facilitate the review process. Throughout this process, the grant personnel and selected external reviewers will adhere to all conflict-of-interest and confidentiality requirements. In keeping with best practices, the grant has adopted a two-phase process, each phase with its own application review steps:

- In the first phase, an initial review of every application will be conducted upon receipt of the grant application forms to ensure that the proposal meets all the requirements specified in the call for proposals. The STUs in the institutions will ensure the completeness of the applications per the guidelines and policies and will check for plagiarism. Subsequently, the STU will send the documents to the Initiative Secretariat. The Secretariat will interact with STUs and applicants as needed to solicit any missing information.
- In the second phase, complete grant applications that meet initiative priorities and budget constraints will be, subsequently, evaluated in terms of technical merit. This step is conducted by at least two independent reviewers and/or a panel committee. The Scientific Review Committee will select reviewers for each application based on relevant expertise and/or experience. Following the receipt of the reviewers' feedback, a summary statement report for each application is prepared, which includes the reviewers' written critiques, recommendations, and an average final score. The summary statement is forwarded to the Oversight Committee, and funding recommendations for high-scoring applications will be approved. A notice of approval or rejection will be sent to the STUs or applicants once the review process is complete.

Award Process

Upon receiving a notice of the award, the procedure for commencing the approved project is set into motion. The grant Secretariat will communicate with the researcher for necessary documentation and hand over the coordination to the STUs. Henceforth, the operational follow-up for the granted proposals will be carried out by STUs.

Management and Monitoring of Research Projects and Other Guidelines

Research Team Obligations

1. The research team must comply with the regulations, policies, and guidelines approved by the RDIA, including scientific integrity guidelines, intellectual property policy, ethics guidelines for research on living creatures, and other policies or guidelines adopted by the RDIA.
2. The research team must take full responsibility for any violation of these guidelines.

Project Monitoring

The grant adopts a balanced and systematic approach for monitoring. The grant Secretariat, in consultation with the STUs, sets forth periodic reviews to ensure that all funded projects progress toward timely completion. Researchers are expected to consistently submit technical and financial reports. The researchers of the winning proposals will be provided with data collection forms, report templates, and guidelines upon a grant award.

Reports

Three key reports for project monitoring and evaluation will be requested:

1. Semi-annual Reports: To enable oversight across the Initiative, while minimizing the burden on the researchers, semi-annual reports will be collected by the STUs using simple forms and report templates approved by the RDIA.
2. Annual Reports: For projects spanning more than a year, an annual report will be submitted by researchers to STUs for evaluation. In this report, comprising technical, management, and financial sections, the researchers are expected to show completed activities, ongoing activities, progress accomplished toward the stated goals, and any risks that may affect the project's progress.
3. Final Project Report: Researcher will submit a final report to the STUs within 30 days of project completion. Similar to the Annual Report, the Final Report will comprise technical, management, and financial sections. In addition, the report should clearly articulate the results and deliverables. The STUs will prescreen the reports before they are reviewed by external reviewers.

Procedure for Submitting Technical Reports

1. The PPI is obligated to submit periodic technical and financial reports on the progress of the project as follows:
    - The technical reports should be submitted to the STU.
    - The PPI should submit a periodic technical and financial report to the STU every six months, outlining the technical progress of the project as well as its financial status.
    - The PPI must submit an annual technical report for the previous year and a final technical report upon completion of the project's execution period.

- If the project duration is a year or less, the PPI is only required to submit the final technical and financial reports.
- The PPI must submit the final technical and financial reports to the STU at the end of the project, including any extension period, in accordance with RDIA's requirements.
- The STU will evaluate the annual and final technical reports of the research projects through a neutral scientific body.

2. The PPI must make modifications according to the recommendations and comments provided by the RDIA regarding the annual technical report and take them into consideration when preparing the next technical report.
3. The cost of evaluating rejected technical reports will be deducted from the project budget.
4. The PPI is authorized to delegate some of their tasks to the project manager.
5. If the final report is not submitted within the designated timeframe, the STU may withhold some or all of the research team's allowances, in coordination with the RDIA.
6. If the technical report is rejected more than twice, the project will be classified as a stalled project, and the RDIA, in coordination with the STU, has the authority to appoint another research team from project members/others to continue the research or cancel the project. The research team is responsible for all the repercussions of this decision, including the repayment of any paid allowances.

Postponement of Report Submission

The PPI is permitted to request postponement of the submission deadline for technical or financial reports, subject to the following regulations:

- The request for postponement must be supported by compelling justifications.
- The request for postponement must be submitted at least 30 days before the report's due date.
- The request for extension of the annual or final report submission cannot exceed 60 days.

Project Outputs

1. The PPI is obligated to submit the minimum required research outputs as specified for each grant.
2. A weighted-points system is used to evaluate the performance of projects under this grant, prioritizing quality over quantity. The system is designed to recognize and reward researchers who produce high-quality research with a significant impact, as specified in Table 6.
   - The minimum points required for Technology Breakthrough Grants is 70 points.
   - The RDIA encourages researchers to publish their research outputs in scientific journals, file patents that have the potential for economic impact, and participate in conferences.

Table 6: Weighted-Points System for the Saudi Applied Research and Technology Initiative.

#	Project Output	Weighted Points
1	Proof of Localization of technology /Proof of concept technology[1]	40
2	**Economic impact**: If any of the following objectives is achieved: • Establish a start-up • Direct or indirect Job creation • Create a spin-off company	50
3	**Policy impact:** If the following objective is achieved: • Policy changes	50
4	**Industry adoption:** If any of the following objectives is achieved: • Implementation of research outputs by a company • Awarded a business contract • Develop a working prototype • Develop a minimum viable product (MVP) • Achieve an efficiency gain in a service or system	50
5	Each postdoc, who is participating in the project (two postdocs maximum)	5
6	Each postgraduate, who is participating in the project (two students maximum)	5

3. Tracking these outputs is crucial to assess a project's success and ensure that it meets its intended objectives; this evaluation helps to determine the effectiveness of the project and whether it has achieved its goals
4. The evaluation process of the research outputs shall be conducted by the STU, who shall notify RDIA
5. The evaluation process of research outputs will be conducted in accordance with the guidelines and regulations established by RDIA.

Nomination for an Award

The research team can nominate the research or part of its results for an award according to the following procedure:

- Obtaining prior approval from the project's affiliated entity
- Financial benefits, if any, from this nomination shall be divided according to the regulations followed by the project's affiliated entity.

Liability Waiver and Project Closure

1. Upon submission and acceptance by the RDIA of the following documents, the responsibilities and obligations of the research team for the project shall come to an end:
    - Accepted final technical report
    - Approved final financial report

[1] For Baseload Applied Grants only

- A copy of the published scientific outputs from the project

2. All the aforementioned documents must be submitted within one month of the STU's notification of the acceptance of the final technical report.
3. Upon receiving the aforementioned documents, the RDIA will issue a notice to the entity to close the project within a maximum period of one month. If no notice is received from the RDIA, the project shall be deemed closed.

In the Absence of a Specific Provision

In case these rules do not contain a specific provision, then the regulations approved by the RDIA or any applicable entity regulations, as well as any decisions issued by the RDIA, shall be followed.

The Right to Interpret or Amend the Rules

The RDIA holds the exclusive right to interpret or modify any provision of these rules and guidelines. Decisions and supplementary regulations concerning research grants regarding RDIA issues are an essential part of these rules and guidelines.

Implementation of the Rules

1. These rules apply to all grant projects as of their approval date and replace the previous rules and instructions; all conflicting provisions or exceptions shall be annulled.
2. These rules are subject to revision every five years from the date of issuance or as needed.

National Priorities Topics

Health and Wellness

- **Prevention, surveillance, monitoring, and disease management**
    - Diabetes
    - Obesity
    - Infectious disease
    - Congenital heart Disease
- **Screening and diagnostics**
    - Rapid molecular identification of pathogens
    - Early detection and diagnosis of cancer
    - Genome and epigenome of rare diseases
    - Sleep disorders
    - Mental health disorders
- **New biotech drugs development**
    - RNA therapies
    - Vaccine development
    - Immunotherapies
    - Stem cell therapies
    - Aging
    - Microbiome therapeutics
    - Antimicrobial resistance research
    - CRISPR and base-editing technologies
- **Emerging rejuvenation technologies**
    - 3D bioprinting
    - Bioartificial organs
    - Synthetic biology
    - Digital therapeutics
    - Single-cell analysis
    - Telemedicine and virtual healthcare services
    - Wearable medical devices

Sustainable Environment & Affordable Supply of Essential Needs

- **Innovative water research**
    - Enhancements, optimization, and efficiency of desalination systems and technologies
    - Membranes technology
    - Direct geothermal desalination
    - Novel storage to minimize reserve water stagnancy

- Wastewater effluent reuse in industry, agriculture, and treatment
- Innovative methods to reduce water consumption in different applications

- **Biodiversity**
  - Protect existing forests and use natural forest regrowth methods
  - Genetically modified seeds
  - Smart irrigation, innovative fertilization methods
  - Satellite imagery to detect wildfires and emergency messaging devices/systems
  - Carbon absorption sensors and mitigation of air pollution
  - Habitat monitoring
  - Illegal drug, farming, and logging detection
  - Protection from flash floods and environmental disasters
- **Net-zero emissions**
  - Autonomous vehicles and fuel cell electric vehicles
  - Hydrogen internal combustion engine vehicles
  - Renewable energy generation, waste/biomass energy generation
  - Nuclear energy generation (fission-based)
  - Oxyfuel combustion energy generation, chemical-looping technologies
  - Hydrogen combustion, clean hydrogen, and new hydrogen carriers
  - Use of captured carbon for the post-treatment of water instead of carbonates
  - Allam cycle (supercritical CO2) and CO2 as a refrigerant
- **Food sustainability**
  - Feed inventory management and livestock farm intelligence
  - Milk preservation and production optimization
  - Livestock hygiene and waste management
  - Implementation of innovative fertilization methods
  - Soil health, fertility, irrigation, nutrients, and soil microbiome
  - Traceability and food safety
  - Food innovative ingredients and sustainable feeds
  - Regenerative, sustainable farming and Agri-tech
  - Waste food recycling program
  - Circular economy
- **Cooling technologies**
  - Sustainable refrigerants in vapor compression systems
  - Elastic nickel–titanium wires
  - Organic solid crystals to replace refrigerants
  - Advanced evaporative cooling technology
  - Smart thermostats for energy management systems

- Smart material that absorbs moisture
- Microturbines powered by solar energy
- Green roofs to further increase the vegetation coverage in the city and green belts around major cities and surrounding areas
- Reflective paints and coatings
- Adiabatic cooling transfers

Energy & Industrial Leadership

- **Conversion of crude oil into chemicals**
  - Crude oil pretreatment system advancement
  - Development of new catalysis to increase product yield, reduce CO2 emissions, and minimize waste
  - New reactor design, simulation tools, and testing/demo units
  - New generation crackers able to withstand heavy crude coking, reducing maintenance costs
  - Nuclear power plant to supply utility steam and electricity to nearby petrochemical facilities
  - Develop efficient processes for crude oil to hydrogen
  - AI-based real-time demand sensing models to leverage market forecasts and shift application portfolio to reduce variable costs
  - AI and drone programs for monitoring crude oil, gas, and petrochemical pipelines
- **Clean hydrogen**
  - Alkaline electrolyze, proton exchange electrolyze, anion exchange electrolyze
  - Solid oxide high temperature cell
  - Co-electrolysis systems
  - Methane pyrolysis
  - Photocatalytic water splitting
  - Steam and autothermal methane reforming
  - Plasma production of turquoise hydrogen
  - Reduced reliance on precious metals, such as iridium & platinum
  - Transition to cobalt-free alkaline units
  - Liquid organic H2 carriers
  - Liquefaction for transport and storage
  - Pressured containers for stable storage
  - Salt cavern containers for storage
  - Hydrogen/ammonia safety technologies
  - FCEVs–Fuel cell electric vehicles
  - Hydrogen internal combustion engine (H2ICE) vehicles
  - H2-based carbon neutral chemicals
  - Transportation of hydrogen

- **Innovation EV batteries**
    - Smart energy management systems
    - Novel battery chemistries for replacing scarce materials
    - Pressure mapping insights for better design and high-quality batteries
    - 'Million-mile' electric-car battery with lithium–iron–phosphate batteries
    - All-solid battery replacing the liquid electrolyte in batteries
    - Smart compression and compilation
    - Alternative materials to reduce the cost of batteries
    - Dense network of normal-power EV charging points
    - EV charging management
    - Vehicle-to-grid (V2G) enabling charged power to be pushed back to the grid
    - Flexible voltage and power flow control devices
- **Industrial robots**
    - Smart robotic arms and autonomous mobile robots for flexible material handling
    - Silicone, polyurethane, and PVC cables and wires for enhanced assembly line systems and data transmission
    - High-performance torque sensor to achieve back-drivability
    - Smart sorting and picking system assisted with geo analytics and AR-based visualization
    - Geospatial multisensory system design and integration
    - Reinforcement learning for automation
    - Anti-collision sensors
    - 3D embedded vision to provide depth, angle, and contour data for complex tasks
    - Convolutional neural network for object detection and characterization in real-time operation
    - Natural language programming to enable communication between humans and machine
    - Speech and image recognition
- **Nuclear energy**
    - Small modular reactor (SMR) nuclear fission power plant
    - Innovative instrumentation and control (I&C) for diagnostics
    - Reactor test beds to demonstrate different conceptual designs
    - Cooling systems chemistry controls improvements
    - Advanced composites/alloys for novel reactor concepts
    - Liquid metal corrosion reduction
    - Advanced techniques and solutions for joining, welding, machining, and forming
    - Robotics for nuclear waste disposal and nuclear material accounting
    - Develop new fuels for extended refueling cycles
    - Develop intrinsic proliferation resistant fuels
    - Radioactive waste volume reduction through transmutation technologies

- Advanced nuclear fuel cycles to enhance fuel performance
- Advanced fuel and material irradiation and testing facility
- Integral thermal hydraulic test loops

- **Renewable energy**
  - Smart grid networks and applications and increased efficiency
  - Advanced protection distribution grids.
  - PV-distributed generation in the KSA
  - Battery management and modelling
  - Ultracapacitors, cells
  - Novel energy storage materials or cycles for high volumetric
  - Energy density storage systems
  - P2P trading and decentralized energy exchange platforms
  - Hybrid energy generation systems
  - Geothermal efficiency, production improvement
  - Power system planning and operations with high penetration of renewable energy
  - Novel concepts for using solar thermal sources and technologies
  - New PV module architectures, module components, and innovative cells
  - Fundamental understanding of degradation mechanisms in PV
  - Cost-effective methods to recycle photovoltaic (PV) modules and components
- **Autonomous technology**
  - Unmanned aerial drone surveys to identify potential mining sites
  - Geo-analytics and hyperspectral imaging
  - Lidar technology to examine open mine surface for faster mine model building
  - AI-based simulations system for mine safety management and hazard identification
  - IoT systems for continuous software monitoring and control
  - Augmented reality (AR)/virtual reality (VR) interface and digital twins to simulate scenarios
  - Autonomous drill rigs/mining trucks/haulage systems
  - Autonomous operations (blasting, dozing, loading, fueling)
  - Object avoidance/detection systems
  - Automated ore sorting and material handling systems
  - Mine tailings management
  - Carbon capture and storage of mining operations to reduce carbon emissions
  - Carbonated tailings to permanently capture carbon emissions in metal minerals
- **Raw materials and products in industry**
  - Recycled carbon
  - Solar-powered and connected trash compactor
  - Laser-induced breakdown spectroscopy (LIBS)

- Near-infra-red (NIR) sorting technology to sort plastics
- X-ray sorting technology for sorting
- Plasma gasification to change solid wastes into energy-filled products
- Bio-drying to remove moisture from a waste stream and reduce its overall weight
- Sustainability and traceability of materials using blockchain
- Pyrolysis to convert plastic waste into a fuel oil substitute
- Advanced dry recovery (ADR) technology
- Conversion of carboard to carbon fiber and biowaste to carbon fiber

Economies of the Future

- **Space exploration**
  - Geospatial intelligence/earth monitoring/satellite imagery
  - Commercial space launch: hardware and service
  - Building a vertical spaceport
  - Space crafts and components
  - Space refueling service
  - Space-based solar power
  - Laser communication
  - Satellite communication
  - Micro/nanosatellites
  - Orbital logistics
  - Microgravity materials
  - In orbit and off-Earth manufacturing
  - Reusable launch vehicles
  - Environmental control and life support system (ECLSS)
  - Commercial space stations
  - Space food and proteins
- **Smart cities**
  - Circular economy/waste to Products
  - Climate intelligence
  - Urban environment monitoring
  - Smart sustainable buildings
  - Smart road networks
  - Urban air mobility (UAM)
  - Crowd analytics for better crowd management
  - Collective intelligence through smart infrastructure and advanced data fusion
  - Low latency connectivity through 6G
  - Metaverse

- General purpose humanoid robots
- Internet of Things (IoT) air quality and noise pollution monitoring
- Gunshot detection
- Smart disaster management
- Drones for risk management
- Crowd management

- **Artificial intelligence**
  - Generative AI (GenAI)
  - Fast and robust self-supervised learning for faster training times
  - Human machine interface to be able to modify protocols at whichever depth and speed required
  - Personalization of virtual assistants for improved social and emotional engagement
  - Dialect language detection and adaptation (especially for semantically complex languages, such as Arabic and Mandarin)
  - Low data AI able to start in any environment with reduced pre-acquired data
  - Improved locomotion
  - Spatial AI, semantic SLAM (simultaneous localization and mapping), semantic navigation
  - Stronger and more flexible actuators for movement
- **Quantum computer and computing performance**
  - Quantum annealing machine
  - Superconducting qubit
  - Quantum entangled light sensor
  - Optical lattice clock
  - Distributed quantum sensing
  - Topological quantum matters
  - Spintronic materials
  - Photonics material
  - Condensed matter physics
  - Cryogenic engineering
  - Quantum error correction theory and interface technology
  - Standardization of quantum computers
- **Net-zero aviation**
  - Fully/hybrid electric aircraft concepts
  - e-SAF using electrolysis and by thermos–chemical conversion of organic matter
  - Distinctive aircraft design to accommodate liquid hydrogen storage
  - Waste heat utilization for aerodynamic performance
  - Advanced lightweight aircraft design
  - Liquid hydrogen-fueled long endurance drone for cargo

- **Automation of logistics**
    - Robot manipulators for easy and efficient picking, sorting, and packing/palletizing
    - Fully automated generalized bin-picking systems in robots
    - Collaborative robots (cobots) integrating human behavior prediction into planning
    - Drone docking stations for pickup and delivery services
    - 3D printing enabling nearshoring of production
    - Fully robotic ship offloading processes
    - Radiofrequency identification (RFID) technology for logistics and inventory systems
    - Smart wearable technology, including glasses using AR
    - Deploying application programming interface (APIs) for greater supply intelligence
    - Warehouse drones to check inventory
    - Automated storage and retrieval systems
    - Vehicle-to-infrastructure (V2I) testing with smart traffic lights
    - UAV traffic management (UTM) for delivery applications
- **Robots to assist humans**
    - Lithium iron phosphate batteries that do not explode
    - Silent pneumatic actuators, with optimized air compressors
    - Laser sintering of titanium
    - Legged locomotion “brute force” (control command approach) or intuitive biomimicry approach
    - Smart chairs: personal mobility omni-directional robots
    - Sensor fusion to merge data from multiple sources
    - Semantics understanding
    - Real-time object detection models
    - Machine learning
    - Robot decision-making system
    - Humanoid embodiment for humans to relate
    - Robot aesthetics: crossing the uncanny valley
    - Facial expressions
    - Information processing visual cues
- **Future of connectivity**
    - Massive scale of IoT networks
    - Digital twinning for simulations and decision making
    - Software-defined networking
    - Network function virtualization
    - Fully decoupled radio access network (FD-RAN)
    - Spectral efficiency
    - Connected intelligence

- Environmental sensing networks
- Ultra reliable and low-latency Communications
- Ambient backscatter communication
- Quantum communication
- Holoportation (high-quality reconstructed 3D models of people) and holographic communication
- Reconfigurable intelligent surfaces
- Vehicular cloud computing
- Zero-trust architectures
- Homomorphic encryption

- **Technologies for underwater exploration**
  - 3D printed parts able to sustain deep-sea pressure
  - High yield steel alternatives (aluminum, titanium composites)
  - Acrylic sheets that offer double the impact resistance
  - Ocean thermal energy by harnessing temperature differences between ocean surface waters and deep ocean waters
  - Renewable energy supply generated by green hydrogen electrolysis
  - Optical wireless communications (UOWCs)
  - 3D benthic mapping of the sea
  - Underwater acoustic communication network
  - Aquatic drones to explore high-pressure depths
  - Smart sea robots
- **Open RAN**
  - Scalability and Performance Optimization in Open RAN
  - Security Challenges and Solutions in Open RAN Networks
  - AI and Machine Learning Integration in Open RAN
  - Energy Efficiency and Power Consumption in Open RAN
  - Fault Tolerance and Reliability in Open RAN Systems
  - Interoperability Testing in Multi-Vendor Open RAN Environment
  - Advanced Antenna System (AAS) Design in Open RAN
  - Real-Time Analytics and Network Management in Open RAN
  - Quality of Service (QoS) in Open RAN Networks
  - Edge Computing in Open RAN
  - Virtualized Network Functions Design and Optimization in Open RAN
  - Spectral Efficiency and Radio Resource Management in Open RAN

Terminology and Definitions

The following terms and expressions have the meanings indicated unless the context requires otherwise:

Regulation: Executive Research Grants Regulation.

Authority/RDIA: Research, Development, and Innovation Authority.

Entity: Any entity, whether fully or partially involved in conducting any research, development and innovation activities and marketing their outputs, including but not limited to research chairs from the public, private, or nonprofit sectors.

Authorized Representative: The designated individual, duly authorized by the entity, with the power to sign executive contracts for research grants provided by the Authority. The authorized representative is responsible for overseeing their implementation.

The Science and Technology Unit (STU): A specialized administrative unit established within the entity as an independent entity directly linked to the authorized representative of the entity. It is responsible for managing, executing, and monitoring the administrative, technical, and financial tasks of research grants for the entity and its affiliated entities, in accordance with the governing rules, regulations, and instructions issued by the Authority.

Research/Research Project/Research Grant: This is systematic work with a defined beginning and end executed according to established scientific principles to obtain a scientific outcome. It is conducted by a specialized research team with specific resources, including human resources, financial resources, and the necessary facilities for project implementation.

Research Proposal: A scientific and methodological description of the nature and significance of the research problem, objectives, qualified human resources, working methods, implementation timeline, necessary resources and their financial costs for executing the proposed research, expected results, and a mechanism explaining how to utilize the outcomes of the research project and the beneficiaries of such outcomes.

Grant Start Date: The date on which the implementation of the research grant begins according to the approved work plan, which includes scheduling for the submission of the required technical and financial reports.

Budget: A document approved by the funding entity that includes details of the financial support required for the implementation of the research grant in accordance with the approved work plan.

Grant Duration: The period approved by the funding entity for the execution of the research grant.

Human Resources: All the accredited individuals involved in the research grant, including the research team, assistants, and consultants.

Research Team: A group of specialized researchers in the field of the research grant who are assigned to carry out the research as stated in the Researchers' Declaration. It consists of the Principal Investigator, Co-Principal Investigator, Researchers according to the nature of the grant, and the grant project manager.

Principal Investigator: A person who is academically and technically qualified and has direct expertise related to the subject of the research grant. They are responsible for managing, executing, and closing the grant.

Primary Principal Investigator: A person who assumes the lead role and overall responsibility for a consortium research project, and have primary accountability for the project's planning, execution, and reporting.

Secondary Principal Investigator: A person who works alongside the Primary Principal Investigator in contributing to the research project, and have specific responsibilities, expertise, or a complementary role in the consortium research project.

Co-Principal Investigator: A person who is academically and technically qualified and has direct expertise related to the subject of the research grant. They act as a substitute for the Principal Investigator, including primary or secondary PIs, in case of their absence or withdrawal, in addition to their responsibilities as a Researcher.

Researcher: A person who is academically and technically qualified and participates in the research team. They are responsible for the portion of the research grant assigned to them, according to the Researchers' Declaration.

Project Manager: A qualified individual or experienced professional in project management engaged in contributing to the achievement of the research grant's objectives according to the approved timeline.

Consultant: An individual with high academic qualifications and expertise who provides scientific and consultation services in the specialized field of the research project.

Assistants: Individuals assigned to executive tasks in a research project, such as conducting experiments, analysis, and other related activities. This includes

- **Graduate Students**: Students pursuing a master's or doctoral degree (or equivalent) directly related to the research project.
- **Technicians**: Individuals with technical and technological qualifications and expertise required to accomplish necessary tasks.
- **Administrators**: Qualified individuals responsible for performing the required administrative tasks.
- **Professionals/Skillful Labor**: Skilled individuals from various professions are necessary to facilitate professional work.

Review: The process of peer reviewing research grant proposals or periodic and final technical performance reports of supported grants according to specific scientific criteria. This process is carried out by a group of reviewers with expertise, impartiality, and scientific integrity.

Reviewer: A qualified individual assigned to review proposals scientifically, assess their merits, and determine their suitability for funding. They also review the technical reports of the grant to evaluate the extent to which it achieved its approved objectives according to the adopted timeline.

Technical Reports: Reports submitted by the Principal Investigator describing the progress of the grant toward achieving its objectives based on the approved timeline and methodology. These reports are categorized into annual and final technical reports.

Financial Reports: Reports submitted by the Principal Investigator documenting the expenses of the grant according to the approved budget. These reports are categorized into annual and final financial reports.

Research Output: The Results obtained during or after the completion of the research project. These include scientific papers published in internationally recognized journals, granted patents, prototypes, industrial products, experimental products, computer programs, integrated circuit designs, plant varieties, copyrights, and trademarks.

Reporting Extension: A procedural process where the Principal Investigator of the research grant requests an extension for submitting periodic technical or financial reports or final reports for a specified period of time, as specified in the approved research proposal for completing the research grant.

Report Postponement: Failure to meet one of the requirements for submitting project report(s) within a specified timeframe.

Grant/Project Extension: An official administrative procedure carried out by the Authority to extend the duration of the grant for a specified period for valid reasons without additional financial obligations.

Grant Closure: A series of administrative procedures executed to conclude all activities of the research grant. This involves an official announcement by the Authority of the completion of the project, leading to the termination of the relationship between the research team and the funding entity.

Account: Bank accounts designated for support funds and related financial transactions concerning supported grants. It is used for the management and operation of supervisory departments overseeing the support, whether within the Authority or in science and technology entities and Units.

Intellectual Property Rights: The set of organized rules that determine the ownership rights of intellectual property resulting from the research grant and the responsibilities of the involved parties. It clarifies the obligations related to the protection, generation, management, and investment of intellectual property resulting from the grant.

Scientific Integrity Guidelines: A set of guidelines that includes scientific obligations based on fundamental and professional principles for the preparation and implementation of scientific research and its outputs, in accordance with internationally recognized scientific integrity standards.

Start-up Company: A newly established company, typically with the goal of developing and bringing innovative products or services to the market.

Direct / Indirect Job Creation: The creation of new jobs either directly through the hiring of new employees or indirectly through the creation of new business opportunities that result in jobs being created elsewhere in the economy.

Spin-off Company: A company created as a result of the research and development activities of an existing company or organization.

Policy Changes: Changes to laws, regulations, or policies created as a result of research outputs or recommendations.

Industry Implementation: The application of research outputs or technologies in the development of new products, services, or processes within a particular industry.

Business Contract: A formal agreement between two or more parties that outlines the terms and conditions of a business transaction or relationship.

Prototypes: A preliminary version of a product or service created for testing and evaluation purposes.

Minimum Viable Products (MVPs): A product or service with sufficient features to satisfy early customers and provide feedback for future product development.

Efficiency Gain: The improvement in productivity or resource utilization resulting from the implementation of new research outputs, technologies, processes, or practices.

Table 7: Technology Readiness Level (TRL) definitions.

TRL	Stage	Definition	Hardware Description	Software Description	Exit Criteria
1	Discovery	Basic principles observed and reported	Scientific knowledge generated underpinning hardware technology concepts/applications	Scientific knowledge generated underpinning basic properties of software architecture and mathematical formulation	Peer reviewed publication of research underlying the proposed concept/application
2		Technology concept and/or application formulated	Invention begins, practical application is identified but is speculative, no experimental proof or detailed analysis is available to support the conjecture	Practical application is identified but is speculative, no experimental proof or detailed analysis is available to support the conjecture; Basic properties of algorithms, representations and concepts defined; Basic principles coded; Experiments performed with synthetic data	Documented description of the application/concept that addresses feasibility and benefit, or patents
3	Discovery/Development	Analytical and experimental critical function and/or characteristic proof of concept	Analytical studies place the technology in an appropriate context and laboratory demonstrations, modeling and simulation validate analytical prediction	Development of limited functionality to validate critical properties and predictions using non-integrated software components	Documented analytical/experimental results validating predictions of key parameters

TRL	Stage	Definition	Hardware Description	Software Description	Exit Criteria
4	Development	Component validation in laboratory environment.	A low fidelity system/component is built and operated to demonstrate basic functionality and critical test environments, and associated performance predictions are defined relative to the final operating environment	Key, functionally critical, software components are integrated, and functionally validated, to establish interoperability and begin architecture development; Relevant environments defined and performance in this environment predicted	Feasibility documented test performance demonstrating agreement with analytical predictions; Documented definition of relevant environment
5		Component validation in relevant environment	A medium fidelity system/component is built and operated to demonstrate overall performance in a simulated operational environment with realistic support elements that demonstrates overall performance in critical areas; Performance predictions are made for subsequent development phases	End-to-end software elements implemented and interfaced with existing systems/simulations conforming to target environment; End-to-end software system, tested in relevant environment, meeting predicted performance; Operational environment performance predicted; Prototype implementations developed	Feasibility documented test performance demonstrating agreement with analytical predictions; Documented definition of scaling requirements
6		Sub-system model or prototype demonstration in an operational environment	A system/component prototype that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate operations under critical environmental conditions	Prototype implementations of the software demonstrated on full-scale realistic problems; Partially integrate with existing hardware/software systems; Limited documentation available; Engineering feasibility fully demonstrated	Model or Prototype documented test performance demonstrating agreement with analytical predictions

TRL	Stage	Definition	Hardware Description	Software Description	Exit Criteria
7		System prototype demonstration in an operational environment	An engineering unit that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate performance in the actual operational environment and platform	Prototype software exists having all key functionality available for demonstration and test; Well integrated with operational hardware/software systems demonstrating operational feasibility; Most software bugs removed; Limited documentation available	MVP documented test performance demonstrating agreement with analytical predictions
8	Deployment	Actual system completed and qualified through test and demonstration	The final product in its final configuration is successfully demonstrated through test and analysis for its intended operational environment and platform	All software has been thoroughly debugged and fully integrated with all operational hardware and software systems; All user documentation, training documentation, and maintenance documentation completed; All functionality successfully demonstrated in simulated operational scenarios; Verification and Validation (V&V) completed	Product validation documented test and performance verifying analytical predictions
9		Actual system proven through successful operations	The final product is successfully operated in an actual environment	All software has been thoroughly debugged and fully integrated with all operational hardware/software systems; All documentation has been completed; System has been successfully operated in the operational environment	Mass production documented and operational results