NCM
UAEREP
National Center of Meteorology
UAE Rain Enhancement Program

WWW.UAEREP.AE

5th Cycle Solicitation

UAE RESEARCH PROGRAM FOR RAIN ENHANCEMENT SCIENCE

UAEREP is an international research initiative designed to advance the science and technology of rain enhancement by offering managed grant assistance to selected teams of researchers.

5th Cycle Solicitation

UAE RESEARCH PROGRAM FOR RAIN ENHANCEMENT SCIENCE

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I. INTRODUCTION

UAE Research Program for Rain Enhancement Science (UAEREP):

The UAE Research Program for Rain Enhancement Science (UAEREP) requests innovative research and technology proposals that advance the field of rain enhancement, particularly in arid regions. To date, the program has funded eleven awards, which have advanced, and continue to advance, the science and technologies that underpin cloud-seeding operations in the UAE and have contributed to the global knowledge base on rain enhancement (www.uaerep.ae).

A. Program Description and Goals

The overall purpose of the UAEREP is to promote fundamental scientific understanding of rain enhancement, as well as stimulate the development and deployment of rain enhancement technologies. The program goals are to:

1. Advance the science of rain enhancement and the development and implementation of rain enhancement technologies.

The UAE sees the program as an opportunity to bring international recognition to research and development for rain enhancement and its potential to spur additional investments in research funding and partnerships.

2. Increase rainfall for water security in the UAE and globally.

The UAE looks for improved verification of cloud seeding operations and reliable measurements of the effectiveness of cloud seeding, and seeks to firmly establish cloud seeding as a reliable tool for freshwater augmentation. Additionally, new technologies and methodologies are being pursued other than cloud seeding that are aimed at stimulating rainfall.

I. INTRODUCTION

B. Program Objectives

To achieve the above goals, five objectives are identified:

1. Enhance the level of research and innovation in the field.
Increase the level of research activities and funding globally, including attracting new researchers, technologists and entrepreneurs to the field; leverage program funding through matching and in-kind investments from participating entities.

2. Advance scientific understanding of clouds, rainfall and rain enhancement.
Obtain new scientific understanding of cloud physics and dynamics, cloud-cloud interactions, cloud systems, precipitation production, and other relevant physical processes. Additionally, consolidate current knowledge and understanding through archiving and sharing of experimental data, sponsoring symposia, and coordinating community-wide campaigns.

3. Advance the technological and methodological state-of-the art in rain enhancement practice and operation.
Make high-quality experimental data, both current and historical, available to researchers, and spur the analysis and re-analysis of the data with multiple, state-of-the-art techniques. Add to the technology base for cloud seeding with testing of materials and delivery methods. Demonstrate improved cloud and atmospheric modeling capabilities.

4. Enhance and further develop capacity in the field of rain enhancement both locally and globally.
Develop local and regional capacities for meteorology, water and environmental research and development (R&D), and additional workforce capacity for scientific and technical fields in general. Spur global research collaborations in the region and the deployment of infrastructure for meteorology, water, and environmental R&D.

5. Encourage interdisciplinary approaches that examine linkages and interrelationships among the program's research focus areas.
Focus on the grand challenge of rain enhancement, allowing this international competition to play a leading role in maintaining and enhancing engagement and capacity in this field, while fostering new research fronts that have potential to significantly advance applied/industrial practice.

II. PROGRAM SCOPE

A. Research Areas and Approaches

For the UAEREP's 5th Cycle, the program will focus on two high priority areas: **cloud formation and rain enhancement.** Novel, science-based approaches to enhance cloud formation are of particular interest. Also of particular interest are lifecycle-focused approaches to understanding and enhancing rain processes.

Such approaches may include scientific investigations that can inform the development of numerical weather models that are sufficiently accurate to train rainfall machine learning algorithms, which may in turn support novel operational approaches to rain enhancement.

Projects should endeavor to advance the program by generating new knowledge and technologies that will have a significant impact on the field of rain enhancement. While investigations aimed at fundamental understanding of cloud formation and rain enhancement are encouraged, a clear direction toward operational impact is essential.

Therefore, articulation of technology readiness level (TRL) (see Section IX. B) progression for technologies, models, and other relevant deliverables will be a critical factor in the evaluation of proposals. Furthermore, involvement of the UAE research community in proposed activities is strongly encouraged:

II. PROGRAM SCOPE

The following are research topics of importance:

- The physical chain of events leading to cloud and rainfall formation
- Integration of new measurement and numerical tools to gain a clear, scientific understanding of the full chain of events of all the processes involved in cloud formation, rainfall, and rainfall stimulation
- New technologies and approaches, other than cloud seeding, to stimulate cloud formation and rain enhancement
- Remote sensing and in-situ observation and technologies applied to cloud formation and rain enhancement
- Cloud microphysics, dynamics, and thermodynamics
- 3-dimensional characterization of clouds
- Aerosol/cloud interactions and characterization of background aerosols
- Evaluation of warm, cold and mixed-phase cloud physical processes and their interactions that lead to rainfall
- Use of innovative statistical methods for evaluation of cloud seeding applied to data from field experiments, lab experiments, and models
- Creation of testbeds comprising a mix of field campaign data with in-situ upper air, satellite, and ground measurements
- Experiments in cloud chambers and fog to improve understanding of cloud physics and precipitation processes
- Multiscale modeling of relevant atmospheric processes connecting cloud microphysics and dynamics
- Impact of cloud seeding methods and materials on cloud chemistry, physics, and dynamics
- Nowcasting and forecasting of weather to support cloud seeding operations
- Use of Ensemble Modelling (Multi-model/Multi-physics) to determine optimal cloud seeding timing and location
- Use of Artificial Intelligence techniques, particularly novel machine learning approaches, to objectively determine variables important to cloud seedability, possibly paving the way for enhanced forecasting
- Testing and leveraging models of several rain enhancement strategies and technologies to gain further fundamental understanding from the observations and experiments

It is important to note that successful proposals will often integrate multiple research topics in novels way rather than pursuing individual topics alone.

II. PROGRAM SCOPE

B. Characteristics of a Successful Proposal

Projects should carefully describe the observational, modeling and data analysis strategies that will be used. The creation and use of comprehensive data bases, historical and new data, and the analysis and re-analysis of previous experiments are strongly encouraged, as is the planning and implementation of field experiments and campaigns.

Proposers should carefully review projects funded in the four cycles of the program (links are provided for 2015, 2016, 2017 and 2021 awarded projects), in addition to the sessions of the 5th International Rain Enhancement Forum (video links available for Day 1 and Day 2). Redundancy and duplication of funded awards should be avoided unless proposals can clearly and specifically demonstrate how they will build upon and enhance results already achieved.

Emphasis should be given to the development of high-impact, large team projects involving academic, industry and government collaborators, i.e. multi-institutional, multi-national collaborations, and linkages between universities/colleges, national laboratories, private sector research laboratories, and/or state and local government organizations, as appropriate to the project.

Additionally, proposals should aim to achieve an advanced level of technology readiness by the completion of the research program. Prototype and/or model validation in a research environment is the minimum expectation and the most competitive proposals will include technology and/or model validation in a relevant demonstration or production environment. Field testing of a developed technology and/or integration of developed software tools with weather research and forecasting systems is desired. Proposals should specify the initial and targeted TRL(s) of the deliverables; the TRL progression will be considered in the evaluation of proposals.

II. PROGRAM SCOPE

Successful proposals in this competition will have the following general characteristics:

- A clear description of how the proposed research will build on or enhance previous work in the rain enhancement field, particularly research previously supported by the UAEREP;
- A clear hypothesis on which the work plan is based;
- Clear milestones and deliverables toward focused outcomes and not necessarily solutions to all problems;
- A scope and scale to fully justify the proposed funding request;
- Sufficient expertise and experience of the project team to effectively carry out a multi-institutional, complex project;
- A demonstrated institutional commitment by the lead organization and any partnering institutions.

Additionally, all successful proposals will include the following specific components:

- A project plan that integrates research, capacity building/education, and knowledge transfer activities, with inclusion of all partners and affiliates as appropriate. The knowledge transfer plan should include significant intellectual exchange among various types of institutions and organizations; in particular, collaboration with NCM personnel throughout all stages of the project will ensure seamless transition of research outcomes to cloud seeding operations.
- A plan for social and environmental stewardship through community outreach and environmental impact assessment and mitigation, as appropriate to the project; and
- A detailed management plan that describes sound mechanisms for project oversight, team communications, risk mitigation, and financial monitoring.

III. TIMELINE FOR THE PROGRAM FIFTH CYCLE 2023

Registration:
Due by March 9, 2023

Pre-proposal:
Due by Midnight (GMT) March 16, 2023

Invited full proposals notified:
May 26, 2023

Invited full proposals:
Due by Midnight (GMT) August 24, 2023

Award notification:
January 2024

Anticipated start date of the awards:
March 1, 2024

IV. AWARD INFORMATION

The program will support up to two awards. It is anticipated that the awards will be valued up to $1.5 million each and dispersed over a three-year period. All awards will be selected by a rigorous, two-stage merit review process, and awardees will be announced in January 2024.

The awards are likely to be for projects that are technically and/or managerially complex. Therefore, funds will be awarded through a cooperative agreement, which gives the Program Secretariat a significant oversight engagement with the awardees. The project principal investigator (PI) directs the project with the assistance of any Co-PIs. The PI and the PI's sponsoring organization have fiscal responsibility for the award and primary management responsibility for the conduct of the proposed activities. The cooperative agreement, however, will state the nature and extent of expected Program Secretariat involvement, such as receipt of periodic reports and undertaking of regular evaluations. A detailed agreement ensures that the responsibilities of each party are fully understood.

Support for each year of the Cooperative Agreement for the award will be contingent upon satisfactory outcomes as documented in progress reports submitted annually for review by the Program Secretariat. In addition, site visit(s) will be held to evaluate the progress and future plans, with an emphasis on the quality of the research and expected ability to meet the project goals and objectives.

Specific Award Conditions are elaborated further in section VIII. AWARD ADMINISTRATION INFORMATION.

V. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Domestic (UAE) or foreign, public or private, non-profit or for-profit organizations are eligible to receive this cooperative agreement award. All eligible entities must clearly demonstrate that they have access to the facilities and infrastructure necessary to carry out the proposed project. Eligible entities must also agree to the fiscal arrangements that the Program Secretariat requires to ensure that awardees are able to responsibly manage the funds.

Who May Serve as Principal Investigator (PI):

The PI must have substantial research and management experience in the associated field of science and/or engineering to lead the Project. Co-PIs may share in the responsibility of the scientific or technical direction of the project. The first name listed on the application will serve as the primary liaison to the Program Secretariat and have responsibility for the project management and the submission of reports.

Limit on Number of Pre-Proposals per Organization:

There are no restrictions to the number of pre-proposals that can be submitted to this competition by a single organization. However, it should be noted that any one organization may only receive one award per competition cycle.

Limit on Number of Pre-Proposals per PI or Co-PI:

There are no restrictions to the number of pre-proposals that can be submitted by a PI or Co-PI, but it should be noted that a PI or Co-PI may only receive one award per competitive cycle.

Additional Eligibility Information:

Proposals submitted to the program must not have been previously submitted to other agencies and either awarded or currently under review.

Based on the merit review of the pre-proposals, a select number of PIs will be invited to submit full proposals. Only invited full proposals will be eligible for the award. Uninvited full proposals will be returned without review.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

Applications will be evaluated in a multi-phase merit review process. A pre-proposal will be required, and those pre-proposals judged most promising by a review panel and the Program Secretariat will be invited to submit full proposals.

A. Registration on Online Submission Portal: Required

Registrations from the intended PI/Lead Institution should be done at least one week before the pre-proposal submission deadline. This allows sufficient time to resolve any technical issues related to accessing and submitting the pre-proposal requirements on the online portal. The registration should include a brief description (not exceeding 500 words) of the scope of work, the approach, and the potential list of participants. The Program Secretariat will not be responsible for any technical issues occurring during the submission process for anyone registering after the recommended deadline.

Register by March 9, 2023.

The Registration must be filled-out online at www.uaerep.ae.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

B. Pre-Proposal: Required

Pre-proposals and all referenced documents must be submitted through www.uaerep.ae no later than Midnight, March 16, 2023 (GMT). The submission process requires the completion of online forms for the pre-proposal cover page (basic administrative information) and list of project personnel, followed by uploading to the web portal of the pre-proposal main content and supplementary documents in pdf format. A Conflict of Interest (COI) form is also required. The template is downloadable from the web portal, and the completed form must be uploaded to the portal. Once required forms have been submitted, the proposer will receive an e-mail notification that the application was received.Detailed preparation instructions are given below. Pre-proposals that are not compliant with the guidelines may be rejected without review. Pre-proposals must contain the items listed below and adhere strictly to the specified page limitations. No additional information may be provided as an appendix or by links to website pages.Figures and tables must be included within the applicable page limit. Pre-proposals should contain an overview of the proposed research and approach, with sufficient detail to allow assessment of the major ideas and approaches to be used. Anticipated partners and participants should be identified, but their involvement will not be binding. However, neither the PI nor the PI's sponsoring institution may be changed after the submission of the pre-proposal.

The pre-proposal shall comply with the following specifications:

- Written in English
- Paper size when printed: ISO A4
- Margins: 2.5 cm (top, bottom and sides)
- Spacing: single spaced
- Font: no smaller or more condensed than Times New Roman (acceptable fonts also include Arial, Helvetica, Palatino, Linotype or Georgia), 12 point for text and 10 point for figures and tables

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

The pre-proposal will contain the following elements:

(1) Cover Page (to be filled out on-line via the web portal).

Consists of project title, PI and Co-PI (if any) information, sponsoring organization information, and list of senior personnel and their institutional affiliations

(2) A pdf file containing the following sections to be uploaded via the web portal.

Project Summary and Description (1-page minimum, 3-page maximum):

The Project Summary and Description should articulate a vision that clearly outlines the research being addressed and breakthroughs being sought. It should provide sufficient information on the research (hypotheses, concepts, methods, approaches, data measurements and analyses) and anticipated outcomes with a clear indication of the TRL progression of technologies and models that will be developed. The proposed approaches must be innovative, and it must be clear how the proposed project will transform or significantly impact the research area and its broader implications for rain enhancement, particularly for arid regions such as the UAE. It should identify the roles and responsibilities of the PI and/or other senior project leadership, if relevant, along with their respective institutions. The project summary and description should be informative to those working in the same or related field(s), and understandable to a scientifically or technically literate reader. Links to URLs or other supplementary information may not be used.

Note: For the pre-proposals, descriptions of facilities, equipment, and other resources are not required. If this information is an essential component of the research being proposed, it should be indicated briefly within the Project Summary and Description.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

References cited (no minimum, 2-page maximum)

Each reference must include the full citation. Applicants must be especially careful to follow accepted scholarly practices in providing citations for source materials relied upon when preparing any section of the document. This section must include bibliographic citations only and is not be used to provide parenthetical information outside of the project description. It is important to be succinct and select only those references pertinent to the proposed research. Reference numbers should also be shown in the text of the project description. Use of published works should conform with international copyright treaties and best scholarly practices.

CVs of PI, Co-PI(s), and senior research personnel (maximum 1-page for each individual)

For the PI, Co-PI(s), and each senior research personnel listed on the project's cover page, one-page should be provided that includes full name and title, institutional affiliation, brief summary of expertise and relevant experience, and several sentences elucidating the investigator's role in the project, along with other information (e.g. publications, patents, etc.) deemed relevant.

(3) Supplementary Documents Required:

Conflict of Interest Form (Use Excel template provided via the web portal).

The PI is required to submit a spreadsheet listing conflicts of interest for all persons listed on the Cover Page. The template, which has supplementary instructions, must be downloaded from the web portal, and instructions for use of the template must be strictly followed. The completed form should then be uploaded to the web portal.

Additional Information (In a single pdf document)

- List of suggested reviewers or reviewers not to include (with a brief explanation or justification for why the reviewer should be excluded from consideration)
- Three keywords that describe the research proposal listed in order of priority
- Identification of proprietary or privileged information (if applicable)

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

C. Full Proposal: By Invitation Only

For full proposals, all referenced documents must be submitted electronically through www.uaerep.ae no later than midnight August 24, 2023 (GMT).

Questions relating to the submission process may be directed to the Program Secretariat. Once required forms have been submitted, proposers will receive an e-mail notification from the Program Secretariat that the application was received.

Full proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the stated guidelines. Full proposals will be accepted only if invited by the Program Secretariat. When preparing a full proposal for this competition, proposers are advised to review the Program Description and the Proposal Review Information found in this solicitation for general guidance pertinent to this program. Proposers are encouraged to refer to the web portal frequently for updated information and answers to frequently asked questions. In particular, proposers should look for updates on currently funded projects to avoid redundancy and to identify new research opportunities, potential partnerships, and other relevant linkages. Information about on-going projects funded by the UAE Rain Enhancement Program can be found on the Program website.

The full proposal shall comply with the following specifications:

- Written in English
- Paper size when printed: ISO A4
- Margins: 2.5 cm (top, bottom and sides)
- Spacing: single spaced
- Font: no smaller or more condensed than Times New Roman (other acceptable fonts include Arial, Helvetica, Palatino, Linotype or Georgia), 12 point for text and 10 point for figures and tables

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

The full proposal package includes

1. Cover Page (online form)
2. Executive Summary (online form)

The following pdf documents are to be uploaded via the Web Portal:

1. Project Description
2. Facilities, Equipment and Other Resources description
3. Biographical Sketches Including Current and Pending Support
4. References Cited
5. Supplementary Documents And the following .xls (or .xlsx, Microsoft Excel) documents (or other spreadsheet forms, as agreed to by the Program Secretariat) to be uploaded via the Web Portal:
6. Budget pages for each year and cumulative
7. Conflict of Interest (COI) spreadsheet

Note that the proposal will be reviewed as a stand-alone document. Links to URLs or other supplementary information not otherwise specifically allowed for this competition shall not be used as part of the evaluation process.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

The full proposal will contain the following elements:

1. Cover Page (to be filled out on-line via the Web Portal) Consists of project title, PI and Co-PI (if any) information, sponsoring organizational information, proposed total budget, and list of senior personnel and their institutional affiliations.

2. Executive Summary (Maximum of 500 words, to be filled out on-line via the Web Portal) The Executive Summary should include the rationale, vision and potential impact of the proposed research program, including how it substantially contributes to advancing the field of rain enhancement, particularly in arid regions. It should be an overall description of the proposed activity, a statement of objectives, methods to be employed, and major partners and their respective contributions. The summary should be targeted towards those working in the same or related fields, but also understandable to a scientific or otherwise technically literate audience.

3. Project Description (An uploaded pdf file that includes sections A-F below. Total maximum page limit for the Project Description is 20 pages. Within the description, flexibility is given to the PI to adjust the length of the sections as appropriate to the project. However, the description must contain all the sections specified, and it must also conform to the overall page limit.

A. Table of Contents (TOC):

List project narrative sections and corresponding page numbers. The TOC does not count against the page limit.

B. Research Program: (Minimum 8-pages)

This section must address the appropriate elements of the merit review criteria for full proposals. Proposers should carefully review projects funded in the first four cycles of the program (2015, 2016, 2017 and 2021 awarded projects). Redundancy and duplication of funded awards should be avoided unless proposals can clearly and specifically demonstrate how they will build upon and enhance results already achieved. The following elements are expected:

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

1. Provide a compelling vision that clearly outlines specific program aims and objectives. Describe in detail the research to be undertaken and specifically how it will build upon and/or compliment projects already awarded by the UAEREP. The narrative should include the overarching goal or question and how it is relevant to the Program. Within the research plan, provide background, objectives, including hypotheses to be tested, and specific aims. Milestones and the overall timeline for completion of the project must be provided along with a clear description of the TRL progression expected for each technology, model or other relevant deliverable that will be developed.

2. Provide a description of the experimental design, methodologies and techniques, and analyses, as well as proposed assessment and validation methodologies. If available, provide preliminary data to support the feasibility of the proposed work. However, in cases where preliminary results are not available, other means of demonstrating the feasibility of the approach are encouraged. The approach and methods to be employed should be clearly articulated. Address any potential pitfalls and described mitigation approaches that will be employed.

3. Include details of how any data obtained will be validated and analyzed, and offer a full description of any required data management plan, including activities to make data available and widely accessible.

4. Identify major partners and their respective contributions, as appropriate. The contribution of each partner to the integrated research goals must show that the total effort is integrated and greater than the sum of the separate efforts.

5. Identify any potential social or environmental impacts of the project with appropriate plans to address or mitigate them.

6. Elaborate the significance of the proposed activity on the field of rain enhancement and other disciplines that may benefit.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

C. Capacity Building (Minimum, 1-page)

Provide a plan that shows how the research will be integrated with education and training for rain enhancement and, where relevant, related disciplines. Include expected regional impacts of planned activities with regard to research infrastructure. Provide the plan for engaging other partners to enhance regional capability and involvement. Emphasis should be placed on capacity building in the UAE.

D. Knowledge Transfer (Minimum, 1-page)

Discuss how the data, knowledge, technologies and models generated from the research program will be made available to UAEREP and the broader research community. Describe training and educational opportunities that will be created for researchers or workers in the field, especially within the UAE. Describe mechanisms that may attract new small businesses or enhance their capability to undertake activities in the field.

E. Management Plan (Minimum, 2-pages)

Provide a clear description of the how the overall program will be managed. Detail should include lines of authority, communication among team members, how decisions will be made and who makes them, how partnerships are integrated, how unforeseen pitfalls and mid-course corrections will be handled (if necessary), how external advice is incorporated, incorporation of outreach to ensure meaningful national and international collaborations, and mechanisms that will be used to integrate and involve various stakeholders.

F. Timeline (1 page)

Provide an anticipated timeline, including planned activities, project milestones, and deliverables for the three years of the award. A Gantt chart to display milestones and deliverables is required. The expected TRL progression of deliverables should be noted where appropriate.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

(4) Facilities, Equipment and Other Resources (No page limit)

Provide a detailed description of institutional and other resources that will be available to the project, including information on the availability of sufficient infrastructure and technical expertise to ensure effective usage of any major equipment or instrumentation. Include technical specifications of new equipment or instrumentation if the development of these is part of the proposal.
This section is descriptive only, and not to be used as additional space to elaborate the Research Program description.

(5) References Cited (No page limit)

Each reference must include the full citation. Applicants must be especially careful to follow accepted scholarly practices in providing citations for source materials relied upon when preparing any section of the document. While there is no established page limitation for the references, this section must include bibliographic citations only and must not be used to provide parenthetical information outside of the project description. It is important to be succinct and select only those references pertinent to the proposed research. Reference numbers should be shown in the text of the research proposal. Use of published works should conform to international copyright treaties and the best scholarly practices.

(6) Biographical Sketches (2-page limit per person. Compile into a single document)

Biographical sketches, including listing of prior or ongoing research projects of relevance to the program, are required for the PI, Co-PIs and all senior research personnel. Biographical sketches should convey information that demonstrates the individual's expertise as related to the proposed research, and should include:

- Vitae, listing professional and academic essentials and present affiliation.
- A brief description (not more than five sentences) on how stated expertise is relevant to the proposal.
- List of up to 5 publications most closely related to the proposed project and up to 5 other significant publications. Patents, copyrights or software systems developed may be included as well. However, only up to 10 items will be considered in the merit review.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

(7) Required Supplementary Documents (Compile into a single pdf document)

- Letters of Collaboration/Support: A support letter must be provided by the lead institution. Include only other letters from individuals or organizations that are integral to the proposed project, whether or not they are receiving financial support. Ensure that the letters specifically address involvement in some aspect of the project. Letters of endorsement alone are not appropriate
- List of suggested reviewers, or reviewers not to include (with a brief explanation or justification for why the reviewer should be excluded)
- Up to three keywords that describe the project, listed in order of priority
- Identification of proprietary or privileged information and/or relevant background intellectual property (if applicable)

(8) Budget and Budget Justification (Excel spreadsheet template to be downloaded from the Program Web Portal and completed.)

Provide a budget for each of the three years of the project and a cumulative budget in the format specified in the Excel spreadsheet. The proposed budget should be consistent with the needs and complexity of the proposed activity. This competition provides awardees with up to USD $1.5M with an annual cap of USD $550,000. Note that indirect costs are limited to 20%. If additional support beyond what is requested from the UAEREP is necessary and anticipated to complete the proposed project, the PI must identify and provide documentation of the availability of those funds.

The PI's institution receives the full grant amount partitioned into the three annual payments. It is the responsibility of the lead institution (and/or PI) to track budgets and make payments to collaborating institutions (if any). As part of the full proposal submission, a separate budget spreadsheet should be filled in by each collaborating institution's Co-PI. The annual totals from the collaborator budget sheet(s) should be listed in the lead institution's overall project budget spreadsheet under the designated section (Subcontracts, Subawards) for each year.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS

(9) Conflict of Interest Form (Excel spreadsheet to be downloaded from the Program Web Portal and completed.)

The PI is required to submit a spreadsheet listing conflicts of interest for all persons listed on the Cover Page of the proposal. The template, which has supplementary instructions, must be downloaded from the web portal and instructions for use of the template must be strictly followed. The completed form, which is the same as required for the pre-proposal, must be uploaded to the portal. For the full proposal, an update of the form provided for the pre-proposal, reflecting any changes in proposed personnel, may be used. If there are no changes, simply upload the previous form via the Web Portal.

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES

A. Merit Review Principles and Criteria

The UAEREP strives to enhance the level of research and innovation in the field of rain enhancement as well as adjacent fields. To identify which projects to support, the Program Secretariat relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing rain enhancement effectiveness and efficiency, particularly in arid regions. The reviewers will be instructed to base their critique and scores solely on the written materials provided in the application. Therefore, links to URLs or other supplementary information not otherwise specifically allowed for this competition shall not be used as part of the evaluation process.

The reviewers will be selected based on the following criteria: 1) scientific and engineering expertise pertinent to the submitted proposals to ensure ability to evaluate competence, significance and impact of the proposed activity; 2) generalized knowledge of fields related to atmospheric science, and particularly rain enhancement; and 3) extensive knowledge of the scientific and engineering enterprise, including managing and evaluating large research projects. All reviewers will be instructed in the Program's confidentiality, conflict of interest, and ethics guidelines, and required to sign confidentiality and conflict of interest forms to indicate their agreement to abide by these policies.

The Program Secretariat will be responsible for overseeing the proposal submission process, review of conflicts of interests (COIs), panel selection and assignments, and the review and award processes. The Program Secretariat makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects. In all cases, the decisions of the Program Secretariat are final.

B. Criteria for Pre-proposals

Given that the evaluation of the pre-proposals will be based on limited written materials, the merit review process will address the critical elements deemed necessary to determine whether the applicants should be invited to submit a full proposal. Pre-proposal evaluations will be based on the following criteria:

- Research excellence, impact and quality
- Experience and/or expertise of the proposers, and potential for success
- Multidisciplinary collaboration across academic, industry and government partners
- Potential to enhance or transform the rain enhancement research community and industry

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES

C. Criteria for Full Proposals

The full proposals will be evaluated via an extensive panel review based on defined review criteria. Each of the major criteria shown below will be given full consideration during the review and decision-making processes, and provided a numerical score. Each stated criterion is important but none, by itself, is sufficient for a successful proposal. Therefore, reviewers will address all criteria and also provide an overall impact score based on their assessment of likelihood of success in advancing the field and in meeting the UAEREP objectives. Each criterion will receive a number score, and the final score will be calculated based on the percent weight of each criterion. Listed after each individual criterion are some of the questions the reviewers will consider in providing their assessments.

Overall Scientific & Technical Merit, Significance and Innovation: 35%

- How does the proposed activity address important challenge(s), gaps in knowledge and/or critical barriers to the progress of the field?
- If the aims of the proposal are achieved, how will scientific knowledge, techniques and technologies be advanced?
- Is the research based on sound and testable physical hypotheses - and if so how?
- Does the application clearly challenge or seek to validate current research or technology paradigms - and if so, how?
- How are the concepts, approaches, and technologies proposed novel either to the field or in a broad sense?
- What is the planned TRL progression of technologies, models and other relevant deliverables?
- Is the research distinct from projects already funded through the program?
- What are the broader impacts/benefits of the project, including patents, commercialization opportunities, databases, and observational capabilities?

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES

Investigator/Team: 20%

- How well qualified is the proposer (individual or team) to conduct the project?
- Does the team have a strong balance of academic, industry and government collaborators capable of delivering a program with significant impact? Are multi-institutional, multi-national collaborations, and linkages between universities/colleges, national laboratories, private sector research laboratories, and/or state and local government organizations included?
- To what extent are UAE personnel, including NCM, involved in the proposed research?
- If early stage researchers are involved, how adequate is their training and experience?
- For established researchers, have they demonstrated an ongoing record of accomplishments that have advanced the field?
- If the project is collaborative or multi-PI, do the researchers have complementary and integrated expertise and to what extent does the collaboration show added benefit?
- Is the leadership approach, governance and management structure appropriate for success of the project?
- What are the features of the management plan that will ensure success?

Approach: 20%

- How well conceived and organized is the proposed activity?
- Does the plan incorporate a mechanism to assess success?
- Does the plan have a clear set of milestones and deliverables with TRL progressions indicated?
- If experimental, will the design adequately test, and the evaluation plan adequately validate, the hypotheses?
- Are the computational models, laboratory equipment, or field experimental equipment and infrastructure supported with commitments, appropriate, and well planned?
- Is there a correct use of statistics as a supporting tool?
- Is the data plan consistent with the research proposed and with the solicitation's fundamental data principles?
- Does the application identify major risks and, if so, are plans in place to minimize and/or mitigate?
- Does the approach identify and account for any potential environmental and social consequences?
- Does the approach make use of new technologies that are not traditionally applied to rain enhancement?

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES

Capacity Building: 15%

- How is capacity building integrated within the research plan and how does it impact the field of rain enhancement globally and in the UAE?
- What is the potential of the work to increase the visibility and reputation of the field, or to grow the field regionally and/or globally?
- Are there educational and experiential opportunities for graduate students, new researchers, and/or technical workforce, especially in the UAE?
- Will important new research infrastructure be established in the UAE?

Resources and Budget: 10%

- If needed, have additional sponsors or means of support been identified to complement the proposed project budget?
- Does the research team have access to adequate facilities and infrastructure to conduct the proposed research, and has the team demonstrated the necessary institutional commitment to be successful?
- Does the research team exhibit the ability to manage a complex project?
- Are the project costs complete and fully documented?
- Is the budget fully justified and reasonable in relation to the proposed research?
- Are additional resources and in-kind contributions stated in the proposal logical, justified, and providing clear addition to the project impact?

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES

D. Review and Selection Process

Both pre-proposals and full proposals submitted in response to this program solicitation will be evaluated by panel review and augmented by ad hoc reviews. Only PIs of pre-proposals recommended by the pre-proposal review panel will be invited to submit the more extensive and time consuming full proposals. The reviewers will be required to base their comments on the review criteria described above. Each application will be evaluated by at least three expert reviewers. The applications will be scored based on the below rating system.

Review Criteria and Scoring Matrix

Criteria Scores for Pre-Proposals & Full Proposals		
Criterion	**Score**	**Description**
High	5	Outstanding/Exceptional
	4	Excellent
Medium	3	Very Good
	2	Good/Satisfactory
Low	1	Fair/Marginal
	0	Poor/Non-compliant

A limited number of pre-proposals judged the most promising by a panel of experts and agreed upon by the Program Secretariat will be invited to submit full proposals. All applicants will be notified of results. Each applicant will subsequently be provided with the reviewers' comments on the pre-proposal's merits. The Program Secretariat's decision whether to invite is final.

The full proposal review panel will use the above criteria to identify a small number of full proposals deemed worthy to be considered by the Program Secretariat for final selection. After the Program Secretariat selects awards, the selected PI's and their institutions will be contacted. Proposers are cautioned that no commitment should be inferred until the cooperative agreement is officially signed by both the NCM, as funder, and the PI's institution.

Once an award decision has been announced, all proposal PIs are provided feedback about their full proposals. In all cases, reviews are treated as confidential documents. Copies of reviews and a panel summary for the full proposals, excluding the names of the reviewers or any reviewer-identifying information, are sent to the PI by the Program Secretariat.

VIII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Up to two Awards will be announced in January of 2024.

B. Award Conditions

The Award consists of: (1) the award letter, which includes any special provisions applicable to this cooperative agreement; and (2) the budget, which indicates the amounts, by categories of expense, on which the Program Secretariat has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures). The awards are made in the form of Cooperative Agreements issued by NCM (the funder).
The Cooperative Agreements will have an extensive section of negotiated conditions relating to the period of performance, statement of work, awardee responsibilities, NCM responsibilities, joint NCM-awardee responsibilities, funding and funding schedule, reporting requirements, management and performance indicators, key personnel, and other conditions. NCM has responsibility for providing general oversight and monitoring to help assure effective performance and administration. Although individual awards are negotiated, and thus will vary depending on the requirements of the project and performers, all will comply with the following basic agreement policies:

Roles and Responsibilities

The agreement will elaborate the roles and responsibilities between the funder and the awardee and among awardee partners, including who has final managerial and decision authority within the project if disputes arise, how decisions are made, how and when funds are distributed, and under what conditions, and how disagreements are handled.

Data Policy

Data generated are expected, except in rare circumstances, to be available for open dissemination and use after validation and initial analysis.

Intellectual Property (IP) and Property Rights

Terms for tangible and intellectual property generated are specified in the Cooperative Agreements. However, no funds will be awarded until the funder is convinced that the project partners have negotiated and agreed on divisions of roles and funding, and on IP ownership matters. Timely notification of discoveries and inventions will be required.

VIII. AWARD ADMINISTRATION INFORMATION

Allowable Uses of Award Funds

The award should be restricted to a maximum of 20% overhead for any institution, and budget items related to fees or profits will not be allowed. It is important to note that the 20% overhead may be applied to all direct costs. Equipment purchased in excess of $5,000 (US) will be exclusively for the use of the project during the duration of the award. Expenditures must meet a "fair and reasonable" standard, and the Program Secretariat retains the right to audit awardees to determine acceptable use of funds.

Settlement of Disputes

The award must stipulate how disputes and disagreements between performers will be settled. Between awardee and funder, appeals will be allowed on decisions made relevant to evaluations, but the funder may limit the number of such appeals and retains ultimate decision authority.

Changes to Personnel

The PI or Co-PIs on the project must not be changed without the express agreement of the funder. Funder must also be notified in a timely fashion of any changes to senior personnel or partner roles.

Reporting Requirements and Evaluations of Performance

Discussed separately below but detailed as elements of the cooperative agreements.

C. Reporting and Evaluation Requirements

The Principal Investigator must submit an annual project report to the Program Secretariat at least 60 days prior to the end of each year's current budget period. The report must include details of both progress and future plans as the information provided will serve as the basis for annual performance assessment and continued funding. To augment this review, during the course of the three-year cooperate agreement, the Program Secretariat will conduct site visits that may also involve other experts in the field. This team of visitors will prepare site visit reports, evaluating progress and highlighting any concerns. The PI will be asked to provide written responses to questions raised by the site visit panel. Within 60 days following expiration of the award, the PI also is required to submit a final project report, and, as requested, a project outcomes report for the general public, which is intended to be made available on the UAEREP website.

IX. OTHER INFORMATION

About the UAEREP and the UAE National Center of Meteorology

A. The UAE Research Program for Rain Enhancement Science (UAEREP) is a program established under the UAE National Center of Meteorology (NCM). NCM is engaged in the study of a broad range of atmospheric phenomena and processes, using methods ranging from mathematical analysis to field experimentation. Additional information about UAEREP can be found on its website and additional information about NCM can be found on its website (www.ncm.ae)

B. Technology Readiness Level Definitions
(from https://www.nasa.gov/pdf/458490main_TRL_Definitions.pdf)

Technology Readiness Level (TRL) definitions

TRL	Score	Score	Description	Score
1	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.
3	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.
4	Component and/ or breadboard validation in laboratory environment.	A low fidelity system/component breadboard 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.	Documented test performance demonstrating agreement with analytical predictions. Documented definition of relevant environment.
5	Component and/ or breadboard validation in relevant environment.	A medium fidelity system/ component brassboard 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.	Documented test performance demonstrating agreement with analytical predictions. Documented definition of scaling requirements.
6	System/sub-system model or prototype demonstration in a relevant environment.	A high fidelity 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.	Documented test performance demonstrating agreement with analytical predictions.
7	System prototype demonstration in an operational environment.	A high fidelity 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 (ground, airborne, or space).	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.	
8	Actual system completed and "qualified status" through test and demonstration.	Limited documentation available.	Documented test performance demonstrating agreement with analytical predictions.	
9	Actual system proven through successful mission operations.	The final product in its final configuration is successfully demonstrated through test and analysis for its intended operational environment and platform (ground, airborne, or space).	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.	Documented test performance verifying analytical predictions.

Program Contact Information:

The URL of the Program's comprehensive Web Portal is:

www.uaerep.ae

For specific questions about application preparation or the use of the web portal please contact:

info@uaerep.ae

For general information about the Program please contact:

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