



NCM
UAERP
National Center of Meteorology
UAE Rain Enhancement Program

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4th Cycle Solicitation
**UAE RESEARCH
PROGRAM
FOR RAIN
ENHANCEMENT
SCIENCE**



UAERP 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.

4th Cycle Solicitation

**UAE RESEARCH
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FOR RAIN
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SCIENCE**



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Submission Timeline:

Letters of Intent:

Not required but highly encouraged.

 Please submit by February 16, 2021

Pre-Proposal:

Required.

 Due Date: March 18, 2021, by Midnight Greenwich Mean Time (GMT)

Full Proposal:

Invitation Only.

 Due Date: August 26th, 2021 by Midnight GMT

I. INTRODUCTION



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

A. Program Description

The overall purpose of the UAE Research Program for Rain Enhancement Science (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:

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 other arid regions.

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, which are aimed at stimulating rainfall in arid regions.

I. INTRODUCTION



B. Program Objectives

To achieve these 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 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 within arid regions, 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 INCLUDING 2021 AREAS OF EMPHASIS



A. Research Areas

The following list provides the general research areas that are relevant to the Program:

Fundamental Understanding of Rain Enhancement

- Cloud microphysics
- Cloud dynamics and thermodynamics
- 3-dimensional characterization of clouds
- The physical chain of events leading to cloud formation and rainfall
- Aerosol (cloud condensation nuclei and ice nuclei)/cloud interactions and characterization of background aerosols
- Characterization of cloud seeding materials and delivery
- Impact of cloud seeding methods on cloud chemistry, physics and dynamics
- Nowcasting and forecasting of weather to support cloud seeding operations

Modeling and Data Analysis

- Data and analysis (comprehensive data bases, historical and new data, analysis and re-analysis of previous experiments to gain substantial new insights)
- Multiscale modeling of relevant atmospheric processes, including cloud microphysics and dynamics

Observations, Technologies, Instrumentation

- Production and characterization of cloud seeding materials
- Cloud seeding methodology assessments
- New technologies and approaches, other than cloud seeding, to stimulate rain enhancement
- Remote sensing and in-situ observation and technologies applied to rain enhancement
- Field experiments and campaigns

II. PROGRAM SCOPE INCLUDING 2021 AREAS OF EMPHASIS



B. Research Areas of Emphasis for the 2021 Competition

The UAERP initiated nine research projects between 2015 and 2017, each focused on one or more of the program's research areas of interest stated in Section II.A. This new round of research awards will therefore build on and extend the results of these projects while also leveraging new technology advances that can be applied to the field of rain enhancement. Summaries of the nine awarded projects are provided on the UAERP website (links provided here for 2015, 2016 and 2017 awardees). In addition, the report summarizing the output of the 4th International Rain Enhancement Forum (insert web link) is provided in which new areas of emphasis are recommended.

The following topics are therefore of particular interest in this funding round:

Advances in Weather Modeling and Forecasting

- Use of Artificial Intelligence techniques (e.g. unsupervised machine learning) to objectively determine variables important to cloud seedability, possibly paving the way for enhanced forecasting.
- Use of Artificial Intelligence techniques, including but not limited to machine learning combined with physics-based models to link the in-situ cloud and weather observations with stimulation of rainfall through cloud seeding or other techniques;
- Use of Ensemble Modelling (Multi-model/Multi-physics) to determine optimal cloud seeding timing and location.

Evaluation of Rain Enhancement Efficacy

- Evaluation of warm and cold phase cloud physical processes and their interactions that lead to rainfall. The utilization of cloud chamber and/or other novel technologies is desirable;
- Use of randomized inputs in statistical methods for evaluation of cloud seeding. These methods can be applied to data from field experiments, lab experiments and models;
- Innovations in Rain Enhancement Systems
- 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 rainfall and rainfall stimulation;
- Testing and leveraging models of several rain enhancement strategies and technologies to gain further fundamental understanding from the observations and experiments;
- Creation of testbeds comprising a mix of field campaign data with in-situ upper air and ground measurements.

II. PROGRAM SCOPE INCLUDING 2021 AREAS OF EMPHASIS



C. Characteristics of a Winning Proposal

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. Laboratory prototype validation is the minimum expectation and the most competitive proposals will include technology 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.

Successful proposals in this competition will have the following 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 UAERP;
- Specific outcomes as a goal - not necessarily solutions to all problems, but activities that could play a role in operational rain enhancement operations;
- A clear hypothesis on which the work plan is based;
- A scope and scale to fully justify proposed funding request;
- Sufficient expertise and experience of the project team to effectively carryout 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 critical elements:
- A management plan that integrates research, capacity building/education, and knowledge transfer activities, with inclusion of all partners and affiliates as appropriate;
- A plan for knowledge transfer through significant intellectual exchange among various types of institutions and organizations;
- A plan for social and environmental stewardship through community outreach and environmental impact assessment and mitigation, as appropriate to the project; and
- A plan for project oversight and guidance.

Proposers should carefully review projects funded in the first three cycles of the program (links are provided for 2015, 2016 and 2017 awarded projects), in addition to the report summarizing the output of the 4th International Rain Enhancement Forum. 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.

III. TIMELINE FOR THE PROGRAM FOURTH CYCLE 2021



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 2022.

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 PI has control and directs the project, with the assistance of any Co-PIs. The PI and the PI's institutions/organizations have fiscal responsibility for the award and primary management responsibility for the conduct of the proposed activities. The cooperative agreements, however, will state the nature and extent of expected Program Secretariat involvement, such as receipt of periodic reports and conduct 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 NCM. 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. z 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 facilities and infrastructure necessary to carry out the proposed project and agree to the fiscal arrangements that the Program Secretariat requires to clearly prove the ability 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. 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 Info:

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.

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. Letter of Intent: Strongly encouraged but not required

Submission of a Letter of Intent (LOI) from the PI/Lead Institution is encouraged and allows the Program Secretariat to examine the proposal ideas with respect to eligibility requirements, potentially to identify correctable issues, and to categorize the proposed research in preparation for the pre-proposal review process. LOIs are an important part of the process because they support recruitment of the most knowledgeable reviewers for the pre-proposal screening, improving the chances of appropriate and relevant review for those that submit LOIs. The LOI should not be more than 500 words and should include a brief description of the scope of work, the approach, and the potential list of participants.

Receipt by February 16, 2021.

The Letter of Intent should be filled-out online at www.uaerep.ae.

B. Pre-proposal: Required

Pre-proposals and all referenced documents must be submitted through www.uaerep.ae no later than Midnight, March 17, 2021 (GMT). The submission process requires the completion of on-online forms for the pre-proposal cover page (basic administrative information) and list of project personnel, and uploads to the web portal of the pre-proposal body and supplementary documents in pdf format. A Conflict of Interest (COI) form is also required. The template is downloadable from the web portal, and this form must also be uploaded to the portal. Once required forms have been submitted, proposers will receive an e-mail notification that their application was received.

Detailed preparation instructions are given below. Pre-proposals that are not compliant with the guidelines may be returned 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 will not be binding. However, neither the PI nor the sponsoring institution may be changed after the submission of the pre-proposal.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS



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 include Arial, Helvetica, Palatino, Linotype or Georgia), 12 point for text and 10 point for figures and tables

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 and sponsoring 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 or breakthroughs being sought. It should provide sufficient information on the research (hypotheses, concepts, methods, approaches, data measurements and analyses) and anticipated outcomes. 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 arid regions, such as the UAE. It should identify the roles and responsibilities of the PI and/or other senior leadership, if relevant, along with their respective institutions and institutional roles. 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 to 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 personnel (maximum 1-page for each individual)

For the PI, Co-PI(s) and each senior 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 role in the project and how background is relevant to the competition, 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.

Note: Should the PI not have access to Microsoft Excel, other spreadsheet conventions will be acceptable. The use of alternate formats should be negotiated directly with the Program Secretariat via the contacts listed at 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)
- Up to three keywords/phrases that pertain to your research topics, 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 26th, 2021 by Midnight GMT.

Questions relating to submittal process may be directed to Program Secretariat contacts listed in the preliminaries to this document or on the Web Portal. Once required forms have been submitted, proposers will receive an e-mail notification from the Program Secretariat that their application was received.

Full proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the guidelines below. 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 identify gaps, potential partnerships, and linkages. Information about on-going projects funded by the UAE Research Program for Rain Enhancement Science 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 (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

- Cover Page (online form)
- Executive Summary (online form)
- The following pdf. documents to be uploaded via the Web Portal:
 - Project Description
 - Facilities, Equipment and Other Resources description
 - Biographical Sketch Including Current and Pending Support
 - References Cited
 - 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:
 - Budget pages for each year and cumulative,
 - Conflict of Interest (COI) spreadsheet.

Note that the proposal will be reviewed as a stand-alone document. Links to URLs or other supplementary information may not be used anywhere in the text of the proposal to supply additional information.

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 and 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, mission and 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 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 they must also conform to the respective page requirements and limits listed.)

VI. PREPARATION AND SUBMISSION INSTRUCTIONS



A. Table of Contents (TOC):

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

B. Research Program, Approach and Methods: (Minimum 8-pages)

The PI is strongly encouraged to ensure that this section addresses the appropriate elements of the merit review criteria identified for full proposals.

1. The Research Program should include a compelling vision that clearly outlines specific 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 UAERP. 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, specific aims.
2. The research approach should include 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, demonstrate the promise of the approach. The approach and methods to be employed should be clearly articulated. Address any potential pitfalls and consider other methods and approaches.
3. The description should also specifically include 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. Major partners and their respective contributions should be identified 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. (Any potential social or environmental impacts of the project should be identified, with appropriate plans to address or mitigate them.
6. The significance of the proposed activity to impact rain enhancement science should be fully elaborated. The summary should identify milestones and timeline for completion of the project
7. Proposers should carefully review projects funded in the first three cycles of the program [web link]. 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.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS



C. Capacity Building (Minimum, 1-page)

Provide a plan on how the research is integrated with education for training a globally engaged technical and educated workforce in rain enhancement and, where relevant, related disciplines. Include impact on the region of the purchase or deployment of research infrastructure. Provide the plan for engaging other partners or sponsors to enhance regional capability and involvement. Emphasis should be on capacity building in the UAE.

D. Knowledge Transfer (Minimum, 1-page)

Discuss the impact of proposed activities on availability and accessibility of relevant data obtained or knowledge created. 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 compete in the field.

E. Management Plan (Minimum, 2-pages)

Provide a clear description of the how you plan to manage this activity. 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; mechanisms that will be used to integrate and involve various stakeholders.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS



F. Timeline (1 page)

Provide an anticipated timeline, including planned activities, project milestones, and deliverables for the three years of the award. Use of a Gantt chart to display milestones and deliverables is strongly encouraged.

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

Provide a detailed description of institutional and other resources that will be available to this 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 developments of these are part of the proposal.

This section is descriptive only, and not to be used as additional space to describe the project goals, approach, or management.

(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.

VI. PREPARATION AND SUBMISSION INSTRUCTIONS



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

Biographical sketches, including current support research projects of relevance to the program, are required for the PI, Co-PIs and all senior personnel. They should convey the 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. Provide the number of total publications by articles, book chapters, etc. Patents, copyrights or software systems developed may be substituted for publications. Only the list of up to 10 items will be used in the merit review.

(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 parts of the proposed project whether or not they are receiving financial support. Please ensure that the letters specifically address involvement in some aspect of the project, cooperation on education or documentation of permission to access facilities, or other such factors. Endorsement letters 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/phrases that pertain to the research topics, listed in order of priority
- Identification of proprietary or privileged information and/or relevant background intellectual property (if applicable)

VI. PREPARATION AND SUBMISSION INSTRUCTIONS



(8) Budget and Budget Justification (Excel spreadsheet template to be downloaded from the Program Web Portal and completed. Should the PI not have access to Microsoft Excel, other spreadsheet conventions will be acceptable. The use of alternate formats should be negotiated directly with the program general contacts listed in this document's preliminaries and at the web portal.)

Provide a budget for each of the three years, 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 dollars with an annual cap of USD \$550,000. Note that indirect costs are limited to 20%. If additional support beyond what is requested from NCM is necessary and anticipated to complete the proposed project, the PI must identify and provide documentation of the availability of those funds.

(9) Conflict of Interest Form (Excel spreadsheet)

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 must be uploaded to the portal as a completed document. The form will be the same as required for the pre-proposal. For the proposal, this may be simply an update of the form uploaded earlier, reflecting any changes in proposed personnel. If there are no changes, simply upload the previous form via the Web Portal or contact one of the program general contacts to indicate that there are no changes.

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES



A. Merit Review Principles and Criteria

The UAE Research Program for Rain Enhancement Science strives to enhance the level of research and innovation in the field. 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 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 underlying atmospheric science, and particularly rain enhancement, in arid regions; and 3) extensive knowledge of the scientific and engineering enterprise, including managing and evaluation of 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 conflicts of interest forms to indicate their assent 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 overseeing 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 to the competition. 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 have 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. Please note that each criterion is required but none, by itself, is sufficient. 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 Award 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: 30%

- 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?
- How significant are the potential contributions with regard to impact on the stated program goals?
- Is the research distinct from projects already funded through the program?
- What are the broader impacts/benefits for the field, the region, and for the UAE?

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES



Investigator/Team: 25%

- 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?
- 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?
- 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 science?

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 in the UAE?
- What is the potential 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?

Resources and Budget: 10%

- 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? (e.g., does the award leverage other research activities or funding to increase its impact?)

VII. PROPOSAL PROCESSING AND REVIEW PROCEDURES



D. Review and Selection Process

As a means to reduce the proposer's cost of proposal preparation, as well as the workload on the scientific community drawn upon for the merit reviews, the Program solicits in a multi-phase (LOI, pre-proposal, full proposal) process. Applications (both pre-proposals and proposals) submitted in response to this program solicitation will be evaluated by panel review and augmented by ad hoc review. The less-detailed pre-proposals must be recommended by the pre-proposal review panel to be invited to submit the more extensive, and time consuming, full proposal applications.

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.

A limited number of pre-proposals judged the most promising by a distinguished 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 two awards, the selected PI's and 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 2022.

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. 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 contracts are negotiated, and thus will vary depending on the requirements of the project and performers, the awards 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 a limited time of exclusive performer access for validation and initial analysis.

VIII. AWARD ADMINISTRATION INFORMATION



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 questions. Timely notification of discoveries and inventions will be required.

Allowable Uses of Award Funds

The award should be restricted to a maximum of 20% overhead for any institution, and budget items of fee or profit will not be allowed. It is important to note that the 20% 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. Ownership of such purchased property will generally be retained by the awardee, unless stipulated otherwise. 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, including process and plans, which will serve as the basis for annual performance review and for ensuring the continued level of funding. To augment this review, during the course of the three-year cooperative agreement the Program Secretariat will conduct remote or on-location 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. Within 60 days following expiration of the award, the PI also is required to submit a final project report, and a project outcomes report for the general public, which is intended to be made available on the NCM website. Failure to provide the required annual or final project reports, or the project outcomes report, will delay review and processing of any future funding increments.

IX. OTHER INFORMATION



About the UAE National Center of Meteorology (NCM)

The National Center of Meteorology (NCM) in the UAE is engaged in the study of a broad range of atmospheric phenomena and processes, using methods ranging from mathematical analysis to field experimentation.

Research projects range in size from basic studies involving individual scientists to national and international programs involving teams of scientists.

The center is concerned with:

Synoptic Meteorology, which is the analysis and prediction of weather systems, such as cyclones and their associated fronts and jet streams.

Mesoscale Meteorology, which accounts for the majority of weather phenomena directly impacting human activity. Examples of mesoscale phenomena include thunderstorms, gap winds, down slope windstorms, land-sea breezes, and squall lines.

Atmospheric Dynamics, which involves the observational and theoretical analysis of all motion systems of meteorological significance, including diverse phenomena as thunderstorms, tropical storms, jet streams, and global-scale circulations.

Atmospheric Chemistry, which examines the complexity and evolution of the atmosphere due to natural events, biological and anthropogenic activities.

Boundary Layer Research, which looks at the structure and dynamics of the lowest layer of our atmosphere that is of vital importance to the understanding of weather and climate.

Cloud Dynamics, Precipitation Processes and Storms, which concerns the organization of air motions and precipitation processes in all types of clouds, such as convection over the mountain ranges.

Cloud and Aerosol Research, which is concerned with the origins of various particles and gases in the air and their effects on the atmosphere locally.



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:
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For general information about the Program please contact:
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