
Developmental Testbed Center (DTC) Terms of Operation (TOO)

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1. OVERVIEW

The Developmental Testbed Center (DTC) is a distributed facility that engages the broad Earth System Model (ESM) community in testing and evaluation activities of new models, technologies, and techniques with the ultimate goal of accelerating the transition of promising innovations into operations. The DTC serves as a bridge between research and operations to facilitate the following:

The research community benefits from the DTC's development and support of advanced tools for conducting testing and evaluation of new ESM methods, as well as the DTC's expertise in evaluating promising innovations.

The operational community benefits from DTC testing and evaluation of strengths and weaknesses of new ESM advances prior to consideration for operational implementation.

The DTC's activities include both limited-area and global aspects of ESM.

2. PURPOSE

The purpose of the Terms of Operation (hereafter referred to as the TOO) is to define how the DTC operates, describe how the components of the DTC function, and outline the planning and execution processes that enable a smooth and coordinated operation. Elements of the TOO include: DTC vision and mission, governance and oversight, sponsors, activities, strategic direction, operating plan procedures, allocation of funding, and administration of the terms of the TOO.

All DTC participants indicated in this TOO are expected to provide a good-faith effort to fulfill their relevant roles. Current DTC sponsors include the National Oceanic and Atmospheric Administration's National Weather Service (NWS) and Office of Oceanic and Atmospheric Research (OAR), the U.S. Air Force (USAF), and the NSF National Center for Atmospheric Research (NSF NCAR); hereafter referred to DTC sponsors. The National Science Foundation (NSF) also contributes funding to support the DTC Visitor Program. Future partners may be included in the DTC, pending their concurrence with the Charter and TOO and contingent upon approval by the DTC Executive Committee (EC).

3. VISION/MISSION

DTC Vision

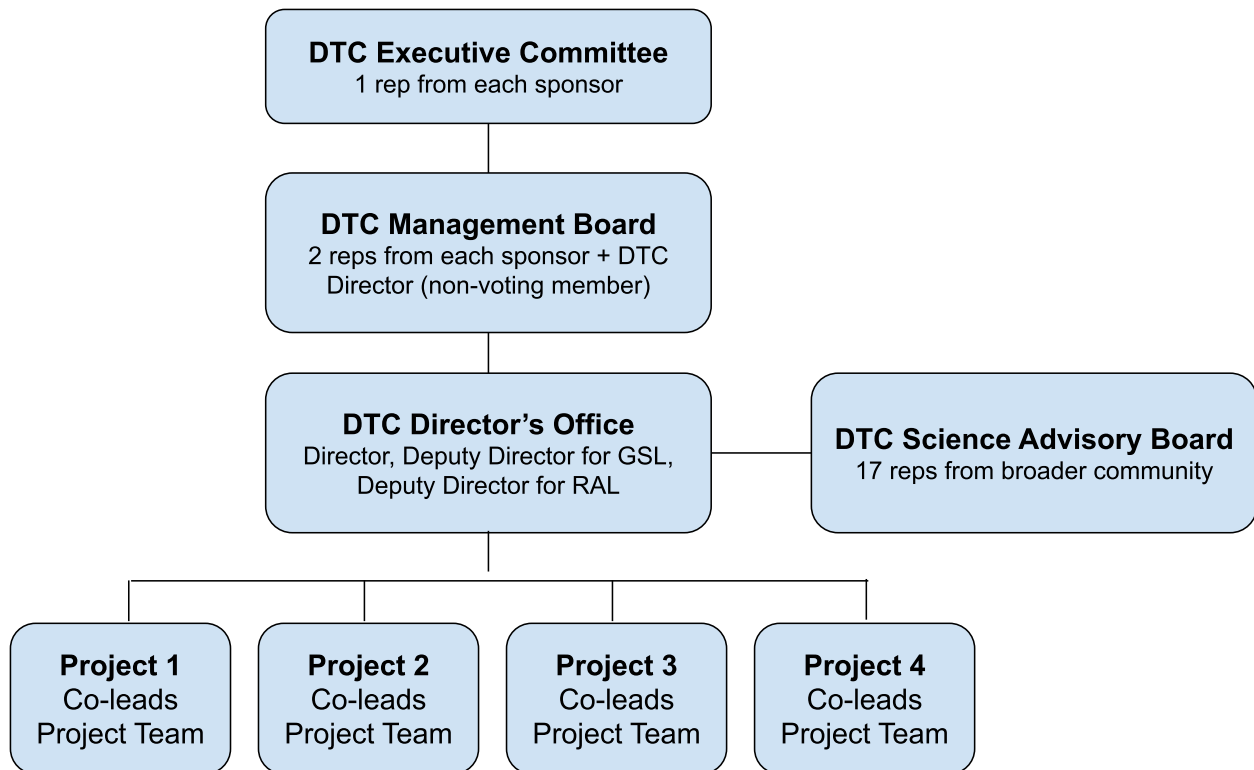
Empowering the Earth system science community with model testing and evaluation solutions.

DTC Mission

Bridge research and operations to accelerate understanding of and improvements to predicting the Earth System by advancing collaborative model assessments and indispensable software tools.

4. GOVERNANCE AND OVERSIGHT - ROLES AND RESPONSIBILITY

The operations and management of the DTC are governed by a Charter (established in 2009; revised in 2017 and 2022). DTC activities are primarily carried out at NCAR's Research Applications Laboratory (RAL) and NOAA's Global Systems Laboratory (GSL). The DTC management and operation are governed by a hierarchical structure of boards and committees whose members represent the interests of the sponsors and the broader ESM community.



Day-to-day management of the DTC is provided by a three-member team consisting of the DTC Director and Deputy Directors from RAL and GSL. The Executive Committee (EC), which is composed of representatives from each DTC sponsor, governs and provides executive oversight for the DTC, with current membership from NOAA/GSL, NOAA/NWS, NSF NCAR, and the USAF. The Management Board (MB), composed of two representatives from each of the sponsors, assists the DTC Director's Office in the preparation of the DTC operating plan and budgets that consist of various Periods of Performance (PoP), selection of code/technologies/techniques for testing, and review of proposals for multi-year testing and evaluation of projects. The DTC Science Advisory Board (SAB), consisting of Subject Matter Experts from the academic sector, research laboratories, private sector, and operational ESM communities, provides perspective on the latest ESM technologies and long-term trends. The DTC SAB also provides insight on new ESM technologies for DTC testing and DTC visitor projects. DTC management provides representation on the NOAA Testbed and Proving Ground Coordination Committee (TBPGCC).

The specific roles of the DTC Executive Committee, Management Board, Director's Office, and Science Advisory Board are described below.

4.1 Executive Committee (EC)

The EC consists of one representative from each sponsor as determined by each agency's leadership. As new sponsors join the DTC, their respective agencies will provide representation to the EC. The EC is responsible for the selection of the DTC Director. The Chair of the EC is occupied on a 2-year rotating schedule with EC members from NOAA/EMC, NOAA/GSL, NSF NCAR, and the USAF in that order. EC members from new sponsors will be added to the end of this order.

The EC provides the authority for the operation of the DTC on behalf of the participants. The EC

determines the overall policy for the DTC, consistent with these Terms of Operation. The EC has the authority to modify the TOO, as needed. On an annual basis, the EC will approve the DTC operating plan. On a quarterly basis, the EC will meet to review progress on the DTC operating plan and EC Action Items. The EC is also in charge of approving SAB member nominations. The EC will approve any annual updates made to the DTC Strategic Plan. The EC is the final authority for any unresolved management issues referred to the EC by the DTC Director, DTC Deputy Directors, or the MB. The EC will work to resolve these unresolved management issues, in partnership with the above listed management partners (Director, Deputies, MB) when appropriate. Depending on the issues, resolution may mean subgroups representing only certain sponsors; however, a high-level summary of the assessment and resolution of the issues will be shared with the EC. The EC meetings may be held in-person or be conducted as virtual meetings. The EC may call for meetings as a need arises.

4.2 Management Board (MB)

The MB comprises two representatives from each sponsor and the DTC Director, where the Director is a non-voting member. The DTC MB strives to meet bi-monthly to discuss on-going business and holds an annual meeting in the January-February timeframe to discuss the full breadth of the DTC operating plan. A quorum, defined as the DTC Director and at least one representative from each of the DTC partners, is required for the MB to conduct its meetings. The MB will notify the DTC director at least one week in advance if unable to attend the next meeting. For orders of business not directly connected to funding, the DTC Director will seek approvals from all MB members, whereas the DTC Director will seek approvals related to funding from the members affiliated with the relevant sponsor. If the required approving members are not present at a meeting, final approval will be sought via an email distributed following the meeting. MB representatives from each agency are determined by the respective agency's leadership. Each agency is permitted to determine the length of tenure of a MB representative.

The MB, in collaboration with the DTC Leadership Team, will review the DTC Strategic Plan on an annual basis and update it as needed. As part of the planning process, MB members are encouraged to suggest new projects for the DTC that are inline with EC priorities, as well as recommendations that some existing tasks are no longer warranted. MB members are expected to consult with other relevant managers and scientific staff from their sponsoring organization. These MB recommendations should be conveyed to the DTC Director according to the planning schedule for specific sponsors. Based on joint considerations and each agency's priorities, the MB will work with the DTC Director to prepare the DTC operating plan, budget, and any necessary guidance for multi-year projects. In defining the priorities and scope for the DTC's operating plan, the DTC Director will seek approval from the MB members of the sponsor funding the specific activities. If significant modifications are required for an approved activity, the DTC Director will seek approval from the MB members affiliated with the relevant sponsor. In addition to supporting the planning process, the MB is responsible for nominating SAB members and approving funding for projects under the DTC Visitor Program. All MB members will respond by email to proposals to fund a visitor project within two weeks with either approval/denial or concerns/questions. In cases where consensus is reached, approval or denial will be conveyed via email. Cases in which consensus is not reached will be discussed at the next bi-monthly DTC MB meeting. All MB recommendations are to be consistent with other guidance contained in this TOO.

4.3 DTC Director, Deputies, and Leads

The DTC Director is appointed by and is accountable to the DTC EC for management of DTC activities. The DTC Director may be removed at any time by the EC. The Director's Office is composed of the DTC Director, the DTC Deputy Director for RAL, and the DTC Deputy Director for GSL. Administratively, the DTC Director reports to and is evaluated through the chain of command in their respective center or agency. The DTC Deputy Directors for RAL and GSL are appointed by their respective leadership and are accountable for their executed DTC activities.

The DTC Director and Deputy Directors receive advice from the MB. The DTC Leadership Team, in collaboration with the MB, will review the DTC Strategic Plan on an annual basis and update it as needed. The DTC Director is responsible for developing and executing the DTC's operating plan based on prioritized inputs from the DTC sponsors and MB, and for the administration of the DTC Visitor Program.

To facilitate the execution of the DTC operating plan, the DTC Director may organize the plan into projects. The DTC Deputy Directors, with concurrence from the Director, define and refine the structure and leadership for these projects, as well as the staffing from the respective nodes (i.e., NCAR and Earth System Research Laboratories [ESRL]). The primary function of the DTC Leads is to provide vision and strategy for the projects and to coordinate the work being carried out by their node in a specific area. The DTC Leads also assist the DTC Director in the preparation of the DTC operating plan, presentations at DTC SAB, MB and EC meetings, DTC reporting and other aspects of day-to-day business. Each DTC staff member has their line of supervision in their home institution at NCAR and ESRL. The DTC Leads have no authority to assign tasks to staff across institutional boundaries.

4.4 Science Advisory Board (SAB)

The DTC SAB is a non-Federal Advisory Committee Act (FACA) body composed of Subject Matter Experts from academia, research laboratories, private sector, and operational ESM centers, where SAB members are expected to represent the broader ESM community. The SAB is tasked with gaining an understanding of the scientific activities underway at the DTC in order to provide valuable insight on the scientific relevance of those activities with respect to the current state of science. Each appointment to the SAB is valid for three years. SAB membership appointments are recommended by the MB and are subject to approval by the EC. The SAB chairperson facilitates its business and reporting. The chairperson is selected annually from the pool of SAB members who have been a member for at least one year.

Annually, the SAB provides insight on emerging ESM technologies and techniques, tools needed to support and inform the development process, and approaches for supporting a closer collaboration between research and operations. Members of the SAB are expected to consult widely with colleagues in the ESM community and consider EC priorities and the role of the DTC as a NOAA testbed with respect to possible near-term and longer-ranging scientific advances that should be considered by the DTC. The SAB considers reports on the work ongoing at the DTC, the input of invited experts, and other guidance from the members when compiling their recommendations. External reviewers for proposals submitted to the DTC Visitor Program are drawn from the SAB based on their expertise. The SAB meets annually to conduct business, typically in the August/September time frame. The DTC Director may also schedule other meetings with the SAB to provide updates on outcomes of the planning process

and how the DTC incorporated their recommendations into their planning.

Federal agencies will not request or accept consensus opinions, advice or recommendations from the SAB. Instead, SAB members will be invited to provide their individual insight on the scientific direction and merits of DTC activities.

5. DTC SPONSORS

Current DTC sponsors include the NWS, the OAR, the USAF, and the NSF NCAR. The NSF contributes funds to supplement the DTC Visitor Program but does not participate as a full DTC sponsor (i.e., NSF does not have representation on the EC or MB). Other potential partners may be included in the DTC, contingent upon approval by the EC, as noted above. New sponsors will be permitted to assign MB and EC members.

6. DTC ACTIVITIES

The DTC is responsible for the following activities:

- Testing and evaluation of methodologies for improving ESM, using modeling systems that are as close as practicably possible to current and/or future operational systems of the sponsors. The scope (regional vs. global, forecast model vs. assimilation system) of DTC activities is intentionally left undefined to allow the focus of activities to shift from year to year.
- Development and support of select ESM components (e.g., the Common Community Physics Package [CCPP] and the advanced Model Evaluation Tools [METplus]) and providing the tools and expertise needed for evaluating promising new technologies.
- Conducting a visiting scientist program. Pending funding availability and proposal acceptance via procedures, the DTC provides support for scientists to collaborate with the DTC to test new ESM technologies and techniques that could potentially improve existing operational ESM systems.
- Coordinating DTC testing and evaluation and related activities in coordination with the Earth Prediction Innovation Center (EPIC) Program Office to maximize the performance and effectiveness of both organizations.

An increased scope of DTC activities is allowed, subject to approval by the DTC EC, as described above. Changes in scope will be reflected in changes in this TOO.

7. STRATEGIC DIRECTION

The DTC will maintain a 5-year Strategic Plan, to be reviewed annually, that describes strategic goals in the DTC's overall mission of testing and evaluation for sponsoring organizations. The Strategic Plan will align with the DTC's Mission and Vision and other Plans (e.g., the 5-year [Implementation Plan for NOAA's Environmental Modeling Center](#)), and will guide the development of the DTC's operating plan.

8. OPERATING PLAN PROCEDURES

Planning for the DTC occurs on an annual basis, with each year's activities defined through an operating plan that is consistent with the DTC Strategic Plan. Multi-year plans may be developed by the DTC leadership team and they will be reviewed and refined on an annual basis. The operating plan is prepared by the DTC Director, with input from the Deputy Directors and Leads. Each activity

has assigned Leads responsible for developing the proposed work plan and for ensuring the successful execution of the approved work plan. The operating plan is reviewed, revised, and endorsed by the MB before it is submitted to the EC for approval. The EC is responsible for approving the operating plan. Given the variety of funding cycles, updates on the scope of work will be provided at each bi-monthly MB meeting and the MB will discuss, request revisions and endorse as appropriate. The DTC is responsible for executing the operating plan.

8.1 Initiation of New Proposed Activities for the Annual Cycle

DTC sponsoring agencies (NOAA, NSF NCAR, and USAF) may have different funding cycles or even multiple funding cycles within a single sponsoring agency depending on the funding lines. The DTC Director establishes an approach to the annual planning process based on the various sponsoring agency's funding schedules to ensure smooth execution of all DTC activities.

DTC management seeks preliminary guidance from sponsors with regards to their funding availability and priorities for the coming year. MB members are encouraged to propose projects to the DTC Director's Office for consideration. The timing for when these proposed projects should be sent to the DTC Director's Office depends on the funding cycle of the relevant sponsor.

The DTC Leads develop initial draft proposals for activities. These proposals are shared with external partners from the appropriate operational centers and research labs (i.e., EMC, ESRL, NSF NCAR and USAF), and the proposals are revised by the DTC Leads in response to the feedback received. If requested by the sponsor, the draft proposal for activities funded by that sponsor may exceed the anticipated funding, with a goal of providing MB members the flexibility to choose priorities and/or in case additional funds become available.

8.1.1 NSF NCAR Base

The planning schedule for NCAR Base funding begins in July when target funding is known. With guidance from DTC leadership and NSF NCAR MB and EC members, DTC Leads develop initial draft proposals for NSF NCAR-funded activities that support NSF NCAR's mission. When significant collaboration is proposed, these draft proposals are shared with partner NSF NCAR labs for feedback and revision. The resulting plan for NSF NCAR Base funding, with revisions as necessary, is then approved by the NSF NCAR MB and EC members in time for an October start.

8.1.2 General NOAA Base

The planning schedule for NOAA Base funding begins in October when a target funding amount is provided by the GSL Director. To kick off the planning, the DTC Director consults EC priorities and seeks guidance from NOAA MB members on executing under those priorities for the coming year. Based on this guidance, the DTC Director's Office works with DTC Leads to prepare a draft proposal before the end of November that includes a detailed description and associated budget for each proposed activity. The scope of this proposal is usually encouraged to exceed the anticipated funding (e.g., by 20%). The draft proposal for NOAA Base-funded activities is then reviewed by the DTC MB for their annual January-February meeting, where potential revisions and priorities are discussed. DTC Leads then revise their proposals as necessary in response to MB feedback and the revised proposal is distributed to the NOAA MB members for approval. The final prioritization and approval of activities funded by NOAA Base funds is the

responsibility of the NOAA MB members. If the final funding amount is not known until after the Annual DTC MB meeting, the DTC Director presents a proposal to the NOAA MB members for approval that matches the final funding amount. This proposal takes into account the prioritization discussed during the annual meeting. Work on NOAA Base-funded activities begins in early May.

8.1.3 GSL Base

Planning for annual GSL-specific DTC contributions is conducted in parallel with NOAA Base funding preparations for the planning period. Funding availability is generally determined at the same time as for NOAA Base funds, and is communicated to DTC management by the GSL Director. Afterward, discussions take place among GSL management, the DTC Deputy Director for GSL, and DTC Leads at GSL to determine research topics of interest specific to the needs and goals of GSL and the DTC. GSL management ultimately determines the scope of work and instructs the DTC Deputy Director for GSL or Leads with the appropriate subject matter expertise to construct a draft statement of work. Following approval from GSL management, the work proposal is presented at the Annual DTC MB meeting alongside the proposal for NOAA Base funding, where potential modifications are discussed and then ultimately approved by GSL management, with work beginning in early May.

8.1.4 NOAA projects and supplementals

In addition to its annual NOAA Base allocation, the DTC may be invited to contribute proposed activities to NOAA-funded multi-institutional projects and/or project plans for supplemental funding. DTC participation in such funding opportunities serve as a means to accelerate the development of critical tools to support testing and evaluation or expand the impact of DTC testing and evaluation activities. The description of these proposed activities will be provided to DTC MB members for review and feedback, but the ultimate funding decision lies with the appropriate NOAA program manager. The timing of this planning and the period of performance will depend on the schedule for the particular funding line.

8.1.5 NOAA Notice of Funding Opportunity (NOFO)

NOAA periodically releases NOFOs for competitive grant applications with a scope that is consistent with the DTC's mission. These NOFOs also serve as a means to accelerate the development of critical tools to support testing and evaluation or expand the impact of DTC testing and evaluation activities. When appropriate, DTC staff affiliated with NCAR and/or Cooperative Institutes can submit proposals to these NOFOs. Prior to developing a proposal, the project leads need to request approval from the DTC management team. DTC management will carefully consider whether the proposed project would be consistent with the DTC Strategic Plan. Collaborative proposals that include both nodes are strongly encouraged, but not required.

8.1.6 U.S. Air Force

USAF Air Combat Command Weather Requirements Division (A5W) collects and validates weather requirements from the USAF, the Army, the Intelligence Community, and others. Weather requirements are shared with USAF Materiel Command Life Cycle Management Center (LCMC) Digital Directorate, Weather Division (HBAW) for technical solutions and contracting. Requirements, technical solutions, and implementation are defined in consultation with 16th Air Force 557th Weather Wing (557WW), the operational center of Air Force Weather (AFW), when appropriate. A5W, HBAW, and 557WW provides DTC management with a Statement of Objectives (SOO) outlining the desired scope of work defined in terms of base operations and

options in the spring timeframe for the coming three years. The DTC management and Leads then develop a Statement of Work and budget in response to the SOO with base operations and options defined for three years, and HBAW executes the contract to the DTC. Options are executed based on need, funding, and availability of DTC staff. Funding is assessed and revised annually in late Spring for the next five fiscal years (beginning every Oct 1) through the USAF Weather budgeting process (“cost trades”), assuming Congress has passed a defense budget. The period of performance for the annual base effort normally starts in February. Options may be funded at different times during the year depending on availability of funds, availability of DTC staff to work the option, needs of the Air Force, etc.

8.2 Prioritization of Tasks

The DTC MB members are asked to review and suggest revisions to all proposed activities. The MB members representing a sponsor have complete oversight on the use of the funds of that particular sponsor. NOAA MB members set the priorities for how NOAA Base funds are used to support DTC activities. Priorities for NOAA funds from other sources are set up according to the statements of work associated with these sources. USAF MB members set the priorities on the use of USAF funds for the DTC activities. NSF NCAR MB members set the priorities for how NSF NCAR funds are used to support DTC activities. GSL MB members represent GSL management and direct priorities for GSL Base funds. The discussion and deliberation of the full MB provides an opportunity for collaboration among sponsors, and to ensure all key functions and key activities of the DTC are funded. It is recognized that the priority of different sponsors may change annually, and adjustments are made each year accordingly.

8.3 Establishment and Tracking of Deliverables Funded By Multiple Sponsors

Activities that are funded by multiple sponsors are broken into subtasks. A clear description of each specific subtask that is funded by one sponsor and distinct separate deliverables associated with that subtask are documented. There is no 'mixing' of sub-tasks or deliverables among sponsors. This approach allows the sponsors to collaborate on a broader activity (and therefore leverage each other), while maintaining the integrity and accountability of individual funding lines.

8.4 Procedure for Disagreement Among Sponsors Regarding Task Prioritization

The DTC MB is the main governing body to organize the activities prioritization according to the priority of each sponsor. The aggregate priority of the MB members of a particular sponsor sets the prioritization for the use of that sponsor's funds. All issues related to funding and prioritization are expected to be resolved by the MB. Unresolved issues will require involvement of the DTC EC. If there is no closure on the use of a particular sponsor's funds, the sponsor representative on the EC will be involved in resolving the dispute. If some key functions of the DTC are not funded, then it will be elevated to the full DTC EC for resolution.

9. ALLOCATION OF FUNDING

DTC sponsors are responsible for DTC administrative expenses that arise from, or are otherwise related to, their participation in DTC activities. Agencies funding the DTC are expected to sustain it at a level necessary to fulfill its purpose, contingent on the availability of resources.

9.1 Separation of Funding

Though discussions of relative priorities are encouraged in the MB, commensurate with federal regulations, each sponsor will be responsible for making decisions on how funding from their agency will be allocated. No commingling of funding is permitted, according to regulation. If multiple sponsors mutually agree that a DTC project should be funded and it requires more funds than one agency can provide, the task will be split into separate components (subtasks) paid for by respective agencies. The work tasked by each agency will be in close proportion to the amount of funding, and separate deliverables may be established by each sponsor according to their discretion.

9.2 Management Costs

DTC management overhead will be shared between agencies, in proportion with the total amount of funding provided by each agency.

10. DTC ADMINISTRATION

10.1 Staff Supervision

Performing organizations are responsible for their own staff supervision. When staff are not performing to DTC Lead expectations for meeting deliverables, the Lead should work first through the relevant node Deputy Director. If issues cannot be resolved between a Lead and the relevant Deputy Director, the issue should be raised to the DTC Director, who will consult with the Director of the institution with the staff issue.

10.2 Period of Performance

The period of performance depends on the sponsor. A No-Cost Extension at the end of a performance period may be granted if regulations permit to complete unfinished tasks. Sponsor requests for additional work not specified in an approved operating plan should be vetted through the DTC Director and Deputy Directors before committing resources. This ensures all parties understand impacts on operating plan activities, and allows Deputy Directors to reject resource commitment if the risks to funded activities are too great.

10.3 Remaining Funds at the End of a Period of Performance

Funds remaining at the end of a DTC period of performance (PoP) are subject to review by the DTC Director. For multi-year projects, funds will remain with the relevant project if regulations permit a No-Cost Extension. If sizable underspending is anticipated for a project, MB members will be provided with projected carryover amounts during the annual planning process, with the potential to reduce new funding allocated to the project. For projects that are concluding, the DTC Director may recommend a No-Cost Extension to the

MB to complete tasks that are not completed by the end of the PoP. Completion of unfinished projects is the first priority for use of unspent funds. The DTC Director's Office will assess whether funds will remain after task completion and if regulations permit a No-Cost Extension, these funds will be incorporated into the planning for the next PoP.

11. TERMS OF THE TOO

The TOO will be revisited on an annual basis by the MB and approved by the EC. The TOO may be modified as circumstances warrant.