

Proposed Amendment to the Fifth National Climate Assessment (NCA5)

Implausible High-Emission Scenario Dependence, Gold Standard Science, and Observational Grounding

A PRODUCT OF THE U.S. GLOBAL CHANGE RESEARCH PROGRAM

Proposed Amendment Determination

NCA5 is amended to clarify that results dependent on RCP8.5, SSP5-8.5, or equivalent high emissions pathways should not be used as expected, baseline, business-as-usual, likely, central, or policy-relevant federal planning futures. These pathways are now treated in this Amendment as implausible scenario outputs.

August 2026

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1. Executive Summary

This proposed amendment corrects the interpretation and federal use of the Fifth National Climate Assessment (NCA5) findings that depend upon Representative Concentration Pathway 8.5 (RCP8.5), Shared Socioeconomic Pathway 5-8.5 (SSP5-8.5), or equivalent high emissions pathways. The correction is necessary because the relevant scenario literature including the Intergovernmental Panel on Climate Change (IPCC), NCA 5's own scenario discussion, and Executive Order 14303, *Restoring Gold Standard Science*, all point to the same conclusion: RCP8.5-type outcomes do not represent plausible policy-relevant baseline futures and should not be used to frame expected, likely, central, or business-as-usual conditions for federal decision making. [1,2,3]

The core deficiency is not merely that climate policy, renewable energy deployment, efficiency improvements, technological innovation, or natural gas substitution altered emission trajectories after these scenarios were developed. The deeper deficiency is structural. RCP8.5 and related pathways depend upon the combination of assumptions regarding coal expansion, energy intensity, fossil resource availability, population growth, economic development, and technological change that have long been recognized as extreme relative to observed trends and mainstream projections. The peer-reviewed literature has repeatedly ruled that the coal-intensive development pathway required to achieve RCP8.5-type forcing levels is unlikely and that treating this scenario as business-as-usual future distorts both climate-risk assessments and policy relevance. [4,5,6,7,8]

Importantly, the high forcing pathways underlying RCP8.5 were not originally developed as forecasts of the most likely socioeconomic future. The Representative Concentration Pathways were designed primarily to provide a range of radiative forcing outcomes for climate-model experiments. The 8.5 W/m² pathway was included to ensure that climate-model experiments encompassed the upper range of forcing outcomes identified in the

scenario literature. Those narratives generally required assumptions regarding population growth, fossil fuel consumption, coal expansion, energy demand, and technological development that were recognized even at the time as representing the upper edge of plausibility rather than a central expectation of future development. Consequently, the scientific utility of RCP8.5 as a sensitivity testing scenario does not justify its use as a policy-relevant baseline or expected future. [4,5,6,9,10]

This proposed amendment is also necessary to align NCA5 with Executive Order 14303, *Restoring Gold Standard Science*. The executive order directs federal agencies to be transparent regarding assumptions and scenario likelihood, to communicate uncertainty, to employ a weight-of-evidence approach, and to avoid reliance on highly unlikely or overly precautionary assumptions in decision making unless otherwise regarded by law or directly relevant to the agency action. A federal assessment that presents impacts derived primarily from implausible high emissions pathways as ordinary planning futures is inconsistent with these principles. [1,3]

The proposed amendment further clarifies that the determination regarding RCP8.5, SSP5-8.5, and related legacy pathways should not be interpreted as an endorsement of all successor scenarios currently under development for assessment activities, including those associated with the IPCC Seventh Assessment Report (IPCC AR7). Scenario plausibility depends on the credibility of underlying assumptions rather than the age or label of the scenario framework. Future federal assessments should evaluate all emissions pathways—including replacement scenarios—on the basis of empirical support, transparency, consistency with observed demographic, technological, economic, and energy-system trends, and relevance to the policy questions under consider. No scenario should be presumed suitable for policy relevant planning merely because it supersedes an earlier framework.

Accordingly, this proposed amendment establishes three immediate corrections. First, RCP8.5, SSP5-8.5, and equivalent high pathways should not be used as expected, likely, baseline, business-as-usual, central, or policy-relevant planning futures. Second, NCA5 findings that depend substantially upon those pathways shall be clearly identified as outcomes associated with implausible high-end scenario assumptions and should not be presented as representative projections without appropriate context, comparison, plausible alternatives, and evaluation against observational evidence. Third, future federal climate assessments shall evaluate all emission scenarios according to their plausibility, transparency, empirical grounding, and fitness for purpose, rather than assuming that newly developed scenarios are inherently appropriate for policy, relevant planning, or decision making.

2. Proposed Amendment Text

This proposed amendment would be added to NCA5 as an interpretive correction and clarification. It applies to all NCA5 statements, figures, tables, traceable accounts, regional summaries, public summaries, derivative federal communications, and federally funded assessment-support products that rely on RCP8.5, SSP5-8.5, or equivalent high emissions pathways.

2.1 Determination

The Office of Science and Technology Policy (OSTP) and the Global Change Research Program (GCRP) determine that RCP8.5, SSP5-8.5, and equivalent high emissions pathways do not constitute plausible baseline futures for federal planning, policy analysis, or risk assessment.

This determination is based not merely on the divergence between observed emissions trends and those projected under these pathways, but on the underlying assumptions required to generate the associated climatic forcing levels. The scientific literature has increasingly concluded that achieving radiative forcing levels equivalent to RCP8.5 or SSP5-8.5 would require a combination of demographic, economic, technological, and energy-system developments that are inconsistent with current observations, mainstream projections, and present understanding of global energy markets. [2,4,5,6,7,8]

Specifically, these pathways generally rely upon assumptions including sustained growth in global coal consumption, exceptionally high fossil-fuel dependence, elevated energy intensity, large future increase in primary energy demand, limited technological substitution, and socioeconomic trajectories that collectively produce emissions substantially above those projected under most contemporary assessments. Multiple studies have concluded that such assumptions represent upper bound exploratory conditions rather than realistic reference futures for policy analysis. [4,5,6,7,8]

The determination further recognizes that the Representative Concentration Pathways were not originally developed as forecasts of the most likely socioeconomic future. Rather, the RCP framework was designed to provide a range of radiative forcing trajectories for climate-model experimentation and intercomparison. The 8.5 W/m² pathway was included to represent the upper range of forcing outcomes identified in the scenario literature and to facilitate analysis of climate system sensitivity under extreme forcing conditions. Socioeconomic pathways capable of producing those forcing levels were subsequently developed and generally required assumptions regarding population growth, energy demand, fossil-fuel utilization, and technological development that were recognized as representing the upper edge of plausibility rather than central expectations of future development. [9,10]

Accordingly, OSTP and GCRP find that the continued presentation RCP8.5 and SSP5-8.5 or equivalent high emissions pathways as expected, likely business-as-usual, baseline, central, or policy-relevant planning futures is inconsistent with the best available scientific evidence regarding scenario plausibility and violates E.O. 14303, *Restoring Gold Standard Science*. [3]

This determination applies to the use of scenarios in federal assessments, planning documents, regulatory analysis, vulnerability assessments, adaptation planning, and other decision-support activities. It shall not be interpreted as an endorsement of any successor scenario framework. Future scenarios shall be evaluated according to their plausibility, transparency, empirical grounding, and fitness for purpose, regardless of whether they are legacy scenarios or newly developed pathways.

High forcing scenarios may remain useful for model intercomparison, sensitivity testing, and exploratory research. However, such scenarios should not be presented as representative expectations of future conditions absent clear justification and disclosure of their assumptions, limitations, and likelihood.

2.2 Interpretation Guidelines

1. Any NCA5 result based on RCP8.5, SSP5-8.5, or equivalent high forcing should be treated as an implausible-scenario output and should not be used as a policy, planning, regulatory, public-communication, or grant-making premise unless independently reproduced under a plausible current-policy, or updated scenario and evaluated against observations.
2. Any NCA5 figure, map, table, caption, callout, chapter highlight, regional summary, or impact statement that presents a high scenario result should carry the scenario label and the implausibility caveat in the same sentence, caption, box, or summary where the projected impact is communicated.
3. Severe late-century claims involving damages, health effects, infrastructure costs, ecosystem disruptions, sea-level impacts, agricultural impacts, regional extremes, labor effects, migration, or adaptation costs should not be used in policy-making unless scenario dependence is disclosed, a plausible comparator is provided, and the claim is compared with observations.
4. RCP8.5, SSP5-8.5, or equivalent pathways are not policy relevant, and should not be used in authoritative federal work products.
5. Research-only technical use of high pathways does not make the resulting impact estimate policy-plausible.

2.3 Standard Amendment Language

Clarification for affected NCA5 claims

This result depends on RCP8.5, SSP5-8.5, or an equivalent high emissions pathway that is no longer policy-plausible as a central federal planning future. It should not be interpreted as expected, likely, baseline, business-as-usual, representative, or central for federal policy-making unless separately reproduced under a plausible scenario, transparently justified, and evaluated against observations.

3. Scientific Basis

3.1 Updated ScenarioMIP-CMIP7 context

The most current basis for this proposed amendment is the Scenario Model inter comparison project for CMIP 7. ScenarioMIP-CMIP 7 states that the high emissions level represented in CMIP6 by SSP5-8.5 have become implausible. It further states that the new CMIP7 high emission scenario is expected to produce forcing below SSP5-8.5, even under assumptions that include rollback of current mitigation policies. [2]

That update is directly relevant to NCA5 because NCA5 defines the high emission scenario as RCP8.5. For CMIP5 and SSP5-8.5 for CMIP6. The CMIP 7 scenario update therefore changes the scientific context in which NCA5 high scenario results should be interpreted. The relevant question is not whether the scenarios were useful when developed, but whether outputs from now implausible pathways should remain operative as policy relevant federal planning assumptions.

3.2 Structural assumptions

The older scenario literature remains relevant because it explains why RCP8.5 and SSP5-8.5 were increasingly recognized as unsuitable reference scenarios long before the recent ScenarioMIP-CMIP7 update. The issue is not simply that observed emissions subsequently diverged from projected emissions. Rather, the pathways were constructed upon the combination of assumptions that collectively represented an extreme future development trajectory rather than a central expectation of future socioeconomic conditions. [2,9,10]

RCP8.5 was designed as the upper-end forcing pathway within the Representative Concentration Pathway framework. The pathway was characterized by high population growth, relatively slow economic development, limited technological advancement, slow improvements in energy intensity, high energy demand, increased reliance on fossil fuels, and the absence of climate policies. The purpose of the scenario was to provide a high forcing outcome from climate-model experimentation and intercomparison across a broad range of possible future climate conditions. Subsequent Shared Socioeconomic Pathway narratives were developed to generate emission trajectories capable of producing similar forcing levels. [9,10]

The significance of these assumptions became increasingly apparent as researchers examined the energy system requirements necessary to achieve our RCP8.5 forcing levels. Multiple studies identified extraordinarily large future coal consumption as a central driver of the pathway. These analyses found that achieving RCP8.5-level emissions would require sustained global expansion of coal use at rates substantially exceeding contemporary energy outlook and inconsistent with observed trends in emerging markets, technology deployment, and fuel substitution. The resulting pathway depended not on a continuation of observed development patterns, but on a combination of demographic, technological, and energy-system assumptions that increasingly diverged from empirical evidence. [4,5,6,7,8]

The historical development of the Representative Concentration Pathway framework further reinforces this conclusion. The RCPs were defined by radiative forcing targets selected for climate-model experimentation rather than derived from forecasts of the most likely socioeconomic future. Socioeconomic narratives capable of generating those forcing levels were developed subsequently. Consequently, the scientific utility of RCP8.5 as an upper-bound forcing experiment does not establish its suitability as a baseline scenario for policy-relevant planning or risk assessment. [9,10]

These findings are not the principal basis for this proposed amendment. The primary basis remains the current ScenarioMIP-CMIP7 determination that forcing levels comparable to SSP5-8.5 are no longer considered plausible, even under assumptions that include rollback of currently implemented climate policies. However, the earlier literature provides important context by demonstrating that concerns regarding the structural assumptions underlying RCP8.5 and related pathways predated the CMIP7 update and were rooted in the assumptions required to generate the scenario rather than solely in subsequent emissions trends.

Accordingly, the issues identified in this proposed amendment should not be interpreted as unique to legacy pathways such as RCP8.5 or SSP5-8.5. The future scenario frameworks, including successor scenarios developed for subsequent assessment activities, should be evaluated with equal rigor regarding the plausibility of their underlying assumptions. Scenarios that depend upon extreme or weakly supported assumptions regarding population growth, fossil-fuel expansion, energy demand, technological development, economic trajectories, or resource availability should not be presumed suitable for policy-relevant planning merely because they are newly developed or incorporated into future assessment frameworks.

Federal agencies should therefore imply continuing scrutiny to the empirical grounding, transparency, and policy relevance of all emission scenarios used in assessments, planning documents, and decision-support activities.

3.3 Gold Standard Science

E.O. 14303 establishes the governing scientific standard for federal use, interpretation, and communication of scientific information. It requires transparency, reproducibility, communication of error and uncertainty, skepticism of assumptions, and a weight-of-evidence approach. It also directs agency employees to be transparent about the

likelihood of assumptions and scenarios, and states that highly unlikely and overly precautionary assumptions and scenarios should only be relied upon in agency decision-making where required by law or otherwise pertinent to the agency action. [3]

This Executive Order specifically identifies RCP8.5 as a worst-case climate scenario based on highly unlikely assumptions, including end-century coal use exceeding estimates of recoverable coal reserves, and states that scientists have warned that presenting RCP8.5 likely is misleading. This proposed amendment applies that standard to NCA5. The issue is not merely a labeling problem. If a severe impact claim depends on an implausible scenario, the claim cannot be used as an operative federal planning result unless it survives under a plausible scenario and is evaluated against observations. [3]

3.4 Observational constraints

Scenario correction should be paired with observational review. Scientific statements should begin with observational metrics. Periods of record, data sources uncertainty and model performance checks before presenting future projections. This approach separates observed change from projected change and allows policy relevant conclusions to be tested against the best available empirical record.

For example, recent work evaluating temperature extreme claims against long observational records illustrates the type of review that should be used.[11] The point is not that every observational study resolves every assessment question. The point is that policy relevant projections should be disciplined by observations, transparent assumptions, and explicit tests of whether modeled outcomes are consistent with the observed metric being assessed.

3.4 Countervailing considerations

This proposed amendment does not claim that rejecting RCP8.5, SSP5-8.5, or equivalent high pathways eliminates global warming or removes all climate risk. The narrower and more important point is that federal policy documents must not use implausible high-emission pathways as if they were expected, likely, business-as-usual, central, or policy-relevant planning futures. Warming and risk claims that remain under plausible current-policy, intermediate, or updated high scenarios should be presented on their own terms, with observations, uncertainty, and assumptions clearly disclosed.

Some have argued that the IPCC and other assessments still show warming under pathways other than SSP5-8.5. That is true, but it does not rescue NCA5 claims whose magnitude, timing, or severity depends on an implausible high-emission pathway. The correct response is to separate observed change from projected change, then re-run or restate policy-relevant claims under plausible scenarios. If the severe impact claim materially weakens, changes timing, or disappears under plausible assumptions, NCA5 should not communicate the high-emission result as an operative federal planning conclusion.

Another objection that has been raised is that high-emission pathways can be useful for exploring uncertainty. Technical usefulness is not the same as policy relevance. E.O. 14303 requires transparency about assumptions, likelihood, uncertainty, and the weight of evidence. A model run based on a pathway now identified as implausible may be useful for narrow research comparison, legacy-model continuity, or bounding physical sensitivity, but that limited technical use does not make the associated impact estimate appropriate for policy-making, public risk communication, grant prioritization, regulatory analysis, or infrastructure planning.

The scope of this correction is therefore technical and targeted. NCA5 findings may continue to inform federal work when they are observationally grounded or reproduced under plausible scenarios. NCA findings that depend on RCP8.5, SSP5-8.5 or equivalent high pathways require clear clarification before use in policy-making, planning, grant review, public communication, or derivative assessment products.

4. Corrections to NCA5 Claims

This section identifies specific NCA5 claim categories that need correction in light of this assessment. The purpose is to state, in narrative form, where high-emission scenario dependence materially affects NCA5 interpretation and where the proposed amendment should be applied before NCA5 is used for federal policy-making, planning, grant review, public communication, or derivative assessment products.

4.1 Report-wide scenario framing

The NCA5 front matter and the Guide to the Report define the High Scenario as RCP8.5 in CMIP5 and SSP5-8.5 in CMIP6, while stating that scenarios are not predictions and likelihoods are not assigned. That caveat is insufficient under current evidence and the Gold Standard Science standard. The front matter should be amended to state affirmatively that RCP8.5 and SSP5-8.5 are not policy-plausible baselines and that high scenario outputs should not be used as central federal planning futures.[1][2][3]

4.2 Climate Trends and timing of warming thresholds

Chapter 2 uses SSP5-8.5 to communicate high-end warming and timing of global temperature thresholds, including the projected timing of reaching 2°C under the high scenario. Such timing is pathway-sensitive and should not be used as a central federal planning benchmark unless reproduced under a plausible scenario and supported by observations.[1][2]

4.3 NCA5 Chapter 3 caveat not carried forward

Chapter 3 acknowledges that SSP5-8.5 is no longer plausible without substantial departure from current trends in energy efficiency, technological development, and deployment of low-carbon energy sources. However, the basis for questioning the plausibility of SSP5-8.5 extends beyond those factors alone.

The broader scenario literature has identified multiple structural assumptions underlying RCP8.5 and SSP5-8.5 that warrant caution, including exceptionally high fossil-fuel consumption, large future coal utilization, sustained growth in energy demand, demographic assumptions that differ from observational population trends, and combinations of economic, technological, and energy-system developments that are increasingly difficult to reconcile with contemporary evidence and mainstream projections. These concerns arise from the internal assumptions required to generate the pathway and are not solely dependent upon the continuation of any particular climate, energy, or regulatory policy.

Accordingly, the Chapter 3 discussion should not be interpreted as implying that reversal of current renewable-energy or efficiency trends would, by itself, restore SSP5-8.5 as a plausible policy-relevant planning scenario. The question is therefore not whether a particular policy pathway could increase future emissions, but whether the full set of assumptions required to achieve SSP5-8.5 remained scientifically credible as a baseline future.

The Chapter 3 caveat is not consistently carried into regional impact chapters, captions, public summaries, or claims regarding damages, health, energy, agriculture, ecosystems, infrastructure, and adaptation costs. This proposed amendment therefore makes the Chapter 3 caveat operational across the report and clarifies that findings dependent upon SSP5-8.5 or equivalent high emissions pathways should be interpreted as conditional outcomes associated with an implausible high-end scenario rather than expected future conditions. [1]

4.4 Energy infrastructure and electricity demand

Chapter 5 includes energy-sector claims such as transmission and distribution expenditures rising substantially by late century under RCP8.5 and maximum summer cooling demand increasing under RCP8.5. These claims can influence utility planning, infrastructure investment, grid reliability analysis, and public communication. They should not be used as expected or central planning estimates unless reproduced under plausible pathways and compared with observed demand, technology, population, and adaptation trends.[1]

4.5 Air quality and human health

NCA5 includes air-quality and health claims tied to RCP8.5, including ozone and pollen effects and a severe Valley fever projection. Such claims are policy-salient because they can influence health planning, environmental regulation, worker-safety framing, and public risk communication. Where those values depend on RCP8.5 or equivalent pathways, they should not be cited as expected health burdens without plausible-scenario replication and observational context.[1]

4.6 Economic damages and adaptation costs

NCA5 economic and regional chapters include damage estimates, utility-planning examples, adaptation-cost comparisons, and infrastructure-cost claims tied to RCP8.5 or equivalent high pathways. Economic outputs can become de facto policy baselines even when labeled as scenario results. This proposed amendment applies

separation of plausible baseline damages from implausible-scenario outputs, including clear disclosure of discounting, socioeconomic assumptions, adaptation assumptions, and scenario dependence.[1]

4.7 Regional impact narratives

Several NCA5 regional chapters rely on RCP8.5, SSP5-8.5, or equivalent high pathways for highly salient impact claims. Examples include Southeast economic damages and agricultural yield claims, U.S. Caribbean warming and rainfall reductions, Midwest health and infrastructure impacts, Northern Great Plains severe-convection and drought claims, Southern Great Plains extreme heat-day projections, Northwest warming, sea-level, and wildfire-smoke health claims, Southwest infrastructure, labor, health, and ecosystem claims, Alaska warming and sea-ice claims, and Pacific island fisheries and migration-related impacts. They should be amended so that plausible-scenario findings and observed trends are distinguished from implausible high-emission outputs.[1]

4.8 Coastal and sea-level claims

NCA5 coastal and regional chapters use high-end sea-level and high emissions language in ways that can blur observed local sea-level trends, plausible planning scenarios, and low-likelihood ice-sheet outcomes. Sea-level planning requires local observations, vertical land-motion context, plausible scenario ranges, and explicit treatment of low-likelihood components. Implausible high-emission pathways should not be used as ordinary coastal-planning futures.[1]

4.9 Derivative products and communications

Any federal materials, web summaries, graphics, speeches, grant solicitations, technical support documents, and agency communications that use NCA5 high-emission outputs should be viewed in light of this proposed amendment.

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