

Attachment 4: Staff Guidance for Cumulative Analysis for New Reactor Environmental Impact Statements COL/ESP-ISG-026

Background

Council on Environmental Quality regulations define cumulative impacts as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. See 40 CFR 1508.7. The U.S. Nuclear Regulatory Commission (NRC) regulations state that Title 40 of the *Code of Federal Regulations* (40 CFR) 1508.7 definitions will be used by the NRC in implementing National Environmental Policy Act (NEPA) (Title 10 of the *Code of Federal Regulations* (10 CFR) 51.14(b)).

In 2007, the NRC amended 10 CFR 50.10 regarding limited work authorizations (LWA), to allow certain construction activities to commence before a construction permit or combined operating license is issued (*Federal Register* notice (FR), 72 FR 57416) ([NRC 2007](#)). In particular, NRC modified the definition of “construction” to eliminate construction activities that do not have a nexus to radiological health and safety, and common defense and security. These activities are considered “preconstruction” activities not under NRC’s jurisdiction. The preconstruction activities are evaluated as part of the cumulative impact analysis. The preconstruction activities are specified in 10 CFR 50.10 (a)(2) and include preparation of a site for construction (clearing, grading, installation of environmental mitigation measures, building of temporary roads and borrow areas), (b) excavation, (c) erection of support buildings, and (d) building of service facilities (paved roads, parking lots, railroad spurs, sewage treatment facilities, and transmission lines).

Rationale

The purpose of this guidance is to clarify the cumulative analysis at the proposed site for new reactor Environmental Impact Statements (EIS). This guidance directs the staff’s cumulative impacts analysis associated with the proposed project when considered in the context of other past, present, and reasonably foreseeable future actions. This plan includes guidance on identifying the time frame of the analysis, the geographic area of interest, the baseline for the analysis and other actions that could contribute to the cumulative impact. The guidance in this section is generally applicable to all the resource areas. If the specific guidance is applicable to only one resource area it will be so identified. The basis for the guidance is specified below:

- [10 CFR 51.10\(a\)](#) with respect to NRC policy to voluntarily take account, subject to certain conditions, of the regulations of Council on Environmental Quality (CEQ) implementing the [NEPA](#). The CEQ regulations specify that an EIS discuss cumulative impacts ([40 CFR 1508.25\(c\)\(3\)](#));
- [10 CFR 51.45](#) with respect to the need to discuss cumulative impacts in an environmental report;

- [10 CFR 51.75](#) with respect to the need to discuss cumulative impacts in an EIS;
- 40 CFR 1508.25 and [10 CFR 51.14\(b\)](#) with respect to the scope of an EIS and consideration of the cumulative impacts of connected, cumulative, and similar actions.

Staff Guidance

Definitions

Baseline is the site as described in Chapter 2 of the EIS.

NRC-authorized impacts are the impacts from NRC-authorized construction activities identified in Chapter 4 and the operational impacts identified in Chapter 5 of the EIS.

Construction is defined in [10 CFR 51.4](#)

Data Needs from Other Chapters of the EIS

The reviewer should obtain input from and provide input to the reviewers for the following Chapters:

- Chapter 2. Chapter 2 provides the baseline information for starting the cumulative review.
- Chapters 4, 5 and 6. Obtain impacts from Chapter 4, 5 and 6. The impact from Chapter 4, 5 and 6 will be considered along with other Federal and non-Federal actions to determine the cumulative impacts. Impacts from preconstruction activities that are not under NRC jurisdiction are considered as cumulative impacts. If pre-construction activities were not evaluated in Chapter 4 then fully discuss them in the analysis in chapter 7.
- Chapter 9 and Chapter 10. Provide cumulative impact characterization of the proposed action to be considered in the alternatives and cost benefit analysis.
- Interface with Environmental Project Manager (EPM). Consult with the EPM on any cumulative impacts characterized as MODERATE or LARGE. Potential mitigation measures and their merits should be discussed for all impact levels.

Steps to perform the resource specific analysis

The resources to be evaluated for cumulative impacts are generally the same ones evaluated in EIS Chapters 4, 5, and 6. The reviewer's analysis should identify and evaluate the cumulative impacts associated with the proposed plant. Each cumulative impact is to be discussed in proportion to the significance of the impact attributed to the proposed plant. It is generally more efficient to have one reviewer do the research to identify the projects in the general area of the plant that may have a cumulative impact using the guidance in step 3. The resource area reviewers can add or remove projects as they perform their resource specific review. For each resource area for which there is a direct or indirect impact, reviewers should perform the following steps:

- 1) Identify the geographic area to be considered in evaluating cumulative impacts for each resource and ecological component. For each resource area the reviewer needs to define the geographical area of interest analyzed for this resource and provide a brief explanation of how and why the area of interest was selected. The geographic area of interest will be different for each resource area, as different resources have different impact areas. The geographic boundaries used in evaluating cumulative impacts for a resource should generally be the same as the one used in Chapters 4 and 5.

CEQ guidance recommends applying natural ecological or socio-cultural boundaries ([CEQ 1997](#)). Possible geographic areas that could be used to determine the appropriate geographic area for a cumulative impact analysis are in Table 2-2 of the CEQ Guidance. EPA guidance recommends that the scope include geographical areas that sustain the resources of concern, but not be extended to the point of becoming unwieldy ([EPA 1999](#)). Geographical proximity to the proposed action should be considered but is not a decisive factor for including other actions. Jurisdictional borders are sometimes useful in defining the geographical area of interest for resource areas such as land use and some socioeconomic areas; however, this approach may not be applicable for defining the geographical area for ecological resources such as aquatic ecology. For example, in socioeconomics, the reviewer may start with the 50-mile radius around site but focus and draw the impact based on the economic impact areas, which is likely to be the nearby counties. For aquatic resources, the reviewer should use the watersheds/water bodies affected by this action. The reviewer needs to use their professional judgment to set the geographic area of interest.

- 2) The time frame for analyzing cumulative impacts is defined as follows:

Past time frame is prior to the receipt of the combined license (COL) or early site (ESP) application.

The past time frame is the point in time prior to the receipt of the application. This could include the time at which a certain land-use was established, or an even more historical baseline that represents the pre-disturbance conditions. The availability of data often determines how far back and to what extent past effects are examined. Certain types of data may be available for extensive periods in the past while other data may be available only for shorter periods of time. Due to lack of data, the analysis of past effects is usually qualitative (CEQ 1997). In many cases, discussion of the past actions may entail a brief paragraph telling the story of how the resource has evolved to its current condition by describing past actions and/or referring to the baseline discussion in Chapter 2.

Example - Historically, the site and vicinity was a combination of wetlands, forests, and agricultural lands. Agriculture was the dominant land use in the region since the 1890s. Residential development in the area began in the early 1900s, and increased steadily until the Energy Complex was built in 1975. The general trend over the past few decades has been an increase in residential areas, roads, utilities, and businesses and a decrease in wetlands, forests, and agricultural lands. See Chapter 2 for a more detailed discussion of these past activities.

Present time frame is from the time of the COL or ESP application until the start of NRC-authorized construction of the proposed new unit(s).

The present time frame is the shortest time frame and should capture any ongoing actions. Many of the resource areas measure the environment as it currently exists. These measurements capture the cumulative impact to the resource from the past and present projects and should be part of the baseline for the resource in chapter 2.

Future time frame is from the start of NRC-authorized construction of the proposed new unit(s) through building and operating of the proposed new unit(s) including decommissioning.

The future time frame captures the reasonably foreseeable future actions. The reviewer then needs to add the impact from any proposed projects and any other actions that could have an overlapping impact on the resource to evaluate the cumulative impact.

Cumulative impacts should be reasonably foreseeable during the time-frame of construction, operation, and decommissioning of the proposed plant. When considering future actions, the following may fall under the definition of reasonably foreseeable:

- a) Actions unrelated to the project but which have been approved by the proper authorities, have submitted license/permit applications, or which may not require approval of a regulating agency, but for which procurement contracts have been signed.
- b) Actions conditioned upon approval of the project under review.

Actions that are *not* reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis. Future actions that do not fall under the definition of reasonably foreseeable, but could potentially take place as indicated by trending in the vicinity or less formal communications, may be addressed in a general manner. The reviewer should acknowledge that various industrial, commercial, recreational, or residential developments are likely to occur in the area, but absent specific proposals to a government agency, or evidence of a signed procurement contract, the impacts of such actions should not be included in the EIS.

- 3) Identify past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts with the proposed action. At minimum, the following sources are to be searched for information that could be relevant to cumulative effects within the geographic area identified:
 - a) The applicant's Environmental Report (ER)
 - b) EISs from the U.S. EPA's NEPA website describing direct, indirect, and cumulative effects within the geographic area (NEPAssist)
 - c) Government websites identifying potential future actions

- d) State Department of Transportation and Environmental Protection websites
- e) Information provided by the applicant or other government agencies.
- f) Information obtained through site audits at the proposed and alternative sites
- g) Local and County land use development planning documents

If the proposed plant is located on the site of one or more existing unit(s), the reviewer should consider the cumulative impacts of the new plant and the existing plant when the new plant is under construction and when the new and existing plant are both operating.

The level of detail available for each project identified as contributing to the cumulative impact will vary, but some of the following information may be helpful in adequately analyzing the cumulative effects: location and size of the facilities, environmental releases, lifetime of the action, workforce (temporary and permanent), frequency of use, transportation routes, approvals/permits required.

Following the above guidance the person assigned will develop a table listing the significant projects that could contribute to the cumulative impact. The table will identify reasonably foreseeable projects and other actions within a 100 mile radius for other nuclear energy projects and within a 50-mile radius for all other projects. The reason for the 100 mile radius for nuclear plants is that the ingestion pathway for the emergency planning zone extends 50 miles around the plant. Therefore, two plants would have to be 100 miles away not to have an overlapping ingestion pathway. The 50 mi radius for other projects is a guideline. For example, the reviewer can designate the geographic area for their resource as a drainage basin or river system that is more or less than 50 miles. The status of the projects will fall under the category of "Proposed" or "Operational". There is also the potential for long term continuous projects (e.g., various mine remediation projects); these will have the status of "Ongoing." Government lands (parks, game preserves, wildlife areas, etc.) where no development projects are being carried out will have the status of "Development Unlikely." See the example below:

Table 1: Past, Present and Reasonably Foreseeable Projects and Other Actions Considered in the Cumulative Analysis

Project Name	Summary of Project	Location	Status
Energy Projects			
[identify projects other than the proposed project] XXX Unit 1	[provide short summary of project] XXX Unit 1 consists of one XXX-MW(e) nuclear power generating plant.	[describe location in relation to proposed project] <1 mi north of proposed site	[provide status] ^(a) XXX Unit 1 is currently operational and is licensed to continue operations through XXXX
Hydroelectric Station	14-MW(e) hydroelectric plant		Operational ^(b)

Project Name	Summary of Project	Location	Status
XXX Natural gas Plant	71-MW(e) natural gas electric generating plant	about 2 mi south of proposed project	Operational
XXX Coal Plant	460 MWe Coal Plant	About 7 mi south of the proposed plant on XX River	Operational
XX Nuclear Station	Two pressurized water reactors	About 52 mi north	Proposed new nuclear plant. Operation would begin in 2021
Transmission Lines	Various transmission lines currently exist throughout region and installation of additional lines would occur if new nuclear plants or other large energy projects are built.	Throughout region	Operational as well as proposed transmission lines
Mining Projects			
XXX Quarry	Products include asphalt aggregate, base material, concrete, and aggregate.	10 mi north of proposed project	Operational
Transportation Projects			
Strategic Corridor System Plan	Strategic system of corridors forming the backbone of the state's transportation system.	State Wide	Planning document with no explicit schedules for projects, however, many strategic corridors coincide with routes which would/could be used for development at the proposed site.
Parks and Aquaculture Facilities			
XXXX Park	7500-acre park	5 mi south of proposed project	Development Unlikely in this area.
Planned Wildlife Management Area	4400-acre wildlife management area	Adjacent to proposed project	Proposed, planned development of wildlife management area to be completed by XXX date.
Other Actions/Projects			
City of XXXX	Municipal water withdrawals from the Broad River	About 26 mi southeast	Ongoing
Various hospitals and industrial facilities that	Medical isotopes	Throughout region	Operational in

Project Name	Summary of Project	Location	Status
use radioactive materials			
XXX Chemical Plant	Industrial Inorganic Chemicals	About 23 mi north of the propose project on the XXX River	operational
Various Wastewater Treatment Facilities (WWTF)	Sewage treatment.	Throughout region	operational
(a) Source: (b) Source:			

The above table is only an example. The categories of projects may not occur at all sites and therefore the reviewer is to develop a table of projects that are specific to each site. Some of the projects listed within the table may not be relevant to all resource areas. For example, an aquaculture facility located near the proposed nuclear plant under review may have overlapping impacts with the nuclear facility for aquatic resources, but the two projects would not have overlapping impacts for air quality, and therefore, would not be appropriate to discuss in the air quality cumulative impact analysis.

All reviewers should reference the table in their cumulative impacts analyses in order to reduce repetition. If a reviewer is aware of other projects in the area that should be included in the table and the review should inform the EPM.

- 4) Evaluate the significance and magnitude of cumulative impacts associated with the proposed plant.
 - a) Reviewers should focus on cumulative impact information that is relevant to reasonably foreseeable significant adverse impacts, is essential to a reasoned choice among alternatives, and can be obtained without exorbitant cost ([CEQ 2005](#)). Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects (CEQ 1997).
 - b) Reviewers should consider if the proposed action will affect the potential for each resource to sustain itself, taking into account how conditions have changed over time and how they are likely to change in the future.
 - c) At the beginning of each resource section (or subsection as needed), the reviewer summarizes the NRC incremental impact and the preconstruction impact as discussed in Chapters 4 and 5. The description of the affected environment in Chapter 2 serves as the baseline for the cumulative impact assessment. The reviewer should describe the impact to the resource from Chapter 4 and 5. Impact information for the proposed project is presented here

so that the reader can easily follow the logic as the impacts from the proposed project are added to the impacts from other projects.

For the discussion of other proposed projects or actions, provide quantitative or qualitative information on the type and magnitude of impact. If quantitative information is not available from other EISs or permit information or other sources, qualitative information can be used. For example, in the air quality analysis, if the permitted levels of emissions from various sources are unknown, the analysis could state that major sources are operating within regulated permits and that the county is in attainment, indicating that the total level of regulated pollutants within the county are within national ambient air quality standards set by EPA. Be sure that the text describing the other projects provides a logical basis for the cumulative conclusion. For some resource areas, other past, and present, projects have been incorporated in the baseline in chapter 2 or in the analysis in Chapters 4 and 5. For example, in water use, the measured value of water flow in the river used as the cooling source would already include the consumptive water use of the upstream users. Another example is in socioeconomics, an economic model of the area may have been used in chapters 4 and 5 that would have included the proposed project along with the economy of the local region. In this situation, ensure that the analysis in Chapter 7 clearly explains how the analysis in Chapters 4 and 5 considered impacts from other projects. As appropriate, include any additional discussion of cumulative impacts that were not described in Chapters 4 and 5.

- d) For each resource area, determine whether the cumulative effect of the proposed action, when overlaid or added to temporary or permanent effects associated with past, present, or reasonably foreseeable future projects, is SMALL, MODERATE, or LARGE.
- 5) Identify any plans by the applicant for mitigation of adverse cumulative impacts, or modification of alternatives to avoid, minimize, or mitigate cumulative impacts. The reviewer should discuss mitigation that may be required by local, state, and federal authorities, including information regarding restoration actions by separate entities, required mitigation of other projects, or voluntary mitigation and enhancement by the entity taking an action. **The reviewer should refer to the cover memo of ISG-026 for more guidance on mitigation.**
- 6) A table similar to Table 2 should be used to summarize the impacts at the end of the cumulative chapter in the EIS for the proposed site.

Table 2: Cumulative Impact on Resource Areas, Including the Impacts of Proposed Unit(s)

Resource Category	Comments	Impact level
Land-Use		
Water-Related		
Surface Water Use		
Groundwater Use		
Surface Water Quality		
Groundwater Quality		
Ecology		
Terrestrial Ecosystems		
Aquatic Ecosystems		
Socioeconomic		
Physical Impacts		
Demography		
Economic Impacts on the Community		
Infrastructure and Community Services		
Aesthetics and Recreation		
Environmental Justice		
Historic and Cultural Resources		
Air Quality		
Nonradiological Health		
Radiological Health		
Severe Accidents		
Fuel Cycle, Transportation, and Decommissioning		

EVALUATION FINDINGS

Wording of the conclusion in this section will depend on whether the impacts are SMALL, MODERATE or LARGE.

If the impact is SMALL – Provide the basis for the conclusion and describe whether or not further mitigation beyond that described in Chapters 4 and 5 would be warranted.

If the impact is MODERATE or LARGE - Summarize the basis for the conclusion (the full explanation should be provided in the preceding analysis). The principal contributor to the MODERATE or LARGE rating could be due to the proposed project (construction, preconstruction, or operations), the current conditions (i.e., the current degraded state of the resource), or other current and/or reasonably foreseeable projects. In the next paragraph, state the NRC-incremental impact and provide a discussion as to whether the NRC-authorized activity is a significant contributor to the MODERATE or LARGE impact. Sufficient information should be provided to show whether the NRC-authorized activity caused the cumulative impact to go from SMALL to MODERATE or MODERATE to LARGE. For example, if the NRC-authorized increment is SMALL, but the impacts from preconstruction, the existing condition, or other projects are the principal contributors to the MODERATE rating, state this. Another

possibility could be that several projects (including the proposed project) are all individually minor, but when considered together result in a MODERATE or LARGE impact (e.g., no one project is the principal contributor). For other than a SMALL impact, discuss if, and to what extent, the NRC authorized impact contributes to the other than SMALL impact.

REFERENCES

1. [10 CFR 51.4](#), Code of Federal Regulations, Title 10, *Energy*, 51.4, “Definitions.”
2. [10 CFR 51.10](#), Code of Federal Regulations, Title 10, *Energy*, 51.10, “Purpose and scope of subpart; application of regulations of Council on Environmental Quality.”
3. [10 CFR 51.14](#), Code of Federal Regulations, Title 10, *Energy*, 51.14, “Definitions.”
4. [10 CFR 51.45](#), Code of Federal Regulations, Title 10, *Energy*, 51.45, “Environmental report.”
5. [10 CFR 51.70](#), Code of Federal Regulations, Title 10, *Energy*, 51.70, “Draft environmental impact statement – general.”
6. [10 CFR 51.75](#), Code of Federal Regulations, Title 10, *Energy*, 51.75, “Draft environmental impact statement-construction permit, early site permit, or combined license.”
7. [40 CFR 1508](#), Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1508, “Terminology and Index.”
8. [Council on Environmental Quality \(CEQ\). 1997. *Considering Cumulative Effects under the National Environmental Policy Act*. Available at: *Considering Cumulative Effects under the National Environmental Policy Act* Accessed on November 7, 2012](#)
9. [Council on Environmental Quality \(CEQ\). 2005. Memorandum from James L. Connaughton, Chairman CEQ, to Heads of Federal Agencies regarding “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.”](#)
10. [Environmental Protection Agency \(EPA\). 1999. Consideration of Cumulative Impacts in EPA Review of NEPA Documents. EPA Publication 315-R-99-002](#)
11. [Environmental Protection Agency \(EPA\). 2008. §309 Reviewers Guidance for New Nuclear Power Plant Environmental Impact Statements. EPA Publication 315-X-08-001](#)
12. Environmental Protection Agency (EPA). 2012. U.S. Environmental Protection Agency, NEPAAssit Tool. Accessed on November 7, 2012. Available at: <http://www.epa.gov/oecaerth/nepa/nepassist-mapping.html>
13. [National Environmental Policy Act of 1969](#), as amended (NEPA). 42 U.S.C. 4321, *et seq*

14. [Nuclear Regulatory Commission \(NRC\). 2002.](#) U.S. Nuclear Regulatory Commission (NRC), Memorandum and Order (CLI-02-14) in the Matter of Duke Energy Corp. (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), April 12, 2002. Docket Nos. 50-369-LR, 50-370-LR, 50-413-LR, & 50-414-LR, Washington, D.C. Accession No. ML021020595.
15. [Nuclear Regulatory Commission \(NRC\). 2007.](#): 72 FR 57416. October 9, 2007. "Limited Work Authorizations for Nuclear Power Plants." *Federal Register*. U.S. Nuclear Regulatory Commission.