

Chapter 5.0

Short-term Uses versus Long-term Productivity

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1 Acronyms and Abbreviations

1969 Lease	Navajo Project Indenture of Lease
BART	Best Available Retrofit Technology
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BM&LP Railroad	Black Mesa & Lake Powell Railroad
BO	Biological Opinion
CAP	Central Arizona Project
CEQ	Council on Environmental Quality
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CO ₂	carbon dioxide
Co-tenants	Salt River Project, Arizona Public Service Company, NV Energy, and Tucson Electric Power Company
Development Fund	Lower Colorado River Basin Development Fund
EIS	Environmental Impact Statement
ERA	Ecological Risk Assessment
ESA	Endangered Species Act of 1973
HHRA	Human Health Risk Assessment
km	kilometer
KMC	Kayenta Mine Complex
kV	kilovolt
kW	kilowatt
MW	megawatt
N-Aquifer	Navajo Aquifer
NEPA	National Environmental Policy Act of 1969, as amended
NGO	non-government organization
NGS	Navajo Generating Station
NGS Participants	U.S. (Reclamation), Salt River Project, Arizona Public Service Company, NV Energy, and Tucson Electric Power Company
NHPA	National Historic Preservation Act
NNEPA	Navajo Nation Environmental Protection Agency
NO ₂	nitrogen dioxide
NO _x	nitrogen oxide
OSMRE	Office of Surface Mining Reclamation and Enforcement
PM	particulate matter
PM ₁₀	particulate matter with an aerodynamic diameter of 10 microns or less
PM _{2.5}	particulate matter with an aerodynamic diameter of 2.5 microns or less
PFR	Partial Federal Replacement
PWCC	Peabody Western Coal Company
Reclamation	U.S. Bureau of Reclamation
ROW	Right-of-way
SO ₂	sulfur dioxide

SRP	Salt River Project Agricultural Improvement and Power District
STS	Southern Transmission System
U.S.	United States
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WTS	Western Transmission System

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5.0 Short-term Uses versus Long-term Productivity

5.1 Introduction

The National Environmental Policy Act requires that an Environmental Impact Statement (EIS) include a discussion of the relationship between short-term uses of man's environment and maintenance and enhancement of long-term productivity (40 Code of Federal Regulations 1502.16). The following are definitions, or assumptions used to conduct this analysis.

- The primary resource-related activities at Kayenta Mining include coal extraction and follow-on reclamation, and withdrawal of groundwater for dust control and other uses. The primary resource-related activities at Navajo Generating Station (NGS) include withdrawal of cooling water from Lake Powell, coal combustion to generate electricity, disposal of coal combustion residuals in a landfill, and evaporation of waste water in cooling towers and in ponds. The workforces that operate both facilities represent the primary human resource activities.
- Natural and human resource impacts from implementation of the Proposed Action and the Alternatives are described in Chapter 3.0.
- Short-term for this EIS is defined as period of 2 years or less, which generally corresponds to the time required to stabilize disturbed soils and initiate revegetation.
- Long-term for this EIS is defined as the operating period for NGS-Kayenta Mine Complex (KMC) Project components, and the additional time required for project impacts to be reduced to levels similar to background conditions. Both NGS and the Kayenta Mine represent long-term operations.
- For renewable resources (e.g., biological resources), productivity means the rate at which quantities of a resource (for example, the weight of new plant growth or biomass) are added (input) to an ecosystem. In economic terms, productivity is a measure of how efficiently inputs, such as labor and natural resources, are being used in an economy to produce a given output of goods and services.
- The Western Transmission System, Southern Transmission System, and associated communication sites would continue to operate through 2044, and likely beyond. No new modifications to this system would occur; only operation and maintenance activities would occur along the rights-of-way on an infrequent basis. As a consequence, the influence of short-term uses on long-term productivity is not relevant for these project components.

For purposes of evaluating project effects on long-term productivity, all the action alternatives are evaluated together because of the operational differences are small. The No Action Alternative is discussed separately. The following resources are discussed in this section because long-term productivity impacts are expected.

5.2 Air Quality and Climate

5.2.1 Proposed Action and Action Alternatives

NGS and the Kayenta Mine would continue to generate emissions of various air pollutants over the remaining life of both facilities. As described in Section 3.1, Air Quality, both components currently operate, and are expected to operate within regulatory limits for emissions and consequent atmospheric concentrations of criteria and hazardous air pollutants. These emissions are not expected to reduce long term productivity because air quality standards were developed to be protective of natural resource and human health.

1 As described in Chapter 3.2, Climate Change, the project would emit greenhouse gases at a maximum
2 rate of approximately 18.3 million metric tons of carbon dioxide equivalent annually through 2044.
3 Greenhouse gas emissions would be slightly lower under the partial replacement alternatives than under
4 the Proposed Action. These emissions are predicted to contribute to climate change, indicated by
5 increases in global temperature and greater variability in precipitation at various geographic scales. The
6 aquatic and terrestrial ecosystems, and agricultural crops and livestock forage may respond to climate
7 changes in different ways as described in Section 3.2, which could result in both increased and
8 decreased productivity.

9 **5.2.2 No Action Alternative**

10 The operational emissions from NGS and Kayenta Mine would cease in 2018, thereby eliminating more
11 than 25 years of greenhouse gas emissions from these facilities. Global, regional, and local increases in
12 greenhouse gases from other sources are predicted to continue (Section 3.2), with consequent
13 productivity changes in natural and agricultural systems.

14 **5.3 Water and Water-Dependent Resources**

15 **5.3.1 Proposed Action and Action Alternatives**

16 NGS would continue to use up to 40,000 acre feet of water per year from Lake Powell, and the proposed
17 KMC would require approximately 1,200 acre feet of groundwater per year through 2044. Based on the
18 analysis provided in Section 3.7, Water Resources, and Section 3.12, Aquatic Resources, the NGS
19 withdrawals would not reduce the productivity of aquatic resources within Lake Powell. At the proposed
20 KMC, the retention and maintenance of impoundments over the long term would provide reliable water
21 for wildlife and livestock, a productivity benefit. Based on the analysis provided in Section 3.7, the project
22 withdrawal of groundwater would result in no or negligible reductions in spring flows and base flows in
23 channels that drain Black Mesa, and therefore the productivity of water dependent resources (riparian
24 vegetation and wildlife habitat) would be maintained. Cumulative reductions in channel base flows are
25 predicted (**Appendix WR-9**) when past pumping (community and mine), future KMC, and future
26 community pumping are considered together, and therefore there may be a slight decline in riparian
27 vegetation productivity within the major Black Mesa drainages. See Section 5.6 for a discussion of
28 community well drawdown impacts from mine pumping.

29 **5.3.2 No Action Alternative**

30 NGS water demands from Lake Powell would cease after decommissioning is completed in 2020, and
31 groundwater withdrawals at proposed KMC would decline to 500 acre-feet per year during a reclamation
32 period extending for 10 to 15 years after 2018. Future cumulative reductions in Black Mesa channel base
33 flows are predicted (**Appendix WR-9**) in the absence of proposed KMC pumping because the continuing
34 aquifer drawdown impacts of past pumping, combined with foreseeable community pumping, would
35 result in slight declines in riparian vegetation productivity.

36 **5.4 Soil and Biological Resources**

37 **5.4.1 Proposed Action and Action Alternatives**

38 Land productivity on approximately 3,724 acres at the NGS plant site and railroad right-of-way would be
39 restored as the result of decommissioning and revegetation after 2044. The time required for vegetation
40 recovery to a level similar to background conditions would be long-term because of low and variable
41 annual precipitation.

42 Areas disturbed by proposed KMC mining would be progressively revegetated. At the completion of
43 mining in 2044, surface facilities such as conveyors, buildings, and roads, would be decommissioned
44 and removed. A total of 10,123 acres of previously disturbed land would remain to be revegetated after

1 2044, requiring 10 to 15 years before control of the land is returned to the Navajo Nation or Hopi Tribe.
 2 The long-term productivity of revegetated land is expected to match or be higher than that for pre-
 3 existing vegetation communities because soil and overburden would be mixed to provide suitable
 4 growing medium for revegetation species.

5 Wildlife habitat would be predominantly suitable for grassland species, with an increasing shrubland
 6 habitat component over the long-term. Restoration of woodlands (pinyon pine-juniper) would be very
 7 long term (greater than 50 years). In summary, the productivity of wildlife habitats would be maintained
 8 or increased, but the support functions would be different (less overall ground cover by woody
 9 vegetation).

10 Based on the ecological risk analysis conducted for wildlife and aquatic communities, and special status
 11 species (Sections 3.8 through 3.13), the long-term productivity of the terrestrial and aquatic communities
 12 receiving trace metal deposition from NGS stack emissions through 2044 would be maintained. When
 13 cumulative sources of trace metal deposition and baseline water quality conditions are considered,
 14 reductions in the productivity of special status fish species are predicted in segments of the Lower
 15 Colorado River (humpback chub and razorback sucker) and San Juan River (Colorado pikeminnow and
 16 razorback sucker). Mitigation measures have been proposed to improve survival and reproduction for
 17 these species (Section 3.13).

18 **5.4.2 No Action Alternative**

19 Under the No Action Alternative, decommissioning activities at NGS and proposed KMC would occur in
 20 2018 to 2019, and previously disturbed areas would be revegetated. Less time would be required for
 21 vegetation productivity to recover as compared to the Proposed Action and Action Alternatives. Trace
 22 metal deposition from NGS stacks would cease, but cumulative impacts to the productivity of special
 23 status fish in the Colorado River system would continue, based on trace metal deposition rates from
 24 other regional and global sources.

25 **5.5 Land Use**

26 **5.5.1 Proposed Action and Action Alternatives**

27 The industrial land use would continue, largely unchanged at NGS through 2044. As described above
 28 under Soils and Biological Resources, proposed KMC mining would progressively remove native
 29 vegetation communities, followed by reclamation of disturbed areas. Access for grazing to areas
 30 undergoing reclamation would be restricted. Over the long-term, revegetated land would be returned to
 31 the Navajo Nation or Hopi Tribe. The appropriate tribal agency in turn would allocate the revegetated
 32 land to community members for the purpose of livestock grazing and other uses. In summary, economic
 33 productivity related to natural resources uses (grazing land) by community members on the proposed
 34 KMC would be reduced during the 2020 to 2044 period to accommodate continued mining, and ongoing
 35 land reclamation. It is expected that economic productivity based on livestock grazing would increase
 36 after community members gain full access to reclaimed lands.

37 **5.5.2 No Action Alternative**

38 Industrial land uses at NGS and proposed KMC would cease in 2018 to 2019, with decommissioning
 39 and reclamation as described above. The effect on natural productivity would be less time required to
 40 meet reclamation productivity goals, and less time for the land to be suitable for intended future uses
 41 (primarily livestock grazing).

1 **5.6 Socioeconomics**

2 **5.6.1 Proposed Action and Action Alternatives**

3 The socioeconomic benefits of power plant and mine related employment would extend through 2044,
4 and then would substantially decline during decommissioning and the final reclamation period. No
5 comparable source(s) of employment and income for power plant and mine workers currently exist or are
6 anticipated to develop in the region. Lease fees, mine royalties and other payments to the tribes and
7 local counties would cease after 2044. Other costs to the Navajo Nation, Hopi Tribe, and affected
8 counties are expected to increase, including costs for employee assistance and education programs,
9 and greater demands for social and medical services as the result of increased unemployment. The
10 overall impact would be an overall reduction in economic productivity because of lowered economic
11 outputs (payrolls and payments), and increased costs to support unemployed workers and their families.

12 Mine-related pumping would result in long-term groundwater drawdown of less than 50 feet in
13 community wells near the proposed KMC, which would slightly increase pumping costs over the next
14 50 years.

15 Proposed Action Central Arizona Project (CAP) pumping cost increases from 2020 levels would range
16 from \$12 to \$14 per acre-foot in 2044 due to the Proposed Action; implementation of the most expensive
17 alternative would increase the acre foot pumping cost in 2044 by \$45 per acre-foot relative to the
18 Proposed Action. Changes in the cost of water could alter decisions on CAP water distribution among
19 agricultural, industrial, municipal, and groundwater recharge uses.

20 **5.6.2 No Action Alternative**

21 Production at NGS and proposed KMC would cease in 2018, with decommissioning and reclamation as
22 described above. The socioeconomic impacts on employment, income, unemployment and support for
23 tribal and local government operations would occur earlier in time, with the impacts of unemployment
24 also occurring earlier. Community pumping costs are anticipated to increase in the future because the
25 continued community N-Aquifer drawdowns would offset the aquifer recovery associated with cessation
26 of mine pumping.

27 Alternative energy sources for CAP pumping would need to be acquired or constructed, or contracts
28 signed for power purchases. Assuming a power purchase agreement for the equivalent of NGS power,
29 the cost per acre-foot is projected to be from \$10 less to \$17 more relative to the Proposed Action in
30 2020, depending on future prices of natural gas (**Table 3.18-83**). In summary, the impacts on economic
31 productivity for the Navajo Nation and Hopi Tribe would occur earlier in time; the economic productivity
32 related to CAP pumping costs may be influenced by a wide range of future natural gas market costs.
33 Changes in the cost of water could alter future use of CAP water among agricultural, industrial, municipal
34 and groundwater recharge.