Columbia Basin Fund

INITIAL ECONOMIC ASSESSMENT

April 2021

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Executive Summary

On February 7, 2021, U.S. Representative Mike Simpson of Idaho announced the broad outlines of a proposed "Columbia Basin Fund," which would invest $33.5 billion in infrastructure, economic development, and salmon recovery. This Fund represents a unique approach to addressing the future of the four dams on the Lower Snake River (LSR). This Assessment constitutes an initial consideration of the proposal from a purely economic perspective. It is not an exhaustive review, but instead an initial consideration of key questions:

- How can investments strengthen the regional economy in the LSR area and Pacific Northwest?
- How will different sectors and communities be impacted by proposed changes? How can investment funds be targeted to mitigate negative impacts?
- How will the expenditure of funds impact the regional economy? How will key sectors fare over the long-term?

SUMMARY OF THE PROPOSED INVESTMENT

Representative Simpson's proposal for the Columbia Basin Fund includes more than 50 line-items for community investment but leaves many of the specifics of investment items up to local communities and industries. Building on the Fund framework, BERK has created an illustrative investment scenario with assumed phasing of the investment over time, high-level assumptions around the kind of expenditures, and assumptions around the geographic location of the investment. The majority of the expenditure would occur in Washington State, with nearly half (45%) of the non-energy expenditure being spent in the nine counties closest to the LSR dams. Funds would also be spent in Idaho, Oregon, and Montana.

Proposed Investment: Key Findings

1. Over $30 billion of the proposed investment (93% of the funds) would be allocated to supporting the region's economic transition.
2. $2.2B (7%) will be invested in Tribal communities.
3. Approximately $20 billion, or just less than 60% of the total investment, would likely be spent during the 8-10 years before breach of the dams.
4. Just more than $21 billion (63%) of the investment would likely be spent on construction and infrastructure.
5. At least $7.9 billion, or 24% of the total investment, would likely be spent in the 9 counties closest to the LSR. Significant additional funding tied to energy replacement and habitat restoration may also be expended in the 9-county region.

ANTICIPATED ECONOMIC IMPACTS

Based on a possible breakdown of costs, we estimate that $21.1 billion would be expended on infrastructure and construction, including planning and engineering, labor, materials, and supplies. Assuming 75% of these contracts by value are awarded to businesses and organizations in the Pacific Northwest, investments during Phases 1 and 2 will support an estimated total average of more than 20,000 jobs each year across the Northwest over this period. Throughout the entire duration of the

Columbia Basin Fund program (between 2022 and 2046, across all four project phases), investments and operations will, on average, support a total employment impact of nearly 11,000 jobs per year in the Pacific Northwest. This is lower than the more than 20,000 jobs supported each year during Phases 1 and 2 because spending is anticipated to ramp down in Phases 3 and 4.

Economic Impact: Key Findings

6. $21.1B would likely be spent on infrastructure, stimulating jobs and spending in the region. The $12.3B spent on planning, design, and services would also benefit the economy, though benefits would be more geographically diffuse.
7. Phase 1 and 2 spending would support an annual average of more than 20,000 jobs across the Northwest. The investment would support an annual average of 11,000 jobs across the Northwest from 2021 to 2046.
8. Local and state net fiscal impacts would likely be positive via additional sales tax and other one-time revenues. Costs of providing services are unlikely to shift significantly.

LONG-TERM ECONOMIC OUTLOOK

Agriculture

Under the status quo, the LSR dams and reservoirs provide transportation and irrigation benefits to agricultural producers in the region. Breaching the LSR dams will eliminate the LSR barge transportation option for grain producers and affect the functionality of some irrigation infrastructure in the region. Previous studies have estimated the costs (in 2020 dollars) to mitigate impacts to grain producers at $403M to $1.4B and the costs to mitigate impacts to irrigators (and other water users) at $153M to $683M. The Fund addresses the impacts to transportation and irrigation through $3.5B for agricultural transportation, including road and rail infrastructure, grain storage, port improvements, expanded barging on the Lower Columbia, and a flexible fund that could directly subsidize grain shipping, as well as $750M for irrigation mitigation, including well and pump construction and improvement, and water conveyance infrastructure.

Agriculture Sector: Key Findings

9. The $3.5B for transportation mitigation is more than double the highest estimate of mitigation costs.
10. The $1.5B fund for grain producers exceeds previous estimates of increased shipping costs under a dam breach scenario, indicating producers will likely face lower shipping costs under the proposal.
11. The $750M for irrigation mitigation is 10% greater than the highest estimate of mitigation costs.

Energy

The four LSR dams generate a median of 795 annual average MWs. To mitigate the impacts of losing the LSR dams as a power source, the investment package focuses on new zero-emission generation capacity, energy storage, and upgrades to the regional transmission network. This portion of the investment offers the following benefits:

- Supports jobs in infrastructure and construction through the duration of the project.
- Exceeds estimated capital and operating and maintenance costs for energy replacement, reducing the likelihood that ratepayers will experience price hikes.

- Invests in improved grid stability, energy efficiency, and regional research and innovation.

While the investment will support new jobs in energy, the quality of employment opportunities is less certain. The investment in energy research in the package attempts to address this uncertainty.

Energy Sector: Key Findings

12. Energy investment is the largest component of the investment, with $16B for energy replacement, efficiency, and grid improvements and $1.25B for the Snake River Center for Advanced Energy Storage.
13. $10B would help mitigate impacts to ratepayers and potentially augment capacity beyond the current level.
14. Investment has the potential to promote regional employment, grid stability, innovation, research, and development.

Recreation and Tourism

Removing the dams will transform the LSR from a flatwater to a whitewater recreation area. Some existing tourism activities, including cruises, boating, and swimming, will cease; while others, including rafting, camping, and fishing, will face new possibilities. To assist the LSR in transforming into a whitewater recreation area, the Fund invests $125M for a national recreation area along the LSR, $125M for tourism promotion, a combined $175M to mitigate impacts to marinas, boat owners, and sport fishers, and, in the long term, the potential return of salmon and steelhead population would support additional sport fishing and other recreational activities.

Recreation and Tourism Sector: Key Findings

15. The industry would likely benefit from the investment of $425M for tourism, $7.3B for salmon and conservation, and $175M for regional economic development.

CONCLUSION

This initial assessment indicates that from a purely economic perspective, the proposed Columbia Basin Fund holds great promise for stimulating job creation, fully mitigating impacts to key regional industries, and investing in future regional growth.

- The expenditure of at least $7.9 billion in the 9-county region around the LSR will stimulate significant positive economic impacts, creating an estimated average of 11,000 jobs a year in the Northwest over 25 years and injecting substantial resources into the regional economy.
- Such significant investment can be used to strategically upgrade infrastructure and strengthen the regional economy, making it more broadly prosperous and resilient to future conditions. By addressing key areas of concern, the package should leave economic sectors of significance stronger than they are now, particularly in the areas of energy generation and tourism.

As soon as a final investment package is identified, further study will be needed to fully understand these risks, and further engagement with affected stakeholders will be needed to strategize how resources and policies can mitigate risks, minimize harms, and maximize long-term economic well-being and resiliency.

Contents

Introduction

On February 7, 2021, U.S. Representative Mike Simpson of Idaho announced the broad outlines of a proposed "Columbia Basin Fund," which would invest $33.5 billion in infrastructure, economic development, and salmon recovery. Envisioned as part of a larger federal infrastructure package, the Columbia Basin Fund represents a unique approach to addressing the future of the four dams on the Lower Snake River (LSR) that have been the subject of intense study, debate, and litigation for decades. The proposal recognizes the various roles the dams play in the regional economy, and includes elements designed to support transformation of the economy through infrastructure investment and economic development, while breaching the dams to support the recovery of threatened salmon populations.

This Initial Economic Assessment, completed in the several weeks after the release of Representative Simpson's announcement, constitutes an initial consideration of the proposal from a purely economic perspective. It is not an exhaustive review but instead an initial look to set the stage for more detailed consideration of key questions:

- How can investments strengthen the regional economy in the LSR area and broader Northwest to make it more resilient to future conditions?
- What sectors and communities will be negatively impacted by proposed changes? How can investment funds be targeted to mitigate these negative impacts?
- How will the expenditure of funds as proposed impact the regional economy? How will key sectors fare over the long-term?

Given the rapid nature of this assessment, it is subject to the following considerations:

- This work builds specifically on prior study of these issues, with limited original analysis.
- It focuses on tangible economic issues, not intangible non-use benefits or environmental or social impacts and outcomes, although we recognize the interconnections among these areas.
- We acknowledge the limits of what we can answer definitively and identify additional ways economic issues can be further examined in future studies.

CONSIDERATION OF THE STATUS QUO

While this assessment focuses on understanding the likely economic impacts of the proposed investment package, it is important to identify our basis of comparison, as continuation of the status quo entails significant ongoing investment and considerable economic uncertainty:

- **Operating, maintenance, and capital investments required.** Continuation of the status quo implies ongoing investment in operations and maintenance, as well as pending capital investments to update aging infrastructure. The federal government is currently responsible for maintaining navigability of the LSR, which it does through routine dredging and other measures. As more fully described in the Energy section, operations and maintenance of the four Lower Snake River dams (LSRD) costs an estimated $52 million annually. Planned capital investments to maintain the functioning of the dams range from $654 million to $1.6 billion from 2020–2040.

- **Economic challenges in key sectors.** As discussed later in this report, key industries in the 9-county region face challenges or have opportunities to increase in performance.
  - **Energy.** The inflation-adjusted price of wholesale electricity has trended upwards at the same time that rates for purchasing power on the Intercontinental Exchange have been decreasing. There is a risk that electricity generated by the existing dams may become less competitive with lower cost power from other sources in the future, eliminating some of the value of the dams.[1]
  - **Recreation and Tourism.** Compared to other areas, the region's tourism industry has room for growth and may benefit from reinvention. At the same time, fishing-based recreation and tourism is under threat from the declining fish populations that are a primary motivator for the proposed breaching of the dams.
- **Litigation risk.** The most significant challenge associated with the status quo is the economic uncertainty associated with the threat of litigation. After decades of studies, lawsuits, and rulings, it is unclear how the courts may eventually rule on the future of the dams. A judgment requiring significant changes to river operations to protect endangered salmon could have significant effects on irrigation, transportation, energy, and recreation benefits currently provided by the dams *without* of the mitigating investment proposed via the Columbia Basin Fund.

ORGANIZATION OF THIS REPORT

In this initial assessment, we focus primarily on a 9-county area surrounding the LSR, including Adams, Asotin, Benton, Columbia, Franklin, Garfield, Walla Walla, and Whitman counties in Washington and Nez Perce County in Idaho. The following sections make up the remainder of this document:

- **Summary of the Proposed Investment** presents summaries of the investment package by categorical benefit area, as well as an illustrative investment scenario.
- **Anticipated Economic Impacts** qualitatively describes the economic impact of the proposed expenditure of investment funds.
- **Long-term Economic Outlook** considers (again preliminarily and qualitatively) how the key economic sectors of agriculture, energy, and recreation and tourism may fare over the long-term.
- The **Conclusion** summarizes the document and identifies the recommended next steps. This includes a recap of **Key Findings**, which are noted throughout the report and summarized on page 30.

Appendix A contains a summary of key assumptions for each investment, and **Appendix B** describes the methodology used for the economic impact analysis. Sources for references throughout the document may be found on page R-1.

Summary of the Proposed Investment

The proposed Columbia Basin Fund would invest $33.5 billion in infrastructure and economic development largely, but not exclusively, in the area around the LSR. Representative Simpson's proposal for the Columbia Basin Fund includes more than 50 line-items for community investment (see **Appendix A**) but leaves many of the specific details up to local communities and industries. As shown in Exhibit 1, only 7% of these funds would be expended on breaching the four Lower Snake River dams (LSRD).

Exhibit 1. Expenditure by Proposed Investment Category

Investment Categories	Amount	Percent
Energy System Investment	$16.0 B	48%
Agricultural Transportation Guarantee	$4.2 B	13%
Water Quality	$3.0 B	9%
Northwest State and Tribal Fish and Wildlife Council	$2.3 B	7%
Breaching Dams	$2.3 B	7%
Agricultural Waste Management	$1.7 B	5%
Community Guarantee	$1.6 B	5%
Columbia and Snake River Dams Certainty	$1.0 B	3%
Agricultural Irrigation Guarantee	$0.8 B	2%
Tourism Guarantee	$0.4 B	1%
Industrial Guarantee	$0.3 B	1%
	$33.5 B	**100%**

Sources: The Northwest in Transition (Representative Simpson website: websiteslides2.4.pdf), 2021; BERK, 2021.

KEY FINDING

1. **Over $30 billion of the proposed investment (93% of the funds) would be allocated to supporting the region's economic transition through investment in the energy system, transportation infrastructure, fish and wildlife, water quality, and more. Approximately 7% of the proposed package would be expended on breaching the four Lower Snake River dams.**

Exhibit 2 summarizes the proposed investments by benefit areas, with some investments contributing to multiple different benefit areas as shown in Exhibit A-2. These benefit areas are distinct from the categories identified in Exhibit 1.

Exhibit 2. Contributions by Benefit Areas

***Certainty, Security, Viability* Categories**	**Amount**
Energy	$17.0 B
BPA	$16.0 B
States	$10.9 B
Salmon/Conservation	$7.3 B
Agriculture	$7.2 B
Transportation	$4.5 B
Communities	$2.8 B
Tribes	$2.2 B
Recreation	$0.4 B

Total not applicable as investments contribute to multiple categories.

Sources: The Northwest in Transition (Representative Simpson website: websiteslides2.4.pdf), 2021; BERK, 2021

KEY FINDING

2. **$2.2 billion, or about 7% of the total proposed package, is designated for Tribal communities, including the $125 million LSR Cultural Resource Protection Fund and $2.1 billion for the Northwest State and Tribal Fish and Wildlife Council.**

Building on the Columbia Basin Fund framework, BERK has created an investment scenario with assumed phasing of the investment over time, high-level assumptions around the kind of expenditures that may be made, and assumptions around the geographic location of the investment. The purpose of this scenario is illustrative, and it is not intended to indicate how the funds actually will or should be expended because:

- As the investment moves forward, the total magnitude and composition of the investment package will surely evolve.
- The proposal allows regional control of much of the funding, with local interests determining when and how various investment categories would be expended to best meet regional priorities.

The illustrative investment scenario supplies the assumptions around the timing of the investment, the types of spending, and the geographic location of the investment that underpin the economic impact analysis described in the section titled Anticipated Economic Impacts. Our assumptions for each investment are shown in **Appendix A**.

1) Investment Phases

As investment will occur over several decades, we have identified several phases of focus. Because phases are defined by the primary focus of work, the number of years in each phase is different, as illustrated in Exhibit 3. Many activities, such as waterfront partnerships, university research on animal waste mitigation, and others, continue throughout the investment period and are not shown below.

Exhibit 3. Investment Phases

	Phase	Length	Example Activities	
2022 2023 2024 2025 2026 2027 2028 2029	Preparing & Implementing Key Investments	8 years	▪ Study and migration of rail and road infrastructure ▪ Energy capacity development and grid optimization ▪ Construction of the Snake River Center for Advanced Energy Storage ▪ Irrigation infrastructure ▪ Animal waste research and biodigester development ▪ Reconfiguring grain transportation and storage infrastructure	▪ Fish habitat restoration and salmon fisheries infrastructure investment ▪ National recreation area infrastructure ▪ Economic development investment – Tri-Cities, Lewiston-Clarkston ▪ Intermodal transportation hub – Tri-Cities ▪ Columbia River lock, dam maintenance
2030 2031	Transitioning	2 years	▪ Removing berms from four LSR dams and sediment from river	▪ Habitat restoration ▪ Continuing energy investment
2032 2033 2034 2035	Adapting	4 years	▪ Corridor restoration ▪ Cultural resource protection ▪ Lewiston-Clarkston waterfront redevelopment ▪ Continuing energy investment	▪ Marina relocation and compensation ▪ Sport fishing compensation ▪ Recreational boating compensation
2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046	Ongoing	11 years	▪ Tourism promotion ▪ Maintaining water quality and habitat restoration	

Source: BERK, 2021.

2) Nature of Expenditure

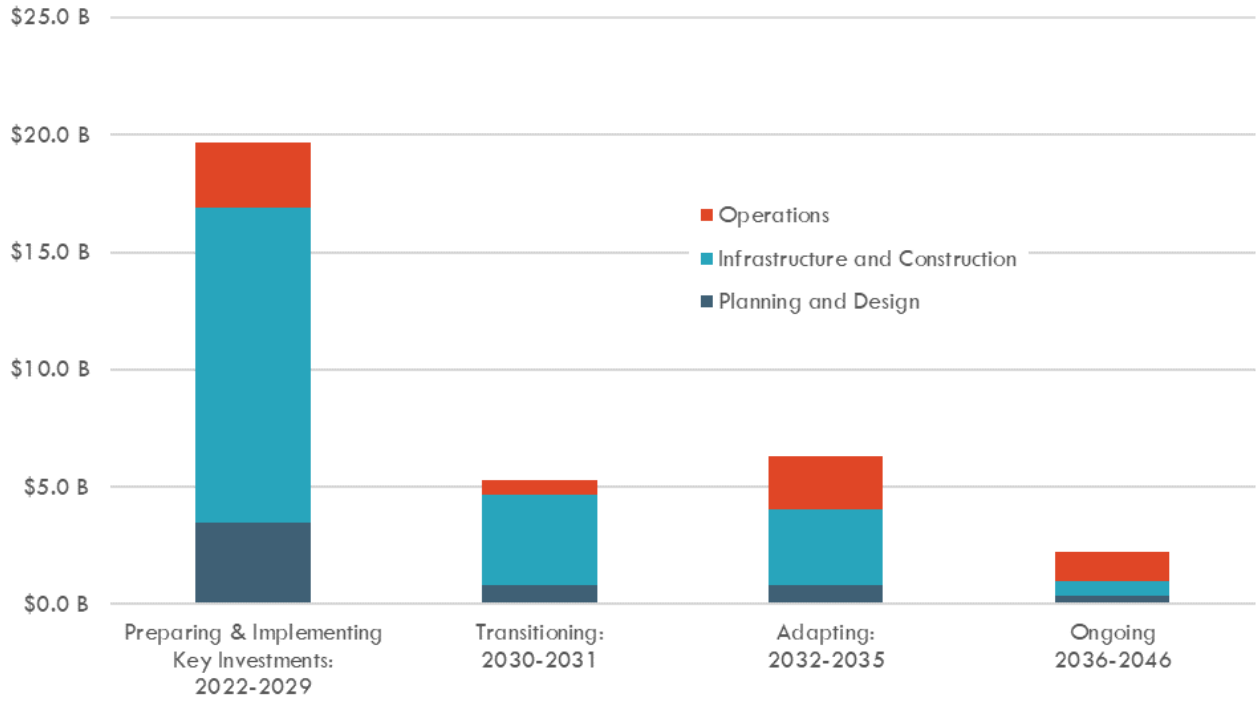
We made high-level assumptions around the nature of the expenditure for each investment according to the work anticipated in each phase. We categorized expenditures according to the three broad categories and illustrative activities shown in Exhibit 4. The Expenditure Type percentages shown in **Appendix A** are a weighted average of these phase-specific assumptions. Exhibit 5 summarizes anticipated spending over time and type, combining the ideas presented in Exhibit 3 and Exhibit 4.

Exhibit 4. Primary Activities by Phase

Planning and Design	Infrastructure and Construction	Operations
▪ Surveying ▪ Infrastructure and construction planning and design ▪ Energy generation, efficiency, and transmission resource planning ▪ Community and stakeholder engagement ▪ Engineering	▪ Berm removal ▪ Dredging ▪ Road construction and maintenance ▪ Irrigation/pipes ▪ Waterfront redevelopment ▪ Snake River Center for Advanced Energy Storage construction ▪ Fisheries improvements ▪ Energy generation and grid infrastructure construction ▪ Rail and barge system infrastructure construction ▪ Agricultural waste management infrastructure construction ▪ Grain storage expansion ▪ Pipe re-engineering construction ▪ Installation of fish protection infrastructure	▪ Workforce development ▪ Habitat restoration ▪ Cultural resource protection ▪ Water quality improvements ▪ Tourism promotion ▪ Compensation funds ▪ Technology partnerships ▪ Oversight, management, and administration ▪ Research and development for biodigesters and advanced energy storage

Source: BERK, 2021.

Exhibit 5. Illustrative Investment Scenario by Phase and Type of Expenditure



Expenditure Type	Preparing & Implementing Key Investments: 2022-2029	Transitioning: 2030-2031	Adapting: 2032-2035	Ongoing 2036-2046	Total	
Planning and Design	$3.5 B	$0.8 B	$0.8 B	$0.4 B	**$5.5 B**	**16%**
Infrastructure and Construction	$13.4 B	$3.8 B	$3.3 B	$0.6 B	**$21.1 B**	**63%**
Operations	$2.8 B	$0.6 B	$2.2 B	$1.3 B	**$6.9 B**	**21%**
Total	$19.7 B	$5.3 B	$6.3 B	$2.2 B	**$33.5 B**	**100%**
Average/Year	$2.5 B	$2.6 B	$1.6 B	$0.2 B		
	59%	**16%**	**19%**	**7%**	**100%**	

Source: BERK, 2021.

KEY FINDINGS

3. **Approximately $20 billion (59% in BERK's expenditure scenario) would be spent before the dams are breached to help the region prepare for this shift.**
4. **Slightly more than $21 billion (63% in BERK's expenditure scenario) is likely to be spent on infrastructure improvement and construction.**

3) Geographic Focus of Investment

Finally, we assigned a geographic area of focus for each investment. Exhibit 6 shows investment across the nine counties most likely to be impacted, and Exhibit 7 shows investments across the Northwest. These maps illustrate the distribution of funding in the illustrative investment package by geography. The geographic designations indicated in the map do not necessarily mean all related expenditures would occur in this location, or that the full economic benefit of such expenditures would be found here, but rather that the majority of spending (and the infrastructure and construction in particular) would be concentrated in these locations. The anticipated regional economic impacts of the proposed investment are discussed in the next section.

KEY FINDING

5. **At least $7.9 billion, or 24% of the total investment, would likely be spent in the 9 counties closest to the LSR. This includes about $1.3 billion in funding for projects in Lewiston-Clarkston, $1.9 billion in the Tri-Cities, and $4.7 billion in the remainder of the 9-county region around the LSR. Beyond these investments directed at these named geographies, significant additional funding tied to energy replacement and habitat restoration may also be expended in the 9-county region.**

Exhibit 6. Distribution of Funding, Lower Snake River Area

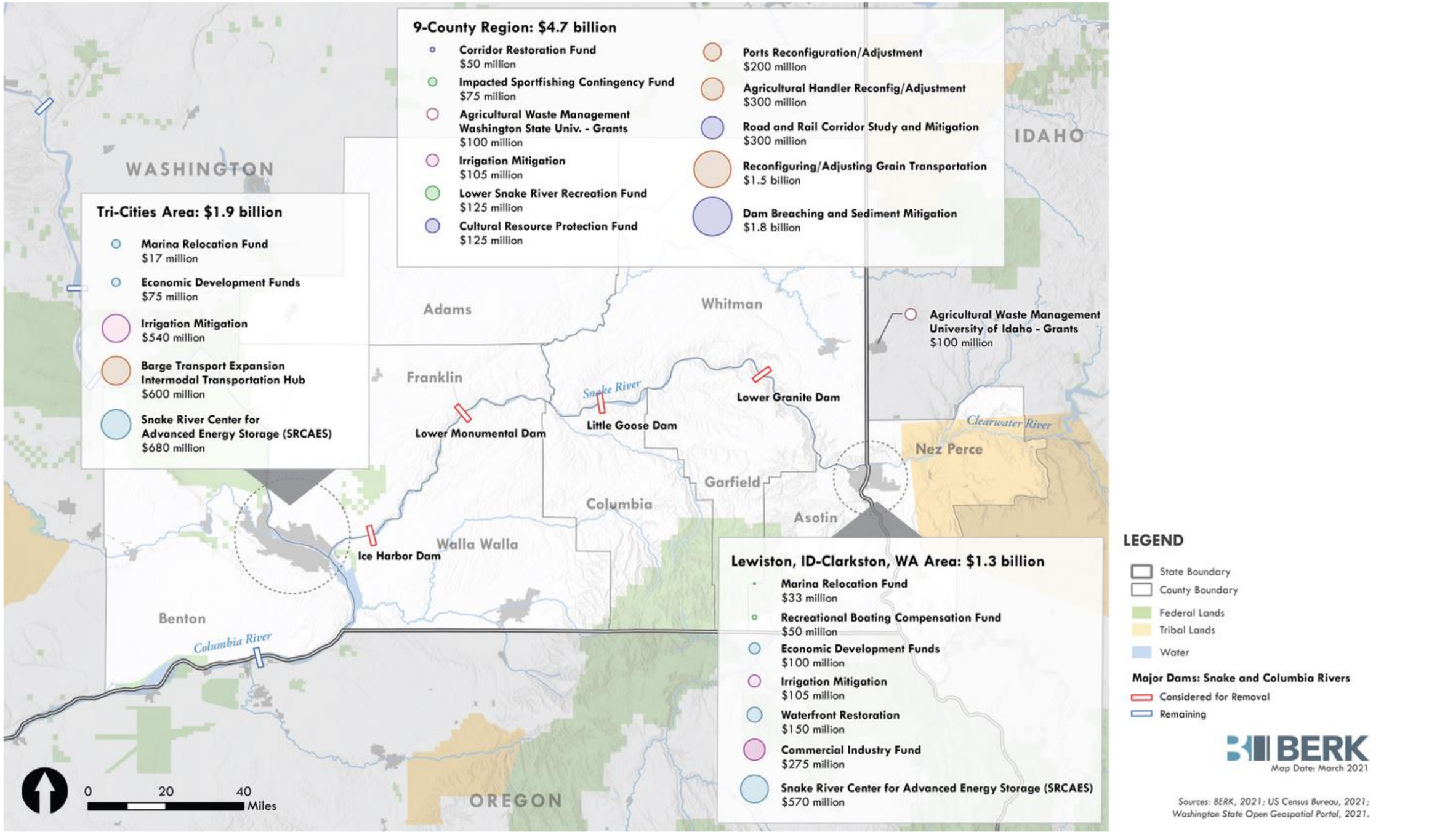
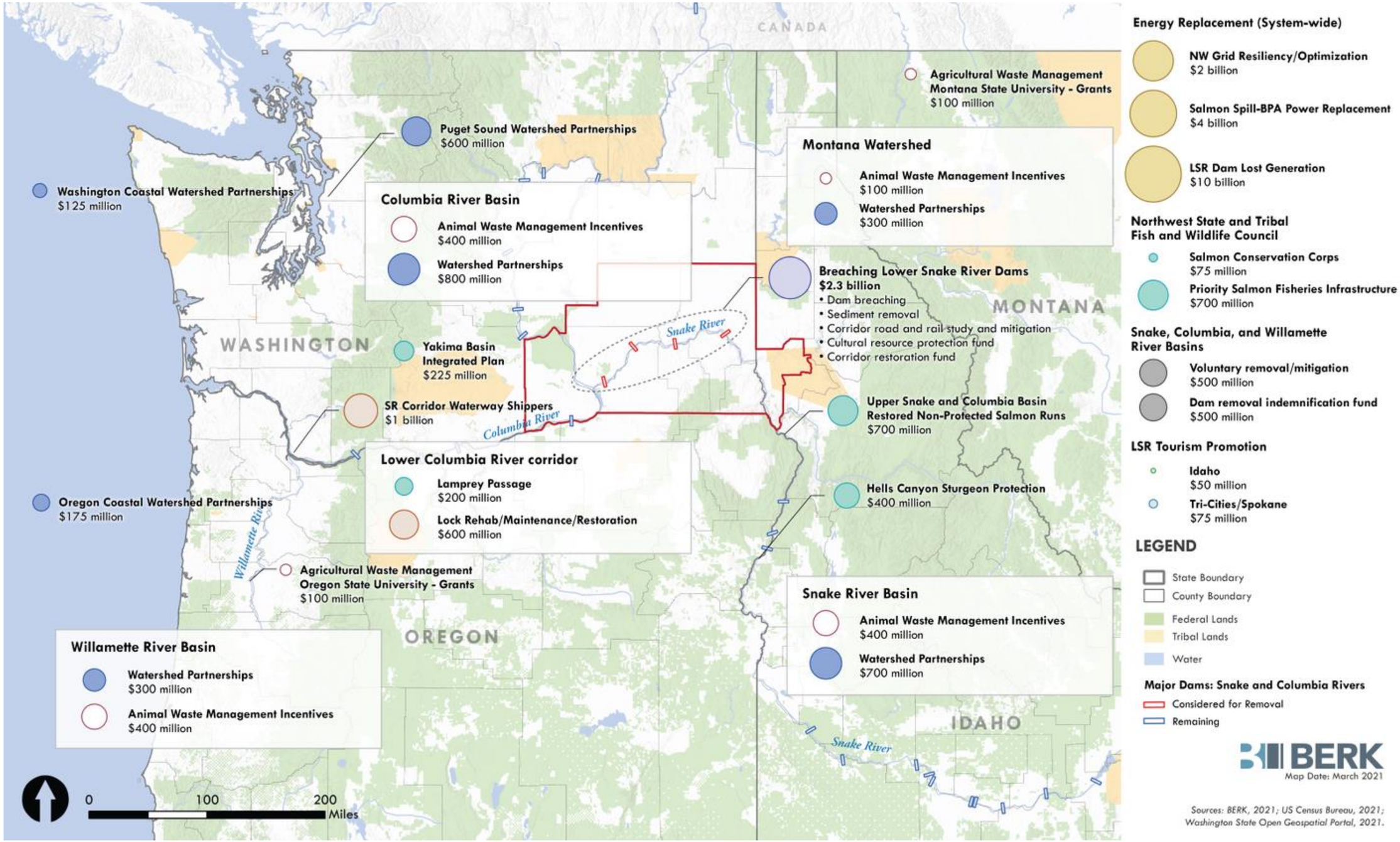


Exhibit 7. Distribution of Funding, Northwest



Anticipated Economic Impacts

The direct expenditure of the investment package described on the preceding pages would lead to additional spending and a total economic effect greater than the initial spending. A full economic impact analysis could answer the following:

- How do the impacts of this investment affect different economic sectors, including industries receiving direct investments, as well as increased activity with indirect and induced effects from suppliers and household spending from wages received from supported labor?
- How many jobs would be created (both temporary and ongoing), in what sectors and locations, and what wages would be received from these positions?
- What share of these economic benefits would be captured within the local region versus "leaking" outside of the area?

For this initial assessment, we rely on the assumptions made in the BERK investment scenario described on the previous pages, specifically for the assumptions regarding spending across categories. A significant portion of the proposed investment package is allocated to infrastructure investment and construction. Based on a possible breakdown of costs, we estimate that about $21.1 billion would be expended on waterfront redevelopment, associated construction, habitat restoration, dam breaching, and other physical and infrastructure improvements as shown in Exhibit 5. This is a significant injection of one-time spending for the construction industry, including planning and engineering, labor, materials providers, suppliers, and others.

The effects across the economy will not be limited to this direct spending, however. Indirect effects related to suppliers and supporting businesses across the supply chain will also promote economic activity, and wages from supported jobs will stimulate spending throughout the economy.

Note that this activity may not all be directed to the 9-county region immediately surrounding the LSR. Many of the planning, design, and engineering firms typically involved in infrastructure and construction projects of this scale are based outside the region, in Boise, Portland, Seattle, Spokane, and urban areas across the country. The supply chain needed to support these activities may also extend outside the region, which can result in indirect benefits accumulating elsewhere. Examples would include fuel, building materials, and equipment. The final legislative package could use local sourcing requirements to address the "leakage" of benefits outside the nine counties most affected by breaching of the dams, and outside the Northwest overall. Efforts to build local and Tribal capacity and connections with supply chains could also help in retaining these benefits in the affected region.

ASSESSING POTENTIAL ECONOMIC IMPACTS

During the first investment phase from 2022 to 2029, an average of $2.5 billion will be spent each year on engineering, design, planning, implementation, and related services. For planning purposes, we assume 75% of these contracts by value are awarded to businesses and organizations located in the Northwest, with the remainder awarded to businesses located elsewhere in the U.S. These contracts will support direct employment and associated labor income for trades workers, administrative staff, and other employees at these firms. Additional revenues, employment, and labor income will be supported by upstream supply chain transactions in the region (indirect impacts), such as the purchase of materials by construction and engineering firms, and household expenditures on goods and services (e.g., groceries, entertainment) by workers employed in support of these projects (induced impacts). Together, these impacts combined are referred to as "total impacts."

Based on a preliminary assessment, **investments and operations during Phases 1 and 2 will support an estimated average of 9,250 direct jobs each year over this period, including members of the building trades and workers at heavy construction and civil engineering firms. When indirect and induced impacts are considered, Phase 1 and 2 investments will support a total of approximately 20,000 jobs each year across the Northwest.**[2] [3] This equates to an employment multiplier of 2.2, where one direct job is tied to an additional 1.2 jobs elsewhere in the economy. Most of these impacts will accrue in Washington state, with large jobs impacts in Idaho, Montana, and Oregon based on a projected geographic distribution of investments. This figure compares to an estimated jobs multiplier of 2.4 for aerospace and less than 2.0 for wholesale and retail activities.[2] To appreciate the magnitude of this total employment impact, in Washington state, this is roughly equal to

CONSIDERING FISCAL IMPACTS

While economic analysis considers employment impacts and spending in the regional economy, fiscal analysis focuses on the impacts to local, state, and national layers of government. Impacts may include tax revenues generated by spending in the region, as well as changes to the cost of providing public sector services. While a detailed fiscal analysis is not possible in this short study period, the following directional fiscal impacts would be associated with the proposed investment package.

- **Federal.** As noted in the Introduction and Energy sections, continuation of the status quo implies significant federal expenditures, including dredging to maintain navigable channels, ongoing maintenance and operations of the dams and surrounding recreational facilities, and capital investments to update aging dam infrastructure. While these costs would likely be less than the expenditure of federal dollars proposed in the investment package, status quo costs should be subtracted from the investment total to understand the net cost to the federal government.
- **State and Local.** It is not anticipated that the investment package would significantly change the cost of providing state and municipal services, although a more detailed analysis would be necessary to evaluate the net fiscal impact on individual jurisdictions. Changes in employment, residential population, visitation by out of area guests, and commercial goods transportation patterns would affect both tax revenues and service delivery costs. It would be important to include these incremental changes on top of the tax revenues that would be generated by the infrastructure investment planned in the region over the next 25 years.

the size of the commercial and industrial building construction industry, which directly employed an annual average of 23,000 workers in 2019.[4]

Throughout the entire duration of the Columbia Basin Fund program (between 2022 and 2046, across all four project phases), investments and operations will, on average, support a total employment impact of nearly 11,000 jobs per year in the Northwest. This is lower than the 20,000 jobs supported each year during Phase 1 and 2 because spending is anticipated to ramp down in Phases 3 and 4.

Appendix B contains a summary of the methodology used to derive these figures, which are based on a high-level, rapid assessment and are intended to provide a general understanding of the potential economic impacts of the proposal. A more rigorous and comprehensive analysis would include detailed estimates of direct and total jobs, income, and revenues broken out by industry and specific geography (e.g., by state, and for the nine counties in Washington and Idaho located in closest proximity to the LSR).

In addition to the above benefits associated with direct spending in the economy, the investment in new capital facilities, including the Snake River Center for Advanced Energy Storage and additional electricity generation capacity and efficiency, will support long-term employment opportunities in various communities. These impacts are further considered in the following section.

KEY FINDINGS

6. **The approximately $21.1 billion to be invested in infrastructure and physical improvements will have significant positive economic impacts, generating jobs and stimulating spending not only in the construction and professional services sectors, but also indirectly in support industries in the supply chain such as suppliers, surveyors, and planners, as well as in household services supporting local employees. The remaining $12.4 billion spent over time on planning and design, operations, and other services will have additional positive impacts on the regional economy, though this may be subject to relatively greater leakage. Policies and investment strategies can be put in place to retain as much of these benefits as possible in the nine counties most directly affected by breaching of the dams, as well as the broader Northwest region.**
7. **Spending during Phases 1 and 2 will support a total average of more than 20,000 jobs each year across the Northwest, primarily in Washington state but with additional jobs impacts in Idaho, Oregon, and Montana. These jobs impacts include workers directly employed in the building trades, at civil engineering and heavy construction firms, and various supporting organizations and services. Additional jobs will be supported by business supply chain transactions and household expenditures. Throughout the entire duration of the project (all four phases, including ramped down spending in Phases 3 and 4), an average of nearly 11,000 jobs will be supported directly and through multiplier effects each year**
8. **Local and state net fiscal impacts are likely to be positive given increased tax revenues associated with sales tax on construction and other one-time revenues. Shifts to the ongoing cost of providing services are not anticipated to be significant, with additional study warranted for jurisdictions likely to see significant changes in population, employment, visitation, or transportation patterns.**

Long-term Economic Outlook

While the previous section discusses the economic impact of the expenditures contained in the proposed investment package, this section considers the future of key sectors of the regional economy that would be affected by the investment proposal, including agriculture, energy production, and recreation and tourism. Employment in these industries is highlighted in Exhibit 8, which shows size of the industry in terms of employment (size of the bubble), average annual employment change between 2014 and 2018 (along the horizontal axis), and the relative concentration of employment in the sector compared to the average for Washington and Idaho (vertical axis).[5] Industries above the 1.0 line are more highly concentrated in the region than in Washington and Idaho as a whole, while those below the line are less concentrated.

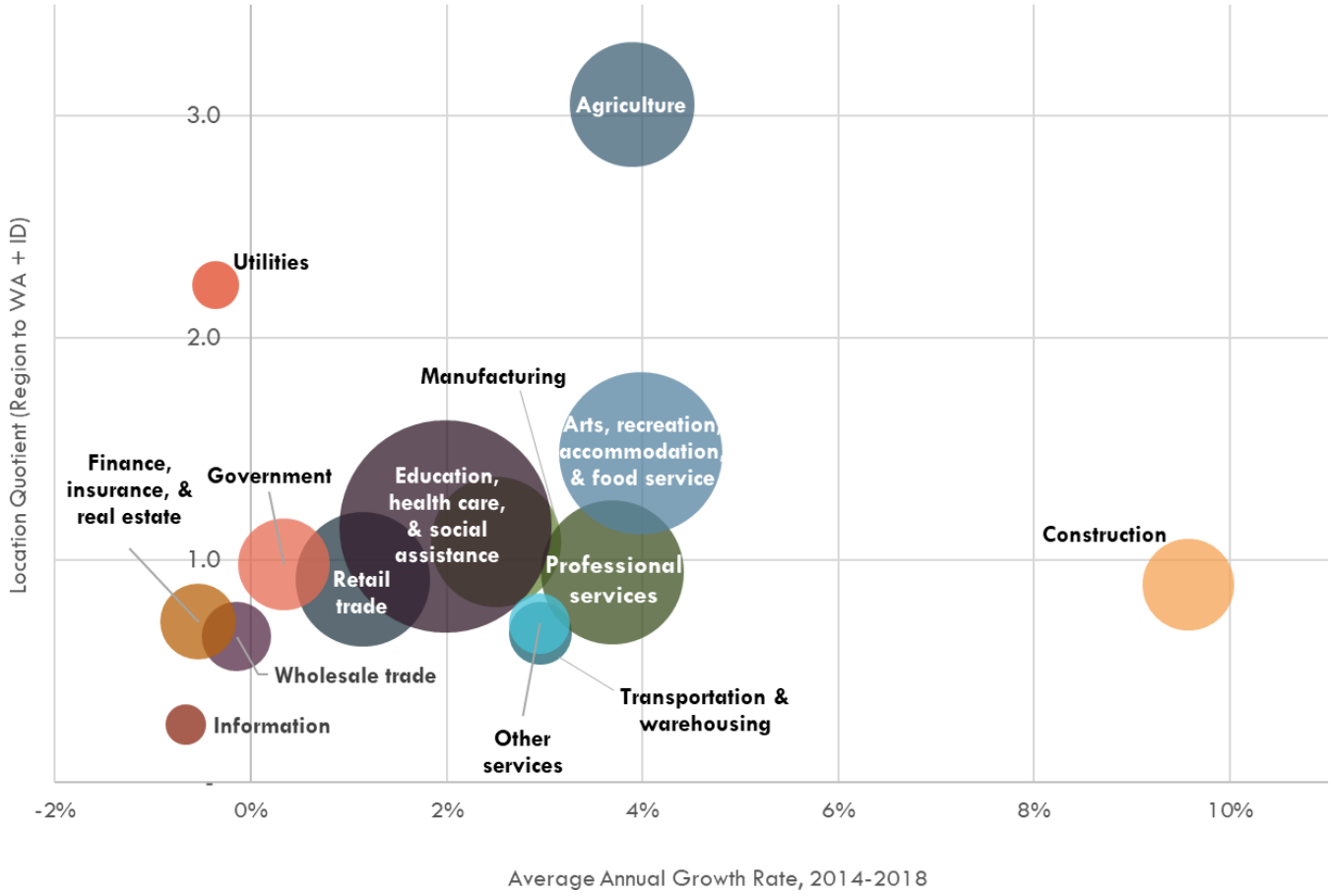
Exhibit 9 presents similar information for the region's gross domestic product by industry. Gross domestic product (GDP) is a measure of economic activity that indicates the value of goods and services produced within a specific geography within a year. While GDP is most frequently calculated on a national basis, the U.S. Bureau of Economic Analysis estimates GDP for U.S. counties. That data forms the basis of this chart.[6] Exhibit 9 indicates the value of goods and services produced within each sector (size of the bubble), the inflation-adjusted average annual growth rate in the value of goods and services produced in each industry between 2014 and 2018 (along the horizontal axis), and the relative concentration of the 9-county region's GDP in the industry, as compared to Washington and Idaho as a whole (along the vertical axis). Industries above the 1.0 line contribute to a larger portion of the region's GDP than they do to the combined GDP of Washington and Idaho.

- **Agriculture** is a strong regional industry, with a high concentration, modest contribution to GDP, large employment, and solid growth. While GDP from the agricultural industry declined by an average of 1% per year between 2014 and 2018, this is primarily due to the nature of the industry, as the value of goods produced in a year is determined largely by commodity prices. The period of 2014-2017 coincided with a drop in wheat prices (the predominant crop in the region). Wheat prices increased between 2017 and 2019 and GDP from agriculture in the 9-county region increased in inflation-adjusted terms each year in that more recent period.
- **Energy generation** (captured in the "Utilities" sector) is also more highly concentrated in the region than across Washington and Idaho as a whole in terms of both employment and GDP. Over the last five years, employment has been relatively modest, and the industry has seen a very slight job loss. The sector's importance should not be understated, however, as energy is a key input for other industries.
- **Recreation and tourism** employment is embedded in Accommodation & Food Service, Arts & Recreation, and other sectors. While the accommodation, food service, arts, and recreation sectors together make up a relatively large percentage of total regional jobs, the majority of these are in the food service sector and include jobs that serve locals as well as visitors. Compared to its share of regional employment, this sector makes up a relatively smaller portion of the region's GDP. As described below, the recreation and tourism industry makes important contributions to the region despite its small size.

In addition to these three key sectors, it is important to note that **construction** is a relatively large industry in the region; while it is slightly less concentrated here than in the Washington and Idaho

economies as a whole, it grew by about 11% per year between 2015 and 2019 and employment in construction grew by an average of 10% per year between 2014 and 2018. This indicates there is increasing capacity regionally to absorb investment in infrastructure and construction.

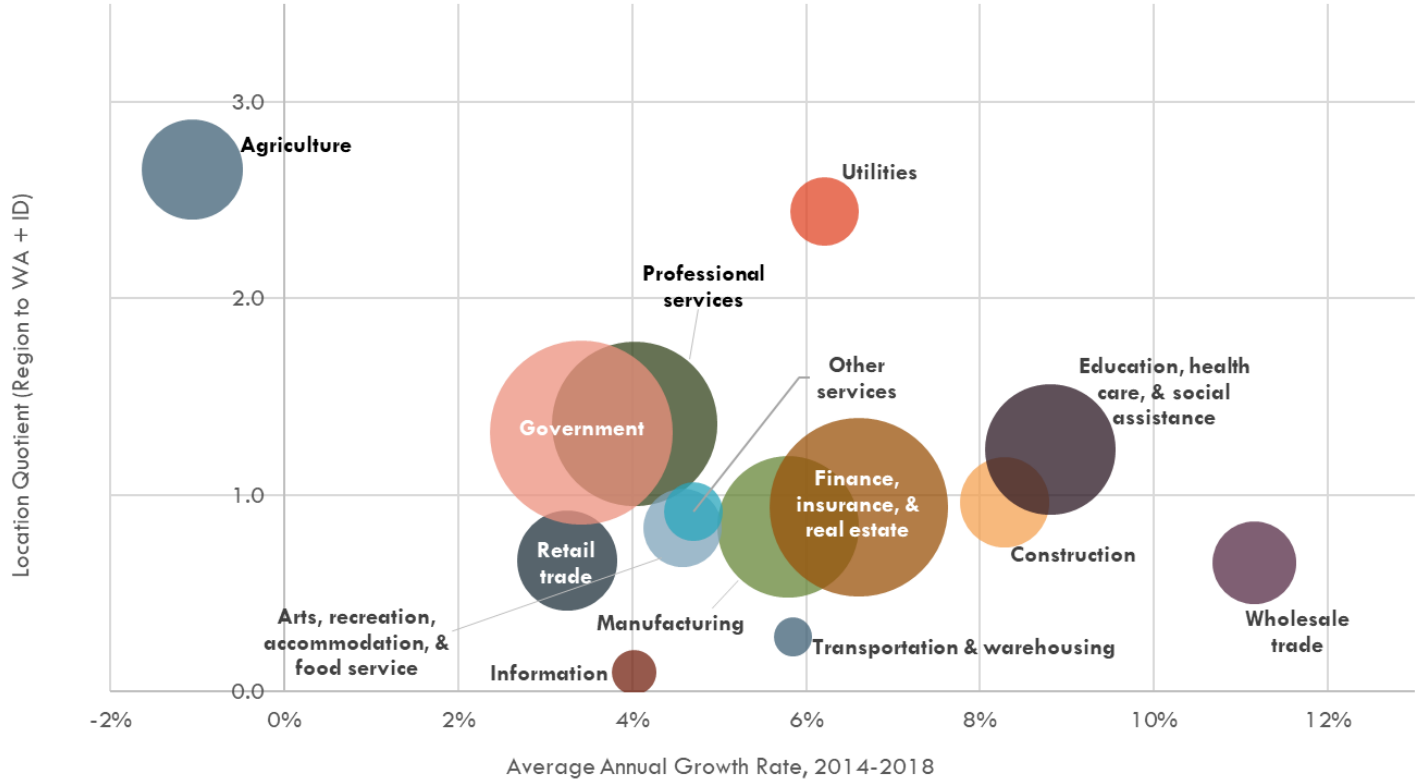
Exhibit 8. Employment by Sector in 9-County Region



Note: Size of bubble represents quantity of jobs in the sector. Horizontal axis represents the 5-year average annual growth rate for employment in the sector. Vertical axis represents the location quotient for employment in the sector, comparing the 9-county region to the states of Washington and Idaho combined. Excludes industries with fewer than 200 total employees across the region.

Sources: U.S. Census Bureau Longitudinal Employer-Household Dynamics (LEHD), 2018; BERK, 2021.

Exhibit 9. GDP by Sector in 9-County Region



Note: Size of bubble represents size of GDP by sector. Horizontal axis represents the 5-year average annual growth rate for GDP in the sector. Vertical axis represents the location quotient for GDP in the sector, comparing the 9-county region to the states of Washington and Idaho combined. Excludes industries with less than $25 million in average annual GDP across the region.

Sources: U.S. Census Bureau of Economic Analysis (BEA), 2018; BERK, 2021.

As we consider the future of the agriculture, energy, and tourism industries, the key questions are complex and nuanced:

- What are the likely long-term outcomes associated with the expenditure of the $21.1 billion in funds dedicated to infrastructure investment and economic development as well as with the breaching of the four LSRD?
- While this expenditure of outside resources will generate significant positive short-term economic gains for the region, will the core industries of agriculture, energy generation, and tourism be enhanced or diminished in the long-term?
- How can investment expenditures best be targeted to minimize economic disruptions, address anticipated challenges, and maximize returns for the region by strengthening the economy and making it more resilient to future changes?

Given the rapid nature of this initial assessment, our analysis here is preliminary and we recommend that additional study be given to these questions with the direct involvement of affected industries and communities. For now, we draw on preexisting studies and previous conversations to briefly describe the current state of each sector and summarize previously identified concerns and opportunities.

AGRICULTURE

Agriculture, and wheat farming in particular, is integral to the economies of Southeast Washington, Northwest Idaho, and Northeast Oregon. In the nine counties closest to the LSR, agriculture contributed an average of $1.4 billion to the area's GDP each year between 2015 and 2019, equal to 5.4% of the area's total GDP.[6] Sales of wheat alone were equal to 1.8% of the area's total GDP in the most recent year in which data was available (2017).[7] Between 2014 and 2018, agriculture accounted for an average annual equivalent of just under 18,000 jobs, representing 9% of total employment in the 9-county area.[8] Grain farming represents about 5% of total agricultural employment in the region, equal to an annual average full-time equivalent of at least 800 jobs.[9] As shown in Exhibit 8 and Exhibit 9, the agriculture industry is generally growing.

Anticipated Investment Outcomes

Grain Transportation

If the LSRD were breached without investment in grain transportation infrastructure, grain growers would face increased transportation costs and longer and less certain transportation times for their products to reach customers. Taken together, these impacts could have significant detrimental effects on the competitiveness of the grain industry in the region. Grain growers have indicated that the cost increases and logistical challenges could be large enough to lead grain growers to exit the industry, threatening the future of the industry in the region.[10]

This is due to two key conditions in the existing transport system:

- The **competitive environment between rail and barge shippers**. Under current conditions, rail and barge shippers have an incentive to compete on price and service (timeliness). Absent a barge system, rail companies have little incentive to compete on price and service, particularly in the absence of government intervention. In interviews as part of prior studies,[11] [12] grain producers have raised this as a major concern and expressed that shipping costs for grain products could increase by as much as 100%. This concern has been borne out in real-world conditions – during the temporary 2010-2011 closure of the LSRD locks to barging, shipping costs for grain producers increased by nearly 40%.[13]
- The **lack of sufficient rail and grain storage capacity** to make timely delivery of grain products via rail shipping possible. In 2019, more than 85 million bushels of grain (primarily wheat) were moved down the LSR by water. Transporting the same quantity via rail would require sufficient capacity to handle nearly 24,000 additional rail car loads (at 3,600 bushels per car) and additional storage capacity.[14] Responsiveness and timeliness are critical factors for grain producers in considering shipping modes, and the current barge configuration has the advantage of offering 3-day turn-around times from notification to delivery.[15] The existing rail system lacks the capacity to transport this additional cargo in the same timeframe. This is due to a combination of factors, including congestion on rail lines, lack of rail car storage space, lack of unit train loaders, and lack of grain storage facilities.[16] [17] [18]

Previous studies of the economic impacts of breaching the LSRD have identified a range of costs for the infrastructure investments that would mitigate the impacts of eliminating the LSR navigable waterway on

agricultural producers. Exhibit 10 summarizes the range of costs identified in these studies. At the high end, the FCS Group study estimates $1.1 billion in total costs to mitigate transportation impacts in 2020 dollars,[19] though this does not include an estimate of increased shipping costs paid by grain producers. Using the highest-cost estimate from either study in each category results in a total high-end estimate of $1.4 billion in mitigation costs.

Exhibit 10. Range of Estimated Agricultural Transportation System Mitigation Costs (in 2020 dollars)

Category	ECONorthwest Study*	FCS Group/ PNWA Study**	Highest Estimate: Either Study
Road Repair (Soil Stabilization)	$214.4M - $575.6M	$96.8M – $387.4M	$575.6M
Road Maintenance and Improvements	$57.6M - $99.1M	$169.2M – $203.5M	$203.5M
Rail and Storage Infrastructure Expansion	$118.2M - $141.9M	$367.8M - $432.7M	$432.7M
Other Infrastructure	*Not estimated*	$49.0M – $73.6M	$73.6M
Increased Transportation Costs to Producers	$42.5M - $81.1M	*Not estimated*	$81.1M
Total	**$403.7M - $832.1M**	**$683.4M - $1.1B**	**$1.4B**

**Expressed in present value, using a 2.75% discount rate over a 30-year period. Original estimates were in 2018 dollars.*
*** Original estimates were in 2019 dollars.*

Sources: ECONorthwest, 2019; FCS Group, 2020; Kramer Consulting et al., 2020; BERK, 2021.

The proposed investment package presents a unique opportunity to expand the capacity of the grain shipping system in the region and to "make the agricultural industry whole" in the event of the breaching of the LSRD. It includes a total of **$3.5 billion**[a] in investments to build and improve road, rail, barge, port, and storage facilities and support transportation of grain, more than double the $1.4 billion highest-end estimate of costs. The package funding is greater than the identified need, even if the increased transportation costs to grain producers (the most uncertain element) exceed those identified in the ECONorthwest study by a large margin.

KEY FINDING

9. The $3.5 billion in dedicated funding for agricultural transport mitigation and improvements is more than double the highest previously identified estimate of the investment needed to make agricultural producers whole.

[a] There is an additional $1.0 billion in the package for a compensation fund for shipping companies currently operating on the LSR. While those funds are included in the $4.5 billion "Transportation" category in the Summary of the Proposed Investment, they are not included in the discussion in this section because they do not directly impact grain producers. In addition, the $3.5 billion in transportation investments cited here includes the $300 million for road and rail infrastructure study and mitigation, which is included in the Dam Breaching category rather than the Agricultural Transportation Guarantee category in Exhibit 1.

The package addresses the transport system issues through the following actions:

- **$300 million** to **study and mitigate the impacts of dam breaching on road and rail** infrastructure in the 9-county region as water levels fall post-breach.
- Providing funding to **expand rail and road capacity** in the area, including **$300 million** for agricultural handler reconfiguration/adjustment, allowing for upgrades to unit train loaders on the corridor.
- Funding to **expand grain storage and loading capacity** in the form of **$200 million** in port reconfiguration/adjustment funds for the ports of Lewiston, Clarkston, Wilma, Whitman, and other grain-collecting ports.
- Providing funding to **expand shipping on the Lower Columbia River** from the Tri-Cities, in the form of **$600 million** for the construction of an intermodal transportation hub and **$600 million** for lock rehabilitation and improvements for dams on the Lower Columbia River.
- Providing funding **to fully compensate grain farmers for the impacts of increased transportation costs**. This is in the form of a **$1.5 billion** grain transportation reconfiguration/adjustment fund to the states of Idaho and Washington. The funds could be applied across a range of investments and solutions, including, but not limited to:
  - Direct subsidies for growers facing increased shipping costs on rail and/or truck. If the funds are placed in trust, the States could provide farmers with an annuity that fully subsidizes transportation costs in perpetuity.
  - Investments in unit train loaders to increase the capacity and reliability of the rail transport system.
  - Expanding rail cooperatives (e.g., Washington Grain Train), which provide lower cost and more reliable rail transport for growers.
  - Additional investments in increasing barging capacity on the Lower Columbia River.

KEY FINDING

10. **The $1.5B flexible transportation fund for grain producers exceeds all previous estimates of the increased shipping costs under a dam breach scenario, indicating producers will likely face lower shipping costs under the investment package.**

In addition to being more than sufficiently large to meet the required transportation system mitigation investments identified to date, the package has the advantage of offering flexibility to affected producers. The $1.5 billion grain transportation reconfiguration/adjustment fund for the states of Washington and Idaho can be invested in a range of different solutions, providing funding where it will be most impactful and addressing the current constrictions from multiple angles.

Irrigation

There are an estimated 57,600 acres of irrigated agricultural land within 5 miles of the LSR that could potentially be affected by the loss of irrigation from the LSRD reservoirs, of which around 37,000 acres are currently irrigated from the Ice Harbor Reservoir.[20] More than half of this irrigated cropland is in orchards and vegetable fields.[21]

In addition to agricultural users, there are a small number of wells and municipal and industrial pump stations located near the LSR that are likely to be affected by the river drawdown. As of the 2002 EIS, these included 228 residential and irrigation wells and six municipal and industrial pump stations, including pump stations used for municipal water backup, golf course irrigation, and paper product production at the Clearwater Paper Mill.[22]

If the LSRD are breached, the existing reservoirs will recede and the groundwater table is likely to drop, at least in the short-term.[23] Previous studies have estimated the costs associated with improving well, pump, and water transportation infrastructure in the region to mitigate the loss of water associated with the dam breaches. Exhibit 11 summarizes the range of costs identified in these studies in 2020 dollars.

At the high end, the 1999 Drawdown Regional Economic Workgroup (DREW) Water Supply Analysis[24] and 2002 EIS study[25] estimated a total of $683.4 million (in 2020 dollars) to mitigate impacts to irrigated agricultural land, municipal and industrial pumps, and private wells by constructing a large central pumping station and water conveyance infrastructure to transport water to agricultural land, and modifying existing wells and pumps. However, the DREW Water Supply Analysis notes that the significantly higher cost shown in this infrastructure-cost estimate (versus the cost shown in an alternate calculation method based on change to land value) likely indicates that those costs are overestimated. The 2019 ECONorthwest study estimated a total cost of $153.2 to $191.5 million to replace 41 affected surface water diversions and 84 wells likely to be affected by the dam breaches.[26]

Exhibit 11. Range of Estimated Irrigation System and Water Supply Mitigation Costs (in 2020 dollars)

Category	ECONorthwest / Vulcan Study *	DREW / EIS **	Highest Estimate: Either Study
Agricultural Irrigation Mitigation	*Not disaggregated*	$227.6M - $494.1M †	
Municipal & Industrial Pump Improvements	*Not disaggregated*	$19.5M - $93.6M ††	
Private Well Improvements	*Not disaggregated*	$95.7M	
Total	**$153.2M - $191.5M**	**$247.1M - $683.4M**	**$683.4M**

** Original estimates were in 2018 dollars.*
*** Original estimates were in 1998 dollars.*
† The range of cost estimates for agricultural irrigation mitigation in the 2002 EIS and the 1999 DREW Water Supply Analysis is based on two cost estimate methods. 1) A method which estimated the potential change in assessed value of irrigated agricultural land if the dams were removed. This method resulted in the lower-end cost estimate. 2) A method which estimated the costs to modify pumps and other irrigation infrastructure. This method resulted in the higher-end cost estimate. The USACE chose to use the lower-end estimate, stating: "The pump modification costs are significantly higher than the estimate of the change in land value, therefore, it is reasonable to conclude that this option is not economically viable, and is an overstatement of the economic effects. The land value approach is therefore carried forward as the approach to measure the economic effects to pump irrigators at Ice Harbor reservoir."[27]
†† The range of cost estimates for municipal and industrial pump improvements is based on a range of construction cost estimates, the range was generated due to uncertainty around the cost of modifications at a papermill in Lewiston, ID.

Sources: ECONorthwest, 2019; U.S. Army Corps of Engineers, 2002; BERK, 2021.

The investment package dedicates **$750 million** to irrigation mitigation for the construction and improvement of wells, pumps, and water conveyance infrastructure. The dedicated funding exceeds the highest previously identified infrastructure cost estimate by 10%, indicating the investment package is at least appropriately sized to address impacts to irrigation and water supply associated with the dam breaches.

KEY FINDING

11. **The $750 million investment in irrigation infrastructure exceeds the highest previously identified estimate of the investment needed to fully mitigate irrigation impacts from dam breach by 10%.**

ENERGY

The four dams proposed to be removed in 2030 were placed in service between 1962 and 1975 as part of the Federal Columbia River Power System (FCRPS) and are currently being operated and maintained by the U.S. Army Corps of Engineers (USACE). The Bonneville Power Association (BPA) maintains the transmission system used to carry this power to utilities and hence consumers and is also responsible for marketing power across the Intercontinental Exchange.

Altogether these facilities provide a total nameplate capacity of 3,033 megawatts (MW) with an estimated 20-year average capacity factor of 32–34%, resulting in a median yearly generation of around 795 annual average MWs (aMW).[28] This includes additional dispatchable capacity that can be employed at short notice and for short periods in response to increased demand from customers. This ability to respond quickly to demand is a key advantage for this source of power, as it provides additional stability to the regional grid during peak-load periods, and opportunities for the export of power outside of the BPA service area to other regions.

Systemwide, these four dams contribute about 14% of the total capacity of the dams in the FCRPS and around 3% of the total generating capacity in the region.[29] It is important to note that continuation of the status quo carries its own uncertainties and costs:

- **A competitive market.** The ECONorthwest study notes that the inflation-adjusted price of wholesale electricity has trended upwards at the same time that rates for purchasing power on the Intercontinental Exchange have been decreasing, calling into question the economic competitiveness of the current generation model.[30]
- **Ongoing operations and maintenance (O&M) costs.** The expense to operate and maintain the dams on the LSR was estimated in a 2016 study jointly issued by the BPA, USACE, and Bureau of Reclamation at $52 million per year in 2018 dollars.[31] These costs are currently incurred by BPA and the USACE and borne by ratepayers.
- **Capital costs of maintain existing generating capacity with dams.** Anticipated capital investments needed to keep the dams operational range between $654 million and $1.6 billion from 2020–2040, with the high range including the replacement of 24 generating turbines at $46 million per unit.[32] [33] Over the longer term, it is expected that regional loads will increase by 1,800–4,400 aMW out to 2035, as projected by the Northwest Power and Conservation Council (NPCC).[34] Although there are concerns about peak capacity for winter and summer loads, the NPCC highlights that energy efficiency and demand-side management strategies could address most if not all of this increase in demand.
- **Requirements for clean power.** Under the 2019 *Clean Energy Transformation Act*, the State of Washington has committed to a goal of 100% clean energy (with offsets) by 2030 and 100% renewable or non-emitting electricity supplies by 2045.[35] [36] Any proposed changes to the grid must be evaluated against the ability to make progress towards this goal.

Proposed Investments

At $16 billion, investments in the energy system constitutes nearly half of the proposed investment package, as illustrated in Exhibit 1. Per **Appendix A**, this includes three related investments:

- $10 billion to replace the current energy production of the four dams.
- $4 billion to replace energy production on downstream Columbia River dams, where additional non-generating voluntary spill will be needed to aid salmon migration.
- $2 billion to optimize the Northwest transmission grid in response to where generation occurs.

In addition to these three core investments, $1.25 billion is dedicated to building and supporting the Snake River Center for Advanced Energy Storage with research and operations at the Pacific Northwest National Laboratory in the Tri-Cities and a new facility to be constructed and staffed in the Lewiston-Clarkston area.

KEY FINDING

12. **The largest component of the investment package is devoted to energy, with $16 billion allocated to replacing capacity and strengthening the grid, as well as $1.25 billion to create the new Snake River Center for Advanced Energy Storage.**

The primary purpose of these investments is to offset generation losses associated with breaching the four LSRD and changes to dam operations on the lower Columbia rivers. As described in the Columbia Basin Fund framework, these investments seem likely to result in:

- **New zero-emission generation capacity**, which would likely include significant wind and solar generation projects.
- **Energy storage**, likely in the form of batteries or pumped storage on the grid, to increase stability during peak demand and reduce the loss of load probability.
- **Upgrades to the regional transmission network** to allow for existing and future projects to be reliably connected to the regional system.

Final strategies to address the loss of capacity after breaching may also include other approaches not identified in early thinking about the investment package, potentially including:

- Purchasing additional clean power from other regions to address peak demand.
- Supporting increased efforts to coordinate with customers to reduce electricity demand.
- Changing pricing structures to encourage lower consumption.
- Investing in distribution systems to increase utilities' ability to integrate variable energy.

While these are not recognized directly in the package under review, they may have distinct economic effects that should be evaluated under a more complete study.

Anticipated Investment Outcomes

The proposed investments in energy generation, storage, and transmission will have multiple economic effects on the region:

- **Direct spending and one-time labor effects in the economy.** The expenditures identified in the investment package are expected to impact the economy as goods, services, and labor are purchased to meet the objectives outlined in the package. As noted previously, effects will move through the economy according to location, supply chain purchases, and employee wages needed to support these activities.
- **Long-term labor shifts.** The jobs associated with operating and maintaining the existing dams will no longer be needed if the dams are breached, but new employment associated with the new capacity for generation and storage will be necessary, and new jobs and opportunities for innovation will be created by siting the Snake River Center for Advanced Energy Storage in the Tri-Cities and Lewiston-Clarkston areas. The qualities of the jobs gained versus lost are not estimable as part of this assessment, but the potential for workers to transfer between lost and gained positions, the differences in wage rates, and other factors will be relevant for understanding the detailed effects of this package on jobs in the energy industry.
- **Wholesale and consumer electricity price impacts.** In previous studies, the costs of installing new zero-emission generating capacity were assumed to be incorporated into consumer electricity rates, resulting in a range of possible rate increases. The proposed investment package seeks to avoid these impacts by providing a significant external investment in new generation infrastructure, including $10 billion identified for replacing LSRD capacity and $4 billion to compensate for diminished generation on the Columbia River. While estimating full energy replacement costs is beyond the scope of this paper, the NWEC report and 2020 EIS provide a range of costs that can be compared to costs under the status quo and the proposed investment amount. As shown in Exhibit 12, the current costs plus an annualized amount for the $10 billion slated for LSRD generation replacement exceed estimated capital and O&M costs under nearly all scenarios.

  There are many variables to consider, and we recommend that this analysis be expanded in future work. The proposed $10 billion will help to mitigate impacts for ratepayers and other stakeholders from the costs of new capacity that would otherwise be capitalized into electricity rates. In fact, this investment may exceed the capital and operating costs associated with building new alternative energy capacity and could represent an opportunity not only to replace LSRD generation, but to augment it.

KEY FINDING

13. **The proposed $10 billion will help to mitigate the impacts to ratepayers associated with the capitalized costs of building replacement capacity. As this amount could exceed the costs associated with developing alternative energy capacity, this investment also represents a potential opportunity to augment capacity beyond simply replacing the lost generation from the four dams.**

- **Public goods resulting from new investment.** There are also other characteristics resulting from new investment that may have downstream effects in the economy: changes in greenhouse gas emissions, improvements in technology, changes in market costs for zero carbon power generation, and so forth. These are noted here, although a full assessment of these impacts may be difficult to calculate.
  - **Improved stability of the grid.** The $2 billion allocated for grid optimization is expected to enhance the overall function of the current grid. This may include adding storage systems (e.g., batteries, pumped storage), supporting transmission line improvements to connect with new projects, and smartening and hardening local electricity systems.
  - **Enhanced regional innovation, research, and development.** The total expenditure of $16 billion on expanding local generating capacity, efficiency, and storage, as well as funding the new Snake River Center for Advanced Energy Storage in partnership with the Pacific Northwest National Laboratory, will have other long-term effects on building capacity for developing zero-carbon power generation in the local economy. Building local capacity in constructing and integrating these facilities can help reduce costs and increase the local economic benefits derived from these projects, and this may even support development of local businesses devoted to energy production, storage solutions, and other energy-related goods and services.

KEY FINDING

14. **The proposed investment has significant potential to produce additional public goods, including regional economic stimulus and employment; improved stability of the grid; and enhanced regional innovation, research, and development.**

The proposed investment in the energy sector represents an opportunity for the Northwest to develop and apply new technologies, advance decarbonization, and harden and smarten the grid. Used wisely, this investment will benefit the region well beyond replacing the energy generation of the four dams. Strategies should be deployed to ensure that the investment is optimized to meet multiple goals, including:

- Energy reliability, including the availability of dispatchable capacity to meet short-term needs.
- Advancing decarbonization goals.
- Creating economic and employment opportunities for regional communities. Provisions may include efforts to increase permitting certainty for new energy projects and provisions to ensure a dedicated portion of benefits accrue to Tribal enterprises, regionally based business, or other communities of interest.

Exhibit 12. Energy Replacement: Capital and O&M Costs

A) Comparison to NWEC Study

Analytic Period	20	years*
Status Quo Costs		
Status Quo Annual Operating Costs	$52	million
Status Quo Total Capital Costs (low estimate)	$654	million
Status Quo Total Capital Costs (high estimate)	$1,600	million

Status Quo Costs - Annualized	**Annualized Capital Costs**	**O&M Annual**	**Total**
Low Capital Estimate	$33 M	$52 M	**$85 M**
High Capital Estimate	$80 M	$52 M	**$132 M**
Median of Low and High Estimates	$56 M	$52 M	**$108 M**

Proposed Investment in LRSD Generation Replacement		
Total Investment	$10	billion
Annualized Investment Amount	$500	million

Replacement Portfolios	**Annualize Capital Costs**	**Annual O&M**	**Total**	**Increase Over Status Quo (median capital costs)**	**Annualized Investment Amount Minus Increase**
NGA	$165 M	$255 M	**$421 M**	$313 M	**$187 M**
NGA Plus	$1,107 M	$84 M	**$1,191 M**	$1,083 M	**($583) M**
Balanced	$183 M	$212 M	**$396 M**	$288 M	**$212 M**
Balanced Plus	$400 M	$63 M	**$464 M**	$356 M	**$144 M**
All Gas	$335 M	$200 M	**$535 M**	$427 M	**$73 M**

B) Comparison to 2020 EIS

	Replacement Portfolios						
	Gas	**Demand Reduction**	**Solar**	**MT Wind**	**Gorge Wind**	**Solar and MT Wind**	**Battery**
Total Annual Increase (per 500 MW, including O&M and capital)	$22 M	$14 M	$27 M	$38 M	$47 M	$33 M	$98 M
Total Increase (500 MW x 7)	$155 M	$97 M	$190 M	$266 M	$328 M	$229 M	$683 M
Annualized Investment Amount Minus Increase	**$345 M**	**$403 M**	**$310 M**	**$234 M**	**$172 M**	**$271 M**	**($183) M**

* This analysis uses a 20-year investment period to align with NWEC's annualized costs.

Sources: NW Energy Coalition, 2018; U.S. Army Corps of Engineers, 2020; BERK, 2021.

RECREATION AND TOURISM

The LSR Basin has many recreation and tourism assets that enhance quality of life for local residents and attract out-of-area residents. While these enhanced quality of life benefits have intrinsic economic value, as noted earlier, the extent of these benefits is beyond the scope of this analysis. Out-of-area visitors who engage in recreation activities bring new money directly into the regional economy, which they spend in restaurants, grocery stores, gas stations, overnight lodging establishments, and on local tourism guides and attractions. Activities include fishing, hunting, birdwatching, boating, swimming, picnicking, hiking, camping, and a variety of other pastimes. Many of these current uses depend on flat water reservoirs and access facilitated by 58 facilities maintained by the U.S. Army Corps of Engineers.

While these are important economic stimulators for the region, it is important to consider the overall scale and health of the sector. The 2020 EIS notes that "regional economic effects associated with… expenditures on recreation in the Basin support 6,480 annual jobs, $265 million in labor income, and $843 million in sales across the recreation study area annually".[37] For context, the report cites the overall size of the regional economy, illustrating that the tourism in the Basin constitutes about 0.2% of total employment, labor income, and sales.

The 2019 ECONorthwest report provides a similar perspective on the Basin's tourism economy, noting that "broader increases in tourism throughout the state have not been captured by Clarkston and Lewiston" and that "significant opportunities for growth exist".[38]

Anticipated Investment Outcomes

The breaching of the dams would trigger a significant transformation of the regional recreation and tourism sectors. Flatwater recreation opportunities would be lost, including water skiing, flatwater fishing, picnicking in facilities established and maintained by the U.S. Army Corps of Engineers, and river boat cruises between Portland and Clarkston. As noted in the 2020 EIS, "With about one-third of the current visitation associated with water-based activities, the loss of this visitation would be large and adverse".[39]

The question is whether new recreation opportunities would offset these losses and whether the region could effectively reorient itself to these new opportunities. The 2020 EIS and the ECONorthwest report are both optimistic. While the ECONorthwest report anticipates substantial additional visitation and economic benefit with breaching of the dams, the EIS is more circumspect, noting that benefits would require substantial investment:

> [A]s the river returns to natural conditions, river-based recreation would increase over time, given that recreational access and infrastructure is developed; the exact long-term beneficial impacts to visitation and social welfare are uncertain, although the losses in reservoir recreation would be offset by increases in river recreation visitors, and may eventually increase to levels and values greater than under the No Action Alternative[40]

The EIS also notes that after adaption of the industry, "there is the potential for an increase in jobs and income for outfitters, boating companies, and other tourism businesses relative to the No Action Alternative".[41]

Our assessment is that a return to a free-flowing river would create significant recreation opportunities:

- **The return to a free-flowing river will create opportunities for rafting, canoeing, kayaking, and other boating.** Sources indicate that there are sections of a restored lower Snake River that could

include class I and II rapids.[42] The net economic value of this shift from flatwater recreation to whitewater recreation includes many nuances, including total number of visits and spending per visit, and deserves additional study.

- **Growth of anadromous fish populations would support increases in recreational fishing.** Sport fishing is already a significant contributor to the regional economy, with the Idaho Department of Labor estimating that fishing brings in $8.6 million per month to Nez Perce and Clearwater counties. Closures of steelhead fishing in 2019 negatively impacted surrounding communities, with Idaho Fish and Game estimating that salmon and steelhead anglers spend approximately $350 per trip.[43] The potential economic contributions of fishing are a case study of extremes: while declines in anadromous fish populations would lead to a reduction or elimination of the industry, the return of healthy populations would be a regional economic boon.
- **The establishment of an additional 14,000 acres of recreation lands along the river would generate significant opportunities for hunting, birding, hiking, camping, and other active recreation.** As noted below, $125 million is set aside for recreation infrastructure development to facilitate such activities.

The proposed investment package includes significant investment designed to help private and public sector stakeholders capture the benefits of this potential evolution. The **$425 million Tourism Guarantee** includes:

- $125 million for development of a national recreation area with river access, campgrounds, boat launches, and other facilities managed by the Bureau of Land Management.
- $125 million in tourism promotion resources for Washington and Idaho to communicate the area's new attractions.
- A $75 million sport fishing contingency fund to offset potential temporary declines in fishing immediately following the breach due to dislodged sediment in the waters.
- $50 million for relocation or compensation of affected marinas.

$50 million to compensate owners of motorized boats designed for use on lakes.

Further, recreation and tourism related to fishing and wildlife would be supported by the $7.3 billion focused on salmon and conservation (Exhibit 2), as well as $150 million for Lewiston and Clarkston waterfront redevelopment, $175 million in locally-directed economic development funding for the Tri-Cities and Lewiston-Clarkston areas, and $275 million in a commercial industry fund to eliminate odors and improve water quality around a pulp mill in Lewiston.

KEY FINDING

15. **Regional tourism is a relatively small but important economic sector with significant opportunity for growth. It is reasonable to assume that the industry would benefit from the proposed investment of $425 million directly related to tourism, as well as the $7.3 billion for salmon and conservation, and $175 million for regional economic development. Together, these investments have the potential to energize and strengthen the regional tourism sector.**

Conclusion

The initial assessment above indicates that from a purely economic perspective, the proposed Columbia Basin Fund holds great promise.

- **The expenditure of at least $7.9 billion in the 9-county region (see Exhibit 13) will stimulate significant positive economic impacts, creating an estimated average of 11,000 jobs a year in the Northwest over the 25-year investment period and injecting substantial resources into the regional economy.**
- **Such significant investment can be used to strategically upgrade infrastructure and strengthen the regional economy, making it more broadly prosperous and resilient to future conditions.** By addressing key areas of concern, the package should leave economic sectors of significance stronger than they are now, particularly in the areas of energy generation and tourism.

These direct and long-term economic impacts are summarized by geographic area of interest in Exhibit 13. Particularly when compared with the economic costs and risks associated with continuation of the status quo, we recommend that the proposed investment package be considered a unique opportunity for largescale regionally directed investment in infrastructure and economic resiliency. The investment package has the potential to bring significant economic benefit to the residents, employers, and employees of the 9-county region and the broader Northwest.

It is important to acknowledge, however, that this transformation will cause economic disruption and loss to some user groups, communities, and other stakeholders. **As soon as a final legislative and investment package is identified and adopted, further study will be needed to fully understand these risks, and further engagement with affected stakeholders will be needed to strategize how resources and policies can mitigate risks, minimize harms, and maximize long-term economic well-being and resiliency**. We recommend that the next phase of analysis and discussion include:

- Conducting a more detailed economic and fiscal impact analysis to calculate indirect and induced impacts of the proposed investment by sector and sub-geography.
- A comprehensive assessment of the long-term economic outcomes in the agriculture, energy, and recreation and tourism sectors, as well as individual communities in the affected area.
- Engaging affected stakeholders directly in shaping this analysis, reviewing the results, and identifying effective investment strategies and supporting policies such as local sourcing requirements, permitting certainty for new energy projects, and other measures to ensure that the investment does as much as possible to create well-paying jobs and a more competitive and resilient regional economy.

SUMMARY OF KEY FINDINGS

Proposed Investment

1. Over $30 billion of the proposed investment (93% of the funds) would be allocated to supporting the region's economic transition through investment in the energy system, transportation infrastructure, fish and wildlife, water quality, and more. Approximately 7% of the proposed package would be expended on breaching the four Lower Snake River dams.
2. $2.2 billion, or about 7% of the total proposed package, is designated for Tribal communities, including the $125 million LSR Cultural Resource Protection Fund and $2.1 billion for the Northwest State and Tribal Fish and Wildlife Council.
3. Approximately $20 billion (59% in BERK's expenditure scenario) would be spent before the dams are breached to help the region prepare for this shift.
4. Slightly more than $21 billion (63% in BERK's expenditure scenario) is likely to be spent on infrastructure improvement and construction.
5. At least $7.9 billion, or 24% of the total investment, would likely be spent in the 9 counties closest to the LSR. This includes about $1.3 billion in funding for projects in Lewiston-Clarkston, $1.9 billion in the Tri-Cities, and $4.7 billion in the remainder of the 9-county region around the LSR. Beyond these investments directed at these named geographies, significant additional funding tied to energy replacement and habitat restoration may also be expended in the 9-county region.

Economic Impact

6. The approximately $21.1 billion to be invested in infrastructure and physical improvements will have significant positive economic impacts, generating jobs and stimulating spending not only in the construction and professional services sectors, but also indirectly in support industries in the supply chain such as suppliers, surveyors, and planners, as well as in household services supporting local employees. The remaining $12.4 billion spent over time on planning and design, operations, and other services will have additional positive impacts on the regional economy, though this may be subject to relatively greater leakage. Policies and investment strategies can be put in place to retain as much of these benefits as possible in the nine counties most directly affected by breaching of the dams, as well as the broader Northwest region.
7. Spending during Phases 1 and 2 will support a total average of more than 20,000 jobs each year across the Northwest, primarily in Washington state but with additional jobs impacts in Idaho, Oregon, and Montana. These jobs impacts include workers directly employed in the building trades, at civil engineering and heavy construction firms, and various supporting organizations and services. Additional jobs will be supported by business supply chain transactions and household expenditures. Throughout the entire duration of the project (all four phases, including ramped down spending in Phases 3 and 4), an average of nearly 11,000 jobs will be supported directly and through multiplier effects each year
8. Local and state net fiscal impacts are likely to be positive given increased tax revenues associated with sales tax on construction and other one-time revenues. Shifts to the ongoing cost of providing

services are not anticipated to be significant, with additional study warranted for jurisdictions likely to see significant changes in population, employment, visitation, or transportation patterns.

Agriculture Sector

9. The $3.5 billion in dedicated funding for agricultural transport mitigation and improvements is more than double the highest previously identified estimate of the investment needed to make agricultural producers whole.

10. The $1.5B flexible transportation fund for grain producers exceeds all previous estimates of the increased shipping costs under a dam breach scenario, indicating producers will likely face lower shipping costs under the investment package.

11. The $750 million investment in irrigation infrastructure exceeds the highest previously identified estimate of the investment needed to fully mitigate irrigation impacts from dam breach by 10%.

Energy Sector

12. The largest component of the investment package is devoted to energy, with $16 billion allocated to replacing capacity and strengthening the grid, as well as $1.25 billion to create the new Snake River Center for Advanced Energy Storage.

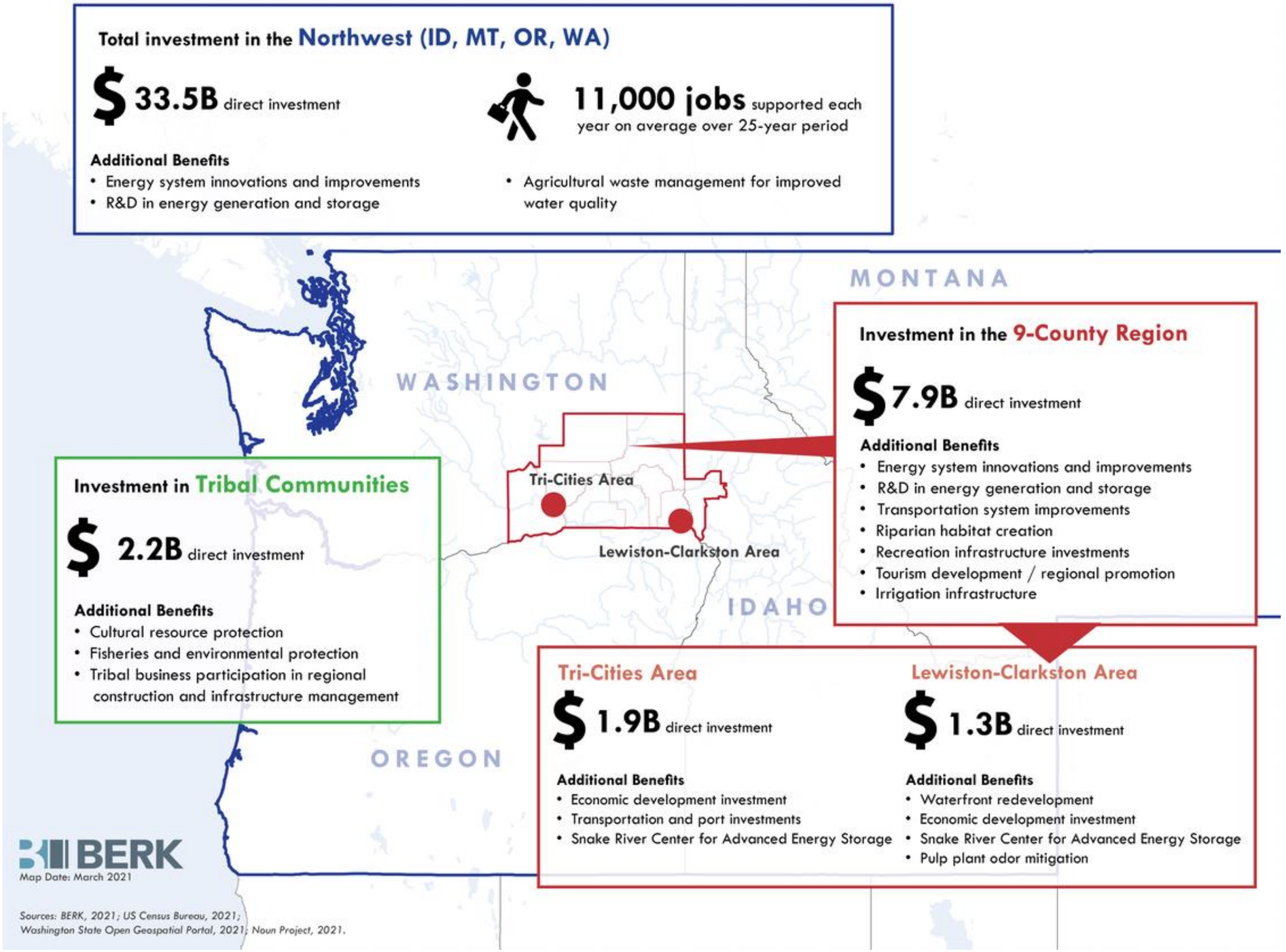
13. The proposed $10 billion will help to mitigate the impacts to ratepayers associated with the capitalized costs of building replacement capacity. As this amount could exceed the costs associated with developing alternative energy capacity, this investment also represents a potential opportunity to augment capacity beyond simply replacing the lost generation from the four dams.

14. The proposed investment has significant potential to produce additional public goods, including regional economic stimulus and employment; improved stability of the grid; and enhanced regional innovation, research, and development.

Recreation and Tourism

15. Regional tourism is a relatively small but important economic sector with significant opportunity for growth. It is reasonable to assume that the industry would benefit from the proposed investment of $425 million directly related to tourism, as well as the $7.3 billion for salmon and conservation, and $175 million for regional economic development. Together, these investments have the potential to energize and strengthen the regional tourism sector.

Exhibit 13. Distribution of Funding, Summary



Appendix A: Summary of Investments and Key Assumptions

The following two exhibits summarize key aspects of the proposed investment package and BERK's illustrative investment scenario that was used to determine likely direct expenditures by time, geography, and type of spend, as well as corresponding indirect and induced economic impacts.

Exhibit A-1. Summary of Data and Assumptions for each Proposed Investment.

Investments			Expenditure		Allocation by Phase				Expenditure Type			Expenditure Location (State)			
Category	Investment	Investment Location	Total	% of Total	Preparing & Implementing Key Investments: 2022-2029	Transitioning: 2030-2031	Adapting: 2032-2035	Ongoing 2036-2046	Planning and Design	Infrastructure and Construction	Operations	WA	ID	OR	MT
A.	**Breaching Dams**		**$2,275,000,000**	**7%**											
	1. Removing berms and sediments														
	a. Lower Granite	9-county region	$400,000,000		10%	80%	10%	0%	15%	73%	12%	100%	0%	0%	0%
	b. Little Goose	9-county region	$350,000,000		10%	80%	10%	0%	15%	73%	12%	100%	0%	0%	0%
	c. Lower Monumental	9-county region	$350,000,000		10%	80%	10%	0%	15%	73%	12%	100%	0%	0%	0%
	d. Ice Harbor	9-county region	$300,000,000		10%	80%	10%	0%	15%	73%	12%	100%	0%	0%	0%
	2. Sediment Mitigation Fund	9-county region	$400,000,000		0%	0%	100%	0%	15%	0%	85%	100%	0%	0%	0%
	3. Lower Snake River Corridor Restoration Fund	9-county region	$50,000,000		10%	10%	80%	0%	30%	0%	71%	90%	10%	0%	0%
	4. Lower Snake River Cultural Resource Protection Fund	9-county region	$125,000,000		10%	10%	80%	0%	30%	0%	71%	95%	5%	0%	0%
	5. LSR Corridor Road and Rail (WA) Study and Mitigation	9-county region	$300,000,000		80%	10%	10%	0%	15%	85%	0%	100%	0%	0%	0%
B.	**Energy System Investment**		**$16,000,000,000**	**48%**											
	6. LSR Dam Lost Generation	Washington, Idaho, Oregon, Montana	$10,000,000,000		65%	15%	15%	5%	20%	78%	2%	67%	3%	20%	10%
	7. Salmon Spill-BPA Power Replacement	Washington, Idaho, Oregon, Montana	$4,000,000,000		65%	15%	15%	5%	20%	78%	2%	50%	10%	30%	10%
	8. NW Grid Resiliency and Optimization	Washington, Idaho, Oregon, Montana	$2,000,000,000		65%	15%	15%	5%	20%	78%	2%	50%	10%	30%	10%
C.	**Columbia and Snake River Dams Certainty**		**$1,000,000,000**	**3%**											
	9. 35 Year Hydro License Extensions		$0		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	10. 35-Year Dam Litigation Moratorium		$0		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	11. Dam Mitigation and Indemnification Program: Incentives for voluntary removal/mitigation	Washington, Idaho, Oregon	$500,000,000		57%	14%	29%	0%	10%	85%	5%	40%	20%	40%	0%
	12. Dam Mitigation and Indemnification Program: Dam removal indemnification fund	Washington, Idaho, Oregon	$500,000,000		57%	14%	29%	0%	10%	85%	5%	40%	20%	40%	0%
D.	**Water Quality**		**$3,000,000,000**	**9%**											
	13. Watershed Partnerships														
	a. Snake River Basin	Idaho	$700,000,000		32%	8%	16%	44%	7%	0%	93%	0%	100%	0%	0%
	b. Willamette Basin	Oregon	$300,000,000		32%	8%	16%	44%	7%	0%	93%	0%	0%	100%	0%
	c. Columbia Basin	Washington	$800,000,000		32%	8%	16%	44%	7%	0%	93%	100%	0%	0%	0%
	d. Puget Sound Watershed	Washington	$600,000,000		32%	8%	16%	44%	7%	0%	93%	100%	0%	0%	0%
	e. Washington Coastal Watershed	Washington	$125,000,000		32%	8%	16%	44%	7%	0%	93%	100%	0%	0%	0%
	f. Oregon Coastal Watershed	Oregon	$175,000,000		32%	8%	16%	44%	7%	0%	93%	0%	0%	100%	0%
	g. Montana Watershed	Montana	$300,000,000		32%	8%	16%	44%	7%	0%	93%	0%	0%	0%	100%
E.	**Agricultural Waste Management**		**$1,700,000,000**	**5%**											
	14. University Grants														
	a. University of Idaho	Idaho	$100,000,000		57%	14%	29%	0%	0%	0%	100%	0%	100%	0%	0%
	b. Oregon State University	Oregon	$100,000,000		57%	14%	29%	0%	0%	0%	100%	0%	0%	100%	0%
	c. Washington State University	9-county region	$100,000,000		57%	14%	29%	0%	0%	0%	100%	100%	0%	0%	0%
	d. Montana State University	Montana	$100,000,000		57%	14%	29%	0%	0%	0%	100%	0%	0%	0%	100%
	15. Columbia, Snake and Willamette Basins Animal Waste Mgmt. Incentives														
	a. Columbia Basin, Washington	Washington	$400,000,000		57%	14%	29%	0%	26%	62%	12%	100%	0%	0%	0%
	b. Willamette Basin, Oregon	Oregon	$400,000,000		57%	14%	29%	0%	26%	62%	12%	0%	0%	100%	0%
	c. Snake River Basin, Idaho	Idaho	$400,000,000		57%	14%	29%	0%	26%	62%	12%	0%	100%	0%	0%
	d. Montana	Montana	$100,000,000		57%	14%	29%	0%	26%	62%	12%	0%	0%	0%	100%
F.	**Community Guarantee**		**$1,575,000,000**	**5%**											
	16. Lewiston-Clarkston Waterfront Restoration	Lewiston-Clarkston	$150,000,000		10%	10%	80%	0%	25%	75%	0%	50%	50%	0%	0%
	17. Snake River Center for Advanced Energy Storage											0%	0%	0%	0%
	a. Siting, Development, and Construction	Lewiston-Clarkston	$250,000,000		80%	20%	0%	0%	20%	80%	0%	20%	80%	0%	0%
	b. R&D and University Grants	Lewiston-Clarkston, Tri-Cities	$350,000,000		57%	14%	29%	0%	0%	0%	100%	84%	16%	0%	0%
	c. Tech Partnership Grants	Lewiston-Clarkston, Tri-Cities	$500,000,000		57%	14%	29%	0%	0%	0%	100%	84%	16%	0%	0%
	d. Infrastructure Development Fund	Lewiston-Clarkston	$150,000,000		57%	14%	29%	0%	15%	80%	5%	20%	80%	0%	0%
	18. Economic Development Funds											0%	0%	0%	0%
	a. Economic Development Funds: Tri Cities Area	Tri-Cities	$75,000,000		20%	25%	55%	0%	2%	67%	31%	100%	0%	0%	0%
	b. Economic Development Funds: Lewiston Clarkston Area	Lewiston-Clarkston	$100,000,000		20%	25%	55%	0%	2%	67%	31%	20%	80%	0%	0%
G.	**Tourism Guarantee**		**$425,000,000**	**1%**											
	19. Lower Snake River Recreation Fund BLM/State of WA	9-county region	$125,000,000		10%	60%	30%	0%	18%	79%	3%	100%	0%	0%	0%
	20. Lower Snake River Tourism Promotion State of Washington (Tri-Cities/Spokane Area)	Washington	$75,000,000		0%	0%	10%	90%	5%	0%	95%	100%	0%	0%	0%
	21. Lower Snake River Tourism Promotion State of Idaho (Lewiston-Clarkston Area)	Idaho	$50,000,000		0%	0%	10%	90%	5%	0%	95%	0%	100%	0%	0%
	22. Impacted Sportfishing Contingency Fund	9-county region	$75,000,000		0%	0%	100%	0%	2%	0%	98%	90%	10%	0%	0%
	23. Marina Relocation Fund	Lewiston-Clarkston, Tri-Cities	$50,000,000		10%	10%	80%	0%	20%	80%	0%	47%	53%	0%	0%
	24. Recreational Boating Compensation Fund Lewiston-Clarkston Area	Lewiston-Clarkston	$50,000,000		0%	0%	100%	0%	0%	0%	100%	20%	80%	0%	0%
H.	**Agricultural Irrigation Guarantee**		**$750,000,000**	**2%**											
	25. Lower Snake River Corridor Irrigation Mitigation	Lewiston-Clarkston, Tri-Cities, 9-county region	$750,000,000		80%	0%	20%	0%	12%	66%	22%	89%	11%	0%	0%
I.	**Agricultural Transportation Guarantee**		**$4,200,000,000**	**13%**											
	26. Reconfiguring/Adjusting Lower Snake River Corridor Grain Transportation	9-county region	$1,500,000,000		57%	14%	29%	0%	14%	64%	21%	90%	10%	0%	0%
	27. LSR Corridor Agricultural Handler Reconfiguration/Adjustment	9-county region	$300,000,000		80%	20%	0%	0%	20%	80%	0%	90%	10%	0%	0%
	28. LSR Corridor Ports Including Lewiston-Clarkston-Wilma Reconfiguration/Adjustment	9-county region	$200,000,000		80%	20%	0%	0%	20%	80%	0%	80%	20%	0%	0%
	29. Columbia River Transportation Guarantee											0%	0%	0%	0%
	a. Barge Transport Expansion- Tri-Cities/Mid-Columbia Basin Intermodal Transportation Hub	Tri-Cities	$600,000,000		100%	0%	0%	0%	20%	80%	0%	100%	0%	0%	0%
	b. SR Corridor Waterway Shippers (Bargers/Riverboats)Barging Reconfiguration/Economic Adjustm	Washington, Oregon	$1,000,000,000		100%	0%	0%	0%	2%	0%	98%	50%	0%	50%	0%
	c. Lower Columbia River Lock Rehab/Backlog Maintenance/Dredging/Maritime Restoration	Washington, Oregon	$600,000,000		57%	14%	29%	0%	10%	90%	0%	50%	0%	50%	0%
J.	**Industrial Guarantee**		**$275,000,000**	**1%**											
	30. Commercial Industry Fund: Lewiston-Clarkston Industrial Pipe Re-engineering and Odor Abatement	Lewiston-Clarkston	$275,000,000		100%	0%	0%	0%	64%	36%	0%	20%	80%	0%	0%
K.	**Northwest Power Council Energy Role Expanded**		**$0**	**0%**											
	31. No associated expenditure.		$0												
L.	**Northwest State and Tribal Fish and Wildlife Council**		**$2,300,000,000**	**7%**											
	32. *Block Grant States (BPA-funded, so not included in cost of package)*	Washington, Idaho, Oregon, Montana	*$3,075,000,000*									25%	25%	25%	25%
	33. *Block Grant Tribes (BPA-funded, so not included in cost of package)*	Washington, Idaho, Oregon, Montana	*$5,375,000,000*									25%	25%	25%	25%
	34. *Joint Fish Council Funding for Operations (BPA-funded, so not included in cost of package)*	Washington, Idaho, Oregon, Montana	*$6,550,000,000*									25%	25%	25%	25%
	35. Priority Salmon Fisheries Infrastructure Backlog	Washington, Idaho, Oregon, Montana	$700,000,000		57%	14%	29%	0%	15%	85%	0%	35%	35%	20%	10%
	36. Upper Snake and Columbia Basin Restored Non-Protected Salmon Runs (NoESA Protections)	Washington, Idaho	$700,000,000		80%	20%	0%	0%	15%	85%	0%	50%	50%	0%	0%
	37. Salmon Conservation Corps	Washington, Idaho, Oregon, Montana	$75,000,000		57%	14%	29%	0%	15%	85%	0%	35%	35%	20%	10%
	38. Hells Canyon Sturgeon Protection	Idaho	$400,000,000		57%	14%	29%	0%	15%	85%	0%	0%	100%	0%	0%
	39. Yakima Basin Integrated Plan	Washington	$225,000,000		57%	14%	29%	0%	15%	85%	0%	100%	0%	0%	0%
	40. Lamprey Passage	Washington, Oregon	$200,000,000		57%	14%	29%	0%	15%	85%	0%	50%	0%	50%	0%
Total Investment Package (does not include items 31-33)			**$33,500,000,000**	**100%**											

Sources: The Northwest in Transition (Representative Simpson website: websiteslides2.4.pdf), 2021; BERK, 2021.

Exhibit A-2. Summary of Investment by Benefit Area.

Investments		Category								
Category	Investment	Salmon/ Conservation	Tribes	States	Communities	Recreation	Transportation	Agriculture	Energy	BPA
A.	**Breaching Dams**									
	1. Removing berms and sediments									
	a. Lower Granite									
	b. Little Goose									
	c. Lower Monumental									
	d. Ice Harbor									
	2. Sediment Mitigation Fund	✓								
	3. Lower Snake River Corridor Restoration Fund									
	4. Lower Snake River Cultural Resource Protection Fund		✓							
	5. LSR Corridor Road and Rail (WA) Study and Mitigation						✓			
B.	**Energy System Investment**									
	6. LSR Dam Lost Generation								✓	✓
	7. Salmon Spill-BPA Power Replacement								✓	✓
	8. NW Grid Resiliency and Optimization			✓					✓	✓
C.	**Columbia and Snake River Dams Certainty**									
	9. 35 Year Hydro License Extensions									
	10. 35-Year Dam Litigation Moratorium									
	11. Dam Mitigation and Indemnification Program: Incentives for voluntary removal/mitigation			✓					✓	
	12. Dam Mitigation and Indemnification Program: Dam removal indemnification fund			✓					✓	
D.	**Water Quality**									
	13. Watershed Partnerships									
	a. Snake River Basin	✓		✓				✓		
	b. Willamette Basin	✓		✓				✓		
	c. Columbia Basin	✓		✓				✓		
	d. Puget Sound Watershed	✓		✓				✓		
	e. Washington Coastal Watershed	✓		✓				✓		
	f. Oregon Coastal Watershed	✓		✓				✓		
	g. Montana Watershed	✓		✓				✓		
E.	**Agricultural Waste Management**									
	14. University Grants									
	a. University of Idaho	✓		✓				✓		
	b. Oregon State University	✓		✓				✓		
	c. Washington State University	✓		✓				✓		
	d. Montana State University	✓		✓				✓		
	15. Columbia, Snake and Willamette Basins Animal Waste Mgmt. Incentives									
	a. Columbia Basin, Washington	✓		✓				✓		
	b. Willamette Basin, Oregon	✓		✓				✓		
	c. Snake River Basin, Idaho	✓		✓				✓		
	d. Montana									
F.	**Community Guarantee**									
	16. Lewiston-Clarkston Waterfront Restoration				✓					
	17. Snake River Center for Advanced Energy Storage (SRCAES)									
	a. Siting, Development, and Construction			✓	✓					
	b. R&D and University Grants			✓	✓					
	c. Tech Partnership Grants			✓	✓					
	d. Infrastructure Development Fund			✓	✓					
	18. Economic Development Funds									
	a. Economic Development Funds: Tri Cities Area				✓					
	b. Economic Development Funds: Lewiston Clarkston Area				✓					
G.	**Tourism Guarantee**									
	19. Lower Snake River Recreation Fund BLM/State of WA					✓				
	20. Lower Snake River Tourism Promotion State of Washington (Tri-Cities/Spokane Area)				✓	✓				
	21. Lower Snake River Tourism Promotion State of Idaho (Lewiston-Clarkston Area)				✓	✓				
	22. Impacted Sportfishing Contingency Fund					✓				
	23. Marina Relocation Fund					✓				
	24. Recreational Boating Compensation Fund Lewiston-Clarkston Area					✓				
H.	**Agricultural Irrigation Guarantee**									
	25. Lower Snake River Corridor Irrigation Mitigation							✓		
I.	**Agricultural Transportation Guarantee**									
	26. Reconfiguring/Adjusting Lower Snake River Corridor Grain Transportation						✓	✓		
	27. LSR Corridor Agricultural Handler Reconfiguration/Adjustment						✓	✓		
	28. LSR Corridor Ports Including Lewiston-Clarkston-Wilma Reconfiguration/Adjustment				✓		✓			
	29. Columbia River Transportation Guarantee									
	a. Barge Transport Expansion- Tri-Cities/Mid-Columbia Basin Intermodal Transportation Hub				✓		✓			
	b. SR Corridor Waterway Shippers (Bargers/Riverboats)Barging Reconfiguration/Economic Adjustm						✓			
	c. Lower Columbia River Lock Rehab/Backlog Maintenance/Dredging/Maritime Restoration						✓			
J.	**Industrial Guarantee**									
	30. Commercial Industry Fund: Lewiston-Clarkston Industrial Pipe Re-engineering and Odor Abatement				✓					
K.	**Northwest Power Council Energy Role Expanded**									
	31. No associated expenditure.									
L.	**Northwest State and Tribal Fish and Wildlife Council**									
	32. Block Grant States (BPA-funded, so not included in cost of package)									
	33. Block Grant Tribes (BPA-funded, so not included in cost of package)									
	34. Joint Fish Council Funding for Operations (BPA-funded, so not included in cost of package)									
	35. Priority Salmon Fisheries Infrastructure Backlog	✓	✓	✓						
	36. Upper Snake and Columbia Basin Restored Non-Protected Salmon Runs (NoESA Protections)	✓	✓	✓						
	37. Salmon Conservation Corps	✓	✓	✓						
	38. Hells Canyon Sturgeon Protection	✓	✓	✓						
	39. Yakima Basin Integrated Plan	✓								
	40. Lamprey Passage	✓	✓	✓						

Sources: The Northwest in Transition (Representative Simpson website: websiteslides2.4.pdf), 2021; BERK, 2021.

Appendix B. Methodology for Economic Impact Analysis

Economic impacts are measured in jobs, income, and business revenues, or "output." These impacts include the following:

- **Direct impacts**. Employment, income, and output tied directly to the activity being modeled, or what is also referred to as "final demand." All subsequent impacts are traced to direct activities, in this case, the infusion of funds and spending from federal sources into the Northwest for infrastructure construction, dam breaching, and related activities.
- **Indirect impacts**. Additional jobs, income, and output supported through upstream, business-to-business transactions. E.g., the purchase of materials and other inputs necessary for completion of a Columbia Basin Fund project by an engineering firm.
- **Induced impacts**. Additional impacts supported by the spending of income earned by direct and indirect workers on household goods and services. E.g., purchases of groceries, entertainment, dining out, household appliances, and retail purchases.

We first assumed that 75% of contracts by value will be awarded to businesses and organizations in the Northwest, with the remainder going to recipients in other parts of the country and world. We then computed average contract spending per year for each phase, state, and expenditure type (infrastructure and construction, planning and design, and operations).

To model the economic impacts of this spending, we employed an input-output modeling approach. There is no readily constructed economic impact model that is specific to the Northwest as a whole. Thus, to estimate impacts, we used existing multipliers for Washington state and national multipliers with adjustments for the remaining three states. Industry employment multipliers for Washington state came from the Washington State Input-Output (I-O) Model, published by the Washington State Office of Financial Management.[44] U.S. national industry economic multipliers are published by the Economic Policy Institute (EPI), based on U.S. Bureau of Economic Analysis input-output tables and employment and wage data from the U.S. Bureau of Labor Statistics.[45]

Estimated program spending retained in the Northwest and occurring in Washington state was redistributed by sectors delineated in the Washington State I-O Model. For example, project spending on "infrastructure and construction" was allocated in the model to "Highway, Street and Bridge Construction" (I-O sector 9), which includes heavy construction. Multipliers were then applied to arrive at direct and total employment impacts.

For remaining spending (in the other three states), we used national multipliers published by EPI to estimate direct and total jobs impacts. A 50% reduction in indirect and induced impacts was then applied to these preliminary estimates to account for potential leakage (e.g., the household purchase of goods and services from outside the Northwest), whereby spillover impacts would accrue to these other regions. Washington state and remaining state impacts were then summed to arrive at a regional total impact estimate.

A MORE RIGOROUS AND DETAILED APPROACH TO ESTIMATE IMPACTS

The above analysis is suitable for a high-level, rapid assessment of impacts. However, the scale of this program should lead to a much more detailed and rigorous approach as part of its implementation. Such an analysis would involve development of an economic impact model specific to the Northwest, as well as state and sub-regional breakouts to allow policymakers to assess the potential economic impacts at smaller geographies, including for the counties in Washington and Idaho directly impacted by the investment package, dam breaching, and related work.

Elements of this more rigorous approach would include:

- Creating a national-level input-output model, using input-output tables, labor income, and personal consumption expenditures published by the U.S. Bureau of Economic Analysis and U.S. Bureau of Labor Statistics.
- Using location quotients and other instruments to refine the model down to the 4-state Northwest region, so as to capture the unique dynamics of the regional economy and leakage effects from spending outside the region.
- Estimating final demand for the Northwest region, including federal, state, and local government purchases, exports, investment, and household spending.
- Further disaggregating the model down to subregional groupings, including the counties in proximity to the Lower Snake River most directly affected by the investment package and dam breaching program.
- Integrating the Washington State Input-Output Model so as to capture multipliers generated from this state-level custom-developed analytic tool for Washington state activities.
- Refining estimates of spending by region, direct employment, and associated income.

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