Appendix A - Item 10

PPL Bell Bend Nuclear Power Plant
Salem Township, Luzerne County, PA

ACOE Information Requirement:

"Describe potential cumulative impacts relative to project purpose and future additional expansion."

Applicant Response:

Introduction

The ACOE is required to determine both potential short-term and long-term effects of a proposed discharge of dredge and fill material on the physical, chemical, and biological components of the aquatic environment, including the effects of cumulative impacts. A review of potential cumulative impacts to jurisdictional Waters of the U.S. resulting from construction of the BBNPP project indicates that the proposed discharge would not have a significant adverse cumulative effect on the aquatic ecosystem.

In the BBNPP Environmental Report (ER), the approach taken in the analysis of cumulative impacts follows the objectives of the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) regulations, and CEQ guidance. In addition, CEQ and USEPA have published guidance addressing implementation of cumulative impact analyses; i.e., *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ 2005) and *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (USEPA 1999).

To determine cumulative effects at BBNPP, readily available environmental documentation regarding known current and past actions in the project area were reviewed. For the region of interest (ROI), specific emphasis was placed on projects in and adjacent to the Project Area and in Luzerne and Columbia Counties. Cumulative impacts include those that are incremental to past and ongoing activities on the site, along with those that are reasonably foreseeable in the future.

Land use in Luzerne and Columbia Counties in the vicinity of the site is predominantly farm, forest and residential housing. The BBNPP site consists mostly of mixed deciduous forest, and fields associated with previous agricultural activities. BBNPP will occupy areas that currently include both farmland and forest, yet structures and construction activities will be located to minimize impacts on the remaining forest and wetlands. The topography of the site is a gently rolling plateau with east-west trending ridges to the north. Grade elevations at the site range from 485 ft mean sea level at the Susquehanna River to approximately 800 ft on the hill where the power block will be located. The highest point of the proposed finished grade level is approximately 719 ft above sea level.

Cumulative Impacts from Construction

Construction impacts associated with BBNPP include grading and clearing, allocation of land to material lay-down and parking, use of ground waters, equipment noise and emissions, increased traffic and use of public resources. These activities are consistent with those conducted during the construction of Susquehanna Steam Electric Station (SSES) Units 1 and 2. Many of the impacts will be temporary and most can be mitigated through the use of best management construction practices and stormwater pollution prevention planning required under State and Federal regulation.

The principal source of water for construction will be water supplied by the Pennsylvania American Water Company (PAWC), Berwick District, drawn from permitted sources. It is estimated that water use on work days will average from 71,500 gpd to 113,000 gpd. Municipal water provided by PAWC will also satisfy domestic needs.

Impacts on wetlands, surface waters and groundwater resources may result from activities that change flow patterns such as construction of sedimentation impoundments, stream channelization, stormwater runoff and dewatering, or discharge of construction-related waste effluents. It is anticipated that several streams and wetlands will be affected by these activities, requiring less than 2 acres of total direct impact (filling) and less than 10 acres of vegetation alteration within wetlands. Environmental controls will conform to applicable regulations and best practices to minimize these effects. Examples include sediment control, stormwater retention, infiltration basins, spill prevention, and control of construction debris. Efforts to reclaim areas not occupied by permanent structures or to provide offsetting habitat such as reforestation and constructed wetlands will also be evaluated.

Agricultural Land Impacts

While much of the site has historically experienced alterations to support development such as agriculture, protection of important or otherwise unique terrestrial habitats will be considered in developing the construction plan for BBNPP. Surveys of the site were undertaken to identify sensitive environments and protected species, and efforts made to limit encroachment on these areas. Examples include locations with federally or state designated threatened or endangered species, wetland buffers and contiguous forest areas. While certain state or federal designated faunal species were found on-site or may occur in the site's vicinity, their presence was not found to be unique to areas potentially affected by construction. No rare, threatened or endangered plants were found on-site.

Impacts to Aquatic Organisms and Surface Water Quality

Impacts to aquatic organisms found within freshwater ponds and streams on-site and within the Susquehanna River may be realized to the extent on-site surface waters are removed, dredging is performed and water quality is affected. A survey of aquatic resources identified that Walker Run contains wild brown trout as well as a diverse aquatic macroinvertebrate assemblage. Because of the natural propagation of brown trout in Walker Run the Pa. Fish and Boat Commission characterized Walker Run as a wild trout stream under state regulation (58 Pa. Code §57.11). Wetlands contiguous to Walker Run are consequently classified as "Exceptional Value" (EV) (25 Pa. Code §105.17). Accordingly, design changes were made to remove all impacts to Walker Run, and reduce EV wetlands impacts within the Walker Run watershed to the greatest extent practicable.

A portion of site wetlands in the Susquehanna River watershed will be permanently lost, and while they are considered a sensitive resource, the on-site wetlands are not unique or otherwise distinguishable from other wetlands in the area.

The Susquehanna River is a valuable natural resource in that it sustains active recreational fisheries for several fish species including Smallmouth bass, Muskellunge, Northern pike, Walleye and Bullhead, among others. The river supports two mussel species listed by the Pennsylvania Natural Diversity Inventory as Rare, the Yellow Lampmussel *(Lampsilis cariosa)* and the Green Floater *(Lasmigona subviridis)*. The invasive species, Asiatic clam *(Corbicula fluminea)* and Zebra mussel *(Dreissena polymorpha)* are also found in the BBNPP vicinity. However, the river is typical of habitats found upstream and downstream of the BBNPP site and

otherwise provides no unique or protected habitat. No migratory species have collected in the BBNPP reach of the river. Potential impacts to the Susquehanna River would be associated with construction of the cooling water intake and discharge structures.

The Circulating Water System Makeup Water and Raw Water Supply System (RWSS) will utilize a common intake structure located just to the south of the existing SSES Units 1 and 2 intake structure. Construction of the intake will involve installation of a coffer dam of interlocking sheet pile, sedimentation curtains, and excavation to bedrock. Dredging of the areas approaching the new intake structure and the installation of sheet pile may create some suspended sediment and remove some benthic substrate. However, the river bed in this area is coarse sand and gravel and, as a result, excess turbidity during construction activities will be limited. The discharge diffuser installation process will be similar. Activities in navigable waters will conform to applicable Pennsylvania and U.S. Army Corps of Engineers regulations.

Impacts to aquatic macroinvertebrates in the river will be negligible as previous studies conducted for SSES Units 1 and 2 indicate that the benthic organisms are similar at locations upstream and downstream of the BBNPP site and are not otherwise unique. Upon removal of the coffer dams, the benthic substrate should stabilize, allowing benthic species to quickly recolonize. Further, there are no endangered or threatened aquatic species in the BBNPP site area of the river that could be affected by sedimentation or sediment removal. As a result, cumulative construction impacts to the Susquehanna River are not expected.

Impacts to Terrestrial Organisms

Through correspondence with state and federal agencies and in-field reconnaissance, the diverse upland habitats at the BBNPP site have been determined to potentially support several protected terrestrial species, including the Species of Concern Baltimore Checkerspot (*Euphydryas phaeton*) and Mulberry Wing (*Poanes massasoit*), the Endangered Northern Cricket frog (*Acris crepitans*), and the (state and federally listed) Endangered Indiana bat (Myotis sodalis).

The life cycle of the Baltimore Checkerspot is tied closely to its host plant, turtlehead (*Chelone glabra*). Turtlehead was not found in the wetlands at the BBNPP site. The Mulberry Wing butterfly prefers tall grass meadow and sedge meadow habitat. Neither of these butterfly species has been sighted within the BBNPP project boundary. For these reasons no significant impact is expected to occur to either butterfly species.

The state and federally protected Indiana bat is known to use hibernacula located within 10 miles of the BBNPP site. Based upon USFWS correspondence, the existence of these hibernacula, along with potentially suitable habitat (wetlands, forests, and riparian areas) may make the BBNPP site suitable for use by this species. PPL is in coordination with the USFWS and the NRC, serving as lead agency under the Endangered Species Act (ESA), to ensure impacts to the Indiana bat are avoided and minimized through project design and provision of suitable on- and off-site mitigation. Incorporation of these measures is expected to prevent any long term or cumulative impacts to this species.

Impacts to Surface Water and Groundwater Hydrology

Preventative measures and corrective actions identified above and the short-term nature of construction activities should limit long-term cumulative impacts. Construction dewatering will temporarily impact the hydrology of the Tributary 1, Tributary 2 and adjacent wetlands to Walker Run. The use of a slurry wall and a groundwater mitigation plan will minimize impacts during construction and allow groundwater levels to return to preconstruction levels. As a result, the cumulative impact on regional surface and groundwater from BBNPP construction in conjunction with the continued operation of SSES Units 1 and 2 should be small. Additionally, the use of the existing off-site transmission right-of-way will limit the amount of land and related natural resources potentially impacted by construction.

Construction Impacts on Cultural Resources

An archaeological survey identified historical sites in the vicinity of BBNPP that are potentially eligible for listing on the National Register of Historic Places. A total of 24 previously recorded sites were identified within 1 mi of the BBNPP site and five architectural resources within 0.5 mi. Six potential sites were located along the west bank of the Susquehanna River near the location of the new BBNPP intake structure. Phase Ib archaeological investigations on the BBNPP site, and subsequent consultation with the Pennsylvania Historical and Museum Commission (PHMC) are underway to identify the presence of additional archeological sites and to determine their eligibility for listing on the National Register of Historic Places. Preliminary results of the Phase 1b studies yielded 2,047 artifacts, eleven archaeological sites, and 26 prehistoric finds. Construction activities will be managed to minimize encroachment on any sites potentially found. Appropriate disposition of historical sites that cannot be avoided will be determined in conjunction with the PHMC.

Construction Impacts on Public Well Being and Quality of Life

Potential adverse cumulative impacts to public health and well-being stem from construction-related noise, increased vehicular traffic, aesthetics and emissions. Noise levels will increase during construction with operation of heavy equipment and vehicles. At the federal level, environmental noise standards are included in the Noise Control Act of 1972 and the Quiet Communities Act of1978. There are no known State or County quantitative noise ordinances. Salem Township has a qualitative noise standard in Section 318 of its Zoning Ordinance. It states "Noise which is determined to be objectionable because of volume, frequency or beat shall be muffled or otherwise controlled." EPA and the Housing and Urban Development Administration (HUD) have established criteria for acceptable outdoor noise. Excess noise levels that may occur during construction will be minimized at the site boundary as a result of distance, topography and surrounding forest. The nearest residence is approximately 1400 ft from the BBNPP site. For on-site workers, it will be necessary to meet Occupational Safety and Health Administration (OSHA) exposure limits through training and use of personal protective equipment.

Cumulative impacts are not expected as construction-related noise will cease upon completion of the construction activities. The sources of noise from operations include the switchyard, transformers, cooling towers and traffic. A baseline noise survey of existing conditions showed that there was no observed off-site audible noise from the operation of SSES Units 1 and 2. Traffic noise will be limited to normal work day business hours during shift changes. Noise from the new on-site switchyard and transformers will be similar to that currently associated with SSES Units 1 and 2. It has been determined that, when taken together, the additional noise associated with BBNPP is not expected to alter predictions that noise levels off-site will not represent an adverse cumulative impact.

Construction Impacts on Traffic

Traffic will increase during construction as workers commute from within and outside Luzerne County. US Route 11 will experience additional traffic during shift change. It is estimated that the peak construction workforce will exceed 3,900 full-time equivalents. The total workforce potentially on-site or traveling to the site during BBNPP construction, including the SSES Units 1 and 2 operations personnel, would approach approximately 5,200 individuals. During an outage at Units 1 and 2, the total workforce on-site would approach 6,600 people.

A new access road will be constructed on-site to accommodate the excess traffic resulting from BBNPP construction. The access road will remain the primary entrance for BBNPP during operation when the number of workers is dramatically reduced. Heavy equipment, plant components and construction materials will be hauled in by rail, thus avoiding temporary blockage of local highways. Construction of the access road, use of rail for heavy equipment, and the decrease in workers following construction will limit the cumulative impacts of traffic. A traffic study of potential impacts identified mitigation alternatives for implementation during the construction period. These include appropriately placed traffic signals at nearby intersections and additional access lanes at the BBNPP access road intersection with US Route 11.

Dust, engine exhaust and other facility operations will result in construction-related emissions. Protective actions will be required to ensure that applicable ambient air quality and hazardous pollutant regulations are met. Applicable permits will be obtained and construction practices, such as dust control, will be implemented so that cumulative impacts on-site from emissions are limited and are discontinued following construction.

Viewshed Impacts

Topography of the site and surrounding forest canopy will limit visibility of construction activities. However, as construction proceeds, structures such as the CWS cooling towers and containment structure will be visible from nearby vantage points. Except for activities related to the intake and discharge, construction will occur approximately 1 mile inland of the river, further reducing visibility from the water surface during periods when leaves are on the trees. Following construction, the plant's discharge will be routed through a multi-port diffuser located on the bottom of the river. The intake structure will be confined to the southern end of the property, will be visible from the river, and its appearance will be consistent with the SSES Units 1 and 2 intake structure.

Socioeconomic Impacts from Construction

Socioeconomic benefits accrue from capital expenditures as well as the increased number of jobs created during construction and additional spending which results. It is estimated that, during BBNPP construction, a total of between 966 and 1,690 households would move into the region of interest (ROI); 42% of these would relocate to Luzerne County and 45% to Columbia County. An increase of between 954 and 1,670 indirect workers would also occur. For each dollar spent, indirect revenue would be generated within the ROI. This influx may impact

various public service institutions such as fire, EMS, education and recreational facilities. However, as a percentage, the increase in population is small and the financial benefit to local governments large, providing opportunities to address capacity.

Cumulative Impacts of Operation

Potential cumulative adverse impacts from operations include the withdrawal of water from the Susquehanna River, discharge of cooling tower blowdown, radiological dose consequences, waste generation, etiological agents, potential for electrostatic shock, electromagnetic interference, noise from the CWS and ESWS cooling towers and socioeconomic changes. Each of these potential impacts is discussed below.

Hydrologic Impacts

Because BBNPP will utilize closed-cycle cooling, the amount of cooling water withdrawn from the Susquehanna River will be significantly reduced below that required for once-through cooling. The two natural draft CWS cooling towers are approximately 475 ft high and 350 ft in diameter. It is estimated that the BBNPP CWS and RWSS will withdraw approximately 25,729 gpm on average to replace evaporative loss, drift, and blowdown. Blowdown to the retention basins of the CWS and Essential Service System (ESWS), and ultimately to the Susquehanna River, will total approximately 8,665 gpm. Maximum CWS and RWSS cooling water makeup demand is approximately 28,179 gpm.

The ESWS will utilize closed-cycle cooling, and will have 4 wet mechanical forced draft cooling towers above 4 rectangular pools. The ESWS cooling towers will typically be supplied with fresh water from the RWSS. Makeup flow to the ESWS cooling towers during normal operations will be approximately 1,713 gpm. Blowdown from the ESWS cooling towers will be routed to the retention basin, and ultimately the Susquehanna River, and will be approximately 569 gpm. Maximum ESWS cooling water makeup demand is approximately 3,426 gpm. Evaporative loss and drift from the CWS towers will be approximately 15,880 gpm, while evaporative loss and drift from the four ESWS towers will total 1,144 gpm.

Physical impacts of cooling system water withdrawal could include alteration of site hydrology in the immediate vicinity of the intake structure. However, it is estimated that the BBNPP makeup water withdrawal rate during normal operations would represent less than 1% of average Susquehanna River flow and approximately 5% at (7Q10) low flow. BBNPP plans to mitigate consumptive water use during river low flow periods in a manner similar to SSES Units 1 and 2

by providing make-up water into Susquehanna River watershed. Since the amount of cooling water to be used for BBNPP and SSES Units 1 and 2 is a small fraction of river flow and is planned to be mitigated during river low flow periods, there should be no incremental cumulative adverse impact to the Susquehanna hydrology.

Impacts to Surface Water Quality and Aquatic Organisms

Aquatic impacts attributable to operation of the BBNPP intake structure and cooling water systems include impingement of organisms on the traveling screens and entrainment of fish eggs and larvae within the cooling system. Use of closed-cycle cooling systems at BBNPP will significantly reduce these impacts compared to power plants that operate open-cycle (once-through) cooling. In addition, BBNPP will incorporate design criteria to limit intake approach velocities to less than 0.5 ft/sec meeting the EPA Phase 1 impingement and entrainment design standards.

Although a small amount of entrainment will occur, studies indicate that the BBNPP site area is not a spawning area for key species of recreational value, and that entrainment at SSES Units 1 and 2 has not resulted in detectable changes in population levels. Further, the dominant species that occur in the BBNPP site area of the Susquehanna River have not been identified as requiring habitat protection.

Blowdown from the cooling towers is returned to the Susquehanna River through a submerged multi-port diffuser. The temperature of this discharge will be less than or equal to 87° F and will quickly achieve ambient river temperature through the diffuser mixing of the discharge with the river. The mixing creates a small thermal plume which causes the river temperature to increase less than 2° F during any 1-hour period. Modeling of this plume shows that its size and distribution will meet all state and federal water quality criteria and will be sufficiently small that it is unlikely to cause impacts to the Susquehanna River's benthic community or motile organisms in the area.

Included in the blowdown discharge are chemicals used in biocide treatment and in plant process control. The concentrations discharged will be in conformance with National Pollutant Discharge Elimination System (NPDES) permit conditions and applicable water quality criteria. Additionally, the amount of water being discharged from the closed-cycle system will be small compared to river flow, such that concentrations of chemicals discharged will rapidly disperse. Solids will be allowed time for settlement and chemical treatment in the on-site retention basin.

Because of the use of closed-cycle cooling, the incremental increase in surface water withdrawal from operation of BBNPP in addition to the SSES Units 1 and 2 should not result in cumulative adverse ecological impacts. The combined withdrawal at mean river flow conditions is about 1%.

Cooling Tower Impacts

Excess heat within the CWS will be dissipated to the environment using two natural draft cooling towers. A visible plume is created when a portion of the cooling water evaporates as it leaves the tower, undergoing partial condensation. Typical impacts from the resulting plume include fogging, icing, and water and solids deposition. The extent of these impacts was simulated using predictive models. The plume length varies with season. The average plume length for the BBNPP CWS cooling towers is predicted to range between a low of 0.274 mi during summer and a high of 0.615 mi during spring. The annual average predicted plume length would be 0.372 mi. Average plume height would range from 776 ft in summer to 961 ft in winter. Fogging and icing from the natural draft towers is not predicted to occur. Since heat loads from the four ESWS trains is only a small fraction (3%) of the CWS towers, impacts would be considerably less and any cumulative effect is expected to be small.

Noise Impacts

The sources of noise from operations include the switchyard, transformers, CWS and ESWS cooling towers and traffic. A baseline noise survey of existing conditions showed that there was no observed off-site audible noise from the operation of SSES Units 1 and 2. A modeled prediction of noise from the CWS cooling towers shows that day and nighttime noise levels beyond the site boundary will be below both the EPA and HUD acceptable outdoor level of 55 dBA measured as average sound pressure over a 24-hour period. There are two residences to the west of the plant that appear to be within the 50 dBA sound contour, where noise would be perceptible during quiet periods of the day and imperceptible at other times. The noise from the ESWS two cell mechanical draft cooling towers will also be less than the EPA and HUD recommendations at these locations. Traffic noise will be limited to normal work day business hours during shift changes. Noise from the new on-site switchyard and transformers will be similar to that currently associated with SSES Units 1 and 2. Taken together, the additional noise associated with BBNPP is not expected to alter predictions that noise levels off-site will not represent an adverse cumulative impact. As such the BBNPP will remain in compliance with Section 318 of the Salem Township Zoning Ordinance.

Radiological Impacts

Exposure of the general public to radiation from the operation of BBNPP is a function of meteorology, relative location, population density, land use practices, harvest and consumption of food sources, and allowable radiological release limits. Dose consequences result from liquid and gaseous releases and from direct radiation. Each of these potential pathways has been analyzed to ensure that applicable public health exposure limits are met. In addition, the potential dose from the operation of BBNPP has been combined with that predicted for SSES Units 1 and 2. Results show that applicable NRC exposure limits are met, and that while there will be dose consequences resulting from operation of BBNPP, exposure will remain within applicable limits and will not represent an adverse cumulative impact.

Conservative estimates of radiological dose to biota also demonstrate that exposure to key selected species should result in no observable effects. An existing long-term radiological environmental monitoring program will continue to verify that dose consequences to the general public are as low as reasonably achievable (ALARA).

The uranium fuel cycle will contribute to cumulative impacts from fuel production, transportation, storage and disposal. Related environmental impacts are attributed to land and water use, electrical consumption, chemical effluents, radioactive effluents and waste generation. The cumulative impacts from each of these sources has been reviewed based on an NRC mandated comparative assessment detailed in 10 CFR §51.51(a).

Non-radioactive and mixed-wastes will be produced during BBNPP operations. Typically these consist of recyclables, solid waste debris, and sewage. Cumulative impacts will be managed through implementation of waste minimization practices including the procurement process, allocation of material for work, storage and recycling. Wastes that cannot be recycled will be stored and disposed in accordance with applicable state and federal hazardous and nonhazardous waste regulations, and at licensed liquid and solid waste disposal locations. Properly sized and designed on-site facilities for storage will be provided and procedures put in place to deal with potential spills and emergency response.

Socioeconomic Impacts

Socioeconomic impacts (benefits) from long-term BBNPP operation result from the increased operational work force, facility taxes, and generation of competitively priced electricity. Approximately 363 additional employees will be required to support BBNPP operations. Most of

these employees are expected to reside primarily within Luzerne and Columbia Counties. The BBNPP workforce will result in increased indirect employment of approximately 690 individuals.

An overall increase in population is expected as families relocate, acquire housing and utilize public services. It is estimated that the additional workforce will increase population within Luzerne and Columbia Counties by approximately 1,366 people compared to the existing 378,034 people (2006 Census) or an increase of approximately 0.4%. An analysis of available housing suggests that adequate supply is currently available to support the influx of operational employees.

BBNPP operational direct and indirect workforce would add about 268 and 284 new households to Luzerne and Columbia Counties, respectively. The number of students in these households would represent an increase of about 0.1% of the existing public and private student enrollment. Furthermore, existing police, fire, EMS, and school districts appear to have adequate capacity, and the additional tax revenue that Luzerne County would realize will provide for increased resources if needed.

While there will be an overall socioeconomic benefit from the operation of BBNPP, the cumulative impact, as a percentage, appears to be small. The median income of residents within Luzerne and Columbia Counties is below that of the state and U.S. To the extent workers are able to seek employment at BBNPP, there would be a net benefit to the ROI. Because the relative proportion of racial minorities in the ROI is small, the relative impact or benefit should not be disproportionate.

There are currently two known projects within the ROI that may compete for resources or otherwise increase demands on public services. These include a new 42 inch natural gas pipeline in Luzerne County, PA and the Susquehanna-Roseland 500 kV electrical transmission line. Transco proposes to expand its existing Leidy gas pipeline to allow additional transport of gas to southern New York. This project is estimated to cost approximately $121 million. Part of the pipeline is located in Luzerne County (FERC, 2006). The new electrical transmission line would run from a substation near Berwick, PA to Roseland, New Jersey. It will be approximately 150 miles in length and is expected to cost between $900 and $1 billion (FERC, 2008). Cumulative impact of these projects, in combination with BBNPP, would be small with respect to competition for construction resources since the gas pipeline and electrical transmission line construction resource requirements are different from those required for BBNPP. Furthermore, only a small portion of gas pipeline and transmission line projects would

occur within the ROI. Additionally, plans are being reviewed for a possible Cargo Airport in Hazleton, Pennsylvania, however, funding has not been finalized at this time. However, collectively, these projects would likely provide an economic benefit from additional employment and expenditures within the ROI during the construction periods.

Cumulative Impacts Summary

The potential adverse short-term and long-term impacts from the construction and operation of BBNPP have been identified and actions to mitigate those impacts proposed. Activities to be undertaken during construction and operation of BBNPP are consistent with those currently in place for SSES Units 1 and 2. Except for the construction footprint, available land use and the terrestrial environmental conditions will remain essentially unchanged.

Operation of the new unit will require the use of certain natural resources including water withdrawal from the Susquehanna River for cooling and will result in the release of gaseous, liquid and solid wastes, all in conformance with applicable Local, State, and Federal permit requirements and standards. Economic benefits accrue from capital expenditures, additional tax revenue and the jobs created during construction and operation. The environmental assessment demonstrates that cumulative adverse impacts to the vicinity and to the region will be small.

References

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