



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 26, 2013

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 - REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR EXTENDED POWER UPRATE (TAC NOS. ME9631 AND ME9632)

Dear Mr. Pacilio:

By letter dated September 28, 2012, as supplemented by letter dated December 18, 2012, Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). The RAI questions were provided in draft form to Mr. Kevin Borton and Mr. David Neff of your staff via e-mail on April 8, 2013. The draft questions were sent to ensure that the questions were understandable, the regulatory basis for the questions was clear, and to determine if the information was previously docketed.

Conference calls between the NRC staff and the Exelon staff were held on April 17, April 18, April 19, and April 24, 2013, to discuss the questions. Following these calls, Mr. Neff stated that Exelon would provide a response to the all of the RAI questions, except for three of the Electrical Engineering Branch (EEEEB) RAIs, within 30 days of the date of this letter. Mr. Neff stated that the response to EEEEB RAI-1, RAI-2, and RAI-3 would be provided within 45 days of the date of this letter. Please note that if you do not respond to this letter by the agreed-upon dates or provide acceptable alternate dates in writing, we may reject your application for amendment under the provisions of Title 10 of the *Code of Federal Regulations*, Section 2.108.

M. Pacilio

- 2 -

If you have any questions, please contact me at (301) 415-1420.

Sincerely,

A handwritten signature in black ink, appearing to read "R B Ennis". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosure:
Request for Additional Information

cc w/encl: Distribution via ListServ

REQUEST FOR ADDITIONAL INFORMATION
REGARDING PROPOSED LICENSE AMENDMENT
EXTENDED POWER UPRATE
PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3
DOCKET NOS. 50-277 AND 50-278

By letter dated September 28, 2012, as supplemented by letter dated December 18, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML122860201 and ML12312A443, respectively), Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific request for additional information (RAI) is addressed below.

Accident Dose Branch (AADB)

Reviewer: John Parillo

AADB RAI-1

In an effort to ensure a complete and accurate review of the dose consequence analyses, please provide additional information (preferably in tabular form) describing, for each design-basis accident affected by the proposed EPU, all the basic parameters used in the dose consequence analyses. For each parameter, please indicate the current licensing basis (CLB) value, the revised EPU value where applicable, as well as the basis for any changes to the CLB. The NRC staff notes that some of the requested information has been provided in textual form in Section 2.9.2, "Radiological Consequences Analyses Using Alternative Source Terms," of Attachment 4 to the application dated September 28, 2012. The NRC staff requests that the information in Section 2.9.2 be expanded to include all of the basic parameters whether or not the individual parameter is being changed for the EPU amendment. The staff also finds it helpful if the information is presented in separate tables for each affected accident.

Fire Protection Branch (AFPB)

Reviewer: Naeem Iqbal

AFPB RAI-1

Section 2.5.1.4.1, "Fire Protection Program," of Attachment 4 to the application dated September 28, 2012, states, in part, that "the higher decay heat associated with EPU may

Enclosure

reduce the time available for the operator to perform the actions necessary to achieve and maintain cold shutdown conditions.” The NRC staff requests the licensee to verify that additional heat in the plant environment from the EPU will not: (1) interfere with required operator manual actions being performed at their designated time, or (2) require any new operator actions to maintain hot shutdown and then place the reactor in a cold shutdown condition.

AFPB RAI-2

Section 2.5.1.4.1, “Fire Protection Program,” of Attachment 4 to the application dated September 28, 2012, states, in part, that:

Modifications to the CST [condensate storage tank] will be implemented to ensure that sufficient inventory is available for the EPU Appendix R scenarios that credit the CST. Because the CST is credited as the exclusive HPCI [high-pressure coolant injection] and RCIC [reactor core isolation cooling] makeup water source to the RPV [reactor pressure vessel] for the EPU Appendix R analysis, additional modifications will be implemented to ensure the CST makeup flowpath to HPCI and RCIC is available for Appendix R scenarios that credit HPCI and RCIC. Except for the CST modifications that are required, other safe shutdown systems and equipment used to achieve and maintain cold shutdown conditions do not change, and are adequate for the EPU conditions.

The NRC staff notes that modifications associated with the CST, HPCI, and RCIC have not yet been completed to address the impact on the fire protection program. The staff requests that the licensee discuss how the results of modifications associated with the CST, HPCI, and RCIC would impact the fire protection program and the plant’s compliance with the fire protection program licensing basis, 10 CFR 50.48 or applicable portions of 10 CFR 50, Appendix R. Also clarify how the licensee will ensure that, once developed and implemented, the modifications will not change this impact.

In addition, clarify whether this amendment request involves other plant modifications, or changes to the fire protection program planned at EPU conditions (e.g., adding new cable trays, re-routing of existing cables, increases in combustible loading affecting fire barrier ratings, or changes to administrative controls). If any, the NRC staff requests the licensee to identify such proposed modifications and discuss their impact on the plant’s compliance with the fire protection program licensing basis, 10 CFR 50.48, or applicable portions of Appendix A to Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, “Guidelines for Fire Protection for Nuclear Power Plants, Docketed Prior to July 1, 1976.”

AFPB RAI-3

Some plants credit aspects of their fire protection system for other than fire protection activities (e.g., utilizing the fire water pumps and water supply as backup cooling or inventory for non-primary reactor systems). If PBAPS credits its fire protection system in this way, the licensee should identify the specific situations and discuss to what extent, if any, the EPU affects these “non-fire-protection” aspects of the plant fire protection system. If PBAPS does not take such credit, the NRC staff requests that the licensee verify this as well.

In your response, discuss if any non-fire suppression use of fire protection water will impact the ability to meet the fire protection system design demands. If so, discuss how fire protection system design demands will be impacted.

Health Physics and Human Performance Branch (AHPB)

Reviewer: Molly Keefe

AHPB RAI-1

Section 2.11.1.2, "Changes to Operator Actions Sensitive to Power Uprate," of Attachment 4 to the application dated September 28, 2012, identifies 3 new operator actions needed as a result of the proposed EPU as follows:

- A new operator action will be created to place the residual heat removal (RHR) heat exchanger cross-tie valve in service if required to mitigate a rise in suppression pool temperature during the accident or event.
- A new operator action will be created to start a second high-pressure service water (HPSW) pump and establish a flowpath through the second RHR heat exchanger when the RHR heat exchanger cross-tie is in service. In connection with this, there will be an operator action to place the HPSW cross-tie in service if required.
- A new operator action will be created to refill the condensate storage tank from the refueling water storage tank about 90 minutes after the start of the event.

Are there any other new operator actions needed as a result of the proposed EPU?

AHPB RAI-2

In addition to the new operator actions discussed above in AHPB RAI-1, Section 2.11.1.2, of Attachment 4 to the application dated September 28, 2012, discusses a number of changes to current operator actions that will occur as a result of the proposed EPU. Please delineate which of these changes are related to emergency or abnormal operating procedures.

AHPB RAI-3

Section 2.11.1.2, of Attachment 4 to the application dated September 28, 2012, identifies the following changes in operator response time due to the proposed EPU:

- Operating procedures will be revised to reduce the time in which an operator is required to secure from the control room a high-pressure coolant injection pump that has spuriously started from 10 to 7.5 minutes during a Method "A" shutdown without a stuck-open relief valve (SORV).
- During a Method "A" shutdown with a SORV, the EPU analysis has determined that the time for entry into alternate shutdown cooling (ASDC) is reduced from 210 to 160 minutes.

- During Method "C" shutdowns, the EPU analysis has determined that the times for initiation of ASDC has increased from 30 minutes to 14 hours while the time after the event in which the operator must initiate reactor pressure vessel (RPV) depressurization has decreased from 27.5 minutes to 26.5 minutes for case C1, and 15 minutes to 14.7 minutes for case C2.
- During Method "D" shutdowns, without a SORV, the EPU analysis has determined that the times for initiation of ASDC has increased from 300 to 364 minutes while the time after the start of the event in which the operator must initiate RPV depressurization has decreased from 5 to 3.5 hours.
- During Method "D" shutdowns, with a SORV, the EPU analysis has determined that the time after the event for initiation of suppression pool cooling (SPC) has decreased from 4 to 2.5 hours, while without a SORV the time for initiation of SPC has decreased from 180 to 150 minutes.

Are there any other operator actions that will involve additional response time or will have reduced time available?

AHPB RAI-4

Identify any operator actions that are being automated or being changed from automatic to manual as a result of the proposed EPU. Provide justification for the acceptability of these changes.

AHPB RAI-5

Were any human factors lessons-learned from any other plant EPU experiences? If yes, please describe.

Electrical Engineering Branch (EEEE)

Reviewer: Sergiu Basturescu

EEEE RAI-1

In Table 2.3-1 of Attachment 4 to the application dated September 28, 2012, the licensee provides the normal, design-basis accident (DBA) and total radiation requirements for rooms at PBAPS. For the environmental qualification (EQ) zones/areas, provide, in table form, a list of components and their respective qualification levels and parameters (i.e., temperature, pressure, humidity, chemical spray, submergence, and radiation) that shows that the EQ limits remain bounding under EPU conditions for normal operation, accident (loss-of-coolant accident (LOCA), main steam line break (MSLB)/high-energy line break (HELB)), and post-accident. Include the existing EQ limits in your response and show how EQ margins (e.g., temperature, pressure, radiation, etc.) are being maintained. Provide more detail with regard to the statement made on page 2-124 of Attachment 4 to the application dated September 28, 2012, about the margin evaluation complying with the Institute of Electrical and Electronics Engineers (IEEE) 323-1974 (Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations).

EEEB RAI-2

On page 2-124 of Attachment 4 to the application dated September 28, 2012, the licensee states that limited life components (less than 60 years) are addressed within the PBAPS EQ program as warranted. Provide a list of all EQ Program equipment that will have a limited life due to increase in temperature, pressure, humidity, and radiation at EPU conditions. Confirm that there is no EQ equipment that needs to be replaced prior to EPU implementation.

EEEB RAI-3

In Figure 2.3-1 of Attachment 4 to the application dated September 28, 2012, the licensee presented the current EQ temperature profile and revised post-EPU EQ temperature profile, for the drywell (DW). Update this profile for the equipment to show that the equipment remains qualified for the temperature in the DW under EPU conditions. Provide a containment LOCA/MSLB Accident Pressure profile curve vs. the plant EQ profile.

EEEB RAI-4

Attachment 3, "Revised Generator Data," to Enclosure 11a to Attachment 11 to the application dated September 28, 2012, provides net and gross megawatt electric (MWe) values different than those shown on pages 2-174 and 2-175 of Attachment 4 to the application. Please clarify what the maximum gross and net MWe values will be at EPU conditions (including the associated power factor and reactive power values).

EEEB RAI-5

On page 2-127 of Attachment 4 to the application dated September 28, 2012, the licensee states that the grid analysis has determined that the EPU will not require transmission system upgrades. Provide the maximum apparent power through the switchyard components (tie-line, breakers, disconnects, buses, etc.) and show that the said component's ratings exceed the apparent power they are exposed to at EPU conditions.

EEEB RAI-6

On page 4 of Attachment 9 to the application dated September 28, 2012, the licensee states that the generator auxiliaries will be modified or retrofitted to accommodate the new generator rating. Provide a description of the auxiliary modifications.

EEEB RAI-7

On page 2-128 of Attachment 4 to the application dated September 28, 2012, the licensee states that the isolated phase bus duct (IPDB) is being modified to increase its continuous current rating to provide for operation at EPU output. Furthermore on page 4 of Attachment 9 to the application, the licensee states that the modification will require replacement of several portions of the existing IPDB. Provide further discussion on these modifications, detailing the portions that will need replacement, their rating and their adequacy for operating at EPU conditions.

EEEE RAI-8

On page 2-128 of Attachment 4 to the application dated September 28, 2012, the licensee states that other than those protective relays associated with the uprated main generator, the relay settings are unaffected by operation at EPU conditions. Provide a summary of the review performed for the protective relay settings at EPU load for the main generator, step-up transformer, and Class 1E transmission system. Also, clarify whether the existing under voltage and degraded voltage settings are adequate at EPU conditions.

EEEE RAI-9

Section 2.3.3.2 of Attachment 4 to the application dated September 28, 2012, states that the analytical electrical system computer model developed for PBAPS updated the main power transformer size to reflect the recent change of main power transformers and the proposed changes to main generators and condensate pumps. Provide a discussion on determining the adequacy of the ratings of the safety-related bus.

EEEE RAI-10

In Table 2.3-3 of Attachment 4 to the application dated September 28, 2012, the licensee provides the nameplate rating, required brake horsepower (BHP) and analyzed BHP for the condensate pumps. Discuss the apparent discrepancy between the condensate pumps nameplate rating and analyzed BHP at EPU conditions.

EEEE RAI-11

On page 2-224 of Attachment 4 to the application dated September 28, 2012, the licensee states that an additional High-Pressure Service Water (HPSW) pump motor and Residual Heat Removal heat exchange cross-tie modifications will be needed due to the EPU. Provide a brief description of these modifications and its impact on the electric system. Provide the current licensed thermal power (CLTP) and EPU loading (kW), and continuous rating of the emergency diesel generators in light of these modifications. Also provide an electrical diagram that shows the additional HPSW pump and the cross-tie modifications.

EEEE RAI-12

In Table 2.3-2 of Attachment 4 to the application dated September 28, 2012, the equipment list does not include the unit auxiliary transformers (UATs). Clarify if the UATs require any modifications for EPU operation.

EEEE RAI-13

On page 2-133 of Attachment 4 to the application dated September 28, 2012, the licensee states that the only EPU effect to the DC system is the operation of the HPSW motor circuit breakers spring charging motor. Clarify whether the increased DC load will not adversely impact the capacity margin of the Class 1E battery. Clarify if there is any difference in capacity margin between CLTP and EPU conditions, for the Class 1E battery.

EEEE RAI-14

On page 2-135 of Attachment 4 to the application dated September 28, 2012, the licensee states that, with respect to station blackout (SBO), sufficient compressed gas capacity remains to perform emergency reactor pressure vessel depressurization. Provide a summary of the evaluation showing that the compressed gas capacity exists under EPU conditions for required automatic and manual operation during an SBO event.

EEEE RAI-15

On page 2-135 of Attachment 4 to the application dated September 28, 2012, the licensee states that areas containing equipment necessary to cope with an SBO event were evaluated for the effects of loss of ventilation due to an SBO. Provide a summary of this evaluation for the following areas: Control Room and Cable Spreading Room, Battery Room, Switchgear Room/Inverter Room, Drywell, Reactor Core Isolation Coolant Room, and High Pressure Coolant Injection Room.

Instrumentation and Controls Branch (EICB)

Reviewer: Samir Darbali

EICB RAI-1

In Section 3.1.12, "Primary Containment Isolation Instrumentation (TS Section 3.3.6.1)," of Attachment 1 to the application dated September 28, 2012, the second bullet describes the allowable value (AV) change to the Main Steam Line (MSL) Flow - High function. The proposed EPU would change the AV from ≤ 123.3 pounds per square inch differential (psid) to ≤ 173.8 psid. Table 2.4-1 in Attachment 4 to the application identifies the change to the MSL High Flow Isolation analytical limit (AL) in terms of % rated steam flow. Specifically, the proposed EPU would change the AL from 137.77% rated steam flow to 140% rated steam flow. However, the application does not describe how the change to the AL modified the AV, and thus how these values are related. Please provide a summary calculation that traces the change in AL (in terms of % rated steam flow) to the change in AV (in terms of psid).

EICB RAI-2

By letter dated February 8, 2013 (ADAMS Accession No. ML13042A096), GE Hitachi Nuclear Energy (GEH) submitted information to the NRC concerning a potential non-conservatism in the calculation of MSL choked flow rates. Specifically, GEH had recently discovered that some calculations of choked flow rates in the MSLs of boiling-water reactors were non-conservative, with potential effects on margins between choked flow conditions and existing MSL high-flow ALs, AVs, Nominal Trip Setpoints (NTSPs), and other setpoint values based on the AL. Please explain how the information provided by GEH in its letter dated February 8, 2013, affects the PBAPS EPU calculations for MSL High Flow.

Component Performance and Testing Branch (EPTB)

Reviewer: John Huang

EPTB RAI-1

In Attachment 4 of the application dated September 28, 2012, the licensee notes in Section 2.2.4, "Safety-Related Valves and Pumps," that certain valves will be deleted from, and new valves added to, the inservice testing (IST) program. The licensee also notes that the surveillance procedure for the Standby Liquid Control Pump will be changed. Please provide a detailed summary of the changes to the PBAPS IST program due to the EPU conditions.

EPTB RAI-2

In Table 2.2-14, "EPU Effects to PBAPS Program Valves" of Attachment 4 of the application dated September 28, 2012, the licensee notes that various actions will be required for valves with Low Margin, Medium Margin or Negative Margin. Please specify the criteria for how the margins are determined, and describe the respective actions required (e.g., switch adjustments, valve modifications or valve replacements).

Steam Generator Tube Integrity and Chemical Engineering Branch (ESGB)

Reviewer: Aloysius Obodoako

ESGB RAI-1

Based on review of Section 2.1.5, "Protective Coating Systems (Paints) - Organic Materials," of Attachment 4 to the application dated September 28, 2012, the NRC staff understands that the licensee does not have test documentation available for the Carboline Carbozinc 11 topcoated with Phenoline 368 (CZ11/368) coating system. It appears that the coating system has not been qualified to withstand a design-basis accident (DBA) and has not been tested to demonstrate that it will not adversely impact the emergency core cooling system (ECCS). In lieu of testing, the licensee performed an analysis to evaluate the acceptability of the coating system at EPU conditions. In order for the staff to complete its evaluation of the acceptability of the coating system at EPU conditions, please provide the following information:

- a. Describe the current licensing basis with respect to the qualification testing for all safety-related coatings in containment.
- b. For the coating system CZ11/368, please provide additional information to justify why this system will be able to endure EPU conditions, including how the CZ11/368 coating system was determined to be suitable to remain adhered to the wall in containment and the torus under post-accident conditions.
- c. Discuss whether the CZ11/368 coating system has been repaired, remediated, or showed signs of degradation since being applied.

ESGB RAI-2

On page 2-13 of Attachment 4 to the application dated September 28, 2012, it states that BIO-DUR 560BLUE is being used as a torus relining material and is qualified for EPU conditions.

- a. Discuss the extent of application of this coating (e.g., 100 percent of torus, only wetted portions) and whether it is or will be applied to the torus of both units.
- b. Discuss how the coating was DBA tested (see ASTM 3911).
- c. Discuss whether the coating was manufactured using 10 CFR Part 50, Appendix B, requirements.
- d. Discuss the qualification of personnel used to apply and inspect this coating.

ESGB RAI-3

On page 2-14 of Attachment 4 to the application dated September 28, 2012, the licensee states, "PBAPS currently follows ASTM D3843-93 to fulfill 10 CFR 50, Appendix B [Quality Assurance], requirements with clarification, exception, and one additional requirement as stated in the PBAPS QATR [Quality Assurance Topical Report]." Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," cites ASTM D3843-00 (reapproved 2008) as an acceptable standard for QA practices. Please provide a copy of the 1993 edition or discuss the differences between the 1993 and 2000 editions. Furthermore, provide a discussion on what is meant by, "...clarification, exception, and one additional requirement..." to the 1993 edition that are discussed in the PBAPS QATR.

Vessels and Internals Integrity Branch (EVIB)

Reviewer: Dan Widrevitz

EVIB RAI-1

Section 2.1.1 of Attachment 4 to the application dated September 28, 2012, concerning the reactor vessel materials surveillance program, notes that PBAPS, Unit 2 contains a capsule slated to be withdrawn and tested consistent with the implementation of the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP) (i.e., BWRVIP-86, Revision 1). Confirm that EPU conditions will not adversely impact the purpose of the capsule within the program, and/or that the appropriate BWRVIP personnel have been notified.

EVIB RAI-2

Section 2.1.2 of Attachment 4 to the application dated September 28, 2012, states that beltline circumferential weld material RT_{NDT} values remain bounded by the requirements of Generic Letter (GL) 98-05, BWRVIP-05, and BWRVIP-74-A. The results supporting this statement are presented in Tables 2.1-3a and 2.1-3b. For boiling-water reactor (BWR) licensees requesting permanent relief from the inservice inspection requirements of 10 CFR 50.55a(g), for the

volumetric examination of circumferential reactor pressure vessel welds, GL 98-05 required, in part, that the licensee implement operator training and establish procedures that limit the frequency of cold over-pressure events. Confirm that the licensee has implemented operator training and established procedures that limit the frequency of cold over-pressure events consistent with GL 98-05. Also confirm that the training and procedures will remain in place following implementation of the EPU and are adequate for EPU conditions.

EVIB RAI-3

Section 2.1.3 of Attachment 4 to the application dated September 28, 2012, identifies the top guide, core shroud, and core plate as potentially being susceptible to irradiation-assisted stress-corrosion cracking (IASCC) at end-of-life. Provide the following information regarding inspection of the core plate and top guide:

Core Plate

- a. Are lateral-restraint wedges installed or has an analysis of the hold-down bolts been conducted for the PBAPS, Units 2 and 3 core plates?
- b. If an analysis of the hold-down bolts has been conducted, provide details of the analysis.
- c. If lateral-restraint wedges are installed, or an analysis of hold-down bolts has been conducted, are inspections following BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines," still planned?

Top Guide

- a. Have BWRVIP-26-A, "BWR Top Guide Inspection and Flaw Evaluation Guidelines," inspections conducted to date identified any cracking in top guide grid beams at PBAPS, Units 2 and 3?
- b. In addition, confirm that PBAPS, Units 2 and 3 are following the inspection schedules outlined in BWRVIP-183, "Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines," or describe the inspection programs implemented to address multiple top guide grid beam failures.

EVIB RAI-4

Section 2.1.3 of Attachment 4 to the application dated September 28, 2012, states that PBAPS, Units 2 and 3 utilize hydrogen water chemistry. Confirm that water chemistry conditions are maintained utilizing BWRVIP-190, "BWR Water Chemistry Guidelines."

M. Pacilio

- 2 -

If you have any questions, please contact me at (301) 415-1420.

Sincerely,

/ra/

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosure:
Request for Additional Information

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