INSP
International Nuclear Safety Program

Activity Report
October-December 2001

Office of International Nuclear Safety and Cooperation - Dr. James Turner, Director
Improving the Safety of Soviet-Designed Nuclear Power Plants

Highlight

Ukrainian authorities officially turn heat plant over to Chornobyl NPP for operation

The Chornobyl heat plant was turned over to the Chornobyl nuclear power plant (NPP) after Ukrainian authorities signed the official commissioning report. However a few final commissioning activities are still under way. Mr. Hartley, PNNL's Senior Project Manager, and Mr. Bogdanov, of the Project Construction Management Group (PCMG), met in December to discuss the status of the heat plant commissioning.

All hot water boilers and three steam boilers had been commissioned on natural gas. Final comprehensive testing was under way on the last steam boiler, # 6. After the remaining steam boiler is commissioned, all boilers will be tested on the back-up fuel, Mazute. This is planned for early January 2002 during required "cold-weather" testing.

PNNL staff also toured the heat plant site and met with management of the Startup & Adjustment General Contractor and the General Contractor to review the completion of their subcontracts. They are essentially complete (with one remaining milestone payment due) and will warranty their work for the next year as a condition for Chornobyl NPP signing off on their final payment request. ***(Jim Hartley, PNNL, 509-372-4428; Riaz Awan, NNSA, 380-44-490-4485)***

Chornobyl Heat Plant officially turned over to Chornobyl NPP for operation.

National Nuclear Security Administration

GRS presents review results on South Ukraine PRA

South Ukraine Nuclear Power Plant's (NPP) Unit 1 level 1 internal event probabilistic risk assessment (PRA) sponsored by NNSA was peer reviewed separately by Gesellschaft fur Anlangen und Reaktorsicherheit mbH (GRS) of Germany and by Engineering Technologies and Developments (ETD) of the Ukraine. The GRS peer review findings for South Ukraine NPP were presented at meetings held on December 13 and 14 in Berlin. GRS performed a vertical slice review, looking at a single accident sequence. ETD's in-depth review covered all aspects of the PRA. Only through the scrutiny of a peer review could presumptions about the adequacy of procedures be questioned and brought to the attention of the power plant staff.

South Ukraine NPP Unit 1 is of the oldest VVER-1000 design, lacking redundancy in safety systems and therefore requiring many independent operator actions. The high-pressure injection system, unlike that at newer plants such as Zaporizhzhya, cannot operate off the plant sump. In addition, there is a pressure gap between 18 and 40 bar at which neither the high-pressure nor the low-pressure safety injection systems can function.

A key outcome of the GRS and ETD reviews was the identification of the ambiguity of operator actions during a small, uncompensated loss of coolant accident (LOCA). Existing procedures for this type of event would allow the operators to choose one of two different procedures – 1) a procedure to cool the primary system at 30°C/hour, or 2) a procedure to cool at 60°C/hour. One of these two choices would result in core damage!

Based on this peer review finding, Sergey Krasnukha (South Ukraine NPP) informed meeting attendants that upon his return to the power plant he would immediately ensure that the operators know which is the correct procedure to use when there is a small, uncompensated leak in the primary system. Sergey Krasnukha announced that, based on the findings of the PRA and the peer review process, the South Ukraine plant now has plans to correct these deficiencies. As a direct result of the NNSA program for PRAs and peer reviews, South Ukraine Nuclear Power Plant is operating more safely today than it did before these reviews. ***(Mark Petri, ANL, 630-252-3719; Walt Pasedag, NNSA, 301-903-3628)***

Cross-Cutting

IAEA's severe accident analysis with MELCOR project progresses

A specialist from Argonne National Laboratory (ANL) met with a representative of the International Atomic Energy Agency (IAEA) to discuss the effort to carry out severe accident analysis with MELCOR, an integrated severe accident progression computer code. Data for this project is currently being collected. There is a strong interest in coordinating this work with the U.S. Department of Energy, National Nuclear Security Administration (NNSA) project, which uses the RELAP5 model, to make sure there is a consistent database and to ensure there is no duplication of effort. There has already been one joint meeting in Armenia to address this coordination and the next meeting is scheduled for January 2002 in Vienna. ***(Philip Pizzica, ANL, 630-252-4847; Walt Pasedag, NNSA, 301-903-3628)***

Russia

EOI training program development initiated at Smolensk

A two-week working session was held October 15 through 27 at the Smolensk nuclear power plant (NPP) to initiate development of a training program for trainers on Emergency Operating Instructions (EOIs). The purpose of the meeting was to initiate development of training materials and programs in preparation for the implementation of the EOIs. A training specialist from the U.S. firm Sonalysts Inc., a Ukrainian specialist from the Chornobyl nuclear plant, and a Russian specialist from the Russian Research Institute for Nuclear Plant Operations VNIIAES (during second week only) worked with training specialists from Smolensk NPP to initiate design of the training materials for the particular group of EOIs to be used in this pilot program activity. Plans for upcoming visits also were discussed. ***(John Yoder, DOE, 301-903-5650; Al Ankrum, PNNL, 509-372-4095)***

Joint agreement between Splav and Target Rock (Curtiss-Wright) has been signed to produce solenoid valves

Representatives from Russian design organizations met with U.S. representatives to discuss the potential use of solenoid valves in safety applications in Russian nuclear power plants. The advantages of the solenoid valves are their small size, low weight, fast action, low energy demand, no external valve leakage, minimal maintenance, and low cost.

A joint venture agreement between Splav (Russia) and Target Rock (Curtiss-Wright, United States) has been signed for the manufacture and distribution of the solenoid valves. Leningrad NPP is interested in the purchase of approximately 20 valves. The first step in obtaining Russian certification will be the

manufacture of two valves at Target Rock for use in the feedwater system at Leningrad NPP. After the completion of the pilot phase, valves will subsequently be manufactured at Splav. The solenoids will continue to be provided by Target Rock. ***(Richard Denning, BCO, 614-424-7412; Greg Trosman, NNSA, 301-903-3581)***

Upper level control system of SWP-5 Kalinin Special Water Purification System installed

The upper level control system for the demonstration control system (SWP-5, Kalinin special water purification system) has been installed at the Russian Research Institute for Nuclear Plant Operations (VNIIAES) simulator facility. In addition, one-half of the lower level control system has been installed. The remaining equipment for the demonstration control system was delivered in late November by the Russian manufacturer, Omsk. ***(Richard Denning, BCO, 614-424-7412; Greg Trosman, NNSA, 301-903-3581)***

Three meetings held to review deliverables and assess progress toward contract completion with SCC and MCC

Two of PNNL's contracts with the Siberian Chemical Combine (SCC) and the Mining and Chemical Combine (MCC) are in support of the effort to evaluate the Russian Federation fossil fuel refurbishment option to end weapons grade plutonium production at Seversk and Zheleznogorsk nuclear plants.

Earlier this fall, specialists from PNNL met with representatives from the SCC and MCC to be updated on efforts to gain tax exemption status. The combines have reached a temporary verbal agreement with the tax ministry to not be assessed VAT until all the paperwork has been finalized. PNNL had been asked to withhold payments before the tax issue was resolved, but will now begin paying on completed invoices. Deliverables from each combine were also reviewed. A discussion was held on the second day of the meetings about the October site visit to Seversk.

The second contract review meeting with SCC and MCC was held in late October within the Closed Administrative Territorial Formation of Seversk. A baseline inspection of the Seversk TET plant was conducted and PNNL specialists met with SCC TETs management and staff. The group toured the new, partially constructed coal handling system and inspected the water treatment facility. During the tour, the U.S. team was shown a renovated room that is to be the workspace for the U.S. technical oversight team during refurbishment activities. The U.S. team and TET representatives toured the boiler house, turbine generators, heat exchangers, water treatment facility, and control room to visibly inspect the equipment and facilities planned for refurbishment. Photographs of the equipment and facilities were

taken to document their current condition. The MCC and SCC contracts, deliverables, and schedules were reviewed, including cost estimates.

The third Contract Review Meeting was held at the International Building of Minatom on November 28-29. Contract deliverables were discussed and progress was assessed. The SCC gave a presentation on the Russian Federation Civil Engineering Norms and Standards. Re-negotiations began with the MCC on the details of where the TET site will be built. ***(Julian Hill, PNNL, 703-413-7801; Jim Mulkey, DOE, 301-903-5481)***

Leningrad NPP Unit 1 and 2 ISA projects and Unit 1 EOI efforts reviewed

A representative from PNNL traveled to Stockholm, Sweden at the end of September and at the end of November to participate in the In-depth Safety Assessment (ISA) project meetings for Leningrad Units 1 and 2 and to help plan the Leningrad Symptom-Based Emergency Operating Instructions (EOI) effort. Other participants in the meetings were representatives from Sweden, the United Kingdom, Finland, Russia, and the United States. Specialists from Lithuania were present at the November meeting.

The Leningrad Unit 2 ISA project was reviewed. With the project nearing completion, a summary report was prepared and reviewed for completeness. The technical committee reviewed the Leningrad Unit 1 ISA project. The scope of work was based in part on the experience of the Unit 2 project. Labor issues and timeline were also discussed and determined to be viable.

The Leningrad NPP EOI project planning committee meeting was the first in a series supporting the development of risk informed EOIs. The meeting's primary objectives were to discuss the project's basis, scope, timing, and participants. The results of the recently completed Leningrad NPP Unit 2 ISA were reviewed and they indicated risk informed EOIs would contribute 82% of the forecast reduction in the core damage frequency presented in chapter 9 of the Unit 2 ISA summary report. The Lithuanian participants discussed their recent EOI experience and offered suggestions to improve Leningrad NPP's EOI project. All agreed that the Leningrad NPP EOI project would significantly benefit from the Ignalina NPP EOI program. Leningrad NPP will re-sequence their proposed scope of work based on Ignalina NPP insight. PNNL agreed to consider funding near-term technical support for Leningrad NPP EOI development groups. Leningrad NPP was expected to provide an updated project description by the end of 2001. ***(Sam McKay, PNNL, 509-372-4059; Walt Pasedag, NNSA, 301-903-3628; Dennis Meyers, NNSA, 301-903-1418)***

Balakovo NPP training materials CD

Balakovo NPP experts, with assistance from staff of Human Performance Analysis Corporation, have designed and produced training compact disks (CD). This material covers the 12 training programs developed at Balakovo through INSP systematic approach to training projects. Contents include program descriptions, course outlines, lesson plans, student guides, test items, simulator scenario guides, and administrative procedures. The two-CD set contains all Russian language training materials in both Adobe Acrobat and Microsoft Windows formats. The CDs will be distributed to nuclear sites in the former Soviet Union. ***(John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)***

Ukraine

Ukraine Control Room Turbine Operator course completed

A two-week working session was held October 15 through 27 at the Zaporizhzhya nuclear power plant (NPP) to continue the transfer of the Control Room Turbine Operator (CRTO) training program initiated during three prior working visits and workshops. As part of this visit, training specialists from the U.S. firm Sonalysts Inc., the Engineering Technical Center (ETC) in Ukraine, and the Khmelnytskyy NPP worked with training specialists from the Zaporizhzhya plant to transfer and modify existing CRTO training materials for specific implementation at each site. The pilot program was implemented during this second week of the visit.

During December 10 through 21, 2001 representatives of PNNL, Sonalysts, Inc., Energoatom, and Ukraine's ETC met with training staff at South Ukraine NPP to finalize implementation of their CRTO pilot course. This completed 18 months of work, which included the course implementation at Rivne NPP and Zaporizhzhya NPP. This work is part of the ongoing effort to transfer technology related to the systematic approach to training used at all U.S. nuclear utilities. As part of the project, enhanced training material will be available to technical staff at Soviet-designed NPPs. This is the third of five pilot courses being developed for critical control room positions and is essential in upgrading operator performance in Ukraine. ***(John Yoder, DOE, 301-903-5650, Don Draper, PNNL, 509-372-4079)***

Work on Ukrainian DDSM, URDB, QA, Infrastructure, and EARLL projects continued

A PNNL specialist met with Ukrainian specialists in Kyiv from December 1 – 8 to discuss continuing work on several INSP projects.

Representatives of the Ukraine utility, Energoatom, and various Ukrainian technical support organizations joined the PNNL specialist in discussing the design document system management (DDSM), the Ukraine reliability database (URDB), Ukraine quality assurance (QA) and infrastructure, and event analysis, reporting, and lessons learned (EARLL) projects.

The DDSM, QA and infrastructure meetings included the NPP Operational Support Institute (NPP OSI) along with Energoatom. The status and impact of recent budget decisions were discussed. The Ukraine reliability database project status was reviewed with Information Technologies Incorporated (INIT), Energoatom, Kyiv University, and Russian Research Institute for Nuclear Power Plant Operations (VNIIAES). Planned activities for the next two fiscal years were discussed and plans were made for a re-examination of methods to allow information sharing between the Ukraine reliability database and the similar database in Russia. During a root-cause analysis conference sponsored under the EARLL project, representatives from Energoatom, some host-country vendors, and the specialist from PNNL discussed future EARLL activities. ***(Tyrone Blackburn, PNNL, 509-372-4092; Dennis Meyers, NNSA, 301-903-1418)***

Safety related security upgrades continue at Zaproizhzhya and Khmelnytskyy NPPs

In early October, the Request for Proposal (RFP) was sent out to Transexpo Corporation of Ukraine to implement security upgrades at Zaporizhzhya Unit 1 and additional upgrades at Khmelnytskyy Unit 1. The Transexpo contract with Khmelnytskyy was established on December 3 and the Zaporizhzhya contract is being finalized. At Khmelnytskyy NPP, equipment and installation activities will start in early 2002 following the PNNL's approval of a project work plan, general layout drawings, and technical specifications. ***(Andrei Glukhov, PNNL, 509-375-3961; Greg Trosman, NNSA, 561-734-8108)***

Project review meeting held for Rivne Unit 2 full-scope simulator

A project review meeting was conducted with the Rivne NPP training center and GSE Systems, Inc. (GSE) site managers. The current project schedule was reviewed and discussed and participants toured the Unit 2 simulator facility. The hardware/software integration was completed one week ahead of schedule on November 16. Pre-acceptance and performance testing started November 19 and is scheduled for completion in May 2002. GSE stated that the project team has been able to recover a total of seven weeks out of the nine weeks of original baseline

project schedule delays due to the now remedied custom clearance delays. The next project review meeting will be held in March 2002. ***(Andrei Glukhov, PNNL, 509-375-3961; John Yoder, DOE, 301-903-5650)***

Wiring and assembly phase completed for Zaporizhzhya Unit 1 full-scope simulator

A specialist from PNNL met with representatives of the Russian Research Institute for Nuclear Power Plant Operations (VNIIAES) to check the status of wiring and assembly activities at the Zaporizhzhya Unit 1 simulator facility, and the preparation for software and hardware integration. The wiring and assembly activities were completed in December and the next step will be the hardware checkout phase. The software/hardware integration phase is scheduled to begin in January 2002. ***(Andrei Glukhov, PNNL, 509-375-3961; John Yoder, DOE, 301-903-5650)***

Close of Khmelnytskyy ISA Phase I coordinated

The U.S. Technical Coordinator of the Ukrainian Khmelnytskyy Nuclear Power Plant (NPP) In-depth Safety Assessment (ISA) project met in Kyiv with Ukrainian specialists working on the project. The meeting also was attended by two staff members of the U.S. Technical Assistant Contractor, Data Systems and Solutions. The meeting included activities toward the closure of the Khmelnytskyy ISA Phase I work on Project Guidelines and Databases and the coordination of the beginning of the Phase II production of Khmelnytskyy Level 1 probabilistic risk assessment (PRA) and the Design Basis Accident (DBA) analysis. Although Phase I is not yet complete, all databases required to begin work on Phase II had been completed prior to the meeting. The first task has been signed with the Engineering Services Company-led Ukrainian consortium, which won the Level 1 PRA contract, and the second task has been signed with the Kyiv Energoproject-led consortium, which won the DBA contract. In preparation for the meeting, technical workshops were successfully presented to Khmelnytskyy NPP staff by both consortia during November.

The Phase II planned work activities were reviewed, including the need for the participation of the Khmelnytskyy technical staff in the production of the PRA and DBA deliverables. The matter of quality assurance (QA) and deliverable review procedures were reviewed and settled. Initial progress made under both activities was reviewed, and the technical approach for the next tasks agreed upon. Data Systems and Solutions also presented a three-day workshop on advanced PRA topics to NPP and PRA consortium analysts. From observations to date, the U.S. team believes that cooperation is quite satisfactory between 1) members within each consortium, 2) each consortium and the NPP, and 3) all three Ukrainian entities with respect to the DBA com-

puter code work which also supports the PRA. Both consortia confirmed the arrangements for timely transfer of lead-plant material from the Zaporizhzhya ISA Project to the Khmelnytskyy ISA Project. The timely transfer of this material is very important to the success of the Khmelnytskyy ISA project. ***(Charles Dickerman, ANL, 630-252-4622; Walt Pasedag, NNSA, 301-903-3628)***

Progress on Ukrainian Nuclear Fuel Qualification Project activities

Fourth UNFQP Working Meeting

In mid-October, the Ukraine Nuclear Fuel Qualification Project's (UNFQP) Fourth Working Meeting was held in Kharkiv, Ukraine. Two specialists from PNNL were on hand along with representatives of all organizations participating in the UNFQP. The Working Meeting was quite productive, including PNNL's receipt of the Dummy Fuel Assemblies Agreement (signed by NAEC "Energoatom"). Shipment of the dummies will be contingent upon the submittal of import and end-user certificates from DOE. Shipments are expected to be made by the end of 2001. An Agreement of Cooperation between NAEC "Energoatom" and the Kharkiv Institute of Physics and Technology was also received.

The Ukrainian parties spent time producing a fourth set of consolidated comments on the Technical Task Document. They also considered the previously undocumented State Nuclear Regulatory Committee of Ukraine's (SNRCU) comments. Out of this activity came the decision to list two additional documents that will need to be submitted. The group, as a whole, considers these new requirements to be appropriate and will add them to the project. The Fifth Working Meeting is planned for February 2002. ***(Richard Libby, PNNL, 509-372-6221; James Cannon, NNSA, 301-903-5016)***

CRCD plans to implement an internal Quality System in alignment with ISO-9000 standards

At the Center for Reactor Core Design (CRCD) working meetings, held mid November, efforts were discussed to develop and implement an internal Quality System. The UNFQP has given authorization to the CRCD to develop the new system. The implementation of such a system is a necessary step toward the accreditation of the CRCD and Ukrainian regulatory authority permission to perform nuclear technical work.

A review performed during the summer 2001 revealed the need for specialized assistance to the CRCD. The needed assistance and project schedule were discussed. The UNFQP elected to use a Quality System consultant from the Kharkiv Institute of Physics and Technology (KhIPT), with extensive experience in the

implementation of the ISO-9000 standards. This consultant is also currently supporting other INSP projects in Ukraine with regard to the development and execution of quality systems.

Also discussed was the number of ways procedures can be reduced and still comply with all aspects of ISO standards. An 8-hour course on ISO-9000 standards was delivered during the meetings and was attended by more than 26 staff members from both the CRCD and KhIPT. ***(Richard Latorre PNNL, 509-372-4418; James Cannon, NNSA, 301-903-5016)***

Armenia

Development of safety related security projects continues at Armenia NPP

A specialist from PNNL traveled to Armenia in late October to continue development of physical security upgrade projects at Armenia nuclear power plant (NPP).

The main topic of discussion was the status of contracts for short-term and long-term upgrades. The short-term activities that were discussed include; 1) Supplying alarm and detection equipment for the extended part of the perimeter, through Russian vendor NIKIRET; 2) A transportation contract with Armenia NPP for equipment shipment from NIKIRET to the Armenia NPP site; 3) Procurement, installation, start up, and commissioning of a security system for the extended part of the perimeter; and 4) A request for proposal (RFP) that was sent out to three Armenian companies.

The long-term activity discussed was the scope of work for the integrated design task. It was agreed that the contract would be awarded on a competitive basis, and the integrated design will have to ensure seamless integration with the short-term upgrades to the service water system perimeter. ***(Andrei Glukhov, PNNL, 509-375-3961; Greg Trosman, NNSA, 561-734-8108)***

Progress continues on the project to upgrade operations and administration procedures for the Armenian Nuclear Power Plant.

Two specialists from PNNL traveled to Armenia to discuss progress on the project to upgrade operations and administration procedures for the Armenia nuclear power plant (NPP). The PNNL representatives reviewed status with Armenia NPP and their contractor, Atom Service. Atom Service has submitted a writer's guide and several administrative procedures for the PNNL specialist's review. In addition to reviewing the project status, the next task in the project was discussed. It was decided that complete sets of procedures for five systems would be developed. These would be coupled with annunciator response procedures and emergency operating procedures already developed by TACIS. ***(Larry Sherfey, PNNL, 509-372-4080; Dennis Meyers, NNSA, 301-903-1418)***

In-depth safety work at Armenia NPP continues: Guidelines for DBA analysis and BDBA analysis were discussed with Armenian staff

A representative of ANL and a technical consultant with Science Applications International Corporation (SAIC) reviewed the guidelines for design basis accident (DBA) analysis, beyond design basis accident (BDBA) analysis, and for plant design and operation improvements. The meetings were held at the Nuclear Power Plant Research Institutes (VUJE) at Trnava, Slovakia on October 25 through 30 and November 29 through 30. The strategy is to obtain agreement among ANL, SAIC, and VUJE on the content of the draft guidelines and then to submit these to the Armenian experts to use as a starting point in developing their own versions which will incorporate plant-specific features.

These guidelines are almost ready to be finalized. The status of the data collection task for RELAP5 was discussed. The RELAP model, being developed at the VUJE workshop, was presented. The model is expected to be ready to calculate steady state conditions by January 2002. A representative from Data Systems & Solutions led a discussion of a draft guideline for safety system descriptions.

Following their meetings at VUJE, the U.S. representatives traveled to Armenia to discuss the development of the safety analysis report with the Armenian NPP staff. The project has committed to developing a production plan, a technical reference matrix, a list of relevant regulatory guides, and a revised format and content guide for the safety analysis report (SAR) based on those developed for Novovoronezh NPP. ***(Philip Pizzica, ANL, 630-252-4847; Walt Pasedag, NNSA, 301-903-3628)***

Hungary

World Association of Nuclear Operators workshop on Emergency Operating Instructions (EOIs) development held in Hungary.

The World Association of Nuclear Operators Emergency Operating Instructions (EOIs) development workshop was held during the week of December 9 through 13 in Paks, Hungary. Two specialists from PNNL and one from DOE attended the conference. Presenters at the workshop shared information regarding the status, successes, and problems of their EOI programs. Additionally, representatives of U.S. utilities made a presentation on the ongoing efforts necessary once EOIs had been implemented. The sessions were attended by representatives from both Central and Eastern European countries.
(Larry Sherfey, PNNL, 509-372-4080; John Yoder, DOE, 301-903-5650)

Lithuania

Priorities of five plant safety analysis projects discussed for Ignalina nuclear power plant

During the second week of December, two technical specialists from Argonne National Laboratory (ANL) traveled to Kaunas, Lithuania to meet with host-country specialists regarding Ignalina nuclear power plant safety issues. The meetings were held at the Lithuania Energy Institute and the Kaunas University of Technology.

Discussions concerned the priorities of five plant-safety analysis projects previously proposed by the Lithuanians for consideration of U.S. support. After determining the details of the proposals, their costs, the duration of the prospective projects, and the true value of their results, an agreement was reached as to which particular projects could be undertaken at this time. Also discussed was the distribution of effort on the proposed projects between personnel of the Kaunas University of Technology and the Lithuanian Energy Institute. The direct contact meetings with the personnel of the institutions were essential for resolving technical issues involved in the reactor safety projects. ***(Mark Petri, ANL, 630-252-3719; Walt Pasedag, NNSA, 301-903-3628)***

Slovakia

Reviewed testing and status of V-2 simulator project at Nuclear Power Plants Research Institute Inc. (VUJE), Slovakia

A specialists from PNNL traveled to Trnava, Slovakia to review the testing and status of the V-2 simulator upgrade project at Nuclear Power Plants Research Institute Inc. (VUJE). The VUJE staff has been performing various tests that include normal plant operation (cool down, heat up, etc,) and PNNL's contractor Data Systems & Solutions was making software corrections with the RELAP software. VUJE reports that the RELAP core model integration with the EVVEREST model is working well and performs better than the original EVVEREST core model. The next training session, starting in March 2002, is expected to use the RELAP simulation load. Final testing will be conducted during the next two months with minor support needed from Data Systems & Solutions. ***(Ken Erickson, PNNL, 509-372-4063; John Yoder, DOE, 301-903-5650)***

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