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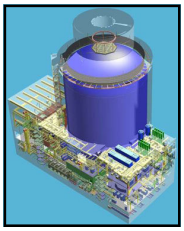
Training Renaissance

Looking at the Future of Nuclear Training: New Reactor Design

By Frank S. Tsakeres, NWI



In this era of power uprates to maximize assets (Nuclear News, June 2006) and planned mergers (e.g., FPL Energy and Alliant Energy, Duke and Cinergy, FPL and Constellation, Exelon and PSEG—see Nuclear News, May 2006), the nuclear marketplace has significantly changed. Even higher uranium prices have transpired (from $7.10/lb U_3O_8 to over $33.50/lb in just one year—see Nuclear News, March, 2006) partially due to anticipated preparations for new nuclear construction. DOE has requested $54M to share costs on 2 construction/operating licenses (COL), one by NuStart and the other Dominion. Reactor design certifications (Westinghouse's AP1000, GE's ESBWR, Areva's USEPR and the Pebble Bed Modular Reactor) are in review and expecting approval by the end of 2006. The designs are simpler (e.g., use of natural circulation, passive safety features, modular construction with less piping, less control cable less seismic volume and fewer pumps and valves than the previous reactor designs). While no one utility has purchased a new reactor, preparations such as environmental impacts and site permits have progressed with a new focus on developing simulators and training programs for the anticipated day of the first reactor purchase and COL approval in this country. Plans for accrediting the new training programs are underway guided by discussions between NEI and NRC (December 2005 meeting) resulting in deliverables by INPO in 2007. This initiative was the subject of a recent Training Manager workshop. As a result of the NEI/NRC meeting, a decision that the new

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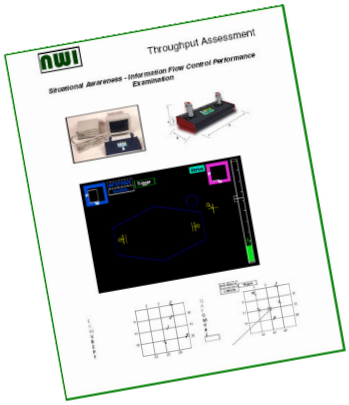
Throughput Assessment Screening Evaluation

Failures in initial operator license examinations and high license candidate drop out rates are impacting utility staffing needs and challenging the utility's confidence in the ability to prepare license candidates. In general, most utilities have had difficulties in achieving high throughput (e.g., successful licensed candidates/initial number of candidates entering initial license training class *100%) due to numerous factors. An INPO Common Cause Evaluation on Operator License Examination Failures indicated that the large number of failures were due to a number of factors of including selection of candidates for initial licensing is lacking formality and rigor. Experience requirements for ISRO are waived or lack the minimum standards required to ensure an adequate practical knowledge of plant operating systems and processes. In some cases candidate selection is based solely on seniority as a non-licensed operator (NLO). Labor agreements sometimes require poorly performing candidates to be re-admitted into the licensing program even after repeated failures or a demonstrated lack of aptitude.



A Throughput Assessment Screening Tool (TAS) was designed and developed to address the selection problem. TAS is a three-phase prediction tool primarily used to determine the probability of an ILT or initial non-licensed operator (NLO-I) candidate to successfully complete the ILT or NLO-I training program. The performance gaps that are targeted by TAS is to 1) reduce NRC license failures and increase throughput from selection to successful licen-

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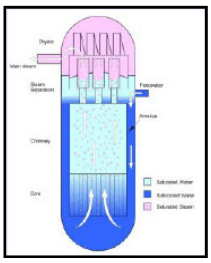
plants will use current regulations/INPO guidance to accredit their training programs prior to fuel load. Goals will ensure that well trained and qualified personnel are ready to operate and maintain new reactors, maintaining the credibility of the Accreditation process with all stakeholders: Reactor owners, National Nuclear Accrediting Board, and NRC. Several options exist regarding the timing of Accreditation: 1) prior to fuel load (or at a time agreed to by INPO and utility management using current process), 2) prior to system turnover using current process or 3) at COL using a modified process. Since these new plants would need qualified personnel prior to key milestones including fuel receipt/load, system turnover and during/prior to construction commencement, Accreditation timing was decided to occur prior to COL approval. This new proposed process provides for early resolution of training issues and accreditation status, incorporates lessons learned from current process, ensures process applicable to plants built at; an existing site, a "green" field site by existing INPO member, and a "green" field site by non-INPO member. Opportunities are being incorporated to drive standardization before, during and after training begins. Since there is a need for qualified personnel at system turnover, training programs are being targeted to be accredited prior to COL issuance. That means that several things must occur prior to the COL including training licensed operators (18-24 months prior), training technical personnel, and building and validating the simulator (See timeline on page 3). There are several advantages by Accrediting prior to COL including validation of training program content prior to implementation, uniform initial training program content, Lowers costs for initial training materials, stimulates procedure, training, and simulator development earlier, removes training development and initial accreditation activities from the construction phase, reduces need for regulator review of training programs, efficiencies are realized for subsequent initial accreditation reviews for same plant design, and promotes potential for resource sharing among reactors of the same design. From a training perspective, Accreditation application content includes a standardized training package based upon vendor reactor type (e.g., job list, task list, task to training matrix, training materials including lesson plans, qualification documents, etc.), a site-specific training package (e.g., task list, task to training matrix, training materials including lesson plans, qualification documents, etc.), corporate/strategic goals addressing training, training process descriptions/procedures, implementation plan including schedule and staffing, and a description of the training facilities. Just like the current process, a submission of the ASER that contains explanations on how the accreditation objectives and criteria are or will be met is required prior to attending an Accrediting Board meeting. Some of the challenges to this new proposed process includes development of the JTA which will be used to make informed decisions about training content and aggressive timeline. In addition, it is not clear what the NRC expects in a COL application regarding training and whether reactor design vendors have the resources and expertise to develop training materials that meet accreditation standards. A large number of unknowns exist regarding this process...but like the past, an evolution of the process should ensue in the coming years.



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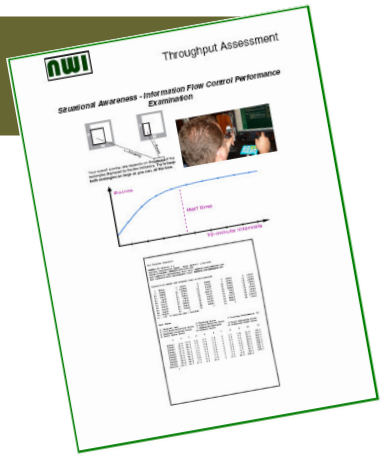
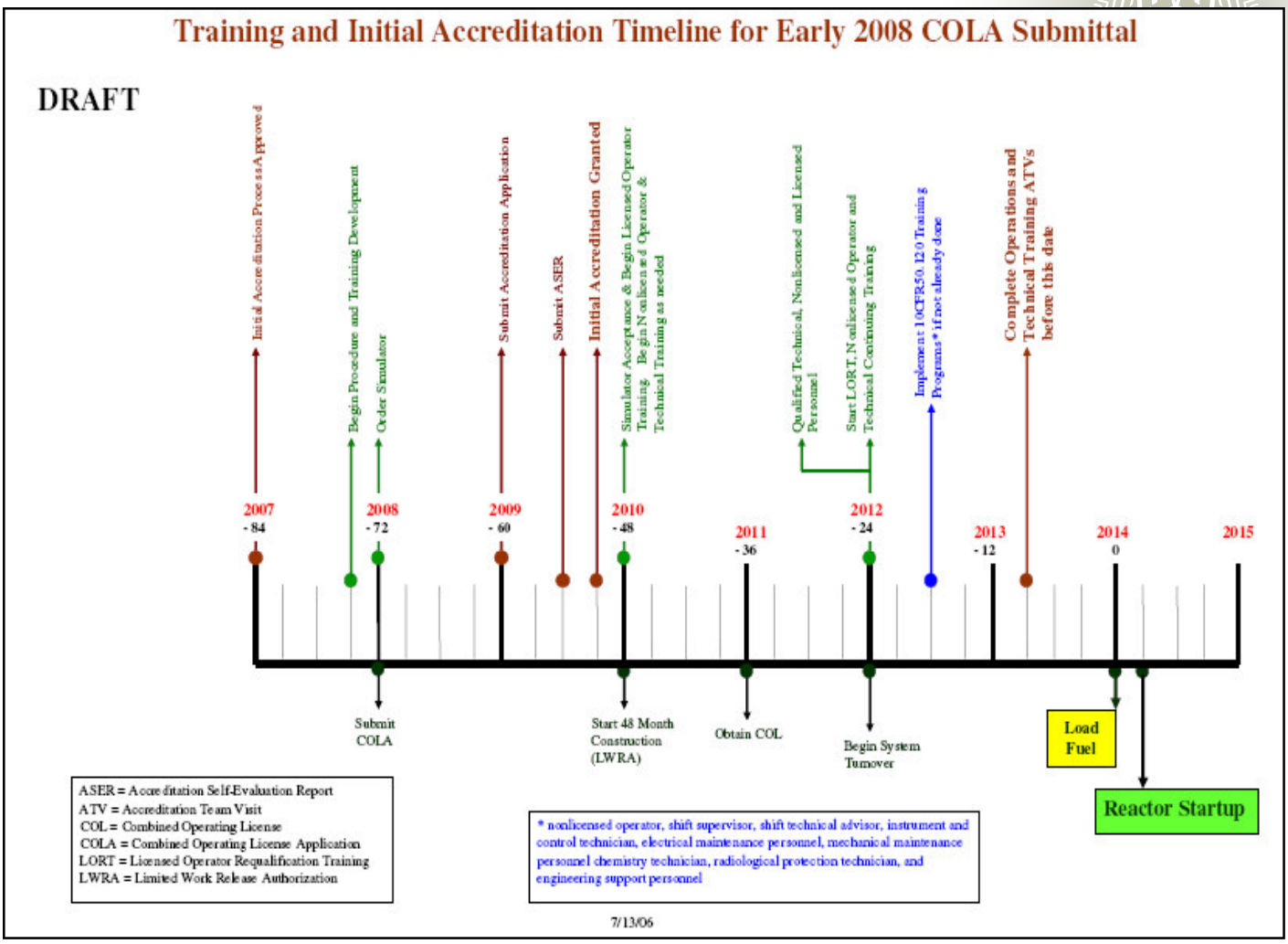


sure for reactor operator and senior reactor operator candidates, 2) secure a more technically-based decision process for license candidate selection and 3) reduce stranded investment costs from license candidate failures. The individual performance output of the three examination phases are processed using a complex empirically-derived algorithm that correlates basic mathematics & science knowledge, comprehension and problem solving abilities and situational awareness performance. The BSE phase (e.g., Basic Math and Science) of the TAS is used as an initial benchmark to evaluate entry-level knowledge and understanding of numerical problems and problem solving including integer functions, arithmetic averaging, content area determinations, operations with decimals, fractions, percentages, ratios and proportions, sums, products, division, simple polynomials, numerical skills and problem solving (word problems). Also included are basic earth science knowledge elements that are evaluated for entry-level understanding. The problem solving capability is correlated to the other phases and incorporated into a complex algorithm that is the ultimate cumulative predictor outcome. The second phase, CE or Comprehension Evaluation, is a series of exercises comprised of reading a paragraph and answering questions, both lower and high cognitive, which is used to evaluate the candidates ability to deductively reason. In addition, the paragraphs are general in nature requiring no prior knowledge of the subject material removing bias from the overall evaluation. Again, problem solving and logic sequence outcomes are primary input into the overall predictor algorithm. While comprehension tests have helped quantify candidates' ability and aptitude for problem solving and deduction, the key to the CE phase is the correlation that is generated based on the pattern of candidate responses and ultimate decisions. The third phase is the SA phase (Situational Awareness) which is used to determines within a short period of time (e.g., 90 minutes) the student's ability to multi-task and predicts situational outcomes while monitoring and making decisions using significant amounts of data. The evaluation is computer based and



Throughput Assessment Screening Evaluation

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is not biased on any keyboard knowledge or prior computer skill is required to improve performance outcomes. In the SA phase, the object is for the student to be able to predict a collision based upon speed, color and future path direction. The evaluation commences requiring the student to monitor variables (via a unique key board and joystick arrangement) that have a path along a grid. In addition, an auto-track feature that is not reliable can be initiated but must be monitored while performing other "bonus" tasks. Just like the distractions in the control room, bonus tasks are required to improve performance ratings and have certain worth based upon candidate resolution time and decision-making logic. Like an operator in the main control room, large amounts of data and critical parameters are required to be monitored and evaluated resulting ultimately in some type of decision. In addition, some distractions compound the operators' problem-solving ability by adding distractions in the ways of surveillances, procedural questions from workers outside of the control room envelope and even questions from the field by non-licensed operators requesting insights about local panel annunciation just to name a few. This phase evaluates the ability of a candidate to ascertain the correct information and prediction from a large amount of variable data streams and unreliable automatic monitoring systems. The SA system that has been developed has been used in a number of industries including the aeronautical fields (e.g., airline pilots, air traffic controllers, etc) and non-nuclear power plant operators on over 5 different continents, numerous cultures, genders, and socio-economic statuses without yielding any notable bias. The outcomes of all three phases are inputted into a complex algorithm resulting an overall score for each candidate in a confidential report. The overall performance evaluation algorithm encompasses the following focal areas; Attention to Detail, Data Retention, Problem Solving, Tracking & Monitoring, and Prioritization. Baseline data has been collected which was used to empirically validate and improved precision of the ILT or NLO-I screening and selection prediction algorithm. A group of

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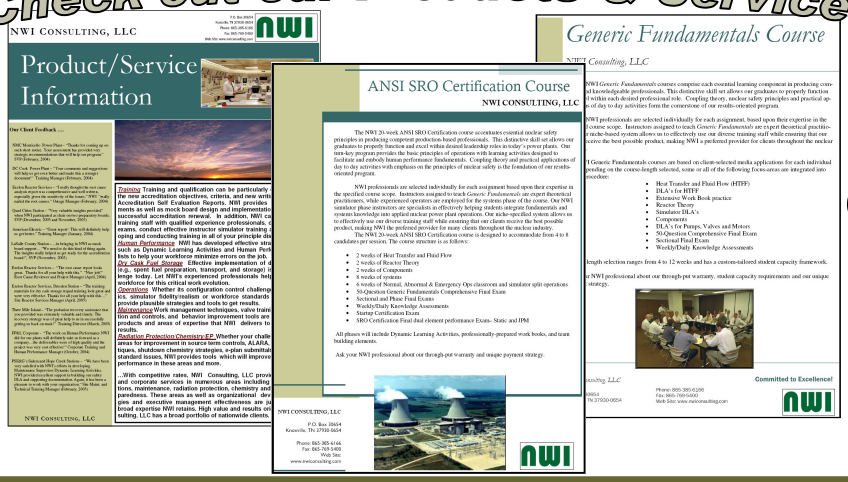

We're on the Web!

Throughput Assessment Screening Evaluation

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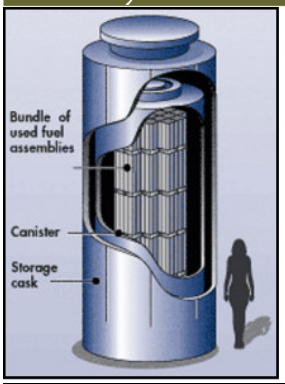
successful and non-successful candidates was chosen from a pilot PWR site (NOTE: The pool of non-successful ILT candidates was selected from technical failures only and not personal, medical or family issue influenced failures). Preliminary data analyses indicated that the prediction tool was extremely accurate.

NWI News Update...

- ***TAS***—NWI's ILT Throughput Assessment Screening evaluation tool has been tested and validated at now 2 separate utilities with incredible success. Call for more information today !

Dry Cask Storage CBT...



In 2006, Exelon's Reactor Services and NWI partnered to develop a first in Reactor Services Technician Training; CBT-based Initial and Continuing Training. Led by CBT project team leader Steve Pettinger, the design included 2 plants, Quad Cities and Dresden, having a common interactive module with nested video clips based upon common procedures with separate modules for site-specifics. It is also SMART as the requalification module is interactive asking questions upfront allowing for bypassing modules that the student has already mastered. An online exam and feedback module at the conclusion of the module highlights automatic recordkeeping that can be exported into the site's training data bases. This flexible product can be run via CBT, WBT or via distance learning via the NWI Intranet! For a demonstration, please contact us at NWI!

Employee Hotline:

WELCOME NEW NWI EMPLOYEES & ASSOCIATES....

- Ken Gerling and new NWI employee George Thullen begin two back-to-back system courses for first line maintenance supervisors at LaSalle County Station in Marseilles, Illinois. Some engineers and chemistry management are included in the class making it a real challenge for instructing due to the diverse background of the student population. This is the first time in over 5 years that this course has been taught onsite and in a turn-key project! Welcome George to the NWI team!
- Dale Hoffman has just joined the NWI team in providing ILT support for the TVA Watts Bar Plant. Welcome Dale!

Editor: Frank S. Tsakeres, NWI

Associate Editor: Kate Hendrickson, NWI

We wish to express special thanks to the following clients for making NWI a preferred consulting company.

- AEP's D.C. Cook Nuclear Power Plant
- Exelon's Three Mile Island, Dresden, LaSalle and Quad Cities Nuclear Stations
- Exelon's Outage and Reactor Services
- SCE's San Onofre Nuclear Generating Station
- Exelon's Braidwood Station
- TVA's Watts Bar Plant