



## Distinguished NSE Alums Turnage, Coxe, Rothrock Illuminate The Business Side of Nuclear Technology

Virtually all engineers want to make a positive impact on society. Technical knowledge is necessary for achieving this goal, but not sufficient, especially in a field like nuclear engineering, where broad economic, political, and business issues are intimately entwined with the technology.

Students in NSE department head Richard Lester's *Managing Nuclear Technology* class recently got a high-level perspective on these aspects of technology leadership at first hand in guest lectures by three distinguished NSE alumni – senior utility executive Joe Turnage (SM '70, Ph.D. '72), consultant Ray Coxe (BS, '82, Ph.D. '88), and venture capitalist Ray Rothrock (SM '78).

The three men offered informative insights into their work, and provided clear evidence of the perseverance and creativity needed to bring good ideas to fruition. An especially helpful aspect was their sharing of spreadsheets, project management charts, presentations, and other tools used to evaluate projects ranging from power plants to infrastructure upgrades to startups.

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**– Ray Rothrock**

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Seeing these types of numbers was “absolutely helpful – it put together in a very concrete sense the theory of what we’ve learned with the cost accounting,” commented masters’ student Russell Rodewald.

A recurring theme of the talks was the evaluation of risk, which bears heavily on financial aspects of new endeavors. “Every project has risk, it’s unavoidable,” said Coxe, whose consultancy specializes in energy infrastructure project development. “Risk means a higher cost to somebody. Some risks are well-apportioned, some are not, and that can sink a project.”

Coxe emphasized the central importance of the proforma – a spreadsheet-based financial model with hundreds of inputs that attempts to quantify every dollar that will go into and out of a given project over its lifetime (up to 60 years in the energy sector). While the pro forma has huge value in assessing the viability of an investment, he added, “risk evaluation is as much art as science...you

can’t capture the unexpected, and there are cognitive limits with uncertainty. Perceptions and emotions play a large role, and risk tolerance is not absolute.”

The fickleness of analysis figured into the talk by Turnage, senior VP of Constellation Energy’s Nuclear Group, and senior VP for strategy at UniStar Nuclear Energy, a separate entity seeking to build several new nuclear power plants in the US, including one in Maryland.

That project has stalled, not because of technical, regulatory or community issues, but from assumptions used by the federal Office of Management and Budget to assess the risk (and therefore the price) of federal loan guarantees. Turnage called the guarantee program, authorized under the 2005 Energy Policy Act, “an important bridge policy for resurrecting the US nuclear industry.” But despite that act of Congress, support from the Department of Energy, and enthusiastic Presidential-level backing, OMB’s pricing of the loan guarantees was several times what UniStar and its investors had expected, derailing the entire effort. “There’s a big gap between energy policy and implementation,” said Turnage, who said his team is actively working on “Plan B.”

Rothrock, a longtime venture capitalist at Venrock, offered an investor’s perspective on risk, noting that on average, three of ten VC investments wipe out and four break even, and only one in ten or one in twenty becomes a “home run” with 10x or more return. Like the others, Rothrock counseled patience, saying, “I’m usually involved for eight to 10 years, because it takes that long to build something, learn how to sell it, and get the distribution going.”

He noted that charisma, vision, and salesmanship are essential for the substantial number of aspiring entrepreneurs in the class. Rothrock urged attention to broad macro trends, because “large markets cover mistakes.” and added compelling advice for the class on pitching a new business idea to investors.

“If you get invited to present, do your homework – know who you’re in front of, where they came from, know their dogs’ names, everything about them,” said Rothrock. “You get 45 minutes, and it can be very magical. Make it a short story. Give a customer example, say what motivated you to take this project on. Describe the solution, the product of science. Why are you special, why can you do it? And never forget – you have to ask for the order. If you’re not going to ask me, you won’t ask a customer.”

Reviews among the students were extremely favorable. “The series was fantastic,” commented one SM student. “One of the greatest challenges is that you can’t just say, here’s a new technology – the real question is, can you do it economically, in a way that makes it society’s choice? If your technology doesn’t get built, you can’t have the real-world impact you hope for. ■

*Written by Peter Dunn*