

PROMOTION RECOMMENDATION

The University of Michigan  
College of Engineering

Department of Nuclear Engineering and Radiological Sciences

Annalisa Manera, associate professor of nuclear engineering and radiological sciences, with tenure, Department of Nuclear Engineering and Radiological Sciences, College of Engineering, is recommended for promotion to professor of nuclear engineering and radiological sciences, with tenure, Department of Nuclear Engineering and Radiological Sciences, College of Engineering.

Academic Degrees:

Ph.D. 2003 Delft University of Technology, Reactor Physics, The Netherlands  
M.Sc. 1999 University of Pisa, Nuclear Engineering (cum laude), Pisa, Italy

Professional Record:

2015 – present Associate Professor (with tenure), Department of Nuclear Engineering and Radiological Sciences, University of Michigan  
2011 – 2015 Associate Professor (without tenure), Department of Nuclear Engineering and Radiological Sciences, University of Michigan  
2007 – 2011 Head of Nuclear Systems Behavior Group, Paul Scherrer Institute, Switzerland  
2006 – 2007 Research Scientist, Systems Behavior Group, Paul Scherrer Institute, Switzerland  
2004 – 2005 Research Scientist, Department of Accident Analyses, Institute of Safety Research, Research Center Rossendorf, Germany  
2003 – 2003 Researcher, Thermal-Hydraulic section, Interfaculty Reactor Institute, Delft University of Technology, The Netherlands

Summary of Evaluation:

Teaching: Professor Manera has made major contributions to teaching, initiating a Nuclear Thermal Hydraulics teaching curriculum and research program in the Department of Nuclear Engineering and Radiological Sciences (NERS). She developed and taught three new nuclear thermal hydraulics courses: 1) NERS344 - Fluid-Dynamics for Nuclear Engineers; 2) NERS444 - Thermal-Hydraulics of Nuclear Systems; and 3) NERS547 - Computational Fluid Dynamics for Nuclear Applications. Professor Manera's student evaluations for Q2 (excellent teacher) averaged nearly 4.5. She also developed a thermal-hydraulic section for the senior-level nuclear reactor design class, NERS442. She has also mentored a large group of students at the undergraduate and graduate levels. She has graduated eight Ph.D. students and currently chairs or co-chairs another five. She has also supervised or co-supervised several M.S. and undergraduate students. Professor Manera's teaching prowess is best described by the many comments in the student letters received.

Research: Professor Manera has single-handedly initiated a major experimental and computational research program in thermal hydraulics for nuclear applications. Her accomplishments have garnered international recognition as an expert in both computational and experimental fluid dynamics, particularly in the area of two-phase flow. She solved the longstanding, critical problem of CRUD deposition on nuclear reactor fuel rods, which limited the operating regimes of nuclear reactors. Professor Manera correctly predicted the experimental striping pattern that was exhibited in reactor fuel rods. She has been extremely successful at securing external research funding from external agencies (over \$3.5M), often in collaboration with leading researchers from top institutions. Professor Manera has a distinguished publication record consisting of over 50 refereed journal articles, numerous conference proceedings and over 40 institute reports.

Recent and Significant Publications:

- Dave, A., Manera, A., Beyer, M., Lucas, D. and Prasser, H.-M., 2016, "Uncertainty Analysis of an Interfacial Area Reconstruction Algorithm and its application to Two Group Interfacial Area Transport Equation Validation," *Nuclear Engineering and Design*, in press.
- Memmott, M.J., Manera, A., Boyack J., Pacheco, S., Wang, M. and Petrovic, B., 2016, "The Primary Reactor Coolant System Concept of the Integral, Inherently-Safe Light Water Reactor," accepted for publication in *Annals of Nuclear Energy*.
- Petrov, V., Nunez, D., Downing, J., Dave, A., Manera, A., 2016, "High-resolution experiments of velocity and concentration fluctuations in a jet flow," accepted for publication in *Nuclear Engineering and Design* (NURETH-16 special issue).
- Wang, M., Manera, A., Qiu, S. and Su, G.H., 2016, "Ammonia-water mixture properties (AWProC) development, and verification and Kalina design for nuclear power plant," *Progress in Nuclear Energy*, 91, pp. 26 - 37.
- Grunloh, T. and Manera, A., 2016, "A novel overlapping domain strategy for the multiscale coupling of CFD with 1D system codes with applications to transient flows," *Annals of Nuclear Energy*, 90, pp. 422 - 432.
- Walter, D., Manera, A., 2016, "Adaptive burnup stepsize selection using a PID controller for 2-D lattice depletion simulations," *Progress in Nuclear Energy*, 88, pp. 218 - 230.
- Petrov, V., Kendrick, B., Walter, D., Manera, A., Secker, J., 2016, "Prediction of CRUD deposition on PWR fuel using a state-of-the-art CFD-based multi-physics computational tool," *Nuclear Energy and Design* (CFD4NRS-5 special issue), 229, pp. 95-104.

Service: Professor Manera has an outstanding record of service to students and the department, including first-year student counseling and instructional laboratory development. She has made major efforts in diversity, particularly through her active participation in the NextProf program for multiple years. She also served on the department's executive committee and several faculty search committees. Professor Manera's national and international service activities have been remarkable, with her service on editorial boards, technical program committees, review boards for federal agencies and as a reviewer for numerous international journals and conferences.

External Reviewers:

Reviewer A: "She is well recognized by her peers and is already one of the leading researchers

in [the] US and world-wide in the area of nuclear reactor thermal-hydraulics and multi-physics. ... She is on the top in her peer group and moreover she is a leader in her field.”

Reviewer B: “... Associate Professor Manera is unquestionably among the top fluid dynamicists in the country.”

Reviewer C: “... Prof. Manera has established a balanced and excellent record in research, teaching and service. She would certainly be promoted to Full Professor at [my institution].”

Reviewer D: “Prof. Manera has [sic] established as a leader in a number of areas in thermal hydraulics and reactor safety both in modeling and experimental research.”

Reviewer E: “She is one of the most dynamic researchers working in the area of nuclear reactor thermal hydraulics and system analysis in her peer group. Her work spans experimental, theoretical as well as CFD and large system code based analyses.”

Reviewer F: “Amongst the researchers [in her cohort] in her field known to me worldwide, Dr. Manera is one of the most talented, most influencing and most acknowledged personalities.”

Reviewer G: “...her *international* visibility, accomplishments, and the quality and quantity of her work and their acceptance by her US and European peers are very evident. ... With such momentum putting herself and the Department in the centre of the most important and national future-oriented research, I foresee a great future for Professor Manera that will certainly reflect positively on the Department and UM.”

Summary of Recommendation: Professor Manera has developed an impressive international reputation as a teacher, scholar and researcher. Her unique experimental and computational abilities have placed her in a leadership position in the area of nuclear thermal hydraulics. Her recent discoveries have greatly advanced the safety and reliability of nuclear fission reactors. She has demonstrated her devotion to teaching and mentoring undergraduate and graduate students. She has performed excellent service at the college and department levels as well as nationally and internationally. It is with the support of the College of Engineering Executive Committee that I recommend Annalisa Manera for promotion to professor of nuclear engineering and radiological sciences, with tenure, Department of Nuclear Engineering and Radiological Sciences, College of Engineering.



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Alec D. Gallimore, Ph.D.  
Robert J. Vlasic Dean of Engineering  
College of Engineering

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