Approved by the Regents May 21, 2015

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, without tenure, Department of Nuclear Engineering and Radiological Sciences, College of Engineering, is recommended for the granting of tenure to be held with her title of associate professor of nuclear engineering and radiological sciences, 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, Pisa, Italy

Professional record:

2011 – present	Associate Professor (without tenure), Department of Nuclear Engineering and Radiological Sciences, University of Michigan
2011 – 2011	Visiting Associate Professor, Department of Nuclear Engineering and Radiological Sciences, University of Michigan
2007 – 2011	Head of "Systems Behavior" Group, Laboratory of Reactor Physics and Systems Behavior Department of Nucelar Energy and Safety, Paul Scherrer Institute, Switzerland
2006 – 2007	Scientist, "Systems Behavior" Group, Laboratory of Reactor Physics and Systems Behavior Department of Nucelar Energy and Safety, Paul Scherrer Institute, Switzerland
2006 – 2006	Senior Consultant, Nuclear Engineering, Colenco Power Engineering AG, Switzerland
2004 – 2005	Scientist in the 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 is an outstanding and dedicated teacher. In order to start a nuclear thermal hydraulics program, Professor Manera initiated three new courses: Thermal-hydraulics of Nuclear Systems, Fluid-mechanics for Nuclear Engineers and Computational Fluid Dynamics for Nuclear Applications. Her teaching evaluations have improved to exceed 4.0 out of a 5.0 scale for the past several terms, after piloting the new courses. Her students describe her as "…one of the best professors that I have had in the university…competent, clear, engaging lecturer and approachable, kind and enthusiastic…." Another states "Professor Manera excels as a professor, but more importantly she excels as a teacher." Professor Manera has been extremely successful in attracting and training graduate students. She has built a strong research group of

seven Ph.D. students and has already supervised one to graduation. Furthermore, Professor Manera is beloved by students for her caring mentoring style.

Research: Professor Manera has established an international reputation as perhaps the top nuclear thermal hydraulics researcher of her generation. She is unique in that she is a leader in both computational and experimental fluid dynamics. Her expertise is unmatched in wire-mesh thermal hydraulics diagnostics. Professor Manera has single-handedly built a new thermal hydraulics computational and experimental program at Michigan. This was an area of research that was sorely lacking at the university before Professor Manera arrived. Her publication activities have been outstanding, with sixteen journal papers and twenty-eight conference papers published since 2011. She has also been extremely successful in attracting funding for her research, having garnered over $3M in directly attributed funding.

Recent and significant Publications:

Wysocki, A., March-Leuba, J., Manera, A., Downar, T., 2014. "TRACE/PARCS analysis of out-of-phase power oscillations with a rotating line of symmetry," *Annals of Nuclear Energy*, 67, pp. 59 – 69.

Drzewiecki, T., Asher, I., Grunloh, T., Petrov, V., Fidkowski, K., Manera, A., Downar, T., 2012, "Parameter Sensitivity Study of Boiling and Two-Phase Flow Models in CFD," *Journal of Computational Multiphase Flows*, Vol. 4(4), pp. 411 - 426.

Freixa, J., Manera, A., 2011, "Verification of a TRACE EPR™ model on the basis of a scaling calculation of an SBLOCA ROSA test," *Nuclear Engineering and Design*, 241 (3), 888-896.

Manera, A., Prasser, H.-M., Lucas, D., van der Hagen, T.H.J.J., 2006, "Three-dimensional flow visualization and bubbles size distributions in stationary and transient upward flashing flow," *International Journal of Multiphase Flow*, 32, pp. 996-1016.

Bolesch, C., Walter, D., Manera, A., Petrov, V., Kendrick, B., 2013, "Impact of thermal-hydraulic fidelity on the prediction of crud deposition on PWR fuel rods," *Transaction of the American Nuclear Society*, Atlanta, Georgia, June 16 - 20.

Service: Professor Manera's has compiled an exemplary record of service. She has served on faculty search committees and the college's first-year advising team, as well as being a member of nine doctoral committees. At the University of Michigan, she has made major efforts in diversity towards the recruitment and retention of women faculty members and students. Professor Manera's national and international service activities have been significant, serving on editorial boards, technical program committees, and review boards for federal agencies. She has also participated as a reviewer for numerous journals and conferences.

External reviewers:

Reviewer A: "She is doing a superb job of maintaining and enhancing her research program and mentorship of graduate students…All her refereed publications are in top-notch journals or conferences, and thus, have a wide readership and her publications and publication rate is quite impressive for a [junior] researcher, whether at a research laboratory or a university...She has become one of the few experts in the world for the unique approach to two-phase flow diagnostics and is a leader nationally..."

Reviewer B: "She has established herself as one of the most talented researchers [of her cohort] in the areas of reactor safety analysis and development advanced best-estimate methodologies for the evaluation of light water reactor passive systems...Dr. Manera is most accomplishable and internationally well-known in the field of thermal hydraulics and reactor safety. I consider her is [sic] the best in her field among her national contemporaries…Dr. Annalisa Manera is superbly qualified for promotion to Associate Professor with tenure…"

Reviewer C: "In this regard, Dr. Manera's reputation in the nuclear industry concerning 2phase flow instrumentation is unmatched. She is the NRC's 'go-to' expert in this field...Dr. Manera has an outstanding international reputation in the fields of thermal hydraulic computational and thermal hydraulic experimentation...Dr. Manera is in my personal list of the top ten thermal hydraulic engineers I have ever had the pleasure of working with. And in terms of thermal hydraulic experimentation and 2 phase instrumentation, she is number one!"

Reviewer D: "I was truly impressed by her work... Based on my more than 45 years of research experiences, I will put her at the top level among relatively young professors in the field of thermal-hydraulics in the world...She is in the top five relatively [junior] researchers in the world...As such, her qualification for tenure is more than sufficient. If she continues her efforts in research as in the past, I have no doubt that she will be one of the most significant international leaders in the field of nuclear thermal-hydraulic and reactor safety."

Reviewer E: "After her coming to UM her visibility has increased and she has reached even higher recognition especially in US…She is well recognized by her peers and is already one of the leading researchers in US and world-wide in the area of nuclear reactor thermal-hydraulics and multi-physics...Her creativity and reputation as a scientist is well established in nuclear engineering community... She is on the top of her peer group and moreover is a leader in her field..."

Reviewer F: "I am very favorably impressed by her record of scholarship and teaching, and believe that promotion is appropriate…Dr. Manera continues to produce an impressive record of scholarly publications… I'm also impressed by her record in teaching…In my judgement, [sic] Dr. Manera's record would merit a positive tenure decision at [my institution], and I think that she will clearly be a highly productive scholar and teacher in the field of nuclear thermal hydraulics going forward."

Reviewer G: "Due [sic] the research work and their impact, Prof. Manera has already been considered as an expert in the area of multi-phase CFD methodology for reactor safety and instability analysis. Prof. Manera [sic] contributions and fast professional growth within last few years is phenomenal and these accomplishments equal that of an early stage high potential Full professor in any top university in USA or world…"

Reviewer H: "She is one of the most dynamic researchers working in the area of nuclear reactor thermal hydraulics and system analysis in her peer group…Professor Manera has already demonstrated that she is one of the best researchers in the field...It is hard to compare her with her peers; she is at least as good if not better than every tenured associate professor working in the field…I strongly recommend her for tenure at NERS."

Reviewer I: "Her international visibility and acceptance by her peers were evident. She is certainly outstanding among her contemporaries by her accomplishments, her visibility, and the quality and quantity of her work…Extrapolating from this impressive record, I have no doubts that Professor Manera will keep developing and growing professionally, fully justifying her tenured appointment."

Summary of Recommendation: Professor Manera has established an outstanding international reputation as a teacher, scholar, and researcher. Her research accomplishments in thermal hydraulics have had a major impact on nuclear safety and interpretation of operating characteristics of existing reactors. She has demonstrated an outstanding commitment to teaching and mentoring of undergraduate and graduate students. Her service to the department has been exemplary. It is with the support of the College of Engineering Executive Committee that I recommend Annalisa Manera for the granting of tenure to be held with her title of associate professor of nuclear engineering and radiological sciences, Department of Nuclear Engineering and Radiological Sciences, College of Engineering.

David C. Munson, Jr.
Robert J. Vlasic Dean of Engineering
College of Engineering

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