Kevin M. Stewart

Energy-Water Resource Systems
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EDUCATION

M.S.C.E., Civil and Environmental Engineering
Georgia Institute of Technology
Area of Focus : Fluid Mechanics and Water Resources
Thesis : *Numerical Simulation of Selective Withdrawal In Stably Stratified Flows*
Advisor : Fotis Sotiropoulos
2002

B.S.C.E., Civil and Environmental Engineering
Georgia Institute of Technology
Area of Focus : Structural Engineering and Mechanics
1999

PROFESSIONAL EXPERIENCE

Water Resources / Hydraulic Engineer
Oak Ridge National Laboratory (ORNL)
Water Resource Science & Engineering Group, Oak Ridge, TN (Dec 2009 - Present)

Support research in the areas of renewable energies, water, and environmental systems with the following expertise:

- Computational Fluid Dynamics & Temperature Modeling and Hydraulic Analysis.
- Flooding Safety Review and Analysis.
- Hydropower Modeling and Analysis.
- System-wide Flow and Reservoir Analysis.
- Headwater Benefits Assessments.
- Application of Neural Network Methods to Hydrothermal Water Temperature Prediction.

Projects of Interest:

- **Standard Modular Hydropower** (SMH) for Department of Energy (DOE)
- **FAST (Furthering Advancement to Solve Time) Commissioning for Pumped Storage Hydropower** for Department of Energy (DOE)
- **Flood Hazard Reevaluation** for United States Nuclear Regulatory Commission (U.S. NRC)
- **Hydropower Diversion Methodology and Assessment for New Stream Reach Development (NSD)** for Department of Energy (DOE)
- **Head-Water Benefits Energy Gains Analysis** (HWBEG) for Federal Energy Regulatory Commission (FERC)
- **Tidal Current Resource Model Validation** for Department of Energy (DOE)

Water Resources / Hydraulic Engineer
Tennessee Valley Authority (TVA)
River Operations, Knoxville, TN (May 2004 – December 2009)
Norris Engineering Laboratory, Norris, TN (August 2002 - April 2004)

Main function is to support investigations and analyses related to regulatory and compliance issues associated with thermal plants and the Tennessee River System. This is accomplished by providing computational fluid dynamic (CFD) modeling assistance for various hydrodynamic and hydrothermal assessments and providing assistance for hydrothermal analysis, monitoring, and river temperature forecasting for nuclear and fossil plants.

- Development of a three-dimensional CFD model using FLUENT software for assessment of nuclear thermal effluent mixing behaviors in the Tennessee River. Analysis includes field and model velocity, flow distribution, and temperature comparisons. Findings help explain unforeseen and misunderstood hydrodynamic behaviors that can affect the monitoring process for National Pollutant Discharge Elimination System (NPDES) permit compliance.
- Monitor and investigate the hydrodynamics, thermal behaviors, and river flow scheduling that affect hydrothermal behaviors at nuclear plants and help determine the most effective and reliable process by which regulatory compliance can be maintained within given constraints and system interdependencies.
- Design and coordination of small and large scale field tests to investigate river velocities, river flow patterns, and river temperature distributions near nuclear and fossil plants that utilize Acoustic-Doppler Current Profilers (ADCP) equipment, drogues with GPS, and arrays of temperature sensors and thermistors.
- Analysis and review of field velocity measurements using WinRiver and temperature distributions using Tecplot visualization.

- Development of various three-dimensional CFD models used to :
  - Investigate forebay hydrodynamic withdrawal zones for temperature and oxygen.
  - Verify loss coefficient for new low-level outlet structure.
  - Study hydrodynamic mixing and flow patterns downstream of dam.
  - Calibrate scroll case flow meters.
  - Assess fossil plant's thermal discharge effect on the receiving waters for cold water refuge for indigenous fish species and helped recommend cooling tower discharge configuration.
  - Compare river flow behaviors at various flow rates and their effect on thermal effluent discharge in the river.
- Conduct hydrothermal river forecasting for nuclear plants and provide recommendations for river and plant system adjustments and cooling tower operations to help minimize adverse hydrothermal effects in support of maintaining NPDES permit compliance.
- Present results from technical assessments to a diversified group of both technical and non-technical professionals with varied interests in discussion and planning meetings.
- Perform various analyses such as :
  - Buoyancy and stability analysis of river temperature float.
  - Statistical investigations of river flow, air and river temperatures.
  - Determination of water intake withdrawal behavior.
  - Assessment of river flow forces on the structural integrity of underwater curtain.
- Address internal clients' technical and operational concerns regarding hydrodynamic issues.

Engineering Intern
Federal Energy Regulatory Commission (FERC)
Division of Dam Safety, Atlanta, GA (part-time internship from 6/2000 to 4/2002)

- Assisted with inspections of earthen and concrete dams and wrote reports regarding findings.
- Reviewed consultant reports for 5-year inspections.
- Performed basic engineering analyses using HEC-RAS.

Graduate Research & Teaching Assistant
Georgia Institute of Technology
Fluid Mechanics and Water Resources Department, Atlanta, GA (April 2001 - July 2002) (September 1999 - April 2001)

- Assisted with development of two-dimensional CFD computer code for axisymmetric intake withdrawal.
- Investigated and calibrated CFD code for prediction of temperature distribution in a turbulent and sharply temperature-stratified flow environment.
- Recommended flow domain length-ratio criteria for stably-stratified intake flow that minimizes inconsistencies in flow and temperature predictions.
- Taught Engineering Graphics and Visualization class which included hand-drawing theory and computer based software Mechanical Desktop.
- Held responsibilities of creating class assignments, tests, and homework; teaching the coursework, and grading assignments.

SELECTIVE LIST OF RECENT PUBLICATIONS

Peer-Reviewed & Technical Reports

Hadjerioua, B**., K. Stewart**, S. DeNeale, B. Smith, W. Tingen, S. Curd, T. Greco, V. Koritarov, J. Saulsbury, J. Garson, C. Vezina (2019), Pumped Storage Hydropower FAST Commissioning Preliminary Analysis. DOE/EE-1926, Water Power Technologies Office, U.S. Department of Energy, Washington, DC**.**

Witt, A., **Stewart, K.**, Hadjerioua, B. 2017. Predicting total dissolved gas travel time in hydropower reservoirs. Journal of Environmental Engineering, 143(12): 06017011.

Witt, A., Magee, T., **Stewart, K.**, Hadjerioua, B., Neumann, D., Zagona, E., Politano, M. 2017. Development and implementation of an optimization model for hydropower and total dissolved gas in the mid-Columbia River System. Journal of Water Resources Planning and Management, 143(10): 04017063.

Hadjerioua, B., S. DeNeale, and **K. Stewart** (2017), Performance, Design and Site Criteria for Testing a Floating Membrane Reservoir System. ORNL/TM-2017/719, Oak Ridge National Laboratory, Oak Ridge, TN.

Stewart, K.M., B.T. Smith, A. Witt, S. DeNeale, M. Bevelhimer, J.L. Pries, T.A. Burress, S.-C. Kao, M. Mobley, K. Lee, S. Curd, A. Tsakiris, C. Mooneyham, T. Papanicolaou, K. Ekici, M. Whisenant, T. Welch, and D. Rabon (2017), Simulation and Modeling Capability for Standard Modular Hydropower Technology. ORNL/TM-2017/175, Oak Ridge National Laboratory, Oak Ridge, TN.

Defne, Z., Haas, K., Fritz, H., Jiang, L., French, S., Shi, X., Smith, B., Neary, V., and **Stewart, K.**, (2012), "National Geodatabase Of Tidal Stream Power Resource In USA.", *Renewable & Sustainable Energy Reviews* 16, 3326—3338.