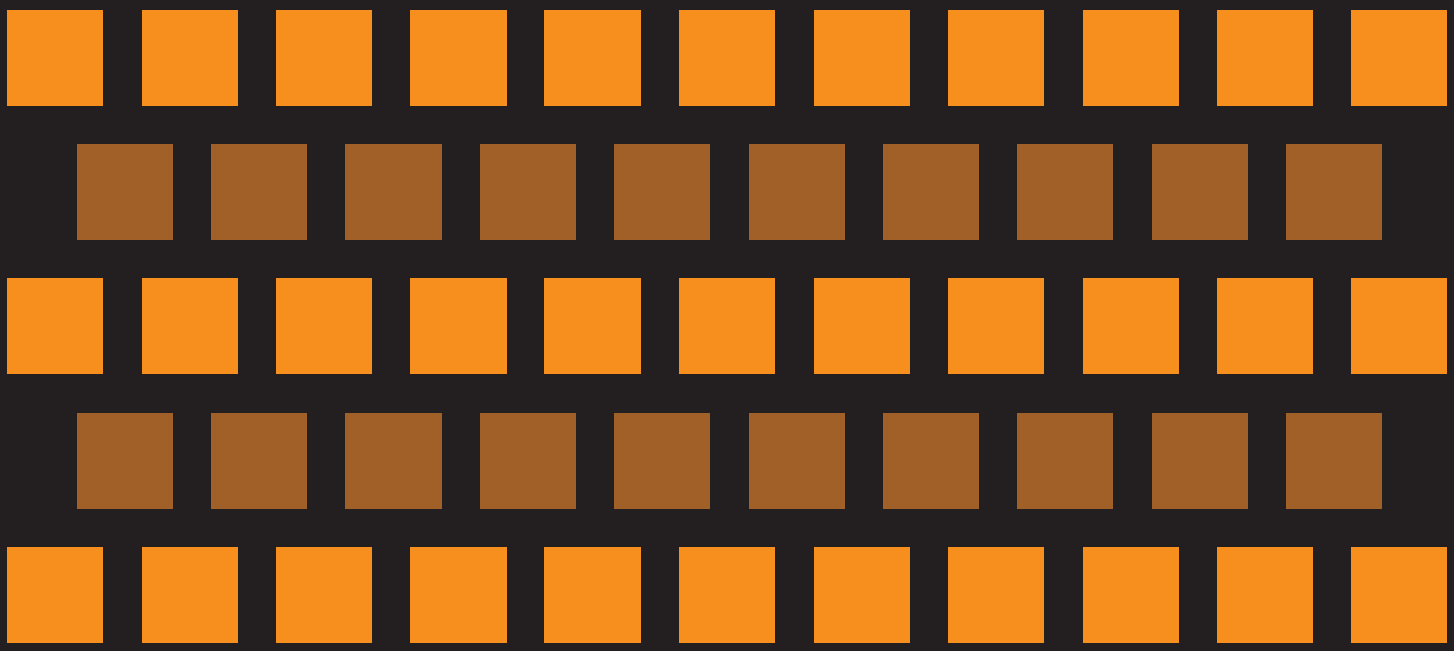
STP-NU-057

ASME CODE DEVELOPMENT ROADMAP FOR HDPE PIPE IN NUCLEAR SERVICE



ASME STANDARDS TECHNOLOGY, LLC

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ASME CODE DEVELOPMENT ROADMAP FOR HDPE PIPE IN NUCLEAR SERVICE

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FOREWORD

The ASME HDPE Roadmap has been developed as a guide toward deploying Code rules for the safe use and advancement of HDPE piping in nuclear services. The principle focus of the ASME HDPE Roadmap is to promote the development of rules that will govern the technical aspects of the design, installation, operation and inspection of HDPE piping systems.

Historically nuclear plants have used metallic pipes for service water and other raw water systems. These pipes have been afflicted by both internal and external microbiologically induced corrosion (MIC), soil attack and other factors. As a result, many of the operating nuclear plants have had to perform significant repair and/or replacement of these piping systems well in advance of realizing their original 40 year design life. Duke Energy began using HDPE piping in the conventional service water system at its Catawba Nuclear Station in 1998 after experiencing a variety of corrosion issues in the original carbon steel system piping; only 13 years after commercial operation. To date, the HDPE piping at Catawba Nuclear Station has performed well and has proven to be a cost effective way to address the corrosion issues in the station's service water piping. HDPE piping is durable, requires very low maintenance and has lower overall cost than metallic piping.

As a result of the success at Catawba Nuclear Station, Duke Energy and other utilities have sought to use HDPE piping in buried ASME Section III, Class 3 service water system applications. In 2008, the Nuclear Regulatory Commission (NRC) approved a Relief Request for the AmerenUE Callaway Nuclear Plant for the use of HDPE in buried sections of its essential service water system. The HDPE piping in the Callaway essential service water system has been in operation since late 2008. In 2009, the NRC approved a Relief Request for Catawba Nuclear Station for use of HDPE in buried sections of its nuclear service water system. Sections of the HDPE piping in the Catawba nuclear service water system have been in operation since late 2010.

It is the desire of ASME, Utilities, Regulators, the HDPE industry, Architect-Engineer (AE) firms and Constructors to develop a technology roadmap, which will support technology strategy and planning goals to achieve safety, reliability, economic and research and development.

Achieving a broad acceptance of HDPE pipe for use in water systems at nuclear plants will require collaboration and sponsorship from industry, regulators, government entities, research organizations, domestic and international associations and individuals.

Established in 1880, the American Society of Mechanical Engineers (ASME) is a professional not-for-profit organization with more than 127,000 members promoting the art, science and practice of mechanical and multidisciplinary engineering and allied sciences. ASME develops codes and standards that enhance public safety, and provides lifelong learning and technical exchange opportunities benefiting the engineering and technology community. Visit www.asme.org for more information.

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EXECUTIVE SUMMARY

Existing metallic piping systems in safety related and non-safety related service water in nuclear power plants are prone to tuberculation, corrosion and leaks, and require replacement, in some instances in less than ten years of service. Non-safety related HDPE piping systems currently installed in nuclear power plants have proved to be reliable since 1996. Several utility owners have successfully installed HDPE piping. The owners would then seek approval by the Nuclear Regulatory Commission (NRC) through a Relief Request process.

The NRC Relief Request process normally requires one year to complete. Development of and NRC approval of ASME Boiler and Pressure Vessel Code rules for use of HDPE would be very beneficial to all parties in the nuclear power industry. Much research and testing has been undertaken and is continuing in support of HDPE use for nuclear power piping.

The ASME HDPE Roadmap proposes strategies which will be used to develop appropriate rules to impart science and structure to the HDPE piping application in nuclear service. The Roadmap identifies critical technologies and infrastructure gaps, barriers and opportunities, and recognizes and prioritizes research and development programs and new technology needs [1].

Among the issues identified for resolution are: piping system design requirements and engineering properties; pipe fusion procedures; fusion integrity analyses and testing procedures development; pipe performance requirements; volumetric examination methods and determination of acceptable material flaws applicable to U.S. and international standards and procedures.

The execution of these strategies requires technical and financial commitment by the nuclear industry operators and suppliers as well as academia and regulators. Immediate financial and technical commitments are needed to execute several of these strategies.

HDPE pipe replacement saves money and enhances safety. It is easy to install, it is corrosion free, durable and not subject to fouling. The ASME HDPE Roadmap is the first step toward establishing a disciplined structure toward creating Code rules to address pressing industry's needs. The next step will focus on follow-up activities dealing with executing current needs, and simultaneously developing future endeavors.

STAKEHOLDERS

The ASME HDPE Roadmap stakeholders are members of Section III Stakeholders Group. The members are:

- Richard Barnes – BVP Standards Committee III Chairman
- Gary Park – BPV Standards Committee XI Chairman
- Steve Lefler* – Duke Energy
- Stephen Boros - Plastic Pipe Institute
- Craig Scott* - AREVA
- Bo Clark – EPRI
- Tim Lupold – NRC
- Frank Schaaf – BPV Standards Committee XI

Members with an asterisk (*) next to their name were called on to become members of the Reviewers Team, whose mission was to advise the Roadmap Author and review and edit the Roadmap content.