U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Update of the Hydropower Vision Roadmap

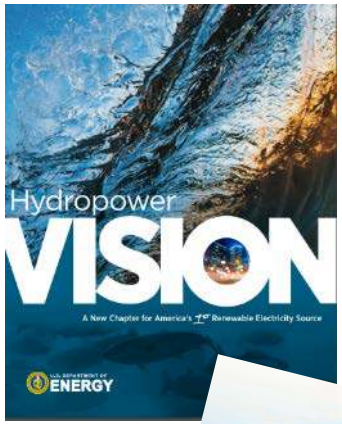
Water Power Technologies Office

October 2019

Outline

- Review of the Hydropower Vision
- What Have We Been Up To?
- Plans for the Future
- How the Visionaries and Forums can Contribute Moving Forward
- Questions

Remembering the Hydropower Vision



A new Chapter in America's 1st Renewable Electricity Source

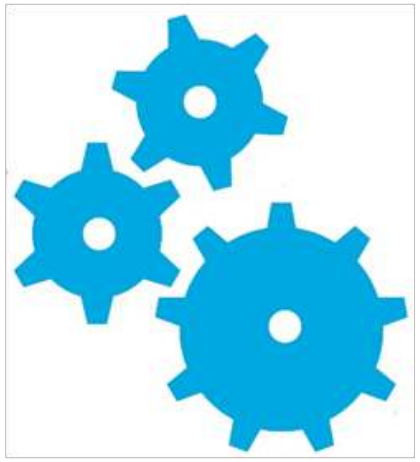
Chapter 2 – *State of Hydropower in the United States:* Summarizes the status of hydropower in the United States as of the end of the year 2015.

Chapter 3 – *Assessment of National Hydropower Potential:* Applies detailed electric sector modeling and impacts assessment to explore an array of possible futures for the hydropower industry and to better understand a subset of the quantifiable impacts associated with multiple scenarios.

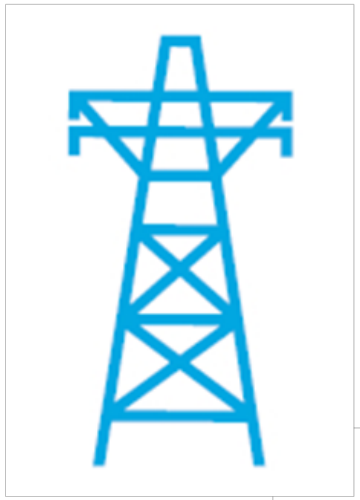
Chapter 4 – *The Hydropower Vision Roadmap: A Pathway Forward:* Provides a detailed roadmap of potential technical, economic and institutional actions by hydropower community to optimize hydropower's continued contribution to a clean, reliable low-carbon domestic energy generation portfolio, while also ensuring the nation's national resources are adequately protected or conserved.

Roadmap Actions: Achieving the Vision depends on all of us!

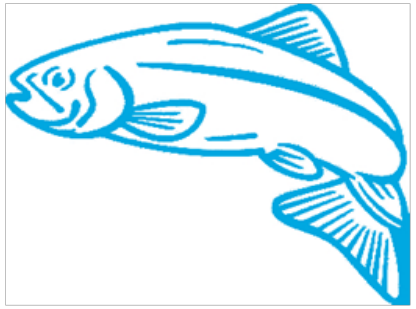
Technology Advancement



Enhanced Revenue and Market Structures



5 Action Areas



Sustainable Development and Operation

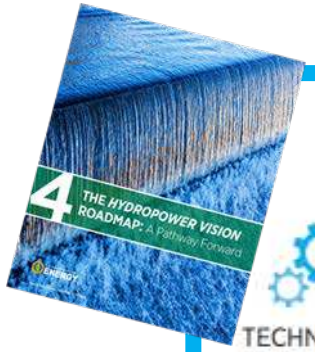
Optimized Regulatory Processes

21 Subgroups of Actions

64 Detailed actions (Activities) developed by task forces

Enhanced Collaboration, Education, and Outreach

Hydropower Vision Roadmap – Overview



Text Box 4-1.

***Hydropower Vision* Action Areas**

4.1 Technology Advancement	
Action 4.1.1	Develop Next-Generation Hydropower Technologies
Action 4.1.2	Enhance Environmental Performance of New and Existing Hydropower Technologies
Action 4.1.3	Validate Performance and Reliability of New Hydropower Technologies
Action 4.1.4	Ensure Hydropower Technology Can Support Increased Use of Variable Renewable Generation Resources

ACTION 4.1.1: Develop Next-Generation Hydropower Technologies

The next generation of hydropower and PSH technologies must be able to realize high efficiencies and enhanced performance, while minimizing environmental footprint and lowering capital costs.

Deliverable: New designs and approaches that will allow developers to tap into previously unrealized potential, while making hydropower more competitive with other generation resources.

Impact: Reduced costs and higher reliability.

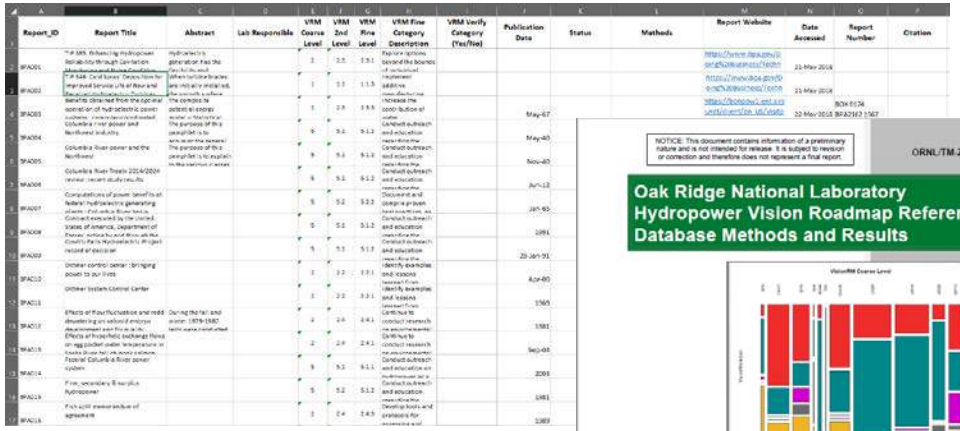
Key Objectives: Optimization, Growth

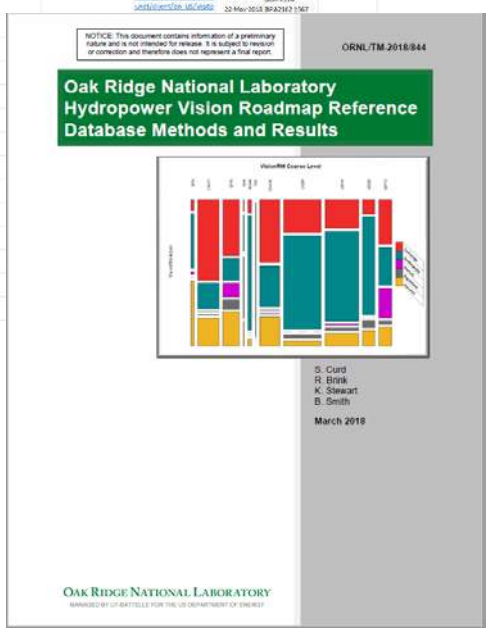
Growth Sectors Addressed: Upgrades, NPD, Conduits, NSD, PSH

Timeframe: All actions in this area could commence immediately and simultaneously. Research is already underway by DOE in standard and modular designs (4.1.1.1 and 4.1.1.2), and components manufactured using advanced techniques and materials (4.1.1.3) already exist, but additional applications should continue to be explored. Research and development efforts in new design philosophies (4.1.1.4) will be ongoing and evolving to adapt to new markets, regulatory actions, and unrealized potential. While closed-loop PSH plants already exist, there are opportunities to explore non-conventional designs at perhaps smaller scales (4.1.1.5).

Action	Deliverable	Impact
Action 4.1.1.1 Standardize equipment components.	Standard equipment components that can be mass produced and assembled in a variety of packaged designs.	Reduced costs, expanded manufacturing capabilities, increased industry collaboration.
Action 4.1.1.2 Develop scalable modular civil structure designs.	Modular civil structure designs, manufacturing and implementation plans, database describing performance characteristics of modular designs.	Reduced construction costs, reduced lead time on project construction.
Action 4.1.1.3 Implement additive manufacturing techniques and advanced materials.	Stronger and lighter hydropower components that are more resistant to corrosion and that can be manufactured and installed quickly.	Faster production of turbine components, lower project and maintenance costs.
Action 4.1.1.4 Explore alternative hydropower design philosophies.	Cost-benefit studies and technical reports documenting the feasibility of new design philosophies.	Reduced capital costs, potential deployment at previously unfeasible sites.
Action 4.1.1.5 Demonstrate potential and feasibility of innovative closed-loop PSH design concepts.	Reports and feasibility studies of innovative closed-loop PSH technologies, such as distributed closed-loop PSH systems.	Greater grid flexibility and storage capacity as a result of increased development of PSH.

Progress in 2018 & 2019



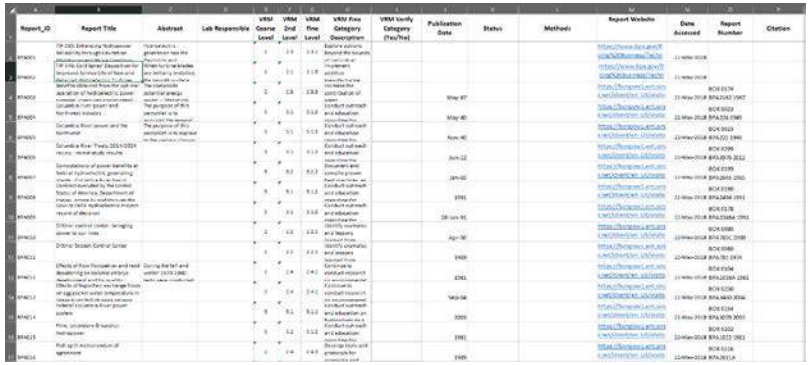


Relational Database & Draft Progress Report

Visionaries & Forum Groups Established

Presented Project Progress at 2018 Waterpower Week

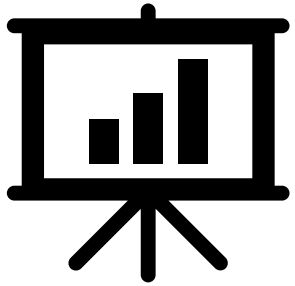
Progress in 2018 & 2019



Relational Database Finalized

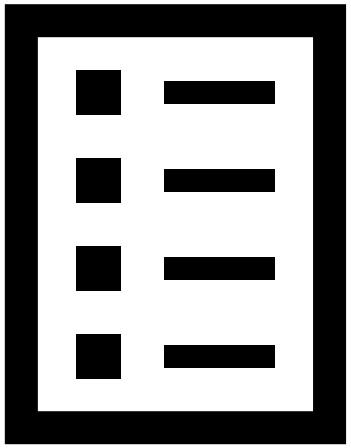
Initial Results Presented to Visionaries

Presented Progress Report draft findings at 2019 NHA California Regional Meeting



Progress Report Results Released and Industry R&D Workshop Held at 2019 Waterpower Week

Progress in 2018 & 2019

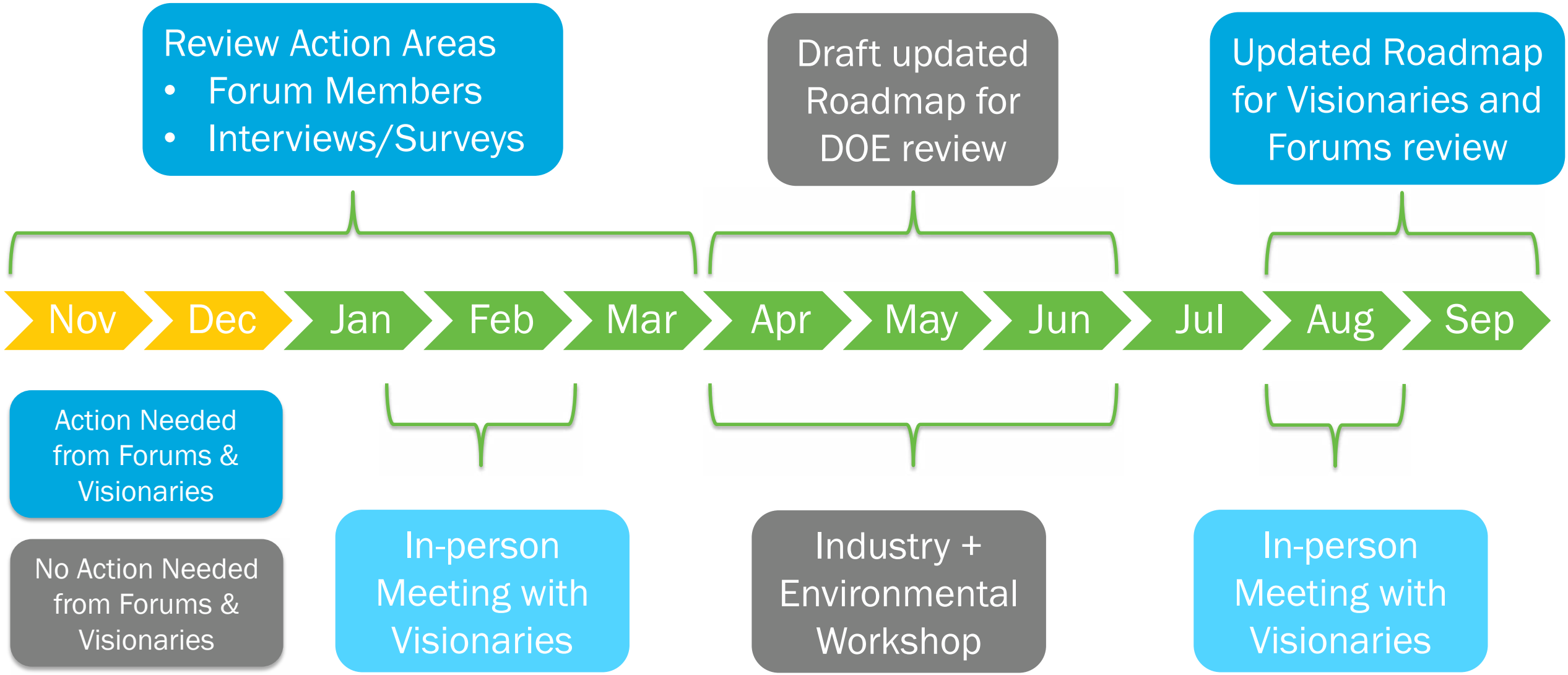


Multi-Year Project Plan Finalized

Progress Report To Be Finalized

Environmental R&D Workshop Held

Plans for 2019, 2020 & 2021



Plans for 2019, 2020 & 2021

Prepare updated Roadmap for DOE review

Release of Updated Roadmap at HydroVision

Action Needed from Forums & Visionaries

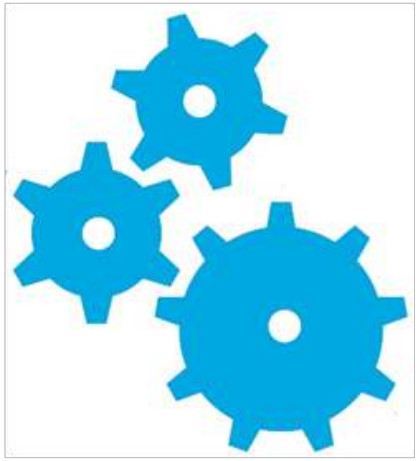
No Action Needed from Forums & Visionaries

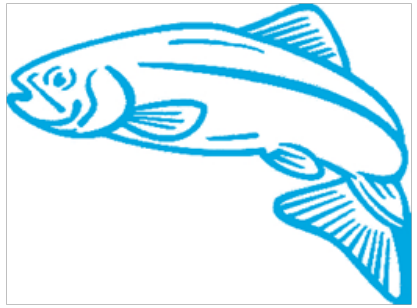
Prepare updated Roadmap for publication

Disseminate updated Roadmap to broader hydropower community

Role of the Forums for Updated Roadmap

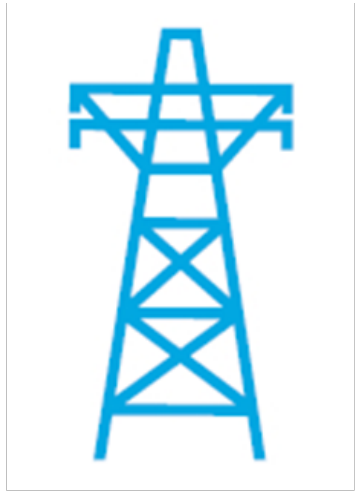
Technology Advancement
Bo Hadjerioua (ORNL)
Mark Christian (ANL)





Sustainable Development and Operation
Kenneth Ham (PNNL)
Jerry Tagestad (PNNL)

Enhanced Revenue and Market Structures
Todd Levin (ANL)



Optimized Regulatory Processes
Bo Saulsbury (PNNL)

Enhanced Collaboration, Education, and Outreach
Lara Aston (PNNL)

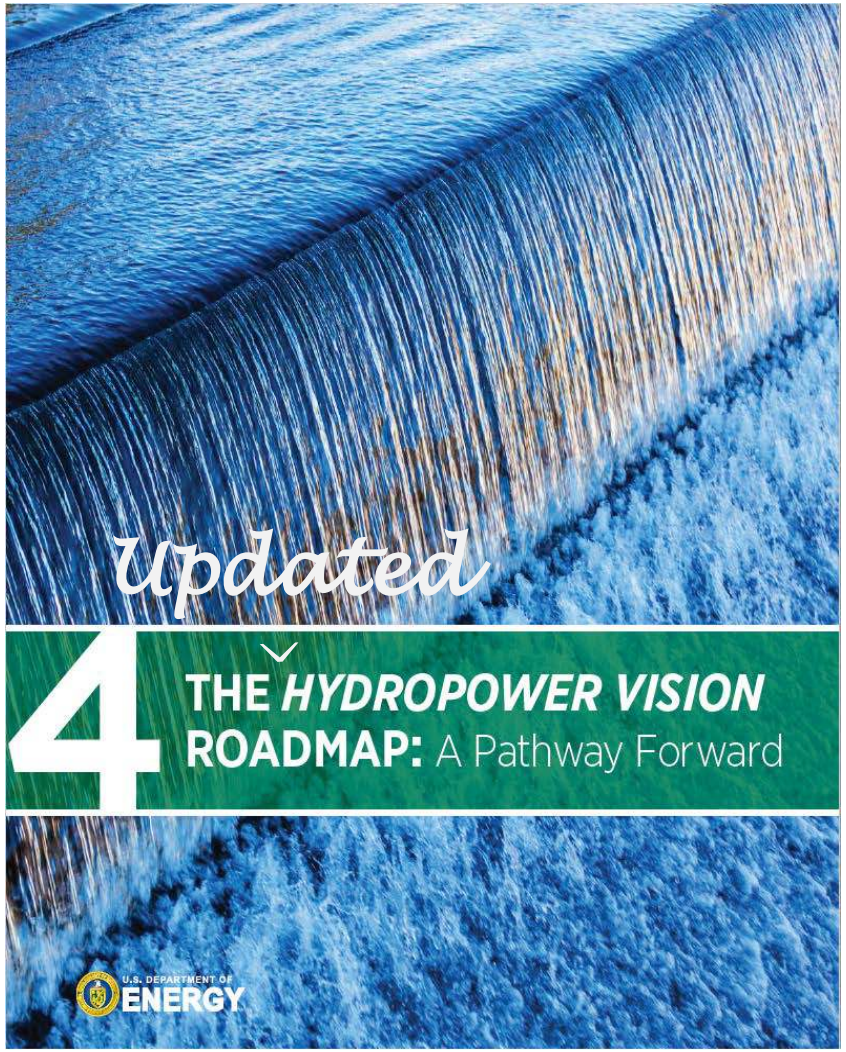
Role of the Forums for Updated Roadmap

- ✓ **Participate in a one-hour webinar in late October to hear details of the review process for the action areas**
- **Assist Forum Leads with the review and update of the Action Areas following a detailed methodology**
  - Revise or remove actions and activities
  - Add new actions and activities, as necessary
  - Update maturity matrix scores
- **Provide review of the draft updated Roadmap**

Role of the Visionaries for Updated Roadmap

- ✓ **Participate in a one-hour webinar in late October to hear details of the review process for the action areas**
- **Participate in two in-person meetings to provide your feedback on the Roadmap update**
  - Winter 2020 (working to coordinate with NHA Board meeting)
  - August 2020
- **Provide review of the draft updated Roadmap**

Thank you for your contributions to this effort!



Questions?

Acknowledgements

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