

Environmental Decision Support (EDS): Science-Based Tools for Hydropower Stakeholder Collaboration

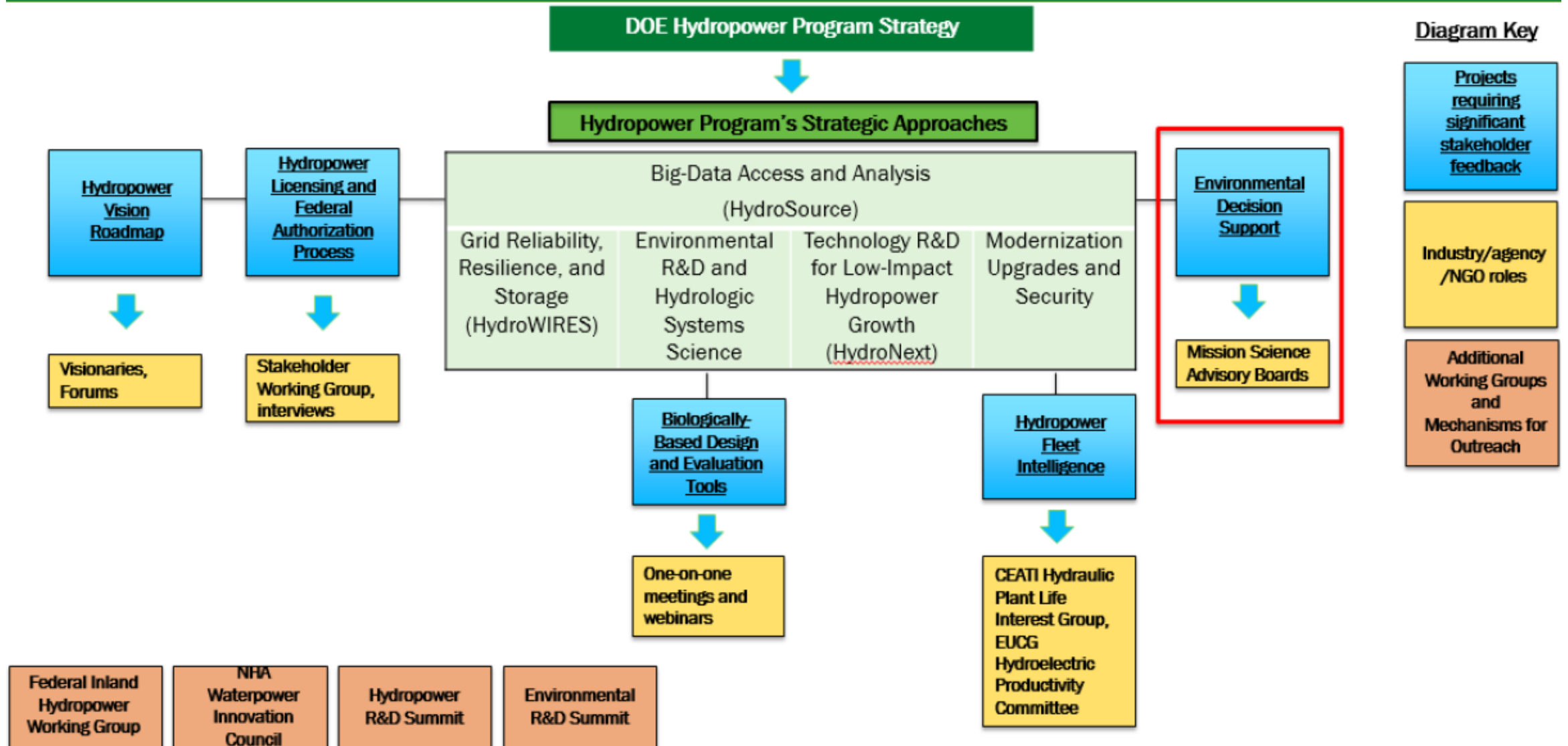
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Webinar Call with Norway

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Vision, Approaches, and Projects: Stakeholder Feedback



Environmental Decision Support (EDS) Project Goals

- Characterize & summarize the best-available science for use by diverse hydropower stakeholders
- Provide tools to better understand which environmental impacts have project nexus (i.e., potential effects on the riverine ecosystem)
- Provide transparent & consistent methodology for identifying & discussing potential gaps in environmental information during hydropower licensing

Phase 1 (Oct 2016-Sep 2018): Environmental Metrics for Hydropower (EMH)

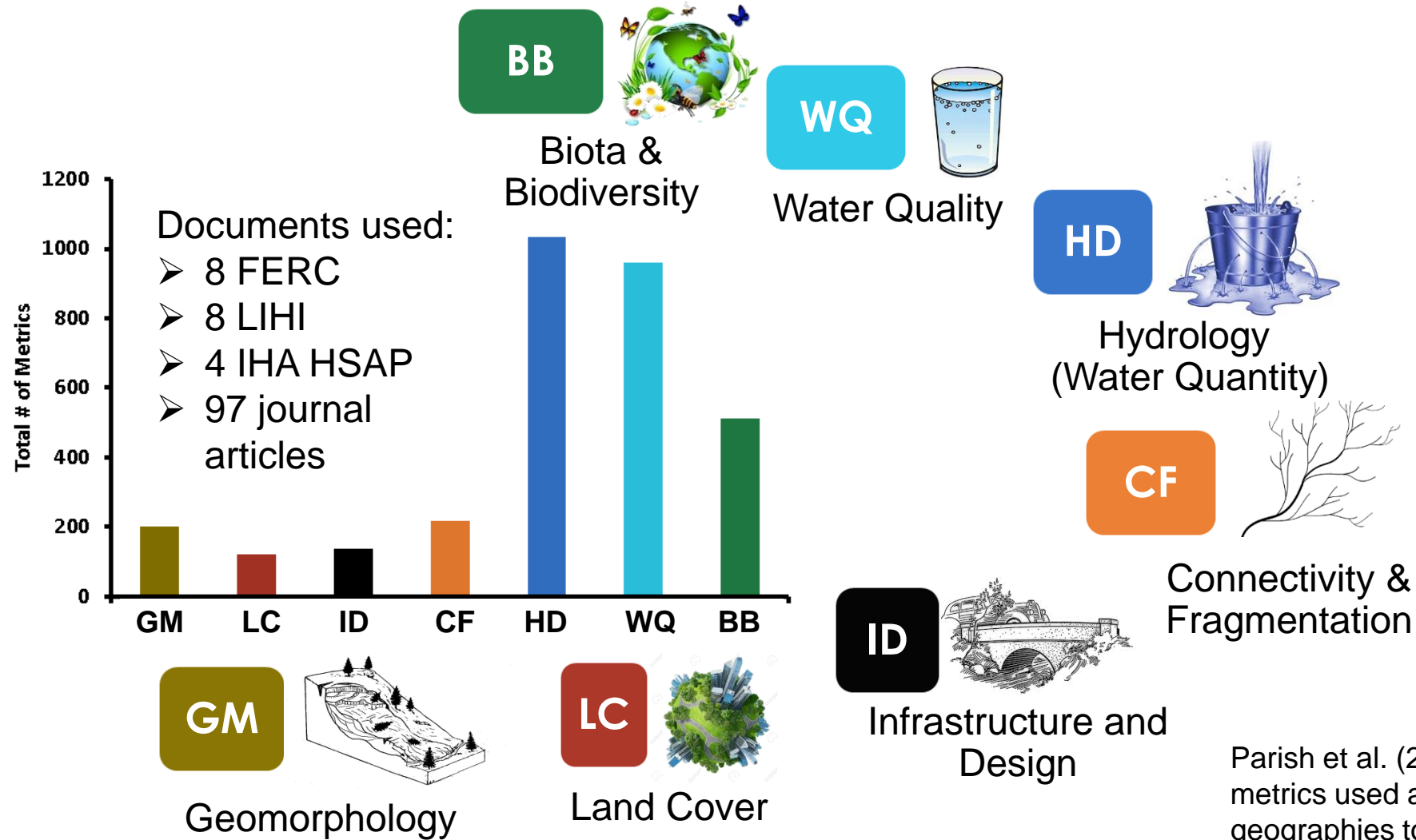
- Characterize the science to inform environmental assessment of non-federal hydropower licensing and assessment
- Define the envelope of essential concepts, measurement types, and classifications needed to define and address—consistently, coherently, and comprehensively—the environmental sustainability of hydropower development and operations across distinct regions of the USA

Phase 2 (Oct 2019-Sep 2021): Environmental Decision-Support (EDS)

- Refine and test science-based tools for hydropower stakeholder decision-support developed during Phase 1

Environmental Metrics for Hydropower (EMH) database

Contains 3,130 metrics from 117 documents related to 231 locations worldwide



Parish et al. (2019) Review of environmental metrics used across multiple sectors and geographies to evaluate the effects of hydropower development. *Applied Energy* 238:101-118.

Logic Tree with 128 questions developed to address 51 river functions identified through analysis of the EMH database

Environmental Decision Support (EDS) Questionnaire, Version 3

Branch 3 (Biota & Biodiversity): 44. Does this project have the potential to impact aquatic and/or terrestrial species?

45. Does the reservoir or upstream river support a commercial or recreational fishery? (BB8, BB11)

46. Does a natural resource agency stock migratory species above or below the project? (BB3, BB11)

47. Does the downstream river support a commercial or recreational fishery that requires cold water temperatures? (BB8, BB11, WQ11)

48. Are there ESA-listed species, state-listed species, species of concern, or designated critical habitats found in or adjacent to project lands or waters? (BB8, BB11)

Yes, ESA-listed species, state-listed species, species of concern, or designated critical habitats are found in or adjacent to project lands or waters.

49. Under project baseflow conditions, will there be adequate downstream habitat available for ESA-listed species, state-listed species, species of concern, or other target species found in the project area? ("Baseflow" means sustained or fair weather runoff, and is composed largely of groundwater effluent in most streams.) (BB8, HD3, HD4)

50. Is growth, survival, or recruitment of any ESA-listed species, state-listed species, species of concern or other target species impacted by project development or operations? (BB5)

51. Is reproduction of ESA-listed species, state-listed species, species of concern, or other target species no longer observed in historic spawning habitats? (BB5, BB8, BB10)

Branch 4 (Land Cover): 88. Does this project have the potential to alter adjacent land?

Yes, this project has the potential to alter adjacent land

89. Is there potential for project development or operations to affect a portion of the surrounding land area via habitat fragmentation or disturbance? (BB8, GM1, LC1, LC3)

90. Are upland areas within or adjacent to the project area susceptible to high rates of erosion due to presence of highly erosive soils and/or lack of vegetated cover? (Erosive soils typically have a rainfall erosivity factors ≥ 5 .) (GM1, LC2)

91. Does the project have the potential to affect a large area of land? In other words, do the land assets extend well beyond the dam, impoundment buffer, powerhouse and switchyard, e.g., to include powerlines from the project switchyard to the nearest substation? (LC1, LC3)

92. Does the project have plans to sell or manage lands for conservation purposes? (LC3, LC4)

93. Does the project have potential to affect protected lands (e.g., conservation easement, land managed for wildlife, recreation, conservation, or special purposes by federal/state/local governments, or NGOs)? (LC4)

Yes, the project has the potential to affect to protected lands

Branch 5 (Water Quality): 96. Are there any water quality concerns associated with this project?

Yes, there are water quality concerns associated with this project

97. Are there current or past land uses upstream of the facility that are agricultural, reservoirs, water control structures, diversions, canals, etc.? (WQ9, WQ10, WQ11)

98. Are the upstream industrial, agricultural, or urban land uses intensively used (e.g., >50% crop cover)? (LC3, HD1, WQ8, WQ9, WQ10, WQ11)

99. Are there currently fish consumption advisories in project waters? (WQ2, WQ8)

100. Do project waters receive effluent from National Pollutant Discharge Elimination Act (NPDES) permits? (WQ9, WQ10)

101. Do project operations have the potential to cause very high pH (>8) conditions upstream of project? (WQ2)


Yes, the pH level in project waters seem very high (>8) or very low (<6) conditions upstream of project?

102. Do project waters, or areas hydrologically connected to project waters, contain active or abandoned mine? (WQ2)

Welcome to the River Function Questionnaire

This River Function Questionnaire (RFQ) is part of the Environmental Decision Support (EDS) system developed by Oak Ridge National Laboratory (ORNL) for the Water Power Technologies Office. The EDS system is the result of discussions among stakeholders and the Federal Energy Regulatory Commission (FERC) hydropower licensees. The EDS system helps decide which environmental studies are needed in the plan development process. This RFQ is used to evaluate different types of hydropower projects, including new-stream reach development, and existing dams.

The Questionnaire was developed using a stakeholder-based process to identify which river functions are most important for a hydropower project. Stakeholders can use the Questionnaire as a resource during the study plan development, licensing proceeding, but the Questionnaire does not suggest project methodologies or suggest project measures.



BIODIVERSITY/BIOTA

45. Does the reservoir or upstream river support a commercial or recreational fishery?

Answers (select 1)

Yes

No

Uncertain

Not Applicable

Justification (select up to 3)

Project Nexus

Meets Agency or Other Goal

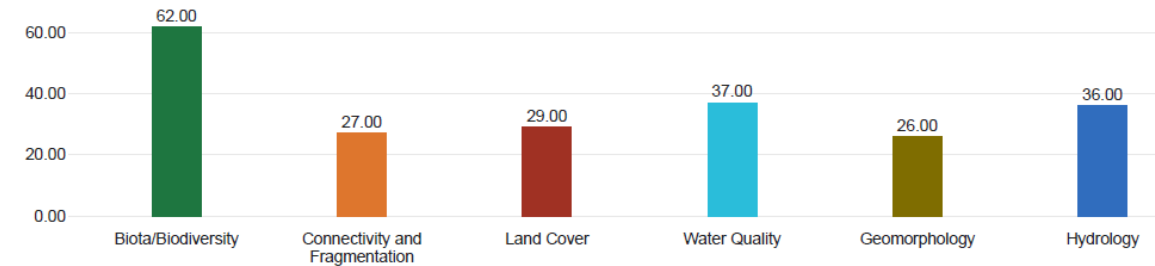
Existing Information to Answer this Question

Pertinent notes may be added here:

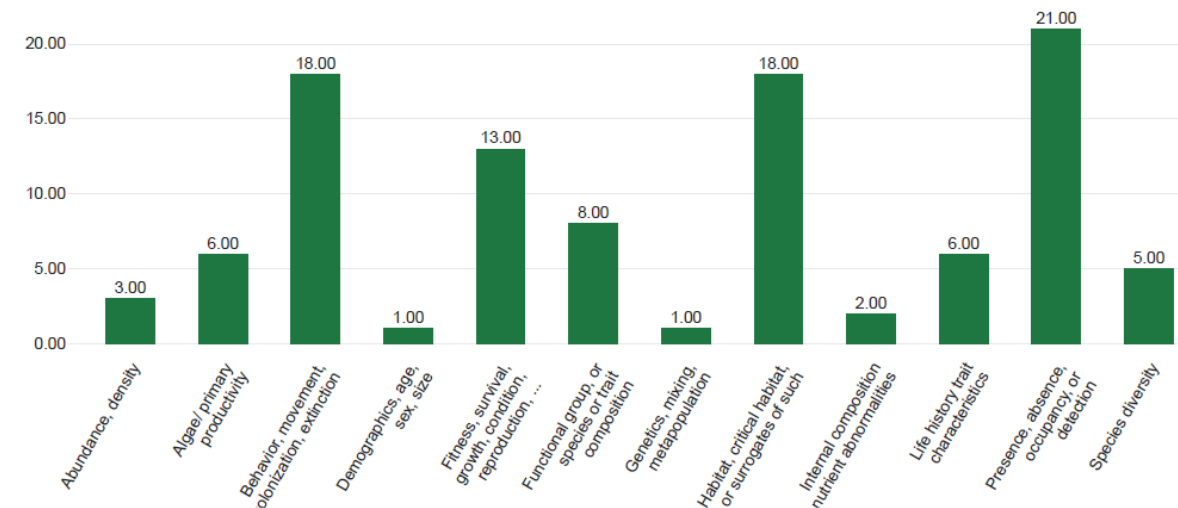
River Function Questionnaire

- Online tool built with Qualtrics software
- Uses logic tree for branching questions
- Version 3 is undergoing technical review
- Will be made available on ORNL HydroSource at <https://hydrosource.ornl.gov/>

Sum of Yes Responses to Questions within Top-Level River Function Categories



Sum of Yes Responses to Questions within Biota & Biodiversity River Functions





What can we bring to the table



- ❑ “River Function Questionnaire” developed over several years through literature review and consultation with Mission & Science Advisory Boards
- ❑ Database of 3100 environmental metrics for hydropower developed from a review of diverse sources of literature
- ❑ Definitions of key environmental terms to facilitate conversations among a diverse body of US hydropower stakeholders
- ❑ Retrospective analyses of environmental studies requested and implemented during nonfederal hydropower licensing processes

Exchange of knowledge and transfer of experiences between researchers from **Norway and USA** emerges as a great **opportunity for improving scientific knowledge** about environmental impacts and tradeoffs for better decision support