

# Deep Creek Hydroelectric Project MDE Dam No. 4

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2019 PERMIT RENEWAL – STAKEHOLDER MEETING #1

FEBRUARY 28, 2019

# Cautionary Note Regarding Forward-Looking Statements

This presentation contains forward-looking statements and information, within the meaning of Canadian securities laws and “forward-looking statements” within the meaning of Section 27A of the U.S. Securities Act of 1933, as amended, Section 21E of the U.S. Securities Exchange Act of 1934, as amended, “safe harbor” of the United States Private Securities Litigation Reform Act of 1995 and in any applicable Canadian securities regulations, concerning the business and operations of Brookfield Renewable. Forward-looking statements may include estimates, plans, expectations, opinions, forecasts, projections, guidance or other statements that are not statements of fact. Forward-looking statements in this presentation include statements regarding the quality of Brookfield Renewable’s assets and the resiliency of the cash flow they will generate, Brookfield Renewable’s anticipated financial performance, future commissioning of assets, contracted portfolio, technology diversification, acquisition opportunities, expected completion of acquisitions, future energy prices and demand for electricity, economic recovery, achievement of long term average generation, project development and capital expenditure costs, diversification of shareholder base, energy policies, economic growth, growth potential of the renewable asset class, the future growth prospects and distribution profile of Brookfield Renewable and Brookfield Renewable’s access to capital. Forward-looking statements can be identified by the use of words such as “plans”, “expects”, “scheduled”, “estimates”, “intends”, “anticipates”, “believes”, “potentially”, “tends”, “continue”, “attempts”, “likely”, “primarily”, “approximately”, “endeavors”, “pursues”, “strives”, “seeks”, or variations of such words and phrases, or statements that certain actions, events or results “may”, “could”, “would”, “might” or “will” be taken, occur or be achieved. Although we believe that our anticipated future results, performance or achievements expressed or implied by the forward-looking statements and information in this presentation are based upon reasonable assumptions and expectations, we cannot assure you that such expectations will prove to have been correct. You should not place undue reliance on forward-looking statements and information as such statements and information involve known and unknown risks, uncertainties and other factors which may cause our actual results, performance or achievements to differ materially from anticipated future results, performance or achievement expressed or implied by such forward-looking statements and information.

Factors that could cause actual results to differ materially from those contemplated or implied by forward-looking statements include, but are not limited to: our limited operating history; the risk that we may be deemed an “investment company” under the Investment Company Act; the fact that we are not subject to the same disclosure requirements as a U.S. domestic issuer; the risk that the effectiveness of our internal controls over financial reporting could have a material effect on our business; changes to hydrology at our hydroelectric stations or in wind conditions at our wind energy facilities; the risk that counterparties to our contracts do not fulfill their obligations, and as our contracts expire, we may not be able to replace them with agreements on similar terms; increases in water rental costs (or similar fees) or changes to the regulation of water supply; volatility in supply and demand in the energy market; exposure to additional costs as a result of our operations being highly regulated and exposed to increased regulation; the risk that our concessions and licenses will not be renewed; increases in the cost of operating our plants; our failure to comply with conditions in, or our inability to maintain, governmental permits; equipment failure; dam failures and the costs of repairing such failures; exposure to force majeure events; exposure to uninsurable losses; adverse changes in currency exchange rates; availability and access to interconnection facilities and transmission systems; health, safety, security and environmental risks; disputes, governmental and regulatory investigations and litigation; local communities affecting our operations; losses resulting from fraud, bribery, corruption, other illegal acts, inadequate or failed internal processes or systems, or from external events; risks relating to our reliance on computerized business systems; general industry risks relating to operating in the North American, Brazilian and European power market sectors; advances in technology that impair or eliminate the competitive advantage of our projects; newly developed technologies in which we invest not performing as anticipated; labor disruptions and economically unfavorable collective bargaining agreements; our inability to finance our operations due to the status of the capital markets; the operating and financial restrictions imposed on us by our loan, debt and security agreements; changes in our credit ratings; changes to government regulations that provide incentives for renewable energy; our inability to identify sufficient investment opportunities and complete transactions; risks related to the growth of our portfolio and our inability to realize the expected benefits of our transactions; our inability to develop existing sites or find new sites suitable for the development of greenfield projects; risks associated with the development of our generating facilities and the various types of arrangements we enter into with communities and joint venture partners; Brookfield Asset Management’s election not to source acquisition opportunities for us and our lack of access to all renewable power acquisitions that Brookfield Asset Management identifies; our lack of control over our operations conducted through joint ventures, partnerships and consortium arrangements; our ability to issue equity or debt for future acquisitions and developments will be dependent on capital markets; foreign laws or regulation to which we become subject as a result of future acquisitions in new markets; and the departure of some or all of Brookfield’s key professionals.

We caution that the foregoing list of important factors that may affect future results is not exhaustive. The forward-looking statements represent our views as of the date of this presentation and should not be relied upon as representing our views as of any date subsequent to the date of this presentation. While we anticipate that subsequent events and developments may cause our views to change, we disclaim any obligation to update the forward-looking statements, other than as required by applicable law. For further information on these known and unknown risks, please see “Risk Factors” included in our Form 20-F.



## Brookfield Renewable at Deep Creek

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## Construction

- Construction began in 1923
- A Garrett County businessman who wanted to harness the power of the water on the Youghiogheny River to produce hydropower
  - The construction included a powerhouse on the Youghiogheny as well as an earthen-concrete core dam that spans Deep Creek

## Producing Power

- Production began in 1925 at a level of 16 MW of installed capacity
- Power is sold into the PJM wholesale market



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### Generating Units

The powerhouse contains two vertical Francis units

2

### Supplying Power to the Region

Enough energy is produced to provide clean, renewable power to 2,500 homes annually

3

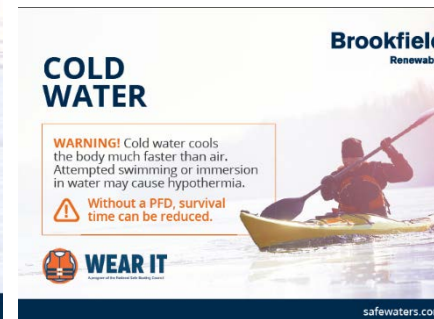
### More than Power

The Deep Creek dam created Deep Creek Lake & has resulted in recreational opportunities both on the lake and downstream

We strive to integrate ourselves into the local communities where we operate

## This Includes:

- Collaborating on projects that benefit the community
- Making charitable donations to local non-profits who fit our core mission
- Having staff available to act as a point of contact for questions or concerns that may arise from local residents & business owners
- Using local businesses and contractors on projects, where feasible
- Putting out public safety messaging campaigns to ensure the safety of those who recreate on and around dams/waterways



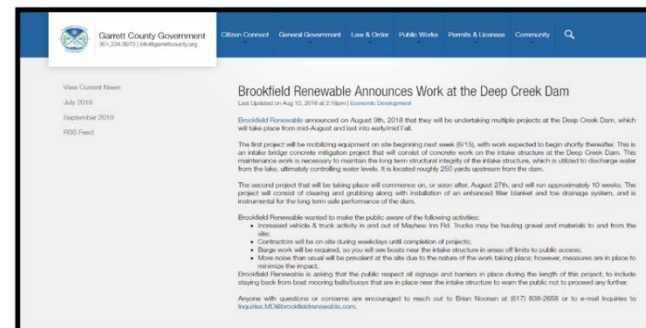
## Positively Impacting Garrett County

- Deep Creek Lake is the economic engine of the region, and we work closely with our partners both on the lake and downstream to ensure positive outcomes
- At the dam, we have two (2) full time employees and have hired seasonal employees for maintenance work as well
- As dam & public safety is our #1 priority, we conduct a lot of maintenance work at the dam and hire local contractors where feasible
- This included local contractor, Beitzel Construction, who performed a large amount of our work for a recent maintenance project we undertook
- We have also worked with local government to partner where possible, such as drawing down the lake for a local sewer line project in 2016



DEEP CREEK LAKE — Brookfield Renewable has announced it will be undertaking multiple projects at Deep Creek Dam, which will take place from mid-August into early/mid fall.

The first project will be mobilizing on-site, beginning this week, with work expected to begin shortly thereafter. This is an intake bridge concrete mitigation project that will consist of concrete work on the intake structure at Deep Creek Dam.





# Deep Creek Project

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Deep Creek Dam is located on Deep Creek, around 1.4 miles upstream from the confluence of Deep Creek & the Youghiogheny River

- Built in 1925
- Impounds a reservoir, Deep Creek Lake, which is 3,900 acres. Located in Garrett County, MD. Reservoir is owned and managed by the MD DNR.
- Normal full pond 2461' (elevation)
- Drainage – 64.7 sq. miles

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## Main Dam (earthen embankment)

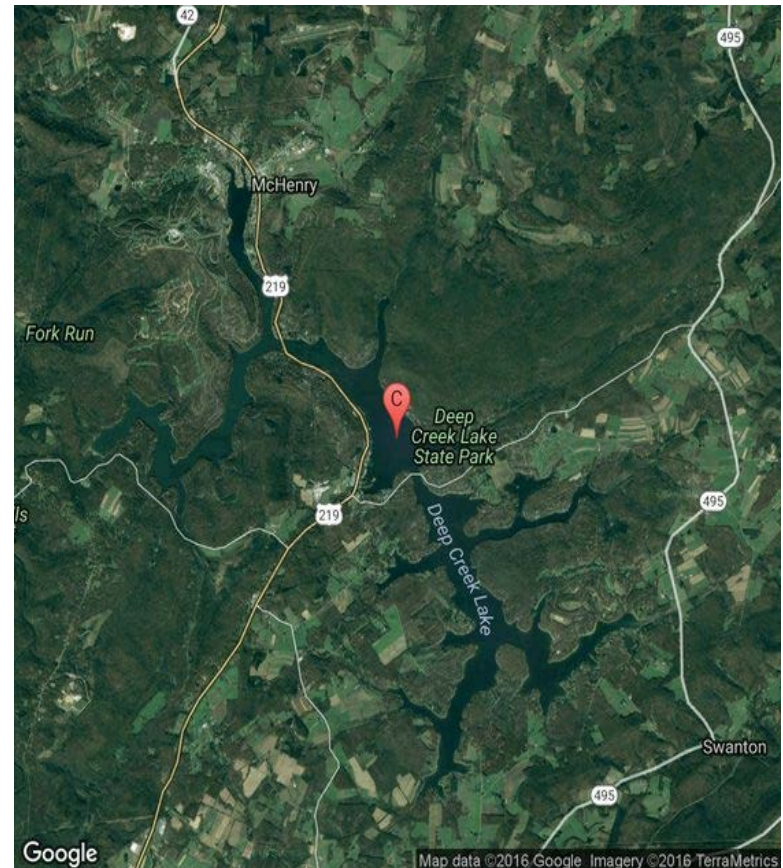
- Max Height: 86 ft.
- Length: 1,300 ft.
- Dam Crest Elevation: 2475 ft.

## Emergency Spillway

- Primary Weir 720' long – Crest Elevation – 2462'
- Secondary Weir 288' long – Crest Elevation – 2452'

## Headworks

- Intake Structure (concrete)
- Tunnel – 6,652' long concrete-lined





# General Layout of Dam





Total length of water conveyance is 1.49 miles

## Power Generating Facilities

- Capacity – 19 MW
- Gross Head – 433 ft.

## Power Tunnel

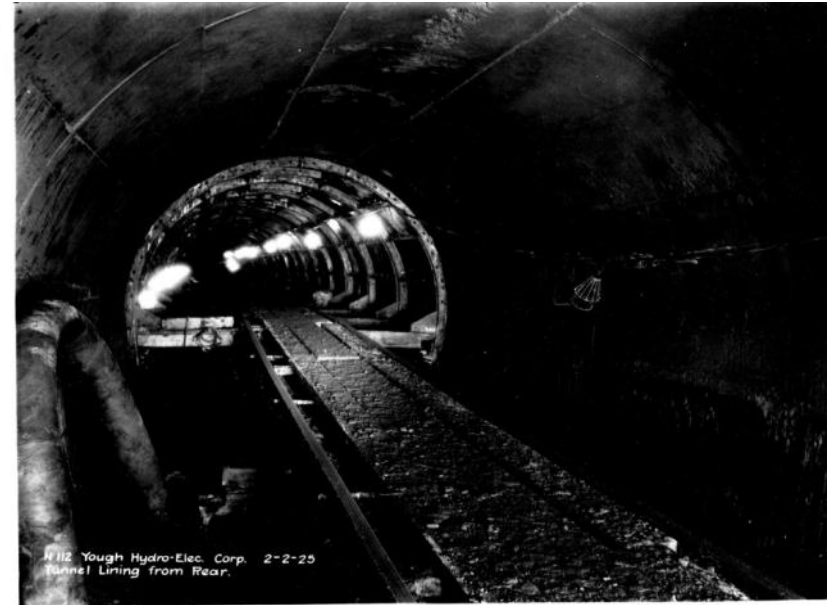
- Single concrete lined rock tunnel – 9 –foot diameter, 6,652 ft. long from intake to surge tank

## Surge Tank

- Height – 145 ft. (52' above ground)
- Diameter – 30 ft.

## Penstocks

- Two (2) steel pipes
- 6' diameter, 757' long from surge tank to powerhouse



# General Layout of Powerhouse



# Generation Floor & Powerhouse





# Water Appropriation Permit

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## Current permit issued in April 2007 – expires April 1, 2019

- Brookfield submitted a renewal application to MDE on October 12, 2018
- At MDE’s request, Brookfield applied for larger average daily use (128 MGD) to include past extreme weather events (1996). Usage is dependent on precipitation and varies year to year.
- Brookfield does not anticipate any changes to the usage of the water

	Average daily use (annual/365)	Max daily use (highest day of the year)
2009	52,640,765.00	397,682,076.00
2010	53,441,059.00	395,174,759.00
2011	82,932,096.00	404,621,683.00
2012	42,164,366.73	398,868,333.84
2013	68,058,169.00	401,672,215.00
2014	51,345,653.00	336,290,549.00
2015	60,860,784.00	403,651,109.00
2016	55,215,412.00	406,476,062.00
2017	60,657,195.00	406,476,062.00
2018	123,785,011.00	413,436,003.00
Average	66,186,947.43	396,434,885.18

## Reporting Requirements Include:

- Semi-Annual Water Withdrawal Reports
- Monthly Temperature Enhancement Reports – June to Sept
- Annual Report
  - Lake Level Monitoring
  - Temperature Monitoring
  - Minimum Flow Release Monitoring
  - Dissolved Oxygen Monitoring
  - Releases Unsuitable for Whitewater Recreation
  - Zebra Mussel Monitoring

## River Gauge Funding:

- Hoyes Run and Oakland



RULE BAND AND OPERATION PROTOCOLS - THE PERMITTEE SHALL OPERATE THE DEEP CREEK HYDROELECTRIC PROJECT (PROJECT) ACCORDING TO THE PROJECT OPERATING RULES SPECIFIED THROUGHOUT THIS PERMIT SUCH THAT WATER ELEVATIONS IN DEEP CREEK LAKE ARE MAINTAINED WITHIN THE OPERATING RULE BAND EXCEPT THAT EXCURSIONS OF UP TO 0.3 FEET ABOVE THE OPERATING RULE BAND LASTING NOT MORE THAN 21 DAYS ARE ALLOWED FROM MAY THROUGH OCTOBER, AND EXCEPT IN THE EVENT OF UNUSUAL OR EMERGENCY CONDITIONS AS DEFINED BELOW. THE UPPER AND LOWER RULE BANDS ARE THE HIGHEST AND LOWEST DESIRABLE RESERVOIR LEVELS AT THE END OF EACH MONTH. THE UPPER AND LOWER END OF EACH MONTH ARE DEFINED IN THE FOLLOWING TABLE. WHEN LAKE LEVELS ARE ABOVE THE UPPER RULE BAND, THE PERMITTEE MAY RELEASE WATER AS NEEDED TO DRAW DOWN THE LAKE TO A LEVEL WITHIN THE RULE BAND. ELEVATIONS ARE GIVEN IN FEET ABOVE MEAN SEA LEVEL.

PROJECT OPERATING RULE BAND

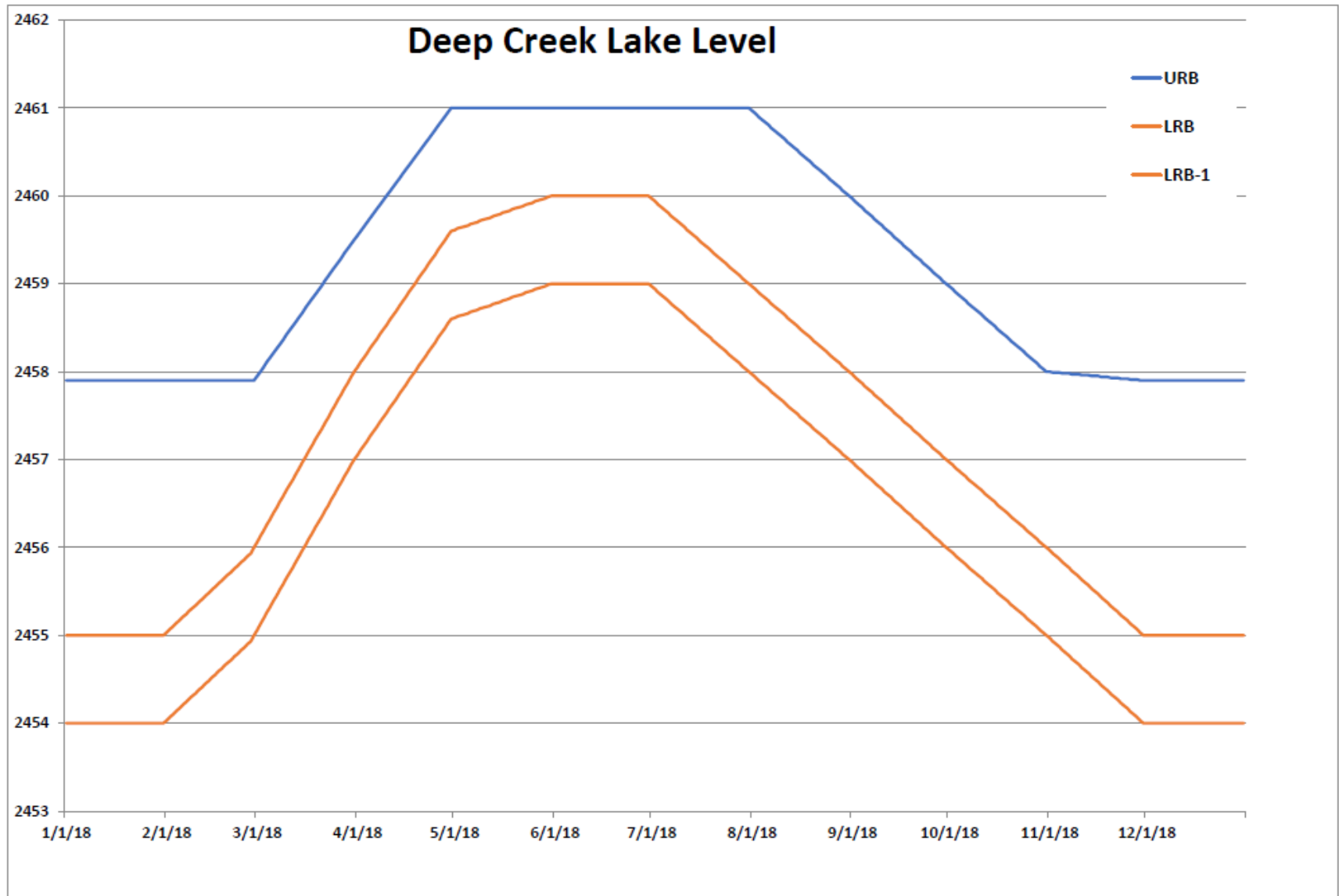
MONTH	UPPER BAND ELEVATIONS	LOWER BAND ELEVATIONS
JANUARY	2457.9	2455.0
FEBRUARY	2457.9	2456.0
MARCH	2459.5	2458.0
APRIL	2461.0	2459.6
MAY	2461.0	2460.0
JUNE	2461.0	2460.0
JULY	2461.0	2459.0
AUGUST	2460.0	2458.0
SEPTEMBER	2459.0	2457.0
OCTOBER	2458.0	2456.0
NOVEMBER	2457.9	2455.0
DECEMBER	2457.9	2455.0

RULE BAND AND OPERATION PROTOCOLS CONT'D

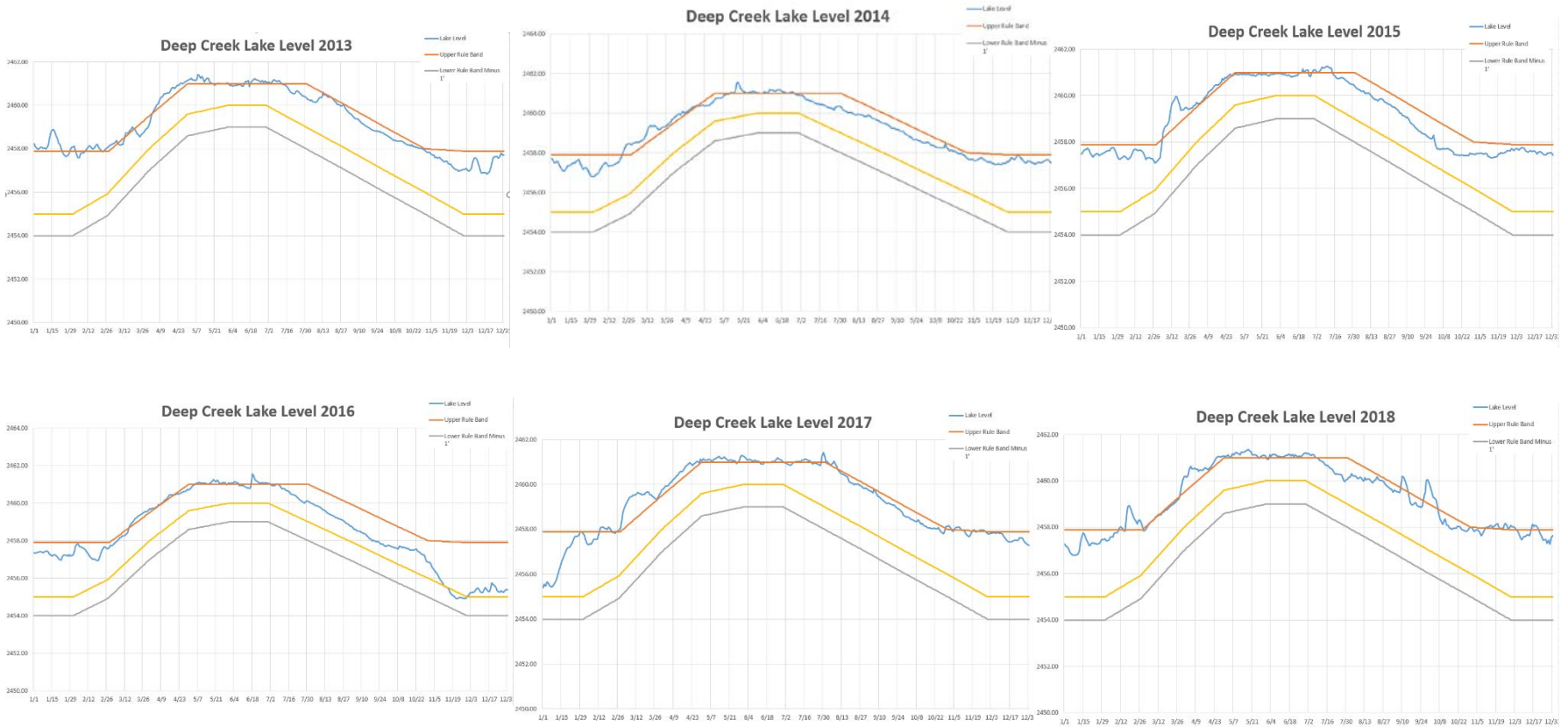
- (B) A SITE EMERGENCY SUCH AS FAILURE OR PROBABLE FAILURE OF THE DAM THAT REQUIRES MAXIMUM RELEASE FOR RAPID DRAWDOWN OF THE RESERVOIR;
- (C) A SITE EMERGENCY OR OTHER FORCED (UNSCHEDULED) OUTAGE REQUIRING SHUTDOWN OF THE INTAKE, POWER TUNNEL, PENSTOCKS, OR GENERATING UNITS, RESULTING IN THE INABILITY TO GENERATE OR TO OPERATE THE PROPOSED MINIMUM RELEASE BYPASS;
- (D) MAINTENANCE OF THE DAM OR REPAIR OF LAKE SHORELINE EROSION WHICH REQUIRES LOWERING OF LAKE LEVEL BELOW THE LOWER RULE BAND TO ALLOW ACCESS OR TO CONTROL INFLOW;
- (E) ACTUAL OR FORECAST EXTRAORDINARILY HIGH RUNOFF OR RAINFALL WHICH REQUIRES UNLIMITED GENERATION IN ORDER TO KEEP THE LAKE LEVEL FROM AVOID SPILLING OVER THE TOP OF THE DAM SPILLWAY.

THE DURATION AND TIMING OF PLANNED OUTAGES SHALL BE APPROVED IN ADVANCE BY THE ADMINISTRATION. IN PROPOSING PLANNED OUTAGES, THE PERMITTEE SHALL DETAIL REASONS WHY THE OUTAGE IS NECESSARY AS WELL AS HOW THE OUTAGE WILL IMPACT THE FISHERY AND WHITEWATER RECREATION IN THE YOUGHIOGHENY RIVER. TO THE EXTENT POSSIBLE, PLANNED OUTAGES SHALL NOT OCCUR DURING MID-APRIL THROUGH MID-OCTOBER.

- (A) A SYSTEM EMERGENCY, DEFINED AS MAXIMUM EMERGENCY GENERATION UNDER THE PENNSYLVANIA-NEW JERSEY-MARYLAND INTERCONNECTION (PJM) HIERARCHY OF EMERGENCY ORDERS, OR EMERGENCY LOADING OF SPINNING RESERVE CAPACITY, OR EMERGENCY CONTROL OF TRANSMISSION FACILITY LOADING;



# Lake Levels Since 2013



\*2016-We brought water levels down to accommodate Garrett County sewer line work

- Maintain water temperatures less than 25 degrees C in the Youghiogheny River between the project tailrace and Sang Run, during the months of June, July and August.
- Real-time monitoring of river temperature.
- Reports submitted to MDE on July 7, August 7 and September 7 and then included in the Annual Report as well.



- Maintain a bypass system at the project to maintain a minimum flow of 40 cfs in the river downstream of the project tailrace.
- A reduction in the min flow may be requested of the MDE when reservoir levels are one foot or more below the lower rule band.
- USGS Hoyes Run gauge directly downstream to monitor and ensure that min flows are met.
- A report of flow estimates and occurrence of bypass releases shall be included in Annual Report.

# Condition #18 – Dissolved Oxygen Mitigation

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- Maintain and operate a tailrace weir designed to increase DO levels above MD water quality standards.
- Monitor June 1 to October 1
- Submit results in Annual Report

- Intent is to enhance recreational whitewater enjoyment from the project tailrace to Friendsville.
- Two types: Standard and Special Releases
- All are subject to the rule band and temperature enhancement releases

### **Special Releases (Brookfield submits annual request in writing to MDE each year):**

- Annual Team Friendsville Upper Yough Race WWR – 4<sup>th</sup> Saturday in July will be extended to 6 hours
- Gauley Week WWR – Tues/Wed/Thurs releases for 3 hours before Gauley Festival Weekend in Summersville, WV

# Condition #19 – Releases for Whitewater Recreation


<u>MONTH</u>	<u>SUNDAY</u>	<u>MONDAY</u>	<u>FRIDAY</u>	<u>SATURDAY</u>
<b>APRIL</b>	NONE	NONE	ALL FRIDAYS AFTER APRIL 14TH (1000 HR TO 1300 HR)	NONE
<b>MAY</b>	NONE	1ST TWO MONDAYS (1000 HR TO 1300 HR)	1ST THREE FRIDAYS (1000 HR TO 1300 HR)	1ST SATURDAY (1000 HR TO 1300 HR)
<b>MEMORIAL DAY WEEKEND</b>	ODD NUMBERED YEARS (1000 HR TO 1300 HR)	ODD NUMBERED YEARS (1000 HR TO 1300 HR)	EVEN NUMBERED YEARS (1000 HR TO 1300 HR)	EVEN NUMBERED YEARS (1000 HR TO 1300 HR)
<b>JUNE</b>	NONE	EVERY MONDAY (1100 HR TO 1400 HR)	EVERY FRIDAY (1100 HR TO 1400 HR)	LAST TWO SATURDAYS (1100 HR TO 1400 HR)
<b>JULY</b>	NONE	EVERY MONDAY (1100 HR TO 1400 HR)	EVERY FRIDAY (1100 HR TO 1400 HR)	EVERY SATURDAY (1100 HR TO 1400 HR) (see also Special WWR below)
<b>AUGUST</b>	NONE	EVERY MONDAY (1100 HR TO 1400 HR)	EVERY FRIDAY (1100 HR TO 1400 HR)	EVERY SATURDAY (1100 HR TO 1400 HR)
<b>SEPTEMBER</b>	NONE	EVERY MONDAY (1000 HR TO 1300 HR)	EVERY FRIDAY (1000 HR TO 1300 HR)	FIRST TWO SATURDAYS (1000 HR TO 1300 HR)
<b>OCTOBER</b>	NONE	ALL MONDAYS BEFORE OCTOBER 16TH (1000 HR TO 1300 HR)	ALL FRIDAYS BEFORE OCTOBER 16TH (1000 HR TO 1300 HR)	FIRST SATURDAY (1000 HR TO 1300 HR)

- Posted online by March – [www.safewaters.com](http://www.safewaters.com)




# Condition #21 – Zebra Mussel Monitoring

- Monitor intake area for zebra mussels from April to October
- None found
- Results shall be submitted in the Annual Report

**Brookfield** Renewable Power 

Deep Creek Lake, MD Zebra Mussel Monitoring Report

Brookfield Renewable Power  
14 River View Terrace  
Oakland, MD 21550  
Phone: 301-387-6616  
Fax: 301-387-5809



Zebra mussel showing byssal threads.

Collector's Name Sean Fredlock

Year 2018

Month 4

Day 30

Hour 10:00

Water Temperature ° F 58

How many days was the sampler exposed to the water prior to collecting this data? 30

Are zebra mussels present at the site? ( NO) ( YES) If yes comment below and notify the Superintendent and Maryland Department of Natural Resources immediately.

Other organisms observed on the sampler? NO

Comments \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What factors decide when to generate?

- Temperature enhancement releases
- Whitewater releases
- Discretionary generation
  - Current elevation and rule band
  - Weather forecast and flows
  - Plant outages

**Thank You**

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**BRIAN NOONAN, MANAGER, STAKEHOLDER RELATIONS**