COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC 2020 INTEGRATED	**)**	**CASE NO.**
RESOURCE PLAN OF BIG RIVERS	**)**	**2020-00299**
ELECTRIC CORPORATION	**)**	

SIERRA CLUB'S INITIAL COMMENTS ON BIG RIVERS' 2020 INTEGRATED RESOURCE PLAN

Sierra Club hereby submits its initial comments on the 2020 Integrated Resource Plan ("IRP") of Big Rivers Electric Corporation ("Big Rivers"), which are subject to potential supplementation by future comments after the public hearing in this matter, as contemplated by the Commission's August 12, 2021, Order in this case.

As a threshold, general matter, Sierra Club observes that Big Rivers' 2020 IRP, filed nearly a year ago, has become substantially outdated in light of prominent interceding developments. These interceding developments include, without limitation:

- Big Rivers has sought and gained approval by the Commission to convert its originally coal-fired, two-unit R.D. Green Station ("Green") to a combined 414 MW gas-fired power plant that will begin generating gas-fired power in 2022, whereas the 2020 IRP's "optimal" plan was to retire Green in 2022 and build a 592 MW of combined cycle gas plant in a theoretical partnership with co-investors that Big Rivers would seek to identify, 90 MW of which Big Rivers would take[1];

[1] *See* Case No. 2021-00079, *Electronic Application Of Big Rivers Electric Corporation For A Certificate Of Public Convenience And Necessity Authorizing The Conversion Of The Green Station Units To Natural Gas-Fired Units And An Order Approving The Establishment Of A Regulatory Asset*, Order (June 11, 2021); *see also* 2020 IRP at 33, 155-156.

- a new President has been elected and taken office, with markedly distinct policies on energy, environmental protection, and climate change;
- the U.S. Environmental Protection Agency ("EPA"), among other agencies, has completed various stages of revoking, replacing, or promulgating (or preparing to do the same) various new regulations and policies that bear intimately on resource planning[2];
- Congress has made progress towards passing infrastructure and spending bills that could materially impact the utility sector.

Big Rivers of course cannot be blamed for not anticipating with certainty, and preemptively factoring in, these developments in the 2020 IRP. It simply means that significant reevaluation of at least some aspects of the 2020 IRP uncontrovertibly will be required. By the same token, it also means the prudence of certain plans in the 2020 IRP are effectively moot, given their predication on now- or soon-to-be-outdated conditions and assumptions—at least unless and until Big Rivers' presents fresh analysis, based on updated information, that purports again to justify the same plans.

Accordingly, a primary thrust of Sierra Club's comments at this time, for particular aspects of the 2020 IRP, is not challenge them as imprudent on their own terms, per se, but rather simply to point out that it is incumbent on Big Rivers to reevaluate their needs and update their modeling inputs before moving forward with any of the same plans. Perhaps most prominent among this category is the 2020 IRP's preferred plan to form a partnership to build a new gas combined cycle unit at the Sebree or Coleman site by 2024, as noted above. With the converted

[2] In this vein, it is important to note that the U.S. Court of Appeals for the District of Columbia Circuit has vacated the so-called Affordable Clean Energy Rule, issued by the Trump-era EPA as a replacement of the Obama-era EPA's Clean Power Plan, and remanded to EPA for its continued consideration of new rulemaking on greenhouse gas emissions from stationary sources like power plants. *See Am. Lung Ass'n v. Envtl. Prot. Agency*, 985 F.3d 914 (D.C. Cir. 2021).

Green plant poised to provide 414 MW of firm capacity starting next summer, which was not factored into Big Rivers' case for the combined cycle plant, there is now no showing of a need for that combined cycle plant—let alone a showing that a combined cycle plant would be the most economical way of satisfying such a (non-existent) need.

Next, Sierra Club urges Big Rivers to conduct, and submit for review no later than their 2023 IRP, a fresh evaluation of when its D.B. Wilson Station ("Wilson"), a 417 MW coal-fired power plant, can be most economically replaced—factoring in any new capital costs as well operating costs—by another resource, or combination of resources, including a clean energy portfolio ("CEP") consisting of renewable generation, storage, and demand-side management. The 2020 IRP identifies the year 2045 as the projected retirement date for Wilson.[3] Respectfully, Sierra Club submits that Wilson could be replaced by a CEP this decade, let alone prior to 2045—even before factoring in more stringent, eventually forthcoming environmental regulations that will disproportionately hamper coal-fired generation, among other trends disfavoring coal. This conclusion tends to be supported by the technical analysis accompanying Sierra Club's public comments in the Green conversion docket—attached for convenience as Exhibit A hereto—which demonstrated, in that context, that a similar amount of capacity could be replaced economically by a CEP in the middle of this decade.

Lastly at this juncture, Sierra Club would ask Big Rivers to provide a discussion about the feasibility of re-attracting at least one of the two Century Aluminum smelters that terminated their contracts with Big Rivers and are now taking power of the MISO wholesale market, albeit facilitated by Big Rivers—and, more specifically, about whether Century could be re-attracted by way of building out cost-effective clean energy, given Century's publicly stated interest in

[3] 2020 IRP at 96.

lowering their carbon footprint and, to that end, Century's apparently ongoing efforts to find renewable energy providers to supply power directly to their smelters.

Sierra Club sincerely thanks Big Rivers, the Commission, and Commission Staff for their consideration of these initial comments. Sierra Club reserves the right to submit additional comments later on in these proceedings, consistent with the current scheduling order.

Dated: September 3, 2021

Respectfully submitted,

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CERTIFICATE OF SERVICE

This is to certify that the foregoing copy of the SIERRA CLUB'S INITIAL COMMENTS ON BIG RIVERS' 2020 INTEGRATED RESOURCE PLAN in this action is being electronically transmitted to the Commission on September 3, 2021; and that there are currently no parties that the Commission has excused from participation by electronic means in this proceeding.

JOE F. CHILDERS

EXHIBIT A

Sierra Club Technical Comments in PSC Case No. 2021-00079:
Clean Energy Portfolio Cost-Effectively Replacing R D Green Coal Units by 2023, Avoiding CCR Compliance Costs

I. Overview

Sierra Club analysts find, based on an analysis of publicly available information, that a clean energy portfolio (CEP) could provide the same energy and capacity requirements as Big Rivers' R.D. Green coal-fired power plant converted to gas-firing, at a cheaper cost, as early as 2023. **Using clean energy rather than converting to gas would save customers over $95.7 million dollars over the lifetime of the resource**. These findings are based on relatively conservative assumptions about the technology, economics, and legal requirements. Interceding developments, such as more stringent regulations or faster technological advancements, could move up those dates.

The clean energy portfolio Sierra Club assesses in this analysis consists of wind, solar, storage, energy efficiency, and/or demand response technologies. It is a more robust mix of resources than the alternative that Big Rivers appears to have considered to date as a possible replacement option for Green, namely a gas conversion only. **While Big Rivers should include increased demand-side management (DSM) in its replacement clean energy portfolio, even if it does not, the CEP without any DSM is still lower cost than the gas conversion in 2025 and would save customers $86.0 million over the lifetime of the resources**.

This analysis suggests that, from a cost-savings perspective alone, Big Rivers should revisit its plans to invest millions of dollars in this gas conversion. Instead, Big Rivers should retire Green by 2022 as planned and replace it with a cheaper clean energy portfolio.

II. Analysis

In our methodology, the CEP is constructed to match the energy, peak capacity, and ramping characteristics of the Green coal plant converted to gas. Portfolios are optimized to satisfy these needs at the lowest cost possible. The technologies included in the model are various forms of energy efficiency and demand response measures within residential, commercial, and industrial customer sets, as well as wind, utility scale solar PV, and battery storage. Once a CEP is built by the model to match the converted coal plant's performance, we compare the cost of building *and* operating that CEP to the going forward costs of operating the converted coal plant. When the CEP cost becomes cheaper, the coal plant is 'stranded' by the CEP. In an economist's terms, this is when the *total* cost of a new solution becomes cheaper than the *marginal* cost of an existing solution. At this point, the sunk costs of the converted coal plant are the same in both the CEP

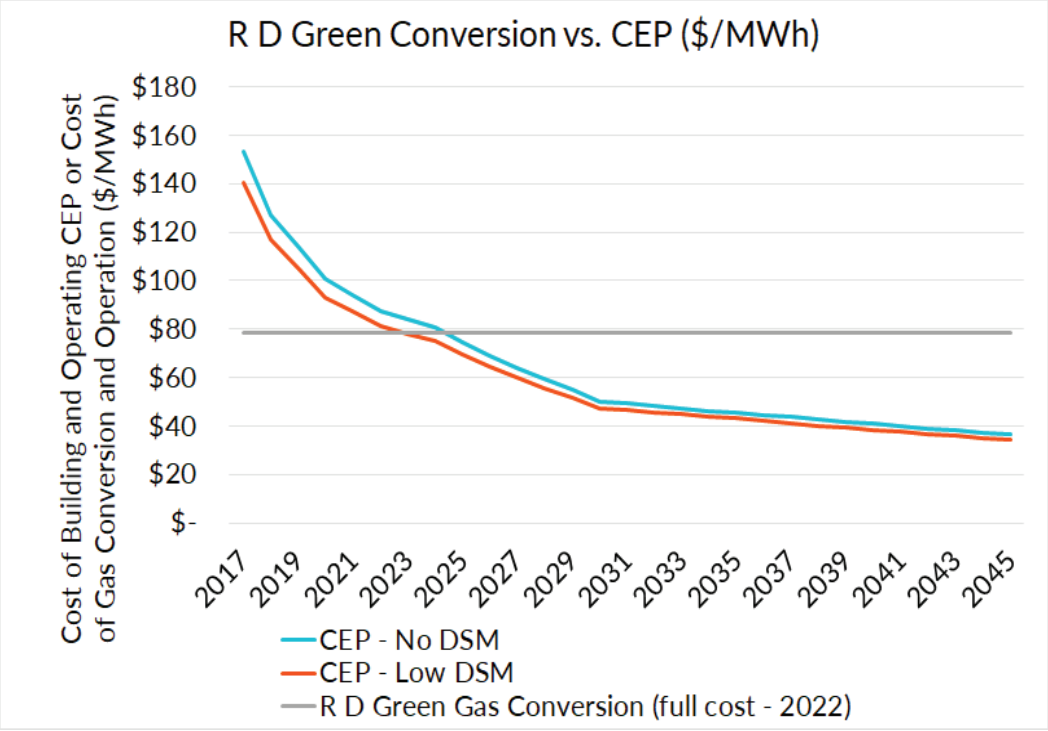
case and the converted coal plant case, but going forward the only way to save customers money is to build and operate the CEP.

The results of the CEP model are shown below in Figure 1 (cost comparison with converted coal plant) and Table 1 (technology mix of the clean energy portfolio). The levelized cost of energy (LCOE) of the CEP would be lower than the cost of the gas conversion in 2023, only one year after the proposed conversion. More details on our methodology and data sources are discussed in the Sources and Methodology section below.

This result means that Big Rivers should not be considering conversion of the Green coal plant to burn gas and instead should plan for replacement with clean energy sources. In Big Rivers' "optimal plan" in the IRP, they planned to retire Green in 2022 and not receive energy from a newly built gas plant until 2024.

Our analysis shows that a clean energy portfolio could cost-effectively replace all units of Green by 2023, only one year after Green retires and before the "optimal plan" in the IRP expects the new gas plant online. Using clean energy rather than converting to gas would save customers over $95.7 million dollars over the lifetime of the resource. This is based on the net present value of the gas conversion or clean energy portfolio over a 20 year operating lifetime.

Figure 1: Cost comparison of building and operating a new clean energy portfolio vs. cost of conversion and operation of coal-fired Green



Importantly, a portion of the CEP can be supplied by demand-side technologies that are cheaper than building large new power plants and thus save customers more money.

The technology mix selected energy efficiency in the form of commercial lighting and residential space cooling, and industrial demand response. Big Rivers can pursue higher levels of energy efficiency and demand response for its customers if it wants to find the most cost-effective energy and capacity replacements for this aging coal plant.

In 2019, the American Council for an Energy Efficient Economy (ACEEE) gave utilities in Kentucky a 1 out of 20 score (the lowest possible score) on their energy efficiency scorecard.[1] In their 2020 scorecard, ACEEE found that on average utilities will achieve energy efficiency savings equivalent to 1% of their annual sales.[2] According to EIA-861 filings, Big Rivers together reported average annual incremental savings from energy efficiency of 1,242 megawatt-hours ("MWh") for 2019 within the commercial sector.[3] Their total commercial sector sales for 2019 was 610 thousand MWh/year, leading to an energy efficiency achievement of 0.2% of sales. This is an incredibly low level of achievement; it means that the utility is leaving most of the cost-effective energy efficiency potential unmet. The achievement in the residential sector was negligible with only 29 MWh of efficiency savings reported by Big Rivers compared to 1.4 million MWh in residential electricity sales.

While Big Rivers should include increased demand-side management (DSM) in its replacement clean energy portfolio, even if it does not, the CEP without any DSM is still lower cost than the gas conversion in 2025 and would save customers $86.0 million over the lifetime of the resources.

Table 1: Technology breakdown for clean energy portfolio to replace R D Green

CEP Composition (MW)	Solar	Wind	Battery Storage	Energy Efficiency	Demand Response
CEP - No DSM	681	-	454	-	-
CEP - Low-DSM	606	-	406	66	52

[1] ACEEE State and Local Policy Database, Kentucky (navigate to the "Utilities" tab), available at: https://database.aceee.org/state/kentucky.
[2] 2020 Utility Energy Efficiency Scorecard (Feb. 2020), Grace Relf *et al.*, ACEEE, at p.26 table 8, available at: https://www.aceee.org/sites/default/files/pdfs/u2004%20rev_0.pdf (compilation of data in table).
[3] See below for EIA and other sources as well as methodology.

III. Sources and Methodology

Sources

The data sources for this analysis are from public sources and S&P Global Market Intelligence, including data reported by Big Rivers Electric Cooperative to the Energy Information Administration (EIA) on fuel costs. Data from S&P Global Market Intelligence is based on their industry estimates for cost items that Big Rivers does not directly report on. In this case, S&P uses regressions based on plant age, generation, and capacity data from plants and utilities that are forced to report both fuel and maintenance costs.

- Gas prices: EIA US Natural Gas Prices: https://www.eia.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm
- Coal and gas price forecasts: EIA Annual Energy Outlook 2020 Reference case: https://www.eia.gov/outlooks/aeo/
- Variable and fixed operations and maintenance costs: Sargent and Lundy. "Generating Unit Annual Capital and Life Extension Costs Analysis". https://www.eia.gov/analysis/studies/powerplants/generationcost/pdf/full_report.pdf
- Capital expenditures: EIA Annual Energy Outlook https://www.eia.gov/outlooks/aeo/assumptions/pdf/electricity.pdf (p. 14)
- Clean Energy Portfolio algorithm: Rocky Mountain Institute, "The Growing Market for Clean Energy Portfolios," https://rmi.org/insight/clean-energy-portfolios-pipelines-and-plants/

Fuel switched plant costs

In order to estimate the levelized cost of energy for a fuel-switched RD Green for a 20 year operating life, we constructed a model to project future costs. All of the assumptions and projections are derived from publicly available information. To build our model, we created starting assumptions or built projections for the following values:

- Capacity factor: The capacity factor stays fixed for the entire period at 19%, which is the average of capacity factors in 2018-2020 for gas combustion turbines located in MISO Kentucky, Illinois, or Indiana.
- Fuel costs: The 2020 average electric power price for Indiana gas plants was used: $2.16/MMbtu. No price was available for Kentucky, per EIA reporting.[4] We assumed a heat rate of 11,500 British thermal units (Btu) per kilowatt-hour (kWh) for the fuel switched RD Green. This is the average of the two units' heat rates for 2019, as we assume the heat rate will not improve materially with the fuel switched boiler.

[4] EIA, Indiana Gas Prices. https://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SIN_a.htm

- Fixed and variable O&M expenses: We used Sargent & Lundy estimate for fixed and variable O&M expenses as a starting point and inflated by two percent per year, in line with standard inflation.[5]
- Annual capital expenses: Ongoing annual capital additions were estimated at $18.86/kW-year and inflated by two percent per year to account for normal inflation.[6]
- The levelized cost of energy (LCOE) was calculated by taking an annualized payment of the net present value of all costs (using a discount rate of seven percent) and dividing it by annual generation.

Clean energy portfolio

Given that continuing to run this coal plant converted to gas would be a net cost to customers compared with the energy market, the next step in the analysis is to investigate whether it can be cost-effectively replaced with clean energy and on what timeline. For this analysis, we used the Rocky Mountain Institute's (RMI) Clean Energy Portfolio's algorithm originated in its 2019 report "The Growing Market for Clean Energy Portfolios" to identify a suite of clean energy technologies (wind, solar, storage, energy efficiency, and demand response) that could replace the services of the converted coal plant. Updates to the algorithm are

A clean energy portfolio, or CEP, is a combination of renewable energy, storage, and demand-side management (DSM) projects that meet the needs of the grid and a utility's customers. We use the term DSM to collectively refer to energy efficiency projects (which lead to a reduction in load) and demand response projects (which lead to the shifting or temporary reduction of load). The use of CEPs differs from traditional resource planning, which typically focuses on a specific technology. Instead, a CEP looks at how a range of available clean energy resources could contribute in each hour of the year, and finds the combination that meets the unique needs of customers at the lowest feasible cost. In this study, the CEPs are constructed to match the energy, peak capacity, and ramping characteristics of the converted coal plant. Portfolios are optimized to satisfy these needs at the lowest cost possible.

The CEPs are conservatively designed to meet peak capacity needs in the top 50 hours of capacity need of the year in the MISO balancing area, the grid region where Big Rivers and its converted coal plant operates. The CEP also must meet the average monthly energy requirement of the converted coal plant's total generation in each month based on 2018 to 2020. The CEP algorithm errs on the side of caution, in the sense that other grid resources (like existing gas plants or market purchases) play no role in the replacement, but those resources are typically included in system dispatch or capacity expansion models that utilities utilize in portfolio analysis. In other words, the CEP algorithm accounts for a complete energy and capacity

[5] See report page 65/179 of Sargent and Lundy, *supra*, steam units under 500 megawatts.
[6] Sargent and Lundy. Page 66/179.

replacement of the coal plant *without the benefit of any other existing grid resources*. We assume that energy efficiency and demand response could only account for up to 25 percent of the replacement energy and capacity of replacement portfolios, respectively.

RMI's model uses storage and renewable cost assumptions from NREL ATB Advanced scenario — a government issued report.[7] In addition, the modeling includes the solar investment tax credit, excludes the wind production tax credit, and includes an investment tax credit for storage (even though many storage projects qualify for that tax credit by pairing with solar). Any excess energy that renewables produced above and beyond the converted coal plant was valued at $15/MWh.

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Dated: June 10, 2021

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[7] National Renewable Energy Laboratory, Annual Technology Baseline. https://atb.nrel.gov/