

## Chapter 8 - Preferred Path

As noted in the previous chapter, the IRP committee and BED staff selected E4-C3-R2 as the preferred decision path. Referred to as the “Energy options open – active demand response – arbitrage RECs” pathway, E4-C3-R2 is the second lowest cost pathway under the utility cost test and the fifth lowest cost pathway under the societal cost. Under the base case scenario, E4-C3-R2 is expected to result in the following outcomes:

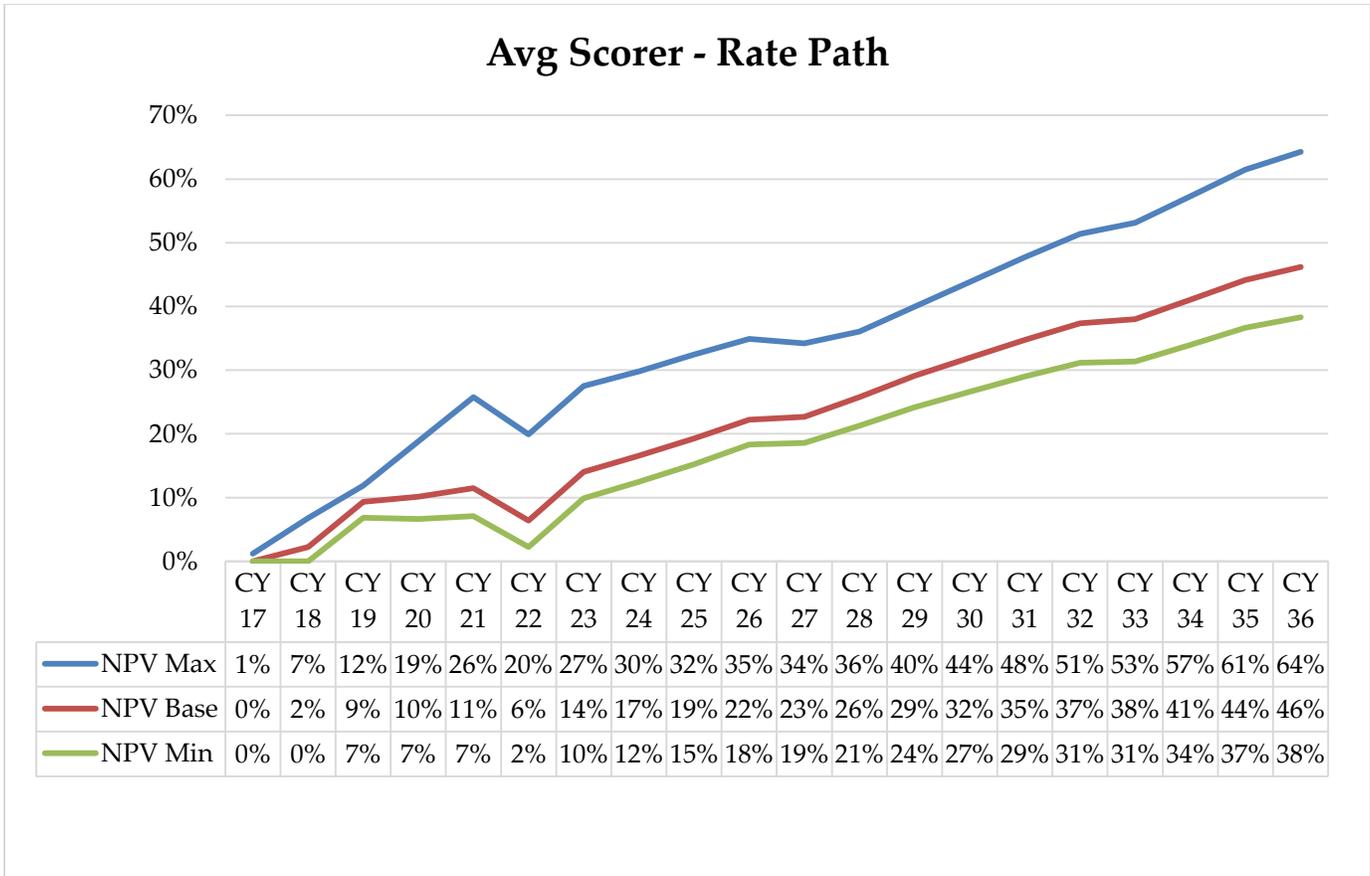
**Table 1: Preferred Path outcomes**

Year	Rate Pressure	Net Power Cost	Cost of Service	Retail MWh	\$/kWh	Renewable %	Non-Renewable MWh	Societal Cost
CY17	0%	\$24,875,239	\$58,276,612	343,965.79	\$0.169	112%	0	\$0
CY18	2%	\$27,114,288	\$61,462,134	353,344.99	\$0.174	94%	27,450	\$1,114,488
CY19	9%	\$30,853,414	\$65,875,579	358,492.46	\$0.184	98%	15,455	\$627,462
CY20	10%	\$30,734,016	\$66,484,651	360,218.86	\$0.185	99%	9,254	\$375,721
CY21	11%	\$30,657,929	\$67,162,583	358,181.88	\$0.188	103%	0	\$0
CY22	6%	\$27,481,931	\$64,894,237	357,698.60	\$0.181	92%	34,704	\$1,408,977
CY23	14%	\$31,029,563	\$69,112,920	358,171.30	\$0.193	96%	23,323	\$946,920
CY24	17%	\$32,160,506	\$71,007,348	359,642.78	\$0.197	96%	23,530	\$955,298
CY25	19%	\$33,078,040	\$72,749,339	360,137.77	\$0.202	95%	23,849	\$968,286
CY26	22%	\$34,371,733	\$74,879,582	361,725.72	\$0.207	93%	34,022	\$1,381,288
CY27	23%	\$34,499,136	\$75,862,528	363,990.72	\$0.208	86%	58,187	\$2,362,375
CY28	26%	\$36,120,087	\$78,358,300	367,255.35	\$0.213	86%	59,748	\$2,425,763
CY29	29%	\$37,630,347	\$80,769,130	369,494.21	\$0.219	86%	61,574	\$2,499,894
CY30	32%	\$38,926,439	\$82,984,663	371,559.55	\$0.223	85%	63,627	\$2,583,266
CY31	35%	\$40,288,088	\$85,292,666	373,822.23	\$0.228	84%	66,245	\$2,689,563
CY32	37%	\$41,660,310	\$87,634,983	377,080.91	\$0.232	84%	67,087	\$2,723,712
CY33	38%	\$41,439,302	\$88,628,926	378,759.85	\$0.234	84%	68,601	\$2,785,206
CY34	41%	\$42,591,392	\$91,020,119	381,435.30	\$0.239	81%	79,091	\$3,211,081
CY35	44%	\$43,832,775	\$93,531,052	382,908.24	\$0.244	82%	76,694	\$3,113,788
CY36	46%	\$44,655,037	\$95,645,365	385,805.90	\$0.248	76%	103,285	\$4,193,374
<b>Total</b>		<b>\$703,999,572</b>	<b>\$1,531,632,719</b>	<b>\$7,323,692</b>	<b>\$0.209</b>	<b>90%</b>	<b>895,726</b>	<b>36,366,461</b>
<b>NPV</b>		<b>\$484,553,076</b>	<b>\$1,058,366,849</b>					<b>\$22,841,032</b>

Selection of this path is expected to produce total NPV costs of \$1.058 billion over the planning horizon. Adding externality costs, as described in the previous chapter, would increase the NPV cost to serve the City to about \$1.081 billion. On a nominal basis, retail rates would likely increase from \$0.17/kWh to \$0.25/kWh, on average across all customer classes. However, adjusted for general inflation, retail rates are not anticipated to be demonstrably different than they are today – assuming all other expectations remain unchanged.

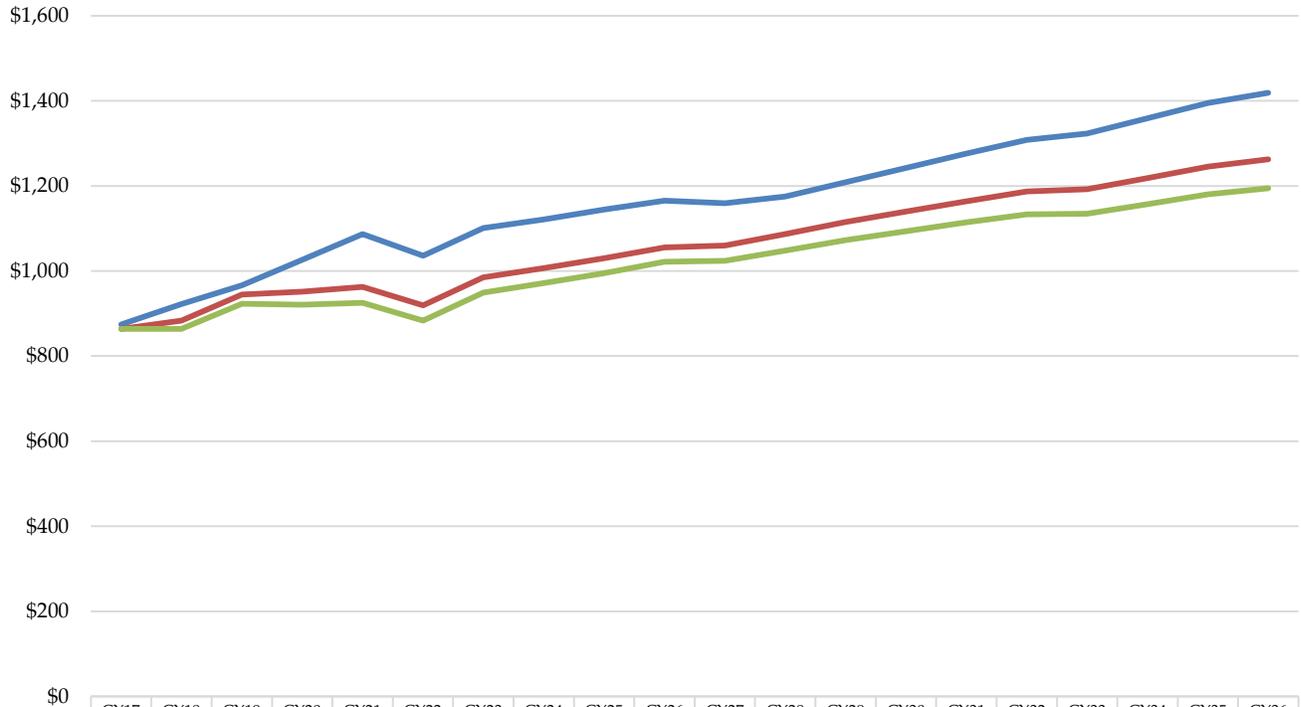
It is important to note that rate calculations take into consideration a host of additional variables that have not been included in this IRP analysis. The above captioned rate values have been presented herein strictly for comparative purposes, and should not be interpreted as a request to increase rates nor should they be understood as reflective of the actual retail rates BED intends to charge customers in future years. Nevertheless, the chart below is indicative of the cumulative nominal rate pressures that the selected pathway could impose upon BED's operations. In the graph below, rate pressure is expressed as a cumulative percent compared to the 2017(CY) base year.

Figure 1: Cumulative rate pressure



For the typical residential customer that uses, on average, 450 kWh per month, the average bill would increase from \$864 per year to \$1,263 per year under this option. On a cumulative basis, the increase would amount to \$400 or about a \$20 per year annual increase.

### Average Residential Customer bills



— NPV Max   
 — NPV Base   
 — NPV Min

As noted throughout this IRP, rate pressures in both directions are a result of the variability in energy, capacity and transmission costs, as well as REC arbitrage opportunities, and BED’s responses to such variability. Also, cumulative rate pressures reflect expectations in inflation, interest rates, owned generation, loads served and other ancillary costs.

Although E4-C3-R2 is not the least cost pathway, its selection by the IRP committee and BED staff rests on several positive attributes; namely the preferred pathway: is consistent with BED’s overall strategic mission, allows for a greater degree of flexibility; it has the second lowest NPV cost of service; has an improved risk – reward ratio compared to the least cost path using weighted average key variable values; and, may result in a lower probability of future rate increases compared to most other decision pathway options.

### *Strategic Mission*

BED's mission is:

*To serve the energy needs of our customers in a safe, reliable, affordable and socially responsible manner.*

Selection of the E4-C3-R2 pathway is compatible with BED's overall mission. As noted in the Transmission and Distribution chapter, several programs were initiated to further upgrade and harden the electric system network. Examples of past investments include: upgrades to the SCADA software system, installation of protective equipment on the distribution system; and, enhancements to distribution system operating procedures designed to expedite restoration of service. The effect of these past investments, and several others, has been to increase safety and reliability, as measured by the System Average Interruption Frequency index (SAIFI). In 2015, BED's SAIFI index was 0.4 interruptions per customer, well below the 2.1 interruptions per customer target.

But BED is not resting on its past achievements.

To further enhance safety and reliability, additional investments are necessary. The selected path will allow for the necessary flexibility to make such investments over time. Examples of future infrastructure investments that are currently under review include but are not limited to:

- Installing redundant SCADA systems in the Lake Street gas turbine building;
- Installing stand-alone capacitor banks to better control voltage and VARs; and
- Micro grid systems.

The intent of these investments, if approved, will be to further improve upon BED's record of achievement with respect to safety and reliability and in the case of micro grids, to gain experience with their operation and integration before storage becomes economically accessible to a larger number of customers. They will also help to build upon an existing foundation that supports BED's efforts to provide affordable service to all customers, while also promoting socially responsible initiatives such as energy efficiency, strategic electrification and active demand response using advanced battery storage and other technologies.

### *Flexibility*

During most hours of the year, wholesale energy prices are at historic lows. Market intelligence reports indicate that energy prices are likely to remain low over the near and intermediate terms. Also, BED staff members anticipate that certain renewable resource options will become available in the near future that will warrant careful review. As a consequence of these expected events, it is prudent to keep BED's options open and fluid at this time. Additionally, new renewable resources will increase BED's exposure to REC prices.

Such flexibility would allow for increased opportunities to negotiate low – cost renewable purchase power agreements in order to keep customers’ electric bills affordable.

#### *Least cost*

As noted above, the NPV cost of service is \$1.058 Billion; only \$7 million more than the lowest cost pathway under the utility test using the weighted average value for key variables. These costs however would be incurred – if at all - over 20 years; and not immediately. In BED’s opinion, the risk of additional short term costs associated with selecting E4-C3-R2 is worth the investment of time to explore even lower cost, renewable options over the coming months. Securing local renewable energy would also mitigate the aforementioned societal costs of roughly \$23 million. If, however, BED is unsuccessful in its attempt to procure additional low- cost, local renewable energy in the short term, it maintains the option to re-visit the alternative lowest cost pathway and pursue additional wind contracts going forward.

#### *Improved relative risk profile*

Selection of E4-C3-R2 as the preferred pathway may expose BED’s customers to some additional risks vis-à-vis E2-C3-R3 (soft landing, which is not shown in the table below due to higher costs). Such risks are primarily associated with fewer REC arbitrage opportunities resulting from deteriorating REC values. This event would have the effect of increasing BED’s net costs. Taken to the extreme, REC-related risks could potentially increase BED’s cost of service to approximately \$1.156 billion under the worst cost scenario, roughly \$98 million more than the E4-C3-R2 base case scenario. But compared to the soft landing pathway, E4-C3-R2 would cost roughly \$48 million less under either of the base case scenarios. Thus, mitigating the risks that may or may not occur as BED pursues its preferred pathway (E4-C3-R2) would come at a very high price; perhaps too high given the potential to procure additional renewable energy in the near future. Moreover, BED staff is confident they can manage the risks that the preferred path would likely impose on BED’s operations. Management of such risks, if they occur, could come in various forms. For example, BED could still initiate a voluntary green pricing program whereby subscribing customers elect to pay more per kWh consumed in exchange for the RECs that would have been sold in the market. Instead of engaging in additional price arbitrage opportunities with these RECs, BED would retire them. And, as more RECs are retired, BED would ultimately lower its exposure to variable REC values over time.

It is important to also point out that while E4-C3-R2 may cost \$7 million more than the least cost alternative (E1-C3-R2), the higher price tag can be viewed as the cost of risk insurance. As the table below illustrates, the total range (or swing) in the preferred pathway’s cost of service is \$134 million, which is \$26 million less than the total range of the least cost pathway. In addition, the comparative swings of the two least cost pathways are not symmetrical. The least cost pathway, E1-C3-R2, could result in overall costs as high as \$1.166 billion, whereas

the preferred pathway could be as high as \$1.156 billion. Thus, under the worst case scenario, E4-C3-R2 would still cost \$10 million less than worst case scenario for E1-C3-R2.

**Table 2: NPV cost of service for top pathways**

Pathway	Total NPV Cost of service (billions)	Range (millions)	Lowest NPV (billions)	Highest NPV (billions)	Path description
E1-C3-R2	1.051	160	1.005	1.166	Add wind - demand response - arbitrage RECs
E4-C3-R2	1.058	134	1.021	1.156	Energy Options open - demand response - arbitrage RECs
E2-C3-R2	1.061	137	1.024	1.161	Extend Hancock wind - demand response - arbitrage RECs
E1-C2-R2	1.066	173	1.012	1.185	Add Wind - demand response - arbitrage RECs

### *Rate pressure*

Because potential risks appear relatively high under the E1-C3-R2 pathways (and represent additional REC risk), BED is electing to choose a slightly higher cost pathway today in order to leave its remaining energy options open. This selection is a prudent course of action, particularly since BED will be investigating and actively pursuing additional low cost energy purchases over the coming months. Also, BED believes that any additional risks that the preferred plan may impose on its operations are manageable in the ways mentioned above. Finally, selection of the E4-C3-R2 pathway would not likely drive nominal retail rates much higher vis-à-vis the alternatives. As shown in Table 1, nominal retail rates are expected to increase to approximately \$0.25/kWh, on average across all customer classes, by year 2036. The other least cost pathways described in the previous chapter all had similar retail rate trajectories. Moreover, the forecasted retail rate trajectory of the preferred path also assumes that BED’s costs continue to be subject to varying REC values. Yet, BED can take tangible and realistic steps to shield customers from this risk, as noted above (i.e. voluntary green pricing programs to reduce REC arbitrage needs, etc.).