The TVA Projection of Increasing Energy Sales is Likely Overstated

Amidst the Tennessee Valley Authority's (TVA) projections of soaring electricity demand, a revolution in energy consumption is taking shape. The TVA planning process assumes that their power supply plans determine the energy supply mix, consumer efficiency implementation, and consumer solar implementation in their service area. These assumptions may prove to be incorrect.

- Currently TVA does have a monopoly on the grid and grid connected generating resources. But non-grid connected solar options are now plentiful and cost competitive.

- TVA can influence and accelerate consumer efficiency improvements through promotional programs. However, increasing electricity rates and improving technology will drive consumer efficiency and there is little TVA can do to discourage that.

- TVA can influence and accelerate adoption of consumer solar installations. Or TVA can hinder adoption of grid connected consumer solar installations with fees and requirements that drive up installation costs. But consumers have the option of appliance connected solar installations that do not connect to the grid and may come in do-it-yourself (DIY) packages. TVA could accelerate the adoption of DIY packages but likely can do little to discourage these projects in the face of rising electric rates.

While grid connection devices, high installation costs, and utility fees result in long pay back times for grid connected consumer solar even with lower cost solar panels, direct appliance connected solar and DIY installations can be much lower cost and have pay back times of one or two years. The cost of power from these solar projects is less than 2 cents per kwh as compared to TVA rates that are above 10 cents and increasing rapidly.

One example of new technology is solar panels connected directly to an inverter-driven heat pump. No expensive inverters or grid connection devices are required. The heat pump seamlessly taps into solar power when available, intelligently switching to the grid only when solar resources are

insufficient. This integration is complemented by the utilization of a smart thermostat. When solar power is plentiful, the thermostat strategically allows slight over-heating or over-cooling within the home. This deliberate deviation from conventional temperature norms utilizes the home's structure and furnishings as thermal mass storage.

Other than utilizing inverter driven heat pumps with connections for solar panels, the only other equipment required is the solar panels which are available at lower prices now. Installation of central unit solar boosted heat pumps will require professional installation. However smaller stand-alone or window unit heat pumps as well as mini-split units combined with solar panels are coming on the market as DIY project kits. It will be difficult for electric utilities to discourage or prevent these DIY off-grid solar installations.

Another low cost off-grid solar option for consumers is the solar boosted electric water heater. Most electric water heaters have both an upper and a lower heating element. Most of the heating is done by the lower element with the upper element used for quick recovery, A low cost solar option is to connect solar panels to the lower element but leave the upper element connected to the grid. The thermostat on the upper element is then set at a lower temperature and/or switched off. Most of the water heating will be done by the solar connected lower element but hot water is still available on cloudy days by switching on the upper element. This works best with larger tanks.

Consumer response to higher electric rates, called price elasticity, is a real thing. These responses may be new technology as discussed above, or improved efficiency, or conversion from whole house HVAC systems to zone HVAC with mini-split units, or other conservation measures. It is an error for an electric utility to think the utility can choose between central generation and consumer side responses. While the utility can hasten the consumer side options with programs, it is ultimately electric rates that will drive consumer response.

The consumer response to higher electric rates will become a serious issue for TVA as it embarks on an ambitious construction plan for new natural gas and nuclear generation plants. The TVA financial plan depends on increasing electric energy sales to produce the necessary revenue. Even with the planned growth in energy sales, the ambitious construction plans will

necessitate rate increases. If energy sales growth falls short of expectations, even more rate increases will be necessary. More rate increases will lead to more consumer response, a deadly spiral for TVA. Even with record winter peak loads and record summer peak loads, TVA energy sales declined in FY2023 as compared to FY2022 already calling into question the TVA energy growth projections.

There are also other factors that may drive TVA rates higher than projected. With the shift to natural gas plants, TVA rates are driven in large part by the volatile price of natural gas. TVA has experienced exceptional good performance of its nuclear units in recent years but some of the nuclear units are approaching 50 years of age and it is likely that the exceptional performance will not continue indefinitely. Reduced nuclear production will increase the exposure to volatile natural gas prices,

The impact of consumer solar options on the TVA load daily load curves are the same whether the installation is directly connected to the grid or is off-grid but reducing the consumer take from the grid. As consumer solar options proliferate, the load served by TVA during the high solar hours will be decreased. The hourly loads may decrease during the sunny part of the day and rebound in the evening creating a load pattern called the duck curve. With lower energy sales and the difficulty of responding to the midday dip in loads, the first response of TVA will be to retire the remaining coal fired plants. If the dip is low enough, it brings into question the wisdom of adding additional nuclear generation as planned. In addition to lower revenue from the decreased energy sales, TVA may have issues responding to the hourly load variations.