

CICV Learning Module: Analyzing Utility Regulatory Filings

PURPOSE

Analyze the potential challenges, opportunities, risks and financial impacts to the end customer that are associated with regulatory filings for the purchase of renewable energy. The subject filing for this learning module is Appalachian Power Company's (APCo) proposed Experimental Rider R.G.P. (Renewable Generation Purchase) program. The Virginia State Corporation Commission docket # is PUE-2015-00040 ("filing").

LEARNING OUTCOMES

- Demonstrate an extended knowledge of electric power markets, including utility tariffs, rate schedules, ratemaking process, and wholesale energy markets.
- Evaluate and discuss the perceived challenges, opportunities, and risks of a utility regulatory filing for the end customer.
- Assess the validity of solar energy valuation methodologies by accurate and appropriate referencing of published approaches taken nationally.
- Apply principles of data collection and analysis in the context of electric power markets.
- Demonstrate proficiency with Microsoft Excel-based models for power-sector data analysis, including historical customer usage data (energy and demand), utility tariffs and rate schedules, and wholesale energy market pricing (PJM), among others.
- Synthesize and describe the expected financial impact of a utility regulatory filing on the end customer.

ASSESSMENT

Case study report that clearly presents results of research, analysis, and modeling activities and synthesizes financial cost/savings impact findings. Modeling methodology and document references shall be clearly documented.

MODULE OPTIONS

- **MODULE A:** Large-scale solar PV project size of 1.4 MW at Ferrum College with solar generation from the National Renewable Energy Laboratory's PVWatts web app.
- **MODULE B:** Small-scale solar PV project size of 104 kW at Ferrum College with solar generation data from Eastern Mennonite University.

Module materials are available at: <http://my.solarroadmap.com/ahj/smp-icv/view>.

INSTRUCTIONS

This learning module uses Ferrum College as a case study to analyze the potential impact of APCo’s proposed RGP Rider on member colleges and universities of the Council of Independent Colleges in Virginia (CICV) in APCo's service territory. The student tasks in this learning module are categorized into four areas: (1) research all documents and models associated with the filing to gain full understanding of regulatory components; (2) identify and analyze the potential challenges, opportunities, and risks from the perspective of participating customers; (3) model the anticipated financial impact of the filing on subject college using a template Microsoft Excel-based model; and (4) synthesize findings in the form of a case study. Below is a list of tasks to be performed.

Table 1: Learning Module Task List

Thorough Document Review	
1	Read APCo filing, including testimonies, and Schedules 1 & 2.
2	Review APCo’s Microsoft Excel model used for sample bill calculation (file name = “*OAG 1-014-Attachment 1”).
3	Review electricity tariff: APCo Tariff 25; relevant rate schedules include: 378, 380 Large General Service (sample) and 306 Large Power (Ferrum College).
Analyze Potential Challenges, Opportunities, and Risks	
1	Analyze potential challenges for prospective participants.
2	Analyze potential opportunities for prospective participants.
3	Analyze potential risks for prospective participants.
Adaptation of Microsoft Excel Model: Module A	
1	“Schedule 2” worksheet: Update billing determinants in “Schedule 2” worksheet to align with actual rate schedule of customer being analyzed (Ferrum College: APCoTariff 25, Schedule 306 Large Power). Copy worksheet 11 times to have one for each month of the year. Enter actual energy usage data values from monthly bills across row 10 for each month.
2	“PVWatts-Detail” worksheet: Run new solar energy generation using PVWatts with appropriate parameters for subject customer, and copy/paste hourly results into column “K”. Create column to establish 12CP values. Create column to establish 5CP dates (from “Capacity—Support” worksheet) – similar to 12CP. Create column to establish 5CP values. Calculate 12CP and 5CP averages at bottom of worksheet.
3	“Capacity—Support” worksheet: Do not modify.
4	“Energy” worksheet: Download PJM Real time Locational Marginal Pricing hourly rates at the AEP/APCo pricing point for each hour of the year. Replace values in column “E”. Update formula in column “H” to correspond to appropriate hour in “PVWatts-Detail” worksheet for each hour. Be careful of two daylight savings hours
5	“Calculations” worksheet: Expand row 9 to accommodate each month of the year and update all formulas accordingly.
6	New “Schedule 2” monthly worksheets: Update values for credit determinants “A, B, C, and D”. “E” and “F” stay the same. “G” should stay the same or changed to desired rate for modeling.
Synthesize Findings	
1	Create “Summary worksheet that pulls data from relevant worksheet for most relevant values to demonstrate findings. Draft purpose, overview, and methodology for clear communication to reviewer of what has been done.

ESSAY QUESTIONS

1. If a customer had a maximum load of 2,125 kW as measured over the past 12 months, but minimum load of 1,403 kW, would they be eligible to participate?
2. Does the timeline allow for CICV member colleges to participate according to the Solar Market Pathway project timeline?
3. What is the relation between the rider program and net metering?
4. Might there any unforeseen issues with the proposed PPA contract structure?
5. Would an average customer be able to clearly understand details of the rider structure?
6. Does the \$30/month program charge seem appropriate?
7. Is there any benefit to aggregating multiple meters across campus?
8. Is there any benefit of the rider program cap being set at 2MW, as opposed to the 1MW cap for a net metering tariff?
9. Would the rider provide any benefit to the utility related to the EPA's Clean Power Plan?
10. What would be the estimated annual cost/savings to Ferrum College if the rider were approved?
11. Which of the three parties in a PPA contract would assume the most/least risk?
12. What risks might be borne by a college's Chief Financial Officer?
13. Is the potential scale of rate impact to other customers significant enough to justify the need for the complex customer credit methodology as an alternative to net metering?
14. Is any credit given for the energy lost during transit from the source to the customer?
15. How does APCo's customer credit methodology compare to the valuation of solar energy methodologies in other electricity markets across the country?
16. Does the proposed rider program provide enough benefit to participating customers to encourage significant program enrollment?

RESOURCES

- Appalachian Power Company. *Virginia Rates and Tariffs*. Available at: <https://www.appalachianpower.com/account/bills/rates/APCORatesTariffsVA.aspx>
- Council of Independent Colleges in Virginia. *Final Microsoft Excel Models for Modules A and B*. August 2015. Available at: <http://my.solarroadmap.com/ahj/smp-icv/view>.
- Interstate Renewable Energy Council. *A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation*. October 2013. Available at: <http://www.irecusa.org/a-regulators-guidebook-calculating-the-benefits-and-costs-of-distributed-solar-generation/>
- Interstate Renewable Energy Council. *Easing the Transition: The Changing Roles of Consumers, Utilities and Regulators Within the Regulatory Compact*. February 2015. Available at: <http://www.irecusa.org/2015/02/landmark-report-released-by-irec-easing-the-transition-to-a-more-distributed-electricity-system/>

- Maine Public Utilities Commission. *Maine Distributed Solar Valuation Study*. April 2015. Available at: http://www.maine.gov/mpuc/electricity/elect_generation/documents/MainePUCVOS-ExecutiveSummary.pdf.
- PJM Regional Transmission Organizations. *Locational Marginal Pricing*. <https://dataminer.pjm.com/dataminerui/pages/public/lmp.jsf>
- Regulatory Assistance Project. “*Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserves*,” August 2011. <http://www.raponline.org/document/download/id/4537>.
- Rocky Mountain Institute. *A Review of Solar PV Benefit and Cost Studies*. 2013. Available at http://www.rmi.org/elab_empower.
- Solar Electric Power Association. *Ratemaking, Solar Value and Solar Net Energy Metering—A Primer*. July 2013. Available at: <https://www.solarelectricpower.org/media/51299/sepa-nem-report-0713-print.pdf>
- Virginia State Corporation Commission. *Application of Appalachian Power Company for approval to establish Experimental Rider R.G.P. for the purchase of non-dispatchable renewable generation*. Available at: <http://www.scc.virginia.gov/case/e-notice/ne150040.pdf>.

Instructor's Guide

INSTRUCTIONS TO INSTRUCTORS

Students should review all resource documents and follow the task list to analyze all aspects of the filing. Below are sample answers to essay questions that should be within students' knowledge base by the end of the learning module based on policy analysis and data analysis.

ANSWERS TO ESSAY QUESTIONS

Assessing Potential Challenges

- 1. If a customer had a maximum load of 2,125 kW as measured over the past 12 months, but minimum load of 1,403 kW, would they be eligible to participate?**

This is Ferrum College's profile and the college would likely be ineligible to participate. As the campus had a monthly aggregate (peak) load of 2,125 kW in Sept. 2014, which is greater than proposed parameters of 250-2,000 kW, Ferrum College might be ineligible to participate in APCo's rider program. The methodology for determining eligibility in the "Availability and Parameters" section of the filing is unclear, but the greatest monthly load as measured over the past 12 months is assumed.

- 2. Does the timeline allow for CIVC member colleges to participate according to the Solar Market Pathway project timeline?**

It is anticipated that CIVC colleges will issue three requests for proposals (RFP) from 2015-2020. The release of the first RFP is anticipated in late 2015 with construction to be completed by December 31, 2016. The release of the second RFP is anticipated in late 2016 with construction to be completed by December 31, 2017. The completion date for the second RFP does not align with the proposed program enrollment end date of June 1, 2017. Thus, colleges would only have one opportunity to participate in the program unless the end date is extended to December 31, 2017.

- 3. What is the relation between the rider program and net metering?**

If a customer were to participate in APCo's rider program, according to the filing the customer would automatically be ineligible to use APCo's net metering tariff at a later date. This is of concern because the proposed window of program enrollment is relatively short (would end June 1, 2017 or earlier) compared to the 20-year term of the program. Thus, if a customer wanted to install a second phase of solar photovoltaic arrays in the next 20 years, they would have no way to do this and receive compensation for the energy generated. This is important for Ferrum College, as their campus is estimated to be able to accommodate approximately 2.61 MW of on-site solar PV capacity, which is beyond the cap that would be imposed by APCo of the college's load as measured over the past 12 months (min of 1,403 kW; max of 2,125 kW). As such, the terms of the proposed rider would preclude the college from fully realizing its solar potential.

- 4. Might there any unforeseen issues with the proposed PPA contract structure?**

Customers and solar vendors may have concerns about privacy and confidential business information being revealed to the utility through APCo's proposed role as a middleman in what would normally be a privately negotiated contract between a customer and a third-party PPA provider. The PPA provider would likely have more concerns with revealing proprietary information to the utility. The only information that APCo should need to execute the rider program is the energy generation and real power output data from the solar monitoring system.
- 5. Would an average customer be able to clearly understand details of the rider structure?**

The methodology of the credit mechanism under the rider program would likely be too complex for customers to comprehend without spending a significant amount of time analyzing the information on a monthly basis. This is contrary to net metering tariffs, which are extremely simple for customers to understand. College and university staff resources are already spread thin and any additional requirement of increased workload to analyze the credit mechanism data could discourage participation. Further, this complex methodology appears to drive
- 6. Does the \$30/month program charge seem appropriate?**

The need for the proposed \$30/month program charge may be necessitated in large part to the unusual approach APCo is proposing for the credit mechanism portion of the rider. This unusual approach complicates the utility's billing calculations, which in turn leads to at least some of the costs to administer the program that is intended to be recovered through the monthly program charge. This program charge would total thousands of dollars over the 20-year program term and may make participation in the rider program less attractive to the customer.

Assessing Potential Opportunities

- 7. Is there any benefit to aggregating multiple meters across campus?**

For many colleges, there are multiple meters spread out across campus. The option to aggregate all meters would potentially help avoid physical challenges associated with multiple solar arrays and multiple points of connection. Meter aggregation could support a participating customer to increase their solar PV system size and associated energy offset. However, there are benefits to not aggregating all meters. If a customer with a load of over 5MW were to aggregate half of their load to one meter and the other half to a second meter, then both meters should be able to participate in the rider program and be eligible for a maximum solar PV capacity limit of 2MW each. This would allow a customer to achieve 4MW of solar PV deployment total, rather than 2MW if all meters were aggregated under one meter.
- 8. Is there any benefit of the rider program cap being set at 2MW, as opposed to the 1MW cap for a net metering tariff?**

Yes, current state law limits any account participating in a net metering tariff to not exceed 1MW, which would cause many colleges to not achieve the full solar energy generation potential of their campuses. By participating in APCo's rider program, the customer would be able to install twice the amount of solar PV capacity. However, the solar energy is valued differently under the net metering and proposed rider tariffs and the financial cost/savings would need to be modeled and compared in order to know which is a better deal for the customer.

9. Would the rider provide any benefit to the utility related to the EPA's Clean Power Plan?

No. The rider states that the participating customer retains rights to environmental attributes of the solar power, which are called renewable energy certificates (or credits). Thus, APCo would not be able to claim that a participating customer's solar power is helping to reduce its greenhouse gas emissions rate.

Assessing Potential Risks

10. What would be the estimated annual cost/savings to Ferrum College if the rider were approved?

The sample bill calculation provided by APCo suggests a high likelihood of near-term bill increases under the proposed credit mechanism for the month of July. When a student-led research team expanded the model on an annual basis using Ferrum College's actual data, it found that the college would incur an estimated annual net cost of over \$38,000 if it were to participate in APCo's proposed rider. Furthermore, there is no guarantee that the annual net cost will not escalate in future years.

11. Which of the three parties in a PPA contract would assume the most/least risk?

Under APCo's proposed rider structure, the third-party PPA provider is assured that it will be paid the full negotiated price for all solar energy generation, while APCo and non-participating customers are completely insulated from any and all lost revenues or lost contributions to fixed costs.

12. What risks might be borne by a college's Chief Financial Officer?

Like all businesses, higher education institutions rely on the ability to forecast expected revenue and expenses in order to make informed decisions regarding long-term planning and operations. APCo's rider program makes the savings from solar energy virtually impossible for customers to predict over the next 20 years, which negates one of the principle attractions of a PPA. Given the increasingly challenging financial environment faced by private colleges in Virginia, this would likely be problematic for a college.

Potential Concerns Regarding Solar Valuation Methodology

13. Is the potential scale of rate impact to other customers significant enough to justify the need for the complex customer credit methodology as an alternative to net metering?

Utilities generally recover most or all of their fixed costs from non-residential customers through a demand (\$/kW) charge. This is the case for CICV customers in APCo's service territory. Non-residential customers, including CICV member colleges, would still pay for their "share" of the utility's fixed costs under a net metering tariff, because they would continue to pay demand charges based on their net demand served by the utility. However, the contribution to fixed costs that is lost due to net metering remains extremely small as long as a small portion of the customer base is net metering. Many net metering tariffs minimize this potential problem by putting a cap on the level of customer participation, including APCo's current net metering tariff.

14. Is any credit given for the energy lost during transit from the source to the customer?

No, under the proposed customer credit methodology, APCo does not provide a credit determinant for the value of avoided line losses. While average line losses are in the range of 6-10% on most U.S. utility grids, they increase exponentially as power lines become heavily loaded. Marginal line losses at peak periods can be as much as 20 percent, according to the Regulatory Assistance Project.¹ This is relevant and important because APCo normally has to purchase at least 6% more than one MWh of energy on the wholesale energy market to serve one MWh of end user load, or in other words the utility avoids purchasing at least 1.06 MWh for each MWh generated on-site by a solar customer.

15. How does APCo's customer credit methodology compare to the valuation of solar energy methodologies in other electricity markets across the country?

The Maine Public Utilities Commission found that the total value of distributed solar generation was 18.2 cents per kWh, while the market value of avoided energy, generation capacity, and transmission capacity was only 9.0 cents/kWh. This suggests that the methodology proposed by APCo could be undervaluing solar generation by as much as 50 percent.²

16. Does the proposed rider program provide enough benefit to participating customers to encourage significant program enrollment?

From a financial perspective, a primary attraction of power purchase agreements is that customers can predict their energy costs over a long-term, typically 20-year planning horizon through an agreed upon fixed rate. APCo's approach to calculating the customer credit makes the value virtually impossible for customers to predict, thereby denying one of the biggest benefits of a PPA. This uncertainty, combined with the likelihood of near-term bill increases under the proposed customer credit methodology, would likely discourage customers from enrolling in the proposed rider.

From an environmental perspective, the rider claims to enable participating customers who wish to be "green" to have that generation located at their site in order to demonstrate

¹ Regulatory Assistance Project. "Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserves," August 2011. <http://www.raponline.org/document/download/id/4537>.

² Maine Public Utilities Commission. *Maine Distributed Solar Valuation Study*. April 2015. Available at: http://www.maine.gov/mpuc/electricity/elect_generation/documents/MainePUCVOS-ExecutiveSummary.pdf.

environmental stewardship. However, the structure of the proposed rider program would provide no real environmental benefit because the customer would be forced sell the environmental attributes (RECs) of the solar PV system in order to minimize their projected additional annual costs. For these reasons, this rider RPG is unlikely to be attractive or beneficial for prospective customers.