BEFORE THE

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UTILITIES COMMISSION

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IN THE MATTER OF IDAHO POWER COMPANY'S APPLICATION TO IMPLEMENT SOLAR INTEGRATION RATES AND CHARGES.	))))))))	CASE NO. IPC-E-14-18

DIRECT TESTIMONY OF RICK STERLING

IDAHO PUBLIC UTILITIES COMMISSION

OCTOBER 23, 2014

Q. Please state your name and business address for the record.

A. My name is Rick Sterling. My business address is 472 West Washington Street, Boise, Idaho.

Q. By whom are you employed and in what capacity?

A. I am employed by the Idaho Public Utilities Commission as the Engineering Supervisor.

Q. What is your educational and professional background?

A. I received a Bachelor of Science degree in Civil Engineering from the University of Idaho in 1981 and a Master of Science degree in Civil Engineering from the University of Idaho in 1983. I worked for the Idaho Department of Water Resources Energy Division from 1983 to 1994. In 1988, I became licensed in Idaho as a registered professional Civil Engineer. I began working at the Idaho Public Utilities Commission in 1994. My duties at the Commission include analysis of a wide variety of electric and large water utility applications. In addition, I lead the Engineering Section and supervise a staff of engineers and utility analysts.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to discuss Idaho Power's request to implement solar integration rates and

charges. I discuss the Company's 2014 Solar Integration Study upon which the request is based, my participation in and the role of the Study's Technical Review Committee, and Idaho Power's proposal to apply solar integration charges as a component of Schedule 87.

Q. Do you believe there are costs associated with integration of solar generation resources on Idaho Power's system?

A. Yes, I believe there are integration costs associated with all intermittent resources, including solar, because they require Idaho Power to increase the reserves that must be carried as well as modify how it dispatches its other resources. The utility strives to dispatch its resources in an optimum, least cost manner while still maintaining reliability, and any change in an optimum dispatch imposes additional costs. In addition, operating reserves must be provided from other resources capable of increasing or decreasing dispatchable generation to accommodate rapid changes in non-dispatchable solar generation.

Q. Why does holding greater operating reserves impose additional costs on the utility?

A. Any resource that must be held in reserve cannot be economically dispatched. That means that a higher cost mix of resources must sometimes be utilized, therefore

increasing power supply costs.

Q. Doesn't Idaho Power already have the capability and existing resources to provide the balancing reserves necessary to integrate intermittent resources such as solar and wind?

A. Idaho Power certainly already has existing hydro and thermal generation resources that can integrate a substantial amount of intermittent generation. In fact, there is already approximately 576 MW of Public Utility Regulatory Policies Act (PURPA) wind generation being integrated now, and according to Idaho Power, there is already 60 MW of approved solar contracts in Oregon and 380 MW of new solar generation seeking contracts in Idaho.

However, as more intermittent solar and wind generation is added to the utility's system, increasing amounts of dispatchable hydro and thermal generation must be held in reserve, forcing Idaho Power to employ a more expensive mix of resources to meet load. At some point, Idaho Power's capacity to integrate intermittent generation will be exhausted and additional dispatchable resources may need to be added. In the meantime, existing resources must simply be held in reserve or dispatched in a more costly, less than optimum manner.

Q. Do you believe it is reasonable that integration costs associated with solar generation be paid by the

owners of the solar generation facilities, rather than by ratepayers?

A. Yes, I do. The solar integration charges proposed to be implemented in this case would be applied to PURPA Qualifying Facilities (QFs). As required by PURPA, avoided cost rates are intended to be set in such a way so that the utility is indifferent as to whether it purchases power from the QF or obtains the power from another source, including its own generation. Regardless of whether the utility obtained the power from another source or generated the power itself, it would almost certainly come from a fully dispatchable source for which there would be no associated integration costs. In order for the utility and its ratepayers to remain indifferent, costs of integration should rightfully be borne by the owners of the non-dispatchable resources.

Q. Have integration charges been included before in any solar PURPA contracts in Idaho?

A. No, they have not. The Commission has previously approved two solar PURPA contracts, but both contracts were subsequently terminated. Neither of the two terminated contracts contained an integration clause. In Grand View Solar I (Case No. IPC-E-10-17), the Commission noted that the contract executed in 2010 did not include a solar integration adjustment, but agreed

with Staff's comments that insufficient data existed to calculate an integration adjustment at that time. In a subsequent 2011 Interconnect Solar case (Case No. IPC-E-11-10), the Commission acknowledged that there is likely some level of integration costs associated with all intermittent resources such as wind and solar and that such factors should be considered in future power purchase agreements.

Q. Has the Commission made other recent statements regarding solar integration charges?

A. Yes. In Case No. IPC-E-14-09 Idaho Power filed a petition requesting that the Commission immediately issue an order temporarily suspending the utility's obligation to purchase energy from solar-powered QFs pending the Company's completion of its 2014 Solar Integration Study. Although the Commission declined to suspend Idaho Power's obligation, it did "direct the utility and its counterparties that their negotiations in pursuit of solar contracts using the IRP methodology should include consideration of a solar integration charge." (Order No. 33043 at 7). The Commission further stated "Our guidance to the negotiating parties is based in part on PURPA's requirements that avoided cost rates be just and reasonable to the utility's ratepayers and in the public interest. As in the case of wind QFs, utilities

incur costs when they must integrate intermittent QF resources into their generation resource stack." *Id.* Finally, the Commission stated, "...we believe that Idaho Power's filing has reinforced our previous view that integration charges should be a part of PPAs, and has adequately demonstrated that there is a pressing need to address the issue of solar integration charges in solar PPAs under consideration by negotiating parties." *Id.* at 8.

Q. Do you believe that the Commission's statements in Case No. IPC-E-14-09 which you just discussed are relevant in this case?

A. Yes, I do. I think the Commission's prior statements are an indication that it believes there are integration costs associated with solar generation and that they should be included in all new solar contracts. Now that Idaho Power has completed its 2014 Solar Integration Study and quantified the costs, solar integration charges can be included in contracts and not be entirely subject to negotiation.

Q. Have you reviewed the 2014 Solar Integration Study and Report submitted by Idaho Power on June 17, 2014 in Case No. IPC-E-14-09, and presented as Exhibit No. 1 to the Direct Testimony of Philip DeVol in support of the Company's Application in this case?

A. Yes, I have reviewed the report.

Q. Do you believe methods and model used by Idaho Power to estimate solar integration costs are reasonable?

A. Yes, I do. For its study, Idaho Power utilized a production cost simulation model which it developed in-house that dispatches the Company's own resources while also accepting intermittent solar and wind generation. Except for the introduction of solar generation, it is my understanding that the model has been adapted from the same model used for the Company's wind integration studies.

Q. Do you believe that the scenarios considered in the Solar Integration Study were reasonable?

A. Yes, I do. Four build-out scenarios were studied ranging from 100 to 700 MW, with development dispersed amongst six sites throughout Idaho Power's service territory. The scenarios were developed in consultation with the Technical Review Committee, based upon the committee members' and Idaho Power's experience and expectations of future solar development. Because several hundred megawatts of development have already been proposed at various locations, speculation about likely development scenarios was minimal.

Q. Idaho Power's 2014 Solar Integration Study Report presents integration costs as both "average

integration costs per MWh" and as "incremental integration costs per MWh." Can you explain the difference between the two?

A. "Average integration costs per MWh" is intended to reflect the costs that would be incurred if all costs at each penetration level were spread equally across all MWhs of solar generation; in other words, the costs that would be attributable to all MWHs if costs were assigned equally to all MWhs. Incremental integration cost per MWh is intended to reflect costs attributable to each increment of solar generation. Incremental integration costs assume early projects are assessed lower integration costs and later projects higher costs to reflect the higher cost of integration as larger amounts of solar are added to the system.

Q. Which set of costs, average or incremental, do you believe should be applied if solar integration costs are approved by the Commission?

A. Under an average approach, costs would be imposed equally to all solar generation. Under an incremental approach, increasingly higher integration costs would be charged as solar generation increased. Because each additional increment of generation caused higher integration costs, new generation would pay higher integration charges. I support the incremental approach

proposed by Idaho Power for two primary reasons. First, I believe it is fair for the earliest solar projects to be the beneficiaries of lower integration costs and to not have to share in covering higher costs caused by later projects. Second, I think an average approach would be very difficult to administer because it would likely require charges for existing contracts to be periodically increased so that all integration costs could be fully recovered by the utility.

Q. Did you participate in the Technical Review Committee?

A. Yes, I did.

Q. What role did you play on the Technical Review Committee?

A. I was considered an "observer" rather than a full member of the review committee. As an observer, I was invited to attend all committee meetings, ask questions, participate fully in discussions, and offer suggestions. The only thing I did not do was comment on the draft report. I believed that it would not be necessary or appropriate to comment on the draft report knowing that I would likely be responsible for submitting comments or testimony at a later date in a formal case. Two staff members from the Oregon Public Utility Commission also participated as observers, although they

did not attend any committee meetings in person or actively participate in discussions.

Q. Do you believe the Technical Review Committee was useful?

A. Yes, I believe it was very useful. Each of the Technical Review Committee members offered expertise and different points of view that helped influence how Idaho Power performed the study.

Q. Do you believe Idaho Power seriously listened to members of the Technical Review Committee?

A. Yes, I do. I believe many decisions Idaho Power made about assumptions and methods of analysis were based in large part on input provided by the committee. Committee members were also instrumental in advising the Company on sources of data, as well as in constructing realistic scenarios for the size and locations of possible future development.

Q. Can you give an example?

A. Yes, I can. At one of the first committee meetings, I raised questions about whether solar irradiance data collected at a single point would be representative over a much broader area encompassed by a typical large photovoltaic project, due to cloud cover potentially affecting only portions of the project but not others. This prompted another committee member to suggest

Idaho Power investigate "wavelet variability modeling" that was being researched at other places in the country. After investigating the research, Idaho Power adapted and incorporated the modeling techniques for its own study. By using wavelet variability modeling, the impacts of partial cloud cover were moderated, indicating fewer reserves were needed for integrating solar.

Q. Do you believe members of the Technical Review Committee had adequate opportunity to comment?

A. Yes, at least initially. In the early stages of the process, the Technical Review Committee met three times as the study progressed. One public workshop was also held. However, in the final production cost modeling stage of the study, and once the draft report was prepared, Idaho Power greatly expedited the process. Idaho Power maintained that there was an urgency to complete the study because the Company was being inundated with requests for new solar projects and it wanted to be able to address integration costs in any new contracts that might emerge. The Technical Review Committee met twice over about a two week period, just prior to the draft report being prepared. While Technical Review Committee members could still provide input and ask questions, they sometimes had to do it using email or phone calls. In addition, the two week time period

allotted for review of the draft report prior to submitting it to the Commission seemed quite short.

Q. Do you believe there is a need for additional study of solar integration by Idaho Power in the future?

A. Yes, I do. The Technical Review Committee raised numerous issues that I believe would be worthwhile to investigate further in subsequent integration studies. Many of those issues have been identified in the Solar Study. I see the 2014 Solar Integration Study as a reasonable first step, but believe further improvements to future studies are possible. In the meantime, however, I believe the 2014 Solar Study is a reasonable basis for the solar integration charges proposed in Schedule 87.

Q. Idaho Power proposes to apply the results of its solar integration study as tariff-based charges applied to all energy generated by PURPA Qualifying Facilities, i.e., Schedule 87. Do you agree with the tariff approach proposed by the Company?

A. Yes. Idaho Power's approach as proposed in Schedule 87 is identical to the approach proposed for wind integration charges. Schedule 87 for wind integration charges was recently approved by the Commission in Order No. 33150 issued on October 10, 2014.

Q. Idaho Power's proposed solar integration tariff includes options for the charges to be either levelized or

non-levelized. Do you agree that both options should be offered?

A. Yes, both levelized and non-levelized avoided cost rates are offered, and both are also provided for wind integration charges. To be consistent, levelized and non-levelized options should also be offered for solar integration charges.

Q. Have the integration charges been properly levelized in your opinion?

A. Although Idaho Power has correctly levelized the charges mathematically, I prefer that the discount rate used to perform the levelization be the same as the discount rate use in the SAR model. In addition, in recently approving wind integration charges for Idaho Power (See Order No. 33150), the Commission accepted Staff's recommendation to use the same discount rate for levelizing wind integration charges as is used in the SAR model. For consistency sake, I believe the same discount rate should be used for levelization of solar integration charges, wind integration charges, and avoided cost rates for PURPA projects. That discount rate is currently 8.18 percent. It represents Idaho Power's weighted cost of capital from its last litigated general rate case, IPC-E-08-10, Order No. 30722.

Q. Have you prepared an exhibit showing what the

levelized solar integration charges would be if an 8.18 percent discount rate were used?

A. Yes, those integration charges are attached as Exhibit No. 101.

Q. Does changing the discount rate have a big impact on the levelized solar integration charges?

A. No, the difference is very small, in part, because the proposed integration charges are relatively low. For example, for a penetration level of 501-600 MW and a 2014 online date, the difference is a decrease of $0.06 per MWh. Despite the small differences, however, Staff believes consistency throughout the levelization process for both integration charges and avoided cost rates is important and helps minimize uncertainty.

Q. Do you believe it is reasonable to impose solar integration charges now on QFs, knowing it is likely that integration operational practices and technology will improve in the future?

A. Yes, I believe it is reasonable. No one can really be certain how or when technology might change. For example, energy storage technology will likely improve and costs are bound to come down, but it is not possible to know if that will happen soon or many years in the future. Similarly, operational practices and market changes may develop, making integration of intermittent

generation easier and cheaper. At the same time, however, the penetration of intermittent generation, particularly solar, is likely to increase rapidly, presenting even greater integration challenges. I believe that in the same way we must make our best effort to estimate avoided cost rates 20 or more years into the future, that we must also do the same to estimate integration costs.

Q. How do you suggest that Idaho Power accommodate changes to solar integration charges going forward?

A. As solar integration costs change in the future and based on updated integration studies, I recommend that Idaho Power make application to the Commission for changes to Schedule 87, just as it does for its other tariffs. Under Idaho Power's proposal, however, the integration charges that are in effect at the time a contract is signed will remain unchanged for the duration of the contract. The new, revised integration charges will only apply to new contracts.

Q. Idaho Power recently received approval in Order No. 33150 for a wind integration tariff. Is the Company's proposed solar integration tariff similar?

A. Yes, Idaho Power proposes to incorporate both wind and solar integration charges in Schedule 87. The format and application of the solar integration charges would be identical to that of the approved wind

integration charges. The only difference would be in the numbers themselves.

Q. Do you believe it is important to implement a solar integration charge as soon as possible, or should the Commission wait until there are actual solar generation facilities on Idaho Power's system?

A. I believe solar integration charges should be implemented as soon as possible, before there are many solar facilities operating. Idaho Power has recently signed six PURPA contracts for 60 MW in Oregon. There are currently two proposed large solar PURPA contracts in Idaho pending before the Commission that contain negotiated provisions for integration charges. One contract is for an 80 MW facility and the other is for a 40 MW facility. In addition, Idaho Power is currently seeking approval of 11 PURPA solar contracts comprising 281 MW of capacity, each of which contain integration charges negotiated pursuant to the Commission's directive in Order No. 33043. The negotiated rates are similar to those in the proposed Schedule 87. The longer we wait before imposing integration costs on intermittent generators, the more integration cost will be borne by ratepayers.

Q. What is your recommendation in this case?

A. I recommend that the Commission issue an order adopting solar integration charges as proposed by Idaho

Power, with the exception that the levelized solar integration charges be computed using the same discount rates used to levelize the utility's wind integration charges and to levelize avoided cost rates in the SAR methodology.

Q. Does this conclude your direct testimony in this proceeding?

A. Yes, it does.

0 - 100 MW Solar Capacity Penetration Level

LEVELIZED	
ON-LINE YEAR	20 YEAR CONTRACT TERM LEVELIZED RATES
2014	0.54
2015	0.56
2016	0.58
2017	0.59
2018	0.61
2019	0.63

NON-LEVELIZED	
CONTRACT YEAR	NON-LEVELIZED RATES
2014	0.43
2015	0.44
2016	0.46
2017	0.47
2018	0.48
2019	0.50
2020	0.51
2021	0.53
2022	0.54
2023	0.56
2024	0.58
2025	0.60
2026	0.61
2027	0.63
2028	0.65
2029	0.67
2030	0.69
2031	0.71
2032	0.73
2033	0.75
2034	0.78
2035	0.80
2036	0.82
2037	0.85
2038	0.87
2039	0.90

101 - 200 MW Solar Capacity Penetration Level

LEVELIZED	
ON-LINE YEAR	20 YEAR CONTRACT TERM LEVELIZED RATES
2014	1.49
2015	1.53
2016	1.58
2017	1.63
2018	1.68
2019	1.73

NON-LEVELIZED	
CONTRACT YEAR	NON-LEVELIZED RATES
2014	1.18
2015	1.22
2016	1.25
2017	1.29
2018	1.33
2019	1.37
2020	1.41
2021	1.45
2022	1.50
2023	1.54
2024	1.59
2025	1.63
2026	1.68
2027	1.73
2028	1.79
2029	1.84
2030	1.89
2031	1.95
2032	2.01
2033	2.07
2034	2.13
2035	2.20
2036	2.26
2037	2.33
2038	2.40
2039	2.47

201 - 300 MW Solar Capacity Penetration Level

LEVELIZED	
ON-LINE YEAR	20 YEAR CONTRACT TERM LEVELIZED RATES
2014	2.32
2015	2.39
2016	2.46
2017	2.54
2018	2.61
2019	2.69

NON-LEVELIZED	
CONTRACT YEAR	NON-LEVELIZED RATES
2014	1.84
2015	1.89
2016	1.95
2017	2.01
2018	2.07
2019	2.13
2020	2.20
2021	2.26
2022	2.33
2023	2.40
2024	2.47
2025	2.55
2026	2.62
2027	2.70
2028	2.78
2029	2.87
2030	2.95
2031	3.04
2032	3.13
2033	3.23
2034	3.32
2035	3.42
2036	3.52
2037	3.63
2038	3.74
2039	3.85

301 - 400 MW Solar Capacity Penetration Level

LEVELIZED	
ON-LINE YEAR	20 YEAR CONTRACT TERM LEVELIZED RATES
2014	3.12
2015	3.22
2016	3.32
2017	3.41
2018	3.52
2019	3.62

NON-LEVELIZED	
CONTRACT YEAR	NON-LEVELIZED RATES
2014	2.48
2015	2.55
2016	2.63
2017	2.71
2018	2.79
2019	2.87
2020	2.96
2021	3.05
2022	3.14
2023	3.23
2024	3.33
2025	3.43
2026	3.53
2027	3.64
2028	3.75
2029	3.86
2030	3.97
2031	4.09
2032	4.22
2033	4.34
2034	4.47
2035	4.61
2036	4.75
2037	4.89
2038	5.03
2039	5.19

401 - 500 MW Solar Capacity Penetration Level

LEVELIZED	
ON-LINE YEAR	20 YEAR CONTRACT TERM LEVELIZED RATES
2014	3.94
2015	4.06
2016	4.18
2017	4.31
2018	4.44
2019	4.57

NON-LEVELIZED	
CONTRACT YEAR	NON-LEVELIZED RATES
2014	3.12
2015	3.22
2016	3.31
2017	3.41
2018	3.52
2019	3.62
2020	3.73
2021	3.84
2022	3.96
2023	4.08
2024	4.20
2025	4.32
2026	4.45
2027	4.59
2028	4.72
2029	4.87
2030	5.01
2031	5.16
2032	5.32
2033	5.48
2034	5.64
2035	5.81
2036	5.98
2037	6.16
2038	6.35
2039	6.54

501 - 600 MW Solar Capacity Penetration Level

LEVELIZED	
ON-LINE YEAR	20 YEAR CONTRACT TERM LEVELIZED RATES
2014	4.76
2015	4.91
2016	5.05
2017	5.21
2018	5.36
2019	5.52

NON-LEVELIZED	
CONTRACT YEAR	NON-LEVELIZED RATES
2014	3.78
2015	3.89
2016	4.01
2017	4.13
2018	4.25
2019	4.38
2020	4.51
2021	4.64
2022	4.78
2023	4.93
2024	5.07
2025	5.23
2026	5.38
2027	5.55
2028	5.71
2029	5.88
2030	6.06
2031	6.24
2032	6.43
2033	6.62
2034	6.82
2035	7.02
2036	7.24
2037	7.45
2038	7.68
2039	7.91

601 - 700 MW Solar Capacity Penetration Level

LEVELIZED	
ON-LINE YEAR	20 YEAR CONTRACT TERM LEVELIZED RATES
2014	5.54
2015	5.71
2016	5.88
2017	6.06
2018	6.24
2019	6.43

NON-LEVELIZED	
CONTRACT YEAR	NON-LEVELIZED RATES
2014	4.39
2015	4.53
2016	4.66
2017	4.80
2018	4.95
2019	5.09
2020	5.25
2021	5.40
2022	5.57
2023	5.73
2024	5.91
2025	6.08
2026	6.26
2027	6.45
2028	6.65
2029	6.85
2030	7.05
2031	7.26
2032	7.48
2033	7.70
2034	7.94
2035	8.17
2036	8.42
2037	8.67
2038	8.93
2039	9.20

CERTIFICATE OF SERVICE

I HEREBY CERTIFY THAT I HAVE THIS 23rd DAY OF OCTOBER 2014, SERVED THE FOREGOING **DIRECT TESTIMONY OF RICK STERLING,** IN CASE NO. IPC-E-14-18, BY MAILING A COPY THEREOF, POSTAGE PREPAID, TO THE FOLLOWING:

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