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BEFORE THE ARIZONA CORPORATION COMMISSION

Bob Stump, Chairman
Gary Pierce, Commissioner
Brenda Burns, Commissioner
Bob Burns, Commissioner
Susan Bitter Smith, Commissioner

IN THE MATTER OF THE APPLICATION OF ARIZONA PUBLIC SERVICE COMPANY FOR APPROVAL OF NET METERING COST SHIFT SOLUTION.	Docket No. E-01345A-13-0248

PROTEST OF THE INTERSTATE RENEWABLE ENERGY COUNCIL, INC.

Pursuant to A.A.C. R14-3-106, the Interstate Renewable Energy Council, Inc. (IREC) hereby protests the Application of Arizona Public Service Company (APS) for Approval of Net Metering Cost Shift Solutions, filed with the Arizona Corporation Commission (Commission) on July 12, 2013 (Application). Concurrently with this Protest, IREC is filing an Application for Leave to Intervene in this proceeding.

As stated in our Application for Leave to Intervene, IREC is a 501(c)(3) non-profit organization whose goal is to enable greater use of clean energy in a sustainable way by (1) introducing regulatory policy innovations that empower consumers and support a transition to a sustainable energy future, (2) removing technical constraints to distributed energy resource integration, and (3) developing and coordinating national strategies and policy guidance to provide consistency on these policies centered on best practices and solid research. The scope of IREC's work includes expanding programs that facilitate consumers' ability to host a renewable energy system to directly self-supply energy needs or sell energy, for example via net metering. As part of this work, IREC been involved across the United States in discussions and proceedings regarding the valuation of

distributed generation.

Under R14-3-106, "a person who may be adversely affected by an application" may file a written protest with the Commission. APS' Application, as well as the study from SAIC Energy, Environment and Infrastructure, LLC (SAIC) associated with it, will have a direct impact on IREC's work on the costs and benefits of distributed generation, and net metering policies. Currently, as APS notes in its Application, these issues are receiving heightened attention nationally as state policymakers and other stakeholders consider how to facilitate renewable energy going forward.[1] Stakeholders in other states will be watching this proceeding and consequently it will influence IREC's ability to work on these issues in other states, potentially adversely. We therefore have a substantial interest in ensuring that this proceeding results in a fair assessment of the costs and benefits of distributed generation, specifically solar photovoltaic (PV) generation, and a net metering program at APS that accurately reflects that assessment.

IREC agrees with the Solar Energy Industries Association (SEIA), however, that in this case the evaluation of APS' net metering program should occur in a separate ratemaking docket. IREC supports the Protest filed by SEIA in this docket on August 20, 2013, which raises significant legal issues with respect to the APS' proposed changes to its net metering program in the Application. IREC urges the Commission to reject APS' Application and to defer discussion of is proposals to a future general rate case.

Although IREC firmly supports SEIA's proposal, we nonetheless provide some additional commentary here to inform the Commission's understanding of the two studies in this docket, and its thinking more generally with respect to the benefits and costs of net metering in Arizona. To assist us in doing so, IREC has retained Clean Power Research (CPR) to evaluate the two studies presently in the docket: the SAIC study mentioned above and a study from Crossborder Energy. CPR's analysis is attached to this Protest as Exhibit 1. CPR has a 20-year history of solar valuation work, and uses its DGValuator™ tool to quickly model cost effectiveness using utility and location-specific data. In the past two years, CPR has performed or supported ten Value of Solar studies for organizations in five states. Most recently, the Minnesota Public Utilities Commission has contracted with CPR for a customer-sited solar valuation analysis in that state. As CPR's analysis demonstrates, further discussion and analysis is required to obtain a comprehensive understanding of the benefits of costs of distributed solar PV in Arizona, which could inform future changes to solar policy and programs in the State, including net metering.

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[1] *See* Application at 2.

I. APS' Proposals Regarding Net Metering in Its Application Are Properly Addressed in a Future General Rate Case and the Commission Should Reject Its Application in this Docket.

As SEIA correctly points out in its Protest, "the two options that APS offers the Commission result in a significant pool of new money being collected and retained by APS from new NEM customers."[2] As such, APS' proposal to collect more revenue is properly addressed in its next general rate case. IREC strongly supports SEIA's Protest, in particular its suggestion that the Commission reject APS' Application in this docket and address APS' proposed modifications to net metering in its next general rate case, anticipated in mid-2015.

IREC further notes that the memorandum entered into the docket by The Alliance for Solar Choice (TASC) on August 16, 2013 brings up significant tax issues related to one of APS' proposals in its Application, which also necessitate further evaluation. IREC agrees that these issues are important. We believe they should also be discussed in a future ratemaking proceeding, when APS' proposals could be re-opened for evaluation.

II. The SAIC and Crossborder Studies Reach Dramatically Different Results.

While IREC supports SEIA's proposal to defer discussion of APS' proposals in its Application to a future ratemaking proceeding, we nonetheless believe that there is value in properly understanding the two studies already submitted in this docket. Therefore, we provide some additional commentary in this section regarding background on the two studies, and in the following sections on whether or not they are both valid, why they reach such disparate results, and how the Commission might move beyond this disagreement and obtain a useful, neutral data set for future discussion.

To inform discussions in the Technical Conference preceding this Application, APS retained SAIC to update a prior study on the costs and benefits of solar PV.[3] On May 10, 2013, SAIC issued the study, entitled *2013 Updated Solar PV Report* (SAIC Study). In sum, the SAIC concluded that avoided fuel costs represented the largest value that solar PV provides, followed by avoided generation capacity costs, transmission capacity costs and fixed operations and maintenance (O&M) costs.[4] According to the

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[2] SEIA Protest at 6-8.

[3] *See* Application at 11.

[4] SAIC Study at 3-14 – 3-15; *see also* Application at 11 (discussing SAIC study results); Testimony of Gregory L. Bernosky on behalf of Arizona Public Service Company 8- 10 (July 12, 2013) (also discussing SAIC study) [hereinafter Bernosky Testimony].

SAIC study, the present monetary value provided by distributed solar PV is approximately $0.0356 per kilowatt-hour (kWh).[5]

Around the same time, on May 8, 2013, Crossborder Energy released another study, prepared for SEIA, entitled *The Benefits and Costs of Solar Distributed Generation for Arizona Public Service* (Crossborder Study). The Crossborder Study found that solar PV provided value to the APS system through avoided fuel costs, avoided generation capacity costs, avoided ancillary services and capacity reserves costs, avoided transmission and distribution costs, avoided costs of compliance with Arizona's Renewable Energy Standard (RES), and environmental benefits, specifically via reduced emissions of criteria air pollutants and lower use of scarce water resources.[6] In sum, Crossborder estimated that these benefits added up to a 20-year levelized value of $0.215 to $0.237 per kWh.[7]

Even from this brief synopsis, it is apparent that the SAIC and Crossborder studies come to substantially different conclusions, due to the different assumptions made in the studies, as discussed below. Given the disparate results, it is not clear what valuation of solar PV the Commission and stakeholders should use in assessing the benefits and costs of net metering, and any future proposed policy changes. In the following three sections, we describe the results of CPR's neutral validation and assessment of the two studies, and offer a possible path forward for the Commission.

III. Both the SAIC and Crossborder Studies are Valid.

As described in more detail in the attached report, CPR made adjustments to both the SAIC and Crossborder studies' assumptions and inputs in order to validate both studies with its DGValuator tool. CPR found that the SAIC and DGValuator results were within three percent of each other when both were run with comparable assumptions and inputs. Similarly, CPR found that the Crossborder and DGValuator results were within one percent of each other. This demonstrates that both studies are valid, but are based on different sets of inputs and assumptions. The chart on the next page shows the levelized values of solar for the SAIC study (one-year value for 2015), the DGValuator analysis and SAIC study using comparable assumptions and inputs (12-year value), and the DGValuator analysis and Crossborder study using comparable assumptions and inputs (20-year value).

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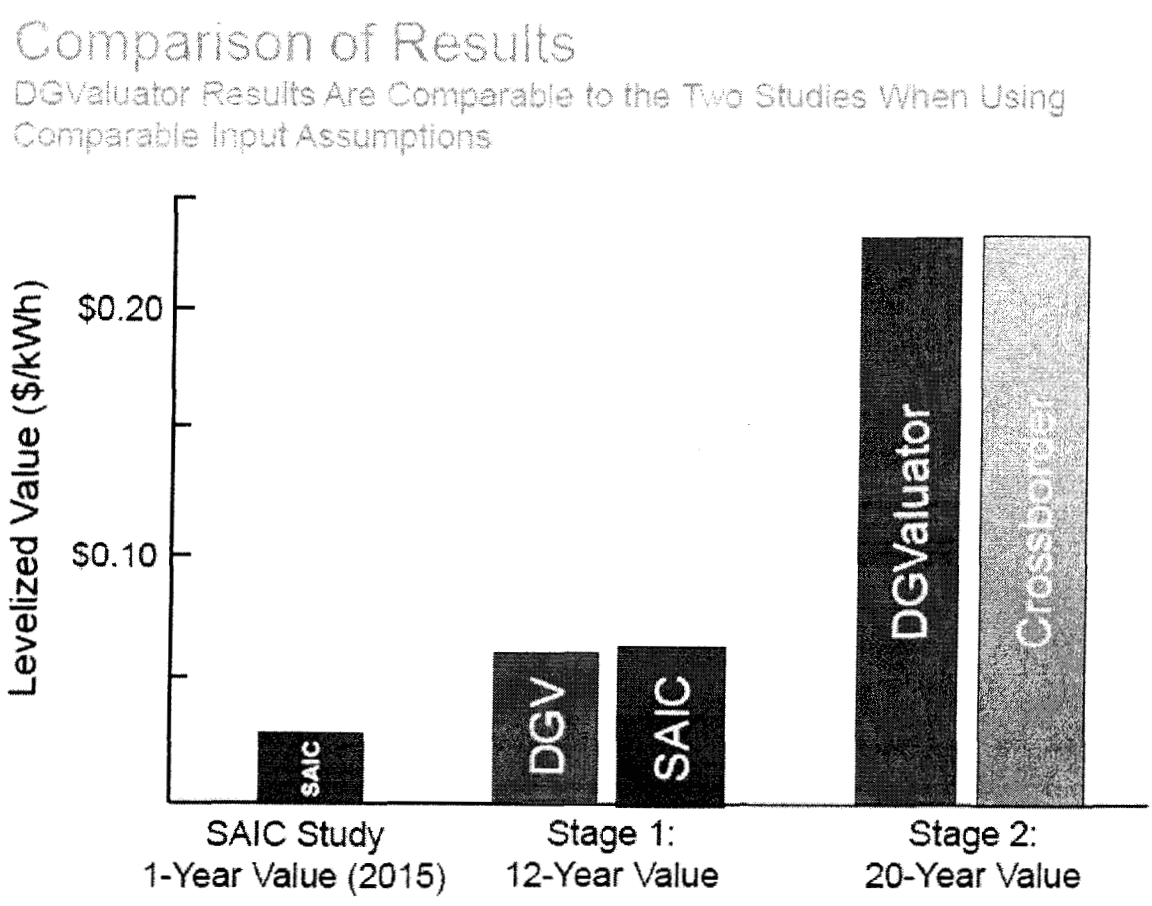
[5] SAIC Study at 3-11; *see also* Bernosky Testimony at 18.

[6] Crossborder Study at 5-14.

[7] Crossborder Study at 2.



IV. The Different Valuations in the SAIC and Crossborder Studies Result from the Different Assumptions and Inputs Used in the Two Studies.

As the graph above illustrates, one of the major differences between the SAIC and Crossborder studies is the timeframe that each uses. The SAIC study relies on one-year snapshot and leads to a short-term value, whereas the DGValuator tool and the Crossborder study rely on levelized, long-term values. In addition, in its analysis, CPR identified a number of different assumptions and inputs built into the SAIC and Crossborder studies, which contribute to their substantially different results. These are summarized in the table below.

In sum, IREC supports SEIA's Protest, and respectfully recommends that the Commission reject APS' Application and defer discussion of its proposals to a future general rate case. We further note that additional analysis will be required to obtain a comprehensive understanding of the benefits of costs of net metering in Arizona. IREC suggests that the Commission rely on a neutral third party to model these benefits and costs, based on a common set of assumptions and inputs developed by the Commission and stakeholders.

Respectfully submitted this 29th of August, 2013.

Estrada-Legal, PC

By _____

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Original and 13 Copies of the foregoing
Filed this 29th day of August 2013 with:

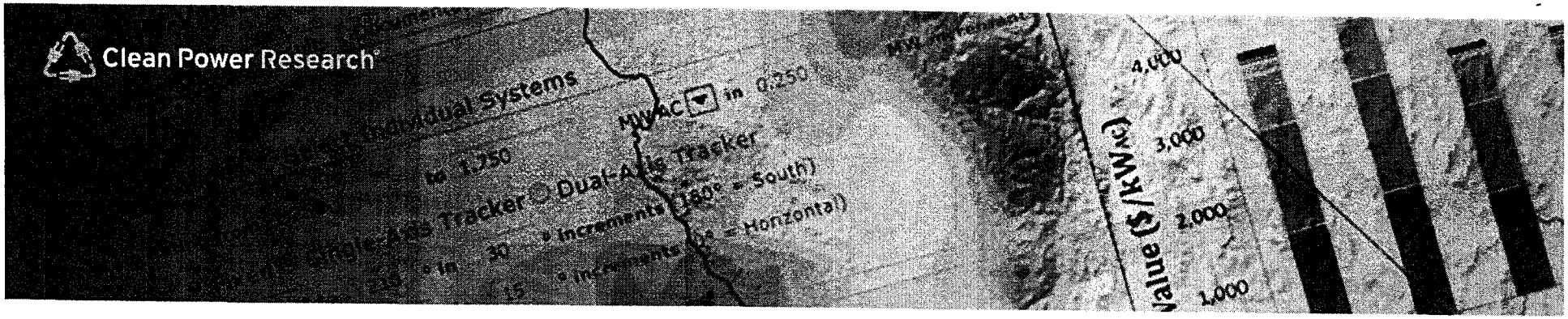
Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

Copies of the foregoing electronically mailed / mailed this 29th day of August 2013 to:

ALL PARTIES OF RECORD

By _____

EXHIBIT 1

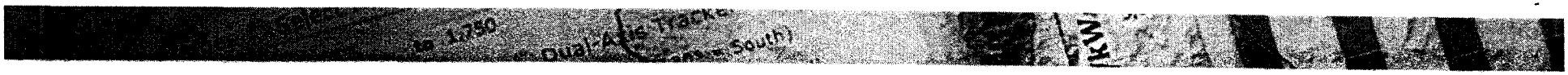


Value of Solar in APS Service Territory

August 11, 2013

Prepared for
Interstate Renewable Energy Council

Prepared by
Clean Power Research



Clean Power Research Disclaimer

- This report was prepared for the Interstate Renewable Energy Council (IREC). The analysis uses data obtained either directly or indirectly from APS, SAIC, and Crossborder Energy, though these organizations have not reviewed this report or its methods.
- This report includes an analysis of utility costs avoided by distributed PV. The analysis does not constitute an endorsement of any of the underlying cost assumptions or the inclusion or exclusion of specific cost or value components.
- Clean Power Research does not recommend any policy positions with respect to the allocation of solar cost or value among parties, including utility rate schedules.

Background (Arizona Public Service)

- APS released a study to quantify the Value of Solar in 2009
- APS is sponsoring a multi-session technical conference on distributed energy and net metering as outlined by the Arizona Corporation Commission
- APS's contractor SAIC has updated the 2009 Value of Solar study as part of this process

Background (Clean Power Research)

- CPR has developed a tool, DGValuator, to quantify the value of distributed generation technologies and systems, including solar
- DGValuator has been designed to satisfy the following criteria:
  - Enable objective and transparent analysis at any level of spatial granularity
  - Facilitate utility cost input data
  - Employ established methodologies
  - Embody solar data and PV simulations for the specific locations, time-synchronized with utility loads
  - Empower end-users

Objective

- IREC desires to provide greater clarity as to the benefits of distributed PV generation in APS service territory
- IREC has contracted with CPR to perform a three-stage Value of Solar study for the APS service territory

Stage 1	Stage 2	Stage 3
Validate DGValuator using SAIC assumptions	Validate DGValuator using Crossborder assumptions	Compare SAIC and Crossborder assumptions using DGValuator

Stage 1	Stage 2	Stage 3
Validate DGValuator using SAIC assumptions	Validate DGValuator using Crossborder assumptions	Compare SAIC and Crossborder assumptions using DGValuator

SAIC Study and DGValuator Software Answer Different Questions

SAIC Study

- Produced value of solar figures for three snapshots in time (2015, 2020, 2025) for varying PV fleet capacity size

- Answers question:

"How much value will the cumulative solar investment provide each year?"

DGValuator

- Produces long-term levelized value of solar for incremental PV fleet investment

- Answers question:

"What long-term rate would compensate PV customers for investing today?"

How Are Results Made Comparable?

- SAIC Study adjustments
  - Present results relative to energy produced by PV
  - Convert SAIC's three "value snapshots" – 2015, 2020, and 2025 – to a 12-year levelized value
- DGValuator adjustments
  - Define "long-term" as 12 years (2014 to 2025)

SAIC Study Adjustment: Present Results Relative to PV Energy Produced by PV

- SAIC calculated the value per unit energy *avoided by generation (this includes both PV generation and loss savings)*
- The present comparison is made instead on the value per unit energy *generated by PV*
- This results in a 7% increase in value as illustrated in the following example:

SAIC Study Result		***Adjusted Result***	
Value per MWh of avoided generation (as presented)		**Re-calculated value per MWh of PV energy produced**	
Incremental MWh (w/Losses)	430,554	Incremental Solar PV Production (MWh)	402,387
Total Nominal Value ($000)	$12,988	Total Nominal Value ($000)	$12,988
Nominal Unit Value ($/MWh)	$30.17	Nominal Unit Value ($/MWh)	$32.28

Example of Adjustment & Levelization: Fuel Savings Value

Year	Utility Savings ($M)	PV Energy (MWh)	Nominal Value ($/MWh)	Discounted ($/MWh)	Levelized Value ($/MWh)	Discounted ($/MWh)
2015	11.8	402,387	29.3	$25.52	$37.12	$32.29
2020	49.6	1,305,771	38.0	$23.32	$37.12	$22.80
2025	132.0	2,562,491	51.5	$22.35	$37.12	$16.10
				$71.19		$71.19

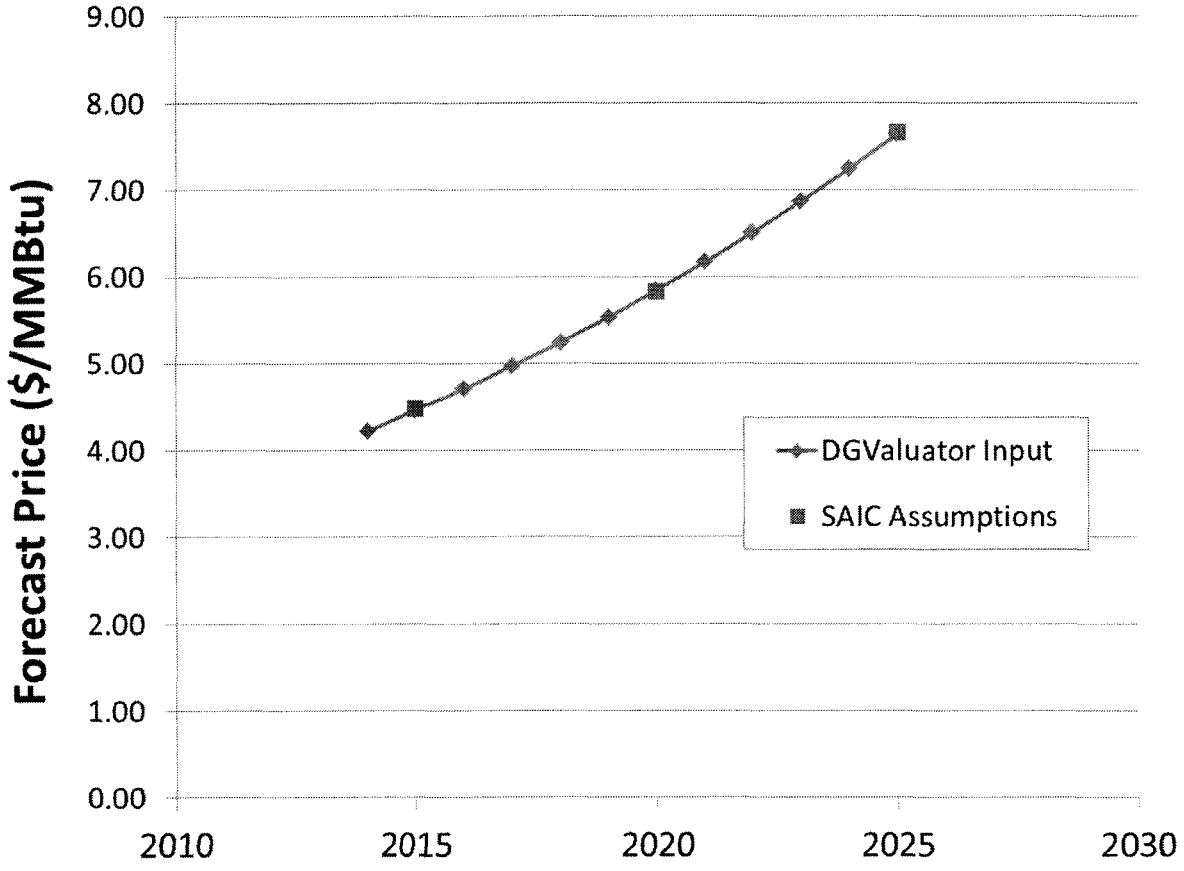
- Let nominal value reflect energy produced by the PV fleet, rather than avoided energy (e.g., 402,387 MWh in 2015)
- Select levelized value such that the discounted levelized value is equal to the discounted nominal value for the three sample years.
- Compare results
  - SAIC levelized fuel savings = $37.12 per MWh ✓
  - DGValuator levelized fuel savings = $37.29 per MWh ✓

Implied Heat Rate

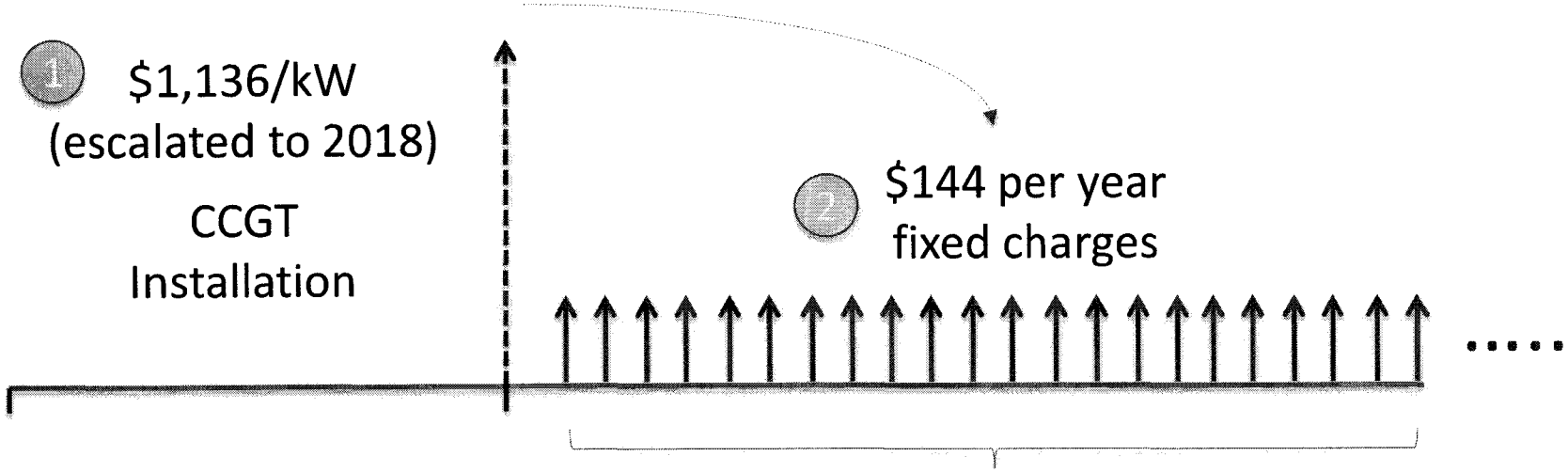
- SAIC Study
  - Fuel savings are calculated using PROMOD simulations
  - Implied 2015 average heat rate is **6120** Btu/kWh based on:
    - $11.8M in calculated fuel savings
    - $4.48 per MMBtu fuel price
    - 430,554 MWh of avoided production (incl. 7% average loss savings)
  - Peaking-unit heat rate is referenced at **9072** Btu/kWh; this figure was not used in this comparison
- DGValuator
  - Uses the solar-weighted average heat rate of 6120 Btu/kWh

Assumed Fuel Prices

Annual fuel prices for DGValuator are scaled to match SAIC values for the three sample years



Capacity cost calculation



$582/kW

Corresponds to SAIC
12-year capacity value

3 Discount fixed charges that overlap with PV life

DGValuator Assumptions: Stage 1

Economic Factors	
Study Period	12 years
Discount rate	7.21%
General escalation rate	2.50%

PV Assumptions	
PV Production Data	2012 SolarAnywhere
PV degradation rate	0.5% per year

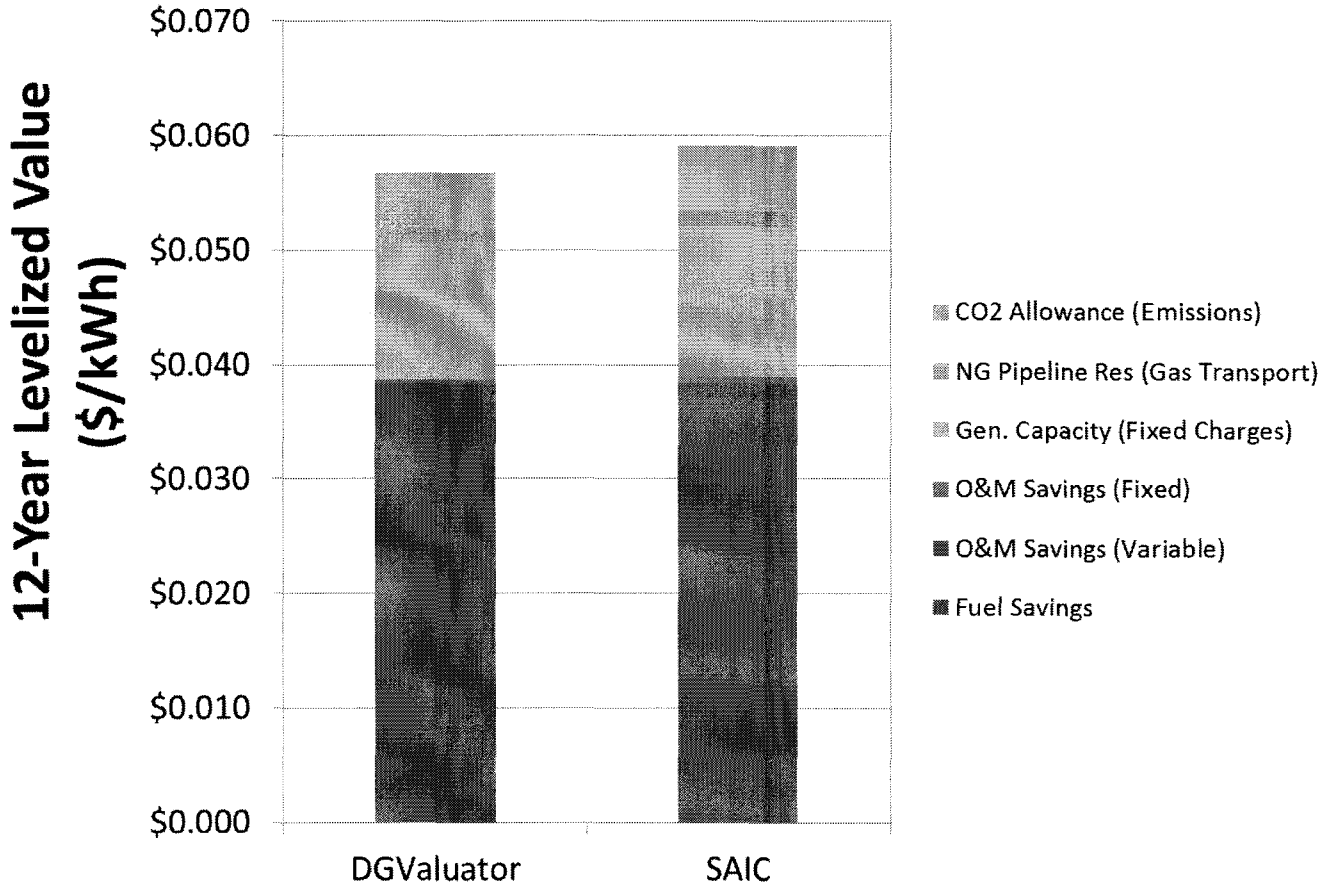
Generation Factors	
Gen capacity cost (installed)	$1136 per kW
Years until capacity needed	5
Fixed charge rate	11.17%
Heat rate (first year)	6120 BTU per kWh
Degradation (per year)	0%
O&M cost (first year) - Variable	$0.77 per MWh
O&M cost escalation rate	2.5% per year

Utility	
PV Capacity	768 MW (2020)
Annual average losses	7%
Loss Condition	3783 MW

NG Wholesale Market Factors	
Fuel	SAIC-compatible fuel prices

Other	
CO2 Allowance Price (Emissions)	$3.77 per MWh
O&M Fixed Cost	$22 per kW (ELCC)
NG Pipeline Res Fee (Transport)	$56 per kW (ELCC)
Fuel Price Hedge Value	Not included
Distribution Value	Not included
Reserve Planning Margin	Not included

Stage 1 Results:
SAIC and DGValuator Results are Within 3%



Stage 1	**Stage 2**	Stage 3
Validate DGValuator using SAIC assumptions	Validate DGValuator using Crossborder assumptions	Compare SAIC and Crossborder assumptions using DGValuator

Calculating comparable assumptions

	Method for calculating comparable DGValuator inputs
Framework	No adjustment needed. Both Crossborder study and DGValuator present long-term levelized value
Fuel Prices	Used Crossborder data
Heat Rate	Calculated seasonally-weighted heat rate from two units designated in report
Capacity Cost, Fixed O&M, Pipeline Reservation Fee, Transmission, Distribution (at 50% impact)	Converted 20 years of annual fixed charges to present value
Avoided renewables, environmental	Converted levelized cost to first-year cost in nominal series
Variable O&M	Estimated Crossborder assumption based on 2012 IRP data.

DGValuator Assumptions: Stage 2

Economic Factors	
Study Period	20 years
Discount rate	7.21%
General escalation rate	2.50%

PV Assumptions	
PV Production Data	2012 SolarAnywhere
PV degradation rate	0.5% per year

Generation Factors	
Gen capacity cost (installed)	$1718 per kW
Years until capacity needed	0
Heat rate (first year)	8046 BTU per kWh
Degradation (per year)	0%
O&M cost (first year) - Variable	$4.00 per MWH
O&M cost escalation rate	2.50%

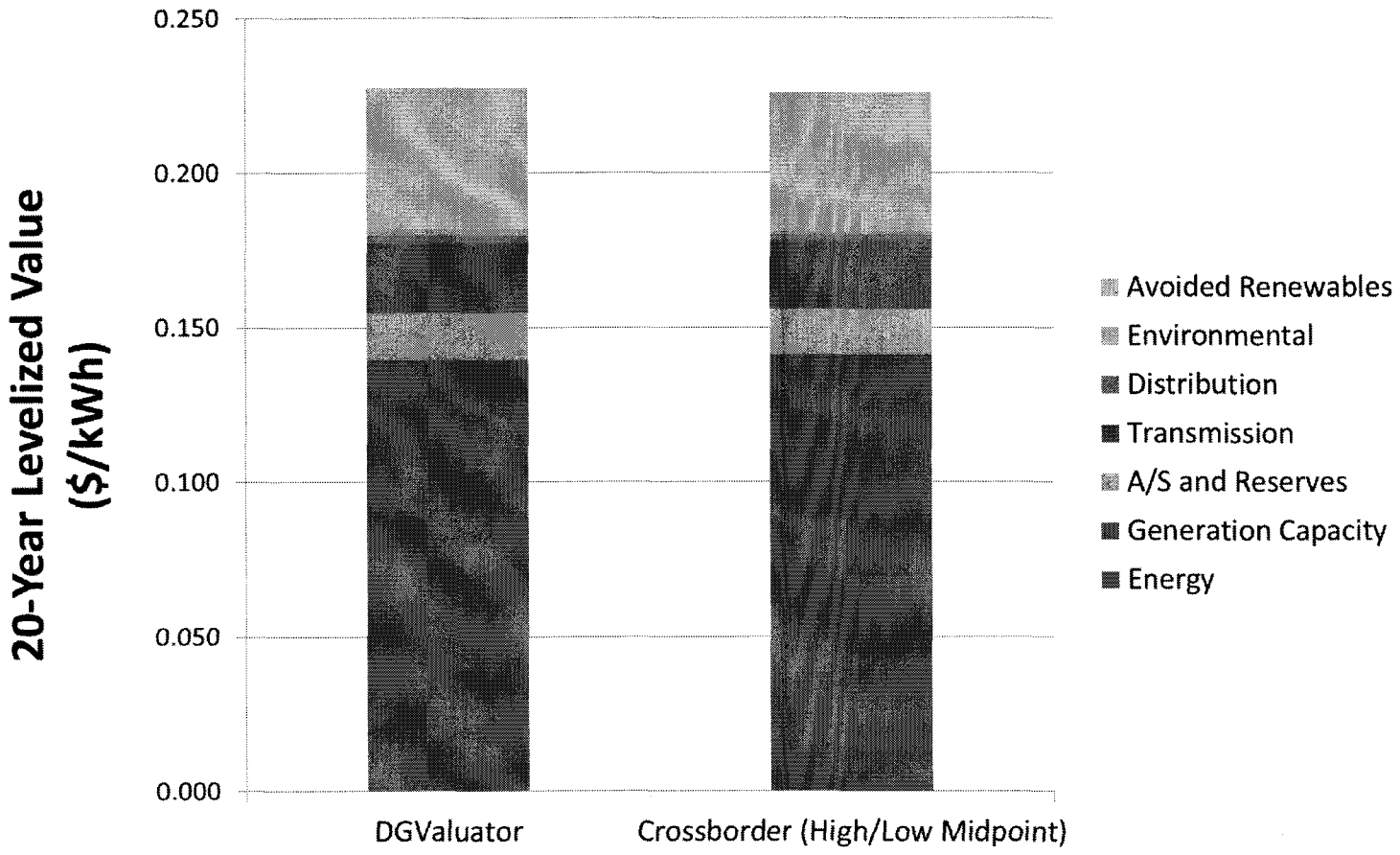
Utility	
PV Capacity	222 MW (2012)
Annual average losses	12.1%
Loss Condition	3783 MW

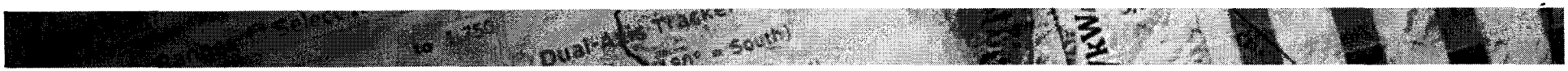
NG Wholesale Market Factors	
Fuel	Crossborder fuel prices

Other	
O&M Fixed Cost	$73.8 per kW (ELCC)
NG Pipeline Reservation Fee	$333 per kW (ELCC)
Ancillary Services	$5 per MWh
Capacity Reserves	$258 per kW (ELCC)
Environmental	$1.2 per MWh
Avoided Renewables	$38 per MWh
Transmission	$728 per kW (Peak Reduction)
Distribution	$82 per kW (Peak Reduction)
GHG Allowance	$6.42 per MWh

Stage 2

DGValuator Results are Within 1% of Crossborder Midpoint Results

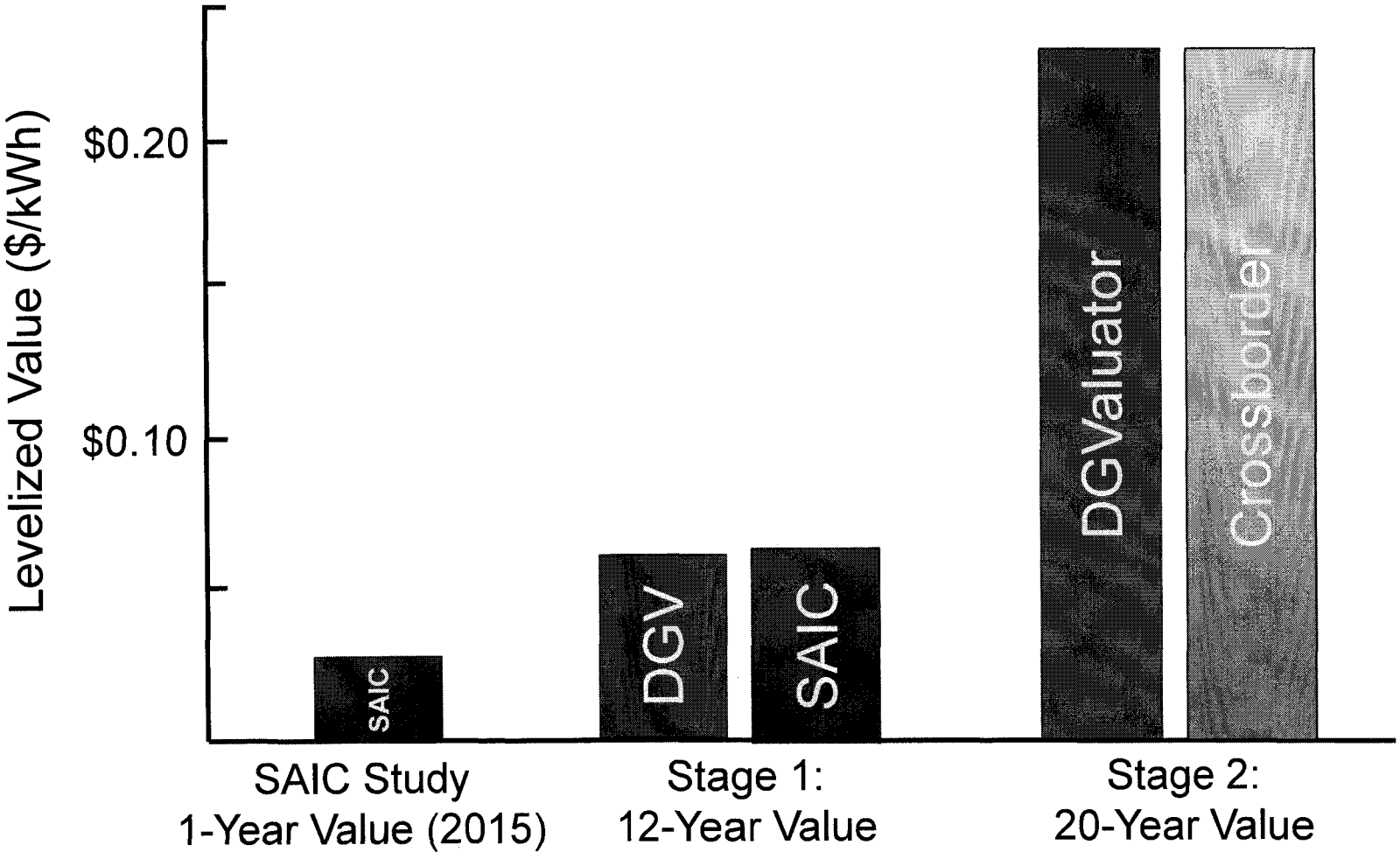




Stage 1	Stage 2	**Stage 3**
Validate DGValuator using SAIC assumptions	Validate DGValuator using Crossborder assumptions	Compare SAIC and Crossborder assumptions using DGValuator

Comparison of Results

DGValuator Results Are Comparable to the Two Studies When Using Comparable Input Assumptions



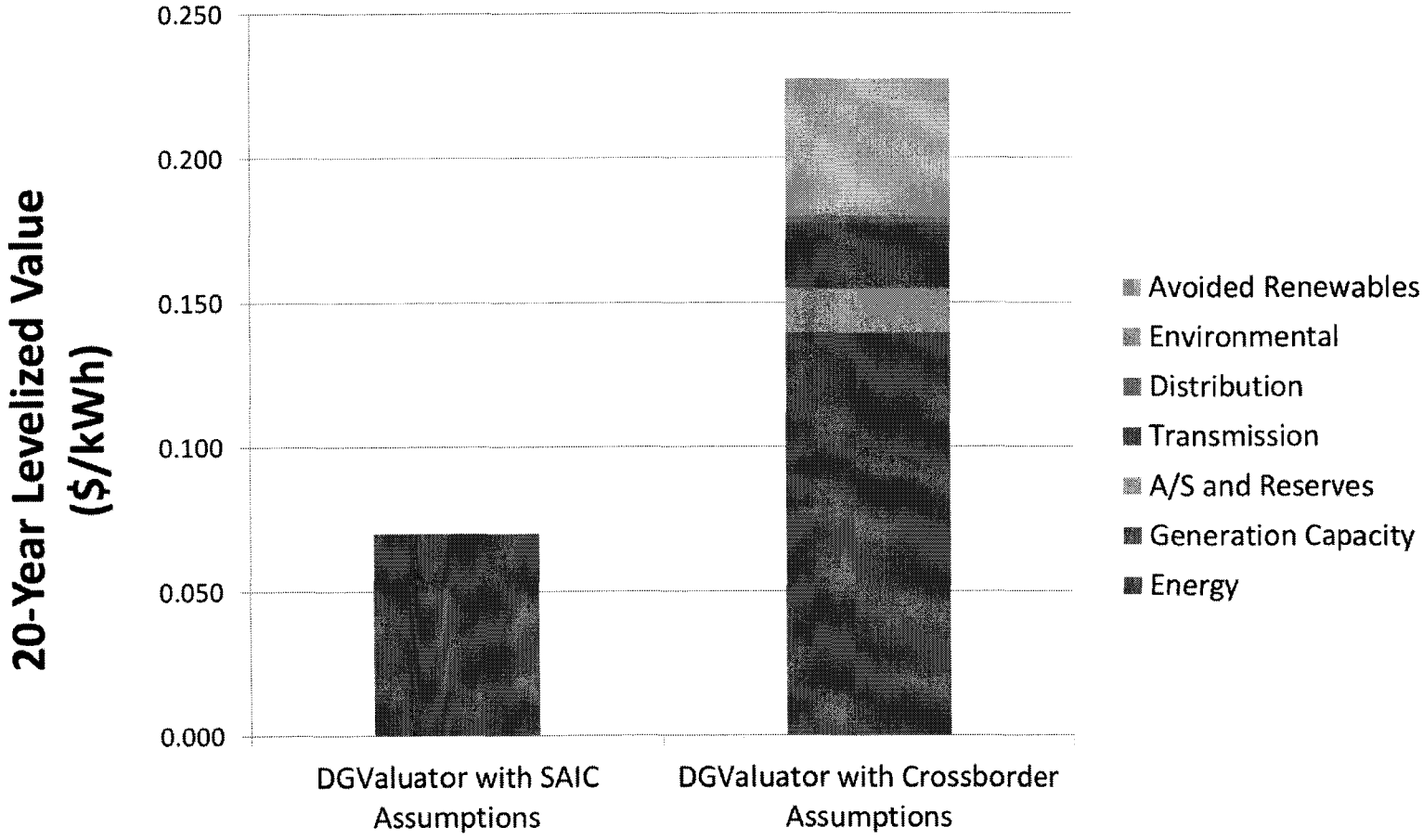
Comparison of DGValuator Assumptions

These assumptions lead to results in agreement with each of the two studies.

	SAIC	Crossborder	
Generation Capacity Cost (Fully Loaded)	$1,136	$1,718	per kW
Years Until Generation Capacity Needed	5	0	years
PV Capacity	768	222	MW
Avoided Generation Heat Rate	6120	8046	Btu/MWh
Generation O&M - Fixed Cost	$22	$74	per kW
Generation O&M - Variable Cost	$0.77	$4.00	per MWh
GHG/CO2 Allowance	$3.77	$6.42	per kWh
NG Pipeline Reservation Fee	$56	$333	per kW
Reserve Capacity Cost	Excluded	15%	of Capacity Value
Ancillary Services Cost	Excluded	$5	per MWh
Transmission Capacity Cost (Fully Loaded)	Excluded	$728	per kW
Distribution Capacity Cost (Fully Loaded)	Excluded	$82	per kW
Avoided Renewable Cost	Excluded	$38	per MWh
Environmental Value	Excluded	$1.20	per MWh
Fuel Price Guarantee	Excluded	Excluded	
Average Loss Factor	7%	12.1%	

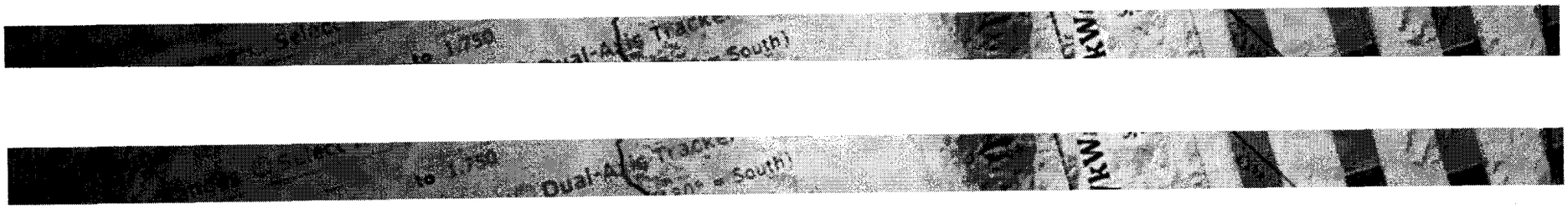
SAIC and Crossborder Study Results:

Recalculated in DGValuator Using Compatible Assumptions on Common 20-Year Levelized Basis



Conclusions

- The SAIC analysis framework leads to short-term value while DGValuator framework results in a levelized, long-term value
- SAIC results were adjusted to put in a common framework with the Crossborder analysis:
  - Results calculated per unit PV production
  - Results levelized over study period
- Comparable study assumptions were calculated for SAIC and Crossborder studies were calculated, and these were validated using DGValuator software runs
- Discrepancies are then explained by comparing comparable study assumptions



Appendix 1: Detailed Results

Stage 1 Results

DGValuator and SAIC Results are Comparable When Using Comparable Input Assumptions (12-year levelized value)

	DGValuator ($/kWh)	SAIC ($/kWh)
Fuel Savings	$0.037	$0.037
O&M Savings (Variable)	$0.001	$0.001
O&M Savings (Fixed)	$0.000	$0.001
Gen. Capacity (Fixed Charges)	$0.012	$0.013
NG Pipeline Res (Gas Transport)	$0.001	$0.001
CO2 Allowance (Emissions)	$0.005	$0.006
TOTAL	$0.057	$0.059

Stage 2 Results

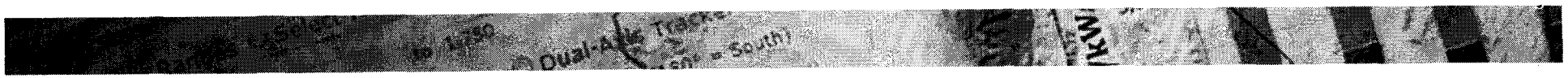
DGValuator and Crossborder Results are Comparable When Using Comparable Input Assumptions (20-year levelized value)

		DGValuator	Crossborder	
		($/kWh)	Low ($/kWh)	High ($/kWh)
Energy				
Fuel	$0.062			
GHG Allowances	$0.010			
Variable O&M	$0.006			
Total		$0.079	$0.064	$0.075
Generation Capacity				
Plant Capital	$0.049			
Fixed O&M	$0.002			
Pipeline Reservation	$0.009			
Total		$0.061	$0.067	$0.076
Ancillary Services and Capacity Reserves				
Ancillary Services	$0.008			
Capacity reserves	$0.007			
Total		$0.015	$0.015	$0.015
Transmission		$0.023	$0.021	$0.023
Distribution		$0.003	$0.002	$0.002
Environmental		$0.002	$0.001	$0.001
Avoided Renewables		$0.046	$0.045	$0.045
TOTAL		$0.227	$0.215	$0.237

SAIC and Crossborder Study Results:

Recalculated in DGValuator Using Compatible Assumptions on Common 20-Year Levelized Basis

		DGValuator (SAIC Assumptions) ($/kWh)		DGValuator (Crossborder Assumptions) ($/kWh)
Energy				
Fuel	$0.044		$0.062	
GHG Allowances	$0.005		$0.010	
Variable O&M	$0.001		$0.006	
Total		$0.050		$0.079
Generation Capacity				
Plant Capital	$0.019		$0.049	
Fixed O&M	$0.000		$0.002	
Pipeline Reservation	$0.001		$0.009	
Total		$0.020		$0.061
Ancillary Services and Capacity Reserves				
Ancillary Services			$0.008	
Capacity Reserves			$0.007	
Total				$0.015
Transmission				$0.023
Distribution				$0.003
Environmental				$0.002
Avoided Renewables				$0.046
TOTAL		$0.070		$0.227



Appendix: Additional SAIC methodology observations

Study Differences

- Rating convention discrepancy
  - Nameplate capacity (Table 2-2) was shown as MW-AC, but may be MW-DC. (see next slide)
- Synchronizing PV and load data
  - SAIC calculated ELCC using TMY data. (for example, during the month of peak load, Phoenix irradiance data was taken from 1972)
- Loss savings
  - Loss savings should be calculated on an hourly, marginal basis as described previously
- Load growth assumptions
  - Future year ELCC calculation depends upon assumption about load growth. The assumptions and methods for calculating new loads are not clear

Rating Discrepancy to be Resolved

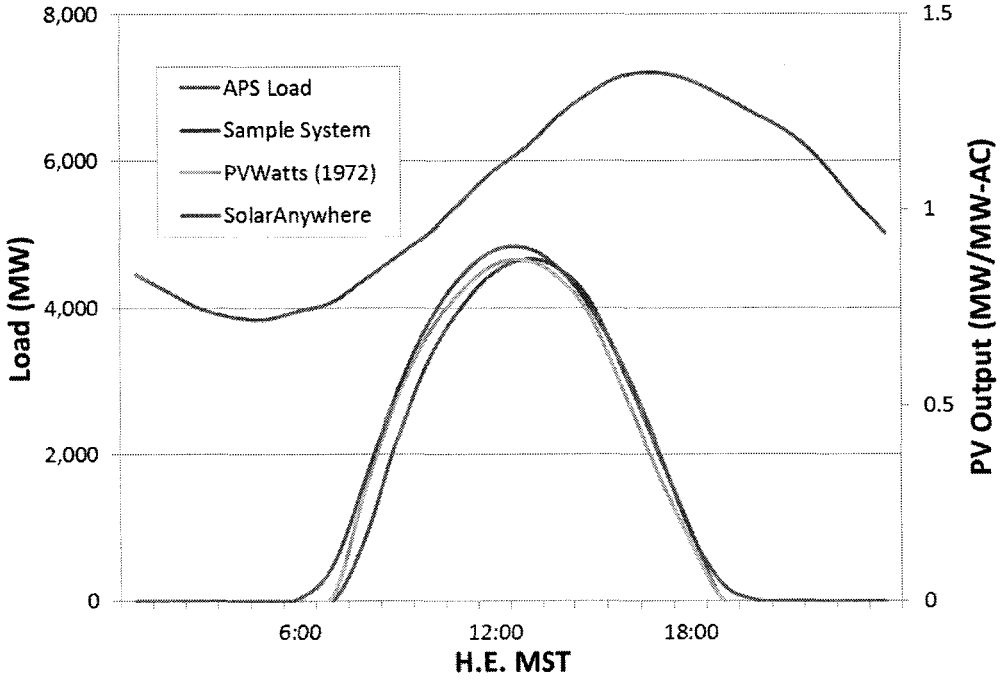
2015 expected penetration case

- SAIC (Table 2-2) presents ELCC in nameplate capacity in **MW-AC**
- PV production equals 402,387 MWh in 2015
- This translates to 402,387 MWh / 242 MW rated capacity = 1662 kWh per kW
- This is consistent with the 1650 kWh per **kW-DC** reported elsewhere
- Conclusion: Either the assumed production is 1650 kW per kW-AC or the nameplate capacity is in MW-DC.
- An example of the impact is shown below, recalculated by assuming the nameplate capacity is MW-DC
- This discrepancy does not affect economic calculations, but ELCC percentages may be incorrectly interpreted

		As Reported	Recalculated
[A]	Nameplate Capacity (MW-AC)	242	186
[B]	ELCC (MW)	111	111
	ELCC (Pct of Rating) = [B] / [A]	45.9%	59.6%

Solar Modeling Requires Time-Synchronized Data

- Accurate technical results require PV production that is time-synchronized with load
- SAIC used typical meteorological year (TMY) data which is not time-synchronized
- The effect of using non-time-synchronized was investigated for the peak day; it turned out to be clear and thus was not an issue (see Figure)
- Other days were not evaluated



Study Difference: Loss Savings Calculation Methodology

- SAIC Study
  - Calculates ***average*** rather than ***marginal*** loss savings. Marginal savings reflect the fact that PV will lower the losses and consequently lower the loss factor during times of PV production.
  - Calculates ***annual*** rather than ***hourly*** loss savings. PV production tends to correlate with hours of high losses (high loads).
  - Assumes loss savings to be 7%, i.e., 7% of centrally-generated energy is lost. SAIC assumed loss savings are 7% of PV generation rather than 7%/(1-7%)=7.5%.
- DGValuator calculates hourly marginal loss savings