

**Imperial Irrigation District v. California Independent System Operator Corporation  
United States District Court for the Southern District of California  
Case No.: 3:15-cv-01576-AJB-AGS**

**Expert Report of Kevin Coffee, PE, ZGlobal Inc.**

Respectfully submitted by:

Kevin Coffee, PE

ZGlobal, Inc.

November 20, 2017

## **I. Background**

I graduated from New Mexico State University in 1983 with a Bachelor of Science in Electrical Engineering, and a Master of Science in Electrical Engineering in 1984. I am licensed Professional Engineer in the State of California, License Number E-12744. I currently reside in San Rafael, California.

I began my professional career in 1984 with Pacific Gas and Electric Company (PG&E) as an Electrical Engineer until 1997 where I was responsible for the following at different times:

- Implementation of PG&E's first generation of real-time transmission system analysis applications (state estimator, power flow, optimal power flow, and security analysis);
- Managing relationships with PG&E's wholesale transmission customers such as California Department of Water Resources, Sacramento Municipal Utility District, Northern California Power Agency, and Western Area Power Administration;
- Interacting with the California Public Utilities Commission in support of regulatory filings associated with annual review of electric operations; and
- Developing electrical design in support of PG&E's Diablo Canyon Nuclear Power Plant

In 1997, I joined PG&E Energy Services where I led the team responsible for delivery of wholesale power to retail direct access customers until 2001. From 2001 to 2002, I was the Director of Operations at Electrade where I headed up operations for an internally developed electronic platform designed for negotiating non-standard energy transactions. In 2002, I returned to PG&E to lead the short-term procurement group that was responsible for procuring and dispatching energy from power plants to serve PG&E's customer load. In 2010, I joined ZGlobal as Vice President of Operations where I lead the team responsible for portfolio management of ZGlobal's clients' electricity assets and contracts.

During the past 10 years I have not authored any publications.

During the past 4 years I have not testified as an expert witness.

I have been retained by Lewis Brisbois Bisgaard & Smith LLP (Lewis Brisbois) to provide expert testimony pertaining the Imperial Irrigation District's legal action against the California Independent System Operator (CAISO) regarding the unauthorized use of the Imperial Irrigation District (IID) electric transmission system from 2012 through 2016. ZGlobal charges Lewis Brisbois an hourly rate of \$695 per hour for deposition and trial testimony. The contents of this report are based on my technical knowledge, previous experience, and analysis of data provided by the IID.

## **II. Statement of Opinions**

### **A. Subjects of Opinions**

Electricity generated by power plants interconnected to the Balancing Authority Area of the CAISO has been and continues to be transported to CAISO load by utilizing the electric transmission facilities of the IID<sup>1</sup>. In this report, I will address the financial impacts to IID from January 1, 2012 through December 31, 2016, and unrealized transmission service revenue over the next twenty years as summarized below:

1. The financial value of CAISO's utilization of IID's transmission facilities in the north-to-south direction.
2. The financial value of CAISO's utilization of IID's transmission facilities in the south-to-north direction.
3. The financial value of CAISO's aiding and abetting the investor-owned utilities in leaning on IID's Balancing Authority Area to obtain windfall energy benefits by accessing less expensive energy from the Southwest and transmitting it to the San Diego load center.
4. The financial value of CAISO's aiding and abetting the investor-owned utilities in leaning on IID's Balancing Authority Area to obtain windfall energy benefits by accessing less expensive energy from generators located in the Mexico Border region and transmitting it to the Los Angeles load center.
5. The financial value of unrealized transmission service revenue that IID would have received from renewable resources interconnecting to IID's transmission system that instead interconnected to the CAISO transmission system.

The quantification of the above financial values is set forth below.

### **B. Facts and Data Considered in Forming Opinions**

Data used in the calculations is contained in Excel file "Exhibit 1\_2017.11.18 IID v CAISO Damages\_Final.xls" and incorporated as Exhibit 1. See Appendix A for a map of tables to data and list of exhibits used in this report. All data, references and exhibits identified herein are part of this report and will be uploaded to CAISO's counsel as part of this report.

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<sup>1</sup> Expert Report of Brian Rahman, ZGlobal Inc., which is relied upon and incorporated herein.

1. Calculation of Value of CAISO's Utilization of IID's Transmission Facilities in the North-to-South Direction

The value of CAISO's utilization of IID's transmission facilities is calculated by multiplying the price of transmission by the quantity of transmission used during the hours that IID's transmission system was utilized. The price of transmission is based on the CAISO's annual High Voltage Access Charges shown in Table 1 below.

**Table 1 – CAISO High Voltage Access Charges for Years 2012 to 2016**

<b>HVAC Rate (\$/MWh)</b>	<b>Effective Dates</b>	<b>Reference</b>	<b>Update Date</b>
6.3934	1/1/2012 – 7/2/2012	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jan_2012_Updated20Nov_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jan_2012_Updated20Nov_2013.pdf</a>	11/30/2013
6.4569	7/3/2012 – 8/31/2012	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective3Jul_2012_Updated20Nov_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective3Jul_2012_Updated20Nov_2013.pdf</a>	11/30/2013
7.4104	9/1/2012 – 9/30/2012	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Sep_2012_Updated20Nov_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Sep_2012_Updated20Nov_2013.pdf</a>	11/30/2013
8.0726	10/1/2012 – 12/31/2012	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Oct_2012_Updated20Nov_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Oct_2012_Updated20Nov_2013.pdf</a>	11/30/2013
8.1680	1/1/2013 – 1/2/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jan_2013_Updated10Dec_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jan_2013_Updated10Dec_2013.pdf</a>	12/10/2013
8.1986	1/3/2013 – 1/10/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective3Jan_2013_Updated10Dec_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective3Jan_2013_Updated10Dec_2013.pdf</a>	12/10/2013
8.1955	1/11/2013 – 3/31/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective11Jan_2013_Updated10Dec_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective11Jan_2013_Updated10Dec_2013.pdf</a>	12/10/2013
8.1958	4/1/2013 – 4/30/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Apr_2013_Updated10Dec_2013.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Apr_2013_Updated10Dec_2013.pdf</a>	12/10/2013
8.2694	5/1/2013 – 6/30/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1May_2013_Updated27Jan_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1May_2013_Updated27Jan_2014.pdf</a>	1/27/2014
8.2638	7/1/2013 – 8/31/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jul_2013_Updated27Jan_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jul_2013_Updated27Jan_2014.pdf</a>	1/27/2014
7.9590	9/1/2013 – 9/30/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Sep_2013_Updated2Jun_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Sep_2013_Updated2Jun_2014.pdf</a>	6/2/2014
7.9339	10/1/2013 – 12/16/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveOct1_2013_UpdatedNov26_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveOct1_2013_UpdatedNov26_2014.pdf</a>	11/26/2014
7.9280	12/17/2013 – 12/31/2013	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveDec17_2013_UpdatedNov26_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveDec17_2013_UpdatedNov26_2014.pdf</a>	11/26/2014
8.0095	1/1/2014 – 4/19/2014	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJan1_2014_UpdatedNov26_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJan1_2014_UpdatedNov26_2014.pdf</a>	11/26/2014
8.0071	4/20/2014 – 4/30/2014	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveApr20_2014_UpdatedNov26_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveApr20_2014_UpdatedNov26_2014.pdf</a>	11/26/2014
7.8859	5/1/2014 – 5/16/2014	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveMay1_2014_UpdatedNov26_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveMay1_2014_UpdatedNov26_2014.pdf</a>	11/26/2014
7.8749	5/17/2014 – 5/31/2014	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective17May_2014.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective17May_2014.pdf</a>	7/22/2015
7.8906	6/1/2014 – 12/31/2014	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jun_2014_Updated21Jul_2015.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jun_2014_Updated21Jul_2015.pdf</a>	7/22/2015
9.4268	1/1/2015 – 2/28/2015	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jan_2015_Updated21Jul_2015.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jan_2015_Updated21Jul_2015.pdf</a>	7/22/2015
9.7986	3/1/2015 – 5/31/2015	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Mar_2015_Updated19Oct_2015.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Mar_2015_Updated19Oct_2015.pdf</a>	10/19/2015
9.7828	6/1/2015 – 7/31/2015	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jun_2015_Updated19Oct_2015.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Jun_2015_Updated19Oct_2015.pdf</a>	10/19/2015
9.7828	8/1/2015 – 12/31/2015	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Aug_2015_Updated10Aug_2015.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective1Aug_2015_Updated10Aug_2015.pdf</a>	8/10/2015
10.3893	1/1/2016 – 1/5/2016	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJan1_2016_RevisedMar21_2016.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJan1_2016_RevisedMar21_2016.pdf</a>	3/21/2016
10.3877	1/6/2016 – 2/28/2016	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJan6_2016.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJan6_2016.pdf</a>	10/10/2016
10.6823	3/1/2016 - 5/31/2016	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveMar1_2016_RevisedNov23_2016.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveMar1_2016_RevisedNov23_2016.pdf</a>	11/23/2016
10.6767	6/1/2016 – 8/31/2016	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJun1_2016_RevisedNov23_2016.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveJun1_2016_RevisedNov23_2016.pdf</a>	11/23/2016
10.6767	9/1/2016 – 11/20/2016	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveSep1_2016_RevisedOct10_2016.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffectiveSep1_2016_RevisedOct10_2016.pdf</a>	10/10/2016
10.6840	11/21/2016 – 12/31/2016	<a href="http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective21Nov_2016.pdf">http://www.caiso.com/Documents/HighVoltageAccessChargeRatesEffective21Nov_2016.pdf</a>	1/3/2017

The quantity of CAISO’s unauthorized use of IID’s transmission system is based on values described in the Expert Report of Brian Rahman, ZGlobal Inc. and summarized by year in Table 2 below<sup>2</sup>.

**Table 2 – Annual Usage by CAISO of IID’s Transmission Facilities in the North-to-South Direction for Years 2012 to 2016**

Year	Sum of Transmission Usage (MWh)
2012	1,828,502
2013	1,802,099
2014	1,784,799
2015	1,691,762
2016	1,749,650
<b>Grand Total</b>	<b>8,856,811</b>

The value of transmission is calculated by multiplying specific CAISO HVAC for each period shown in Table 1 by CAISO’s unauthorized use of IID’s transmission system in each hour of that period. The data and calculations are housed in the Excel spreadsheet referenced as Exhibit 1 in Appendix A<sup>3</sup>. The reason for using the CAISO’s HVAC to determine transmission value is that Section 26 “Transmission Rates and Charges” of the CAISO Tariff stipulates that “All Market Participants withdrawing Energy from the CAISO Controlled Grid shall pay Access Charges in accordance with this Section 26.1 and Appendix F, Schedule 3 ...”<sup>4</sup>. Revenues collected from Access Charges are paid back to relevant CAISO transmission owners. IID’s transmission is being used in the same manner as the rest of the CAISO Controlled Grid to transport energy from resources that are interconnected to the CAISO Controlled Grid through IID’s Balancing Authority Area and back into the CAISO Controlled Grid to serve CAISO customer load. Thus, CAISO Market Participants are withdrawing energy from the CAISO Controlled Grid as well as IID’s transmission, and so the transmission value is based on the HVAC rates in effect for the flow dates included in this period. Annual values are summarized in Table 3.

<sup>2</sup> Expert Report of Brian Rahman, ZGlobal Inc.

<sup>3</sup> The transmission usage MWh in Table 2 is the annual sums of hourly transmission usage MWh. The CAISO High Voltage Access Charges varied within calendar years. The calculation of transmission value is performed at the hourly granularity level using the applicable CAISO High Voltage Access Charge. Results are summarized annually in Table 3. Exhibit 1 is the source of hourly calculations that are summarized in Table 3.

<sup>4</sup> Exhibit 2 - California Independent System Operator Corporation Fifth Replacement FERC Electric Tariff, May 2, 2017, Section 26 Transmission Rates and Charges”. [http://www.caiso.com/Documents/Section26\\_TransmissionRates-Charges\\_Apr1\\_2014.pdf](http://www.caiso.com/Documents/Section26_TransmissionRates-Charges_Apr1_2014.pdf)

**Table 3 – Annual Value of Using IID’s Transmission System in the North-to-South Direction for the Years 2012 to 2016<sup>5</sup>**

Year	Sum of Transmission Value
2012	\$17,826,101
2013	\$19,220,911
2014	\$17,333,332
2015	\$18,857,384
2016	\$19,903,752
<b>Grand Total</b>	<b>\$93,141,480</b>

2. Value of CAISO’s Utilization of IID’s Transmission Facilities in the South-to-North Direction

As described in Section 1, the value of CAISO’s utilization of IID’s transmission facilities is calculated by multiplying the price of transmission by the quantity of transmission used during the hours that IID’s transmission system was utilized. The price of transmission is based on the CAISO’s annual High Voltage Access Charges shown in Table 1 above.

The quantity of CAISO’s use of IID’s transmission system is based on values described in the Expert Report of Brian Rahman, ZGlobal Inc. and summarized by year in Table 4 below<sup>6</sup>.

**Table 4 – Annual Usage of IID’s Transmission Facilities in the South-to-North Direction for the Years 2012 to 2016**

Year	Sum of Transmission Usage (MWh)
2012	262,410
2013	251,688
2014	219,811
2015	256,187
2016	229,493
<b>Grand Total</b>	<b>1,219,590</b>

The value of transmission is calculated by multiplying specific CAISO HVAC for each period shown in Table 1 by CAISO’s unauthorized use of IID’s transmission system in each hour of that period. Annual values are summarized in Table 5<sup>7</sup>. The data and calculations are housed in the Excel spreadsheet referenced as Exhibit 1 in Appendix A.

<sup>5</sup> Annual discount rate of 7% is applied according to Article XV, Section 1, of the California Constitution.

<sup>6</sup> Expert Report of Brian Rahman, ZGlobal Inc.

<sup>7</sup> The transmission usage MWh in Table 4 is the annual sums of hourly transmission usage MWh. The CAISO High Voltage Access Charges varied during the calendar years. The calculation was performed at an hourly granularity

**Table 5 – Annual Value of Using IID’s Transmission System in the North-to-South Direction for the Years 2012 to 2016<sup>8</sup>**

<b>Year</b>	<b>Sum of Transmission Value</b>
2012	\$2,537,925
2013	\$2,681,524
2014	\$2,135,571
2015	\$2,854,300
2016	\$2,610,387
<b>Grand Total</b>	<b>\$12,819,707</b>

3. Windfall Energy Benefits that CAISO Obtained for IOUs by Using IID’s Transmission System to Access Cheaper Energy from Generation Resources East of IID’s System and Transmitting it to the San Diego Load Center

The savings that CAISO enabled the IOUs to realize by accessing lower cost energy from the Southwest and thereby reducing the reliance on more expensive resources within the CAISO Balancing Authority Area can be calculated using CAISO historical market information that reflects the incremental replacement cost of energy if IID transmission facilities were not available to the CAISO. The uncompensated use of IID’s Balancing Authority Area was essential in order to import this cheaper energy. My opinion is that CAISO’s use of IID’s transmission system for this purpose resulted in an average savings of 12.3% of the cost of electricity from 2012 to 2016. I expect similar savings for 2017 and will supplement my report to reflect those numbers when they are available. The simple average of price differences between less expensive generation represented at the Palo Verde price node and more expensive generation in the CAISO Balancing Authority Area is summarized by year in Table 6<sup>9</sup>.

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using the applicable CAISO High Voltage Access Charge. Results are summarized annually in Table 5. Exhibit 1 is the source of hourly calculations that are summarized in Table 5.

<sup>8</sup> Annual discount rate of 7% is applied according to Article XV, Section 1, of the California Constitution.

<sup>9</sup> Prices at the Palo Verde pricing node and the Southern California generation hub are sourced from CAISO market data and stored in the Excel spreadsheet referenced as Exhibit 1 in Appendix A under tab “N-S Hourly”.



**Table 6 – Simple Average of Price Differences between Less Expensive Generation at the Palo Verde Price Node and More Expensive Generation within the CAISO Balancing Authority Area for the Years 2012 to 2016**

<b>Year</b>	<b>Price Spread (\$/MWh)</b>	<b>Percent Savings</b>
2012	\$5.33	18.7%
2013	\$7.62	16.0%
2014	\$6.17	10.5%
2015	\$2.00	6.9%
2016	\$2.68	9.4%
<b>Average</b>	<b>\$4.76</b>	<b>12.3%</b>

Multiplying the price difference between less expensive generation represented by the difference in price between the Palo Verde pricing node and more expensive generation represented by the generator price index for Southern California generation at the CAISO’s SP15 generation hub and the quantity of transmission based on values described in Expert Report of Brian Rahman, ZGlobal Inc. for each hour produces the windfall energy value to CAISO<sup>10</sup>. Those values are summarized by year in Table 7<sup>11</sup>.

**Table 7 – Windfall Energy Value to CAISO Ratepayers Realized by Utilizing IID’s Transmission System in the North-to-South Direction for the Years 2012 through 2016<sup>12</sup>**

<b>Year</b>	<b>CAISO Benefit from Using IID System for SWPL Flow</b>
2012	\$15,298,326
2013	\$17,043,073
2014	\$11,112,881
2015	\$4,353,045
2016	\$5,140,593
<b>Total</b>	<b>\$52,947,918</b>

<sup>10</sup> Expert Report of Brian Rahman, ZGlobal Inc.

<sup>11</sup> Exhibit 1 is the source of hourly calculations that are summarized in Table 7.

<sup>12</sup> Annual discount rate of 7% is applied according to Article XV, Section 1, of the California Constitution.

4. Windfall Energy Benefits that CAISO Obtained for IOUs by Using IID’s System to Access Cheaper Fossil Fuel Energy from Generators Located in the Mexico Border Region and Transmitting it to the Los Angeles Load Center

The energy value that CAISO obtains by accessing to lower cost energy from generators in the Mexico Border Region and reducing the reliance on more expensive resources in the CAISO’s Balancing Authority Area can be calculated using CAISO historical market information that reflects the incremental replacement cost of energy if IID transmission facilities were not available to the CAISO. The CAISO saved 6.4% of the price of electricity from 2012 to 2016. The simple average of price differences between less expensive generation represented at the Imperial Valley price node and more expensive generation represented by the generator price index for Southern California generation at the CAISO’s SP15 generation hub is summarized by year in Table 8<sup>13</sup>.

**Table 8 – Simple Average of Price Differences between Less Expensive Generation at the Imperial Valley Price Node and More Expensive Generation within the CAISO Balancing Authority Area for the Years 2012 to 2016**

Year	Price Spread (\$/MWh)	Percent Savings
2012	\$2.40	8.6%
2013	\$3.06	7.1%
2014	\$0.87	2.1%
2015	\$1.54	5.2%
2016	\$2.33	9.0%
<b>Average</b>	<b>\$2.04</b>	<b>6.4%</b>

By multiplying the price difference between less expensive generation represented by the price at the Imperial Valley pricing node and more expensive generation in Southern California and the quantity of transmission based on values described in Expert Report of Brian Rahman, ZGlobal Inc., produces the windfall energy value to CAISO<sup>14</sup>. Those values are summarized by year in Table 9.

<sup>13</sup> Prices at the Imperial Valley pricing node and the Southern California generation hub are sourced from CAISO market data and stored in the Excel spreadsheet referenced as Exhibit 1 in Appendix A under tab “S-N Hourly”.

<sup>14</sup> Expert Report of Brian Rahman, ZGlobal Inc.

**Table 9 – Windfall Energy Value to CAISO Realized by Utilizing IID’s Transmission System in the South-to-North Direction for the Years 2012 through 2016<sup>15</sup>**

Year	IID Portion of MXB Generation
2012	\$970,982
2013	\$1,036,117
2014	\$266,069
2015	\$489,891
2016	\$631,215
<b>Total</b>	<b>\$3,394,273</b>

The Mexican energy is generated by the burning of fossil fuels and generates substantial air emissions that are unregulated by any United States state or federal agency.

5. Unrealized Transmission Service Revenue from Renewable Resources that Did Not Interconnect IID’s Transmission System that Instead Interconnected to the CAISO Transmission System

As described in the Expert Report of Brian Rahman, ZGlobal Inc., IID’s ability to offer interconnection and transmission services to new renewable generation resources was compromised resulting in lost transmission revenue from renewable generation resources that would have interconnected to IID’s transmission system and paid IID for transmission services offered under its Open Access Transmission Tariff (“OATT”)<sup>16</sup>. Table 10 below is a subset of renewable generation resources totaling over 1,000 MW located in Imperial County and interconnected to the CAISO grid.

**Table 10 – Subset of Renewable Generation Resources Located in Imperial County and Interconnected to the CAISO Grid<sup>17</sup>**

CEC-RPS-ID	Facility Name	Facility City	Facility State	Facility County	Commercial Operations Date	Nameplate Capacity	Technology	Certification Status
60652A	Campo Verde Solar Project	El Centro	CA	Imperial	10/25/2013	147.42	Photovoltaic	Approved
60837A	Centinela Solar Energy	Calexico	CA	Imperial	8/15/2014	174.80	Photovoltaic	Approved
61292A	Silver Ridge Mount Signal	Calexico	CA	Imperial	3/4/2014	200.00	Photovoltaic	Approved
61400A	Ocotillo Express LLC	Ocotillo	CA	Imperial	7/30/2013	265.44	Wind	Approved
61657A	Tenaska Imperial Solar Energy Center South	Calexico	CA	Imperial	8/23/2013	130.00	Photovoltaic	Approved
62278A	Tenaska Imperial Solar Energy Center West	Seeley	CA	Imperial	3/27/2015	150.00	Photovoltaic	Approved

For the reasons described in the Expert Report of Brian Rahman, ZGlobal Inc., these six Imperial County renewable generation resources were disincentivized from interconnecting to IID’s

<sup>15</sup> Exhibit 1 is the source of hourly calculations that are summarized in Table 9. Annual discount rate of 7% is applied according to Article XV, Section 1, of the California Constitution. Exhibit 1 is the source of hourly calculations that are summarized in Table 9.

<sup>16</sup> Exhibit 4 - Imperial Irrigation District Open Access Tariff, Effective October 1, 2014; [http://www.oasis.oati.com/IID/IIDdocs/IID\\_OATT\\_10.01.2014.pdf](http://www.oasis.oati.com/IID/IIDdocs/IID_OATT_10.01.2014.pdf)

<sup>17</sup> Exhibit 3 - [www.energy.ca.gov/portfolio/documents/List\\_RPS\\_CERT.xls](http://www.energy.ca.gov/portfolio/documents/List_RPS_CERT.xls) as of January 23, 2017.

transmission system. Had these generation resources listed in Table 10 interconnected to IID's transmission system, IID would have received transmission service revenue under its OATT for the life of the projects, which is at least 20 years under power purchase agreements agreed to by investor-owned utilities. The applicable OATT service schedules are listed below<sup>18</sup>.

- Schedule 1 – Scheduling, System Control, and Dispatch Service at \$0.1926/kW-month or the Economic Development Rate of \$0.43/MWh
- Schedule 2 – Reactive Supply and Voltage Control from Generation or Other Comparable Sources at \$0.0420/kW-month or the Economic Development Rate at \$0.13/MWh
- Schedule 7 – Long-Term Firm and Short-Term Firm Point-to-Point Transmission Service at \$1.69/kW-month or the Economic Development Rate at \$3.38/MWh

Table 11 below summarizes the value of unrealized transmission service revenue for each of the Imperial County renewable generation resources listed in Table 10 based on IID's OATT Standard Rate. The total value of the unrealized revenue for all generators over 20 years is \$397.9 million.

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<sup>18</sup> The applicable IID OATT service schedules assume that these resources would transfer their energy from the IID Balancing Authority Area to the CAISO Balancing Authority Area via a dynamic transfer and IID would not provide OATT services under Schedule 3A - Generator Export Regulation and Frequency Response Service, Schedule 5A – Generator Export Operating Reserve – Spinning Reserve Service, Schedule, Schedule 6A – Generator Export Operating Reserve – Supplemental Reserve Service, and Schedule 9 – Generator Imbalance Service.

**Table 11 – Estimated Value of Unrealized Transmission Service Revenue at IID’s OATT Standard Rate Schedules 1, 2, and 7<sup>19</sup>**

Year	Sum of Transmission Service Value (Standard OATT Rate)						Total
	Campo Verde Solar Project	Centinela Solar Energy	Silver Ridge Mount Signal	Ocotillo Express LLC	Tenaska Imperial Solar Energy Center South	Tenaska Imperial Solar Energy Center West	
2012	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2013	\$722,725	\$0	\$0	\$2,876,596	\$1,207,561	\$0	\$4,806,882
2014	\$3,699,851	\$1,667,066	\$4,166,160	\$6,661,840	\$3,262,655	\$0	\$19,457,571
2015	\$3,598,727	\$4,267,110	\$4,882,277	\$6,479,758	\$3,173,480	\$2,819,515	\$25,220,868
2016	\$3,500,366	\$4,150,482	\$4,748,835	\$6,302,654	\$3,086,743	\$3,561,626	\$25,350,706
2017	\$3,404,694	\$4,037,041	\$4,619,040	\$6,130,390	\$3,002,376	\$3,464,280	\$24,657,821
2018	\$3,311,637	\$3,926,701	\$4,492,793	\$5,962,834	\$2,920,315	\$3,369,594	\$23,983,874
2019	\$3,221,124	\$3,819,376	\$4,369,996	\$5,799,858	\$2,840,497	\$3,277,497	\$23,328,348
2020	\$3,133,084	\$3,714,985	\$4,250,555	\$5,641,337	\$2,762,861	\$3,187,916	\$22,690,738
2021	\$3,047,451	\$3,613,447	\$4,134,379	\$5,487,148	\$2,687,346	\$3,100,784	\$22,070,555
2022	\$2,964,158	\$3,514,685	\$4,021,378	\$5,337,173	\$2,613,896	\$3,016,034	\$21,467,324
2023	\$2,883,142	\$3,418,621	\$3,911,466	\$5,191,298	\$2,542,453	\$2,933,600	\$20,880,579
2024	\$2,804,340	\$3,325,184	\$3,804,558	\$5,049,409	\$2,472,963	\$2,853,418	\$20,309,872
2025	\$2,727,692	\$3,234,300	\$3,700,572	\$4,911,399	\$2,405,372	\$2,775,429	\$19,754,763
2026	\$2,653,138	\$3,145,900	\$3,599,428	\$4,777,161	\$2,339,628	\$2,699,571	\$19,214,826
2027	\$2,580,623	\$3,059,916	\$3,501,049	\$4,646,592	\$2,275,682	\$2,625,786	\$18,689,647
2028	\$2,510,089	\$2,976,283	\$3,405,358	\$4,519,591	\$2,213,483	\$2,554,018	\$18,178,822
2029	\$2,441,484	\$2,894,935	\$3,312,283	\$4,396,062	\$2,152,984	\$2,484,212	\$17,681,959
2030	\$2,374,753	\$2,815,811	\$3,221,752	\$4,275,909	\$2,094,139	\$2,416,314	\$17,198,677
2031	\$2,309,846	\$2,738,849	\$3,133,695	\$4,159,040	\$2,036,902	\$2,350,271	\$16,728,603
2032	\$2,246,714	\$2,663,991	\$3,048,045	\$4,045,365	\$1,981,229	\$2,286,034	\$16,271,377
<b>Grand Total</b>	<b>\$56,135,638</b>	<b>\$62,984,684</b>	<b>\$74,323,617</b>	<b>\$102,651,413</b>	<b>\$50,072,563</b>	<b>\$51,775,900</b>	<b>\$397,943,814</b>

Table 12 below summarizes the value of unrealized transmission service revenue for each of the Imperial County renewable generation resources listed in Table 10 based on IID’s OATT Economic Development Rate. The total present value of the unrealized revenue for all generators over 20 years is \$169.6 million.

<sup>19</sup> As of November 16, 2017, the rate is 2.81% (<https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield>).

**Table 12 – Estimated Value of Unrealized Transmission Service Revenue at IID’s OATT Economic Rate Schedules 1, 2, and 7<sup>20</sup>**

Year	Sum of Transmission Service Value (Economic Rate)						Total
	Campo Verde Solar Project	Centinela Solar Energy	Silver Ridge Mount Signal	Ocotillo Express LLC	Tenaska Imperial Solar Energy Center South	Tenaska Imperial Solar Energy Center West	
2012	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2013	\$322,401	\$0	\$0	\$1,283,222	\$538,681	\$0	\$2,144,304
2014	\$1,642,216	\$739,944	\$1,849,192	\$2,956,924	\$1,448,162	\$0	\$8,636,438
2015	\$1,589,344	\$1,884,530	\$2,156,212	\$2,861,725	\$1,401,538	\$1,245,213	\$11,138,562
2016	\$1,538,175	\$1,823,857	\$2,086,792	\$2,769,591	\$1,356,415	\$1,565,094	\$11,139,924
2017	\$1,488,653	\$1,765,137	\$2,019,608	\$2,680,423	\$1,312,745	\$1,514,706	\$10,781,271
2018	\$1,440,725	\$1,708,308	\$1,954,586	\$2,594,126	\$1,270,481	\$1,465,939	\$10,434,165
2019	\$1,394,340	\$1,653,308	\$1,891,657	\$2,510,607	\$1,229,577	\$1,418,743	\$10,098,233
2020	\$1,349,449	\$1,600,080	\$1,830,755	\$2,429,778	\$1,189,991	\$1,373,066	\$9,773,118
2021	\$1,306,003	\$1,548,565	\$1,771,813	\$2,351,550	\$1,151,678	\$1,328,860	\$9,458,469
2022	\$1,263,956	\$1,498,708	\$1,714,769	\$2,275,841	\$1,114,600	\$1,286,077	\$9,153,951
2023	\$1,223,263	\$1,450,457	\$1,659,561	\$2,202,570	\$1,078,715	\$1,244,671	\$8,859,236
2024	\$1,183,879	\$1,403,759	\$1,606,131	\$2,131,657	\$1,043,985	\$1,204,598	\$8,574,010
2025	\$1,145,764	\$1,358,564	\$1,554,421	\$2,063,028	\$1,010,374	\$1,165,816	\$8,297,968
2026	\$1,108,876	\$1,314,825	\$1,504,376	\$1,996,608	\$977,845	\$1,128,282	\$8,030,812
2027	\$1,073,175	\$1,272,494	\$1,455,942	\$1,932,327	\$946,363	\$1,091,957	\$7,772,257
2028	\$1,038,624	\$1,231,525	\$1,409,068	\$1,870,115	\$915,894	\$1,056,801	\$7,522,027
2029	\$1,005,185	\$1,191,876	\$1,363,703	\$1,809,906	\$886,407	\$1,022,777	\$7,279,853
2030	\$972,823	\$1,153,503	\$1,319,798	\$1,751,635	\$857,868	\$989,848	\$7,045,476
2031	\$941,503	\$1,116,366	\$1,277,306	\$1,695,241	\$830,249	\$957,980	\$6,818,645
2032	\$911,191	\$1,080,424	\$1,236,183	\$1,640,662	\$803,519	\$927,137	\$6,599,116
<b>Grand Total</b>	<b>\$23,939,544</b>	<b>\$26,796,228</b>	<b>\$31,661,873</b>	<b>\$43,807,537</b>	<b>\$21,365,087</b>	<b>\$21,987,565</b>	<b>\$169,557,835</b>

**Conclusion**

The direct economic impact of the CAISO’s use of IID’s transmission facilities is calculated between \$331.9 million and \$560.2 million as summarized in Table 13 below.

**Table 13 – Estimated Value of Benefits of Using IID Transmission Facilities**

Benefits	Value of Benefits (\$)
North-to-South Transmission Usage	\$93,141,480
South-to-North Transmission Usage	\$12,819,707
Windfall Energy from Southwest to San Diego Area	\$52,947,918
Windfall Energy from Mexico to Los Angeles Area	\$3,394,273
Transmission Services under OATT Standard Rate	\$397,943,814
Transmission Services under OATT Economic Development Rate	\$169,557,835
<b>Total (Using Standard OATT Rate)</b>	<b>\$560,247,194</b>
<b>Total (Using Economic Development Rate)</b>	<b>\$331,861,214</b>

<sup>20</sup> For the Economic Development Rate, the assumption is that solar resources generate electricity at 30% capacity factor. The resulting annual MWh for each generator is calculated by multiplying the AC MW capacity of the project by 8,760 hours per year and the 30% capacity factor. A factor of 0.5% per year was applied to each year’s energy production to account for equipment degradation. The discount rate applied to forward years is based on the current 30-year United States Treasury. As of November 16, 2017, the rate is 2.81% (<https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield>).

Respectfully submitted by:

A handwritten signature in black ink that reads "Kevin Coffee". The signature is written in a cursive style with a large, sweeping initial "K".

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Kevin Coffee, PE

ZGlobal, Inc.

## Appendix A

### List of Exhibits and Mapping of Report Tables to Data

**Exhibit 1** – Source data for damage calculations is an Excel spreadsheet “Exhibit 1\_2017.11.18 IID v CAISO Damages\_Final.xlsx.”

**Exhibit 2** – California Independent System Operator Corporation Fifth Replacement FERC Electric Tariff, May 2, 2017, Section 26 Transmission Rates and Charges.

[http://www.caiso.com/Documents/Section26 TransmissionRates-Charges Apr1 2014.pdf](http://www.caiso.com/Documents/Section26_TransmissionRates-Charges_Apr1_2014.pdf)

File name is “Exhibit 2\_Section26\_TransmissionRates-Charges\_Apr1\_2014.pdf”

**Exhibit 3** – California’s Renewables Portfolio Standard (RPS) List of Facilities per the California Energy Commission as of January 23, 2017.

[www.energy.ca.gov/portfolio/documents/List\\_RPS\\_CERT.xls](http://www.energy.ca.gov/portfolio/documents/List_RPS_CERT.xls). File name is “Exhibit 3\_CEC List\_RPS\_CERT-2017Jan23.xlsx”

**Exhibit 4** – Imperial Irrigation District Open Access Tariff, Effective October 1, 2014,

[http://www.oasis.oati.com/IID/IIDdocs/IID\\_OATT\\_10.01.2014.pdf](http://www.oasis.oati.com/IID/IIDdocs/IID_OATT_10.01.2014.pdf)

File name is “Exhibit 4\_IID\_OATT\_10.01.2014.pdf”

**Table A1 – Mapping of Tables to Data Sources**

Table	Reference Document	Notes
1	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "HVAC Rates"; Cell = A1; Note that the Excel file is not the source of the data but reproduced to apply rates to calculations
2	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "KC Tables 1"; Cell = B3
3	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "KC Tables 1"; Cell = E3
4	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "KC Tables 1"; Cell = H3
5	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "KC Tables 1"; Cell = K3
6	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "N-S Hourly"; Cell = K2
7	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "N-S analysis"; Cell = W47
8	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "S-N Hourly"; Cell = K2
9	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "S-N analysis"; Cell = W47
10	Exhibit 3_CEC List_RPS_CERT-2017Jan23.xlsx	Source is <a href="http://www.energy.ca.gov/portfolio/documents/List_RPS_CERT.xls">www.energy.ca.gov/portfolio/documents/List_RPS_CERT.xls</a> as of January 23, 2017. Data is filtered to show six specific Imperial County solar and wind resources.
11	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "KC Tables 2"; Cell = R2
12	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "KC Tables 2"; Cell = R28
13	Exhibit 1_2017.11.18 IID v CAISO Damages_Final.xlsx	Tab = "KC Tables 1"; Cell = N3