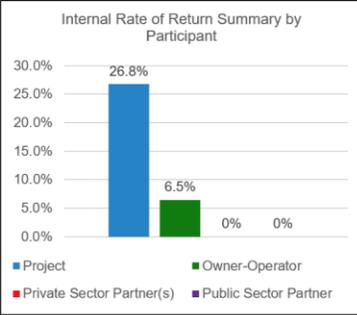
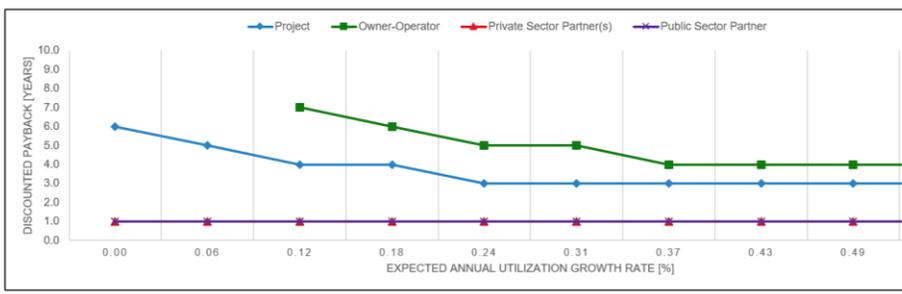
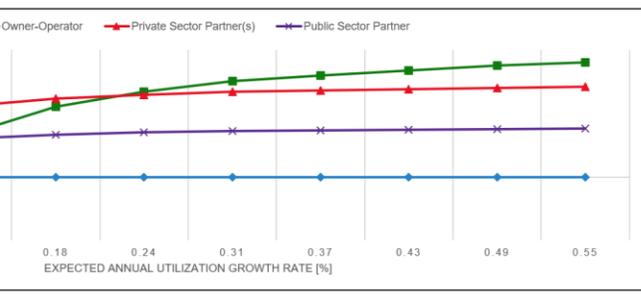
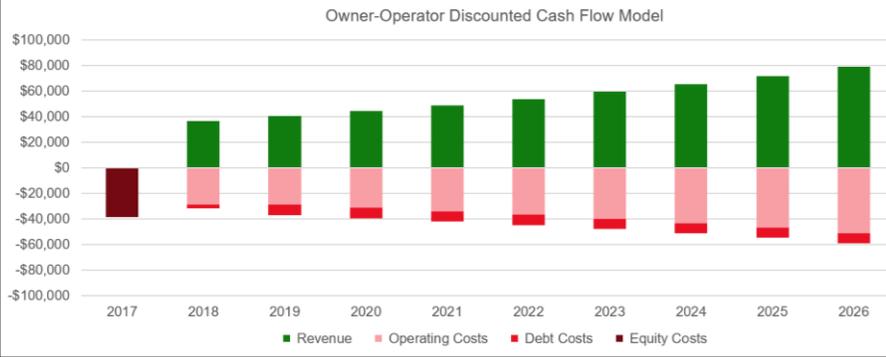


Financial Performance Details		Charging Infrastructure Statistics	
Project		Total New Sites	1
Capital Investment	\$96,189	Total New Stations	1
Net Present Value	+\$84,779	Number of Charging Sessions Provided	88,086
Internal Rate of Return (IRR)	26.8%	Energy Provided (kWh)	814,589
Discounted Payback (Years)	4.00	Total Energy Security Benefits	\$950
Owner-Operator		Total Electrical Grid Benefits	Captured
Capital Investment		Total Climate Benefits	\$18,294
Equity	\$38,475	Greenhouse Gas Emissions Abated (CO2e tons)	436
Private Debt	\$57,713		
Public Subsidized Debt	\$0		
Net Present Value	+\$16,787		
Internal Rate of Return (IRR)	6.5%		
Discounted Payback (Years)	8.00		
Private Sector Partner(s)			
Funds to owner-operator initially	\$0		
Funds to owner-operator annually	\$6,103 - \$14,029		
Capital Investment	\$0		
Other Contributions	\$96,895		
Net Present Value	+\$41,798		
Internal Rate of Return (IRR)	N/A		
Discounted Payback (Years)	1.00		
Public Sector Partner			
Capital Investment	\$0		
Other Contributions	\$0		
Net Present Value	+\$22,639		
Internal Rate of Return (IRR)	N/A		
Discounted Payback (Years)	1.00		



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Revenue	\$ -	\$ 36,886	\$ 40,576	\$ 44,632	\$ 49,093	\$ 54,000	\$ 59,399	\$ 65,336	\$ 71,871	\$ 79,000
Operating Costs	\$ -	\$ (28,618)	\$ (29,071)	\$ (31,411)	\$ (33,986)	\$ (36,818)	\$ (39,934)	\$ (43,362)	\$ (47,134)	\$ (51,134)
Debt Costs	\$ -	\$ (3,115)	\$ (8,099)	\$ (8,050)	\$ (7,995)	\$ (7,934)	\$ (7,867)	\$ (7,794)	\$ (7,712)	\$ (7,625)
Equity Costs	\$ (38,475)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ (38,475)	\$ 5,154	\$ 3,406	\$ 5,171	\$ 7,112	\$ 9,248	\$ 11,597	\$ 14,180	\$ 17,024	\$ 20,241



EV CHARGING FINANCIAL ANALYSIS TOOL USER GUIDE

A free tool designed to evaluate the financial viability of EV charging infrastructure investments involving multiple private and public sector partners

APRIL 2019



ATLAS PUBLIC POLICY
WASHINGTON, DC USA

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ABOUT THE EV CHARGING FINANCIAL ANALYSIS TOOL

The EV Charging Financial Analysis Tool equips users with critical information on the financial performance of electric vehicle charging projects. The Microsoft Excel-based tool is capable of evaluating a variety of business arrangements, including sophisticated public-private partnerships.



The tool uses the discounted cash flow method to evaluate the financial performance of a charging project through a variety of revenue streams over the lifetime of the charging equipment. The tool is highly flexible, with over 100 inputs and supports customizable sensitivity variables.

The tool can be downloaded free at www.atlaspolicy.com.

The tool was originally developed by the Cadmus Group in partnership with the Center for Climate and Energy Solutions for as part of a study commissioned by the Washington State Legislature’s Joint Transportation Committee to identify business models for financially sustainable, private-sector funded charging networks. The study was conducted from May 2014 to March 2015. The final report can be found online at <http://leg.wa.gov/JTC/Pages/ElectricVehicleChargingStationNetworksStudy.aspx>.

Below is the contact information for all contributors to the design and development of the EV Charging Financial Analysis Tool.

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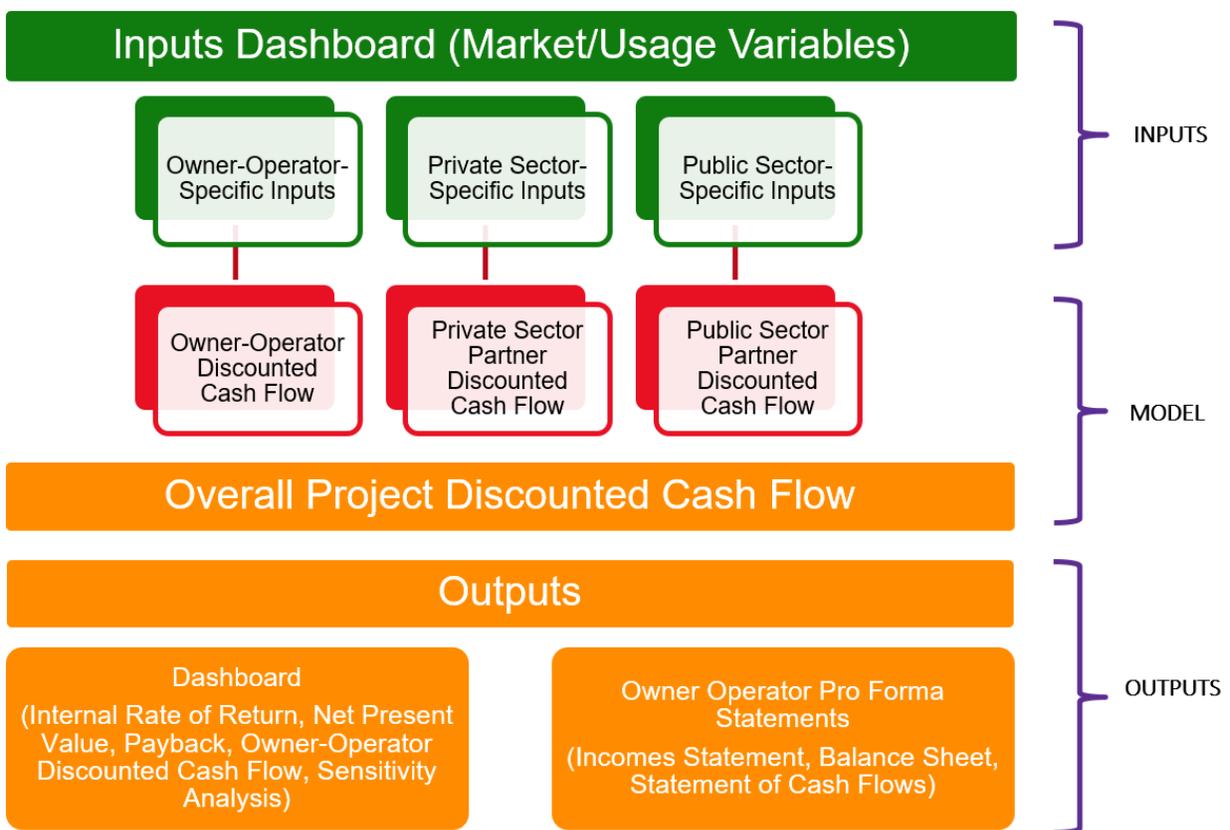
OVERVIEW OF THE TOOL STRUCTURE

The EV Charging Financial Analysis Tool was built using Microsoft Excel and is contained in a standalone Excel workbook. It is divided into four functional areas, each area consisting of multiple like-colored tabs within the spreadsheet, as follows:

- **Overview and Settings** – Black Tabs
- **User Inputs** – Light Blue Tabs
- **Financial Calculations** – Green Tabs
- **Analysis Results and Financial Statements** – Dark Blue Tabs

Information flows from the user inputs, through the calculations, to the analysis results, as shown in the diagram on the first “Overview” tab in the tool and presented below.

FIGURE 1: STRUCTURE OF THE EV CHARGING FINANCIAL ANALYSIS TOOL



OWNER-OPERATOR, PRIVATE SECTOR PARTNER, & PUBLIC SECTOR PARTNER

The tool analyzes the proposed EV charging infrastructure investment from the perspective of three potential partners, a private sector owner-operator, a private sector partner who contributes funding to project deployment, and a public sector partner who contributes funding or in other ways helps finance project deployment. The roles of these three partners are described below. For the model to produce useful results, it requires information about the overall EV market and the owner-operator. Information about the other partners may be added or removed as needed.

- **Owner-Operator** – Organization that owns and operates the charging station and receives the revenue associated with charging services.
- **Private Sector Partner** – A private sector organization that contributes funding to the owner-operator, to help pay charging network deployment costs. This partner stands to benefit from the deployment of charging infrastructure through an increase in revenue related to the provision of EV charging services. This organization is assumed to value this benefit and be willing to share some of its related revenue or otherwise subsidize the deployment of EV charging infrastructure.
- **Public Sector Partner** – A state or local entity that contributes funding or enacts policies to enable a private owner-operator to successfully deploy a charging network. The public partner is assumed to value the deployment of charging infrastructure because of its benefit to the public and is willing to support the owner-operator through a combination of low-interest debt, grants, etc.

GETTING STARTED

STEP 1: OPENING THE TOOL

To open the tool, double click on the file entitled “ev_charging_analysis_tool.xlsm.” Make sure to enable macros by clicking the “Enable Content” button that appears in the yellow bar at the top of the screen. Enabling macros will allow you to use the save and load functionality built into the tool.

STEP 2: INITIAL SETTINGS TAB

Initial Settings

The “Initial Settings” tab contains basic inputs for the model including:

- Scenario Name
- Initial Year

This information should be completed before proceeding to the other tabs.

TIP: User input cells are designated in the tool with a border and a light blue background. If a number is not designated as a user input, it is a calculation and cannot be modified or changed

Scenario Name
Initial Year

OPEN AND SAVE FUNCTIONS

The “Initial Settings” tab includes buttons that allow you to save or “export” all of the user inputs to an external file. The format of this file allows it to be read in any text editor, including Microsoft Notepad or Word. These saved inputs can be reloaded later or shared with other users of the tool. If you have received a user inputs file from another user or if you have previously exported a file, you can reload them into the tool by clicking the “Open” button and selecting the previously saved file.

Note: Loading inputs from an external file will overwrite any existing inputs in the tool.

SENSITIVITY ANALYSIS SELECTION

The tool allows you to conduct sensitivity analyses on up to 10 user inputs. For each sensitivity variable, you can select any input field via a dropdown menu selection. You can also set the minimum and maximum values for the sensitivity analysis. The results of the sensitivity analysis are found in the output tabs.

To improve performance, you may set Excel to disable automatic calculations for data tables. In this case, you must select the “Update” button for the results to reflect the current sensitivity variables and settings.

STEP 3: USER INPUT TABS

Market Inputs

Owner-Operator Inputs

Private Sector Partner Inputs

Public Sector Partner Inputs

The light blue input tabs are where you can enter the inputs for the financial analysis. There are four tabs with inputs by theme as follows:

- **Market Inputs** – Contains inputs related to the expected overall demand for EV charging services and expected growth in that demand. You can also input market-level assumptions about fuel and environmental performance for use in the public benefit calculations. On this tab, you can select one of two options for entering expected charging station utilization. The first option attempts to derive utilization from traffic patterns along the route. The second option allows you to enter charging station utilization factors directly.
- **Owner-Operator Inputs** – Contains inputs for the owner-operator organization, including information on charging equipment (the tool allows for up to three different types of equipment

each with unique cost, technical, and usage profiles), revenue sources, costs, investment/funding sources, and factors that affect financial statements for the owner-operator.

- **Private Sector Partner Inputs** – Contains inputs related to the revenue sources and costs of the private sector partner. The model allows for three sources of revenue: revenue from leasing of sites, revenue from sales due to increased traffic at the site, and indirect revenue (revenue unrelated to time spent by the customer at a charging site). These can be used in conjunction with each other or independently. This tab also defines how much of this revenue will be shared with the owner operator and whether the private sector partner will provide additional subsidy.
- **Public Sector Partner Inputs** – Contains inputs that define the involvement of the public sector including whether the public sector will provide low interest debt, equity, a one-time grant, or ongoing financial support.

STEP 4: FINANCIAL CALCULATION TABS



*TIP: Each line where a user input is required contains **a label, a unit, and an input cell**. In the example below, the line indicates an input for “average charging energy per session” (label) in “kWh/session” (unit) and the blue box is the input cell.*

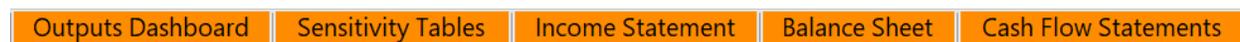
Energy Usage

Average charging energy per type 1 session [kWh/session]

9

The green financial calculation tabs do not contain any user inputs. They show the details of the discounted cash flow analysis from the perspective of each of the three partners and for the investment as a whole (all of the money going in and all of the money coming out). It is possible for an investment to have positive financial performance in the aggregate, but be financially unviable for one or more of the individual participants or vice versa.

STEP 5: OUTPUT TABS - ANALYSIS RESULTS AND FINANCIAL STATEMENTS



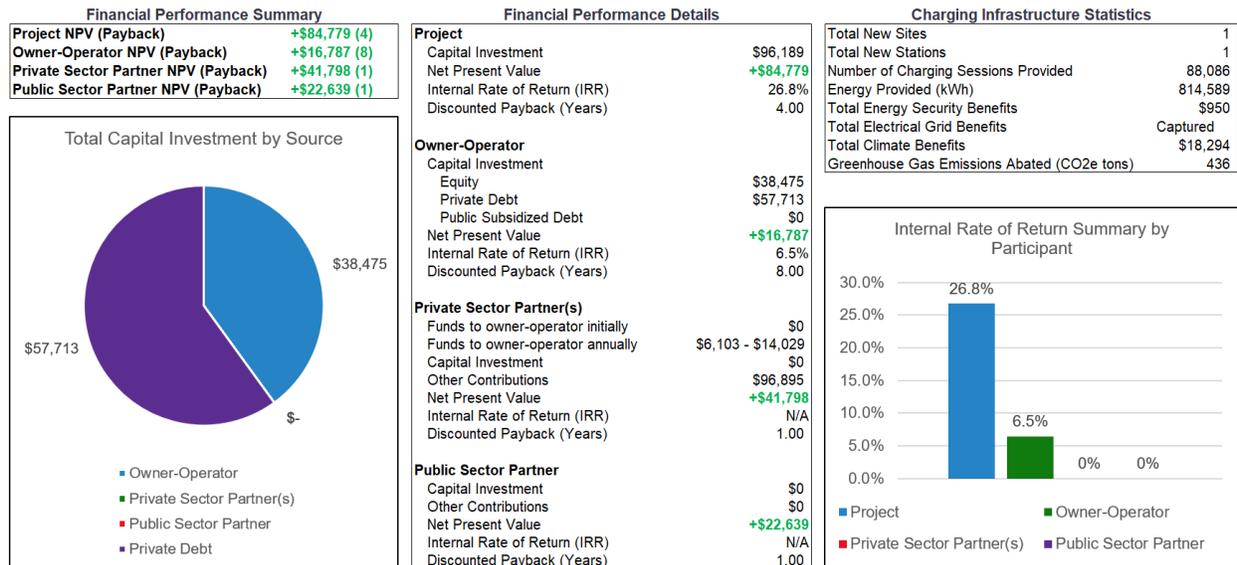
The dark blue output tabs contain a dashboard that displays the results of the discounted cash flow analysis and a sensitivity analysis on various key inputs. The remaining three output tabs contain financial statements like those used by entrepreneurs or private companies to communicate financial performance.

OUTPUTS DASHBOARD

The top section of the outputs dashboard displays key performance metrics for each of the partners. Financial metrics include:

- **Total Capital Investment** – The total outlay of funds by all participating organizations.
- **Net Present Value (NPV)** – Shows the net profit or loss of an investment by summing incoming and outgoing cash flows over the lifetime of the equipment and adjusting for the time value of money. A positive NPV indicates an investment will result in a net profit in today’s money. A negative NPV indicates a net loss in today’s money.
- **Internal Rate of Return** – Measures the profitability of an investment. Expressed as an annual rate.
- **Discounted Payback** – A simple payback (or breakeven measure) based on cash flows adjusted for the time value of money.

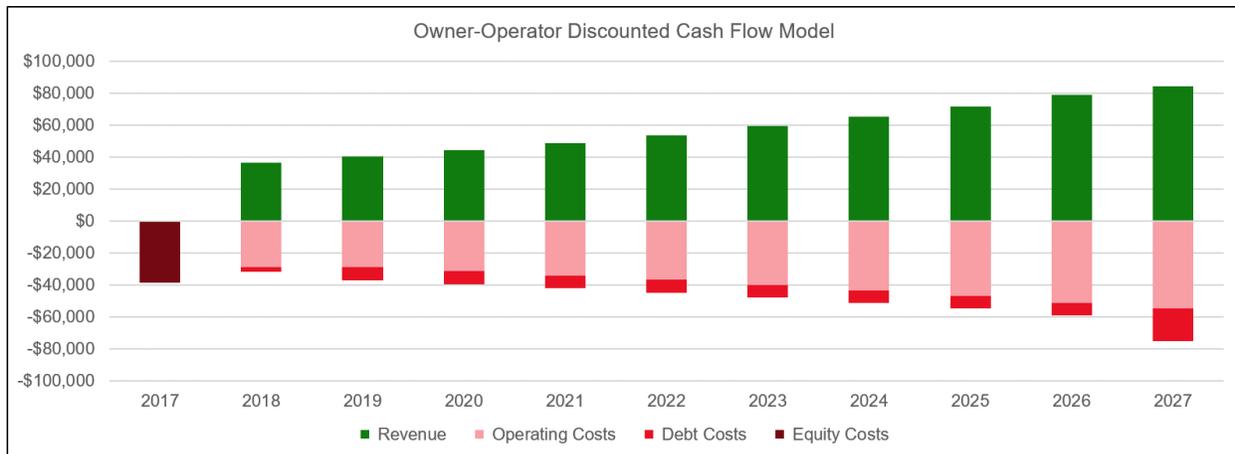
The dashboard also displays non-financial metrics like number of charging sites, number of new stations, projected number of charging sessions provided over the analysis timeframe and the total charging energy provided.



The dashboard also contains the discounted cash flow for the owner-operator, including revenue costs from operating, debt, and equity.

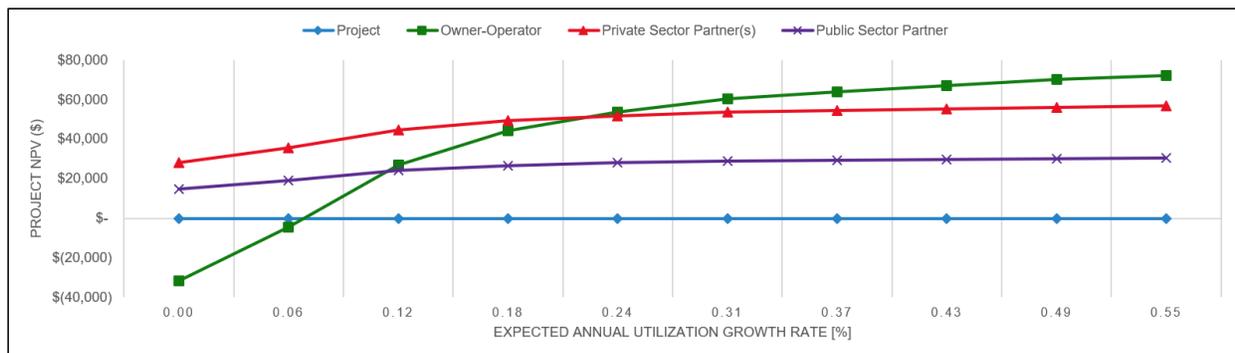
EV CHARGING FINANCIAL ANALYSIS TOOL USER GUIDE

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Revenue	\$ -	\$ 36,886	\$ 40,576	\$ 44,632	\$ 49,093	\$ 54,000	\$ 59,399	\$ 65,336	\$ 71,871	\$ 79,058	\$ 84,796
Operating Costs	\$ -	\$ (28,618)	\$ (29,071)	\$ (31,411)	\$ (33,986)	\$ (36,818)	\$ (39,934)	\$ (43,362)	\$ (47,134)	\$ (51,284)	\$ (54,560)
Debt Costs	\$ -	\$ (3,115)	\$ (8,099)	\$ (8,050)	\$ (7,995)	\$ (7,934)	\$ (7,867)	\$ (7,794)	\$ (7,712)	\$ (7,624)	\$ (20,568)
Equity Costs	\$ (38,475)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total	\$ (38,475)	\$ 5,154	\$ 3,406	\$ 5,171	\$ 7,112	\$ 9,248	\$ 11,597	\$ 14,180	\$ 17,024	\$ 20,151	\$ 9,669



In the dashboard tab, underneath the statistics tables are a series of sensitivity analysis charts. The sensitivity analysis charts isolate a single input and run multiple versions of a scenario varying only that input. The resulting chart shows how the results of the analysis would be different for each of the partners if that assumption turned out to be higher or lower than initially projected (all other inputs held equal). The example below shows changes in the net present value if the expected annual growth rate in charging station utilization were higher or lower than projected, over a range from 0 percent utilization to 55 percent utilization.

Expected annual utilization growth rate [%]



The figure below shows the sensitivity table for station utilization growth rate. The default value set by the user in the “Input Settings” tab (5.00 percent) is shown in purple. In this case, the range is 0 to 55 percent. The results of the analysis are presented in the table and serve as inputs to the sensitivity analysis graphs in the “Outputs Dashboard” tab.

You can adjust the assumptions for the sensitivity analyses results in the Initial Settings Tab, including the input variables along with the minimum and maximum range for the sensitivity analysis.

EV CHARGING FINANCIAL ANALYSIS TOOL USER GUIDE

Sensitivity Analysis #01

Scenario	Expected annual utilization growth rate [%]									
	NPV					Payback				
	Project	Owner-Operator	Private Sector Partner(s)	Public Sector Partner	Project	Owner-Operator	Private Sector Partner(s)	Public Sector Partner		
0.10	\$84,779	\$ 16,787	\$ 41,798	\$ 22,639	4.00	8.00	1.00	1.00		
0.00	\$11,379	\$ (31,480)	\$ 28,389	\$ 14,846	6.00	#N/A	1.00	1.00		
0.06	\$52,263	\$ (4,562)	\$ 35,863	\$ 19,173	5.00	#N/A	1.00	1.00		
0.12	\$100,028	\$ 26,968	\$ 44,565	\$ 24,191	4.00	7.00	1.00	1.00		
0.18	\$125,840	\$ 44,467	\$ 49,318	\$ 26,712	4.00	6.00	1.00	1.00		
0.24	\$139,634	\$ 53,956	\$ 51,894	\$ 28,006	3.00	5.00	1.00	1.00		
0.31	\$148,781	\$ 60,295	\$ 53,615	\$ 28,848	3.00	5.00	1.00	1.00		
0.37	\$154,272	\$ 64,120	\$ 54,653	\$ 29,346	3.00	4.00	1.00	1.00		
0.43	\$158,650	\$ 67,181	\$ 55,484	\$ 29,740	3.00	4.00	1.00	1.00		
0.49	\$163,168	\$ 70,339	\$ 56,341	\$ 30,146	3.00	4.00	1.00	1.00		
0.55	\$165,913	\$ 72,262	\$ 56,863	\$ 30,392	3.00	4.00	1.00	1.00		

FINANCIAL STATEMENTS

The tool includes a set of financial statements for the owner-operator business model. These statements include:

- Income Statement – Shows the revenues, costs, and resulting income for the owner-operator over the lifetime of the equipment.
- Balance Sheet – Shows the assets, liabilities, and resulting equity for the owner-operator over the lifetime of the equipment.
- Statement of Cash Flows – Shows the flow of money in and out of the owner-operator organization and the resulting cash balance over the lifetime of the equipment.

The financial statements may be of interest to potential partners in the private sector who are considering pursuing an owner-operator role.



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