



Energy Performance Verification & Visualization

Andy Jin, Andrew Saba, Richa Sharma

Client: Jeffrey Shawver

Faculty Advisor: Dr. Ebru Bish

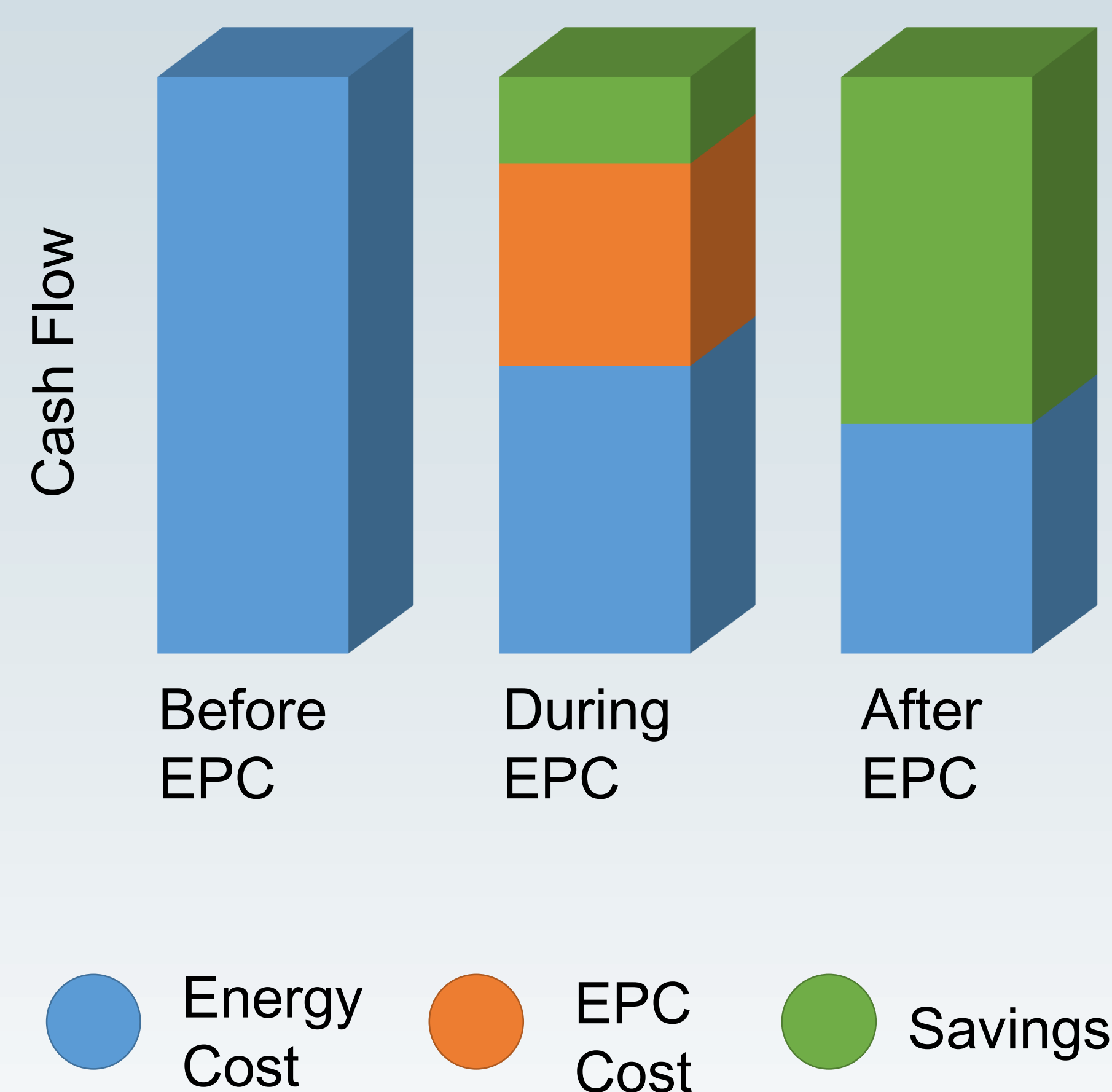


Company Background

Roanoke City Public Schools (RCPS) is a school district located in and around the City of Roanoke, Virginia. RCPS provides educational services to approximately 14,000 students. The school district is made up of seventeen elementary schools, five middle schools, two high schools, the Roanoke Valley Governor's School for Science and Technology, a vocational school, two alternative education facilities, an adult education programs, and preschool programs.

Project Background

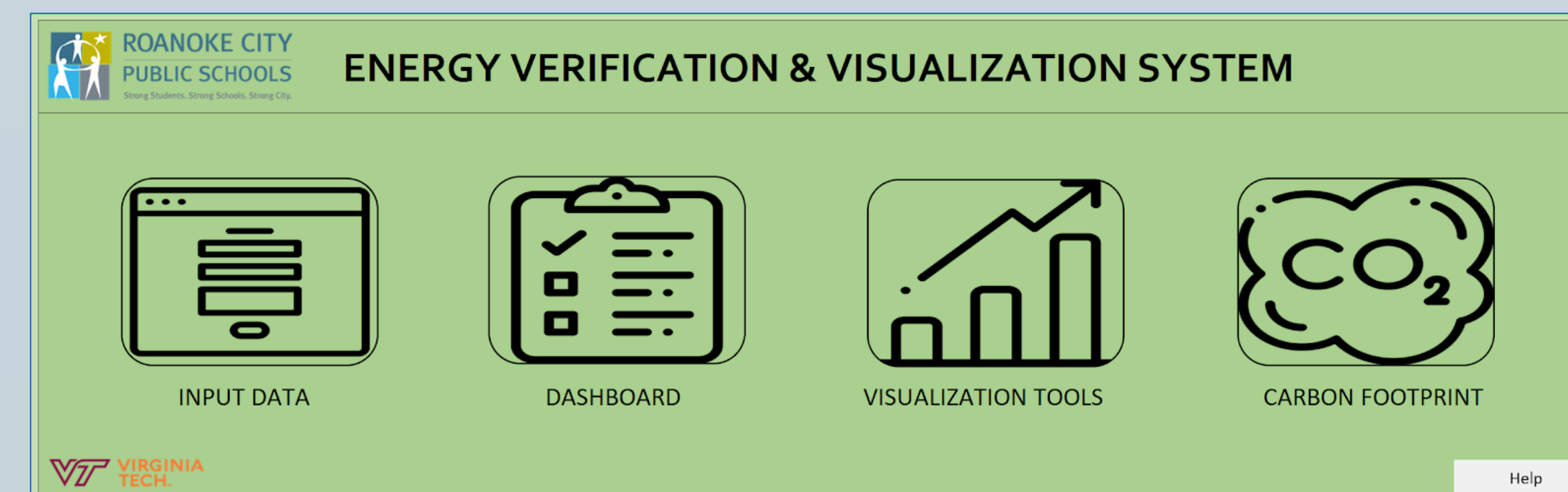
Roanoke City Public Schools (RCPS) entered into a \$16.3M Energy Savings Performance Contract (EPC) with Trane. Trane will provide new energy-efficient equipment to RCPS. The contract states that the energy savings from the equipment will cover the cost of the project. RCPS would like a way to meet and sustain Trane's estimated cost savings in order to have a cost effective project.



Implementation/Solution

The Verification and Visualization System is a Microsoft Excel application. This system will verify if Trane's estimated savings have been met for each school on a monthly basis. The system will also provide visualizations for RCPS to monitor their energy savings (electricity, water, and gas).

Main Menu



Data Input

Dashboard

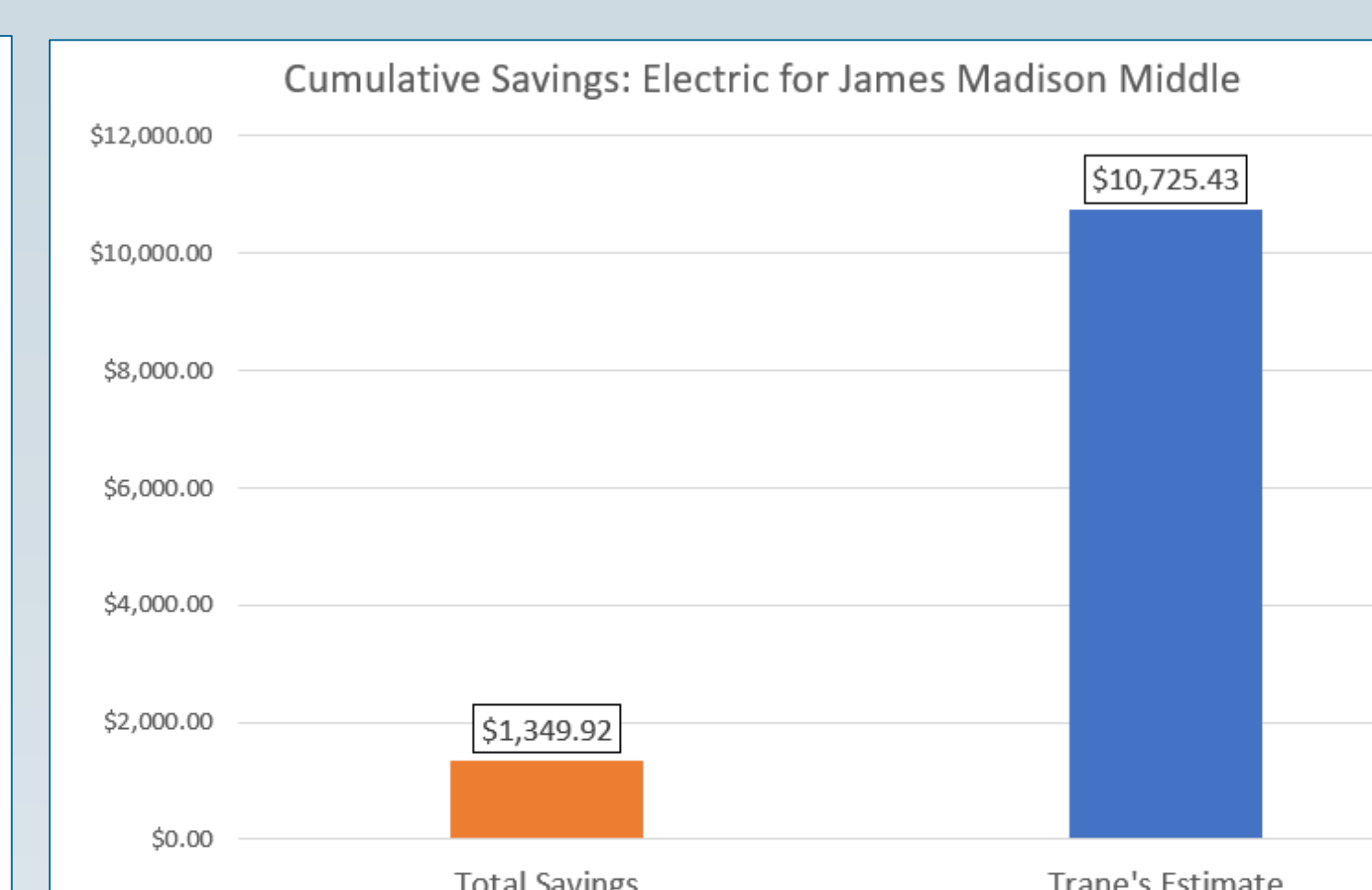
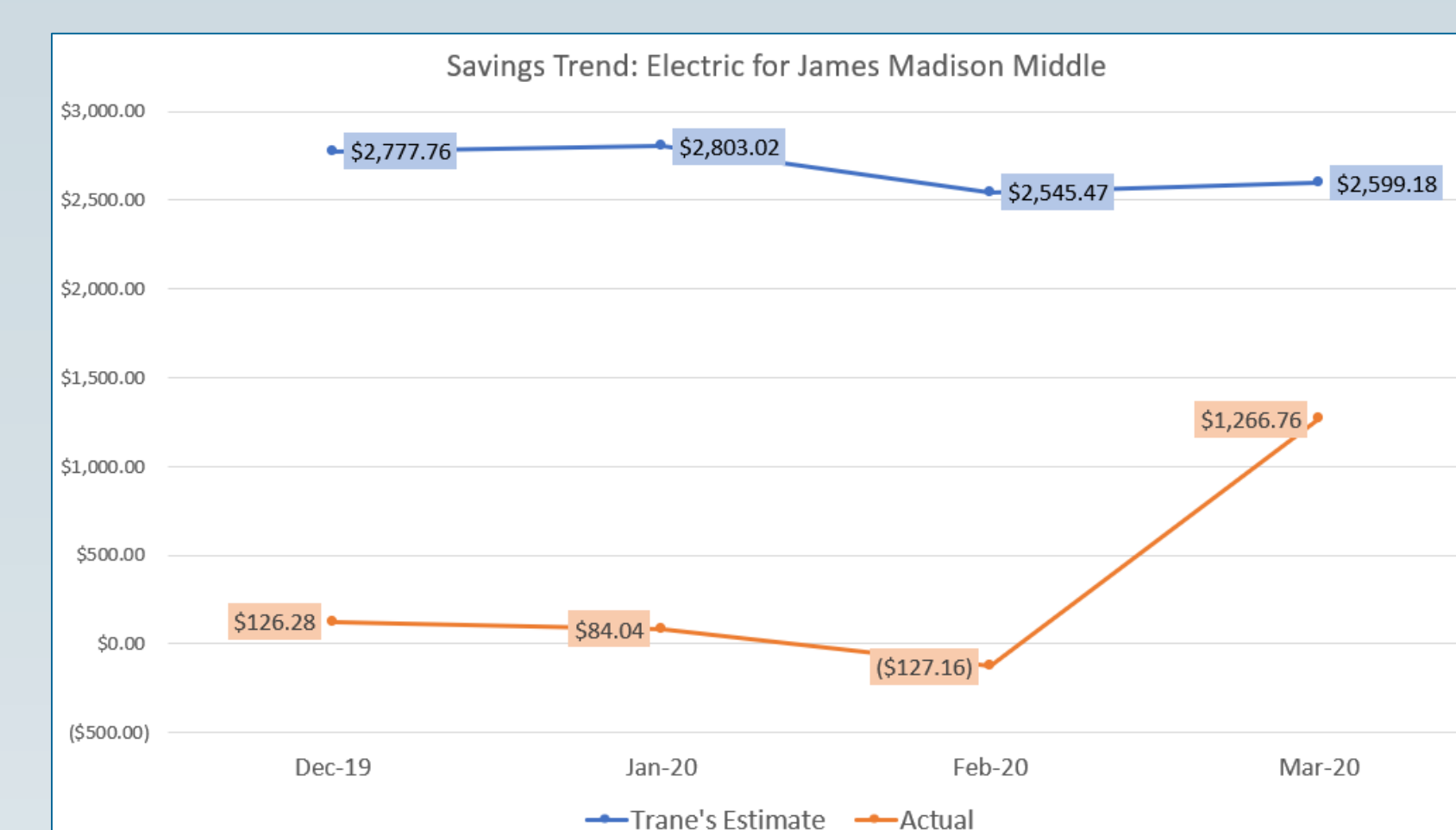
Electric RCPS Dashboard: January 2020											
Administration	<div><div></div></div>	-101%	Fishwick Middle	<div><div></div></div>	-92%	Highland Park Elementary	<div><div></div></div>	-5%	Monterey Elementary	<div><div></div></div>	N/A
Breckinridge Middle	<div><div></div></div>	N/A	Forest Park Academy	<div><div></div></div>	N/A	Hurt Park Elementary	<div><div></div></div>	N/A	Morningside Elementary	<div><div></div></div>	N/A
Crystal Spring Elementary	<div><div></div></div>	N/A	Garden City Elementary	<div><div></div></div>	N/A	James Madison Middle	<div><div></div></div>	-97%	Noel C. Taylor Learning Academy	<div><div></div></div>	-129%
Fairview Elementary	<div><div></div></div>	18%	Governor's School	<div><div></div></div>	N/A	Lincoln Terrace Elementary	<div><div></div></div>	N/A	Patrick Henry High	<div><div></div></div>	39%
Fishburn Park Elementary	<div><div></div></div>	N/A	Grandin Court Elementary	<div><div></div></div>	N/A	Lucy Addison Middle	<div><div></div></div>	N/A	Preston Park Elementary	<div><div></div></div>	N/A

Key

Red = Savings are more than 10% under Trane's guarantee
Yellow = Savings are about equal to Trane's guarantee
Green = Savings are more than 10% over Trane's guarantee
White = No bills input for this facility

The dashboard shows which schools have and have not met Trane's guarantee.

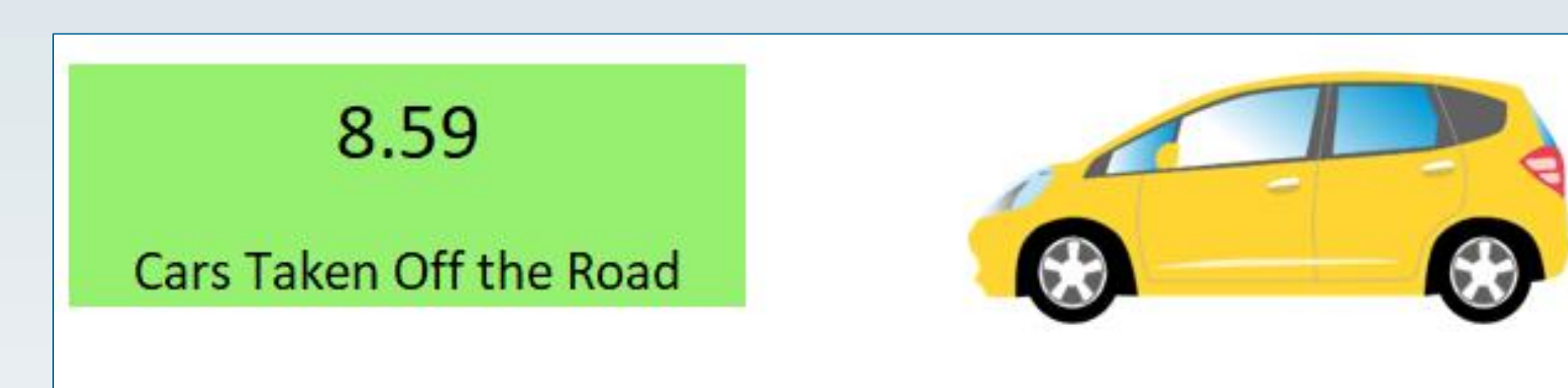
Visualization Tools



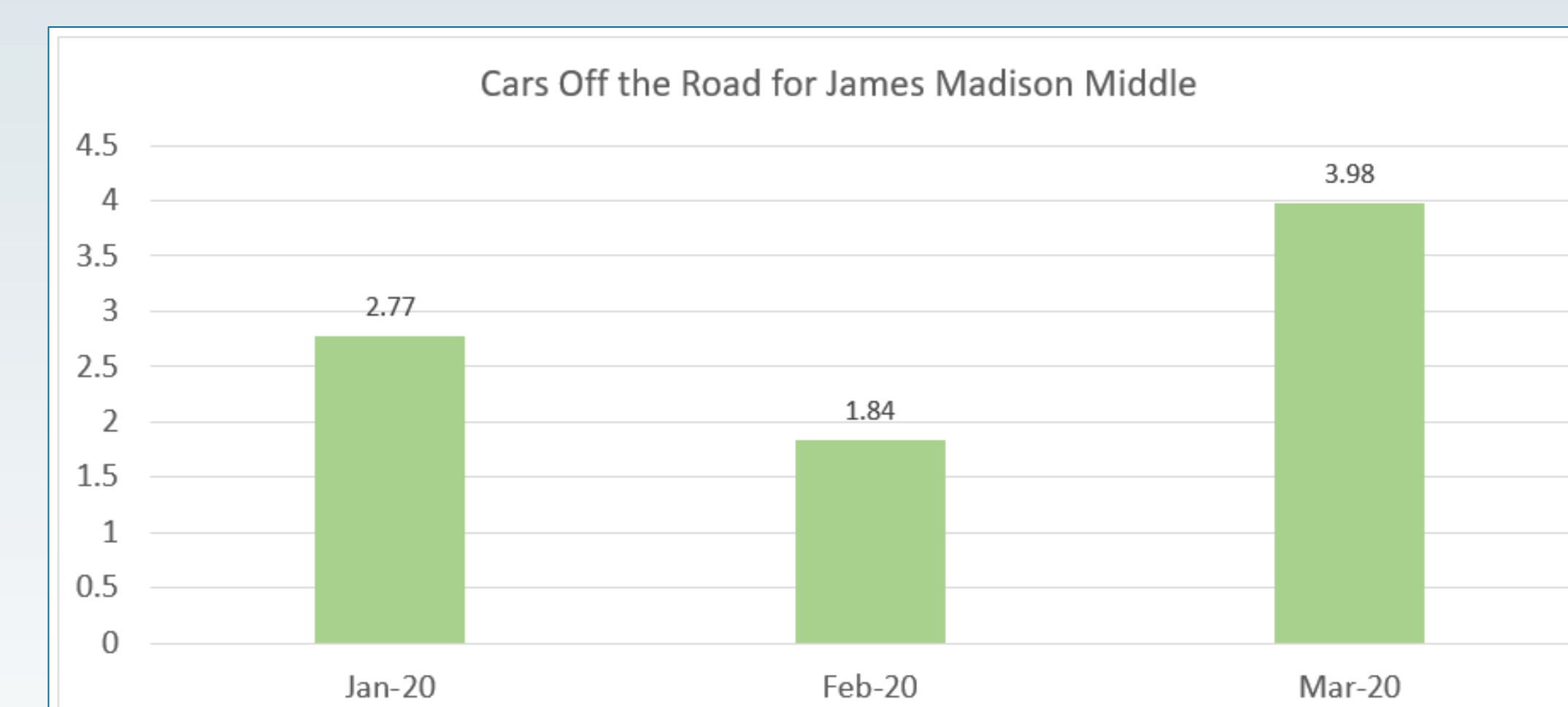
The line graph that shows the difference between actual versus guaranteed savings.

The bar graph shows the cumulative savings for the chosen facility and date range.

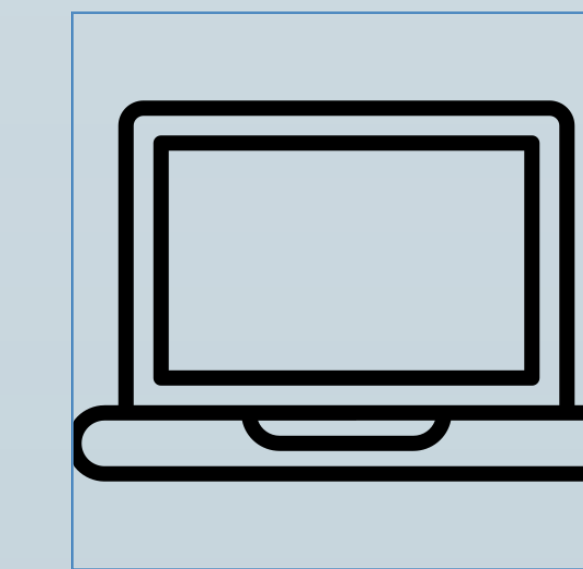
Carbon Footprint



The carbon footprint shows the amount of carbon emissions saved equivalent to the number of cars taken off the road for a certain year.

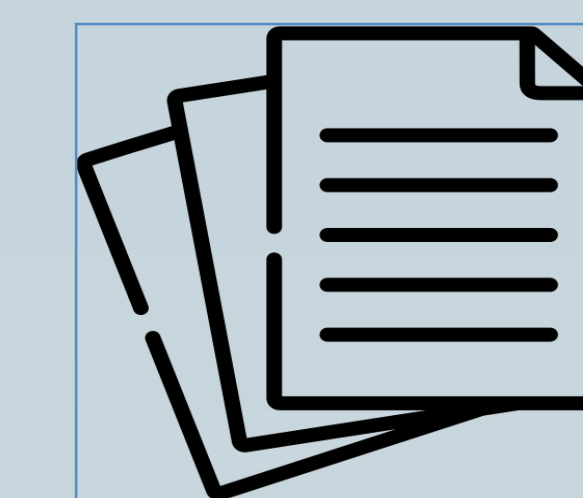


Deliverables



Verification & Visualization System: Provides a variety of tools to be used for the life of the contract (15 years).

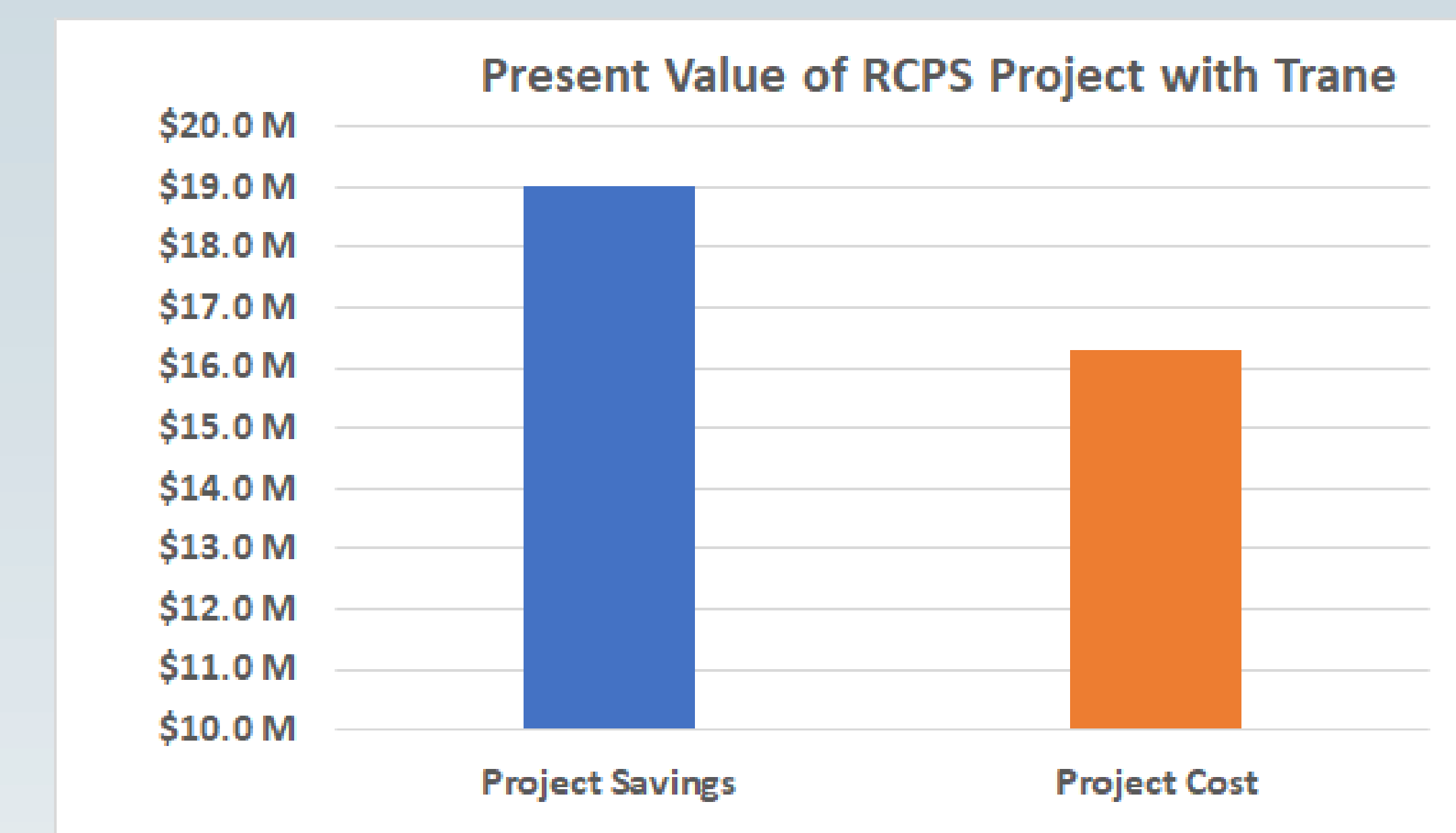
Notification System: Monthly summarized email of all in-scope facilities energy cost savings in comparison to Trane's estimate.



User Manual: Provides detailed assistance on how to use the system as well as steps to take to maintain the system.

Impact

The project cost with Trane is \$16.3M, while the project is expected to save RCPS a total of \$19M, over 15 years.



The system will empower RCPS to verify annual energy savings of approximately \$1.2M and take action accordingly to sustain the savings over 15 years.