

Energy Software as a Service (ESaaS)

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Energy Software as a Service (ESaaS)

Overview

BOSS' ESaaS solution revolves around the Atmospheres® software platform and combines software, IoT cybersecure embedded chip technology, data analytics and behind-the-meter device control. The solution is delivered through a service-based model that enables a building operator / owner to optimize energy consumption and cost at the device level, as well as for the entire building. The behind-the-meter controls are easily installed or retrofitted to get building energy cost savings started. In addition, this installation can be accomplished with no upfront cost and no operational disruption and can be funded by future energy savings. The customer realizes benefits immediately. Atmospheres® controls, analyzes, verifies energy savings, and provides advanced data analytics and predictive models, thereby creating value to both building owner clients and energy companies (such as utilities).

There are six million small-mid-sized commercial buildings in the U.S., representing 80% of building population, which is an untapped opportunity in the energy industry transition. Behind-the-meter-controls, along with distributed energy resources (DER), such as solar, battery, or generators, evolve properties into smart buildings by adding visibility, predictability, and control. Historically, small and mid-size buildings were not large enough to participate as DER assets to grid operators. However, Atmospheres® is able to aggregate customers and their power, thereby broadening commercial building participation. BOSS' ESaaS solution strives to product, with respect to the energy load managed by the behind-the-meter controls, energy and operational efficiency savings of at least 40% and an increase of DER value maximization of at least 10%.

BOSS' ESaaS solution measures, controls, and collects real-time power data at each electrical control point within a building. In addition, the ESaaS solution incorporates and analyzes wholesale energy and other market data. BOSS leverages these capabilities to accurately project energy savings, by device, and establish a lifetime value for each junction point under control. This granular view at the device level enables the accurate pre-sales prediction of kWh savings per square foot of a building and ensures that the ESaaS solution is profitable and still provides significant savings for the customer. In addition, the ESaaS solution can manage the energy use within the entire building envelope, as the system of record, or can provide advanced information and analytics to existing customer BAS investments, thereby enabling more information-based decisions.

ESaaS is based upon an "as a service", data analytics model, like Facebook, Google, and Apple. This model supports the collection and monetization of anonymized building and device data and addresses consumer privacy concerns. With customer growth, the value of the customer data and device behavior data will grow exponentially as correlation and predictive algorithms gain source data and accuracy.



By leveraging the ability to accurately predict savings and measure usage, BOSS can also bundle the ESaaS solution with energy supply contracts for increased customer energy cost savings. BOSS can also ensure that the ESaaS shared savings revenue will be sufficient to cover the upfront ESaaS installation cost.

The ESaaS customer agreement contains both fixed and variable savings streams and applies risk-weightings to ensure that services levels and client savings targets are met or exceeded.

ESaaS is a unique business model that helps transition the power industry and electric grid from a centralized, supply-centric view, to demand-centric or customer-centric approach. ESaaS also promotes a transition from inefficient fossil fuels and provides customers with a decentralized, resilient, secure energy grid.



ESaaS Savings Categories

BOSS' ESaaS solution enables commercial properties, with no upfront investment, to become smart buildings with behind-the-meter control for electrical devices. Clients benefit from reduced energy cost through improved measurement, automated control, and predictive models that optimize load shedding / shifting for maximum savings. The ESaaS solution targets at least 40% energy cost savings related to devices connected to the behind-the-meter controls in the following areas:

1) Reduced energy consumption (30% portion of ESaaS savings)

Each device attached to the Atmospheres® platform, which is a component of the ESaaS solution, has a built-in automated energy measurement and verification (M&V) that can be remotely controlled in real-time, allowing automatic schedules and actual energy savings to be realized and validated. Devices can be assigned schedules to automatically deactivate on weekends, after business hours, and on holidays, resulting in up to 67% reduction per year. For a 100W device at 10 cents per kWh, the energy savings can amount to \$587 per device, per year.

Tactics to reduce energy consumption include:

- Automate device load shedding controls
- Off hours weekday energy avoidance
- Weekend energy avoidance
- Holiday energy avoidance
- Remote monitoring and control for electrical assets

2) Reduced energy cost (10% portion of ESaaS savings)

The Atmospheres® platform enables a client to automatically shift connected load use to avoid high cost periods and adjust to other market-based signals, thereby reducing the effective kWh cost. Since ESaaS can also manage inside-the-meter casual generation devices (e.g., backup generators, solar, and battery storage) there are additional opportunities to optimize energy cost reduction when such generation is deployed.

With ESaaS market data analytics capabilities, clients can predict peak load measurement days used by the utilities and/or Independent System Operators (ISO) in allocating energy costs to customers with at least a 90% accuracy. Because the energy use during these peak load days are used by the ISO or utility to set the energy cost rate for an entire billing year, curtailing energy use during these predicted peak load days can impact energy cost by over 30%. By predicting and automatically target load shedding / shifting on the predicted peak days, ESaaS customers can manage their peak load contribution, capacity, and transmission charges.



Since ESaaS is able to control inside-the-meter devices in less than a minute, clients can participate in applicable ISO and/or utility DR programs, thereby gaining additional net cost savings.

Tactics to reduce the cost of energy include:

- AI to identify peak load measurement days
- Optimized load shedding or shifting during peak load
- Enabled participation in IOS or utility DR and other curtailment programs
- Optimized energy contract sourcing
- Optimized grid and onsite energy production and storage utilization
- Load under control, lowers utility costs that get passed through to customer [Not clear on this one]

3) Improved operational efficiencies and asset performance (3% portion of ESaaS savings)

The ESaaS platform provides centralized monitoring and control of the devices and collects and records energy use data relating to each device. Using data analytics on this collected data, the ESaaS platform is able to correlate events and trends for predictive maintenance, usage optimization, and extended life for capital equipment. For example, these analytics can produce more effective operations, including filter changes, machine maintenance, and the flagging of pre-failure indicators to avoid catastrophic events.

Tactics to improve operational efficiencies include:

- Asset management support
- Remote electrical device management and control
- Detection of abnormal device activity for preventative maintenance, avoiding catastrophic failure
- Centralized facility management for building portfolios
- Smart building data analytics for the building and all capital equipment
- The monitoring of energy supply quality for more efficient operations
- Data collection to lower insurance costs as catastrophic failure risk is managed

ESaaS 15,000 ft² Savings Example

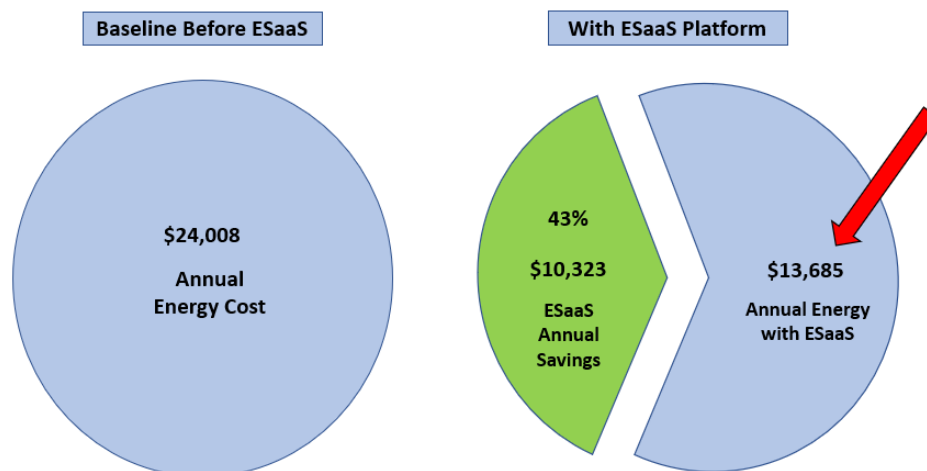
Commercial Building (Square Feet)	15,000
Number of Buildings	1
Average Building Age in Years	55
Energy Cost (cents/kWh)	10.67
Annual kWh	225,000
Annual Energy Cost	\$24,008

		Category	Impact	Control Point Wattage	Weighted Average Contribution	Annual		10 Year
						kWh Savings	Dollar Savings	Dollar Savings
Demand Reduction	30%	HVAC ¹	51%	250	15%	34,425	\$3,673	\$36,731
		Lighting	10%	100	3%	6,750	\$720	\$7,202
		Office Equipment	8%	150	2%	5,400	\$576	\$5,762
		Appliances	17%	125	5%	11,475	\$1,224	\$12,244
		Other	14%	100	4%	9,450	\$1,008	\$10,083
					30%		\$7,202	\$72,023
Reduced Energy Cost	10%				10%		\$2,401	\$24,008
Operational Efficiency ^{2,3}	3%				3%		\$720	\$7,202
							\$10,323	\$103,232
CO ₂ ~ lbs. coal saved →						52,178		

1 BOSS target market are older buildings with multiple HVAC systems that make up a large percentage of the HVAC energy usage.

2 Reduce sub-optimal equipment usage related to competing HVAC controlled areas.

3 Intelligent dimmer switches to match lighting requirements with daylight contribution.



Note: For sample proforma information on this example please refer to the appendix



Process and Control

Accuracy and Control

BOSS relies on several key control measures to ensure accuracy, customer satisfaction, and savings performance:

1. Strong processes to pre-qualify customers and establish high level savings predictions (90+%)
2. Detailed customer engagement process to ensure collection of actual customer building, device, and energy performance data (~100%)
3. Accurate, automated M&V to measure actual device/building performance and savings (~100%)
4. Accurate, mature processes to predict peak day events (91%)
5. Oversight to ensure BOSS solution performance and customer behavior monitoring and rapid escalation of anomalies
6. Contract provisions that appropriately allocate commercial risks relating material changes or unforeseen market events.
7. Cybersecurity investments to that protects process availability, security, accuracy, and operation from unwanted or unintentional breaches and exploits.

Reference the ESaaS model/example in appendix. This model has been used across 8 different customer campuses, currently in various implementation stages, and supports the accuracy measurements above.



ESaaS Sales Process

Step 1 – Pre-Sale Qualification

BOSS maintains internal models and uses industry data to determine potential sales targets, based primarily on high level information related to the customer business and building infrastructure.

As part of the ESaaS, pre-sales client data are collected in the ESaaS assessment process to create a client profile, which includes:

- Client background
- Electricity spend history
- Sample utility bills (pricing tiers, kWh cost, energy contract, etc.)
 - Infrastructure (# of buildings and type, age, square footage, etc.)

The above information is then used to create an ESaaS savings estimate and scoping profile.

Step 2 – Predictive Savings Estimation Based Upon Building Data Inputs

Upon engagement, BOSS utilizes a customer onboarding methodology to ascertain necessary information and then targets the following areas for review:

- Detailed building inventory (age, location, type, ft² ... etc.)
- Device type, by building (focused on desired target devices)
- Energy contract and cost
- Historical energy usage data from the energy provider

Utilizing the inputs, BOSS runs the information through its model to estimate number of potential control points, device energy consumption (by device type), annual cost, and potential savings opportunities.

Risk weightings are applied, based on data confidence and overall customer profile.

Step 3 – Initial Draft ESaaS Contract

While the customer onboarding information gathering and estimation is taking place, BOSS initiates a 2-part contract process.

Part 1 covers BOSS performing a detailed analysis for energy profiling, savings potential, and customer energy management execution roadmap.

BOSS also includes risk weightings in this phase.



Step 4 – Select ESaaS Positive Savings Control Points

BOSS performs a detailed audit to ensure target device coverage and plans a baseline implementation that will provide detailed and actual M&V information related to each device and building. BOSS M&V accuracy has been validated through a pilot with PG&E, utilizing ADM.

Step 5 – ESaaS Baseline Implementation

Based on target devices, BOSS will install the solution and begin measuring consumption and employee behavior. Based on a standard one-month period, BOSS and the customer would then agree to:

- Scheduled off-time, by device
- Device participation for peak load shaving (or shifting)
- Device participation for demand response

At this point, part 2 of the contract is implemented and the customer is obligated to minimum savings payments, based on BOSS' ability to perform and provide regular reporting.

BOSS also utilizes a risk weighting approach to ensure high confidence in achieving minimum savings performance. Regular reconciliation reporting is used to identify additional savings opportunities that provide benefits to both the customer and BOSS.

Step 6 – Real Time Savings Monitoring and Confirmation Monthly

Given the confidence in the estimate, combined with the confirmed energy performance monitoring and regular account oversight, BOSS guarantees base level savings to the customer (and ensures achievement of expected cash flow to BOSS).

BOSS has a focused customer centric approach and works diligently to ensure that the target buildings and devices will have highly predictable behavior relating to non-mission-critical functions. The ESaaS model incentivizes both client and BOSS to maximize energy savings and cost reduction. In addition, contract provisions protect BOSS in the event of material changes in customer behavior, building purpose or occupancy, future energy consumption decisions, or the use of alternative energy resources.

Step 7 – Monitor and Provide Client with Data Analytics

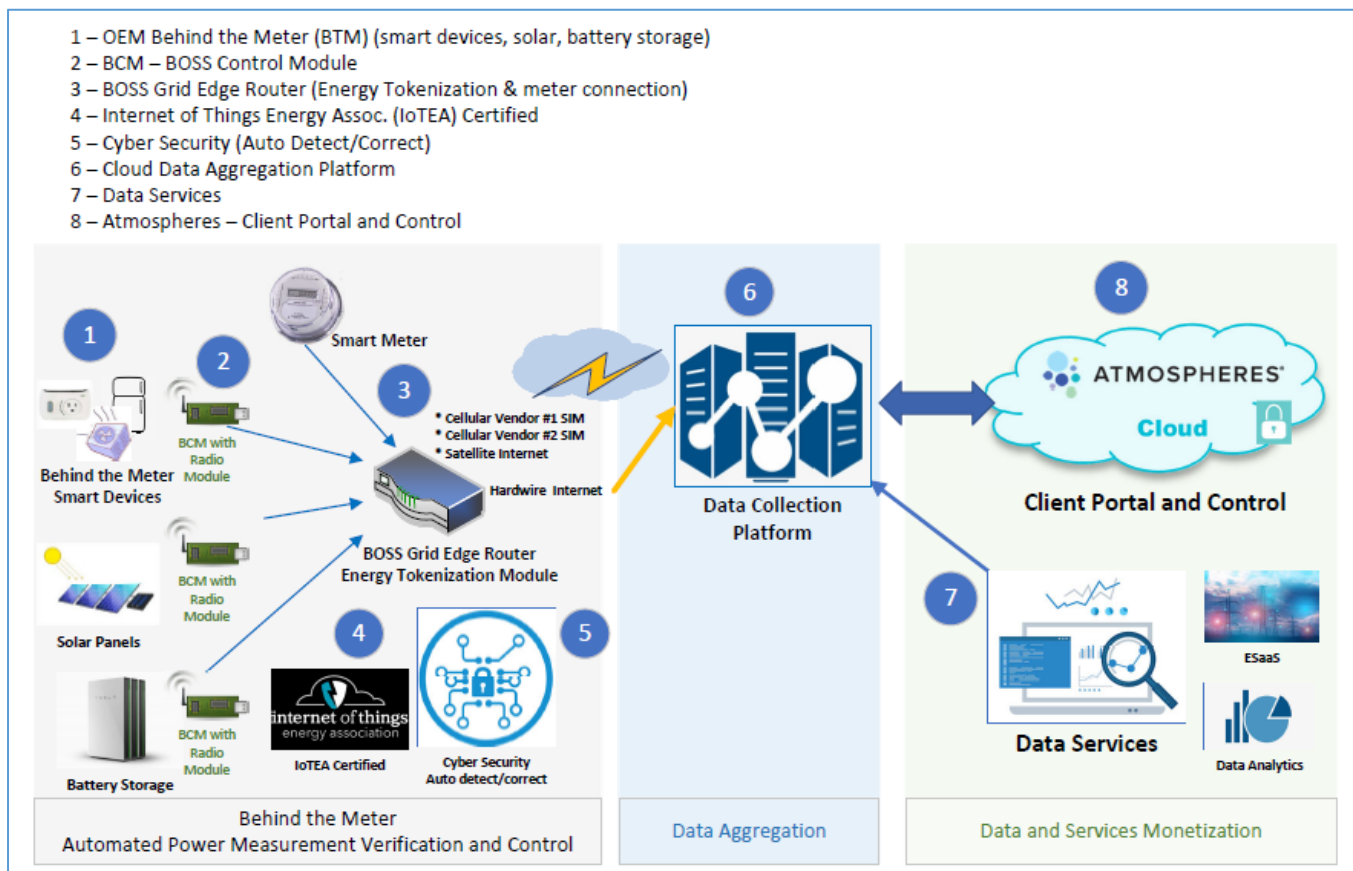
The ESaaS solution, with its granular real-time inside-the-meter energy measurement, enables the monitoring of asset performance and can quickly identify and correct non-optimal control points. Being able to monitor daily performance ensures that any issues are identified and addressed early, thereby dramatically reducing risk and ensuring that base-line savings are met or exceeded consistently.

Appendix

ESaaS Technology Components


ESaaS combines IoT technology, software, data analytics, and control, delivered through a service-based business model that enables a building operator to optimize energy consumption, at the device level. The behind-the-meter (BTM) smart controls are easily inserted to get buildings started, all at no upfront cost, no operational disruption, and funded by future energy savings. Atmospheres® is the BOSS software application that controls, analyzes, and verifies energy savings, enables DER visibility into the marketplace, and provides advanced data analytics and predictive models.

The ESaaS solution consists of eight primary components and services



Detailed Data ESaaS Example

Pre-ESaaS Contract Analysis			
	Description	Est. Wattage	Measured Wattage
1	WRE Lounge Vending Soda P#135		454.09
2	PS Vending Soda P#189		369.32
3	Lounge Vending Soda P#141		283.58
4	DHS Gym3 Vending Soda P#46		255.56
5	DFC Office Vending Soda P#26		245.82
6	2nd FL Vending Soda P#140		207.16
7	FME Kitchen R Cooler P#150		178.39
8	EMS Rm#L2 18-Com P#66		138.62
9	TME Kitchen R Cooler P#159		95.17
10	DEAP 8Com P#193		92.77
11	EMS Rm#L2 6-Com P#64		86.77
12	PS 2nd FL Bottle WC P#190		61.32
13	EMS Rm#L2 7-Com P#65		58.21
14	PS 1st FL Xerox P#186		50.71
15	FME Office Xerox P#153		47.32
16	Admin Keurig WC P#123		36.39
17	DEAP Keurig WC P#119		36.33
18	DEAP 4Com P#194		30.92
19	PS Keurig & Coffee Pot P#187		27.86
20	EMS County Office Xerox P#54		20.61
21	PS 2nd FL Xerox P#191		11.79
22	EMS Main Office Xerox P#52		9.82
23	Finance Xerox P#115		9.24
24	FME 300 Hall WC P#215		7.24
25	Ben Dial Office Xerox P#185		4.83
26	FME Rm#300 16Com P#157		2.04
Totals		2,600.00	2,821.87



92% Wattage
Prediction Accuracy



ESaaS Contract Calculation

	Description	Baseline	With ESaaS			
		Annual Cost before ESaaS @ 14cents/kWh	Annual Cost (Use Reduction)	Annual Cost (Cost Reduction)	Annual Cost (Ops Efficiency)	Annual CO ₂ ~ Lbs. Coal Saved
1	WRE Vending Soda P#135	\$557	\$215	\$200		
2	PS Vending Soda P#189	\$453	\$175	\$162		
3	Lounge Vending Soda P#141	\$348	\$134	\$125		
4	DHS Gym3 Vending Soda P#46	\$313	\$121	\$112		
5	DFC Office Vending Soda P#26	\$301	\$116	\$108		
6	2nd FL Vending Soda P#140	\$254	\$98	\$91		
7	FME Kitchen R Cooler P#150	\$219	\$85	\$78		
8	EMS Rm#L2 18-Com P#66	\$170	\$66	\$61		
9	TME Kitchen R Cooler P#159	\$117	\$45	\$42		
10	DEAP 8Com P#193	\$114	\$44	\$41		
11	EMS Rm#L2 6-Com P#64	\$106	\$41	\$38		
12	PS 2nd FL Bottle WC P#190	\$75	\$29	\$27		
13	EMS Rm#L2 7-Com P#65	\$71	\$28	\$26		
14	PS 1st FL Xerox P#186	\$62	\$24	\$22		
15	FME Office Xerox P#153	\$58	\$22	\$21		
16	Admin Keurig WC P#123	\$45	\$17	\$16		
17	DEAP Keurig WC P#119	\$45	\$17	\$16		
18	DEAP 4Com P#194	\$38	\$15	\$14		
19	PS Keurig & Coffee Pot P#187	\$34	\$13	\$12		
20	EMS County Office Xerox P#54	\$25	\$10	\$9		
21	PS 2nd FL Xerox P#191	\$14	\$6	\$5		
22	EMS Main Office Xerox P#52	\$12	\$5	\$4		
23	Finance Xerox P#115	\$11	\$4	\$4		
24	FME 300 Hall WC P#215	\$9	\$3	\$3		
25	Ben Dial Office Xerox P#185	\$6	\$2	\$2		
26	FME Rm#300 16Com P#157	\$3	\$1	\$1		
Totals		\$3,461	\$1,337	\$1,241	\$1,138	1,911 lbs.
			61%	64%	67%	



Risk Matrix

BOSS Controls utilizes the DoD Risk Management Framework (RMT) and NIST standards as the basis for technology, security, and operating risk assessment. Additionally, BOSS augments RMF with industry, business, competition, and financial risk assessment criteria. Detailed risk assessments are performed and reviewed regularly by executive management to ensure adequate management and monitoring.

Below is an executive level summary for BOSS' top 5 risks and associated risk management:

Risk	Inherent Rating	Trend	Mitigations
Failure of BOSS solution to provide savings necessary for customer satisfaction and profitability	High	Stable	<p>High</p> <ul style="list-style-type: none"> • BOSS data modeling ensures appropriate target customers and buildings. • Baseline analysis and savings calculations ensure predictable savings, including risk-weighting for specific devices and use cases. • BOSS embedded chipset includes M&V (as validated by certified engineering firms) and uses actual usage and energy price data to calculate savings. • Contract language and BOSS monitoring ensure predictable cost savings, across contract lifetime, and prevents customer building purpose changes, or business behavioral changes from impacting savings commitments. • Residual risk exists in the event of catastrophic electric market failure.
Market readiness for BOSS' value proposition and unique business model	High	Decreasing	<p>High</p> <ul style="list-style-type: none"> • Market assessment and seeding activities have positioned BOSS to capitalize on the market shift and energy transition. • De-regulation has created a utility and competitive retailer business model receptive to ESaaS. • Energy markets are in a paradigm shift moving to a customer-centric, smart building, market • Increasing investments in electrical grids to: (a) cyber-harden and to protect from active threats and IoT vulnerabilities; and (b) prepare grids for multiple decentralized energy sources • BOSS has aligned its capabilities, strategy, and roadmap with the transition of the energy markets resulting from: total electrification; digitization; decarbonization; and decentralized energy source.
Failure of BOSS hardware or software to perform	High	Stable	<p>High</p> <ul style="list-style-type: none"> • ESaaS technology is mature with rigorous processes for design specifications, manufacturing, programming, and quality assurance. • BOSS' customer support and engineering teams provide ongoing performance monitoring to identify and correct issues. • BOSS has multiple marquee customers and many smaller customers successfully operating on the platform, with a mean-time-to-failure in excess of 10 years.
Failure for ESaaS technology to be secure or resilient	High	Stable	<p>High</p> <ul style="list-style-type: none"> • BOSS offers best-in-class, cyber secure chip-to-cloud technology with a strategy for ongoing threat assessment, emerging risk analysis, and control capabilities. • BOSS maintains a roadmap to manage the inherent vulnerabilities, threats, and exploits associated with the Nation's electrical grid and devices that can connect to it. • BOSS technology is rigorously designed, manufactured, and tested within the U.S. boundaries and follows NIST guidelines. Components are built-for-purpose to prevent unexpected activity; chip-level secure to eliminate back-door access; encrypted and controlled to prevent misuse; and highly predictable with anomaly detection. • Network communications are secured through: multi-layered encryption; digital signatures; connection limits; and Wi-Fi standards.

Inability for BOSS ESaaS to remain competitive	High	Increasing	High BOSS competitive analysis explores feature/functionality across multiple industry participants and concludes: <ul style="list-style-type: none">• BOSS is approximately 18-24 months ahead of competition, regarding an end-to-end, integrated, cybersecure solution• Many competitors perform components of BOSS' solution, with varying levels of effectiveness• Competition is quickly evolving and aggressive roadmap execution and capability buildout, as well as capital raising, will be required.
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U.S. Market Size

U.S. Commercial Customers ¹				
Commercial Clients	Total Annual Energy (TWh)	Total Annual Spend @ \$0.1067/kWh (in Billions \$)	Average use per month (kWh)	Average Use per Year (kWh)
18,605,000	1,381.76	\$147.434	6,189	74,268

U.S. Commercial Building					
Commercial Buildings ²	Total Annual Energy (TWh)	Total Annual Spend @ \$0.1067/kWh (in Billions \$)	Average use per month (kWh)	Average Use per Year (kWh)	Average Commercial Building Size ³ (Square Feet)
6,000,000	1,381.76	\$147.434	19,191	230,293	15,353

1 ["Electric Power Annual 2018 - U.S. Energy Information Administration"](#)

2 Projection based upon 5.6 million buildings stated in 2012 Constellation study

3 Calc. 2012 Constellation study found average commercial building used 15kWh/ft² annually

Building Owner Benefits - 15,000 ft² Building Example

Customer Baseline Energy Cost prior to ESaaS

Building Owner Benefit Calculation							5 Year Total	Est Lifetime
	Year 1	Year 2	Year 3	Year 4	Year 5			
Annual Electricity Cost	\$24,008	\$24,008	\$24,008	\$24,008	\$24,008	\$120,038	\$240,075	
ESaaS Energy Reduction Savings	\$7,202	\$7,202	\$7,202	\$7,202	\$7,202	\$36,011	\$72,023	
ESaaS Energy Cost Savings	\$2,401	\$2,401	\$2,401	\$2,401	\$2,401	\$12,004	\$24,008	
Operational Efficiency Savings	\$720	\$720	\$720	\$720	\$720	\$3,601	\$7,202	
	\$10,323	\$10,323	\$10,323	\$10,323	\$10,323	\$51,616	\$103,232	
Annual Electricity Cost with ESaaS	\$13,684	\$13,684	\$13,684	\$13,684	\$13,684	\$68,421	\$136,843	
ESaaS based fee (Atmospheres license)	\$1,802	\$1,802	\$1,802	\$1,802	\$1,802	\$9,012	\$18,025	
ESaaS Fee (Based upon % Share of Savings)	\$3,359	\$3,359	\$3,359	\$3,359	\$3,359	\$16,796	\$33,592	
Net Energy Cost to Bldg Owner with ESaaS Fee	\$18,846	\$18,846	\$18,846	\$18,846	\$18,846	\$94,229	\$188,459	
Annual Energy Cost per Ft ²	\$1.60							
Annual Energy Cost per Ft ² with ESaaS	\$1.26							
Percentage Savings per Ft ²	22%							

Customer Net Energy Cost

Customer Energy Savings with ESaaS

