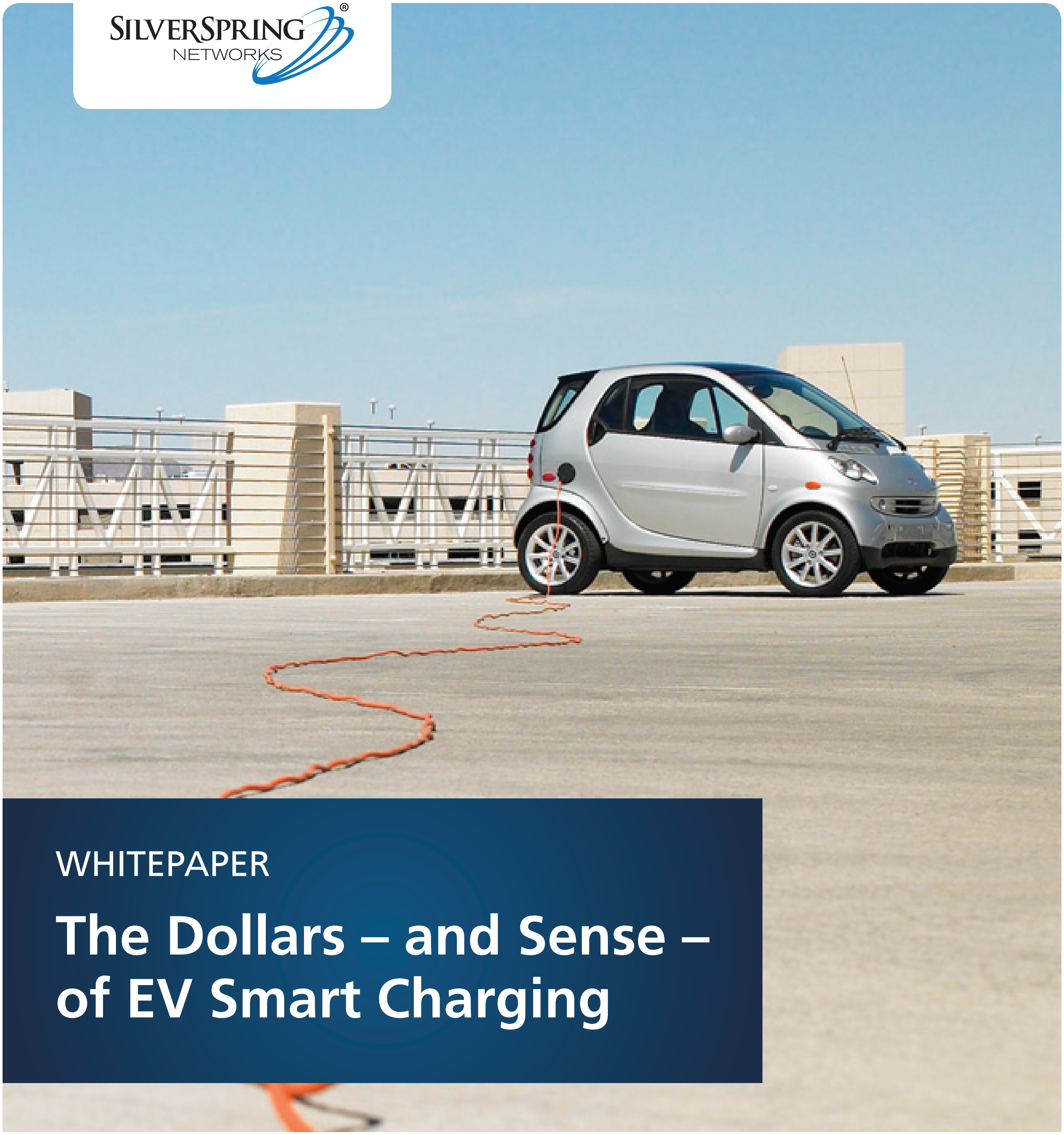


SILVERSPRING NETWORKS

WHITEPAPER

The Dollars – and Sense – of EV Smart Charging

Thinking Through the Options for Utility Integration of Electric Vehicles

Executive Summary

Significant public and private investment has been flowing into the electric vehicle (EV) market, driven by energy security, environmental, and economic trends. As a result, battery-powered and plug-in hybrid EVs, along with EV supply equipment (EVSE), have begun to debut. These EVs are expected to have a major impact on utilities – even a low level of EV adoption could strain the electric infrastructure, particularly in residential areas where as much as 80 to 90 percent of EV charging is expected to occur.

Utilities that don't prepare to integrate EVSEs into their distribution networks are likely to incur unplanned costs and grid reliability problems, as well as be perceived as a bottleneck to EV adoption. Utilities that prepare for EVSEs with smart grid "smart charging" technologies and customer incentives will be able to proactively influence when and how EV charging occurs, enabling them to reduce peak demand, mitigate the impact of EV charging on the grid, and actively support customers with EVs.

Consequently, utilities should proactively assess how they will manage the adoption and charging of EVs within their service territories. When evaluating different EV integration options, utilities will need to consider variables such as who owns the EVSE, who owns the meter used for EVSE billing, and how electricity rates can influence consumers' EV charging behavior.

No single approach to EV integration has yet emerged as the best choice for utilities to support EVs, and the optimal solution likely will differ across utilities. To help utilities determine the best approach for their particular situation, Silver Spring Networks has developed a model that analyzes the costs and benefits of different EV integration options. This paper presents three sample scenarios that fall along the spectrum of utility involvement: utility ownership of smart grid EVSE; utility subsidy of customer-owned smart grid EVSE, either with or without a separate smart meter for billing; and customer ownership of the EVSE where the EV is treated like an appliance and metered through the existing residential meter.

Silver Spring's analysis indicates that utility ownership of smart grid EVSE has the highest costs but yields the greatest benefits. In cases where the utility owns or subsidizes the EVSE, the utility has peak load control and therefore can avoid increases in peak demand and the associated costs of added generation, transmission and distribution capacity. But in the scenario where the utility owns the EVSE, it is assumed the utility also can perform load scheduling during off-peak times to shift EV charging in real time to balance energy supply and demand. This flexibility enables utilities to integrate more intermittent renewable sources, reduce grid reliability risks and charge EVs at times when the cost to procure energy is lowest. All of these benefits can be achieved while providing for consumer convenience in EV charging.

Clearly, the cost to the utility is lower when customers pay for the smart grid EVSE hardware and installation, even if the utility pays a partial subsidy. However, customer ownership of EVSE creates risks with regard to billing and/or metering accuracy. If the utility opts to install its own EVSE-specific meter to mitigate the risks, the utility gains more control but its costs nearly double, offsetting a large portion of benefits. And if utilities treat EVs like an appliance, they lose the ability to do smart charging and are likely to incur costs for adding generation, transmission and distribution capacity and procuring additional energy at peak times to service EV charging.

As this business case analysis shows, the combination of EVSE ownership and smart charging can reduce a utility's operational and financial risk relative to other EV integration options. This model also benefits customers by providing attractive rates for EV charging and better grid reliability.

The Emerging Electric Vehicle Market

A combination of energy security, environmental, and economic trends are prompting the United States and other countries to electrify transportation. As a result, a significant amount of both public and private investment has been directed at the electric vehicle (EV) market. For example, the Energy Independence and Security Act of 2007 (EISA) authorized $25 billion in loans for automakers and suppliers to establish or re-equip plants to produce EV components. Private investors have helped fund makers of EV charging stations, also known as EV supply equipment or EVSEs. For example, in early 2010, venture capitalists gave EVSE infrastructure start-ups Coulomb Technologies $14 million in funding and Better Place a hefty $350 million.

Thanks in part to these investments, EVs will soon be hitting the market. Beginning in late 2010, more than 20 automakers will introduce battery-powered EVs or plug-in hybrid EVs. Research shows there's pent-up demand for EVs, with the number of early adopters likely to outstrip the available supply. Numerous utilities are launching pilot EV programs and working with their respective Public Utility Commission/Public Service Commission (PUC/PSC) to smooth EV deployments. In California, the PUC is leading efforts to bring together utilities, automakers, EVSE companies, and environmental groups to facilitate adoption of EVs.

Without utility management of EV charging loads, EVSEs will exacerbate peak load problems and have a de-stabilizing effect on the grid.

EVs will have a major impact on utilities, particularly in residential areas since as much as 80 to 90 percent of EV charging is expected to occur at night, with owners plugging in at home (according to the ISO/RTO Council's "Assessment of Plug-in Electric Vehicle Integration with ISO/RTO Systems"). Like hybrid vehicles today, EVs are expected to be clustered in specific geographic areas, zip codes, and neighborhoods. As an EV charges, it will draw an electricity load ranging from the equivalent of one-third to one full household. Consequently, even low levels of EV adoption could strain the electric infrastructure and create problems in the local distribution system, especially during peak demand periods.

The specific energy draw per residence will depend on the type of EVSE a customer uses. Three levels of charging technologies are being developed: AC Level 1 (L1) and 2 (L2) for residential use, and DC Fast Charging (L3) for commercial charging stations, workplace or fleet charging, and similar installations. With L1 charging, the consumer plugs into a traditional 110 volt plug. L1 charging is relatively slow; a 24 kWh battery in a pure EV could take approximately 16 to 18 hours to charge. Because of this slow charging rate, L1 EVSE is expected to account for a low share of the residential EVSE installed. Level 2 EVSEs, which generally draw higher current (15A-30A) at 220 volts, can charge the same 24 kWh battery pack in approximately 3 to 7 hours. Given the faster charge time, L2 EVSEs are expected to account for a large majority of residential EVSE.

Without utility management of EV charging loads – for example, through demand response (DR) programs, including direct load control and pricing incentives – EVSEs will exacerbate peak load problems and have a de-stabilizing effect on the grid. For more background on the tie between EVs and the smart grid, read the Silver Spring whitepaper "How the Smart Grid Enables Utilities to Integrate Electric Vehicles."

Why Take an Active Role in EV Charging?

Regardless of whether a utility is proactive or reactive in supporting EVSEs, they face significant change as EVs hit the market. Utilities that do not prepare to integrate EVSEs into their distribution network face a number of challenges.

Unprepared utilities risk:

- **Being perceived as a bottleneck** – customers, their PUC, environmental agencies, and other groups will all be watching how utilities handle the EV rollout . Negative press reports about long delays for customers who want to install a charging station, for example, could discourage EV adoption and damage a utility's reputation. Such perceptions can be hard to dispel and may subject the utility to greater scrutiny.

- **Incurring significant unplanned costs** – even a modest uptake of EVs by customers could require unprepared utilities to increase generation and/or transmission capacity and upgrade their distribution network, including new transformers, substations, and extra line capacity. Unplanned spending can have a negative impact on the bottom line.

- **Suffering new grid reliability issues** – EVs have the potential to overload transformers and distribution circuits.

- **Paying higher energy costs** – utilities that need to supply additional energy to charge EVs during peak times could face significant costs.

Utilities that proactively prepare for EVSEs with smart grid "smart charging" technologies and customer incentives will be able to proactively influence when and how EV charging occurs. With smart charging, utilities gain a number of opportunities.

Proactive utilities can:

- **Actively support EV adoption**, using smart grid technology to collect EV-specific meter data, apply specific rates for EV charging, and implement DR programs.

- **Reduce peak demand**, defer capacity upgrades and reduce energy procurement costs by enabling utilities to shift charging to non-peak times, including periods when loads are lightest and energy costs are lowest.

- **Mitigate the potential reliability impact of EV charging** on the grid by allowing utilities to better control when EV charging occurs.

- **Create closer relationships with customers** by leveraging smart grid data and providing consumers with information through web portals regarding their EV charging status, billing information, energy savings, and greenhouse gas reductions.

- I**ncrease the use of renewable energy sources** by utilizing load scheduling, which makes it easier for utilities to match charging demand to intermittent renewable generation supply.

- **Collect data for greenhouse gas credits** with the positive environmental impact of supporting EV charging.

- **Create the potential for rate reduction** by using electricity sales for EVs to help lower the amortization of fixed infrastructure costs and therefore reduce rate impacts.

Thinking Through the Options for EV Smart Charging

Utilities should proactively assess how they will manage the adoption of EVs within their grids. Variables to consider include who owns the EVSE, who's responsible for installing the EVSE, and who owns the meter used for EVSE billing. In addition, utilities need to decide whether to bill at a different electricity rate for EV charging and what level of influence they want on EV charge management.

At this early stage of EVSE market development, questions remain about whether customers would want to or should own their residential EVSE. Examples from other industries may shed some light on the issues. For instance, cable television operators install and own the customer's set-top box, often with a lease charge to the customer. And like a furnace, central air conditioning system, or tankless water heater, EVSEs require an electrician to install them, so they likely would be viewed by consumers as part of a residence's infrastructure (potentially one that adds value) and left in place when the consumer moves.

Utility ownership of the EVSE is one option that would provide the utility with rights to inspect and verify the accuracy of the EVSE meter.

Even if customer ownership of EVSE may seem to be attractive, it creates risks with regard to billing and/or metering accuracy. When evaluating customer ownership of the EVSE and meter, key questions for the utility to consider include:

- If an EVSE includes a utility revenue-grade meter, and the customer owns the EVSE, would the utility bill off the EVSE's meter? Going a step further, would the utility offer specific rates for EV charging using a customer-owned EVSE meter?
- What would a utility do if a customer connected non-EVSE loads – for example, a washer, dryer, or air conditioner – to the EVSE meter to obtain the lower EVSE charging rate for these appliances?
- If the customer owns the EVSE and the EVSE meter is in the garage, is the utility able to gain access to it? What if the customer blocks communication to the EVSE meter, making it impossible for the utility to verify its accuracy?
- Who pays for maintenance and verification that the customer-owned meter is accurate?
- As EVs become more prevalent, fuel taxes will likely shift from gasoline to the electricity used to supply EVs. What happens if the data from the customer-owned meter does not accurately match EV charging demand?

Utility ownership of the EVSE is one option that would provide the utility with rights to inspect and verify the accuracy of the EVSE meter. Also, utilities that have deployed a smart grid and opt for EVSE ownership are in a good position to implement smart charging, including time-of-use rate plans and other programs that leverage their ability to communicate with a network of EVSEs.

To address these challenges and define a program to support EV integration, utilities must assess the benefits and costs of different EV integration options.

Modeling the Business Case for Smart Charging

Although utilities could create dozens of potential EV smart charging programs, to simplify the business case assessment, Silver Spring has outlined three sample scenarios that fall at differing points along the spectrum of utility involvement as well as program costs and benefits.

Scenario 1: The utility owns the smart grid EVSE.
In this scenario, the utility pays for and owns the EVSE, with an internal meter, and is responsible for installing, maintaining, and managing it as part of its smart grid. Customers are able to set their charging preferences, but they give the utility peak control and load scheduling rights in return for lower EV-specific electricity rates (for example, a flat rate or time-of-use based rate) and limited override options. Variants of this case could include "lease" payments from the customer or other customer contributions.

Scenario 2: The customer owns the smart grid EVSE, with utility subsidy.
In this case, the customer buys the EVSE, with an internal meter, owns it, and pays to install it. The utility would provide incentives, such as rebates and EV-specific electricity rates, in exchange for the ability to control charging a certain number of times per year, such as during days with high peak loads.

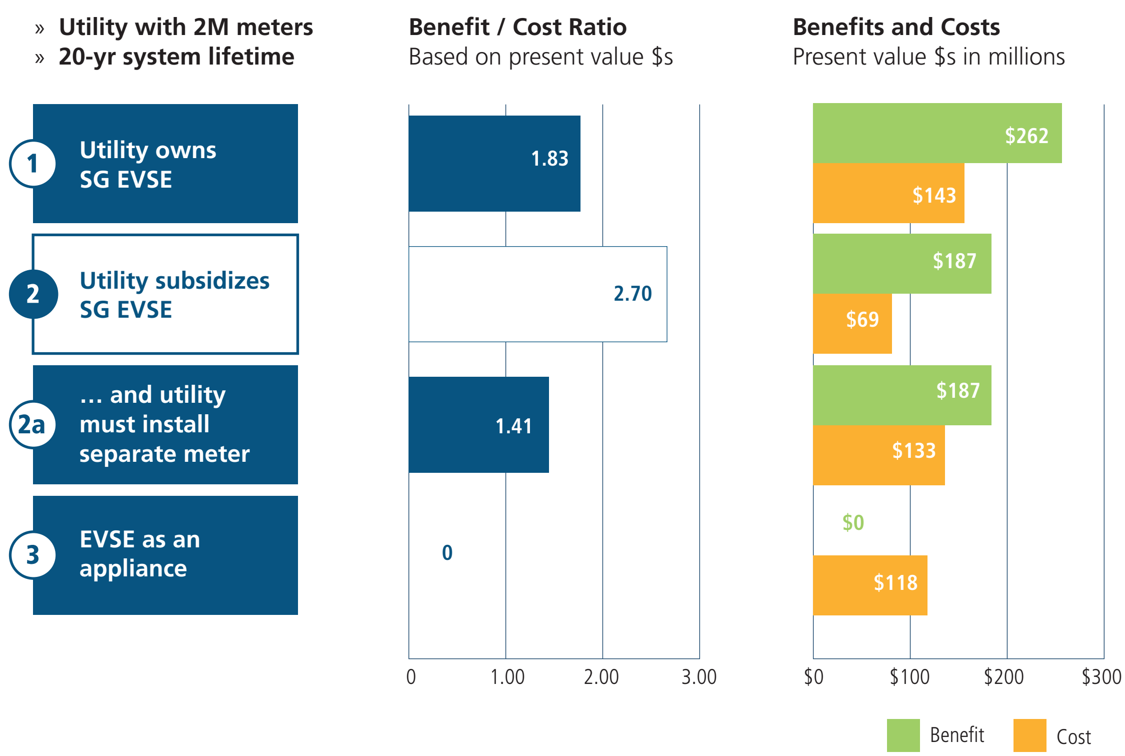
What approach a given utility takes will depend on how actively they want to participate in enabling EVs, the capabilities of their infrastructure, the expected rate of EV adoption in their territory and their regulatory support or requirements.

Scenario 2a: The customer owns and the utility installs the smart grid EVSE, with a separate smart meter for EVSE billing.
As in Scenario 2, the customer owns the EVSE and pays to install it, but the utility installs a separate EVSE-related meter. As in Scenario 2, the utility would provide the same incentives and have the same level of charge management.

Scenario 3: The EV is treated as an appliance.
In this scenario, the utility takes no responsibility for the EVSE and treats the EV just like any other appliance. The consumer owns the EVSE and hires a contractor for installation – the utility is likely notified during the permitting process. The EVSE is metered through the residence's existing meter and charged at the regular household rate; the utility offers no rebate or EV-specific rate and gets no EV charge management capabilities. To handle additional load, the utility upgrades the distribution system and other parts of the grid as required to support the customer's EVSE installation.

No clear-cut business model has yet emerged for how utilities will support EVs. What approach a given utility takes will depend on how actively they want to participate in enabling electric vehicles, the capabilities of their smart grid infrastructure, the expected rate of EV adoption in their service territory and their regulatory support or requirements. Using the EVSE integration scenarios outlined, Silver Spring has developed a benefit-cost model to help utilities assess each approach from the perspective of the entire utility's customer/rate-payer base, not just customers with EVSEs. To provide a common baseline for the scenarios, the analysis assumes a utility with two million meters and a 20-year EVSE system lifetime. Figure 1 presents this benefit-cost analysis both as a ratio in present value dollars and nominal investment.

Figure 1. Benefits, Costs, and Benefit-Cost Ratio for EVSE Ownership Scenarios



While the benefit-cost ratio of Scenario 2, where the utility subsidizes a customer-owned EVSE, may look the most compelling, customer ownership of the meter may be unfeasible for many utilities. Scenario 1, with the utility owning the EVSE, may prove most attractive overall.

At first glance, it may appear that Scenario 2, subsidizing customer ownership of smart grid-enabled EVSE, is the most attractive scenario, with the highest benefit-cost ratio. However, customer ownership of the meter may make this scenario unfeasible for the utility, so the utility therefore would install its own meter. Once the model incorporates the cost to the utility of installing its own meter, as Scenario 2a does, Scenario 2 becomes less cost effective and Scenario 1 becomes the most attractive approach.

A closer look at how the model's benefits and costs were derived will provide a better understanding of the results.

Cost Components of the Model

The costs of the various EVSE implementation scenarios span a range of categories; the actual costs to a specific utility may vary from Silver Spring's assumptions, depending on factors such as the utility's service territory, local labor rates, and EVSE-related decisions such as EVSE functionality and the amount of the subsidies provided to customers. In its analysis, Silver Spring included the following costs:

- » EVSE, including hardware and embedded firmware
- » Software, including the EV management software on the utility side and the customer EV portal
- » Installation, excluding customer service panel upgrades if required
- » Start-up program costs, including software system integration and project management
- » Ongoing costs for program operation, including expenses for call centers, IT, asset and inventory management, and project management

Note that in the Silver Spring model, the costs of capital are included in their respective cost categories for those costs that utilities would capitalize.

As Figure 1 shows, Scenario 1 has the highest costs since the utility owns the EVSE infrastructure and must pay all the costs associated with its purchase, installation, and support. Conversely, Scenario 3 appears to have the lowest cost because the customer bears the cost of owning, installing, and maintaining the EVSE infrastructure. However, the utility incurs other costs, including the cost to add capacity to the grid, ensure distribution system reliability, and procure EV charging energy at peak times.

With Scenario 2, the EVSE hardware and installation costs are borne by the customer, with the utility paying a subsidy, assumed to be $1,000 for analysis purposes, which may help pay for the network interface and metrology. With Scenario 2a, the cost to the utility nearly doubles because it includes the subsidy as well the expense of the additional meter, meter base, and meter installation.

In all the modeled scenarios, EVSE hardware is a major cost, accounting for approximately 60 percent of the total costs over time. The model assumes that as the EV market matures, more EVSEs will be sold and this scale will drive down per-unit costs. The model also assumes that the number of EVSEs the utility purchases in a given year has a volume-pricing effect, which drives incremental reductions.

A key issue that will impact purchasing scale is which entity or entities – automakers, third parties, utilities, or other companies – will sell, distribute, and install EVSEs. Automakers face the hurdle of having to support dozens of different utilities across the country. Third parties may emerge that work with multiple EVSE manufacturers and operate in specific geographic regions in conjunction with local utilities. If utilities supply the EVSE, they can ensure the EVSEs are supported on their smart grid network and use subcontractors to handle the installation.

Installation varies for each scenario – in Scenario 1, for example, it accounts for approximately 30 percent of the total cost. In some cases, consumers will need to upgrade their electricity service panel to install an EVSE; since this cost will be borne by consumers, it's excluded from the model. If the utility installs the EVSE, it must factor the cost of installation into the benefit-cost analysis. This cost is likely to decline significantly over time, as the market matures and the process for installing EVSE becomes standardized. In contrast, given the maturity of utility processes for meter and meter base installation, the installation costs for Scenario 2a likely will not decline, but rather the model assumes they will rise with labor inflation.

Benefits Components of the Model

The benefits to utilities of the various EVSE implementation scenarios also fall into several categories. Some benefits accrue from avoiding an increase in peak demand and include not having to build peaker plants, additional transmission and distribution lines, or new substations. Still other benefits result from a utility being able to flexibly schedule EV charging, including the ability to save energy costs by shifting EV charging to times when energy costs are low, to maintain reliability of the local distribution network, and to more easily integrate renewable sources into its generation portfolio.

Table 1 summarizes these benefits. Scenario 3 has been omitted from the table because the model assumes that no benefits accrue to utilities in this scenario.

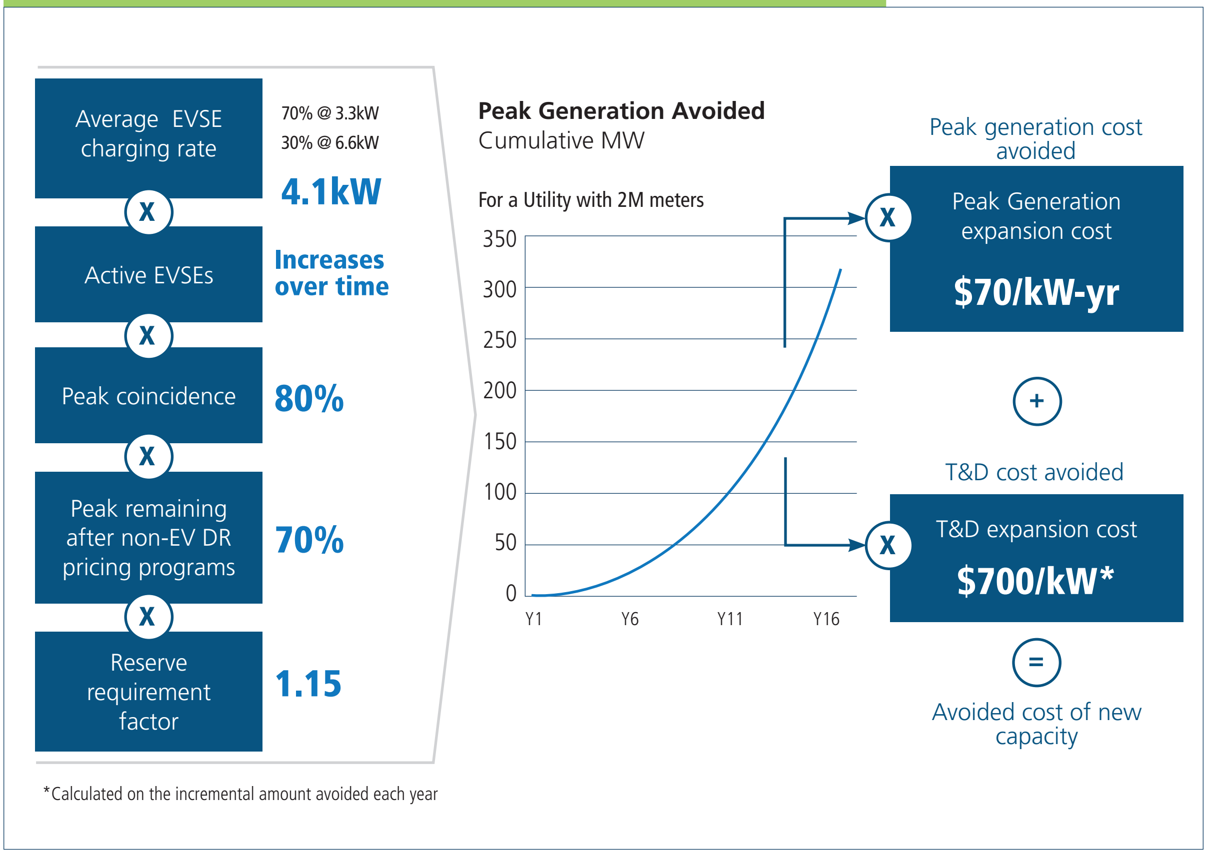
Table 1. Utility Benefits for Scenarios 1, 2, and 2a

Driver	Benefit	Scenario 1	Scenario 2	Scenario 2a
Peak control	Reduces cost of peak generation	Yes	Yes	Yes
	Reduces cost of transmission and distribution expansion	Yes	Yes	Yes
	Lowers energy cost due to shifting EV charging to non-peak times (set number of peak days per year)	Yes	Yes	Yes
Load scheduling or time-of-use rates	Lowers energy costs by shifting loads to non-peak times (ongoing as needed)	Yes	Depends on customer engagement	Depends on customer engagement
Load scheduling	Maintains local distribution network reliability	Yes	No	No
	Supports integration of more renewable energy	Yes	No	No
EVSE ownership	Greenhouse gas abatement credits	Yes	No	No

Beyond reducing peak demand, smart charging allows utilities to implement time-of-use rates and other pricing incentives. Time-of-use rates enable consumers – and therefore utilities – to save money by shifting their charging from peak times, such as early evening, to night time or other periods when rates – and energy costs – are low. However, since the customer is in control of when charging occurs, the benefits to the utility will vary depending on the level of engagement by customers and the consistency with which they take advantage of time-of-use rates.

The ability to control peak usage through smart charging delivers significant benefits for utilities implementing Scenarios 1, 2, and 2a. Peak control is key to reducing new generation, transmission, and distribution costs. Figure 2 illustrates how the dollar value of these reduced costs is derived.

Figure 2. Key Factors That Drive Benefits of Avoided New Capacity



Controlling charging of EVs helps utilities avoid peak power consumption and, in turn, expansion of peak generation and T&D facilities.

Only Scenario 1, in which the utility owns the EVSE and metering infrastructure, delivers additional benefits through the load scheduling capabilities that smart charging supports. Load scheduling lets utilities shift EV charging as needed in real time – not just a fixed number of times per year as in peak control – to balance energy supply and demand and to take advantage of periods when the cost to procure energy is lowest. While time-of-use rates encourage customers to avoid charging their EVs during peak usage periods, if customers begin EV charging at roughly the same time, they could create a second peak problem. Load scheduling makes it possible for a utility to smooth out demand and avoid simply shifting peaks.

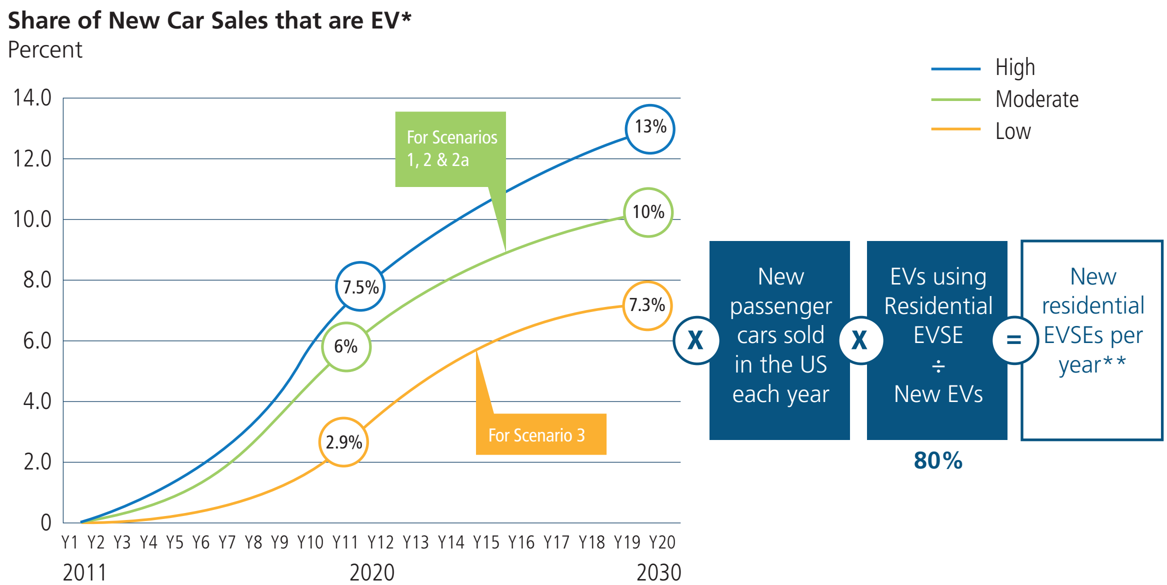
Load scheduling also helps a utility maintain local distribution network reliability by overcoming potential bottleneck situations, such as trying to supply more current than a distribution circuit can handle and preventing transformer overloads. Likewise, for utilities interested in increasing their use of renewable energy sources, load scheduling helps utilities match charging demand to intermittent renewable generation supply, thereby enabling them to integrate a higher proportion of renewable sources into their energy supply portfolios.

In general, utilities can produce electricity for powering an EV with lower greenhouse gas (GHG) emissions than the equivalent amount of energy required to power a vehicle with an internal combustion engine (ICE). As a result, using an EV rather than a traditional ICE-based vehicle can reduce these emissions. The Silver Spring model assumes that GHG credits will accrue to the owner of the EVSE, impacting the benefits analysis of the various scenarios.

Effect of EV Adoption Rates

The rate of EV adoption will have an impact on both the benefits and costs for each EVSE installation scenario. In factoring EV adoption rates into its model, Silver Spring relied on research that indicates that 80 percent of new EV owners are expected to use residential L2 EVSEs and assumed that the remaining EV owners use either L1 chargers or public charging infrastructure. While the exact ratio of L2 to L1 and public charging will vary by utility and territory, it's reasonable to assume L2 EVSE will be used for the majority of EV charging. Figure 3 illustrates high, medium, and low EV adoption rates.

Figure 3. Estimated EV Share of New Car Sales



* Includes plug-in hybrid electric vehicles and battery electric vehicles
** This is then scaled for a given utility territory by the number of meters in the territory to the number of meters in the US. There are also factors to account for residential moves that impact EVSE demand.
Source: BCG (2009) "The Comeback of the Electric Car?" [for the Moderate case to 2020]; Deutsche Bank

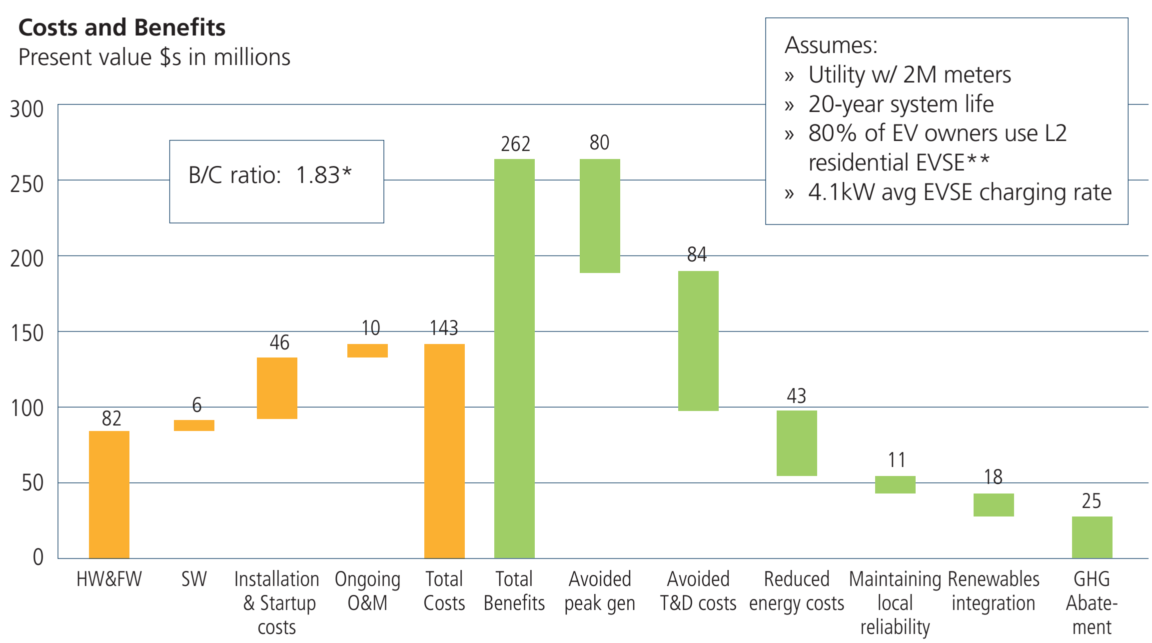
Modest assumptions about the uptake of EVs estimate them to account for 6% of new car sales by 2020, 10% by 2030.

The medium rate is based on estimates from Boston Consulting Group through 2020; the high and low rates are extrapolated from this baseline, assuming faster and deeper adoption rates and slower rates, respectively. The low adoption rate also assumes the utility is passive on EV integration.

The Pros and Cons of Utility EVSE Ownership

Each EVSE implementation scenario has its own set of pros and cons. Utility ownership of the EVSE and/or EVSE meter clearly represents a cost to the utility. However, EVSE ownership reduces a utility's operational and financial risk and enables it to take advantage of any GHG abatement credits. In addition, by gaining peak and load scheduling control, utilities benefit greatly from peak reduction, lower energy costs, and the ability to more easily integrate renewable energy sources, all of which offset a utility's costs. The largest source of benefits, roughly 60 percent of the total, derives from the ability to reduce peak generation and transmission and distribution expansion. Although utility ownership of EVSE involves the largest investment among the scenarios, utilities that choose this option reap the highest benefits – in excess of $260 million with a benefits-cost ratio of 1.83, as Figure 4 illustrates.

Figure 4. Sources of Costs and Benefits for Utility Ownership of EVSE



* Assumes 7.5% discount rate, 9.8% cost of capital. Costs of capital are included in the associated cost categories.
** Due to the high percentage of L2 usage, utility costs to serve L1 users is assumed to be negligible

While utility ownership of EVSEs creates the highest costs, it also yields the greatest benefits.

In contrast, consumer ownership of EVSE directly places EVSE equipment and installation costs on the customer, while giving them the flexibility to take their EVSE with them if they move. In addition, in Scenarios 2 and 2a, consumers who receive EV-specific time-of-use electricity rates benefit from lower EV charging costs, although those benefits are lower than the ones derived by load scheduling in Scenario 1. The major difference between Scenarios 2 and 2a is that the latter, in which the utility owns the EVSE-related meter, mitigates risks faced from customer ownership of the EVSE and meter but at a high price.

Representing a highly reactive approach, Scenario 3 essentially eliminates EV smart charging costs for the utility because the customer pays for the EVSE and its installation and does not receive a rebate. However, in this scenario, the utility incurs costs to ensure reliability, misses the opportunity to reduce energy costs and runs the risk of delaying EV rollouts. Table 2 summarizes the pros and cons of the various EVSE integration scenarios.

Table 2. Pros and Cons of EVSE Ownership Scenarios

Scenario	Pros	Cons
1. The utility owns the smart grid EVSE.	Reduced grid capacity expansion costs Energy costs reduced due to peak and load scheduling control Operational risks minimized Integration of renewable enabled Greenhouse gas abatement credit utilized	Utility incurs high equipment and installation costs
2. The customer owns the smart grid EVSE, with utility subsidy.	Reduced grid capacity expansion costs Energy costs partially reduced due to peak control and time-of-use rates EVSE costs borne by customers	Operational risk due to limited utility access to EVSE Financial risks around offering EV-specific rates
2a. The customer owns and the utility installs the smart grid EVSE, with a separate smart meter for EVSE billing.	All benefits from scenario #2 Risks of offering EV-specific rates are mitigated	Utility incurs higher equipment and installation costs
3. The EV is treated as an appliance, and the utility has no responsibility for the EVSE	EVSE costs borne by customers EV charging costs are based on household electricity rates and are therefore easier for customers to predict	Grid capacity expansion required Missed energy cost savings opportunity May cause delays that impact customer satisfaction

The Case for Utility Ownership of EV Smart Charging Infrastructure

As this business case analysis has shown, utilities and their customers benefit when utilities are actively involved in smart charging. Utilities gain the most flexibility and the greatest number of benefits for themselves and their customers by owning the EVSE infrastructure and implementing smart charging management, including time-of-use rate plans.

Utilities gain the most flexibility and the greatest number of benefits for themselves and their customers by owning the EVSE infrastructure and implementing smart charging management, including time-of-use rate plans.

With EVs arriving in showrooms now, it is urgent that utilities proactively define an EV integration approach. Each EVSE implementation scenario has pros and cons. While utility ownership of the EVSE and/or EVSE meter entail costs, these are more than offset by significant benefits.

The Silver Spring benefit-cost model should help utilities understand and gauge the benefits and costs of EV integration, with an eye to building a business case for the approval and funding of a smart charging solution. The analysis shows that utility ownership of the EVSE, coupled with smart charging management, is a compelling approach.

About Silver Spring Networks

Silver Spring Networks is a leading smart grid solution provider that enables utilities to achieve operational efficiencies, reduce carbon emissions and empower their consumers with new ways to monitor and manage their energy consumption. Silver Spring provides the hardware, software and services that allow utilities to deploy and run multiple advanced solutions, including Smart Metering, Demand Response, Distribution Automation and Distributed Generation, over a single, unified network. Silver Spring's Smart Energy Platform is based on open, Internet Protocol (IP) standards, allowing continuous, two-way communication between the utility and devices on the grid. Silver Spring has numerous deployments with leading utilities in the US and abroad, including Baltimore Gas and Electric, Florida Power & Light, Jemena Electricity Networks Limited, Pacific Gas & Electric, Pepco Holdings, Inc., and United Energy Distribution, among others. For additional information, please visit **www.silverspringnet.com**.

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