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Going Electric

By Richard Izzo

The California Air Resources Board voted in August to require that all new automobiles and light trucks sold in the state be zero emission by 2035. Recently, New York, Washington and Massachusetts adopted similar requirements, and up to 14 other States are expected to follow suit. These emerging requirements are viewed by many as a bellwether for the shift towards clean sustainable energy.

However, there remains challenges, both real and perceived, in the shift toward EVs. According to the Edison Electric Institute, there will be in excess of 25 million EVs on the road in the US by 2030, including both plug-in EVs and Fuel Cell Electric Vehicles (FCEVs) which utilize a hydrogen fuel cell to recharge the battery and provide extra power for acceleration (much like current gasoline/electric hybrids). Critics of the new regulations argue that there isn't sufficient infrastructure within the nation's electric grid to support this number and projections of grid expansion by that time fall short at the current rate of development. Additionally, opponents of EVs argue that because the majority of electric power produced in the US currently comes from fossil fuel combustion, the shift to EVs won't necessarily equate to lower greenhouse gas emissions.

Furthermore, the current manufacturing of EVs, most notably the mining of Lithium and Cobalt used in the vehicles' batteries creates environmental impacts which some maintain outweigh the benefits of emission-free vehicle operation.

So is the shift to electric vehicles by the proposed legislative dates practicable? To date, Congress has authorized $7.5B from the Infrastructure Bill to build a half million public charging stations including the costliest and fastest "DC fast charging" capabilities (providing an 80% charge in around 30 minutes). However, much more must be done to prepare for future projections. Federal, State and local governments will need to extend monetary incentives for building public charging stations and investment in

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Lightning-Fast Vapor Intrusion Mitigation

by Jason Cooper

Facilitating a property transaction via a Phase I Environmental Site Assessment is not always a fast and easy process, even for properties that have historically been used for purposes that are not deemed environmentally detrimental. Sometimes the usage of the general area is a cause for concern.

Recently CA RICH encountered such a situation at a warehouse building located on Long Island, New York. CA RICH was commissioned by the property owner (seller) to prepare a Phase I Environmental Site Assessment as part of the sale of the property. Our Phase I Report revealed the potential for impacted soil vapor and its potential intrusion at the property due to the use of the nearby area for commercial / industrial purposes. We subsequently performed a Phase II investigation including the collection of sub-slab, indoor air and exterior air samples. The results of the Phase II investigation revealed sub-slab vapors impacted by the solvent-related volatile organic compounds (VOCs) tetrachloroethylene (PCE) and trichloroethylene (TCE). These VOCs were detected at elevated concentrations requiring mitigation in accordance with the New York State Department of

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Health (NYSDOH) Guidelines (*Guidance for Evaluating Soil Vapor Intrusion in the State of New York; October 2006 - updated 2017*).

According to the NYSDOH guidelines, mitigation can include one or more of the following actions: sealing the floor to keep vapors from passing through; creating negative pressure beneath the building slab by actively venting sub-slab vapor to the atmosphere with a sub-slab depressurization system (SSDS); and/or creating positive pressure within the building through HVAC modifications or installation of a heat/air exchange device. Because the elevated concentrations were found in the sub-slab vapor, a SSDS was the action of choice.

The elevated sub-slab vapor levels were not anticipated at the outset of the property transaction, which was a concern for our client as additional unaccounted time was needed to install the SSDS to facilitate the sale. As the property transaction was scheduled to be completed by the end of the year for tax purposes, time was of the essence.

The owner was motivated to install the SSDS and CA RICH immediately mobilized to perform a pilot test for the design of the SSDS. The pilot test included the installation of a suction pit below the slab including a PVC vapor well sealed to the slab. A vacuum source was then applied to the vapor well and vacuum readings were taken beneath the slab at five-foot horizontal intervals away from the vapor well. Based upon the results of the pilot test, an SSDS design was generated and sized to scale by the engineer.

The SSDS design consisted of eight vapor mitigation fans with each fan connected to a vertical PVC pipe that terminated in a vapor well installed two-feet below

Trenching of suction pit for riser placement

SSDS riser with fan and gauge

the warehouse floor and sealed to the top of the floor. Special attention was made to the placement of the eight vertical PVC pipes so that useable warehouse space was not lost. To minimize the impact to the warehouse footprint space, the SSDS pipes were installed in horizontal trenches below ground until they transitioned to vertical SSDS piping.

The vertical SSDS vent pipes were placed immediately adjacent to the warehouse's existing I-beams. In addition to taking up less space near the I-Beams, the I-Beams provided a level of protection around the SSDS pipes. The vertical SSDS pipes exited from the side of the building and not through the roof, thus effectively removed the concern for roof leaks.

The SSDS was equipped with magnahelic gauges to measure vacuum at each vapor well riser location along with a visual alarm system to alert building occupants if vacuum is lost at any of the eight vapor well locations. Upon successful completion of the of the SSDS installation, an SSDS startup test was performed including measurement of vacuum beneath the slab at representative locations throughout the building, confirming proper and effective system operation. Following completion of the start-up test, an SSDS Completion Report and Operations, Maintenance & Monitoring (OM&M) Plan were expedited and submitted to the Client. The total time needed from pilot test to report submittal was 15 business days. Although it was a tight timetable, CA RICH was able to complete all necessary items on time and on budget, satisfying the buyer's needs to expedite the transaction.

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Level 2 in-home charging capabilities (providing 10 range miles of charge per hour and requiring 240 V AC) must be greatly expanded as well. Much greater investment in power grids will be required to support the estimated projected 5% to 25% increase in power generation needed to power the charging stations. This will include "smart grid" technologies such as "managed charging" which optimizes charging times/costs and "vehicle to grid" technology which shares back excess power to the grid (much like we see with solar powered buildings). Finally, additional investment is necessary in widespread development of FCEVs and associated refueling infrastructure to provide a cost-effective and safe alternative to plug ins.

According to industry experts, emissions generated by EV charging are vastly offset by the absence of tailpipe emissions even with the current level of fossil fuel combustion used to generate electric power. The reason for this is that although the battery and fuel production for an EV currently generates much higher emissions than the manufacturing of a gas or diesel-powered automobile, those higher environmental impacts are offset by EVs' superior energy efficiency over time (by around 25% to 70%). However, concurrent with the development of a workable EV charging infrastructure, further development of wind, solar and other renewable energy sources is necessary to help power the grid along with development of more environmentally friendly batteries.

Currently, the vast majority of EVs utilize lithium-ion batteries which contain lithium and cobalt along with aluminum, manganese, and nickel. At lease 40% of the environmental impact from the manufacture of EV batteries stems from the mining of lithium primarily from Australia which produces around 46% of the world's lithium supply through "hard rock mining" of spodumene ore. Additional sources of lithium include "salt flat mining" from Chile, Argentina and Bolivia. Lithium mining is labor intensive and produces wastes from tailing ponds used in hard rock mining, and also involves copious amounts of water usage in salt flat mining operations. Cobalt is mined primarily out of Congo with heavy Chinese investment and little in the way of worker or environmental protections.


DC fast charging station


Lithium mining in Australia

Much can be done to offset the environmental impacts of battery production. EV batteries are highly recyclable with over 95% of their components available to be extracted via hydrometallurgy. However, only around 5% of batteries are currently recycled. With the value of the raw materials on the rise, it is projected that recycling operations will dramatically increase in the coming years. In addition, research and development is currently underway for better, more environmentally friendly batteries including carbon nanotube electrodes which utilize a vertically-aligned carbon nanotube that can boost battery power ten times over current battery packs, increase energy storage by a factor of three and increase the lifecycle of a battery five times, with an 80% charge achieved in around 5 minutes. Other promising battery technologies include silicon anode batteries, solid state batteries, a battery extracted from seawater as well as Wi-Fi and over the air ultrasound charging, to name just a few.

It has been argued that setting a "drop dead" date for the ban of gas-powered vehicle sales is the worst way to transition and the ramp-up to wide-spread purchase of EVs by consumers will only really happen when they are perceived to be a great substitute for their gas-powered counterparts. Once this happens the shift will take place naturally. It is clear that there is much work to do and a long way to go before there's an EV in every garage, but the technology and infrastructure are emerging and, as such, the market will follow. It's just a question of when.

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CA RICH CONSULTANTS

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The Company provides: environmental consulting; Phase I & II assessments (ASTM 1527-21); compliance audits; emerging contaminant sampling; investigation; remediation; groundwater resource, storage tank, indoor air quality & hazardous waste management; soil vapor testing & mitigation; brownfield redevelopment; real property transfer support; asbestos, mold & lead testing; expert testimony & litigation support; dispute resolution; and all other professional services related to evolving regulations responsive to a diversified Clientele.

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