CUSTOMER PRESENTATION BRIEF
As presented at the 2015 Users Conference

OSIsoft.

SUMMARY

eMotorWerks

Industry

Transportation (Electrified)

Business Value

- Electric Vehicles
- IoT
- Grid Demand-Response Management
- Smart EV Charging
- Industrial Service Provider
- Renewable Energy
- Connected Services

PI System™ Components

- PI Server™
  - Data Archive
  - Asset Framework
  - Asset Analytics
- PI to PI Interface™
- PI Coresight™

The JuiceBox™ Charging Solution Leverages Data from Connected EV Network for Smart Charging and Grid Optimization

How can a residential electric vehicle [EV] charger improve grid reliability, reduce emissions and support clean energy? At OSIsoft's 2015 Users Conference, Dr. Valery Miftakhov presented how eMotorWerks uses the PI System to enable "true vehicle to grid integration" through their JuiceBox Smart[Grid] Charging System. By shifting when and how much electricity the JuiceBox network draws from the grid, the Smart[Grid] System tailors EV charging parameters according to grid conditions to "maximize electric vehicle [EV] charging speed and efficiency while reducing costs." Using the PI System, eMotorWerks has created a shared data ecosystem "to deliver superior charging performance while providing valuable services to improve grid stability and enable growth of renewable [power] generation."

Dr. Miftakhov, Founder of eMotorWerks, introduced his talk by presenting some of the challenges and benefits of the growing EV market. Charging EVs creates "large, concentrated electrical loads, both in time and location, that strain local, and soon, state-wide electricity distribution." Dr. Miftakhov stated, "By 2025, [it is predicted that] there will be 10 million EVs in the US, which will create a significant infrastructure challenge unless EV loads are managed. If all 10 million EVs were charged at the same time, it would cause an additional 100 GW in demand – representing up to 15% of total US load. You can imagine how problematic that would be for the electric grid."

Dr. Miftakhov went on to say that "the problems that we can solve exist today" for ISOs, utilities and EV owners. For utilities and ISOs, EVs bring volatility to demand-supply management. "As people come home and plug in an EV, they can generate a 20 KW demand, which is huge at the house level." As more EVs come online, utilities will face costly capacity upgrades to handle spikes in demand. Furthermore, most EV chargers are expensive, "dumb" boxes that charge the cars at maximum rate when they are plugged in, which Dr. Miftakhov said prevents EV market penetration and is "the worst thing you can do from a grid perspective."

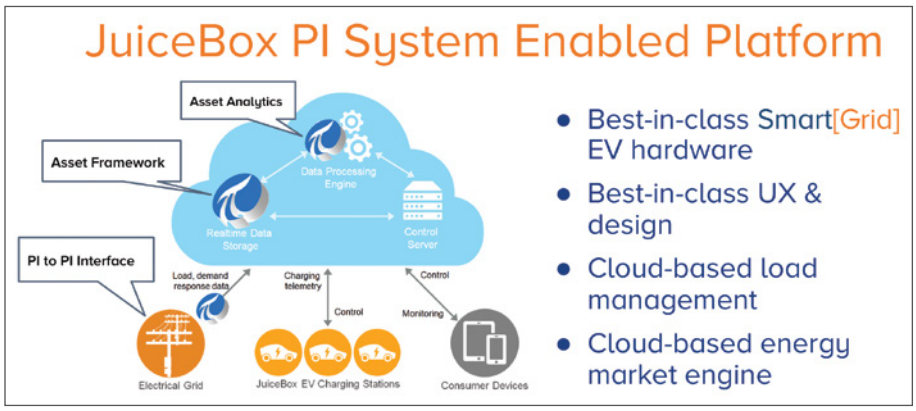
eMotorWerks believes that the Smart[Grid] EV Charging Platform offers a solution that benefits EV owners, utilities and ISOs. "What our company does is bring a radically new model to EV charging. When we were designing our product, we started with the premise that is was going to be a grid resource and not just a charging station." The Juicebox PI System enabled platform has four components:

1. Smart[Grid] hardware - to adapt charging parameters to grid conditions and events, the JuiceBox incorporates out-of-the-box, grid-sensing and fast-response capabilities that are not found in a typical EV charger.

2. Best-in-class User Experience and Design - the JuiceBox "is the only mass-sold charging station that provides real-time smart phone and web interfaces" so customers "have intuitive control and visibility that traditional EV chargers lack."

3. Cloud-Based Load Management - the PI System-enabled Load Management Engine allows eMotorWerks to manage thousands of stations at under a 3-second latency. The JuiceBox can also "respond to even faster grid events by uploading local response profiles. The station does not need to connect to the central server to respond to local grid events."

4. Cloud-Based Energy Market Engine - through the PI to PI Interface, the Energy Market Engine "will eventually read all the data through PI to PI transfer from ISOs and utilities." The Market Engine "will read the data on wholesale pricing, demand-response events and process it to derive the best way to control distributed resources."



With almost 5000 units deployed, the JuiceBox has penetration in all fifty US states and Canada, with up to 25 MW total peak load under management. eMotorWerks is working with OSIsoft to expand their data and business ecosystems. Dr. Miftakhov stated, "In addition to charging services, what our platform does is collect data accessible at the grid edge using a device sitting on the outside of your house. For example, "others are interested in using these data for grid reliability purposes. Automotive OEMs are interested in using charging data to detect failures in charging systems."

To conclude, Dr. Miftakhov stated, "We are excited about processing data in real time, running the analyses in real time and producing triggers in real time - all of which are core to our business model." Looking ahead, "we can do a lot of things that are adjacent to our main business model just because we store so much data at such high frequency."

"For us, the PI System is a mission-critical application that helps drive revenue."

- Dr. Val Miftakhov, Founder, eMotorWerks

Miftahov, Val. *Vehicle-Grid Integration with the PI System.* OSIsoft.com. April 2015. Web. 24 June 2015. <http://www.osisoft.com/Templates/item-abstract.aspx?id=12433>.