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## Final Copy of Case Study

YEAR:
*2012*

STATUS:
*Laureate*

**Organization:**
The California Independent System Operator (ISO) Corporation

**Organization URL:**
www.caiso.com

**Project Name:**
Managing Renewable Energy Sources with Situational Intelligence

**What social/humanitarian issue was the project designed to address? What specific metrics did you use to measure the project's success?**

While local, state and national governments, as well as industries of all types, are seeking ways to address the issue of climate change, organizations responsible for power delivery and management have a particularly important role to play in driving greener, more sustainable approaches to energy consumption. The California Independent System Operator Corporation (ISO) is a non-profit public benefit corporation that manages 80 percent of California's power grid and its wholesale electricity market, delivering 289 million megawatt-hours annually over 25,000 circuit-miles of power lines for about 35 million consumers. California, which represents the world's eighth largest economy, also has one of the world's most ambitious agendas for addressing climate change, with a goal of generating 33 percent of its power from renewable sources by 2020. As part of this agenda, wind and solar facilities are being developed rapidly, along with other renewable power sources. The California ISO needs to be able to optimize the use of these resources, and also achieve the right balance between intermittent and highly variable renewable energy, while ensuring stability and reliability of the electric grid. Doing this requires an up-to-the-minute understanding of factors such as weather, usage patterns, pricing, grid performance and more -- a challenging prospect, as multiple streams and big volumes of data need to be assimilated from different sources. To combat "data overload" and manage renewable resources more precisely, the California ISO deployed a Situational Intelligence solution from Space-Time Insight. The solution, which uses innovative geospatial/visual analytics,

empowers the California ISO to integrate data from multiple sources, view the results in intuitive visual displays and take action to quickly deploy renewables. Success of this deployment is being measured by how effectively the organization integrates renewable energy sources into the state's power grid.

**Please describe the technologies used and how those technologies were deployed in an innovative way. Also, please include any technical or other challenges that were overcome for the successful implementation of the project.**

Previously analyzing data in a traditional tabular format, the California ISO operators were finding it increasingly tough to spot trends/anomalies, and respond quickly to changing situations, especially given the influx of data points necessary to track growing renewable energy sources. Additionally, independent software systems/processes used by various teams made sharing/synchronizing information complex and time consuming. To address these challenges, the ISO deployed a collection of Situational Intelligence applications from Space-Time Insight (STI), including one specifically designed to capture and leverage data relevant to renewables management. The Renewables Intelligence application provides dispatchers with the ability to assess, in real time, current conditions such as how unexpected storms, cloud cover, and wind speed might impact solar fields/wind farms so they can make appropriate adjustments to optimize the use of renewable power and keep California on its emission-reduction trajectory while keeping the grid safe and reliable. In addition, it enables the ISO to stay within defined limits on the transmission paths, which prevents damage to the power system infrastructure and helps avoid millions of dollars in potential fines. The application tracks all the generation sources -- conventional hydroelectric, solar, wind -- displaying their varying real-time outputs and external impacts in easy-to-digest visual displays. This helps ISO operators make quick decisions about how best to integrate renewable resources and balance their use against energy demands. Recently, the ISO incorporated the Renewables Intelligence application, and several other STI applications that track potential risks to the grid and market pricing, into an 80 ft. x 6.5 ft. video wall that fronts a state-of-the-art control center. The video displays contain multiple layers of information at-a-glance, delivering a big-picture view of the entire system, ensuring better information sharing and faster decision-making throughout the organization.

**Please list the specific humanitarian benefits the project has yielded so far.**

The success of these new visualization capabilities enabled by this project is measured by how effective the California ISO operators are, how reliable the system is and how effectively renewables are being integrated into the system. Today, the California ISO operators are more productive despite a far more complex environment. And the ability of the California ISO to avoid blackouts and disruptions in supply means that the applications are enabling the organization to increase the renewables level on the grid while maintaining reliability, which is the ultimate goal for both the California ISO and the state the California. We see Space-Time Insight's technology as integral to our ability to maintain a high level of grid reliability as we integrate thousands of additional megawatts of green power that can fluctuate in output with minutes.

**Please provide the best example of how the project has benefited a specific individual, enterprise or organization. Feel free to include personal quotes from individuals who have directly benefited from the work.**

The innovative visual/geospatial displays enabled by situational intelligence software benefit the individual operators at the California ISO, the entire organization, and California's ability to make progress towards its climate change goals. "The operators jobs have changed dramatically as a result of the renewable resource integration. Space-Time Insight allows them to bring in data that they couldn't in the past and gives them the opportunity to take action on it. They are now

operating at a higher level in a more complex environment."- James McIntosh, Director/Executive Operations Advisor, the California ISO. For example, a renewables portfolio displayed on the ISO's video wall shows a rolling 24-hr. view of the energy produced by the basic renewables groups, with color-coding showing the usage of energy sources. Solar output, wind output and wind speed variances are tracked. One part of the display shows what small hydro facilities (capable of 30 megawatts production or less) are producing. Biomass, biogas, geothermal sources are also illustrated. By studying the 24-hour look-back and comparing that period's weather pattern with the forecast for the next 24 hours, the ISO generation dispatchers make more accurate predictions about changing patterns and adjust their set points out to the generators. "Our state has an ambitious agenda for addressing climate change, and as a result, we want to be able to take advantage of renewable power sources, whether wind, solar, geothermal or hydro, where and when they are available. Situational intelligence enables us to constantly optimize our renewables portfolio and make fast, informed decisions about the reliable integration of alternative sources of energy into the grid. It's a powerful capability in our renewables arsenal."- Steve Berberich, President/ CEO, the California ISO. See video, http://www.spacetimeinsight.com/video/renewables_intelligence.php.