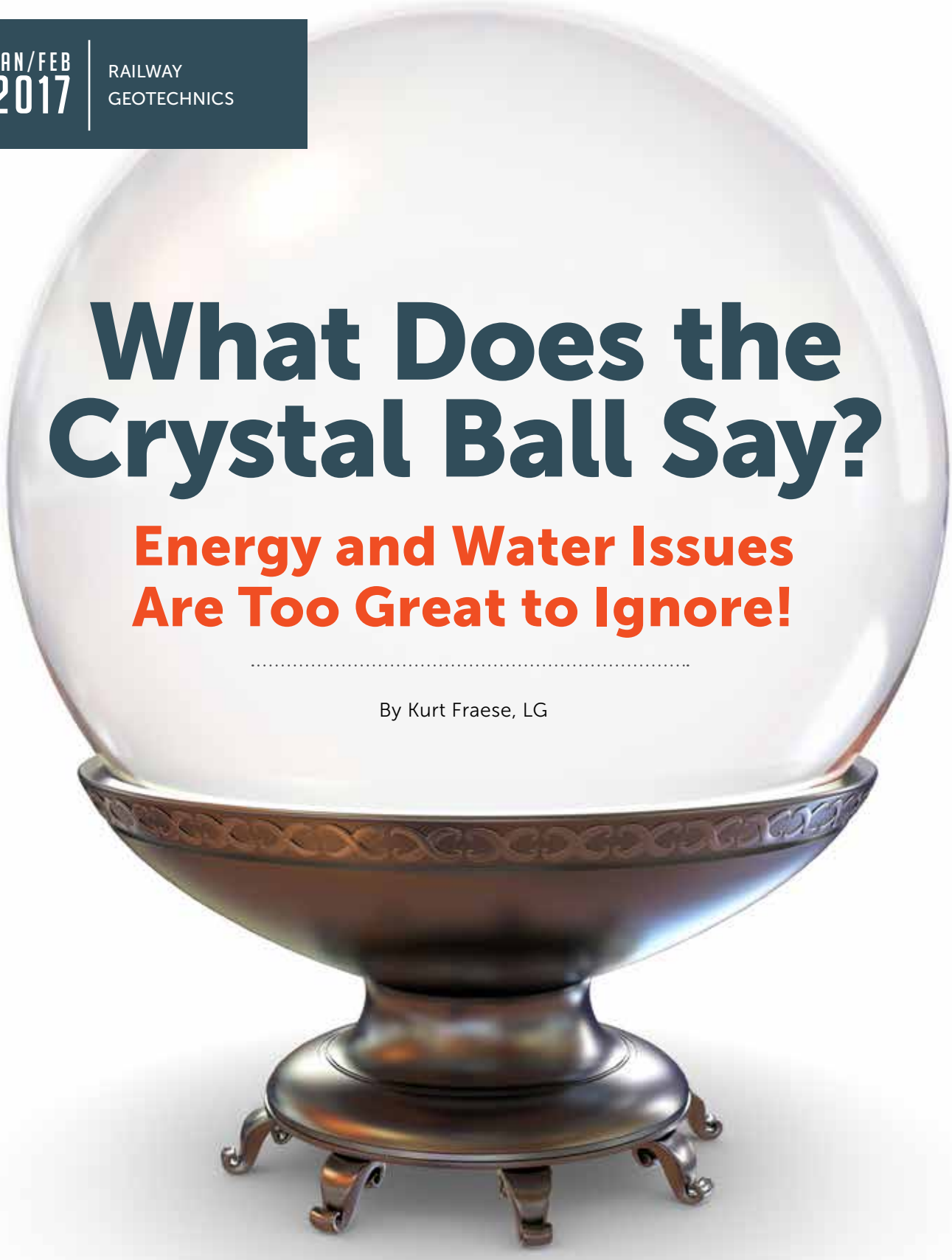
What Does the Crystal Ball Say?

Energy and Water Issues Are Too Great to Ignore!

By Kurt Fraese, LG



Over the past 15 years, the Geoprofessional Business Association's (GBA) Emerging Issues and Trends Committee has held a series of Crystal Ball Workshops (Workshops) to identify long-term emerging issues and business trends, and their potential impacts on the organization's member firms. Like other forecasts, some predictions come to pass, while others never materialize. Recent Workshops have accurately foreseen consolidation trends in our industry, as well as many of the impacts from demographic and economic shifts that geoprofessionals have experienced.

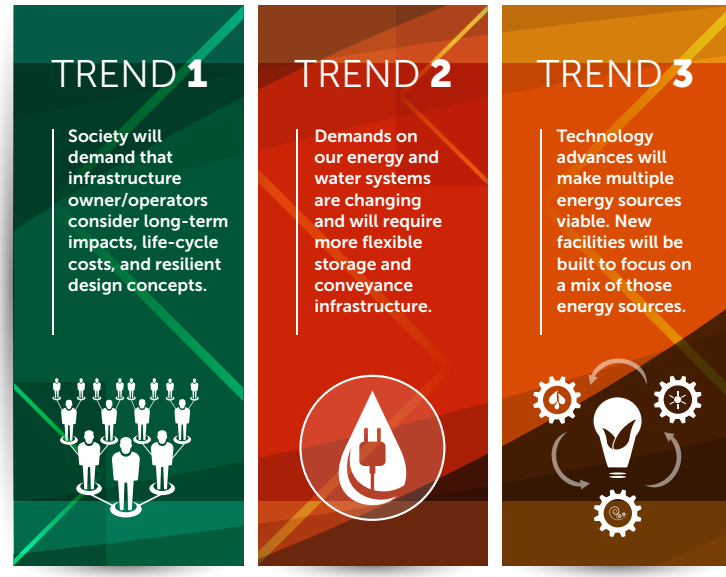
The most recent Workshop, co-sponsored by the Geo-Institute, was held in Dallas on April 13, 2016. Twenty people participated, representing clients, practitioners, contractors, and educators. The group explored drivers and disruptors that are expected to have an increasing impact on the infrastructure market over the next five years, with a special focus on business opportunities for geoprofessionals and their firms. With climate change emerging as one of the predominant issues of this young century, particular attention was paid to the energy and water markets and the nexus between the two.

Mark Cook, an expert in helping companies improve their productivity and the managing partner of CrossGroup, facilitated the Workshop discussions. Subject matter experts Jack Hand, chairman of Power Engineers and chair of the Environment & Energy Committee of the American Council of Engineering Companies, Jerry Selke of Bechtel Marine Propulsion Corporation and past president of the American Water Resources Association, and David Curtis, vice president and a flood risk management expert from WEST Consultants, provided informed perspective that served to stimulate and shape the Workshop's exploration of the present and future.

The Broad View

The Workshop's discussions underscored a growing sense that the past is no longer the prologue for addressing many issues to be faced by our firms, clients, and communities at the dynamic intersections of the built and natural environments. These intersections have potentially significant implications for the geoprofession, and particularly its engineering practices. Whether or not you provide service to the energy or water markets, changes in these markets will affect your future. Together these markets are anticipated to be the primary drivers of the physical and economic health of society in this century. As weather patterns shift and infrastructure degrades, energy and water systems must evolve beyond what we came to rely on in the last century. The related challenges create the prospects of a bright future for geoprofessionals who choose to engage in these markets.

Through review of past Workshop trends, presentations from the Workshop's experts, and subsequent Workshop dialogue, the group concluded that the market drivers/disruptors of our immediate future could be summed up in this overarching conclusion: *Traditional planning and design approaches are being disrupted by rapidly changing social, economic, technological, and environmental demands.* Three primary trends support this conclusion:



Primary trends showing that traditional planning and design approaches are being disrupted.

Opportunities in the energy and water markets.

Business Opportunities

The case for specifically targeting energy and water markets over the next 5-10 years is compelling. The subject matter experts for the Workshop, and the ensuing dialogue, presented a vivid picture of the tremendous opportunities for geoprofessionals in these markets. Here are some highlights.

Climate Change

It's a fact that we are in a period of profound climate change that demands we take a closer look at the inherent relationship between water and energy. Clients, our firms, and society must adjust perspectives to evaluate how climate-related disruption to critical energy and water infrastructure matters not only for short term, but increasingly longer-term needs. Understanding, and seeking advantages in the energy-water nexus, is central to improving our resiliency to climate change impacts. We depend on energy to transport and clean our water. We depend on water as a key source and component of energy production. Stress in one of these arenas stresses the other. Energy conservation measures have advanced with tremendous headway over the last decade. Water conservation measures may not have advanced as far, but much progress is being made. Gains in water use efficiency in agriculture is a good example. Particularly close attention should be paid to water economics. Consumers don't pay the true cost for water use. Climate-change-induced resource and economic imbalances will need to be effectively addressed more rapidly than our current pace. The manner in which this will be achieved is uncertain, but it will undoubtedly have significant impact on markets.

Resilient Design


Folsom Dam, CA.

One growing trend is resilient design that is less hardened and more flexible to handle more extremes without failure. In California, the nation's most populous state, nearly 20 percent of energy resources are consumed by the collection, treatment, and distribution of water. This condition is becoming representative of the increasing number of other states being subjected to prolonged drought. Against this backdrop, water and energy policy often has conflicting objectives. Folsom Dam, for example, is used for water storage, flood control, power production, and recreation. It literally takes an act of Congress to change the way some dams are operated.

There is increasing need to incentivize data sharing among stakeholders. In western parts of the U.S., there may be multi-decade ±30-40 percent changes in precipitation in certain climate regimes. It's difficult to accommodate for this long-term, wider range of precipitation in the operation of infrastructure when your capital improvement horizon or

Workshop experts predict that wave technology will emerge as another energy source as more is spent on its development.

design life is only 20 years. These conditions drive changes in design parameters and can lead to evolving standards of care that geoprofessionals must track and help define. The dynamic can create difficulty and stresses for traditional risk management methods, necessitating a broader scope for engineering firms that includes consideration of both client and social needs. Public relations skills are in demand, with opportunity for firms that can help educate the public and influence decision makers.

Multiple Solutions Needed

It will take multiple solutions to solve water and energy shortages and impacts, with no clear technology emerging as the "winner." Alternative energy sources so far have not produced a "silver bullet." Each solution seems to have a downside or a detractor. For instance, biofuels use a significant amount of water to produce electricity. Nuclear energy is socially and environmentally controversial. While hydro-fracking methods have been used for decades, policy changes in 2005 removed certain restrictions, and now the practice is more widely applied as its range of impacts and public acceptance are debated. Geoprofessional expertise is central to addressing many of the impacts associated with new energy sources.

Energy Storage

Energy storage is emerging as a primary challenge for both energy providers and consumers. Large-scale power generation and delivery of electricity is not very portable. Storage systems are needed to shave peak demand periods and to transfer power, requiring less expensive generation infrastructure than we have today. The power delivery market has been booming for over a decade in response to these challenges, and experts predict this will continue for at least a decade more. The market driver to watch is not just where, but also understanding when power is needed by customers.

Water Storage

Storage also will remain a big issue for water infrastructure. Pumped storage for water projects is a type of hydroelectric energy storage used by electric power systems for load balancing. Aquifer storage and recovery (ASR) is the re-injection of potable water back into an aquifer for later recovery and use. ASR is being developed for municipal, industry, and agriculture use.

Renewable energy options.

Transition to Renewable Fuels

Policy is driving continued conversion from fossil to renewable fuels. The EPA's Clean Power Plan to reduce carbon emissions has been delayed by recent court rulings, but not stopped. It and other regulations and global treaties on power emissions remain factors to watch. Technologies with continued upside in diversification of cleaner energy sources include cogeneration, rooftop solar, wind, and small hydro projects. Additionally, our Workshop identified geothermal production as continuing to become more cost effective. Production tax credits to incentivize the development of wind and solar power across the nation are reducing, but have been extended for another five years. Workshop experts also predict that wave technology will emerge as another energy source as more is spent on its development. Of course, not every new energy source with significant investment has succeeded. Despite the increasing popularity of rooftop solar sources, much larger scale "concentrated solar" power plants, with around $2 billion dollars in overall investment, have not achieved significant traction in the marketplace.

Regulatory Impacts

Regulation often creates demand for geoprofessional services. There's uncertainty and difficulty in the timing, outcome, and impacts of permitting processes that require geoprofessional expertise to navigate efficiently. It can take half a dozen years and tens of millions of dollars just to permit one interstate transmission line or significant water infrastructure project.

Whether or not you provide service to the energy or water markets, changes in these markets will affect your future.

Microgrids

Microgrids represent new opportunities for facility planning, design, construction, and maintenance. These are discrete systems consisting of distributed energy sources (including demand management, storage, and generation) with loads capable of operating in parallel with, or independently from, the main power grid. Their use is envisioned for significant development in such environments as hospitals and university campuses because they create a much better balance of energy use.

Power Transport Terminals

Power transport terminals for direct current (DC) are increasingly recognized as being needed to make our overall energy distribution system work. This approach contrasts with the more common alternating current (AC) systems in that it's potentially less expensive and offers lower electrical losses for long-distance transmission.

Older Power Plants

Closure of older power plants, and reclamation of associated lands, will continue to require a diverse set of geoprofessional services. As new power technologies and related infrastructure are constructed, owner/operators of former facilities will need specialized geoscience and engineering expertise for their conversion and/or other future beneficial use.

Security

Security is becoming a primary concern. Underscoring this time of rapid change is the backdrop of one "wildcard" trend that was identified in the Workshop. That trend is the increasing emphasis being placed on security in virtually all corners of the marketplace. Physical and cyber security for critical infrastructure, within client and regulatory organizations, will become a bigger component of planning, project execution, and operations. The desire for more security is being driven both globally and locally. This new dimension will directly affect the projects geoprofessionals work on to varying degrees, and must be considered in our approach to business.

Response Actions

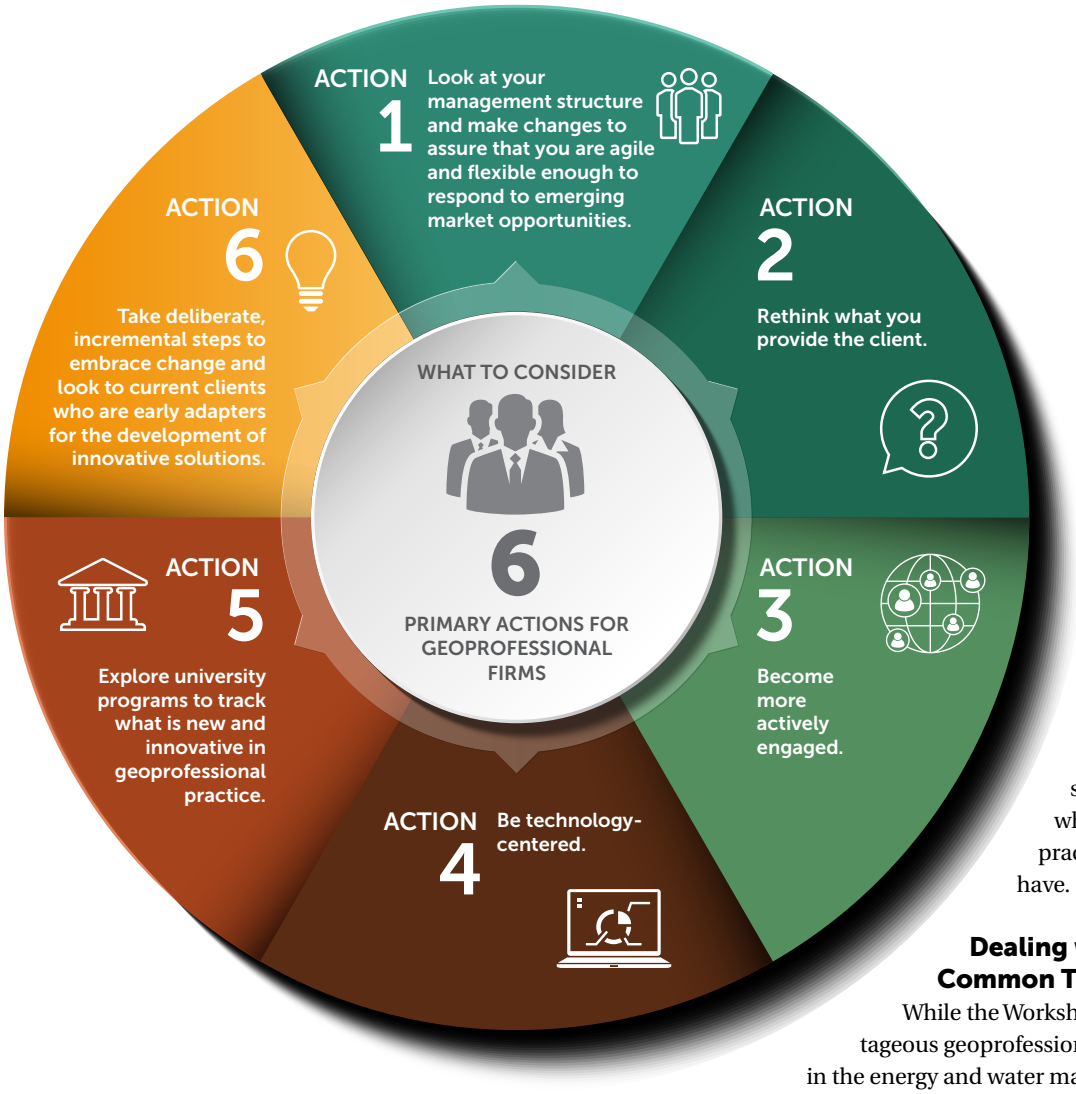
The Workshop identified six primary response actions that geoprofessional firms should consider in responding to market drivers/disruptors and emerging trends.

Action 1: Examine your management structure and make changes to assure that you are nimble and flexible enough to respond to emerging market opportunities. Traditional management structures often inhibit flexibility to address future trends. Find entrepreneurial individuals and empower them to solve problems in new ways. Consider creating an innovation or development group in your organization. Give them appropriate levels of permission to experiment and fail. Measure the effectiveness of your firm's creativity and provide incentives and rewards to those who succeed with new ideas.

Action 2: Rethink what you provide to clients. Develop and demonstrate to clients that you have the ability to facilitate exploration of their broader business needs and help them plan for the future. Recognize that, increasingly, the value demanded of the geoprofessional is much more than just engineering skills. Planning and other "soft" skills are critical for helping clients survive and thrive in a much different world. Consider making investments to strengthen your firm's communication skills. Become more socially aware, and increase your ability to influence. Transition to diversified cross-discipline thinking.

Action 3: Become more actively engaged in local, regional, national, and global community outreach. We live in a more transparent and technologically connected time where it is easier for society, clients, and the workforce to judge a firm's role in the communities it serves and inhabits. Consider providing more flexibility for employees to be active in community organizations. Volunteer for community service. Practice philanthropy and support non-profit organizations. Invest in leadership development. If your firm is somewhat isolated from communities at large, challenge your current business model.

Action 4: Be technology-centered. Technology will continue permeating all aspects of business. You can gain advantages by shifting from resistance to embracing new technology.



Consider finding ways to get out front and drive change in your areas of influence. Use new methods to increase efficiency and deliver better solutions to clients. Seek ways to improve data access, management, and visualization. Pursue better technology coordination with clients. Smaller firms that want to play a bigger role, in particular, should assess the use of technology to connect with and create teams of global technical resources to expand their capabilities.

Action 5: Explore university programs to track what's new and innovative in geoprofessional practice. Knowledge centers, such as universities, are not only a source for talent, but also ideas to help your business succeed and thrive in times of rapid change. Consider developing relationships with institutions of higher education and open a dialogue of sharing applied science, engineering, and technology business knowledge. Such relationships will naturally place your firm in a position to learn about cutting edge research and innovation that can be applied in solving the emerging technical issues that our clients face.

Action 6: Take deliberate, incremental steps to embrace change and look to current clients who are early adapters for the development of innovative solutions. A growing number of clients are seeking new ways to run their organizations. Look for them. In a time of rapid change, many will choose to no longer engage those geoprofessional service providers who have not evolved their practice in favor of those who have.

Dealing with Change Is the Common Thread

While the Workshop's focus was on advantageous geoprofessional responses to changes in the energy and water markets, these same actions are likely to have beneficial effects on a firm's efforts to penetrate other markets. Change, and how we choose to deal with it, is the common thread that ties together this Workshop with its predecessors. To underscore the importance of embracing change, Workshop expert David Curtis shared a quotation from a popular song that seemed applicable to the topics we covered and an appropriate way to conclude this summary of our Workshop:

"Come gather 'round people, wherever you roam, and admit that the waters around you have grown, and accept it that soon you'll be drenched to the bone. If your time to you is worth savin', then you better start swimmin' or you'll sink like a stone, for the times they are a-changin'." – B. Dylan

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