NATOMA TECHNOLOGIES, INC. RESPONSE TO THE

CALIFORNIA AIR RESOURCES BOARD

REQUEST FOR INFORMATION
FOR A
MARKET TRACKING SYSTEM

JUNE 10, 2010

SUBMITTED BY:

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June 10, 2010

Matthew Botill and Raymond Olsson
Air Resources Board, Office of Climate Change
1001 I Street, P.O. Box 2815
Sacramento, CA 95812

Subject: Response to Market Tracking System Request for Information (RFI)

Dear Mr. Botill and Mr. Olsson:

Natoma Technologies, Inc. (Natoma) is pleased to submit the included information and recommendations regarding the RFI for a Market Tracking System. Natoma is a Sacramento-based information technology (IT) consulting and systems integration firm with a 12 year, proven record of designing, developing, and implementing solutions for California State agencies and departments, including the Air Resources Board (ARB).

We are responding to this RFI from the perspective of a systems integrator rather than a software product vendor. It is our intent to provide ARB with information and recommendations for the planned Market Tracking System that will complement other RFI responses from the software product vendor community.

Given the specific needs of the Market Tracking System and the current timeline for its implementation, ARB is likely to focus on existing systems that could be leveraged for the core functionality of the Market Tracking System. Natoma does not offer such a system, but we are providing this feedback and recommendations to the ARB for consideration in the planning and execution of this project.

Relative to the Market Tracking System project, we have significant experience in the areas of:

- Registration systems, including ARB regulatory and compliance programs
- Air quality emission inventory and emissions data management systems
- Business intelligence (BI) and reporting systems
- Systems integration
- Interface development
- Data conversion
- Overall project management experience implementing large, enterprise-level systems involving diverse stakeholder groups

With AB-32, it is exciting to see California again lead the nation in proactive environmental programs and innovative IT solutions designed to serve a wide variety of stakeholders in an evolving “greener” future.

If there are any questions regarding this submittal, please contact Ned Dickson at (916) 317-2935 or ndickson@natomatech.com.

Sincerely,

R. Wyatt Dietrich

R. Wyatt Dietrich
Vice President & COO

CAPABILITIES

Natoma is a Sacramento-based technical consulting and system integrator firm with proven experience in architecting, developing, and delivering mission-critical software solutions using the latest technologies. As a firm dedicated to the State of California market, Natoma has been in business for 12 years with a proven record of delivering IT projects similar in their high political visibility, technical complexity, and schedule-driven criticality.

Natoma has a strong background in air quality issues and regulatory compliance, with many of our senior managers and IT professionals coming from Radian International prior to joining Natoma. In our Radian days, we had the opportunity to develop custom IT solutions and products used by commercial and government clients, including emissions data management systems, fugitive emissions data management systems, and stationary and mobile source emissions datasets supporting regional, state, and national inventories and modeling programs.

Natoma's strength is helping clients use information and Web technologies to improve work processes, reduce costs, and increase levels of service. Natoma completes all projects with a dedication to 100 percent on time, on budget performance and a commitment to long-term client satisfaction and success. Natoma is a recognized business leader in the Sacramento region, serving both state agencies and commercial clients. We are a very stable, profitable, owner-operated company with a positive culture, which ensures our clients will work with the team they expect to throughout the life of their projects. We have 40 professional staff providing IT services to clients in the Sacramento area.

"On a scale of 1 to 10, 10 being the highest mark for outstanding performance, I rate Natoma a 10. Natoma has been the most accessible and responsive consulting group that made sure our projects were on time and within budget. They have the right attitude, and they really incorporated our organization' objectives into their project performance goals."

—John Mott-Smith
Program Manager
California Secretary of State

As a certified California small business, Natoma is proud to offer clients the best value choice, combining the benefits of lower rates, flexibility, responsiveness, and dedicated, local staff with industry-leading technical and project management expertise. Natoma is headquartered in Sacramento and is committed to the successful delivery of projects here in the capitol region—our reputation is at stake with every project so you can be assured of receiving the best possible service. This high prioritization of every client has given Natoma an enviable record of 100 percent client referenceability.

Natoma offers a wide range of subject matter experts across a comprehensive selection of specific products, platforms, and technologies, with experience ranging from resolving security issues to implementing enterprise application suites. Our team includes skilled solution architects, business/system analysts, expert .NET and Java developers, senior database administrators, quality assurance and testing specialists, and award-winning project managers skilled at bringing the most complicated projects across the finish line successfully.

LEADERSHIP

Natoma is a recognized leader in the IT industry because of our team's successful implementation record for State government clients. Our recent leadership positions include:

- **California Department of General Services Small Business Council** – Natoma was recently selected to be the IT industry representative on the Council and serves as a co-chair along with the Department of General Services (DGS) Deputy Director.
- **American Electronics Association (AeA)** – Technology industry peers selected Natoma to serve as their Sacramento Council Chair for the AeA, the largest high-technology industry trade association. Natoma further represents the Sacramento region by serving on the National Board of Directors for AeA.
- **State/Assembly** – Natoma was the only firm to testify at the joint Senate/Assembly hearing on IT Governance.
- **California Performance Review (CPR) Leadership Forum** – The State Chief Information Officer (CIO) recently invited Natoma as the only small business to speak at the CPR Leadership Forum.
- **California Governor's IT Council** – The Natoma Chief Executive Officer (CEO) was the only small business CEO invited to participate in a discussion with Governor Schwarzenegger hosted by Cisco's John Chambers.

These leadership positions demonstrate why Natoma stands out from other firms—Natoma understands California State government perspectives and is committed to truly helping the State solve its IT challenges. Natoma is equally respected by the wide range of firms within the IT industry, serving at the leading edge of the industry and shaping the direction of IT as a whole.

AWARDS

The success of Natoma projects has been recognized by both State and national awards. Recent recognition and awards include the:

- **CIO 100 Award** that the Port of Long Beach received for the Clean Trucks Program. The Clean Trucks Program requires trucks to be registered in the Natoma-developed Port Drayage Truck Registry (PDTR). The PDTR checks a truck's compliance with the Clean Trucks Program air emissions standards, determines whether the truck should be allowed entry, and calculates the fee that should be paid per container.
- **"Best Fit" Technology Integrator Award**, Reinvention in Health and Human Services to Natoma for the first California State government project to design, develop, and implement shared Web services in a service-oriented architecture (SOA) infrastructure consistent with the California Enterprise Architecture Program (CEAP) vision.
- **2007 National Electronic Commerce Coordinating Council (eC3) Award Winning Project for Excellence in Government Transformation** for the Cal-SOLQ/MMA project developed by Natoma to provide real-time access to the Federal Social Security Administration.
- **Best of California Project Award** for the design and implementation of the Governor's eBudget System.

AIR RESOURCES BOARD – REGISTRATION SYSTEM EXPERIENCE

Natoma was selected by the California ARB to design, develop, and implement the Air Resources Board Equipment Registration (ARBER) system. ARBER is currently in production, including the statewide transport refrigeration unit (TRU) and drayage truck registry (DTR) registration and reporting functionality.

Natoma is also working with ARB to design, develop, and implement a new registration and compliance system for the statewide Portable Equipment Regulatory Program (PERP). The PERP is a voluntary, statewide program to register portable equipment such as air compressors, generators, concrete pumps, tub grinders, wood chippers, water pumps, drill rigs, pile drivers, rock drills, abrasive blasters, aggregate screening and crushing plants, concrete batch plants, and welders. Portable equipment registered in PERP may operate throughout the State without obtaining permits from any of California's 35 air quality management or air pollution control districts (air districts).

CALIFORNIA PORTS – DRAYAGE TRUCK REGISTRATION SYSTEMS

Natoma brings proven experience in developing secure, mission critical, operational database systems for California ports (Long Beach, Los Angeles, and Oakland) and federal, state, and local agencies. Natoma was the prime contractor for the national, award-winning PDTR database system in production at the Port of Long Beach and Port of Los Angeles since September 2009. The PDTR database system was custom built to meet the needs of the licensed motor carriers, marine terminal operators, and Ports' staff to manage drayage truck operations and compliance with the Clean Trucks Program. Natoma is also the prime contractor for the California Statewide Drayage Truck Registry, which has been in production since June 2009. A Natoma-built DTR database system was implemented at the Port of Oakland in February 2010.

FEEDBACK

Leveraging Natoma's experience in the areas of statewide registries, emission inventory, business intelligence, system integration, interface development, and overall project management experience implementing large enterprise-level systems involving diverse stakeholder groups, we are providing our feedback in the form of the recommendations on the following topics:

- Recommendation #1: Incorporate Implementation of Business Intelligence from Project Inception
- Recommendation #2: Establish Information Governance
- Recommendation #3: Consider Service-Oriented Architecture for Interfaces
- Recommendation #4: Consider "Software-as-a-Service" System Business Model
- Recommendation #5: Independently Validate Implementation Timeline
- Recommendation #6: Encourage Phased Implementation
- Recommendation #7: Establish the Project Management Office Early
- Recommendation #8: Begin Requirements Analysis As Soon As Possible

RECOMMENDATION #1: INCORPORATE IMPLEMENTATION OF BUSINESS INTELLIGENCE FROM PROJECT INCEPTION

Some projects have delayed development of the business intelligence (BI) and advanced reporting functionality of the project until later phases due to resource constraints or lack of clarity in project reporting requirements. While this may seem to make sense, waiting until requirements are fully understood and the system configuration established produces a non-optimal solution and significantly delays realization of new system benefits.

A BI solution is broadly accepted as the most efficient and powerful way in which to organize data into information—and deliver that information as knowledge. This means providing decision-makers with the breadth and depth of understanding they require to make informed decisions, while being freed from the restrictions and limitations inherent in multiple operational systems that are not designed to provide analysis and decision support, but rather to support daily transaction processing.

As a separate system with its own copies of the operational data, development and expansion of a BI solution can be flexible to meet the complex and changing information needs of an organization's analysts and management. Natoma's recommended approach is to first establish the overall goals and implementation plan for developing, deploying, and enhancing the BI solution through a strategic roadmap deliverable process that requires participation from executive stakeholders representing the entire organization. Involving all of these stakeholders at a strategic level promotes the development of a solution that is not only broadly accepted at every level of the enterprise, but also delivers the most value for the investments made. After the strategic roadmap is in place, development of a BI solution can take advantage of the freeing of data from the necessary constraints of the operational systems. The BI solution can be phased in an incremental fashion that delivers metrics and tools quickly—often while also allowing the organization to make modifications to the solution with little disruption to service.

For example, Natoma is currently developing the BI component for a major system implementation for a California State agency. The project, correctly in our opinion, included the BI components at the Request for Proposal (RFP) stage. By allowing the BI reporting solution to come online at the same time as the transactional solution, management will not only receive reports and alerts as soon as the system is live, but also adapt as the user community adjusts to the new system. Parallel information growth provides a baseline of understanding and builds lines of communication between management and the data warehouse analysts.

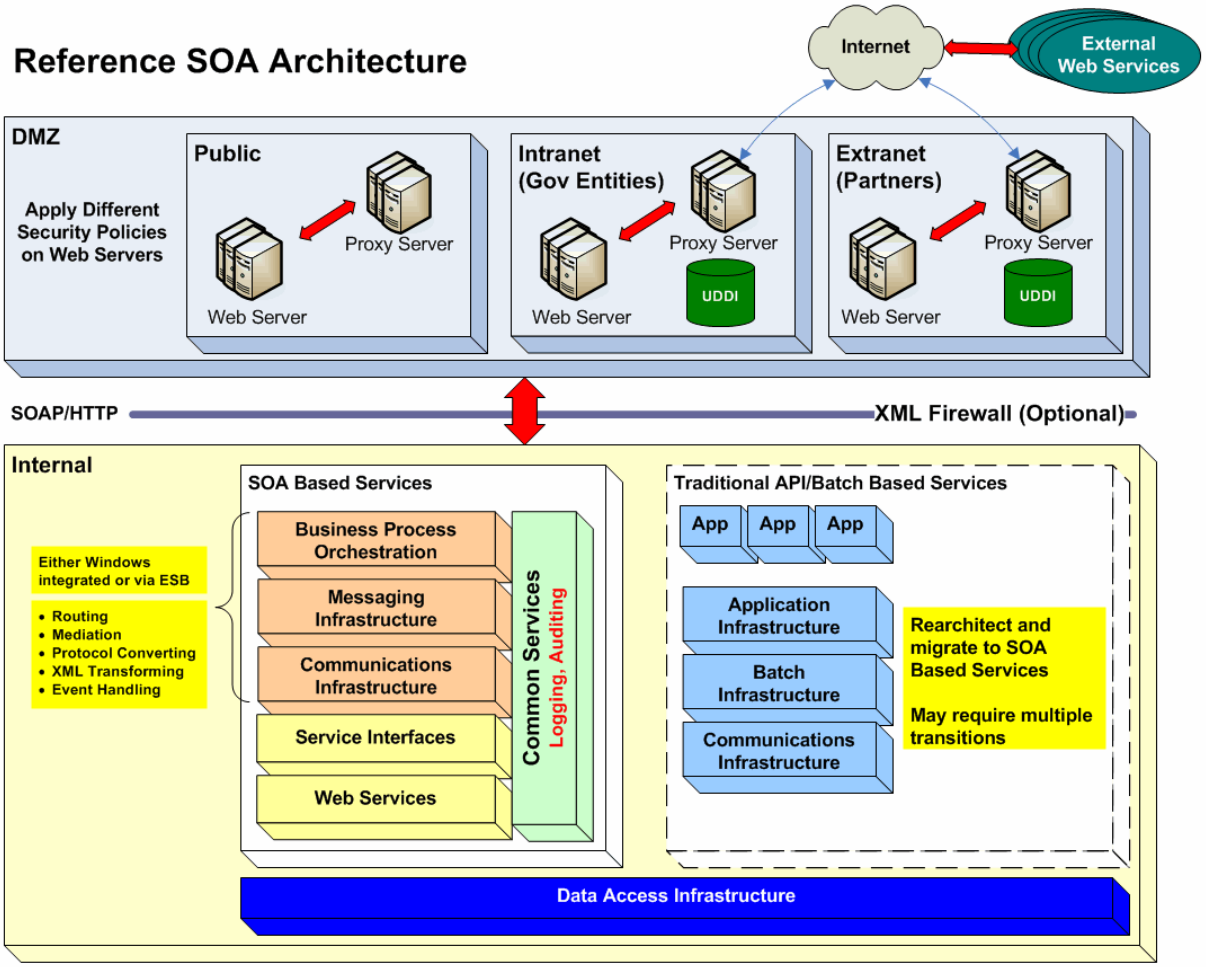
RECOMMENDATION #2: ESTABLISH INFORMATION GOVERNANCE

We recommend early establishment of information governance within ARB for the new Market Tracking System, which will enable the ARB to proactively work and manage the emissions, allowance, offsets, and compliance instruments data in a planned, thorough fashion. By having information governance at the outset, you validate that all datasets being collected are meaningful and have the same meaning built into them. It is critical in these types of systems that all data is consistent in terms of meaning, standardized formats, and clearly defined "data ownership" based on thoughtful consideration and knowing the long-term impact to system operations. The cap-and-trade program will have many perspectives to the data including, but not limited to, legal (Sarbanes-Oxley), scientific, and political perceptions. These differing, yet important, viewpoints require that an executive team regularly meet to establish guidance and rules regarding data ownership, transparency, and publication.

RECOMMENDATION #3: CONSIDER SERVICE-ORIENTED ARCHITECTURE FOR INTERFACES

The Market Tracking System requires a very large number of interfaces using a variety of formats. While many of these interfaces may have established, industry-accepted specifications, ARB should consider the use of a SOA to provide a flexible, secure method to exchange information with external parties. Properly designed, a SOA will save time and effort versus ARB having to develop individual interfaces. It will allow efficient scaling to accommodate the common needs of the large number of system registrants and external stakeholders. It will also provide a common foundation for interfacing with the system via Web services, including the security protocols that will allow only authorized users the ability to input or access data.

The exchange of information will be crucial to the success of both the tracking of the carbon allowances and the collection of information from the carbon producing industry. Anywhere data must be shared or collected from external sources will be areas where SOA plays a large part. It will provide the backbone for the transmission of data to and from the Market Tracking System, and will enforce a standards-based, secure infrastructure for the exchange of information. The following figure shows any number of systems exchanging information using an example SOA infrastructure.



Source: California Enterprise Architecture Program, 2006

The basic SOA infrastructure is made up of several key elements. They are:

- **Enterprise Service Bus (ESB)** – An ESB is used by the application to route information from one server or application to another. It essentially does the actions necessary to "connect the dots" in a complex infrastructure, both internal and externally. The ESB can do simple transformations where needed but in its most basic form it is really just a message routing engine.
- **Business Process Execution Language (BPEL)** – BPEL is a standard that allows various SOA vendors to create tools that can use the same BPEL-written processes interchangeably. BPEL creates workflows of Web services and other processes to create the business process. These can include both machine-based tasks (Web services) and human tasks where the process flow waits for interaction from a user.
- **Web Services** – Generally, these are standards-based processes using simple object access protocol (SOAP), hypertext transfer protocol (HTTP), and extensible markup language (XML). These are the actual procedures that will either perform a unit of work or start a BPEL process, which is itself a unit of work. The Web service, if implemented as a XML Web service, will allow most (nearly all) systems to interchange data without large conversion efforts.
- **Identity Management** – Most SOA applications require some sort of security. This will be especially true in the Market Tracking System. It is important to know who is doing what within a SOA infrastructure and tight integration with an identity management package is critical to accomplishing this.
- **Audit** – SOA applications promote the ability to change information coming from multiple different applications where permission has been granted. However, knowing who, what, when, and where a change has occurred is critical, especially if the application involves government regulations, since knowing that a change occurred and that it was correct is very important. Frequently, the application of audit functions is performed as a service within a BPEL flow, but other implementations are at the ESB level depending on the product selected.

In general, these features are available from product vendors and will include the elements listed above, as well as other SOA and BI features.

RECOMMENDATION #4: CONSIDER "SOFTWARE-AS-A-SERVICE" SYSTEM BUSINESS MODEL

Software-as-a-Service (SaaS) is commonly used within industry for the purchase of services that are common across most industries, such as customer relationship management or, as in this case, the use of "trading" software. There are great benefits to this model because it allows the State to offload large amounts of "application maintenance" work to the private sector, where existing processes are in place to manage them and it is incentivized (cost versus payment) to maintain well-functioning systems. An example might be that the State would require all participants to create an account in "Widget Trade Systems" so that they can trade carbon emissions. The State could offload the cost of the account to the participants so that the State is not burdened with having to pay for this service, other than the initial offering to the "Widget Trade Systems." The State would just have an oversight account that would have full access to the reporting data for the system to enforce compliance and overall reporting of information to regulatory agencies as appropriate.

The SaaS model has several benefits to the State. These are:

- Hardware and processing needs are outsourced, meaning that part of the service level agreement with the vendor might be that when utilization reaches X then the vendor adds additional capacity without any kind of change control process
- Application maintenance is outsourced, with changes to the code based on the operating system or the addition of new functions that would be as needed as part of the vendor contract with the State
- Enforceable service level agreements for system hosting uptime and performance
- State Staff can focus on the cap-and-trade program rather than maintaining the Market Tracking System hardware and software

RECOMMENDATION #5: INDEPENDENTLY VALIDATE IMPLEMENTATION TIMELINE

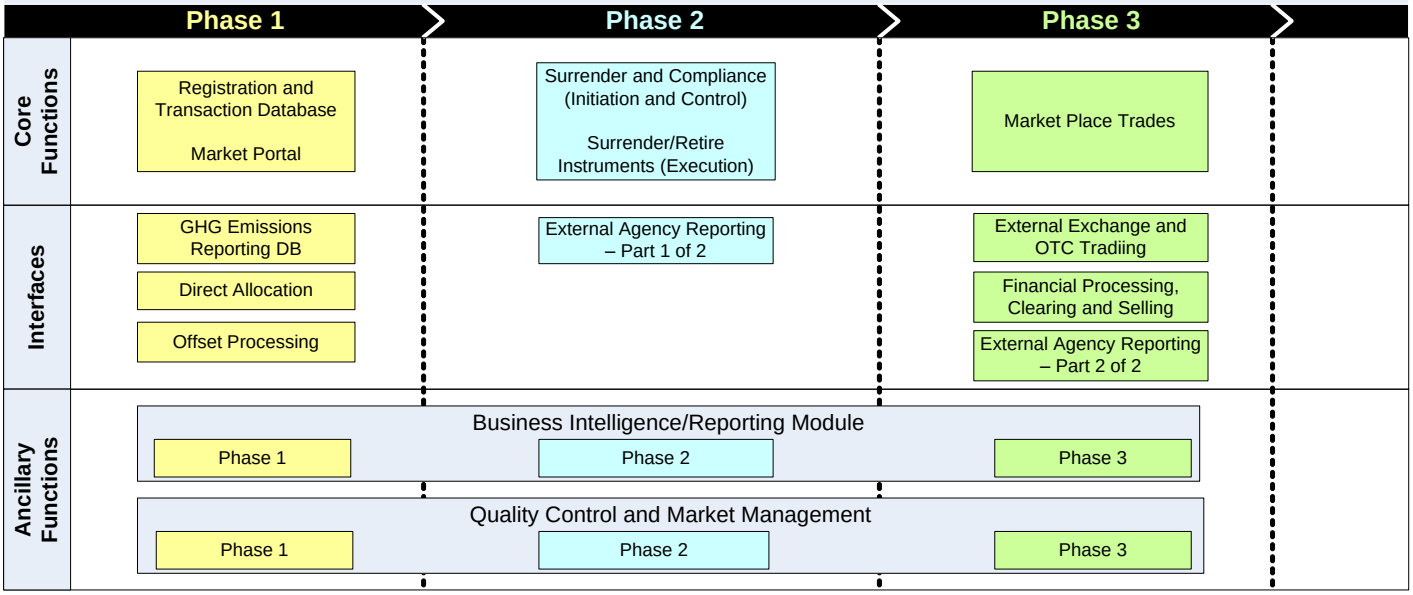
Given the size and scope of the Market Tracking System, the implementation timeline for the system to be operational by end of the third quarter of 2011 is extremely aggressive. We understand the deadline as mandated from AB32 and the need to align activities with efforts such as the Western Climate Initiative; however, based on our experience with the implementation of enterprise-scale, statewide IT systems such as the Market Tracking System, an overly aggressive schedule raises many risks. In particular, incomplete requirements definition is a common outcome of aggressive schedules, leading to incomplete or incorrect functionality. While the AB32 timeline may be out of ARB's control, we recommend that ARB engage with experts experienced in implementations of this type to perform an independent evaluation of the project timeline to be included in the Feasibility Study Report (FSR). An independent assessment will help ARB gauge the level of schedule risk involved in the project.

RECOMMENDATION #6: ENCOURAGE PHASED IMPLEMENTATION

IT systems of this scope and complexity are rarely implemented in a single phase. Phased implementations reduce risk by allowing the team to plan and focus on implementation of smaller, individual components of the overall system. Often the core functionality is implemented first, and then additional components are added in sequence. This spreads out risk and impact to the stakeholders, although it increases complexity of the implementation process itself. The implementation of the cap-and-trade system itself is a phased operation for exactly this reason.

Although the RFI did not discuss implementation strategies, the same principle should be applied here. We encourage consideration of a phased implementation approach. The Market Tracking System is highly integrated and full separation of the functionality into phases may not be feasible. One possible scenario would split the implementation into three phases, as shown in the example figure below.

ARB MARKET TRACKING SYSTEM



The three phases could encompass:

- **Phase 1**
  - Implement core registration, transaction database, and market portal
  - Integrate with necessary emissions inventory databases, such as ARB's greenhouse gas reporting database
  - Test and implement registration processes
  - Integrate with ARB systems for allocations and offsets
  - Implement Phase 1 of the BI/Reporting, Quality Control, and Market Management modules
- **Phase 2**
  - Add surrender, compliance, and retirement instruments
  - Add initial reporting interface to external agencies, which would be implemented in two parts with the first part here in Phase 2
  - Implement Phase 2 of the BI/Reporting, Quality Control, and Market Management modules
- **Phase 3**
  - Add integration with market trading systems and clearinghouses
  - Complete external agency reporting interface
  - Complete the BI/Reporting, Quality Control, and Market Management modules

RECOMMENDATION #7: EARLY ESTABLISHMENT OF THE PROJECT MANAGEMENT OFFICE

When implementing major IT systems, the resource impact on sponsoring organizations and key stakeholder organizations is often underestimated. In the final recommendations on the formation of the cap-and-trade program, the Market Advisory Committee commented:

> *Especially at the outset, however, the Air Resources Board should evaluate the practical constraints imposed by data availability, management capacity, administrative complexity, and transaction costs*[1]*.*

This comment was directed at the impact to affected industry sectors; however, in the case of IT system implementations, the comment is equally applicable to ARB as the implementing organization. Vendor teams will be hired to configure and physically implement the system but the impact on ARB and other stakeholder resources will be significant as the system is designed, tested, and implemented. In the case of ARB, this resource demand will occur on top of existing Office of Climate Change workload as staff carry on with other AB32 activities. Key areas that will require significant involvement from ARB staff will include:

- Technical and business subject matter expertise during the requirements definition and design phases
- Ongoing stakeholder communications throughout the project
- System testing
- Vendor management
- Post-implementation system management

In particular, the dedication of the necessary subject matter expertise resources is usually a challenge. For example, consider analysis conducted for the upcoming FI$Cal project being undertaken by Department of Finance, which quotes Gartner analysis of staffing for Enterprise Resource Planning (ERP) projects[2]. While not fully analogous to the Market Tracking System, there are parallels in functionality and system complexity.

GARTNER BENCHMARK DATA ERP PROJECT STAFF ALLOCATION
33% Consulting Staff
33% Business Staff
9% Contracted Staff
25% Internal IT Staff (includes project management staffing)

Note the high level of participation from ARB and stakeholder business staff (33 percent). This resource constraint is frequently underappreciated. ARB is likely already dedicating the

[1] Recommendations of the Market Advisory Committee to the California Air Resources Board *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California*. June 30, 2007. Executive Summary, p. iv. http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF

[2] Gartner Research: Gaining Insights from [ERP Support] Staffing, 2005

resources to meet many of these needs. Based on our experience, Natoma encourages that effort, and recommends the Project Management Office that will oversee all of these activities be formed and begin planning as soon as possible.

RECOMMENDATION #8: BEGIN REQUIREMENTS ANALYSIS AS SOON AS POSSIBLE

The speed with which the system can be implemented could be significantly improved if a Technical Advisory Committee can be formed to bring together key stakeholders and subject matter experts and immediately begin work to detail specifications for the many interfaces and reporting structures required by the Market Tracking System. In normal system implementations, this activity would not commence until a system integrator is selected. However, the extremely aggressive timeline requires some creative approaches, such as beginning those portions of the requirements definition process early.