

External Verification of Conversion Technologies

A Proposal for Removing the Key Barrier to CT Advancement

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Introduction

A key barrier to implementation of advanced Conversion Technology (CT) systems is the lack of credible external validation through testing and demonstration for systems efficacy and operational control. This perspective has been advanced in a paper released by the Hamilton Project housed within the Brookings Institute, wherein the author proposes that an Energy Technology Corporation¹ be instituted by the federal government and advised by private specialists.

Our article offers reasons why this might be an effective approach for advancement of CTs and proposes a means for implementation. Unlike the Hamilton Project's Department of Energy (DOE) oversight proposition, it is proposed here that the Environmental Protection Agency (EPA) is better suited for the purview and we outline a plan to build on the EPA's existing Materials Management and Remediation Center (MMR)² program. One national MMR Center has already been established in Florida; a second Center in the western region would greatly enhance the EPA's overall Environmental Technology Verification (ETV) program. The Florida site seldom offers CT assessment at this time; a western facility could become the CT third party verification flagship.

To understand the importance of both external environmental technology verification and the critical need for such a program specifically focused on the CT industrial sector, the socio-political background is summarized below.

CT Implementation Efforts and Objections

Use of thermal platforms for conversion of waste to beneficial uses has been an approach both actively promoted and strenuously opposed. To dramatically advance to public and private acceptance, there is a critical need for credible CT verification data. A review of recent California progressive actions and frustrating forestallments can place this need in context.

California's legislative efforts focused on CTs have previously been profiled³, providing a history and detailed assessment of the prescriptive language that later was to be promulgated as Public Resources Code (PRC) Section 40117. Repeated public and private attempts to correct technical inaccuracies in the PRC have been met with entrenched legislative opposition, while our state agencies have followed the law and the previous governor's direction in support of CT advancement, inclusive of thermal waste conversion platforms.

The most recent "clean-up legislation" effort was proposed as Assembly Bill 222, released a year ago.⁴ A joint agency letter in support of the draft as amended followed closely,⁵ citing findings of the Working Group "re-invigorated" by the Governor:

¹ An Energy Corporation will Improve the Federal Government's Efforts to Accelerate Energy Innovation. John M. Deutch, The Hamilton Project, Brookings Institute, May 2011. http://www.brookings.edu/~media/Files/rc/papers/2011/05_energy_corporation_deutch/05_energy_corporation_deutch_paper.pdf

² EPA ETV/MMR Center Fact Sheet, December 2008. <http://www.epa.gov/nrmrl/std/etv/pubs/600etv09004/600etv09004.pdf>.

³ Solid Waste Conversion and Renewable Energy: A Legislative Review of AB 2770, SB 1038, and SB 1078. Michael Theroux, June 2008. <http://www.terutalk.com/Articles/Solid-Waste-Conversion-and-Renewable-Energy.html>.

⁴ AB 222 draft amendments, Assembly Members Adams and Ma, released March-April 2010.

⁵ California's Energy Commission, Air Resources Board, CalRecycle. April 15, 2010. Support for AB 222 Regarding Energy from Biogenic Waste.

"Since 2006, the Bioenergy Interagency Working Group has advocated in its Bioenergy Action Plan to "Amend existing law to revise existing technology definitions and establish new ones, where needed. In particular, review the definitions of gasification, transformation, fermentation, pyrolysis, and manufacturing. Such statutory clarification would enable the utilization of biomass residues through combustion or non-combustion technology." ⁶

In spite of overwhelming support from agencies and municipalities, the bill never made it to the Governor's desk.

State Action: Case in Point

CalRecycle, California's realigned⁷ waste management agency, exercised the purview they were given over CT eligibility in November 2010. Based upon extensive documentation supplied by the developer, CalRecycle certified that the plasma waste conversion project proposed by Plasco Energy Group for thermal conversion of Salinas Valley's municipal solid waste (MSW) met the stipulated prescriptive criteria of the PRC⁸ as a gasification facility that would require a solid waste facility permit to operate.⁹ The prior finding by CalRecycle was requisite to California Energy Commission (CEC) pre-certification, by law; the CEC subsequently identified the Salinas Valley project as an "eligible renewable energy generating facility" in compliance with the Renewable Portfolio Standard.^{10, 11}

The agencies' actions prompted a negative response from a number of associations who have long been volubly opposed to thermal conversion, apparently initiated by a senior staff member of the seated President Pro Tem of the Senate, the Honorable Darrel Steinberg. In an April 14, 2011 letter to California Natural Resources Agency Secretary John Laird, the opposition advanced the claim that the agencies had over-extended their purview, asking the pre-certification actions be rescinded. To date, no formal action has been taken.

In a scathing April 21, 2011 letter to legislators in his own political party, past Senator David Roberti chastised Senator Steinberg for becoming directly involved in a legal opinion issued by an executive agency. The letter cautioned that the Agency was within purview *because* the Legislature would not facetiously promulgate law:

"It is clear that CalRecycle's ruling on this issue, reached after long discussion, was the correct opinion. Legally, there could be no other interpretation, because it would never be the intent of the legislature to pass a law with which no one can comply."

Senator Roberti further advised that, "In a free market economy, the waste-to-clean-energy industry has just as much right to be permitted and operate under California's stringent environmental laws as any other."¹²

Municipal Leadership

California's municipalities are either actively pursuing Waste Conversion projects, or are clearly in a "watch mode". On April 20, 2010, the Los Angeles County Board of Supervisors voted to approve contracts and initiate the next Phase III and IV stages of the long-running Alternative Technologies Assessment program to permit three CT projects in Southern California and to pursue a wide range of CT

⁶ Bioenergy Action Plan, p.9. July 2006. California Energy Commission.

⁷ Teru Talk report: <http://www.terutalk.com/TERU-Reports/CalRecycle-Realignment.html>

⁸ PRC 40117: "Gasification" means a technology that uses a noncombustion thermal process to convert solid waste to a clean burning fuel for the purpose of generating electricity... (code then stipulates eight prescriptive criteria).

⁹ Regulatory Status of Proposed Salinas Valley Project. November 23, 2010 letter to Alisdair McLean, Plasco Energy Group, from California Department of Resources Recovery and Recycling (CalRecycle). Elliot Block, Chief Counsel

¹⁰ Renewables Portfolio Standard Eligibility Guidebook, Fourth Edition. Publication # CEC-300-2010-0007-CTF. <http://www.energy.ca.gov/2010publications/CEC-300-2010-007/CEC-300-2010-007-CMF.PDF>

¹¹ Plasco pre-certification listing as #1387: http://www.energy.ca.gov/portfolio/documents/List_RPS_CERT.xls

¹² Letter to Honorable Senator Darrell Steinberg, April 21, 2011. Senator David Roberti.

activities within the County itself. The program provides ample reason to support clean post-recycling conversion of municipal solid waste, backed by almost a decade of assessment.¹³ Turning the heavy liability of waste management and resource disposal into the significant asset of resource recovery is persuasive, especially during the crushing economic crisis we face. We must, of course, temper economics with “environmental sanity”; a cautious public rightly demands proof of efficacy beyond any one company’s own claims.

Industrial and Societal Buy-In

In the Hamilton Project’s paper, Chapter 2 addresses *The Innovation Chain and Navigating the “Valley of Death”*, defining three inherent stages in technology emergence as Research and Development, Demonstration, and Deployment. For a technology to become commercialized, the Demonstration phase must take into account several factors:

“Successful energy innovation must simultaneously consider technical performance, economic cost, and commercial competitiveness, as well as environmental effects. These numerous considerations point to the need for an integrated development effort that combines consideration of these three factors from the beginning of the development.”¹⁴

Yet high costs and uncertainty of outcome discourages private demonstration. Moreover, testing contracted by a technology developer holds no higher place in social acceptance than does Industry-paid university research; there *must* be a credible vetting of efficacy upon which to base valuable trust necessary for Deployment. Again, from the Hamilton Project:

“At the application level, technology demonstration has the purpose of establishing technical performance, cost, and environmental effects for pioneer technology applications, thus providing technology options for private sector investment. ... The demonstration process must facilitate the transition of knowledge from the public to the private sector.”¹⁵

Central Objection

All CT implementation supporters also recognize the presence of deeply entrenched and well organized opposition. In the tense socio-political atmosphere of California, as elsewhere in the country, the most resonant and damning charge against CTs are that they are “unproven”. In a recent “web alert”, Bill Magavern, Director of the California branch of the Sierra Club, posts:

“Sierra Club California has kept an open mind to the possibility that new technologies could reduce the need for landfills, but we insist that these technologies not emit poison into our air or water and not interfere with the 3Rs [referring to Reduce, Reuse, Recycle, the first three steps in California’s Waste Management Hierarchy]. During the many years that the issue has been debated in the Legislature, our mantra has been “show us the emissions data”. Without credible, verifiable real-world data on the effect that gasification and pyrolysis facilities have on our air and water, we can not support any policies that would favor or subsidize such plants. Although the companies selling the products have often promised that such evidence was imminently forthcoming, they have yet to actually present it.”¹⁶

Whether these statements can be debunked or not, the lack of any standardized, court-recognized mechanism for third-party data acquisition and system verifications will greatly impede permitting, including certification under the California Environmental Quality Act (CEQA) and as eligible renewable

¹³ Los Angeles County Integrated Waste Management Task Force, Alternative Technology Assessment program: <http://www.socalconversion.org>.

¹⁴ Ibid. Hamilton Project, pg. 7.

¹⁵ Ibid. Hamilton Project, pg. 8.

¹⁶ Sierra Club California, website posting “The New Alchemy of Garbage”; as of 4/23/2010: <http://www.sierraclubcalifornia.org/the%20new%20alchemy%20of%20garbage.pdf>

energy generation facilities under the state's Renewable Portfolio Standard. Without credible third-party verification, there is a basis for "reasonable doubt".

Functional Alternative

The Hamilton Project proposal did not find past efforts of the DOE to be effective in addressing the verification needs of this broad sector:

"The DOE should focus on demonstrating the technical performance, economics, and environmental effects of alternative technologies and thus create options for the private sector. ... The past record of DOE management of technology demonstration projects is unsatisfactory."¹⁷

Perhaps the DOE is neither the culprit nor the agency to provide the best technical oversight. There is an under-utilized Environmental Protection Agency (EPA) program specifically designed to test technology, and to make the resulting data available to public and private concerns in response to this demand for credible answers. The EPA's Environmental Technology Verification (ETV) program offers an existing infrastructure that may be expanded to include a focus on CT efficacy validation.

The ETV program began with a five year pilot program in 1995. The program's website provides the following statement of focus and intent:

"Developers of innovative environmental technology report numerous impediments to commercialization. Among those most frequently mentioned is the lack of acceptance of technology developer/vendor performance claims. The success of the pilot program shows that objective, independently acquired, high-quality performance data and operational information on new technologies significantly facilitates the use, permitting, financing, export, purchase, and general marketplace acceptance of such technologies. ETV provides these data and information to the customer groups that require them to accelerate the real world implementation of improved technology. Improved technology more thoroughly, rapidly, and efficiently protects human health and the environment. It is important to stress that the product of ETV is high-quality data and information, not technology approval or endorsement. Although there is substantial EPA involvement in guiding and administering this program, ETV does not provide EPA endorsement or certification of commercial products."¹⁸

The ETV program was initially designed to include six Technology Centers:

- Advanced Monitoring Systems Center (AMS);
- Air Pollution Control Technology Center (APCT);
- Greenhouse Gas Technology Center (GHG);
- Drinking Water Systems Center (DWS);
- Water Quality Protection Center (WQP);
- Pollution Prevention, Recycling and Waste Treatment Center (P2,R,WT)

The proposed "P2,R,WT" Technology Center would have been the logical program for Conversion Technology oversight, but was not fully implemented at the end of the 1995-2000 pilot program due to inadequate funding and general angst regarding the EPA's own on-going struggles in assessing and curbing toxins.¹⁹

¹⁷ Ibid, Hamilton Project, pg. 20.

¹⁸ US Environmental Protection Agency, Jan. 2008. Environmental Technology Verification Program, Quality Management Plan. EPA/600/R-08/009, version 3.0. pg.1.

¹⁹ For background and current status, see Draft Dioxin Reassessment, National Academy of Sciences (NAS) Review Draft 2003.

<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=55265&CFID=17329668&CFTOKEN=57156992&jsessionid=38308544e5cf02caacb2751d1d65411f2353>

Expanding on this base in 2005, the EPA initiated the Environmental and Sustainable Technology Evaluations (ESTE) program to directly respond to high priority Agency problems. There are currently no specific high-priority categories focused on *thermal* conversion of waste to beneficial commodities and uses. The closest approach would be for two programs charged with the assessment of anaerobic digestion of agricultural wastes and animal manure

“Materials Management”: Resource Recovery from Waste

The original “P2,R,WT” Technology Center concept was revised, and established in 2008 as the new Materials Management and Remediation Center (MMR). The current MMR Center exists at one facility located in Florida, operated in cooperation with the non-profit Battelle Institute²⁰:

“This center verifies the performance of materials management technologies, including for recycling, beneficial use of waste materials, recovery of useful components of waste, and treatment to minimize disposal requirements (e.g., containment, volume, cost); and technologies to remediate contaminated land and ground water, such as that found at Superfund sites and other properties where industrial or commercial activities have resulted in a legacy of hazardous constituents that limit future use of the property. This center is also part of the Land Remediation and Pollution Control division, which is under EPA’s National Risk Management Research Laboratory.”²¹

Battelle has developed and the EPA has certified a Quality Management Plan for the Florida MMR center; this document would provide a template for other MMR Centers.

Currently, the EPA’s ETV website includes a “Vendors Wanted” section, and lists the first five Center topics, but without mention of the MMR center. Considering the breadth of scope of the ETV program overall, there is a latent demand nation-wide for active assessment of this Clean Tech sector.

Materials Management is inclusive of Conversion Technologies, yet the Florida MMR Center does not currently pursue solicitations on this sector. Further, the Florida location is not appropriate for western regional development, especially as a ready reference for meeting public and private needs and demands for credible testing programs and data. A Western Regional MMR Center would attend to this need.

Proposed Western Location: Sacramento Region

California has elevated the dialogue regarding all aspects of CTs and their potential implementation over the past decade, yet *thermal* system development and deployment remains mired in debate that effectively has stopped progress. The momentum for change is now impacting all California socio-political venues, from private residential and on-farm deployment through municipal adoption, from military application to state and Tribal implementation. Conversion technologies *will* be integral to our western waste management and resource recovery tool-set. Providing a credible vetting mechanism is a form of environmental insurance. Any such program should be located in an area easily accessible to all levels of public and private interest, yet also be securely sited with regard to the very proprietary nature of new, critical technology.

There is strong regional, state and Congressional impetus to brand the "Capital Corridor" from San Francisco to Reno as a national "Clean Tech" growth center. Perhaps the best and most recent introduction to this arena can be found in the brochures and web-based materials of the Sacramento Area Regional Technology Alliance (SARTA) and their "CleanStart" program²², the Sacramento Area Commerce and Trade Organization²³, and an amalgam of industrial, agency and financial interests called

²⁰ Battelle Memorial Institute (Battelle) is a 501(c)(3) charitable trust headquartered in Columbus, Ohio: <http://www.battelle.org/aboutus/index.aspx>

²¹ Ibid, MMR Fact Sheet, December 2008.

²² Sacramento Area Regional Technology Alliance: <http://www.sarta.org>

²³ Sacramento Area Commerce and Trade Organization: <http://www.sacto.org>

the Green Capital Alliance.²⁴ Under Mayor Kevin Johnson's guidance, the Green Capital Alliance was instrumental in completing "Greenwise Sacramento Action Plan" earlier this year; much of the Plan is directed toward Green Energy, including advanced Biofuels.²⁵

Privatized military bases appear ideal to provide the accessibility and security necessary to accommodate a Western Regional MMR Center. One particular former base has been developed by the federal government at great expense, within a few minutes' drive of the California state capitol. The 7000 + acre privatized McClellan Air Force Base is now managed as McClellan Park. McClellan Park has already become known as a cost-effective, risk-reduced campus within which developers may test and commercialize clean advanced and alternative technologies. Many state and federal agency, institutional, non-profit and private programs already are sited within McClellan Park. Partnering with SACTO and SARTA, the Park's contract management has a rapid-response team at the ready to work closely with any clean tech company interested in locating here. There are long lists of incentive and assistance programs, packaged in an impressive, well coordinated public-private approach. Park directors agree that an EPA program of this nature would improve the overall commercialization of the Park and should help attract high quality technology-based companies.²⁶

The US Army has sponsored a Renewable Energy Testing Center²⁷ (RETC) run on contract by the firm Technikon, which now hosts a group advanced and emerging technology companies focused on alternative power generation. The EPA could leverage the fine start that the Army has made, and replicate ETV clusters elsewhere within McClellan. The RETC only offers contract assessment services, rather than the non-commercial third party verification that is sorely needed. The ETV MMR program could thus overlay and increase the credibility of the existing RETC efforts.

Conclusions and Recommendations

The Hamilton Project report clearly identifies the need for federally-sponsored third party demonstration and verification of emerging clean energy technology efficacy, so critical to bring about CT deployment. The unsatisfactory grade given the Department of Energy is understandable, but off-target. It is the Environmental Protection Agency that both must be taken to task for missed opportunities, and empowered to redirect scarce resources toward our CT industrial sector of Environmental Technology.

Industrial verification follows many paths, and with passage of sufficient time one may assume there will emerge "flagship" reference projects depicting each viable alternative for the clean conversion of waste into energy, fuels and other commodities. Much of the confusion stems from lack of communications, and we are attending to that issue.²⁸ There are indeed CT reference projects globally available for assessment, as determined by the Los Angeles County Alternative Technology Assessment Subcommittee efforts.²⁹ The "Show Me" attitude of the California branch of the Sierra Club reflected above is both specific and quite *local*: show us that this specific CT works *here*, under *our* environmental constraints, with *our* waste. Good or bad, California stands as an example for the rest of society, whether we compare stringent environmental quality standards or access to market deployment, penetration and acceptance.

The EPA ETV program has decades of experience, albeit not focused on vetting CTs. Expanding upon this base holds promise. Perhaps the cautious oversight mechanism proposed by the Hamilton Project might be compared and contrasted to current EPA management, in developing an administrative control structure for a CT-focused Western Regional MMR Center. Upon Presidential appointment of

²⁴ Green Capital Alliance: <http://www.greencapitalalliance.org>.

²⁵ Greenwise Sacramento Action Plan. January 20, 2011. Mayor Kevin Johnson and the Greenwise Task Force: <http://greenwisesacramento.org>

²⁶ McClellan Park: <http://www.mcclellanpark.com>

²⁷ Renewable Energy Testing Center: http://www.technikonllc.com/renewable_energy_testing_center.php

²⁸ Teru Talk, an industrial web service focused on all matters pertaining to the clean conversion of waste for resource recovery: <http://www.terutalk.com>.

²⁹ Ibid, Los Angeles County Integrated Waste Management Task Force, Alternative Technology Assessment program: <http://www.socalconversion.org>.

administrative staff, "The ETC [Environmental Technology Corporation] would be financed for one ten-year term (subject to renewal) and would have the authority to hire technical and financial experts from the private sector. It also would develop a sophisticated simulation capability and evaluation metrics that would enable it to assess technology programs before and after those programs are completed."³⁰

The Sacramento region seems ideally suited for a Western Regional Environmental Technology Verification (WR ETV) Center. The privatized Air Force base is a designated Local Agency Military Base Recovery Area (LAMBRA).³¹ As discussed, there is an existing clean technology incubator with numerous sub-commercial CTs undergoing supported assessment by the Army's contractor. While individual reference projects may be found around the globe as examples of one CT or another, the McClellan Park WR ETV would provide a single campus with an inherent high degree of public and private visibility. The massive grounds include direct air, road and rail access, and are strategically the center of the "clean tech corridor" stretching from San Francisco, California to Reno, Nevada. Sacramento is California's capitol city. This would position the McClellan Park WR ETV Center "under the nose" of the Governor and the State Legislature.

Establishment of a Western Regional MMR Center would remove a key barrier to implementation of advanced Conversion Technologies by providing credible third party testing and verification of CT systems efficacy and operational control.

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³⁰ Ibid, Hamilton Project, pg 25.

³¹ California Enterprise Zone (CAEZ) designation: <http://www.caez.org/LAMBRAs-MEAs--TTA/index.html#LAMBRAs>.