2001 RUDY BRUNER AWARD PROJECT DATA
# PROJECT DATA

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Attach, if you wish, a list of relevant project dates

Application submitted by:

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Key Participants (Attach an additional sheet if needed)

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Please indicate how you learned of the Rudy Bruner Award for Urban Excellence. (Check all that apply).

- Direct Mailing
- Magazine Advertisement
- Previous RBA entrant
- Previous Selection Committee member
- Other (please specify)

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Signature

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Project Name: SunLine Clean Fuels Mall and Education Pavilion

Location: Thousand Palms, CA

Owner: SunLine Transit Agency

Project Use(s): Public Transit/Clean Fuels Sales Beta Test Site/ Hydrogen Generation/Community Education

Project Size: 10 acres

Annual Operating Budget: $1 million

Total Development Cost: $6.5 million (CNG/H2 related infrastructure)

Date Initiated: February, 1994

Percent Completed December 1, 2001: 100% complete

Project Completion Date (if appropriate): Liquid H2 date?

Attach list of relevant dates

Submitted by:

Jeffrey Spencer, Transportation Planner
Caltrans
1227 O Street, MS 83
Sacramento, CA 95814

Key Participants

Public Agencies: Coachella Valley Association of Governments, Patricia “Corky” Larson, 760-346-1127

Developer: SunLine Transit Agency, Richard Cromwell III, 760-343-3456, RCCNG@aol.com

Professional Consultant: Catherine Rips, 760-341-2924, copybyrips@netpipeline.net

Community Group: Coachella Valley Economic Partnership, Michael Bracken

Other: Schatz Energy Research Center, Dr. Peter Lehman, (707) 826-4345, pal1@humboldt.edu
ABSTRACT

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Project Name: Sunline Clean Fuels Mall and Education Pavilion

Location: Thousand Palms, CA

1. Give a brief overview of the project, including major project goals.

Sunline Transit has made a firm commitment to clean fuels. This effort encompasses the entire fleet of buses, trucks, and street sweepers. It is the first transit agency to deploy a fuel-cell powered bus in the U.S.

2. Why does the project merit the Rudy Bruner Award for Urban Excellence? (You may wish to consider such factors as: effect on the urban environment; innovative or unique approaches to any aspect of project development; new and creative approaches to urban issues; design quality.)

Due to the innovative leadership and commitment to education, Sunline has improved the air quality of the Coachella Valley; improved the economy by partnering with local schools and colleges; and increased transit ridership. This translates to a better quality of life in the urban area.
ABSTRACT

Project Name: SunLine Clean Fuels Mall and Education Pavilion

Location: Thousand Palms, CA

1. Give a brief overview of the project, including major goals.

California is credited with creating shopping malls and auto malls. But it took a public transit agency to create the world’s first Clean Fuels Mall! A joint powers authority of nine desert resort cities and the county of Riverside, SunLine Transit Agency provides public transit, paratransit and regional street sweeping services to its member entities. In 1992, SunLine’s board, all elected officials, passed a resolution to replace its diesel fleet with one powered by clean-burning alternate fuels. Since February, 1994, when SunLine opened the valley’s first compressed natural gas station (CNG) at its Thousand Palm headquarters, it has replaced all its fleets with CNG vehicles and developed a potpourri of clean fuels options including CNG, liquefied natural gas, gaseous hydrogen, Hythane®, and liquid hydrogen, all available to the public 24-hours a day in one convenient location.

In conjunction with the Clean Fuels Mall, SunLine opened an on-site Education Pavilion to help students and visitors understand why their fuel choices impact the environment, public health, national security and the U.S. balance of trade. Interpretive signage helps explain complex technical processes; exhibits, collateral print material and a series of two-minute videos (for use in schools, on the Internet, and in kiosks), further explains that “Energy Matters.”

Off-site, five additional CNG stations, all open to the public, make clean fuel available throughout the valley. A mobile education center, currently in development, will allow SunLine to take the show on the road and share it with partners, such as the California Fuel Cell Partnership and Schatz Energy Research Center, in other locations.

Goals were to a) ensure the valley’s public transit system was reliable, non-polluting, and efficient, b) develop clean fuels infrastructure for use by the agency, fleet operators and the general public; c) encourage other fleet users to convert to cleaner fuels; d) create a year-round clean industry that would benefit the entire region; e) advance the commercialization of clean fuels by serving as a beta test site for new technology; f) create an education center for use by local schools, community agencies, national/international transit professionals, scientists and researchers; g) launch a U.S. Department of Energy Clean Cities program with enthusiastic community participation.

All and more have been met.
2. Why does the project merit the Rudy Bruner Award?

According to a recent study by the University of Southern California, controlling air pollution in the South Coast Air Basin “presents a challenge unrivaled anywhere in the United States.” The Basin, which extends to the Coachella Valley, has, says the study, “the unfortunate distinction of having the worst air quality in the country, for both PM10 and ozone”—those considered the most harmful to human health. Diesel emissions are particularly deadly and have been listed by the state of California as a “known carcinogen.” Yet the overwhelming percentage of public transit fleets in this country (and internationally) are still powered by diesel fuel.

While the Coachella Valley has much cleaner air than its neighbors in Los Angeles and Riverside, smog travels from the L.A. area through the Banning Pass. For years, valley leaders have been challenged with how to preserve the pristine desert environment that draws four million visitors a year. Reducing mobile source air pollution was key.

In May, 1994, Sunline became the first public transit agency in the country to park a diesel fleet and convert overnight to a one powered 100% by an alternate fuel. Today, it operates 54 CNG transit buses, which keeps approximately 54 tons of pollutants out of the air each year. In all, SunLine operates over 100 CNG, hydrogen fuel cell and Hythane® vehicles, which reduce emissions by xx tons per year. But its own emissions reductions are only part of its achievement. By forming partnerships to create valley-wide infrastructure and alternate fuels training curriculum, tirelessly advocating the use of clean fuels, leading efforts to create the Coachella Valley Clean Cities Region, helping other fleet operators obtain grants and vehicles -- SunLine has been a catalyst for the conversion of over 500 clean fueled vehicles. In addition, with the help of numerous partners, SunLine took a lead role in hydrogen research and development, opening the first hydrogen generation/storage/compression/fueling facility in the country in April, 2000. Renewable hydrogen generated from on site solar panels and hydrogen reformed from methane on site is currently being used to fuel the country’s largest zero emissions fuel cell fleet. Then, the agency created a community education program to teach school children that fuel choices matter—emissions impact health.

SunLine not only helped preserve the valley’s main tourist draw, its clear blue skies, it actually created a year-round clean industry: alternate fuels. Tourists still come to play golf. But hundreds have come from all over the world to see this project in action. The economic impact, environmental, and public health benefits of SunLine’s Clean Fuels Mall will resonate for decades.
American cities embody our nation’s greatest triumphs and most daunting challenges. At their best they showcase the rich diversity, cultural achievement, and democratic values that characterize the American spirit. At their worst they reflect our country’s most persistent social ills – economic disparity, hopelessness, neglect and abandonment. Yet there are those places that are developed with such vision and imagination that they transform urban problems into creative solutions. The Rudy Bruner Award for Urban Excellence (RBA) seeks to discover those special places and to celebrate and publicize their achievement.

Excellence exists in every city. It can be found in downtowns, neighborhoods, and parks. The Rudy Bruner Award is a search for examples of this often overlooked excellence and a celebration of their contribution to the richness and diversity of the urban experience. Often these places transcend the boundaries between architecture, urban design, and planning. They are born through processes of transformation – the renewal of something old, or the creation of something new that resonates in the history of community life.

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Prizes and Presentation

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Rosanne Haggerty, Executive Director, Common Ground HDFC Inc., New York, NY
Allan Jacobs, University of California at Berkeley, Berkeley, CA
Gail R. Shibley, Asst. Secretary for Public Affairs, US Department of Labor, Washington, DC
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PUBLIC AGENCY PERSPECTIVE

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Name Corky Larson
Title Executive Director
Organization Coachella Valley Association of Governments
Telephone (760) 346-1127
Address 73-710 Fred Waring Drive, Suite 200 City/State/ZIP Palm Desert, CA 92260
Fax (760) 340-5949 E-mail

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Signature

1. What role did your agency play in the development of this project? Describe any requirements made of this project by your agency (e.g., zoning, public participation, public benefits, impact statements).

The Coachella Valley Association of Governments and SunLine Transit Agency have enjoyed a long history of collaborating to improve air quality and public health in the Coachella Valley. In 1998, SunLine’s CNG refueling stations and CVAG’s fine particulate matter (PM10) reduction plan were singled out for national honors by the Federal Highway Administration. (SunLine operates a fleet of CNG-powered PM10 reducing street sweepers as part of that plan.)

Continuing their efforts, in 2000, the two agencies worked closely to further advance the use of clean fuels in the valley, putting the valley’s first CNG-powered water truck and first CNG-powered dump truck into service.

(It’s interesting to note SunLine uses the sand it collects from the street sweepers to build habitat for the federally endangered Fringe Toed Lizard! Sand is cleaned and transported to the Fringe Toed Lizard Preserve on a regular basis.)

2. How was this project intended to benefit your city? What tradeoffs and compromises were required to implement the project? How did your agency participate in making them?

SunLine Transit Agency’s Clean Fuels Mall and Education Pavilion has a profound effect on the future of the nine desert cities that comprise the Coachella Valley. The threat of air pollution to a local economy based on tourism and agriculture could have grave economic implications. Educating the public to understand why and how clean alternative fuel choices impact their environment and public health will help deter the oversights made by other metropolitan areas that are faced with the dilemma of high air pollution.

Founded in 1977, SunLine Transit Agency was operating one of the oldest diesel bus fleets in the nation. In 1992, despite economic and infrastructure barriers, the SunLine board of directors unanimously decided to purchase a new bus fleet powered by clean fuels. No tradeoffs have been required. When faced with limited funds, SunLine allied with the private and public sector to achieve its goals. And since 1994 operates a fleet solely powered by clean alternative fuels.

The Coachella Valley Association of Governments (CVAG), a joint powers authority, is just one of more than 100 stakeholders who are active participants in the promotion and public awareness of the Clean Fuels Mall and Education Pavilion at SunLine Transit Agency.
3. Describe the project's impact on the neighborhood and the city. Please attach relevant data where available.

Because of SunLine's leadership role in the promotion and public awareness of clean alternative fuels (CNG, LNG, hydrogen and Hythane®) via the "mall" and Education Pavilion, residents and visitors come away with an appreciation and understanding of how fossil fuels and the air pollution they produce adversely impact the Coachella Valley; what alternatives are available now; and what the future holds as we transition to alternative fuels.

By retiring its diesel fleet, which produced 10.0 NOx and .6 particulate matter per brake horsepower per hour, and converting to CNG vehicles, SunLine has reduced NOx emissions by 600% and particulate matter by 3000% (CNG engines produce 1.5 NOx and .02 particulate matter per brake horsepower per hour).

4. Did this project result in new models of public/private partnerships? Are there aspects of this project that would be instructive to agencies like yours in other cities?

In April 2000, SunLine opened the Clean Fuels Mall and Education Pavilion. By working with partners like the DOE, Clean Air Now, Schatz Energy Research Center, FIBA Technologies, Hydrogen Burner Technology, Pickens Fuel Corp., QuestAir, Stuart Energy, Teledyne Brown and XCELLSIS, SunLine is generating hydrogen from renewable solar energy and "reforming" it from natural gas. SunLine has also partnered with College of the Desert to facilitate the training of its mechanics and vehicle operators in the use of CNG. Because of SunLine's expertise with clean fuels, Hydrogen Components, Inc. (which holds the patent on Hythane®), recently joined this partnership to test its equipment in the desert's extreme climatic environment.

Because SunLine is the destination of choice for advanced transportation technologies, alternate fuels research and development, job training and job creation, SunLine is a national and global resource for transportation agencies investigating the possibility of converting their fleets to clean alternative fuels. Visiting delegations have included engine manufacturers, national transit officials, automakers and representatives from Egypt, England, France, China, Brazil, Chile, India, among others.

5. What do you consider to be the most and least successful aspects of this project?

Clean air is a global concern and we must do all we can to make it a reality. SunLine Transit Agency, in concert with key partners in the development and promotion of alternative fuels is striving to make this happen.

Crucial components to this end are an established infrastructure for clean burning alternative fuel vehicles, like the Clean Fuels and education provided through the efforts of the Education Pavilion. Achievements of these two critical components to the Coachella Valley and visitors ride in alternative fuel buses, taxis and shuttle vans; our trash is picked up by alternative fuel refuse trucks; our street fuel sweepers; and many desert cities now maintain alternative fuels vehicles in their fleets. All this helps preserve our desert health and validates that clean burning alternative fuel vehicles are viable.
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1. What role did you or your organization play in the development of this project?

I started the hydrogen portion of the Clean Fuels Mall. The idea for a Renewable Hydrogen Transportation Project (originally to be located at the City of Palm Desert), was developed here at the Schatz Energy Research Center (SERC). We worked with a consultant, Doug Lynn, and Paul Shillcock, then Economic Development Director for the City of Palm Desert. I first presented the idea to the Palm Desert City Council in August 1994. Bruce Finley, then SunLine's alternate fuels engineer, was there, which is how SunLine learned of the project and how we became acquainted with the agency. We formed a coalition including the City, Schatz, Teledyne Brown, DuPont, ASE Americas, Livermore Lab, and Wintec, and secured funding from the DOE and the South Coast Air Quality Management District. SERC was the prime contractor for the $4M project.

The project was the first to bring hydrogen technology to the Coachella Valley. We introduced our prototype fuel cell powered golf cart during the 1995 electric vehicle parade in Palm Desert. We introduced our first commute vehicle (a green golf cart now at SunLine) in 1996; it is still running. Paul rode it back and forth to work for over two years. The other carts and the car came later.

SunLine got involved when we were unable to site the refueling station at either the City Hall complex or at the adjacent College of the Desert. Dick Cromwell, SunLine's general manager, offered to locate the station at SunLine. He then got involved in moving the Clean Air Now (CAN) facility there as well. Eventually, the City made SunLine the administrator of its money ($300K) and DOE contracted with SunLine for the whole project. Schatz then subcontracted with SunLine to build the hydrogen refueling station there. The station is now up and running and we continue to help with maintenance, training, and outreach.

2. From your perspective, how was the project intended to benefit the urban environment?

One of the project's goals was to make the Coachella Valley the center for clean fuels technology in the U.S. It has actually made it an international Center. That is apparent from the international media attention SunLine has attracted, the national and international visitors who regularly tour the facility, the environmental awards the agency has won and, among other things, the fact that the Hydrogen Technology Advisory Panel (a group that advises Congress on hydrogen appropriations) met this fall at SunLine so they could see the project in action. The Clean Fuels Mall and Education Pavilion has started the Valley on a path towards a completely clean and sustainable transportation system, the goal of the original Palm Desert project.

3. Describe the project's impact on its surroundings and on the people in the area. Do you have data that document these impacts? Attach supplementary material as appropriate.

The project has had a tremendous impact on the environment and on local residents. Besides the substantial emissions reductions the project has brought millions of dollars into the local economy and, as previously mentioned, made the Coachella Valley an international center for alternate fuels. The significant community support the project has generated is also an indication that the message about clean transportation is getting out and is being well received.

We have also developed a sound maintenance program and are training maintenance workers. That creates jobs (another local economic benefit), and helps ensure the success of cutting edge clean fuels technology.
PROFESSIONAL CONSULTANT PERSPECTIVE (continued)

4. What tradeoffs and compromises were required during the development of the project? How did your organization participate in making them?

There were trade-offs and compromises in the hydrogen portion of the project and yes, I participated in some of them. One involved the vehicles. Since, when we began, fuel cells were not developed or powerful enough for passenger automobiles, we decided to go with golf carts. That compromise was positive though, since the fuel cell systems in the carts worked well and they were street legal in Palm Desert and served the purpose for park maintenance.

The biggest controversy was in locating the refueling station. At first, it was to go in the City Park, adjacent to City Hall. This ran into political opposition. Locating it at College of the Desert ran into institutional and regulatory opposition and problems with insurance. The eventual compromise to site the station at SunLine, with auxiliary fueling at the City, has worked well.

5. What are the most and least successful aspects of this project?

The most successful aspect of the hydrogen project has been that it works. We are generating solar hydrogen, compressing it, and dispensing it to clean, fuel cell vehicles. We have fuel cell vehicles up and running; they represent the longest running fleet of fuel cell vehicles in the world. That has even attracted the attention of automakers including Nissan, Honda-Japan and Daimler Chrysler. We have developed a sound maintenance program and trained maintenance workers. We have successfully transferred the technology. The march towards clean and sustainable transportation has begun.

The least successful aspect of the project is our failure to be able to site the generating and refueling station in the City Park. Our original idea was to have this facility in a prominent, public place so citizens could learn about hydrogen and get comfortable with it. The SunLine facility is a bit off the beaten path, though well situated for clean fuel fill-ups by vehicles on I-10. But it's not what we (SERC) had intended at the outset.

6. How might this project be instructive to others in our profession?

There are several ways that this project is instructive. The first involves the technology. This project has developed the engineering designs necessary to operate clean, hydrogen-powered fuel cell vehicles, generate the hydrogen fuel from renewable energy sources, and dispense it safely and conveniently to the vehicles. These designs were implemented in prototype hardware and are being tested. This will result is a wealth of real-world engineering knowledge that will be extremely valuable to future designers.

The second involves the political and regulatory groundbreaking that was accomplished. Introducing a new technological system into society is not easy, especially so in the case of hydrogen which is (incorrectly) considered by many to be dangerous. Numerous politicians, building inspectors, fire marshals, and others in decision-making positions were educated about hydrogen. Almost everyone involved in this project has come to understand the great benefits of hydrogen technology, the issues involved in its implementation, and its ultimate safety.

The third involves the trained cadre of technicians and mechanics that has been formed. This group of people is the beginning of the newly trained professionals necessary to implement clean transportation technology.
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PROJECT DESCRIPTION

1. What local issues did this project address? How has it affected the community?

The Coachella Valley consists of a string of nine desert resort cities (the best known of which is Palm Springs) and the County of Riverside. For nearly 100 years, its only two industries have been agriculture and tourism, both 100% weather dependent. A cold or wet winter can have a profound economic effect.

But since smog is devastating to agriculture, and most of the valley's four million annual visitors come to enjoy sun, blue skies, golf, tennis and hiking -- air pollution is even more of a threat than temporary weather patterns. Though there's little that can be done to stop smog drifting from the L.A. Basin, much could be done to limit locally produced mobile source air pollution.

The only one of its kind in the world, the SunLine Clean Fuels Mall and Education Pavilion addresses transportation, environmental, public health and economic issues. Literally every facet of life has been affected. Today in the valley, students, residents and visitors ride in clean air buses and clean air vans. Mail is delivered by CNG vehicles, refuse collected by CNG trucks, streets swept by special PM10-reducing CNG-powered sweepers. Palm Desert parks are maintained by hydrogen fuel cell and electric golf carts. A CNG station located at the Palm Springs International Airport helped it earn its International Clean Airport designation. To further reduce emissions, all airport taxis will soon be required to operate on alternate fuels. All of those vehicles use SunLine's Clean Air Mall and satellite stations.

Equally important, SunLine's project has focused incredible positive attention on the Coachella Valley. Since 1994, the agency has earned over a dozen prestigious honors for its innovation. Highlights include the 2000 California Transit Assn Innovative Transit Award and California Transportation Foundation 2000 Executive Manager TRANNY Award; 1999 State of California Governor's Environmental and Economic Leadership Award for Environmental Management and South Coast Air Quality Management District Environmental Stewardship Award; 1998 Renew America Environmental Sustainability Award and Federal Highway Administration Award for Outstanding Use of Air Quality Funds; 1997 Federal Transit Administration Administrator's Award; 1996 U.S. Department of Energy Special Recognition Award; 1995 Natural Gas Vehicle Coalition Annual Achievement Award and California Assn of Local Economic Developers Grand Prize Award of Excellence; 1994 South Coast Air Quality Management District, Clean Air Award and California Community Colleges Chancellor's Industry Award.
2. Describe the underlying values of the project. What, if any, significant tradeoffs were required to implement the project.

SunLine Transit Agency was founded in 1977. Under-funded from the outset, its initial fleet consisted of used diesel buses the agency retrofitted with air-conditioning and wheelchair lifts. By 1992, though SunLine was just 15 years old, it was operating one of the oldest, least reliable bus fleets in the country.

SunLine's board of directors, all elected officials, took bold action in 1992 by passing a resolution mandating the purchase of an entirely new bus fleet powered by clean fuels. Then it went a step further and required the use of clean fuels whenever vehicles were replaced or new vehicles were purchased.

At the time, no clean fuels infrastructure existed within 100 miles of SunLine and alternate fueled buses each cost at least $50,000 more than their diesel counterparts. Agencies that had tried conversion to alternate fuels were happy to share horror stories. The fact that SunLine had no experience with alternate fuels, nor a budget for new buses (let alone $1.2 million for a compressed natural gas station!), failed to deter the unanimous vote.

The board's decision was driven by an unswerving belief in the benefit of reliable public transit (as a means to reduce mobile source air pollution, reduce traffic congestion, alleviate parking difficulties, increase the mobility of the valley's senior and low-income population and reduce wear and tear on local roads); and of clean air and a healthy environment.

From the day of the board's initial vote, no tradeoffs have been required. When funds were short, SunLine partnered with other public and private sector partners to pull off each miracle. Bus service has never been reduced or delayed, and in fact, public support of SunLine's clean air efforts is so strong, bucking national trends, ridership has increased every year since 1994.

3. Describe the key elements of the development process, including community participation where appropriate.

a) Clean Fuels Mall Development: To build the initial CNG station in Thousands Palms, SunLine partnered with Southern California Gas Company, the local gas utility. SunLine "owned" 25% of the station and was able to use its share of profits to offset fleet fuel costs. From 1995-1999, SunLine was preparing for phase 2: a dramatic expansion of clean fuels options. In April, 2000, the agency added gaseous hydrogen and Hythane®, a mixture of CNG and hydrogen, to those options; in February, 2001, liquefied natural gas. Before December, 2001, a liquid hydrogen station will be operable. All are open to the public 24-hours a day. They represent the world's widest selection of clean fuels choices in one locations available to the public.
b) Offsite Development: In 1994, SunLine partnered with the local community college, College of the Desert, to create training curriculum for all agency mechanics and vehicle operators so conversion to CNG would be successful. Next, the agency encouraged other public and private fleet operators to convert to CNG. To accommodate those who were unable to use the Thousand Palms station, SunLine purchased a mobile tanker and filled customers at their locations. To make fueling more efficient for all CNG users, the agency next opened a second station at the SunLine Clean Air Center in Indio (located at the east end of the valley). In 1998, SoCal Gas sold its interest in the stations to SunLine's current private sector partner, Pickens Fuel Corp. Since then, SunLine and Pickens have opened four additional CNG stations creating valley-wide coverage, including a station with another community partner, Waste Management of the Desert. In 1996, SunLine spearheaded the formation of the valley's U.S. Department of Energy Clean Cities region. Presently, more than 100 stakeholders (including all cities, the county, four local Indian nations, media, business and others) are active participants in the program. SunLine has helped many find grant funds to help purchase alternate fuels vehicles.

4. Describe the financing of the project. Please include all funding sources and square foot costs where applicable.

Because of the nature of the project, square foot costs are not really meaningful but the list of funding partners is lengthy and impressive! Sources include:

Local: Southern California Gas Company, City of Palm Desert, Coachella Valley Association of Governments, Coachella Valley Economic Partnership, Imperial Irrigation District,

Regional: City of Chula Vista, Clean Air Now, Riverside County Transportation Commission, South Coast Air Quality Management District,

State: California Air Resources Board, California Energy Commission


5. Is the project unique? If so, how is the model adaptable to other urban settings?

Unquestionably, this project is unique and adaptable to other urban settings -- and not just those in the U.S.

In the past 18 months alone, besides hosting dozens of U.S. transit officials, automakers, engine manufacturers and others, SunLine has hosted delegations from Brazil, Canada, Chile, China, Egypt, England, France, Germany, India, Japan, Mexico, South Korea, Sweden and Trinidad --- all looking to convert their transit fleets to
alternate fuels. Some are interested in CNG, others in hydrogen. SunLine helps any organization with any conversion challenge. As the agency's General Manager/CEO Richard Cromwell III points out in every presentation he gives, the problem is called "global warming" for a reason. And each fleet converted to clean fuels helps everyone's air quality.

Cromwell and Co. actively participate in local, regional, state, and national organizations to promote clean fuels. SunLine also participated in the first International Clean Fuels Symposium in Japan, helped Beijing Transit Agency devise a plan to convert its 6,000 buses to CNG, and with international partners Ballard and XCELLSIS, formed the Worldwide Fuel Cell Consortium. Representatives from five countries will participate at SunLine in January 2001.

The national significance of SunLine's Clean Fuels Mall should not be understated. In November, the Hydrogen Technical Advisory Panel, a group that advises Congress on how to spend appropriations, met at SunLine's Education Pavilion. It was the largest attendance in the group's history because SunLine has the only working program in the world where hydrogen generated from renewable sources and methane reformation is actually used in vehicles. SunLine's highly replicable model -- find partners, build infrastructure, use existing curriculum, train employees -- will work anywhere with any clean fuel. It just takes commitment, which SunLine has in spades.
2001
RUDY BRUNER AWARD
DEVELOPER
PERSPECTIVE
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Craig Barton, AIA, RBCC Associates, and University of Virginia, Charlottesville, VA
John Bok, Esq., Fedex, Hoag, and Eliot, LLP, Boston, MA
Rosanne Haggerty, Executive Director, Common Ground HDFC Inc., New York, NY
Allan Jacobs, University of California at Berkeley, Berkeley, CA
Gail R. Shirley, Asst. Secretary for Public Affairs, US Department of Labor, Washington, DC
Mayor Wellington Webb, City and County of Denver, CO

Perspective Sheets

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- Community Representative perspective;
- Public Agency perspective from local, state or federal government agencies;
- Developer perspective;
- Professional Consultant perspective;
- Architect or Designer perspective;
- Other perspective which might not fit above categories.

Perspective Sheets (cont.)

Please obtain as wide an array of perspectives as possible. More than one "Other" perspective may be submitted if appropriate.

Use the perspective sheet marked "Other" for people who do not fit into the categories provided or for a unique point of view that will enhance your submission. The completed perspective sheets must be included in the application package.

Applicants should feel free to use photocopies of the application forms if needed. If possible, answers to all questions should be typed directly on the forms. If the forms are not used and answers are typed on a separate page, each answer must be preceded by the question to which it responds. The length of each answer should be limited to the area provided.

Eligibility/Who May Apply

- The project must be a real place, not just a plan or a program. Since site visits are integral to the award process, the project must have been in operation for a sufficient amount of time to demonstrate success.
- The project must be located in the United States. It is not feasible to conduct site visits at international locations.
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DEVELOPER PERSPECTIVE

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This sheet is to be filled out by the person who took primary responsibility for project financing or is a representative of the group which did.

Name: Richard Cromwell III
Title: General Manager/CEO

Organization: Sunline Transit Agency
Telephone (760)343-3456

Address: 32-505 Harry Oliver Trail
City/State/ZIP: Thousand Palms, CA 92276

Fax (760)343-3097
E-mail: rccng@aol.com

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Signature

1. What role did you or your organization play in the development of this project? Describe the scope of involvement.

SunLine was developer and is project manager of the Clean Fuels Mall and Education Pavilion. We have also taken the lead role in coordinating and implementing the Coachella Valley U.S. Department of Energy Clean Cities program. Our involvement is absolute. We operate a 100% clean fuel fleet, have developed CNG stations throughout the valley, have on-site CNG, LNG, hydrogen and Hythane® fueling facilities, have trained all 260 of our employees in the use and importance of clean fuels, have helped create a clean fuels training program now being used at community colleges throughout California, have traveled throughout the U.S. and internationally promoting the understanding of and use of clean fuels, and currently serve as a beta test site for dozens of products all designed to reduce emissions and increase energy efficiency. In addition, we have helped many other fleet users secure grant funds for clean fuels vehicles, have trained their employees and to make it even easier for them to convert, do maintenance work on their vehicles.

2. What, if any, modifications were made to the original proposal as the project was developed? What tradeoffs or compromises were required during the development of the project?

The original board mandate called for conversion to an alternate fueled bus fleet and the purchase of clean fuels vehicles as autos, trucks, paratransit vans, etc. were subsequently replaced. In a way, everything else has been icing! We have capitalized on every opportunity that has come our way or that we have created (most we have created!), to heighten the impact of the board’s decision. First we built our on-site station. We added the mobile fueling truck when we began to create customers who found our Thousand Palms station inconvenient. Next we built the Indio station to serve the east end of the valley. It continued as we found partners, funding opportunities, needs in the marketplace, developing technology.

The only compromises have related to funding (i.e., we were unable to go purchase all new CNG paratransit vans at the same time we purchased all new CNG buses), or to technology (i.e., we would have liked to have gone from diesel to hydrogen in 1994 but the technology wasn’t ready...). There have been NO tradeoffs or compromises regarding our level of service to our riders, our air quality benefits, or economics. We proved CNG actually saves us money.

3. How was the project financed? What, if any, innovative means of financing were used?

We used every innovative financing technique in the book and wrote some new ones! In 1994, we not only became the first public transit agency in America park a fleet of diesel buses and convert overnight to a fleet powered 100% by CNG, we became the first in the nation to issue certificates of participation against future Section 9 funds (we borrowed $12 million against future federal funding.) Then we formed a separate joint powers authority to allow us to pursue entrepreneurial activities. Our first foray into free enterprise was to get into the natural gas business. We partnered with our local natural gas utility to build our first station and used our share of the “profits” generated by sales to the public to help reduce our gas bills. We went into the graffiti removal, taxi administration and street sweeping businesses and plowed dollars back into clean air transit.

We obtained local, state, and federal grants as well as funding from numerous private sector partners. In dozens of presentations we’ve made since 1994, we point out that while no public transit agency could afford to convert to clean fuels on its own, partners abound. It takes some effort to put funding collaboratives together. But it’s very do-able.
DEVELOPER PERSPECTIVE Continued

4. How did the financial benefits and economic impacts of this project compare with or differ from other projects you have been involved in?

While many of us at SunLine have been involved with other transit agencies and private industries, nothing compares with what we've achieved in the last six years. There really is no comparison.

When the decision was made to switch to a clean fuels fleet, SunLine was running one of the oldest, least reliable fleets in history. Breakdowns were a regular occurrence. Ridership was low. Public opinion was lower!

Since converting to CNG and developing the Clean Fuels Mall and Education Pavilion, the financial benefits to the agency have been impressive. The three-year study we conducted with Sacramento Regional Transit proved we saved over $200,000 in 1997 and that the incremental cost of a CNG bus over a diesel bus ($35,000-$50,000) will be paid back in under eight years. The federal government has estimated the useful life of a transit bus to be 12 years. In years 8-12, we will actually make money because we converted to clean fuels. Farebox recovery (income from riders) has also risen dramatically because of intense public support. Ridership has risen each year since 1994. Last fiscal year, we carried over 3.8 million riders, up from 2.7 million in 1994. And as previously noted, we've been able to secure millions of dollars in grant funds since 1994.

Community economic benefits also abound. The fact that our projects have created a third clean, year-round industry in the valley is certainly the most important.

5. What about this project would be instructive to other developers?

We've found it difficult to work in an arena (developing hydrogen infrastructure) for which no codes and standards exist. We encourage all those attempting to develop alternate fuels infrastructure or those operating experimental fueled vehicles to participate in professional organizations that have input on setting standards.

We've also found that Congressional appropriations for research and development are often so fragmented the commercialization of new technology is inadvertently slowed. Again, we encourage those involved to express their desire for coordinated research efforts and the sharing of information. The more any developer can partner with like minded entities and share existing resources, educational materials, etc., the more successful the project will likely be.

Finally, to anyone developing clean fuels infrastructure, the key to the widespread acceptance of non-polluting vehicles is making the infrastructure AVAILABLE TO THE PUBLIC 24-hours a day.

6. What are the most and least successful aspects of this project?

From our perspective, there are multiple successes and no unsuccessful aspects.

We started by researching available clean fuels. We chose CNG. We feel we made the right choice at the time. Since the day we parked our diesel buses, we've "made line" every day – that is, we've never failed to run every route every day for 6 years. That's unheard of with experimental engines/vehicles. Our employees and community are totally behind the project; and because we've been successful in acting as a clean air catalyst for our region, our stations are well used by hundreds of fleet vehicles. We've even been successful in saving money.

More importantly, by converting our fleet and helping other transit properties in our area convert to clean fuels (including Morongo Basin Transit Authority and Imperial Transit), we've been successful in eliminating tons of pollutants from our air. That helps preserve the beauty and quality of life for which the Coachella Valley is famed.

Last, we've extended our air quality benefits by helping professionals nationwide (and internationally) learn how to start their own clean fuels programs, and in taking the next step: beginning the conversion to a zero-emissions future powered by renewable hydrogen.
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- Rosanne Haggerty, Executive Director, Common Ground HDFC Inc., New York, NY
- Allan Jacobs, University of California at Berkeley, Berkeley, CA
- Gail R. Shibley, Asst. Secretary for Public Affairs, US Department of Labor, Washington, DC
- Mayor Wellington Webb, City and County of Denver, CO

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- Other perspective which might not fit above categories

Perspective Sheets (cont.)

Please obtain as wide an array of perspectives as possible. More than one “Other” perspective may be submitted if appropriate. Use the perspective sheet marked “Other” for people who do not fit into the categories provided, or for a unique point of view that will enhance your submission. The completed perspective sheets must be included in the application package.

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Eligibility/Who May Apply

- The project must be a real place, not just a plan or a program. Since site visits are integral to the award process, the project must have been in operation for a sufficient amount of time to demonstrate success.
- The project must be located in the United States. It is not feasible to conduct site visits at international locations.
- There are no distinct categories. Projects may include any type of place which makes a positive contribution to the urban environment.
- Urban environment is broadly defined to include cities, towns, or villages; a neighborhood within a city; an urban county; or an officially recognized region made up of two or more cities.
- Applications may be initiated by any person who has been involved in the planning, development or operation of a project.
- An applicant may submit more than one project.

Key Dates:

- Submissions must be received at the Foundation no later than Monday, December 4, 2000.
- Finalists will be notified by January 15, 2001.
- Site visits to finalists will take place in January, February and March, 2001.
- The Gold and Silver Medal Winners will be selected and notified in Mar., 2001.
- Presentations of the Rudy Bruner Award for Urban Excellence will be made in May and June of 2001.

For more detailed information, please visit our web site: www.brunerfoundation.org

For complete applications please visit our archive site: http://ublib.buffalo.edu/libraries/projects/bruner/index.html
COMMUNITY REPRESENTATIVE PERSPECTIVE

Please answer questions in space provided. Applicants should feel free to use photocopies of the application forms if needed. If possible, answers to all questions should be typed or written directly on the forms. If the forms are not used and answers are typed on a separate page, each answer must be preceded by the question to which it responds, and the length of each answer should be limited to the area provided.

This sheet is to be filled out by someone who was involved, or represents an organization that was involved, in helping the project respond to neighborhood issues.

Name: Michael Bracken
Title: President & Chief Executive Officer
Organization: Coachella Valley Economic Partnership
Telephone (760) 340-1575
Address: 73-710 Fred Waring Drive, Suite 205
City/State/ZIP: Palm Desert, CA 92260
Fax: (760) 340-9212
E-mail: michael@cvep.com

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Signature

1. How did you, or the organization you represent, become involved in this project? What role did you play?

The Coachella Valley Economic Partnership is a private/public partnership of over 120 businesses and governmental entities working together to build and diversify the economic base of the Coachella Valley. CVEP embraced the National Automotive Center project in 1996 as a means of working to bring a potential "Third-leg" of the economic equation to the region. The efforts began as one designed to raise the level of knowledge to Congressional Members regarding the emerging alternative-fuel vehicle technology. These efforts were based on the growing Sunline fleet of alternative-fuel vehicles and the growing need to explore hydrogen and fuel cell technologies. The CVEP team included, and still does, representatives from Sunline Services Group, College of the Desert, University of California Riverside and local industry partners.

2. From the community's point of view, what were the major issues concerning this project?

As a regional Economic Development Corporation, we are tasked with the implementation of a common vision for the economy of the Coachella Valley. It was clear from the onset that the residents, businesses and governmental entities within the region were not only supportive but also truly embraced the potential for alternative-fuel research & development, assembly and distribution as an industry cluster for the Coachella Valley. The true challenge, which was met and exceeded by the team, was truly forming a long-lasting alliance between different levels of government and higher educational providers to developing mechanisms for which to foster a true intellectual property transfer between both people and organizations.

The true role of CVEP over the past four years has been to facilitate the efforts of our team and act as an educational liaison between Congressional Members federal staff and us. Our success as a team speaks for itself; we have garnered in excess of $14 million just in federal funding to research and develop hydrogen fuel-cell vehicles in a public transit application.

3. What tradeoffs and compromises were required during the development of the project? How did your organization participate in making them?

In our efforts to bring a first phase of a new industry cluster, our true tradeoffs were within time and coordination elements. There is no question that there were doubters within the community and business environment that believed that the development of alternative-fuel vehicles as an industry cluster might be a long shot. Project team members felt quite the opposite, it is a commonly shared vision that the team truly had the resources for which to garner funding, provide appropriate matches and produce results that would far exceed the contracting requirements.

Compromise within the project team was needed based on the members and some of the competing interests and organizational challenges. A system of open communication with strong leadership from CVEP (as a "facilitator") assisted in these efforts. The result, is one of the first and only partnerships between University of California, a community college and a transit agency.
COMMUNITY REPRESENTATIVE PERSPECTIVE (continued)

4. Has this project made the community a better place to live or work? If so, how?

The National Automotive Center Project has been a catalyst for a variety of alternative-fuel vehicle projects. While many are not connected with the NAC Project, the synergy created and the institutional knowledge that is being generated within the region through the project team is creating some long-lasting effects. The Coachella Valley is home to the ONLY fleet of all alternative-fueled transit vehicles. We are also the home of one of the nation's ten largest electric vehicle manufacturer's (Western Golf Car) whom has recently expanded to 60,000 square feet and over 100 employees. Companies such as Allied Signal and Ballard have utilized manufacturers as testing beds for project development. The region is truly becoming known internationally as a home to alternative fuel technologies, in fact Lee Iacocca is using this region as the test launch for his new e-bike and e-car models. Other alternative fuel vehicle manufacturers are currently in negotiations to have a presence in the nation's Alt-Fuel Hub, the Coachella Valley.

5. What would you change about this project, or the process you went through?

Creating a critical mass in any industry cluster is a region's greatest challenge. Once that has been achieved, and CVEP believes that the fundamentals are there for alternative fuel's, it becomes necessary to create better communication tools to involve the business community that may be able to transfer the technology into consumer uses. The NAC efforts have created a catalyst for which SunLine and other project team members, including CVEP must be willing and able to establish new communication tools to effectively transfer research technology to the marketplace through the private sector.
COMMMUNITY REPRESENTATIVE PERSPECTIVE

Please answer questions in space provided. Applicants should feel free to use photocopies of the application forms if needed. If possible, answers to all questions should be typed or written directly on the forms. If the forms are not used and answers are typed on a separate page, each answer must be preceded by the question to which it responds, and the length of each answer should be limited to the area provided.

This sheet is to be filled out by someone who was involved, or represents an organization that was involved, in helping the project respond to neighborhood issues.

Name: Jack Dempsey
Title: Director of Energy Technology Training Center
Organization: College of the Desert
Telephone: (760) 773-2596
Address: 43-500 Monterey Avenue
City/State/ZIP: Palm Desert, CA 92260
Fax: (760) 773-9128
E-mail: j.dempsey@dcd.as.cc.ca.us

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Signature: __________________________

1. How did you, or the organization you represent, become involved in this project? What role did you play?

In the early 1990s, SunLine Transit asked the College of the Desert (COD) to provide assistance in the conversion of their diesel bus fleet to CNG. As a result, the Energy Technology Training Center was formed at College of the Desert and a CNG training manual and instructional programs was developed. This initial project with SunLine Transit has developed into a national training program at College of the Desert for Alternative Fuels. Currently, College of the Desert is working with industry, government and educational agencies throughout California and the Nation to support the development of an emerging Advanced Transportation Industry.

2. From the community’s point of view, what were the major issues concerning this project?

The major issue to the Coachella Valley and the larger community of Riverside and San Bernardino counties was controlling air pollution. The major issue at College of the Desert was the restructuring of a conventional automotive program to an Advanced Transportation Technology program capable of supporting the development of a new industry.

3. What tradeoffs and compromises were required during the development of the project? How did your organization participate in making them?

To support this effort, the college was required to hire new personnel, convert facilities to support alternative fuel training and purchase equipment and materials necessary to conduct and effective training program. This evolution in training required many compromises on campus and the formation of partnerships with industry and government to raise the necessary funds to implement the program.
COMMUNITY REPRESENTATIVE PERSPECTIVE (CONT'D)

4. Has this project made the community a better place to live or work? If so, how?

The major benefits to the community are:

- Creates a healthy environment for the residents of the Coachella Valley to live and work.
- Supports the Tourism and Agriculture Industries.
- Development of an infrastructure to support the transition to alternative fuels and the building of an alternative fuel industry in the Coachella Valley.
- Brings new high-tech jobs to the community.
- Created partnerships between College of the Desert and universities and private industry across the nation.
- Supports the national goal of reduced dependency on foreign produced oil.
- Creates a sense of community pride.

5. What would you change about this project, or the process you went through?

The college needs to move faster toward the goal of becoming a National Alternative Fuels Training Center.
American cities embody our nation’s greatest triumphs and most daunting challenges. At their best they showcase the rich diversity, cultural achievement, and democratic values that characterize the American spirit. At their worst they reflect our country’s most persistent social ills – economic disparity, hopelessness, neglect and abandonment. Yet there are those places that are developed with such vision and imagination that they transform urban problems into creative solutions. The Rudy Bruner Award for Urban Excellence (RBA) seeks to discover those special places and to celebrate and publicize their achievement.

Excellence exists in every city. It can be found in downtowns, neighborhoods, and parks. The Rudy Bruner Award is a search for examples of this often overlooked excellence and a celebration of their contribution to the richness and diversity of the urban experience. Often these places transcend the boundaries between architecture, urban design, and planning. They are born through processes of transformation – the renewal of something old, or the creation of something new that resonates in the history of community life.

The Rudy Bruner Award considers form only one aspect of urban excellence. An excellent urban place involves the interplay of process, place and values. Processes may be inclusive, innovative or participatory. Places may be grandiose or modest, new or historic, but they must be well-designed. Values guide the inevitable trade-offs involved in bringing a project to life. The Award recognizes that these relationships are not simple. It seeks to illuminate the complex process of urban placemaking, so that it may be strengthened to better reflect the balance between form and use; opportunity and cost; preservation and change.

Prizes and Presentation

The Rudy Bruner Award for Urban Excellence is given to five winning projects in each award cycle.

- One Gold Medal Winner is awarded $50,000.
- Four Silver Medal Winners are each awarded $10,000.
- The winning project teams may use prize money in any way they choose to benefit the project.
- All winners are promoted by the Bruner Foundation and are included in books which are published by the Foundation at the end of each award cycle.
- All finalists will be featured in award ceremonies, and a media outreach effort.
- A plaque suitable for outside mounting will be presented to each winning project.
- Certificates acknowledging the key project participants are presented at the award ceremony.

1999 Rudy Bruner Award Winners

Gold Medal:
Yerba Buena Gardens, San Francisco, CA

Silver Medals:
ARTScorpsLA, Los Angeles, CA
National AIDS Memorial Grove, San Francisco, CA
Parkside Historic Preservation Corporation, Philadelphia, PA
Portland Public Market, Portland, ME

The Selection Process

Established in 1987, the Rudy Bruner Award recognizes one Gold Medal Winner and four Silver Medal winners in each biannual cycle. The Rudy Bruner Award is distinguished from other award programs by its broad eligibility criteria; the multi-disciplinary Selection Committee; and the detailed on-site evaluation of each finalist. Each award cycle is documented in a book, which includes in-depth case studies of the winners and a distillation of the Selection Committee discussion. The publications are available from the Bruner Foundation.

The Foundation does not restrict the kinds of projects that may apply. Urban excellence is a dynamic and changing concept, and the Award is enriched by a diversity of applications. Rudy Bruner Award winners are not selected through an established set of criteria. Rather, the issues emerge from the Selection Committee discussion of the applications. It is incumbent upon each applicant to characterize the essential elements of urban excellence found in the submission, and to identify the most significant elements for consideration.

Each Selection Committee includes the mayor of a large city and other urban experts from across the country, such as architects, planners, developers, financiers, writers, community activists, and others who know and understand cities. The Selection Committee discussion is a national forum for exploring the nature of urban excellence. The Award and its publications bring these discussions to the public domain, and make new models of urban placemaking widely available.

2001 Selection Committee
Craig Barton, AIA, RBGC Associates, and University of Virginia, Charlottesville, VA
John Bok, Esq., Foley, Hoag, and Eliot, LLP, Boston, MA
Rosanne Haggerty, Executive Director, Common Ground HDFC Inc., New York, NY
Allan Jacobs, University of California at Berkeley, Berkeley, CA
Gail R. Shibley, Asst. Secretary for Public Affairs. US Department of Labor, Washington, DC
Mayor Wellington Webb, City and County of Denver, CO

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For complete applications please visit our archive site: http://ublib.buffalo.edu/libraries/projects/bruner/index.html
1. What role did you play in the development of this project?

Dick Cromwell, the Executive Director of SunLine Transit Agency and myself were in Toronto at an American Passenger Transport Association (APTA) conference when we took our first ride in a natural gas fueled bus. We gassed it up, smelled the tail pipe and standing in the lack of exhaust, shook hands and agreed we would change our entire fleet of 40 buses out at one time to CNG buses.

At the time I was the Chairman of SunLine and although we knew that the ultimate bus would be powered by a fuel cell, we also knew there was a 20-year window of opportunity to use natural gas. Our agency had never purchased more than three new buses in our 20-year existence. We bought second hand worn out buses and refurbished them. You can see this was an ambitious commitment, but we did it.

Also, I was the leader and it was my idea to make it legal to drive golf carts in city streets in California. I made many trips to Sacramento and because of this legislation, many companies used the City of Palm Desert as a place to develop small alternate fueled vehicles. As a result of our success, the Schatz Energy Research Center at Humboldt State University proposed a partnership with the City of Palm Desert. We were successful in qualifying for several grants and eventually turned our project over to SunLine Transit Agency because they were better equipped to deal with the rapid growth and success of the fuel cell development.

2. Describe the impact that this project has had on the neighborhood and the city. Include any data or supplementary materials that support your conclusions.

Our city depends on tourism for our success and clean air is a must because clean air and weather are the reasons people come to visit.
3. What tradeoffs and compromises were required during the development of the project? Did you participate in making them?

We had to stick our neck out and take chances to be in on the first order for natural gas operated buses. At one point, the Orion Bus Company actually had to be taken over by the Ontario Province government for them to succeed. SunLine Transit Agency made a large advance to help keep them afloat. We took a big chance!

4. What are the most and least successful aspects of the project?

This project has been a large success from the beginning. Our citizens love us. They appreciate driving behind our buses without being asphyxiated.
1. What role did you play in the development of this project?

Prior to taking a fulltime position as SunLine's Marketing Director in July 2000, I had worked for the agency for five years as a contract copywriter and speechwriter. I was responsible for writing dozens of articles, press releases, brochures, speeches, reports, etc. about SunLine's clean fuels projects and the valley's Clean Cities program.

As the project grew and developed, and took on international significance, my role shifted from publicity to public education. By attending various meetings, reading background materials, and learning enough about the environmental and health impacts of people's fuel choices to explain it to our varied audiences, it became clear that SunLine had the opportunity to bring that message home in abundantly meaningful ways.

Since coming on-board fulltime, I've helped create the funding collaborative which is paying (in part) for on-site interpretive signage, educational displays, educational videos, the alternate fuels website, education coordinator and mobile education program. I'm also coordinating production of the various components and working with Schatz Energy Research Center, California Fuel Cell Partnership, Riverside County education and public health departments to ensure materials meet California standards and will be used in local schools.

2. Describe the impact that this project has had on the neighborhood and the city. Include any data or supplementary materials that support your conclusions.

Some impacts are hard to measure, others are easy. As the attached Clean Cities Second Report to Congress shows, the list of Clean Cities stakeholders continues to grow, clean fuels infrastructure continues to expand, and the number of clean fuels vehicles was projected to more than double from 1999-2000. We know the U.S. Postal Service relocated nearly 200 under-utilized CNG delivery vehicles to the valley because of our widespread infrastructure and that Waste Management of the Desert (which opened a public CNG station in 1999) is committed to converting its entire fleet. In addition, every city in the valley has alternate fueled vehicles in its fleet, as do school districts, taxi companies, rental car companies, and others. Clean fuels vehicles are so mainstream in the desert, several large resorts have electric vehicle charging stations on site and AAA certified a number of local garages and mechanics for emergency CNG road service. It's clear that every aspect of life has been affected by the changes that began when SunLine converted its fleet.

Regarding air quality benefits, the Environmental Protection Agency lists the South Coast Air Basin and the Southeast Desert regions of Riverside County respectively as "extreme" and "serious" for ozone pollution (the deadliest form of mobile source air pollution) yet the Coachella Valley is no longer considered a 'non-attainment area.' In other words, the valley's air meets EPA standards for healthy levels of ozone. (We're still working on PM 10 but blowing sand in a desert is tough to reduce.)
3. What tradeoffs and compromises were required during the development of the project? Did you participate in making them?

The only compromises I've participated in concern slowing down the educational programs we want to implement until funding is secured. We're very excited to finish both the on-site educational displays and mobile education center. But we can only move as fast as the money comes in.

The same has been true of other facets of the development. We've learned there can be a significant lag time between being awarded a grant and receiving funds.

4. What are the most and least successful aspects of the project?

People only participate in changing the status quo when they believed their participation matters. I think the most successful aspect of the SunLine Clean Fuels Mall and Education Pavilion is that one at a time, we've educated hundreds of people (first our own employees, then other fleet operators, then other transit properties, then other civic leaders....) that their fuel choices matter and emissions harm health.

I am most excited by the next phase, which is working to incorporate an environmental health module into local middle school curriculum, then bringing the kids to our project so they'll understand that by the time they get their licenses or buy their first cars, they'll have meaningful choices. And those choices will impact their health and our environment.

While I don't really believe there are unsuccessful aspects, the only "disappointment" is that if we had more funding for public outreach and education, we could accomplish so much more. It's difficult to see what can and needs to be done but not be able to do it all!
SunLine Clean Fuels History
(Updated 11-28-00)

1977  SunBus rolls into service; 22 buses; $1.9M budget, 500,000 psgrs.
1991  SunDial rolls into service w/10 vans; carries over 28,000 psgrs.
1992  Board of Directors passes resolution calling for clean fuels fleet
      SunLine Service Group Joint Powers Authority formed
1993  Groundbreaking for first CNG station in Thousand Palms
      SunLine mechanics first to graduate from COD's Energy Technology
      Training Center
1994  SunLine becomes first fleet in the country to convert overnight to 100% 
      CNG fleet
      SunGas delivers CNG with Tren-Fuels Mobile Delivery System
1995  SunGas refueling station opens Palm Springs Regional Airport
      Grand Opening of SunLine Clean Air Center in Indio (new home to 12 
      transit buses and SunDial)
      On behalf of the Coachella Valley, SunLine submits application to DOE as 
      a Clean Cities Region
1996  U.S. Dept. of Energy Clean Cities Designation bestowed on April 22, 
      Earth Day
      Three CNG SunBuses transport spectators at Centennial Olympics in 
      Atlanta as part of American Gas Association clean fuels program
      PremAir "smog munching" device tested on SunBus
1997  CNG refueling station at Palm Springs upgraded airport
      SSG begins managing PM-10 reducing Regional Street Sweeping 
      Program
      SunBus goes to Taipei to help Taiwanese convert to CNG bus fleet
      SunLine installs bus shelter misting system
      CVEP $2.5 appropriation for research center in Coachella Valley
      Palm Desert Post Office gets first mobile CNG delivery
      SunLine takes over operation of neighboring Imperial Transit
      SunLine forms Community Partnerships of the Desert, a non-profit 
      organization
1998  Electric Shopper Hopper goes to year-round service
      CNG-powered Vets Express service starts
      SunLine forms first public-private clean fuels partnership with Pickens Fuel 
      Corp.
1999  SunLine becomes Ford Clean Fuels Maintenance Center
      Waste Management public refueling station opens in Palm Desert 
      SunLine/Sacramento Regional Transit 3-year CNG study published
      SunLine conducts CNG training for Beijing Transit employees
      Chilean delegation and Trinidad/Tobago Transit delegation visit SunLine 
      to learn about alternate fuels
      ZEbus (H2 fuel cell bus) debuts in the desert
Mary Bono announces multimillion National Automotive Center appropriation for hydrogen/diesel reforming project

2000  SunLink service launched to connect region to Riverside Metrolink
SunLine Supervisor represents US at Chilean CNG conferences
SunLine becomes Associate Partner of California Fuel Partnership
SunLine opens on-site Hydrogen Generating/Education Pavilion
SunLine obtains fuel cell/Hythane®/hydrogen ICE vehicles
SunLine puts the first CNG-powered Bookmobile into the community
Delegations from Brazil, China, England, Egypt, Germany, India, Japan, Korea, Nissan, Honda, the Hydrogen Technical Advisory Panel and others visit SunLine to learn about alternate fuels
SunLine co-founds International Fuel Cell Consortium
SunLine launches marketing/education collaborative w/technology partners, Schatz Energy Research Center and California Fuel Cell Partnership
SunCycle kick off (in-house recycle project )
CNG refueling station opens in Desert Hot Springs
CNG refueling station opens in Cathedral City (pending)
CNG refueling station opens in Imperial
Imperial Transit buses replaced with CNG fleet
Groundbreaking on LNG refueling station in Thousand Palms
SunLine exceeds 20 million clean air miles

2001  LNG refueling station opens
SunLink vehicles converted to LNG

2002  Methanol refueling station opens in Thousand Palms
CNG liquefaction facility opens in Thousand Palms
History of SunLine Clean Air Awards

1993

American Lung Association of the Inland Counties, Clean Air Award

National Public Transportation Innovation Award, Best Application of a New Technology

1994

California Community College Chancellor’s Industry Award, Exemplary Leadership in Developing Successful Partnership Activities Between Private Industry and Public Higher Education

1995

California Association of Local Economic Developers, Grand Prize Award of Excellence, New Technology Fuels Jobs and Partnerships

Natural Gas Vehicle Coalition, Annual Achievement Award

South Coast Air Quality Management District, Clean Air Awards, Innovative Transportation Project

1996

U.S. Department of Energy, Special Recognition Award, Energy Efficiency and Renewable Energy

“The World is Riding on us”

Official Provider of Public Transportation, Atlanta Olympic Games

1997

Federal Transit Administration, Administrator’s Award, Outstanding Public Service for Excellence in Rural Public and Intercity Bus Transportation (from Gordon J. Linton)

Gas Research Institute, Product Champion Award

CalStart Blue Sky Award

APTA AdWheel, 1st place Advertisement-Promotion
Clean Cities Special Recognition Award (CNG-Powered Street Sweeper Program (jointly awarded to CVAG))

Clean Cities Rainmaker Award for the most grants and funds leveraged for AFV projects.

1998

Renew America, Environmental Sustainability Award

Federal Highway Administration, Outstanding Use of CMAQ Funds

APTA Distinguished Service Award to Richard S. Kelly (SunLine Board Member)

Clean Cities Department of Energy Madison Avenue Award for Outstanding Public Outreach

1999

South Coast Air Quality Management Clean Air Environmental Stewardship Award to Richard Cromwell III

American Public Transit Association's AdWheel Awards First Place

State of California Governor's Environmental and Economic Leadership Award for Environmental Management

2000

Desert Business Achievement Awards for Most Entrepreneurial, Creative Public Agency

California Transportation Foundation TRANNY Award to Richard Cromwell III

Southern California Emergency Services Association (SCESA) Public Sector Silver Award
ENERGY POLICY ACT OF 1992
SECTION 505
Second Report to Congress

Report on Voluntary Commitments for the Replacement Fuel Supply and Demand Program

Clean Cities Program

October 1, 1999

U.S. Department of Energy
Office of Transportation Technologies
Office of Energy Efficiency and Renewable Energy
The Coachella Valley Clean Cities Coalition will be working with Pickens Fuel Corporation to establish three additional CNG refueling sites in the area by 2001.

The Coachella Valley Clean Cities Coalition is working to expand the use of fuel cell technologies. The area currently has a fleet of three fuel cell vehicles, and the City of Palm Desert and SunLine Transit will break ground in 2000 for the first hydrogen generation and refueling facility for these vehicles. The hydrogen generating equipment belongs to a non-profit group, Clean Air Now, and will be relocated to the desert with a grant from the U.S. Department of Energy.

Fifty-six stakeholders including: Cathedral City; Coachella; Desert Hot Springs; Indian Wells; Indio; La Quinta; Palm Desert; Palm Springs; Rancho Mirage; County of Riverside; SunLine Transit Agency; Coachella Valley Association of Governments; Riverside County Transportation Commission; South Coast Air Quality Management District; California Energy Commission; Riverside County Economic Development Agency; College of the Desert; Advanced Transportation Technologies Initiative; General Services Administration; Southern California Gas Company; Southern California Edison; Agua Caliente Band of Cahuilla Indians; Avis; Building Industry Association; California Air Resources Board; Calstart; Clean Air Now; Coachella Valley Economic Development Association; Coachella Valley Economic Partnership; Coachella Valley Enterprise Zone; Coachella Valley Water District; Del Webb California Corp.; Desert Hospital; Desert Sands Unified School District; Eagle Mountain Landfill and Recycling Center; Eisenhower Medical Center; Environmental Protection Agency; Hertz; Imperial Irrigation District; John F. Kennedy Memorial Hospital; KDES Radio; Lapis Energy Organization; Living Desert; NGV Ecotrans; Palm Springs Desert Resorts; Palm Springs Regional Airport; Palm Springs Unified School District; Sunrise Company; The Torres Martinez Desert Cahuilla Indians; United States Postal Service; Waste Management of the Desert; Western Waste Industries; Cabazon Band of Mission Indians; Morongo Band of Mission Indians; 29 Palms Band of Mission Indians; and U.S. DOE.

American Honda Motor Company; Bombardier Motor Company of America; Big League Dreams Sports Park; Electric Vehicle Superstore; Ford Motor Company; General Motors Corporation; John Deere; KESQ-TV; KMIR-TV; Pickens Fuel Corporation; The Desert Sun; Toyota Motor Sales USA, Inc.; University of California-Riverside; Western Golf Cart Manufacturing, Inc.; and Western Waste Industries.

Tracy Daly, Director of Resource Development
SunLine Transit Agency
32-505 Harry Oliver Trail
Thousand Palms, California 92276-3501
Phone: (760) 343-3456, ext. 112
Fax: (760) 343-3845
Coachella Valley Clean Cities Program

**Designation Number** | **Date** | **Participating DOE Official**
--- | --- | ---
46 | April 22, 1996 | Thomas J. Gross, Deputy Assistant Secretary, Office of Transportation Technologies

**Summary of AFVs and Infrastructure**

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**Achievements**

In 1998, the U.S. Postal Service replaced 180 gasoline-powered mail trucks with CNG. Their goal is to deliver all of the mail in the Coachella Valley with alternative fuel vehicles.

Waste Management of the Desert has begun implementing their plan to convert all 55 of their waste trucks to CNG within seven years. Currently, they have converted 20 trucks.

Hertz Corporation has established a program to rent CNG Ford Crown Victorias from the Palm Springs International Airport. Currently there are five vehicles, which are very popular with renters. Once the vehicles have reached the end of their term with Hertz, the Coachella Valley Clean Cities Coalition will work to sell the vehicles to local taxicab companies.

In 1998, Coachella Valley was featured on a documentary that was aired on PBS and the Discovery Channel. The program, entitled “Cleaning the Air”, highlighted the region’s efforts to improve its air quality. In addition, the local television station KMIR-TV regularly runs public service announcements recognizing outstanding Coachella Valley stakeholders.

**Grants Received**

In 1995, the State of California received a NOPI grant of $250,000 from DOE to increase the use of alternative fuels and alternative fuel vehicles in fleets throughout California, as required by EPACT, but specifically to target placement of zero emission vehicles. In 1999, the Coachella Valley area received a $100,000 SEP grant to place 50 CNG taxis into service and construct 3 CNG stations.

The Coachella Valley was awarded a $100,000 grant from the Gas Research Institute to place 55 CNG refuse haulers into service with Waste Management of the Desert and construct a public CNG refueling station.
Bus company making inroads in fuel-cell study with project

Firm testing buses powered by hydrogen

BY NATALIE SINGER
THE DESERT SUN

Go behind the scenes at SunLine Transit Agency and you might get a taste of what Disneyland's Tomorrowland felt like to the first visitors 45 years ago.

What once was a diesel tractor now sits with its engine removed and something called an auxiliary power unit running tests in its belly.

Photovoltaic panels collect power to make hydrogen. And smiling employees scurry around, efficiently tending to a fleet of alternative-fuel buses.

But the similarity to the Tomorrowland of yore stops there.

The various test projects that dot the SunLine compound not only look and feel like the wave of the future, they are.

EXPERIMENTS: SunLine is the test site for a number of projects and innovations that use fuel cells, powered by hydrogen, to generate clean, zero-emission electricity.

An anchor project, known as 21st Century Truck, is entering its second phase at SunLine.

Funded by the Department of Defense, including a recent $10 million appropriation for its second phase, the project is redefining the future path of the U.S. Army.

"It's extremely unique," said Dick Cromwell, general manager of SunLine. "Some of us think of it as an evolution."

Because the Army already has a long-term plan to receive diesel fuel en masse to run its vehicles, the most evolved hydrogen power (which doesn't need any diesel at all) would not be convenient.

CONVERSION: So SunLine is testing a method of transforming diesel into hydrogen power, using a fuel cell while vehicles are in motion.

Because hydrogen has no carbon atom, there are no harmful emissions, as with fuel.

"They want to shift to a fuel-cell vehicle, but they have this diesel they have to deal with," said Bill Clapper, executive director of SunLine Services Group, a division of SunLine.

So a "hybrid" system was developed wherein the Army would still use its diesel, but only to extract hydrogen, cutting down on dangerous emissions.

"The only thing we really haven't figured out yet is what to do with the rest of the diesel after we pull out the hydrogen," said Clapper.

"But there's time. It takes about 10 years to go through a project like this."

Hydrogen power is especially useful to the Army because it is clean-burning cell phones developed to power soldiers must carry and extend their mission capability.

CLEARING THE AIR

Fuel-cell technology is being developed to provide clean energy for cars, homes, lightweight portable power for laptops, cell phones and other electronic devices.

FUEL-CELL POWER SYSTEM

A fuel-cell uses hydrogen and oxygen to create an electric current.

APPLICATIONS OF FUEL-CELL TECHNOLOGY

Automobiles
Consumer electronics
Home systems
Battlefield technology

The Big Three carmakers all plan to launch clean-burning fuel-cell-powered models in the next several years.

New small fuel-cells could power cell phones for weeks and laptops for a full day.

Fuel-cell units are already being developed to power homes in Japan.

Fuel-cells could lighten the electronic load soldiers must carry and extend their mission capability.
Continued from B1

cause the electrochemical process of creating it is far less detectable by foreign satellites than traditional combustion, Cromwell said.

The Army hopes to integrate the technology after 2010, SunLine officials said.

But that is just one part of a larger effort by SunLine and a coalition of other agencies and groups to bring transportation into the new age of fuel-cell technology. At the forefront is the development of hydrogen-run fleets of buses. SunLine is the first place in the world, according to officials, to construct a hydrogen-manufacturing factory, and it boasts the only running fuel-cell bus, now being tested.

The new technology will help transportation systems evolve into the future by saving money, keeping the air clean, and making the United States less dependent on foreign nations for oil.

One day in the near future, fuel cells and hydrogen power could be used to run all commercial vehicles and even entire homes, Cromwell said.

“There’s no question the interest in hydrogen and fuel cells has been increasing,” said Cromwell. “Now we’re at the stage where we have to test the possibility of making it mainstream.

“We’re seeing how ready this technology is for the common man.”

Natalie Singer covers Riverside County and transportation for The Desert Sun. She can be reached at 778-1652.
A driver coming over the 8,000-foot-high San Jacinto Mountains into the Coachella Valley, home of Palm Springs and half a dozen other southern California desert communities, may be surprised sometimes to see a thick layer of smog hanging over the valley.

The smog comes from Los Angeles, blown in by winds that carry the yellow layer 120 miles through canyons and mountain passes, until the effluent spreads over the valley. It wasn't made there, but there it sits until the winds blow it somewhere else.

Dick Cromwell, general manager of SunLine Transit Agency in Thousand Palms, doesn't like the smog. It's not good for either agriculture or tourism, the valley's two main income sources. There's not much he can do to prevent L.A.'s smog, but he can do something to ensure that Coachella Valley doesn't add to the problem.

His small transit company in the desert has become one of the largest users of alternative fuels in California, as well as the driving force in establishing one of the first AF technician and fleet manager training centers in the country and a nationally-recognized fuel cell research center.

All because Cromwell said he didn't know any better.

Getting started

SunLine is the only transit system in the Coachella Valley. It operates 47 buses and carries more than three million residents and tourists a year. It is also the consolidated transportation ser-
training our people took, they were all ready before the buses came here,” said Cromwell.

**Fleet ROI**

Next came maintenance.

SunLine pays an average of $30,000 more for the CNG buses versus diesel, and about $5,000 more for automobiles and light pickup trucks. The trade-off is longer maintenance cycles and longer engine life, according to Skip Haynes, manager of engineering.

The buses average about 46,000 miles/year. Maintenance is tracked by mileage: 3,000 miles for safety inspections; 6,000 miles for preventive maintenance checks; 12,000 miles for oil changes, and 18,000 for major PMs. As with most fleets, tires, fuel and preventive maintenance are the biggest cost areas once the buses are in service.

The switch to CNG has enabled SunLine to double oil change intervals (to 12,000 miles) and engine life. They now run 500,000 miles before expecting to have to do an engine rebuild, said Haynes.

“There’s also less hazardous waste disposal due to our extended oil change cycle, as well as the overall cleanliness of the engine compartment.”

Tune-ups cost more with CNG because the spark plugs don’t last as long. The fuel system regulators and filters also cost more Haynes said.

Cromwell credits the CNG and maintenance for a huge difference in road calls. “We look at distance between road calls as a measurement of efficiency. The transit industry’s average is between 4,000 and 6,000 miles. We do 29,000 to 40,000 miles between road calls. That’s a benefit from the CNG units and these various training programs.”

SunLine’s clean air influence has spread to other municipal vehicles among the desert cities. The refuse trucks, mail trucks, school buses, even a fleet of seven street sweepers, are all powered by CNG. SunLine also delivers CNG to 10 fueling stations throughout the valley. The company has a hydrogen filling station on site to power current fuel cell test vehicles.

**Alternative projects**

Because of its AF network and infrastructure, SunLine has taken the lead in a number of research and development projects, especially into hydrogen-powered fuel cells.

“The Department of Energy looked at our infrastructure, saw we were already looking at hydrogen, and asked us to research several things for them,” said Cromwell.

One project is helping to develop a fuel cell engine for the Army’s 21st Century Truck. The Army wants a fuel cell engine powerful enough to be used in an on-the-road tractor or a tank. The College of the Desert and the University of California at Riverside are two of the groups working with SunLine on this project.

The company is charged with developing the reformer that will be used in the engine. This part extracts hydrogen from diesel fuel to power the fuel cell.

SunLine is in the second year of the three-year project and is testing the unit in a tractor used to haul a multi-passenger trailer — a “Super Bus”, as Clapper and others call it.

SunLine is also a beta test site for a number of diesel engine manufacturers, said Clapper. “We’re kind of rural out here, but our guys are on the cutting edge of technology. We’re doing test work for Cummins Engine Co., Detroit Diesel and others.”

In addition to the R&D projects, SunLine Services Group, a joint powers authority, markets other services in the valley, all of which came from the agency’s initial foray into alternative fuels:

- Street cleaners: SunLine operates and maintains seven CNG street sweepers used throughout the valley.
- Graffiti removal: since the company removes graffiti from its own bus stops, it now markets this service commercially.
- Taxi regulation: SunLine Regulatory Administration regulates more than 100 cabs registered in the Valley. It also leases CNG-fueled taxis to cab owners.
- SunGas Network: SSG retails CNG at three in-ground fueling sites in the valley. It also leases CNG-fueled taxis to cab owners.
- Hydrogen R&D: SSG coordinates hydrogen research and development projects with local municipalities and agencies on behalf of the DOE.

All this points to continued efforts on the part of SunLine to increase the role of alternative fuels throughout the Valley. And while CNG use is spreading, SunLine is ready to move on to the next step.

“CNG is just a stepping stone,” said Cromwell. “We think our future will be in fuel cells, and going from diesel to natural gas is just the bridge to go to fuel cells.”
vice for more than 40 social service agencies in the valley, providing transportation to the elderly, handicapped and other special needs groups.

Since 1994, the company has been running more than 150 vehicles, including buses, trucks, cars and other pieces of municipal equipment, on either Compressed Natural Gas or electricity.

All the buses are powered by Cummins L10, C 8.3 and B 3.9 CNG engines. SunLine also operates and maintains 28 pickups, 20 Ford E-350 vans, five cars and seven sweepers, all running with CNG power. In addition, they run three electric buses and five electric Ford Ranger pick-ups.

Suggested we look at alternative fuel power. I was new and didn’t know much about the transit business, about what others said you could and couldn’t do. So, I said, ‘Sure’ It was that innocent.”

Cromwell and his staff started the process of researching alternative fuels and looking for the buses.

A changeover like that is often done in steps. A few units are brought in at a time as older, fossil fuel units are retired.

SunLine must have built up a bank of good karma. Its switch to CNG, including acquisition of the units, building the fueling systems, training drivers and technicians, was done over the period of one year.

SunLine’s AF epiphany came in the early 1990s as the agency began coping with an aging diesel-powered bus fleet. Like many small transit operations. SunLine’s policy was to grab used buses that had finished their useful life somewhere else, refurbish them and put them into operation in the desert. That policy means heavier maintenance and often leads to frequent breakdowns. “At one point in 1992, we had 27 of 37 buses down,” said Bill Clapper, executive director.

That was enough for the board of directors.

“Our start in this was pretty simple,” said Cromwell. “Because tourism and agriculture are our two main resources, clean air is an important aspect of what we do. When we started looking at new buses, one of our board members, Dick Kelley, volunteered to support us.

SunLine contacted Southern California Gas and asked them to provide the fuel. SCG agreed to install the first CNG fueling station next to SunLine’s facilities, and also agreed to provide $7,500 in cash for each CNG bus SunLine acquired.

SunLine contracted to buy 34 new buses and acquired five used CNG-powered units, giving them more than $260,000 in incentive money from SCG. That provided seed money for training.

“Natural gas works, and works very well. But you have to train the technicians to look after this equipment,” said Cromwell. “We looked around but saw that training was missing in the industry. We couldn’t find any school specializing in alternative fuel repair and maintenance.”

Cromwell approached the nearby College of the Desert, part of California’s extensive community college network, and asked them to help by developing an alternative fuel training curriculum. He brought an incentive to get their attention.

“I took the money we received from California Gas for the buses and gave it to the community college and asked them to develop a training program on how to maintain and repair natural gas engines and buses,” he said.

Spurred by SunLine’s initiative and money, the school developed the Energy Technology Training Center to train engineers and technicians in compressed natural gas, propane and liquefied natural gas technologies.

Cromwell is proud of SunLine’s role in pushing for this training program. “This is new technology, moving from the diesel to the natural gas environment, and there was no where to get the training.”

The college designed a comprehensive, flexible program that offers training for varied needs, from individual, non-accredited courses for drivers and training for technicians, to engineering degree programs, according to Larry DaShiell, professor of automotive and alternative fuels at the school.

“Students can pick from 42 courses. We offer individual classes as well as certificates in nine Society of Automotive Engineers’ programs, on up to an Associate degree in Alternative Fuels. Students can then transfer into engineering degree programs at other schools in the University of California network,” he said.

For SunLine, DaShiell said the training focused on establishing a level of knowledge and comfort for both the technicians and drivers.

“We developed courses that would give the technicians an understanding of the nature of gas: how to address it and work with it. For drivers, we had to show them that it was safe to work around.”

The training program the College of the Desert established was the first in the nation and is now used by the Department of Energy as the certification tool for natural gas training, said Cromwell.

“With that tool in place, with the
INTERNATIONAL
SunLine Transit Helps Launch International Fuel Cell Consortium

Flights from Sao Paulo, Brazil, to the Palm Springs, Calif., International Airport usually don't stop in Stuttgart, Germany. But the stop proved to be a direct route to a new international partnership.

Prior to the start of the recent Intertech Commercializing Fuel Cell Vehicles 2000 Conference in Berlin, Germany, representatives of SunLine Transit Agency, Thousand Palms, Calif., took advantage of their proximity to the German city of Nuernern to meet with representatives from XCELLIS Fuel Cell Engines Inc. (formerly Jbb fuel cell inc.), Ballard Automotive, and Ballard Power Systems. Participants in the visit included SunLine General Manager and Chief Executive Officer Richard Cromwell III; Percy Byrd, SunLine chairman and mayor of Indio Wells, Calif.; and Bill Clapper, executive director of SunLine Services Group.

During the meeting, the fuel cell professionals reviewed their program to introduce fuel cells into the marketplace and SunLine's role in the rollout.

"While touring the plant where research and development work is done on the Ballard fuel cell," Cromwell said, "we chanced to meet two executives from Empresa Metropolitana de Transporte Urbanos of Sao Paolo, who also plan to utilize fuel cell buses. Needless to say, we hit it right off?"

EMTU, Cromwell explained, is the approximate equivalent of the Riverside County (Calif.) Transportation Commission: "They look after and assist in funding the various public and private bus systems in their region."

After the tour, the five fuel cell boosters went to dinner with Professor Ferdinand Panik, Ph.D., president and chief executive officer of XCELLIS. "Over dinner," Cromwell recalled, "we were discussing the various issues that concern moving fuel cells into the commercial marketplace—issues like training, maintenance, public acceptance, etc. That's when we came up with the idea for the 'WWF—the Worldwide Fuel Cell Consortium.'"

The mission of the consortium would be to allow those transit properties moving into fuel cells to learn from and network with one another, he said. "Dr. Panik loved the idea and had us all sign a ceremonial napkin making the consortium official."

The group agreed to announce the consortium at SunLine's presentation in Berlin later that week. True to the "napkin compact," the announcement was made naming SunLine Transit Agency, EMTU, XCELLIS, and Ballard Automotive as founders of the new international information-sharing group.

"The Coachella Valley now has a clean air 'sister city' in Sao Paolo, Brazil," Byrd said. "That's important because clean air is a global concern. We must work together around the world to advance new technologies."

Four days later, the SunLine contingent had the opportunity to present the agency's hydrogen progress to an international audience.

"Conference attendees included automakers, oil company representatives, researchers, governmental agencies, and others interested in commercializing hydrogen fuel cell vehicles," Cromwell said. "They were very interested to learn about our Hydrogen Generation and Education Pavilion, our participation in the California Fuel Cell Partnership, and our 12-month road test of XCELLIS' prototyper bus. XCELLIS Sales Manager Bruce Roshwell joined us in SunLine's presentation."

During breaks between sessions, Byrd, Cromwell, and Clapper networked with fuel cell pride-words. "SunLine is a founding stakeholder in the Coachella Valley'
Clean Cities program.” Bvd pointed out, “and the goals of that program are to advance the use of clean air vehicles and feed local economic growth. So in our spare time, we did our best to lobby for a fuel cell plant. We try never to miss an opportunity!”

After returning to the U.S., SunLine remained front and center in the move toward hydrogen-fueled vehicles with the opening of its transit hydrogen generation facility on April 28. The program was attended by representatives from AC Transit, the American Hydrogen Association, Cal State-Los Angeles, City of Palm Desert, Clean Air Now, College of the Desert, the Federal Transit Administration, Hydrogen Burner Technology, ISE Photovoltaics International, Schott Energy Research Center, Staut Energy Systems, University of California-Riverside, the U.S. Department of Energy, renowned hydrogen proponent Robert Zweig, M.D., and others.

SunLine is now using renewable energy to extract hydrogen molecules from water, storing hydrogen on site, and filling fuel cell vehicles from its hydrogen fueling station. Both Hythane® and pure hydrogen are available at the pump.

SunLine is also an active participant in the “21st Century Truck” project for the National Automotive Center, a division of the U.S. Army. The project’s goal is to commercialize on-board diesel reforming technology to further advance hydrogen fuel cell vehicles.

“The trip to Germany was fantastic,” Cromwell concluded. “We saw a lot, learned a lot, and met future partners. Now we look forward to their visits to California so they can see firsthand what we’re accomplishing. We hope by sharing information, we can substantially shorten the span between fuel cell development and commercialization.”

For more information, contact SunLine Transit Agency at telephone (760) 343-3430.
"We’re trying to find out if hydrogen is ready for prime time."

Richard Cromwell III, SunLine general manager and chief executive officer

Hydrogen age blossoms in the valley

SunLine only commercial site where fuel available in the nation

By Lukas Velush
THE DESERT SUN

The country’s first commercial hydrogen-fueling station for fuel-cell vehicles is now open for business in the Coachella Valley.

There just aren’t any private fuel-cell vehicles to use it.

Yet.

There are only four government-owned fuel-cell vehicles in the Coachella Valley, but officials at SunLine Transit Agency hope that will increase dramatically now that there is a hydrogen-fueling station at SunLine’s Thousand Palms facility.

Industry experts predict fuel-cell vehicles will, within the next decade, become the car-type of choice.

The fuel-cell station was constructed with federal and state grants from the many partners involved in the project.

UNIQUE OPERATION:

“There’s nothing like this in the world, much less the United States,” said Richard Cromwell III, SunLine’s general manager and CEO.

Zero-emission fuel-cell vehicles are powered by electricity produced when a fuel cell converts hydrogen and air into electricity and water.

Because fuel cells produce nothing but a little water, the only way they can pollute the atmosphere is when the hydrogen used to power a fuel cell is pulled out of the air and compressed.

Cromwell said SunLine’s new hydrogen gas station — at least in part — relies on solar energy to create the hydrogen. The hope is to also use wind that, like sunlight, is in ample supply in the Coachella Valley.

The U.S. Department of Energy and a long list of partners are using SunLine as their test site for extended use of fuel-cell technology, Cromwell said.

SunLine converted its entire fleet of buses and mass-transit vehicles to compressed natural gas in 1992 and created a similar facility for it. That was so successful that several other agencies in the valley also converted to compressed natural gas, including Waste Management of the Desert and local branches of the U.S. Postal Service.

The next step for SunLine was to convert from natural gas to fuel-cell technology. If it proves to be as successful as compressed natural gas, others could follow suit.

THE BIG QUESTION: “We’re trying to find out if hydrogen is ready for prime time,” Cromwell said.

Cromwell said three types of hydrogen-generating methods are being tested at the SunLine station.

Two methods use electricity. Please see FUELS, A12

A fuel cell uses hydrogen and oxygen to create an electric current.

1. Hydrogen is pumped into one side of the fuel cell.
2. Oxygen into the other.
3. Hydrogen protons pass through the membrane.
4. That leaves behind negatively charged electrons (the electricity).
5. On the other side of the membrane, the hydrogen protons create a positive charge and combine with the oxygen to form water, which is vented.

SunLine’s "ZE Bus" is powered by fuel cell

Michael Dolan, The Desert Sun

Fill 'er up: Research engineer James Zoellick of Schatz Energy Research Center pumps hydrogen gas at the SunLine Transit Agency yard in Thousand Palms on Wednesday.
IMPERIAL IRRIGATION CONTRIBUTES TO SUNLINE HYDROGEN PROJECT

(Thousand Palms CA –) Some gifts keep on giving, says Richard Cromwell III, general manager and CEO of SunLine Transit Agency. Like Imperial Irrigation District’s (IID) decision to support the SunLine Hydrogen Generation and Education Pavilion. One week after attending the grand opening ceremonies, IID gave $60,000 to help offset the $139,500 cost of solar tracking panels. The remaining $70,000 was contributed through Clean Air Now, which had received grant funds from the U.S. Department of Energy for the project.

“Imperial Irrigation District’s partnership with SunLine Transit Agency illustrates our continued commitment to promoting the use of clean energy and renewable resources,” said Jesse Silva, general manager. “The hydrogen project is an important milestone in helping develop alternative forms of renewable energy, and we are proud to share this moment with our partners.”

“We would not have been able to open the Hydrogen Generation and Education Pavilion without the support of our national and regional partners. Now, we’re looking to community partners like IID to complete this important demonstration project,” Cromwell noted.

IID’s contribution will help pay for a structure adjacent to the Schatz Hydrogen Generation Center that supports fixed flat plate solar arrays. Solar -more-
power collected from the arrays and photovoltaic panels is used to operate
electrolyzers that extract hydrogen molecules from water. Hydrogen is then
stored on site and used to fuel vehicles including Hythane® buses (which run on
a mixture of hydrogen and compressed natural gas) and the XCELLSIS (formerly
dbb) zero-emissions fuel cell bus, which will arrive in September in the desert for
a 13-month road test.

IID’s $60,000 contribution is part of the Public Benefits Program adopted
in early 2000 by the District’s board of directors. The $4.9 million program
dedicates 2.85% of IID’s power revenue to low-income discounts, energy
conservations programs, renewable resources, and research and development.

The Sunline project consists of the Schatz Hydrogen Generation Center,
City of Palm Desert Vehicle Complex, Zweig Education Building, storage facility
and hydrogen fueling station. It is the first in the world to be built and operated by
a public transit agency.

In 1994, SunLine Transit Agency became the first transit agency in the
nation to park a fleet of diesel buses and switch overnight to buses powered
100% by clean-burning compressed natural gas. Since then, the agency has
been a beta test site for projects ranging from a smog-munching catalyst to
a hydrogen fuel cell powered bus.

Because of its leadership role in promoting alternate fuels, in 1999,

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IMPERIAL IRRIGATION CONTRIBUTES TO SUNLINE HYDROGEN PROJECT

SunLine won the California Governor's Environmental and Economic Leadership Award for Environmental Management.

For more information on SunLine's alternate fuels projects, contact Sharon O'Donnell, (760) 343-3456, ext. 170.
NATION'S FIRST HYDROGEN PAVILION OPENS AT SUNLINE TRANSIT AGENCY

(Thousand Palms – ) On April 28, the millennium’s first major clean air achievement was cast in concrete. The hand-prints-in-cement ceremony was part of the dedication of the SunLine Hydrogen Generation and Education Pavilion, located at SunLine’s Thousand Palms headquarters. The project is the first hydrogen generation and education facility in the nation to be built and operated by a transit agency.

“This is a true milestone for transit, the Coachella Valley, and for public-private partnerships,” noted Richard Cromwell, III, SunLine general manager and CEO. “What happens here in the next few years has the potential to change transportation forever. We believe the air quality and economic benefits will be staggering!”

To honor SunLine’s valued hydrogen partners, three buildings were named: the Schatz Hydrogen Generation Center, City of Palm Desert Vehicle Complex and Zweig Education Building.

Distinguished innovator Louis W. Schatz, Ph.D., president of General Plastics Manufacturing Company, established the Schatz Energy Research Center (SERC) at Humboldt State University in 1989. In 1990, SERC introduced one of the first solar hydrogen/fuel cell power plants in the nation. In 1994, the...
NATION'S FIRST HYDROGEN PAVILION OPENS AT SUNLINE TRANSIT AGENCY

City of Palm Desert, which had a "golf carts as public transportation program," approached the research center with the idea of developing solar/hydrogen fuel cell technology for mobile uses.

By 1996, SERC's first hydrogen fuel cell powered vehicle was put into service in Palm Desert. Two additional vehicles arrived in 1997; the fourth, a neighborhood electric vehicle, in 1998. The fleet, which is still operating, was the first to test hydrogen fuel cells in daily service. Today, SERC is known as one of the foremost fuel cell development laboratories in the world, and the City of Palm Desert operates the world's largest fleet of fuel cell vehicles.

Renowned hydrogen proponent Robert Zweig, M.D., became interested in the components of smog in 1972. He began investigating alternate fuels, found hydrogen to be the cleanest and most healthful, and has dedicated the years since to developing hydrogen vehicles. He is chairman of the public advocacy group Clean Air Now, which developed a solar-hydrogen generation facility and vehicle demonstration at Zerox Corporation's campus in El Segundo. That project was relocated and reintegrated into the SunLine Hydrogen Generation & Education Pavilion.

In 1994, SunLine Transit Agency became the first transit agency in the nation to park a fleet of diesel buses and switch overnight to buses powered -more-
Second Add

NATION'S FIRST HYDROGEN PAVILION OPENS AT SUNLINE TRANSIT AGENCY

100% by clean-burning compressed natural gas. Since then, the agency has been a beta test site for projects ranging from a smog-munching catalyst to a hydrogen fuel cell powered bus.

Because of its leadership role in promoting alternate fuels, SunLine received California's highest environmental honor, the Governor's Environmental and Economic Leadership Award for Environmental Management.

For more information on SunLine’s alternate fuels projects, contact Sharon O'Donnell, (760) 343-3456, ext. 170.

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SUNLINE HYDROGEN PAVILION OVERVIEW

Generating Hydrogen

SunLine relocated and reintegrated hydrogen generating projects by Clean Air Now and Schatz Energy Research Center to its Thousand Palms headquarters. The goal of the combined project is to generate hydrogen from a renewable source. A Teledyne Brown electrolyzer at the Schatz Hydrogen Generation Center uses solar power from solar panels and photovoltaic arrays to convert water to hydrogen and oxygen (which will be vented to the atmosphere). Hydrogen is then stored on property for use as motor fuel.

In addition, a phase 3 Stuart Energy electrolyzer located next to the Schatz Hydrogen Generation Center will operate 24-hours a day for 13 months as an endurance test under a contract with the Department of Energy.

Public Education

The Zweig Education Building features an important component of the overall project. Visual displays allow people to see hydrogen being extracted from water. Tours will be available for groups of all ages. The building is already booked well into the future by organizations affiliated with hydrogen research, including the U.S. Department of Energy, Department of Transportation, military and others.

-more-
SUNLINE HYDROGEN PAVILION OVERVIEW

City of Palm Desert Vehicle Complex

Two hydrogen fuel cell powered neighborhood electric vehicles (NEVs) located on property allow people to see the theoretical in a practical application. The NEVs have been in daily use by the City of Palm Desert for the past two years.

Reforming Hydrogen

Hydrogen can be generated from renewable sources or extracted from hydrocarbons. SunLine is researching all available options. The agency is managing the National Automotive Center's (NAC) $20+ million project designed to commercialize on-board diesel reforming technology for the U.S. Army. In addition to its participation in NAC's “21st Century Truck” project, funded by the Department of Defense, SunLine is working with other partners to commercialize a natural gas reformer.

Storing Power

SunLine's hydrogen storage facility consists of a large volume, Department of Transportation (DOT) hydrogen storage trailer that will store 104,000 standard cubic feet of hydrogen, and two high-pressure American Society of Mechanical Engineers (ASME) tube tanks that will store an additional 12,500 standard cubic feet. This storage facility is attached to a cascade system used to fill hydrogen buses and pickups at the public fueling island across from SunLine's on-site compressed natural gas station in Thousand Palms.

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Second Add
SUNLINE HYDROGEN PAVILION OVERVIEW

Because the project generates more hydrogen than can be stored,
SunLine will market hydrogen to area customers. The trailer provides a ready
distribution system to fleet users like the City of Palm Desert.

Fueling Station

SunLine's new on-site high-pressure hydrogen dispensing station was
designed to accommodate buses, trucks and passenger vehicles.

###
SunLine Founding Partner in International Fuel Cell Consortium

(Thousand Palms, CA – ) Last week was a big one for SunLine Transit Agency. First, representatives were in Berlin, Germany making a presentation to the international audience attending the Intertech Commercializing Fuel Cell Vehicles 2000 conference. Then, they announced the formation of a Worldwide Fuel Cell Transit Consortium with a Brazilian transit agency and international private sector partners.

Consortium founders are SunLine Transit Agency in Thousand Palms, CA; Empresa Metropolitana De Transportes Urbanos (EMTU) in Sao Paulo, Brazil; and international fuel cell manufacturers XCELLSIS and Ballard Automotive. The Consortium goals revolve around the exchange of information and coordination of training.

Making the announcement in Germany from SunLine were Percy Byrd, SunLine Chairman and Indian Wells Mayor; Richard Cromwell III, SunLine General Manager/CEO; and Bill Clapper, SunLine Services Group Executive Director.

"Clean air is a global concern and we must do all we can to make it a reality. The idea for the Consortium came out of discussions about how we could accelerate the fuel cell movement. We must work together and share our experiences as we embark into the new clean air technologies. The Coachella Valley now has a new clean air 'sister city' in Sao Paul, Brazil," said Cromwell.

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First Add

**SunLine Founding Partner in International Fuel Cell Consortium**

SunLine is front and center in the U.S. movement to zero emission, fuel cell power. Later this month SunLine will unveil the first U.S. transit hydrogen generation facility. The agency is also an active participant in research and development projects for the National Automotive Center (a division of the U.S. Army), U.S. Department of Energy, Federal Transit Administration, XCELLSIS Fuel Cell Engines Inc. (with offices in Germany, Canada and California), and the California Fuel Cell Partnership.

For more information please contact SunLine Transit Agency, 760-343-3456.

# # # #
SUNLINE TRANSIT AGENCY NAMED CALIFORNIA FUEL CELL ASSOCIATE PARTNER

(Thousand Palms – ) SunLine Transit Agency was recently named one of just two transit agencies statewide to become part of the California Fuel Cell Partnership, announced, Richard Cromwell, Ill, general manager and CEO. The partnership, which formally began in April, 1999, is an international coalition of automakers (DaimlerChrysler, Ford, Honda, Nissan and Volkswagen), energy providers (ARCO, Shell and Texaco), a fuel cell manufacturer (Ballard Power Systems), as well as the U.S. Department of Energy, the California Air Resources Board and the California Energy Commission. The Partnership, whose goal is to commercialize fuel cell vehicles, has added as Associate Partners, three global industrial gas companies (Air Products and Chemicals, Inc., Linde AG, and Praxair), and now two transit agencies: AC Transit in the San Francisco Bay area, and SunLine based in the Southern California Desert Resorts area.

"SunLine will serve as a test site for the Partnership's bus demonstration program," Cromwell explained, "which is a natural for us because we're already road-testing hydrogen vehicles for the U.S. Army, Department of Energy and Federal Transit Administration. Participating in the Partnership's efforts will put us a step closer to providing public transit in zero-emissions hydrogen fuel cell buses. And improving public transit and improving air quality are our primary goals!"
First Add
SUNLINE TRANSIT AGENCY NAMED CALIFORNIA FUEL CELL ASSOCIATE PARTNER

"We're pleased to welcome SunLine to the Partnership," said John Wallace, Chairman of the Partnership's Steering Committee and Executive Director, Think Group, an enterprise of Ford Motor Company. "SunLine brings valuable fuel cell experience to the table and bolsters our efforts to demonstrate fuel cell vehicles and alternate fuel technologies."

Converting from a hydrocarbon to a hydrogen economy offers every advantage: unlike oil and diesel, hydrogen is renewable, abundant, economical, clean, proven, highly efficient and domestically produced. And unlike gasoline and diesel internal combustion engines, fuel cells produce no emissions. They convert hydrogen to electrical power (which ultimately powers the vehicle), and release water vapor into the atmosphere.

The California Fuel Cell Partnership is a voluntary effort to advance a new automobile technology that could move the world toward practical and affordable environmental solutions. The Partnership will demonstrate fuel cell-powered electric vehicles under real day-to-day driving conditions; demonstrate the viability of alternate fuel infrastructure technology, explore the path to commercialization and increase public awareness of fuel cell electric vehicles. The Partnership will place approximately 50 fuel cell passenger cars and buses on the road between 2000 and 2003.

Because of its leadership role in promoting alternate fuels, in 1999,
SUNLINE TRANSIT AGENCY NAMED CALIFORNIA FUEL CELL ASSOCIATE PARTNER

SunLine won the California Governor's Environmental and Economic Leadership Award for Environmental Management, South Coast Air Quality Management District's Environmental Stewardship Award and the American Public Transit Association Adwheel Award. In 1998, the agency earned the Renew America, Environmental Sustainability Award, Federal Highway Administration Award for Outstanding Use of CMAQ Funds and the American Public Transit Association, Distinguished Service Award.

For more information on SunLine's alternate fuels projects, contact Sharon O'Donnell, (760) 343-3456, ext. 170.

###
Clearing the air

Fuel cell technology is being developed to provide clean energy for cars, homes, lightweight portable power for laptops, cell phones and other electronic devices.

Fuel cell power system
A fuel cell uses hydrogen and oxygen to create an electric current.

1. Hydrogen is pumped into one side of the fuel cell.
2. Oxygen into the other.
3. Hydrogen protons pass through the membrane.
4. That leaves behind negatively charged electrons (the electricity).
5. On the other side of the membrane, the hydrogen protons create a positive charge and combine with the oxygen to form water, which is vented.

Applications of fuel cell technology

- **Automobiles**: The Big Three carmakers all plan to launch clean-burning fuel cell-powered models in the next several years.
- **Consumer electronics**: New small fuel cells could power cell phones for weeks and laptops for a full day.
- **Home systems**: Fuel cell units are already being developed to power homes in Japan.
- **Battlefield technology**: Fuel cells could power soldiers' electronic load and extend their mission capability.

Valley leading in research, use

Staff Report

The Coachella Valley is on the leading edge of fuel-cell technology research and application.

Valley officials have been experimenting with the promising technology for about six years.

For example, the city of Palm Desert boasts the largest operating fleet of hydrogen fuel-cell powered vehicles.

Another major player in research and use of the technology is SunLine Transit Agency.

SunLine is a member of the California Fuel Cell Partnership and is scheduled to test a fuel-cell bus this spring. The bus is expected to cruise Coachella Valley streets within about three months.

SunLine also plans to make its own fuel by using the sun's heat to extract hydrogen from water. The agency is building a plant to do just that at its headquarters in Thousand Palms. It should be ready to produce hydrogen in three weeks.

SunLine plans to show the public how hydrogen is extracted from water by giving tours of its solar-powered generator.

SunLine's efforts will help partnership members determine the costs of producing hydrogen, building fueling stations and the mechanics of keeping a fuel-cell vehicle on the road.

Much of the research is funded by the U.S. Department of Energy and the California Energy Commission, which are also members of the partnership.

DaimlerChrysler, Ford, Honda and Volkswagen — which are all experimenting with fuel-cell vehicles — are also members of the partnership.
SunLine joins fuel-cell team

Statewide partnership will benefit from firm's wisdom

For the latter half of the 1990s, the SunLine Transit Agency's cutting-edge expertise in alternative-fuel research and development has been an environmental blessing to the Coachella Valley.

And now that the 21st century has arrived, the bus company that is a lot more than a bus company is showing no signs of slowing down.

SunLine recently was accepted into the California Fuel Cell Partnership, a membership honor that should help Coachella Valley officials who have been experimenting with fuel cells for six years secure the grants they need to fund ongoing research.

"It actually puts us in with a very prestigious group of individual partners," SunLine Assistant General Manager Tracy Daly said. "For us to be picked to be included is quite an honor."

Indeed it is, and the benefits are certain to be felt throughout the desert SunLine serves so admirably. The city of Palm Desert, for instance, already home to the world's largest fleet of fuel-cell powered vehicles, could expand its lead thanks to SunLine's unique position. And other valley cities could get in the game, as well, considering that a chief goal of the partnership is to get another 50 fuel-cell-powered cars and trucks on the road by 2003.

Typical of SunLine's innovative strategies, the company plans to mark its participation in the program with the development of its own fuel by using the sun's heat to extract hydrogen from water — and use that hydrogen to power its fuel cells. The company also will roll out a prototype fuel-cell bus in May under the auspices of the partnership.

We congratulate SunLine for being admitted to a group it — and we — will benefit from. And we congratulate the California Fuel Cell Partnership, as well, for enlisting the services of such a forward-thinking partner.
SunLine joins fuel-cell partnership

Membership may help valley get grants to study energy source

BY SUSAN HERENDEEN
THE DESERT SUN

Membership in the California Fuel Cell Partnership has its privileges, and the SunLine Transit Agency recently gained admission, local officials said Friday.

Inclusion in the group may help Coachella Valley officials, who have been experimenting with fuel cells for six years, in their quest for grants to fund ongoing research.

And it's a stamp of approval for pioneers who want to be more than bit players who were simply ahead of their time.

"It actually puts us in with a very prestigious group of industry partners," said Tracy Daly, assistant general manager at SunLine. "For us to be picked to be included is quite an honor."

"It raises the profile," said Riverside County 4th District Supervisor Roy Wilson of Palm Desert, who helped launch the valley's experiments with alternative fuels. "SunLine is a major player."

LARGEST FLEET: With a couple of golf carts, a two-seater and a small truck, the city of Palm Desert has the world's largest by 2003.

SUN'S HEAT: But SunLine is taking the experiment a step further. They plan to make their own fuel by using the sun's heat to extract hydrogen from water.

The partnership, a group of industry and government leaders, hopes to get another 50 such cars and trucks on the road by 2003.

Tests on a fuel-cell bus will begin this spring at SunLine. The bus is expected to hit Coachella Valley streets by May.

"They're going to be part of our first round of test sites," said Joe Irvin, spokesman for the California Fuel Cell Partnership. "They are familiar with the technology. and comfortable with it."

The Alameda-Contra Costa Transportation District will also conduct tests.

SUN'S HEAT: But SunLine is taking the experiment a step further. They plan to make their own fuel by using the sun's heat to extract hydrogen from water.

A hydrogen-generating facility is now under construction at SunLine's headquarters in Thousand Palms.

The bus demonstrations are supposed to help partnership

Please see CELLS, B-4
Cells

Continued from B1

members determine the costs of producing hydrogen, building fueling stations and the mechanics of keeping a fuel-cell vehicle on the road.

If successful, the tests could quicken the commercialization of fuel-cell technology.

Much of the research is funded by the U.S. Department of Energy and the California Energy Commission, which are also members of the partnership.

DaimlerChrysler, Ford, Honda and Volkswagen — which are all experimenting with fuel-cell vehicles — are also members of the partnership.

They are betting on fuel cells and have turned away from electric vehicles, which have a limited range.

California law will require 10 percent of all new cars to meet zero-emission standards by 2004.

A headquarters for the partnership, which was formed last April, is under construction in West Sacramento. A gallery of fuel-cell cars is also planned to pique public interest.

And SunLine plans to show the public how hydrogen is extracted from water by giving tours of its solar-powered generator.

Daly said the gizmo should be ready in about a month.

“You’ll be able to see the A to Z of how you create hydrogen. It’s just really getting exciting. It’s so close we can feel it.”

Tracy Daly, assistant general manager at SunLine

“You’ll be able to see the A to Z of how you create hydrogen. It’s just really getting exciting. It’s so close we can feel it.”

Susan Herendeen covers Riverside County and Coachella for The Desert Sun. She can be reached at 775-4204.
Rancho Dominguez, CA – August 9, 2000 – Hydrogen Burner Technology, Inc. (HBT) announced today that it has been awarded a grant from the California Air Resources Board (CARB) for a hydrogen refueling station for fuel cell powered vehicles. The refueling system is being installed at the SunLine Transit Agency in Thousand Palms, CA. The system will help support the introduction of Hythane® buses and new fuel cell buses from Excellis Fuel Cell Engines, Inc.

David Moard, HBT president explained, “Why not use the natural gas infrastructure as a transportation mechanism for hydrogen? Why not use currently unharvested vented or flared natural gas as a source of hydrogen?” He added, “The SunLine project provides the opportunity to examine these possibilities and the relevant economics.”

HBT’s refueling system is based on the patented Under-oxidized Burner (UOBTM) technology. UOB™ technology can convert virtually any infrastructure fuel into pure hydrogen for a variety of applications, including fuel for hydrogen-powered vehicles or as a critical feedstock for various manufacturing processes, including heat-treating, refining and glass manufacturing. These systems are skid-mounted for ease of installation, efficient, cost-effective and virtually emission-free.

The grant was awarded under CARB’s Innovative Clean Air Technologies Program (ICAT), which represents a partnership between the State and technology developers. The ICAT program focuses on the development of technologies that will succeed in the California marketplace, thereby resulting in benefits to California taxpayers. These benefits can take many forms, including environmental benefits, health benefits, increased jobs and/or decreased pollution control costs. It is a broad-based technology development program that is meant to attract the best ideas in air pollution prevention and control.

“The ICAT program is designed to help promising air pollution control technologies move from the inventor’s workbench to the marketplace. Only ideas that are fully developed into commercial enterprises can be used to help cut air pollution. HBT’s project can result in cleaner air by tapping a previously unused resource,” said Michael Kenny, ARB Executive Officer.

For more information contact California Air Resources Board, Innovative Clean Air Technologies Research Division, 2020 L Street, 1st Floor, Sacramento, California 95814-4219, icat@arb.ca.gov

SunLine Transit Agency is recognized as a leading champion in the use and conversion of transit vehicles to cleaner-burning fuels. For more information contact SunLine Transit Agency 32-505 Harry Oliver Trail, Thousand Palms, CA 92276, 760/343-3456, http://www.sunline.org
This past year has been one of the most exciting in Sunline's history! General Manager/CEO Richard Cromwell III says with characteristic enthusiasm. "We took seamless transit to new levels by launching SunLink express service to Riverside. From there, desert passengers can connect to Metrolink and the Riverside Transit Agency system. We opened the world's first Hydrogen Generation and Education Pavilion built and operated by a transit agency. And in partnership with Pickens Fuel Corp., continued our efforts to build compressed natural gas (CNG) stations throughout the valley. We think the desert now has the greatest concentration of alternate fuels stations in the nation."

For those reasons and more, Sunline received the state's highest environmental honor — the Governor's 1999 Environmental and Economic Leadership Award for Environmental Management.

Worldwide Hydrogen Headquarters

Since 1994, when SunLine became the first public transit fleet in the nation to park all its diesel buses and switch overnight to a fleet operated 100 percent by clean-burning CNG, the agency has continuously served as a beta test site for clean air equipment innovations.

"Because of our extensive experience in translating research into commercially viable products," Cromwell says, "we were tapped by the U.S. Department of Energy to coordinate several projects designed to commercialize hydrogen as a transportation fuel. As a result, today, at our Thousand Palms headquarters, we're generating hydrogen from renewable sources and extracting it from natural gas via a stationary reformer, we're deploying two Hythane® buses (which use 80 percent CNG/20 percent hydrogen), and we're road-testing the country's only XCELLSIS ZE-bus, a zero-emissions fuel cell bus."

SunLine also co-owns the world's largest fuel-cell powered fleet with the City of Palm Desert and Department of Energy, and at a recent conference in Berlin, founded the first Worldwide Fuel Cell Consortium with XCELLSIS, Ballard Automotive, and Empresa Metropolitana de Transportes Urbanos — transit partners from Sao Paolo, Brazil. In addition, SunLine manages a $14-million project by the National Automotive Center to commercialize on-board diesel reforming technology for the U.S. Army.
Though it sounds like an exaggeration, there's more being done to advance alternate fuels in the Coachella Valley than anywhere else in the world.

"But we never forget," Cromwell points out, "that our first responsibility is to our riders. After revamping SunDial, we were able to shorten the lead time for rides from two weeks in advance to same day, plus more than triple the number of rides without expanding the SunDial fleet."

A joint powers authority of all nine valley cities and the County of Riverside, SunLine's board includes an elected official from each member entity: Cathedral City, Coachella, Desert Hot Springs, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, Rancho Mirage and Riverside County. Their commitment to clean air helps SunLine preserve the desert's blue skies while linking the valley through seamless transit service.

#### SunBus Ridership

<table>
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<tr>
<th>Year</th>
<th>Ridership</th>
<th>Change</th>
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<tbody>
<tr>
<td>1996</td>
<td>2,806,319</td>
<td>+8.3%</td>
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<tr>
<td>1997</td>
<td>2,964,057</td>
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<td>1998</td>
<td>3,405,406</td>
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<td>3,642,003</td>
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<tr>
<td>2000</td>
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#### SunDial Ridership

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</thead>
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<td>65,626</td>
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<td>61,035</td>
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<td>2000</td>
<td>98,876</td>
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#### Total Ridership

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<tr>
<th>Year</th>
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<th>Change</th>
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</thead>
<tbody>
<tr>
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<td>+8.6%</td>
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<tr>
<td>1997</td>
<td>3,026,663</td>
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<tr>
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#### SunLine Transit Agency Funding Sources

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<tr>
<td>Local Transportation Funds</td>
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<td>Measure A</td>
<td>15</td>
</tr>
<tr>
<td>Federal Funding</td>
<td>19</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>
Testing New Technology

The only way to test new technology is in the real world. If you’ve spent a summer in the desert, or been in a blowing sand storm, you know how real it can get!

Hydrogen Components, Inc. (which holds the patent on Hythane®), partnered with SunLine because of our expertise with clean fuels like hydrogen. But the company also wants to test its equipment in our extreme temperatures.

So as always, you have our General Manager’s pledge: if SunBus service is interrupted for any reason, we’ll send another bus to pick you up and take you to your stop. And if service is interrupted while you’re on board a Hythane® bus, we’ll also give you a free monthly SunBus pass, good for unlimited rides.

If that happens, just fill out the form below, have the driver sign it, and send it to our Customer Service specialists. We’ll send your pass, pronto!

Thanks for being part of history in the making!

NAME ________________________
ADDRESS _________________________
CITY/STATE/ZIP __________________________
DATE & LOCATION OF SERVICE INTERRUPTION:
DRIVER’S SIGNATURE ________________

The California Fuel Cell Partnership

SunLine is proud to be represented in the California Fuel Cell Partnership (CaFCP), and to be the first test site for its bus demonstration program. We were chosen because of our experience handling alternate fuels and road-testing hydrogen vehicles for the U.S. Army, Department of Energy and Federal Transit Administration.

Formed in April of 1999, the CaFCP is an international coalition of automakers (Daimler-Chrysler, Ford, Honda, Hyundai, Nissan, Volkswagen), energy providers (BP, Shell, Texaco), fuel cell companies (Ballard Power Systems, International Fuel Cells), state, federal and regional agencies (California Air Resources Board, California Energy Commission, South Coast Air Quality Management District, U.S. Department of Transportation, U.S. Department of Energy), industrial companies (Air Products, Methanex, Praxair) and public transit agencies (SunLine and AC Transit), whose goal is to commercialize fuel cell vehicles. In addition to the bus demonstration project, the Partnership plans to place some 50 fuel cell passenger cars and buses on the road between 2000 and 2003.

So you can see, by riding this Hythane® bus, you’re part of transit history. And the future of transportation. Thanks for helping!

SunLine Transit Agency / SunLine Services Group
32-505 Harry Oliver Trail
Thousand Palms, CA 92276-3501
(760)343-3456 FAX (760)343-3845
www.sunline.org
Hythane® Math: How 20% = Nearly 45

If you’re on-board the Hythane® bus pictured in this brochure, you’re riding one of just two in the world! Purchased by SunLine Transit Agency at the end of a pilot project in Montreal, both of these buses now take riders around the Coachella Valley. Like all SunBuses, these help the environment. But they’re even cleaner than our fleet of compressed natural gas (CNG) buses.

Hythane® is a mixture of hydrogen and CNG. By adding just a small amount of hydrogen to CNG at the pump, CNG’s already low emissions are cut by up to another 45%! That means Hythane® gives one of the cleanest rides available today.

While our ultimate goal is to have a fleet of hydrogen fuel cell powered buses (which would give us a zero-emissions fleet), Hythane® may prove to be the most cost-effective bridge from natural gas to hydrogen. That’s part of what we’ll learn as we road-test these prototype vehicles.

Hydrogen offers many advantages over gasoline and diesel engines. It’s abundant and renewable. Using it lessens our country’s dependence on foreign oil and strengthens our national economy. And because hydrogen vehicles have such low emissions, they help the environment and protect public health. They’re safe, clean, quiet and powerful. And best of all — no toxic diesel fumes!

The Road to Hydrogen Runs through the Coachella Valley

SunLine Transit Agency is 100% dedicated to keeping the valley’s skies blue. In 1992, at the direction of our board of directors, we started looking for a healthier alternative to dirty diesel buses. At the time, compressed natural gas (CNG) was the best choice.

One night in May of 1994, SunLine parked all its diesel buses and started service the next morning with a fleet powered entirely by clean-burning CNG buses. Since then, the SunBus fleet has stopped tons of harmful pollutants from entering the air. Take a deep breath and enjoy it!

But SunLine has always believed hydrogen would be the fuel of the future. Hydrogen engines just weren’t commercially available back in ’94. And though they still aren’t ready for widespread use today, terrific progress is being made. SunLine is currently testing a number of hydrogen powered vehicles: Hythane® buses, the nation’s only XCELLSIS ZEbus—a zero emissions fuel cell bus, fuel cell golf carts, a fuel cell powered neighborhood electric vehicle, and a pickup with a hydrogen internal combustion engine. Experts predict that many different hydrogen engines will be in use in the future. SunLine will be familiar with them all!

SunLine is ahead of the curve with its on-site “Hythane®” dispensing station.

Scientists, environmentalists, elected officials and others celebrated the Spring 2000 opening of SunLine’s hydrogen project.

Fill ‘er Up!

In April 2000, SunLine opened the first hydrogen generation, storage, education and fueling facility ever built by a public transit agency. By working with partners like the Department of Energy, Clean Air Now, the Schatz Energy Research Center, FIBA Technologies, Hydrogen Burner Technology (HBT), Pickens Fuel Corp., QuestAir, Stuart Energy, and XCELLSIS, we are generating hydrogen from renewable solar energy and “reforming” it from natural gas.

Now, when our hydrogen or Hythane® vehicles run low on fuel, we just fill up in Thousand Palms at our on-site public hydrogen station. And when people around the world want to see a successful fuel cell project, they visit SunLine — America’s hydrogen headquarters.
Testing New Technology

The only way to test new technology is in the real world. If you've spent a summer in the desert, or been in a blowing sand storm, you know how real it can get!

XCELLSIS partnered with SunLine because of our expertise with clean fuels like hydrogen. But the company also wants to test its equipment in our extreme temperatures and sometimes harsh environment.

So as always, you have our General Manager's pledge: if SunBus service is interrupted for any reason, we'll send another bus to pick you up and take you to your stop. And if service is interrupted while you're on board the ZEbus, we'll also give you a free monthly SunBus pass, good for unlimited rides.

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NAME ____________________________
ADDRESS ____________________________
CITY/STATE/ZIP ____________________________
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DRIVER'S SIGNATURE ____________________________

Partnering for Progress --
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As you can see, by riding this ZEbus, you're part of transit history. And the future of transportation.

SunLine Transit Agency / SunLine Services Group
32-505 Harry Oliver Trail
Thousand Palms, CA 92276-3501
(760)343-3456  FAX (760)343-3845
www.sunline.org

The Cleanest Ride in History

Is the Future of Transportation
**ZE Means Zero Emissions -- Not Any, Nada, None!**

If you’re on-board the XCELLSIS ZEbus pictured in this brochure, you’re riding on a 100% pollution-free bus. You’ll never see soot or black exhaust coming out of this tail-pipe — just a little water vapor. That may sound like science fiction, but the story gets even better.

Drivers stopped behind the ZEbus get a lesson in clean fuels technology!

The ZEbus uses hydrogen, the most abundant element in the world, as its source of fuel. The reason it’s so clean is that unlike gasoline or diesel, the hydrogen is never burned. Instead, it’s mixed with oxygen in a fuel cell. That process creates electricity, which is used to power the engine.

Hydrogen fuel cells offer many advantages over gasoline and diesel engines. They use renewable energy — hydrogen and oxygen. That lessens our country’s dependence on foreign oil and strengthens our national economy. And because fuel cell vehicles actually run on electric power, they help the environment and protect public health. They’re safe, clean, quiet and powerful. And best of all — no toxic diesel fumes!

**The Road to Hydrogen Runs Through the Coachella Valley**

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SunLine’s CNG buses are the ideal bridge to hydrogen fuel cell buses — the environment’s favorite fuel.

But SunLine has always believed hydrogen would be the fuel of the future. Fuel cell engines just weren’t commercially available back in ’94. And though they still aren’t ready for widespread use today, terrific progress is being made. Thanks to the information XCELLSIS and Ballard Power Systems are gathering by using this pre-commercial ZEbus in service in the valley, commercial fuel cell buses will be just a few years away. In fact, SunLine plans to have a number of fuel cell buses on desert streets by 2003.

In April 2000, SunLine opened the first hydrogen generation, storage, education and fueling facility ever built by a public transit agency. By working with partners like the Department of Energy, Clean Air Now, the Schatz Energy Research Center, FIBA Technologies, Hydrogen Burner Technology (HBT), Pickens Fuel Corp., QuestAir, Stuart Energy, and XCELLSIS, we are generating hydrogen from renewable solar energy and ‘reforming’ it from natural gas.

Now, when the ZEbus runs low on fuel, we just fill up in Thousand Palms at our on-site public hydrogen station.

Scientists, environmentalists, elected officials and others celebrated the Spring 2000 opening of SunLine’s hydrogen project.

SunLine is ahead of the curve with its on-site hydrogen dispensing station.

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And when people around the world want to see a successful fuel cell project, they visit SunLine — America’s hydrogen headquarters.
SunLine Builds First "Clean Fuels Mall"

Clean fuel options abound at SunLine in Thousand Palms. Trend-setting transit agency will add yet another choice: a liquefied natural gas (LNG) station built in conjunction with partner Pickens Fuel Corp. At that station, SunLine will fill its fleet of SunLink "superbuses" to LNG. LNG, points out Skip Haynes, SunLine's engineering manager, is more appropriate than CNG for the SunLink vehicles' heavy-duty tractor-trailer configuration. Future plans call for methanol and liquid hydrogen, which may also play key roles in more low-emissions vehicles offered by manufacturers.

Like other malls, this one offers shoppers (in this case, drivers and fleet operators) a number of excellent buys. "Today's bargain hunters will find that clean-burning compressed natural gas (CNG) motor fuel sells at per gallon prices that are significantly lower than gasoline and diesel," Cromwell says. "And more important from an environmental point of view, all these alternate fuels help keep desert skies blue!"

Throughout the Spring 2001 semester, SunLine will be working with local school districts to bring students to the district's official school and middle school students get their drivers' licenses, and commercial establishments that drive the SunLink board of directors meetings. The timing was perfect, Dr. Peter Lehman, director of the Schatz Energy Research Center at Humboldt State University, made a presentation on fuel cells as well. Like everyone who has seen the girls' work, he offered an enthusiastic two thumbs up!

Try It. Roy Liked It!

To make our air healthier to breathe, South Coast Air Quality Management District (SCAQMD) has the authority to mandate the use of clean fuels. But the District doesn't want to burden you with something that hasn't worked. So last spring, at SCAQMD's request, Riverside County Supervisor Roy Wilson test drove a Honda Insight for three months. Next he'll try a Toyota Prius. The two models are the first mass-produced hybrid electric cars to hit the market. They combine a conventional gasoline engine, a stack of rechargeable batteries and an electric motor, globally to increase fuel mileage and reduce emissions.

According to Supervisor Wilson, "The car and batteries performed well in the desert heat, and I averaged 50 miles per gallon." With today's gas and diesel prices, that's money in the bank! Both models are available at local auto dealers.

Valley's Official E-bike

Touted as "the most advanced electric vehicle in the world today," Roy Wilson's "E-Bike" has been named the official bike of the Palm Springs Desert Classic Conventions and Visitors Authority (CVA). The CVA has signed an agreement with locoos that will allow an enjoyment of the Palm Springs Desert Classic Conventions and Visitors Authority (CVA). Valleys has signed an agreement with locoos that will allow an enjoyment of the Palm Springs Desert Classic Conventions and Visitors Authority (CVA). Valleys has signed an agreement with locoos that will allow an enjoyment of the Palm Springs Desert Classic Conventions and Visitors Authority (CVA). Valleys has signed an agreement with locoos that will allow an enjoyment of the Palm Springs Desert Classic Conventions and Visitors Authority (CVA). Valleys has signed an agreement with locoos that will allow an enjoyment of the Palm Springs Desert Classic Conventions and Visitors Authority (CVA). Valleys has signed an agreement with locoos that will allow an enjoyment of the Palm Springs Desert Classic

Imperial Irrigation Supports Renewable Energy Project

A $60,000 gift from Imperial Irrigation District (IID) is helping Sunline Transit Agency raise a solar tracking structure to complete the agency's Hydrogen Generation and Education Pavilion. Energy collected from the arrays and existing photovoltaic panels provide renewable power to operate on-site Stuart Energy and Teldyne Brown electrolysers. Both units extract hydrogen molecules from water; hydrogen is stored on site and used to fuel a variety of hydrogen-powered vehicles.

Imperial Irrigation District's partnership with SunLine Transit Agency illustrates our continued commitment to promoting the use of clean energy and renewable resources," said Jesse Silva, general manager. "The hydrogen project is an important milestone in helping to develop alternative forms of renewable energy, and we are proud to share this development with our partners."

IID's $60,000 contribution is part of the Public Benefits Program adopted in early 2000 by the District's board of directors. The $4.8 million program dedicates 2.85% of IID's power revenue to low-income discounts, energy conservation programs, renewable resources, and research and development.

COACHELLA VALLEY by Bert Kronenmiller

First, Southern California popularized shopping malls. Next, auto malls. "But here in the Coachella Valley, says Imperial Irrigation District's general manager and CEO of SunLine Transit Agency, "we've launched an entirely new concept: the Clean Fuels Mall."

Last February, SunLine expanded local clean fuels options by opening the first hydrogen generation and fuel cell bus fleet in North America. "The agency has invested in the valley's first public CNG station at its Thousand Palms headquarters in December, and five additional public stations have opened throughout the desert, a sixth is nearing completion. The agency has also built a hydrogen fueling station, a world-class research and development facility in conjunction with partner Pickens Fuel Corp. At that station, SunLine will fill its fleet of SunLink "superbuses" to LNG. LNG, points out Skip Haynes, SunLine's engineering manager, is more appropriate than CNG for the SunLink vehicles' heavy-duty tractor-trailer configuration. Future plans call for methanol and liquid hydrogen, which may also play key roles in more low-emissions vehicles offered by manufacturers.

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Clear into the 21st Century

Created to advance the objectives of the Clean Air Act and promote the use of alternate fuel vehicles, Clean Cities is an unusually effective program because it creates public/private partnerships that help clear the air and feed local economic growth.

The Coachella Valley earned its official designation as a U.S. Department of Energy Clean Cities Region on Earth Day 1996. It is a coalition of 100 stakeholders including those listed below.

- All nine desert cities
- County of Riverside
- Four Indian nations
- Local governmental agencies
- School districts
- Business leaders
- Media

Every Day is Earth Day

Though Earth Day is the official anniversary of the Coachella Valley's Clean Cities program, every day we breathe clean air is a day to be celebrated. There are other reasons to celebrate, too. SunLine Transit Agency's clean air bus fleet and the local Clean Cities program continue to earn state and national acclaim. Here are the most recent highlights.

2000 Desert Business Achievement Award, Most Entrepreneurial, Creative Public Agency
1999 Governor's Environmental Economic Leadership Award
1999 South Coast Air Quality Management District, Environmental Stewardship Award
1998 American Public Transit Association Distinguished Service Award
1998 Federal Highway Administration Award for reducing PM10
1998 U.S. D.O.E. Clean Cities Madison Avenue Award for Outstanding Public Outreach
1998 Renew America Environmental Sustainability Award
1997 CALSTART Blue Sky Merit Award
1997 Gas Research Institute Product Champion Award
1997 Federal Transit Administration, Administrator's Award
1997 Clean Cities Special Recognition Award, CNG-Powered Street Sweeping Program
1995 Natural Gas Vehicle Coalition, Annual Achievement Award
1995 California Association of Local Economic Developers, Grand Prize Award of Excellence
1994 California Community Colleges, Chancellor's Industry Award
Take a look around

You’ll see natural gas buses, taxis, hydrogen fuel cell vehicles, electric cars, golf carts, e-bikes and more.

Nearly four million visitors come to the Coachella Valley each year. While most play golf, lounge in the sun, shop, play tennis or dine, others come from around the world to learn about alternate fuel vehicles.

Since 1994, when SunLine Transit Agency became the nation’s first public transit agency to switch overnight to a fleet powered entirely by compressed natural gas (CNG), the Coachella Valley has become an interna-

ional center for alternate fuel vehicles.

Much of the credit goes to SunLine’s initial partners: College of the Desert, which developed the nation’s first curriculum for alternate fuel vehicles, and our local utility, Southern California Gas Co., for helping create infrastructure. More credit goes to the 100 stakeholders who actively support the valley’s clean air efforts and its Clean Cities program.

Over the past six years, CNG stations have opened throughout the valley and alternate fuel infrastructure continues to be developed. Factory-equipped electric and CNG vehicles are offered by local auto dealers and AAA offers emergency road service for CNG vehicles.

Now, the desert is the destination of choice for advanced transportation technologies, alternate fuels, research and development, job training and job creation.

SunSweep CNG-powered street sweepers help reduce emissions and harmful PM10 throughout the Coachella Valley.

What does that really mean?

• We ride CNG buses.
• Our trash is picked up by CNG refuse trucks.
• Our streets are swept by CNG sweepers.
• Our cities have alternate fuel vehicles in their fleets.
• Our visitors enjoy clean transportation, too, like CNG taxis, and clean air Ford shuttle vans.

In Palm Springs, you can rent an electric bike by the month. In Palm Desert, park maintenance workers use golf carts powered by hydrogen fuel cells. To help ensure the valley’s air stays clean, SunLine serves as a beta test site for equipment ranging from new alternate fuel engines to a smog-munching catalyst. The trend-setting transit agency is also lead partner in a cooperative program to bring hydrogen fuel cell technology to the marketplace with help from the Coachella Valley Economic Partnership.
Imagine an economy based on the world's most abundant element and the substance most vital to human life. If that sounds like science fiction, keep a close eye on what's happening at SunLine Transit Agency.

In 1994, when SunLine rolled out its compressed natural gas (CNG) fleet, the road to hydrogen loomed long and lonely. Not so today. The trend-setting transit agency is currently leading national projects for the Department of Energy and Federal Transit Administration designed to shorten the path to hydrogen's commercialization. While some transportation industry officials predict hydrogen fuel cell vehicles won’t be viable until 2020, SunLine and its partners hope to have fuel cell buses in service by 2002-3.

To meet that goal, SunLine built and is operating the region’s first hydrogen generation/storage facility and first public-private fueling station; is testing hydrogen vehicles; reforming hydrogen from diesel and natural gas; and working with partners to develop training curriculum to support various vehicle powertrain configurations. There’s more happening in the Palm Springs, CA desert resorts region than anywhere else in the world!

A Collaborative Effort
The following partners play a critical role in advancing hydrogen technology.

**Technology/Industry Partners**
- Clean Air Now
- FIBA Tanks
- Hydrogen Components, Inc.
- Hydrogen Burner Technology
- ISE Research
- Photovoltaics International, LLC
- Siemens
- Stuart Energy USA
- Teledyne Brown Engineering
- XCELLIS (dbb fuel cell engines inc.)

**Government Partners**
- California Air Resources Board
- California Energy Commission
- City of Palm Desert
- Coachella Valley Association of Governments
- Federal Transit Administration
- Palm Springs International Airport
- Riverside County Transportation Commission
- South Coast Air Quality Management District
- State of California
- U.S. Department of Defense
- U.S. Department of Energy

**Education Partners**
- Advanced Transportation Technologies Initiative
- College of the Desert, Palm Desert, CA
- Georgetown University, Washington, D.C.
- Miramar Community College, San Diego, CA
- Schatz Energy Research Center, Humboldt State University
- Southwest Community College, Chula Vista, CA
- University of California Riverside

**Clean Fuel for the 21st Century**

SunLine
32-505 Harry Oliver Trail
Thousand Palms, CA 92276
Phone: (760)343-3456 • Fax: (760)343-3845
Why SunLine?

In 1992, SunLine Transit Agency's board of directors mandated a conversion from diesel buses to a fleet powered by a clean-burning alternate fuel. That decision, reached to preserve the desert's blue skies, may lead to the greatest changes in transportation since the turn of the last century.

SunLine's research revealed three things: in the early '90s, compressed natural gas (CNG) was the most practical technology available; CNG would be a gateway to hydrogen; hydrogen would be the fuel of the future. Although it was not yet commercially viable, hydrogen was deemed to offer every advantage: it is renewable, abundant, economical, clean, proven, highly efficient and domestically produced.

To accomplish its initial conversion to CNG, the agency sought partners. College of the Desert, the local community college, devised training curriculum; Southern California Gas Company, the local natural gas utility, helped build infrastructure. With their help, in 1994, SunLine became the first public transit agency in the nation to switch overnight to a fleet powered 100% by an alternate fuel.

Since then, SunLine has shared information with transit agencies worldwide and has become an international leader in alternate fuels. While proving and enjoying the economic and clean air benefits of CNG, SunLine has concurrently led efforts to commercialize the next generation of alternate fuel vehicles: those powered by hydrogen fuel cells. As it did with CNG, the agency is once again partnering with higher education, manufacturers and research institutions to advance transportation technology. SunLine is also one of just two transit agencies statewide to have been invited to join the California Fuel Cell Partnership.

Generating Hydrogen

SunLine has relocated, redesigned and integrated hydrogen generation projects by Clean Air Now and Schatz Energy Research Center to its Thousand Palms, CA headquarters. The goal of the combined project is to generate hydrogen from a renewable source. A Teledyne Brown electrolyzer will use solar power to convert water to hydrogen and oxygen (which will be vented to the atmosphere). The building will also feature an important educational component; tours will be available for all age groups.

In addition, SunLine envisions a wind-powered generator to test the viability of a second renewable source of energy.

Reforming Hydrogen

Hydrogen can be generated from renewable sources or extracted from hydrocarbons. SunLine is researching all available options. The agency is managing the National Automotive Center's (NAC) nearly $14 million project designed to commercialize on-board diesel reforming technology for the U.S. Army. In addition to its participation in NAC's "21st Century Truck" project, funded by the Department of Defense, SunLine is working with other partners to commercialize a natural gas reformer.

Fueling Station

SunLine's new high-pressure hydrogen dispensing station was designed to accommodate buses, trucks and passenger vehicles. Both Hythane® and pure hydrogen are available to private fleet operators and the general public.

Hydrogen Vehicles

SunLine, the City of Palm Desert, and the U.S. Department of Energy co-own the nation's largest fleet of hydrogen fuel cell vehicles: three park maintenance vehicles and one neighborhood electric vehicle. The fleet is soon to be increased with Ford Ranger F150 trucks powered by hydrogen internal combustion engines and two Hythane® buses (80% CNG, 20% hydrogen). The agency is also road testing an XCELLSIS (formerly dbb fuel cell engines inc.) zero-emission hydrogen fuel cell bus, and a diesel reformer on-board a special "SuperBus" that connects riders from the Palm Springs area to Riverside. SunLine's hydrogen fleet will continue to grow until every CNG bus has been replaced by a fuel cell bus.

CNG, A Bridge to Hydrogen

Over the past five years, SunLine has gained valuable experience using a gaseous fuel. That will simplify the transition to hydrogen. Because its existing (and expanding!) CNG infrastructure can be converted to accommodate hydrogen, conversion expenses will also be lessened.

Hydrogen fuel cell vehicles need a source of hydrogen. Natural gas is the cleanest, most readily available source. When SunLine converts to a fuel cell fleet, having a CNG infrastructure in place will be even more important.
A Synergistic Effort

When attempts were first made to commercialize compressed natural gas (CNG) as a motor fuel, dozens of organizations, universities, transit agencies and manufacturers received grant funds. Most worked independently on their own projects. Many of those projects duplicated efforts while other pieces of the puzzle were completely overlooked.

The lack of coordination among researchers slowed the development of marketable solutions. While that scenario was beginning to repeat itself, that won't now be the case with hydrogen. SunLine Transit Agency is taking a lead role in coordinating efforts for the Department of Energy and the Federal Transit Administration to generate hydrogen from renewable sources and to build a public fueling facility.

Projects by Clean Air Now and the Schatz Energy Research Center (SERC) at Humboldt State University were disassembled, relocated, and integrated into SunLine's Thousand Palms, CA facility. Clean Air Now and SERC contributed technology; SunLine contributed labor, land, management and other resources.

By working together, these organizations have taken years off the clock! The generation/storage/fueling facility is coming to fruition.

A Collaborative Effort

Few public agencies have as much expertise with alternate fuels as SunLine Transit Agency. In 1994, SunLine parked its entire fleet of diesel buses and switched overnight to a fleet powered 100% by compressed natural gas (CNG).

To facilitate the conversion, SunLine partnered with its natural gas utility (Southern California Gas Company) to build a fueling station and with its local community college (College of the Desert) to develop training curriculum for alternate fuels. SunLine also created SunLine Services Group (SSG), a joint powers authority, to perform non-transit services like developing infrastructure and researching new clean fuels technologies. Since then, SunLine has become a popular beta test site for manufacturers including Cummins Engine Company, Detroit Diesel, Engelhard Corporation, John Deere and others.

Because of its extensive experience in translating research into commercially viable products, SunLine is leading this fascinating project. And once again, the agency is collaborating with valued partners to accomplish the task at hand.
Hydrogen from Solar Power

California's first solar hydrogen generation facility is exciting, educational and trend-setting. And it's perfectly located in a desert resort area boasting 350 days of sun per year!

Two units will produce hydrogen from water, then vent oxygen to the atmosphere—a Teledyne Brown electrolyzer capable of producing 40 standard cubic feet of hydrogen per hour and a phase 3 Stuart Energy electrolyzer that produces 1,400 standard cubic feet of hydrogen per hour. The former will test the viability of producing hydrogen from solar power; the latter will operate 24-hours a day for 13 months as an endurance test under a contract with the Department of Energy.

The Stuart Energy electrolyzer is a self-contained unit located next to the new hydrogen generation buildings. The structures house the Teledyne Brown electrolyzer and an educational component that shows hydrogen being produced. Tours are available for all age groups.

To produce hydrogen, the Teledyne Brown electrolyzer requires 7.5 kilowatts per hour (kw/hour). Power will be supplied by 480-feet of raised photovoltaic panels (which, to the delight of SunLine employees, will ultimately create a covered parking structure!) and 200 Siemens solar panels connected to the building. Combined, the panels produce 37 kw/hr. Excess power will be used to operate the building. In the unlikely event solar power is not available, the electrolyzer can draw power as needed off the grid.

As the Teledyne Brown electrolyzer produces hydrogen, it will be stored in mobile storage tanks at low pressure, then fuel the world's largest hydrogen fuel cell fleet: three park maintenance vehicles and one neighborhood electric vehicle jointly owned by SunLine, the City of Palm Desert, and the U.S. Department of Energy. That fleet requires 360 standard cubic feet of hydrogen per day. Soon to be added are Ford Ranger F150 trucks powered by hydrogen internal combustion engines, and two Hythane® buses.

Storing Power

SunLine’s hydrogen storage facility was funded by Clean Air Now and the Coachella Valley Air Quality Enhancement Fund. It consists of a large volume, 16-tube Department of Transportation (DOT) hydrogen storage trailer that will store 104,000 standard cubic feet of hydrogen at 3130 pounds per square inch (psi), and two high-pressure American Society of Mechanical Engineers (ASME) tube tanks that will store an additional 12,500 standard cubic feet at 4000 psi. This storage facility is attached to a cascade system used to fill hydrogen buses and other vehicles. Dispensing will occur at SunLine’s compressed natural gas public fueling island in Thousand Palms.

Because the project generates more hydrogen than can be stored, SunLine will market hydrogen to area customers. The trailer provides a ready distribution system.

Photovoltaic panels collect power for the electrolyzers.

Hydrogen at the Pump

SunLine also debuted the desert’s first public hydrogen fueling station. Funded by Clean Air Now, the station utilizes equipment by Stuart Energy USA and Fueling Technology. It features two hose dispensers: one for pure hydrogen and one for Hythane®, a mixture of hydrogen and compressed natural gas (CNG). The Hythane® dispenser is being specially designed to allow the two fuels to be mixed as they are being pumped.

Short-term, the station will provide fuel for SunLine’s two Hythane® buses and the XCELLSIS (formerly dbb fuel cell engines inc.) fuel cell bus the agency is road-testing. Long-term, SunLine is committed to hydrogen. The agency intends to begin converting its CNG bus fleet to hydrogen fuel cell buses by 2002-2003. The station will ultimately accommodate its hydrogen buses, trucks and passenger vehicles for private fleets.

Related Ventures

Hydrogen can be generated from renewable sources (wind and sun), or extracted from hydrocarbons. SunLine is involved in projects that approach it from every angle.

In addition to its solar project, the agency envisions a wind-powered generator. Sufficient electric power would be produced by the generator and stored in batteries to run the Teledyne Brown electrolyzer for 18 hours. That in turn, would produce enough hydrogen to operate the fuel cell fleet for two days. When the batteries are at full capacity and the wind is still blowing, hydrogen could be produced directly off the wind generator.

In the future, SunLine also hopes to procure a stationary natural gas reformer which uses 3,600 cubic feet of natural gas per hour to produce 4,200 standard cubic feet of hydrogen per hour. SunLine is already the lead agency on a national project designed to commercialize on-board diesel reforming for the National Automotive Center, funded by the Department of Defense.

Project Goals

In all these fascinating projects, SunLine and its partners hope to:

♦ Determine the cost of producing hydrogen from solar, wind, electric, and natural gas sources; and reforming diesel on-board;
♦ Analyze emissions from reforming hydrocarbons;
♦ Learn the efficiencies of solar and wind;
♦ Determine how much hydrogen can be produced and stored;
♦ Determine monthly and yearly operating costs;
♦ Determine, more accurately, various vehicles’ hydrogen fuel needs;
♦ Set safety standards and procedures;
♦ Develop training curriculum;
♦ Educate the public.
A Collaborative Effort

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Because of its extensive experience in translating research into commercially viable products, SunLine was named contract manager for the NAC project. Once again, the agency is collaborating with valued partners to accomplish the task at hand. The University of California, Riverside, College of Engineering Center for Environmental Research and Technology (CE-CERT) is developing technology with Hydrogen Burner Technology and ISE Research. Georgetown University is providing technology consultation. College of the Desert is testing the tractor’s electric propulsion system. SunLine is road testing the hybrid powertrain configuration. And to ensure technicians and operators are properly trained to use the new systems, College of the Desert is developing training curriculum.

Taking it to the Streets

While CE-CERT advances the needed technology, SunLine is gathering data. In the summer of 1999, weighted by sandbags to simulate commuters, SunLine’s “SuperBus” took trial runs from the Palm Springs area to Riverside using the existing diesel engine. Those figures will later be compared with data from the fuel cell-powered bus.

Ultimately, the commercial success of hydrogen will be determined by its ability to work in everyday operations. It is already being used to power the world’s largest hydrogen fleet—three utility vehicles and one neighborhood electric vehicle (NEV) jointly owned by SunLine, the City of Palm Desert, and the U.S. Department of Energy.

In the near future, more vehicles will be tested. SunLine will take delivery of Ford Ranger F150 trucks powered by hydrogen internal combustion engines, two Hythane transit buses, and one XCELLSIS (formerly dbb fuel cell engines inc.) fuel cell bus. The bus with the on-board diesel reformer is slated to be in service by 2002, and in conjunction with its participation in the Department of Energy Clean Airports initiative, the Palm Springs Regional Airport is hoping to convert its electric baggage “tugs” to hydrogen fuel cells.

If successful, this technological odyssey will have an incalculable impact on our military and our society, and of utmost importance to us, to our local community. It will affect our transportation systems, air quality, public health and more.
Tourism to R and D

The Coachella Valley is known internationally as the "golf capital of the world." Each year, four million visitors enjoy the pristine desert environment. How, then, did a tourist mecca become the headquarters of a project designed to convert the U.S. Army's fleet from diesel to clean-burning hydrogen? And why is a prototype on-board diesel reformer being tested on a special SunLine Transit Agency "SuperBus?"

In 1997, representatives of the National Automotive Center (NAC), a division of the U.S. Army Tank-automotive Research, Development and Engineering Center, were looking for a site for the "21st Century Truck" project. They heard about SunLine's experience with compressed natural gas (CNG) and the Coachella Valley's leadership in alternate fuels, and scheduled a visit. The trip was a resounding success.

Many people and organizations, including SunLine and the Coachella Valley Economic Partnership, contributed to that success. But much of the credit is due to the late Congressman Sonny Bono, under whose stewardship funding efforts began, and to Congresswoman Mary Bono, whose tireless efforts have already helped secure nearly $14 million in Department of Defense appropriations.

As a result, the valley's position as a leader in advanced transportation technologies has been greatly enhanced. And the U.S. military is closer to its goal.

Clean Machines for the U.S. Military

Its goal is to identify alternatives to gasoline and diesel for use in military vehicles. The benefits are enormous. Technologies such as fuel cell power and hybrid/electric drive systems will enable the 21st century Army to significantly improve performance while reducing dependency on foreign fuel sources, fuel consumption and emissions.

The Army's goal is to neutralize harmful diesel emissions via an on-board reformer. But logistically, switching to an alternate fuel will be complex. Clearly, the Army operates too many diesel vehicles to replace en masse. And since those vehicles are constantly on the move, stationary reformers are impractical.

The military's best choice may be to transform diesel on existing vehicles while they're moving. To accomplish the conversion, the Department of Defense is funding a national research project dubbed the "21st Century Truck" project to commercialize on-board diesel reformers.

An on-board reformer utilizes a three-step process. First, as a vehicle needs fuel, the reformer extracts hydrogen from the diesel (or any other hydrocarbon). Hydrogen then powers a fuel cell that generates electricity. Ultimately, the vehicle runs on the electricity, a zero-emission fuel.

Project Goals

A comprehensive program, goals of the "21st Century Truck" project include:

- Designing and building an on-board reformer,
- Developing a hybrid electrical control system,
- Installing the technology and road testing it on a 60-foot SunLine "SuperBus," and
- Developing training curriculum.

In early 2002, the on-board reformer will be demonstrated on the Palm Springs-to-Riverside bus that connects desert passengers to cities throughout Southern California via the Metrolink rail system. SunLine contributed two vehicles to the project, valued at $339,000.
The authors wish to thank staff from the following organizations for their technical review of the article before final publication: Clean Air Now (Riverside, California), Gas Research Institute (Chicago, Illinois), INFORM (New York, New York), National Renewable Energy Laboratory (NREL; Golden, Colorado), Natural Gas Vehicle Coalition (Washington, D.C.).

Revised August 1999

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EX ECTIVE SUMMARY

This report details the experiences of two California public transit agencies which replaced aging diesel buses with new compressed natural gas (CNG) buses in 1994. The operating characteristics and costs of 170 natural gas buses were compared with 73 older diesel buses. The natural gas bus fleets have operated well and led to cost reductions in both fleets.

The findings are particularly significant because both Sacramento Regional Transit District (RT) and SunLine Transit Agency have been using the same engine-chassis configuration, thus enabling a valid method to combine cost data for a large sample fleet of buses. The data indicates that labor for diesel equipment was almost twice that for CNG vehicles, parts were 25% more and fuel costs were nearly double.

In 1997, CNG buses saved RT over $1 million in fuel, maintenance, parts and hazardous waste disposal, a 38% per mile reduction over the cost of their diesel buses. This was an approximate cost savings that year of $0.197 per mile over 5.7 million miles with 136 buses. That same year, SunLine’s CNG buses saved over $200,000, a 27% per mile reduction from the cost of RT’s diesel buses. SunLine saved approximately $0.142 per mile over 1.5 million miles with 34 buses.

The incremental capital costs of CNG buses run between $35,000 and $50,000 more per unit. After three years and a combined 22.2 million miles of experience, the payback appears to be realized in approximately six to eight years or 250,000 to 350,000 miles per bus. Lower maintenance costs are attributable to thorough mechanic training and some CNG life-cycle cost reduction because of reduced engine wear.

With the absence of carbon deposits, the CNG engines at both agencies show no signs of needing a mid-life rebuild as usually done with diesel engines at approximately 250,000 miles. The Federal Transit Administration’s standard 12-year replacement cycle could potentially be extended with maintenance practices concurrently improving chassis life expectancy.

Even though new CNG buses were compared to older diesel buses, the data show that the margin of cost reductions continues to grow over diesel. The rate at which diesel expenses climbed from 1995 to 1997 was 16%, while RT’s CNG expenses went up 11% over the same period. This is particularly significant given that RT reduced their diesel fleet by 36% and increased the new CNG fleet by 30% during that time.

Particulate matter and other harmful emissions from CNG buses are greatly reduced over their diesel counterparts. Both Sacramento RT and SunLine have found a win-win in CNG as it is a more economical fuel over diesel and their respective communities enjoy the good citizenship of transit promoting cleaner air.
INTRODUCTION AND BACKGROUND

At the beginning of their respective transitions to alternative fuel, Sacramento RT and SunLine were operating fleets of diesel buses that were reaching significant age and needing replacement. Both public agencies began independent research into the plausible alternatives and each decided upon CNG as the best choice at the given time. It became mere coincidence that they chose the same transit bus manufacturer, chassis and engine configuration, albeit determined in great part by the availability of California Air Resources Board-certified (CARB) engine choices.

While there are known air quality advantages of CNG fuel, what has been missing is a protracted study comparing the maintenance cost impacts of CNG to diesel. Reports at the onset of the alternative fuels movement featured small sample sizes and/or a relative short study of operating periods. The data in this study was collected from a large sample of buses from two transit agencies. CNG versus diesel is compared head-to-head in equal service environments and maintenance practices.

RT first began service in 1973 in the growing Sacramento, California region. RT currently operates in a 418 square mile area serving a population of 1,060,000 with 60 bus routes and light rail. The transit fleet consists of approximately 209 buses and 36 light rail vehicles. RT serves an area that the Environmental Protection Agency has classified as severe non-attainment for air quality and is committed to eventually replacing all diesel buses with buses fueled by lower emission CNG. Ridership on buses and light rail totals approximately 24,802,000 unlinked trips per year. Overall annual operating expense is approximately $55,000,000 for all agency operations.

SunLine first began service in 1977 in the Palm Springs and desert resort region of the Coachella Valley in Southern California. The current population is more than 260,000 and the service area is approximately 406 square miles. Once having the dubious distinction of operating one of the oldest fleets in the country, in 1994 SunLine replaced its entire fleet with CNG buses. Ridership exceeds 3,500,000 per year. The overall annual operating budget is approximately $11,000,000.

Both CNG fleets surpass the 1994 CARB stringent emission standards, primarily in reduction of particulate matter and NOx emissions. Both agencies operate fueling stations on-site. Both systems have had steadily increasing ridership over the last few years.

PROFILE OF FLEETS

In fixed route service, RT operated 136, 40-foot Orion V CNG buses built since 1993. These 136 buses operated approximately 5.7 million miles per year, each averaging about 42,000 miles per year. The 73 bus diesel fleet operated approximately 50 percent less.

SunLine operates a 100% CNG fleet of 34, 40-foot Orion V buses built in 1993 and 5, 29-foot El Dorado buses. For the purposes of this report, only the 34 Orion buses have been compared with RT's buses. Each vehicle averaged about 43,500 miles per year, together nearly 1.5 million miles in annual fixed route service. The study fleet composition is listed in Table 1.

Both agencies operate fully accessible fleets and complementary paratransit services, according to the Americans with Disabilities Act. The common CNG fleet configurations studied in this report are model years 1993/1996 Orion V powered by 6 cylinder Cummins L10G engines, original equipment manufactured for dedicated CNG operation. All buses at both agencies have bike racks to allow for multi-modal travel, wheelchair lifts, and air conditioning, due to extreme summer air temperatures in both regions. The diesel buses are model years 1985/90 Gillig powered by Detroit Diesel 6V92 series engines. These 2-stroke diesel engines are the most common source of bus power in the American public transit system.

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturer</th>
<th>Model</th>
<th>Engine</th>
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</thead>
<tbody>
<tr>
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</tr>
<tr>
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<td>2030</td>
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</table>

METHODOLOGY

This report was prepared by researching the maintenance records and databases of both agencies. RT and SunLine use different computer-based programs to track cost categories and have different philosophies on tracking the work order process as applied to cost allocations. Those differences were manually adjusted in the final analysis and cost breakdown, such that the data could be collated into matching categorical descriptions. It appears that this process was successful as indicated by the final totals for CNG-to-CNG cost performance between the two agencies.

Assumption 1: New buses versus old. It is difficult to quantify the maintenance advantage of a completely new bus in comparison to one that has been aged in service. Certainly, a new diesel bus would show maintenance cost advantages over an old diesel bus, and the new CNG buses are being compared to old diesel. For an agency attempting to discontinue diesel purchases, the CNG cost data can still be used to make comparisons to similar vintage diesel.

All of the buses show increasing annual expense as each of the fleets age. But, the margin of cost reductions of CNG buses over diesel continues to grow, as explained in the Year to Year Costs section (page 6).

Assumption 3: Weight disadvantages of CNG buses. The weight of a CNG bus can be 2500 pounds more than a diesel bus because of the CNG storage cylinders. Yet this did not present a clear problem to either agency and operational cost savings were still substantial. Tire wear was included in the parts category. The intuitive conclusion for increased brake wear due to the reduced rolling resistance was not a problem for either agency. This was due to the nature of the electric traction systems on each, which has its own unique maintenance needs. There was no attribution to maintenance for a roadcall to provide refueling (or "rescue") service because planning strategies have eliminated those type of roadcalls.

Assumption 4: Fuel range impacts. The potential need for interim, reserve fueling was not a problem for either agency; each has its own fueling facilities on site. Yet, this did not present a clear problem to either agency and operational cost savings were still substantial. The only portion of capital investment considered is the incremental cost of bus price over a similar diesel bus. In calculating capital recovery periods, the cost of mid-life rebuild has been omitted. At this point in their maintenance history, mid-life CNG engine rebuilds will not need to occur as with diesel buses, since engine wear is substantially reduced.

Of note, the fuel range on the Orion buses is specified to be at least 350 miles for a diesel bus. Range can be less due to high ambient temperatures combined with CNG heat of compression and air conditioning use. Various management strategies are employed when routes are longer than the range. Rather than using maintenance servicing trucks, a coach operator may drive out to the relief point in a fully-fueled bus and have the relieved operator return to base in the bus lower on fuel. Another scenario may have coach operators exchange buses mid-route when one is traveling back to base. These options would then be reflected in operating cost rather than maintenance cost. Management planning is crucial within the dispatch strategy to think through the mileage and bus range of each line. Dispatchers acknowledge that it is an easy process and soon becomes standard procedure.
DESCRIPTION OF COST CATEGORIES

As was shown in Public Transportation Alternative Fuels: A Perspective for Small Transportation Operations (Booz-Allen & Hamilton, Inc., 1992) use of "gaseous fuels will potentially allow less maintenance and greater engine durability than operation with liquid fuels. This is because of the elimination of formation of deposits on the fuel injector tip, ring grooves, piston bowl and other combustion chamber surfaces. Oil change frequency is longer because of the reduction of formation of acidic products of combustion. Gaseous fuels will not dilute the lubricating oil, accelerating ring, cylinder and bearing wear" (pages 2-62).

Data from both agencies demonstrates this general assessment, as can be seen in the comparison of CNG and diesel maintenance costs (Table 2 and Figure 1). SunLine did not have diesel costs after 1994, since no diesel buses remained in the fleet after that time. RT continued to operate both diesel and CNG vehicles, so both comparative costs are available. Following is a discussion of 1997 statistics in Table 2.

Maintenance Labor. Labor costs were computed for mechanics with chargeable time against a specific bus. Graffiti removal is included by SunLine in the labor and parts categories (body/glass). No administrative time is computed in this cost.

Maintenance Parts. Maintenance parts were consistent for both agencies, although coding for computer input varied somewhat. All parts chargeable to a specific bus were included. In general, categories included: heating/ventilation/air conditioning, body/glass, headsign, wheelchair lift, farebox, brakes, suspension, tires, driveline, cranking/charging, electrical, engine/transmission cooling, preventive maintenance, accident, and vandalism.

<table>
<thead>
<tr>
<th>TABLE 3.</th>
<th>FUEL PRICES (PER GALLON EQUIVALENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CNG</td>
</tr>
<tr>
<td></td>
<td>1995</td>
</tr>
<tr>
<td></td>
<td>1996</td>
</tr>
<tr>
<td></td>
<td>1997</td>
</tr>
</tbody>
</table>

Fuel. The cost of compression (capital, electricity, and maintenance) was not included in the figures of Table 2. RT owns 100% of its fueling facility. SunLine owns 25% of one facility and 90% of another facility. These percentages are used in fuel cost calculations. On Table 3 is a listing of fuel prices for CNG and diesel over the years of the study. While RT's diesel buses averaged 3.51 miles per gallon, their most recent mileage for CNG buses was 3.07 and SunLine's was 3.09 miles per equivalent gallon.

Oil. This category includes only the cost of oil, while other associated preventive maintenance costs (such as the filters and labor), are allocated against parts and labor, respectively. Both agencies have monitored oil quality through independent analysis and are able to extend oil change intervals to 10,000 to 12,000 miles.

Indirect Costs. Indirect costs include "bench stock," overhead, and minor parts such as bulbs, fuses and hoses which are generally low cost and not charged to specific buses. Over several years, these costs can vary dramatically depending on bulk purchases, fleet diversity and specific fleet issues. Although these costs were a minor portion of the overall cost, sometimes varying accounting procedures can affect this type of line item.

MAINTENANCE COST SAVINGS ANALYSIS

FY 1997 Category Costs. RT labor and fuel for the older diesel buses were nearly twice that for CNG buses and parts were 25% more. Indirect costs and oil remained approximately the same during the reporting period, since RT had not yet decreased the frequency of oil changes for the CNG buses. Oil change frequency has since gone from 8,000 miles to 10,000 miles.

For FY97, the data shows that CNG buses saved RT $1,122,900 in fuel, maintenance labor, and parts. This is significant with cost savings of $0.197 per mile over 5.7 million miles with 34 CNG buses. Similar to RT, cost savings are seen in fuel, maintenance, and parts. Oil changes for SunLine did occur every 6,000 miles while the buses were under warranty, and now oil changes are performed every 12,000 miles.

As expected in the data of Table 4, all of the buses showed increasing annual expense as the fleets aged. It is interesting to note that although there were expected cost savings in the first years on CNG due to the warranty coverage, the margin of cost reductions continues to grow over diesel. Figure 2 represents the rate at which costs grew trending costs.

## Table 2: FY 1997 CNG vs. Diesel Cost Per Mile

<table>
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<th>Cost</th>
<th>CNG</th>
<th>RT</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Labor</td>
<td>.087</td>
<td>.111</td>
<td>.198</td>
</tr>
<tr>
<td>Parts</td>
<td>.088</td>
<td>.061</td>
<td>.149</td>
</tr>
<tr>
<td>Fuel</td>
<td>.122</td>
<td>.178</td>
<td>.300</td>
</tr>
<tr>
<td>Oil</td>
<td>.006</td>
<td>.012</td>
<td>.018</td>
</tr>
<tr>
<td>Indirect</td>
<td>.019</td>
<td>.015</td>
<td>.034</td>
</tr>
<tr>
<td>Total</td>
<td>$0.322</td>
<td>$0.377</td>
<td>$0.699</td>
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The total cost per mile differences between the two transit agencies can be attributed to various factors. SunLine has an aggressive preventive maintenance program (PM), and therefore PM costs (labor and materials) account for 23% of the budget, whereas at RT it comprises 16%. This particularly rigorous program is also due in large part to the desert climate of the SunLine service territory, where blowing sand is a daily occurrence and vehicles must be cleaned thoroughly. SunLine also uses each vehicle approximately 3% more than RT in revenue service.

Indirect costs were slightly higher for RT than for SunLine due to the diversity of its fleet, requiring more overhead in bench stock/small parts.

Year-to-Year Costs. Cost savings can be attributed, in part, to the newness of the CNG buses. Any new bus might cost less to maintain than an older model, especially during the manufacturer's warranty period.

As expected in the data of Table 4, all of the buses showed increasing annual expense as the fleets aged. It is interesting to note that although there were expected cost savings in the first years on CNG due to the warranty coverage, the margin of cost reductions continues to grow over diesel. Figure 2 represents the rate at which costs grew by comparing the slope of trending costs. Diesel expenses climbed 16% from 1995 to 1997, while CNG expenses went up 11% over the same period for RT. That is even more significant when considering RT reduced its diesel fleet by 36%, increased the new CNG fleet by 30% over the same time frame, and the diesel buses incurred about 50% less miles each year than the CNG buses.
SunLine had higher expenses in FY95 relative to the next two years that could be attributed to two significant situations. First there was a pressure relief device (PRD) failure in December 1994 that required removal and replacement of PRDs for the total fleet. That event would have contributed a cost of vented fuel loss to depressurize the storage system and increased mechanic time to accomplish the upgrade to newer PRDs (RT upgraded in FY97). Second, in January 1995 SunLine opened a second operating division that required the additional expense of mobile fueling of the fleet until the installation of a fixed-site compressor station.

The significant conclusion depicted here is that the reduced rate of CNG cost growth may indeed be an indicator of lower life cycle costs as addressed in the cost category descriptions and the increasing cost savings shown in Table 5.

### FIGURE 2. TREND COMPARISONS OF COSTS AND SAVINGS

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>RT</td>
<td>157</td>
<td>172</td>
<td>197</td>
</tr>
<tr>
<td>SunLine</td>
<td>81</td>
<td>123</td>
<td>142</td>
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### TABLE 4. YEAR-TO-YEAR COMPARISON TOTAL COST

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<tbody>
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<td>Diesel</td>
<td>RT</td>
<td>447</td>
<td>466</td>
<td>519</td>
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<tr>
<td>CNG</td>
<td>RT</td>
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<td>294</td>
<td>322</td>
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<tr>
<td>SunLine</td>
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<td>343</td>
<td>377</td>
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### TABLE 5. YEAR-TO-YEAR COMPARISON COST SAVINGS

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</tr>
<tr>
<td>SunLine</td>
<td>81</td>
<td>123</td>
<td>142</td>
</tr>
</tbody>
</table>

### ADDITIONAL SAVINGS

Both RT and SunLine are experiencing cost savings in hazardous waste disposal. This can be explained because of fewer oil changes. Since the 4-stroke, spark-ignited engine remains cleaner in the absence of heavy particulate matter, it does not require steam cleaning as often, which in California creates hazardous waste that must be carried away for disposal. In addition, clean-up in the shop and in the parking area is also substantially less. SunLine’s hazardous waste disposal costs have decreased approximately 72% since removal of diesel buses from the fleet. RT’s hazardous waste costs have decreased by one third, but are expected to decrease further as fewer diesel buses make up the fleet.

Road calls have not been compared because of the diversity of reporting procedures between the two agencies. For example, the Federal Transit Administration (FTA) does not specify if a malfunctioning air conditioner is a roadcall, but both agencies count these as road calls because of climatic conditions. Still, neither agency has experienced a significant number of CNG-system related road calls.

The transit industry diesel average is approximately 4,000 miles between road calls for all categories. Even with variances in reporting between the two agencies, the differences are impressive. SunLine’s most recent figures exceeded 29,000 miles between road calls. RT’s most recent figures show the CNG bus average exceeded 8,500 miles compared to 6,200 miles between road calls for their older diesel buses. SunLine’s advantage can be attributed to an innovative practice of a joint inspection by the operator and mechanic when the bus returns from service each day. This reduces the potential of unreported problems producing road calls.

### INCREMENTAL COST PAYBACK

Until the manufacturing volume of CNG buses begins to match that of their diesel counterparts, the incremental cost of a CNG-equipped bus will be higher (currently between $35,000 and $50,000 more per unit). At the rate of savings experienced during the first three years of operation, the payback of the incremental cost would occur about half way through the life of the buses. Table 6 shows the payback calculated at $50,000 incremental cost per unit without consideration of life cycle cost factors.

All information currently gathered indicates CNG will have a favorable reduction in life cycle costs. RT sought to find out whether their fleet would need the mid-life engine rebuild normally required for diesel engines at 250,000 miles. Cummins West, Inc., analyzed internal wear factors to assess engine durability during disassembly of an RT engine which had 296,628 miles. The engine was found to be in very good condition and no problems were discovered which would have prevented it from continuing to operate in the fleet. The internal report noted that the bearings could easily go for double the mileage, the crankshaft was reusable without rework, the pistons were visually in “new” condition, and the oil pump was in excellent condition.

With the absence of carbon deposits, additional life cycle cost savings have resulted as the CNG engines at both agencies show no signs of needing a $3,000 to $4,000 mid-life rebuild.

### TABLE 6. PAYBACK OF INCREMENTAL COSTS

<table>
<thead>
<tr>
<th>Number of Buses</th>
<th>Incremental Cost per Bus</th>
<th>Savings per Year per Mile</th>
<th>Payback* in Years</th>
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<td>SunLine</td>
<td>$50,000</td>
<td>$213,000</td>
<td>$0.142</td>
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* FTA guideline for the planned replacement life of a bus is 12 years or 500,000 miles.
It should be noted that many of these up-front costs of facility modification were incurred for safety reasons and a vast array of choices exist between regulatory jurisdictions in interpreting guidance for the acceptable level of mitigation versus the potential for a hazardous occurrence.

Mechanic training. SunLine's mechanics attended 100 hours of training at College of the Desert (COD), which cost approximately $86,000 in mechanic wages and benefits. RT invested between $27,000 and $30,000 in labor costs to retain their mechanics.

As is the case with any relatively new product, personnel need to be trained in order for the introduction of the new technology to be successful. SunLine and RT firmly believe the positive results shown in this study are directly related to thorough training practices. For training to be effectively implemented there has to be a commitment from top management toward the alternative fuel and acceptance of lost productivity during the transition period.

Costs of New Technology and the Payback. As discussed in the Maintenance Cost Savings Analysis section (page 6), both agencies replaced pressure relief devices which affected expenses. In 1998 following this study, RT began replacing their EDO brand cylinders because of a leakage problem, whereas cylinders usually last 15 years.

The up front costs incurred in fueling and maintenance facilities are not calculated here in terms of payback. Because both agencies have committed to procurement of a growing number of CNG vehicles over time, it would be inaccurate to load the upfront infrastructure costs against the initial vehicles. In SunLine's case, public access infrastructure supports paratransit and non revenue vehicles, as well as a variety of local government vehicles and heavy duty refuse trucks. At RT, their CNG bus fleet is growing each year and their 200+ fleet will be all CNG in the next few years. Both agencies are in natural gas for the long run, and the greater the number of vehicles using the infrastructure, over time, the lower those costs are per vehicle and operating costs per mile.

Maintenance Cost Savings Analysis

As SunLine has done) or by not incurring those costs at all by fueling off-site. Another way of looking at the cost is determining the cost of a diesel fueling facility and its ongoing facility costs.

Use of CNG technology also improves the image of mass transit. Transit buses are usually thought of as belching black smoke, and no driver enjoys being behind a bus in slow moving traffic. CNG buses emit no black smoke particulates, which stain the buses making them appear unattractive, and they are also quieter to operate. This presents a more appealing perspective of bus riding; hopefully encouraging more individuals to use mass transit and take community pride in their transit systems.

In August of 1998, California became the first state in the nation to declare that diesel exhaust is a toxic air contaminant, one that can cause cancer and other diseases. With the growing environmental and health concerns of diesel, both agencies are sending strong messages to the citizens of their communities that alternative fuels help maintain a clean environment. Elected officials at both public agencies share a commitment to use alternative fuels and assist other local partners in using alternative fuels. Such efforts are already occurring with sanitation/refuse haulers, local water districts, car rental agencies, shuttle services, and municipalities. Both agencies are active participants in their regions' U.S. Department of Energy Clean Cities programs.

CNG buses support the local economies of Sacramento as the California state capitol, and the Coachella Valley as an international resort destination. Air quality is an important destination criteria to visitors and residents alike. Both Sacramento RT and SunLine have found a win-win in CNG with significant maintenance savings and emission reductions. It is more economical to power buses on CNG than diesel and both communities take pride in transit's leadership in promoting cleaner air.
The Driving Force in Clean Air Transportation
This past year has been one of the most exciting in SunLine's history! We took seamless transit to new levels by launching SunLink express service to Riverside. From there, passengers can connect to Los Angeles, Orange County and San Diego via Metrolink. The luxury SuperBus coaches are modeled after high-speed trains and come complete with refreshments and computer hookups. We opened the world's first Hydrogen Generation and Education Pavilion built and operated by a transit agency. And in partnership with Pickens Fuel Corp., upgraded our compressed natural gas (CNG) station at the Palm Springs Airport, opened a new station in Desert Hot Springs, and have another under construction in Cathedral City. We think the Coachella Valley now has the greatest concentration of CNG fueling stations per capita in the nation.

With CNG available throughout the desert, it's easy for non-fleet users like local resorts and the convention and visitors authority to operate alternate fuel vehicles. Especially when they can now lease them through SunLine's new SunLease program!

For those reasons and many others, SunLine recently received the state's highest environmental honor, the Governor's Environmental and Economic Leadership Award for Environmental Management. In making the announcement, Governor Davis' office summarized our modus operandi: "SunLine considers clean air central to its mission. Through partnerships with local governments, businesses, and the local community college, the agency has advanced the knowledge of and use of alternative fuel vehicles for California and the nation. According to the California Air Resources Board, SunLine is the biggest advocate of natural gas buses in the state." Make that the biggest advocate of clean air technology in the world!

Our reputation for clean air leadership knows no boundaries. International visits are becoming part of our routine. Transit officials from dozens of countries have toured SunLine's facilities. Recent visitors came to Thousand Palms from China, Chile and Trinidad to learn about CNG and our hydrogen projects; we attended a fuel cell conference in Berlin. While in Germany, we co-founded a worldwide fuel cell partnership. And this past spring, SunLine Maintenance Trainer and Special Projects Supervisor Tommy Edwards represented SunLine and the U.S. government at two conferences on alternate fuel vehicles in Santiago, Chile.

We never forget, however, that our first responsibility is to our riders. To accommodate more group trips and have more SunBuses available for route service, this past year, we added seven barely used CNG buses to our fleet. Plus, to give greater freedom to our passengers with disabilities, we also assumed responsibility for operating SunDial paratransit service. After revamping the existing service, we were able to dramatically shorten the lead-time for rides (from two weeks in advance to same-day service in all zones!) and more than triple the number of rides without expanding the SunDial fleet.

We're also aiding neighboring Imperial County with its transit needs. Since 1997, when we began managing Imperial County Transit (IT), riders have learned they have a safe, comfortable, reliable way to travel throughout Niland, Calipatria, Westmorland, Brawley, Imperial, El Centro, Calexico, Holtville and Winterhaven, and IT ridership has continually increased. We could not have accomplished so much without the support of the community and our staff. Though we've singled out a dozen for special recognition in this annual report, it takes the commitment of each of our 238 employees to provide SunLine's valued services. We give a great deal of credit to our strong partnership with Amalgamated Transit Union Local 1277 and other community and industry partners.

As you can see, our role in the community extends beyond a transporter of people. SunLine is a vital part of the local economy and worldwide clean air movement. We hope you will share our pride in our diverse achievements.

Thanks for your support!
At SunLine Transit Agency, our mission is to provide and expand the Coachella Valley’s innovative public transit services, with a commitment to excellence and environmental leadership. Our goals are to enhance our environment through leadership and technology; to empower a strategic thinking ethic in the team; to pursue partners who compliment our strengths, and to advocate the value of public transit to a vibrant community.

A joint powers authority of all nine valley cities and the County of Riverside, our board includes an elected official from each member entity:

Desert Hot Springs, Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, Indian Wells, La Quinta, Indio, Coachella, Riverside County.

Their commitment to clean air helps SunLine preserve the desert’s blue skies while linking the valley through seamless transit service.

**SunBus**
- 54 bus fleet: 46 CNG, 2 Hythane®, 3 electric, and 3 SuperBuses
- 15 fixed routes; 124 x 16-mile territory
- 3,865,454 total annual ridership; nearly 900 bus stops
- 56,604 average annual miles per bus

**Curb-to-curb transportation for passengers with disabilities**
- 23 vehicles operating 7 days per week with same day service
- Over 65,000 passenger trips

**SunDial**
- Express service weekdays to the Inland Empire
- 3,351 passenger trips since starting February 1, 2000

**Total Ridership**

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<tr>
<td>Ridership</td>
<td>2,869,168</td>
<td>3,029,863</td>
<td>3,486,444</td>
<td>3,760,540</td>
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<td>Increase</td>
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<td>+8%</td>
<td>+15%</td>
<td>+7.8%</td>
<td>+2.8%</td>
</tr>
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**Funding sources:**
- 59% Local transportation funds
- 19% Farebox
- 15% Measure A
- 6% Federal funding
- 1% Other revenue

**Total annual ridership 230,905**
- 752 passengers per day

**Imperial County Transit**

**Community Partnerships of the Desert**

SunLine created the non-profit organization Community Partnerships of the Desert Inc. The area’s Consolidated Transportation Services Agency, CPD coordinates programs such as Vets Express and Foundation for the Retarded which provide almost 30,000 passenger trips per year. CPD also oversees the T.R.I.P. Program. It provides mileage reimbursements to members of the senior and disability communities.

**Award-winning**

Since becoming the first fleet in the nation to convert overnight to a fleet powered 100% by CNG, SunLine has won numerous awards, the highlights of which are listed below. We couldn’t have done it without the help of all our dedicated employees, especially those who were honored throughout the past year.

**2000**
- California Transportation Foundation, 2000 Executive Manager TRANNY Award
- State of California, Governor’s Environmental and Economic Leadership Award
- South Coast Air Quality Management District, Environmental Stewardship Award
- Renew America, Environmental Sustainability Award
- Federal Highway Administration, Outstanding Use of Air Quality Funds
- American Public Transit Association Distinguished Service Award
- SunLine Transit Agency 32-505 Harry Oliver Trail Thousand Palms, California 92276-3501 • Phone 760-343-0436 • www.sunline.org

**1999**
- California Transportation Foundation, 2000 Executive Manager TRANNY Award
- State of California, Governor’s Environmental and Economic Leadership Award
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**1997**
- Federal Transit Administration, Administrator’s Award
- Gas Research Institute, Product Champion Award
- CALSTART Blue Sky Merit Award
- U.S. Department of Energy, Special Recognition Award
- Natural Gas Vehicle Coalition, Annual Achievement Award
- California Association of Local Economic Developers, Grand Prize Award of Excellence
- South Coast Air Quality Management District, Clean Air Award
- California Community Colleges, Chancellor’s Industry Award
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**WORLDWIDE HYDROGEN HEADQUARTERS**

Though it sounds like an exaggeration, there's more being done to advance alternate fuel technology in the Coachella Valley than anywhere else in the world. It all started in 1994, when SunLine became the first public transit fleet in the nation to park all its diesel buses and switch overnight to a fleet operated 100% by clean burning CNG. After the conversion, we began working with manufacturers like Cummins Engine Company, Detroit Diesel, Engelhard Corporation, John Deere and others as a beta test site for equipment innovations. Because of our extensive experience in translating research into commercially viable products, we were tapped by the U.S. Department of Energy to coordinate several projects designed to commercialize hydrogen motor fuel.

On April 28, 2000, a long-time dream became reality. SunLine opened the first hydrogen generation/education/storage/dispensing facility in the world to be built and operated by a transit agency. We are presently generating hydrogen from renewable sources, deploying Hythane® buses (which use 80% CNG/20% hydrogen), and have begun road testing an XCELLIS® (formerly dbb fuel cell engines, inc.) ZEbus, a zero-emissions fuel cell bus. SunLine co-owns the nation’s largest fleet of hydrogen fuel cell vehicles (three park maintenance vehicles and a neighborhood electric vehicle). And at a recent conference in Berlin, we founded the world’s first International Fuel Cell Consortium along with XCELLIS®, Ballard Automotive, and Empresa Metropolitana de Transportes Urbanos (E.M.T.U.), our new transit partners in Sao Paulo, Brazil.

SunLine is also managing a $14 million project for the National Automotive Center (N.A.C.) to commercialize on-board diesel reforming technology for the U.S. Army. In addition to its participation in N.A.C.'s "21st Century Truck" project, funded by the Department of Defense, we’re working with other partners to commercialize a natural gas reformer.

Our partners include the Department of Defense, Department of Energy, Department of Transportation, Federal Transit Administration, Clean Air Now, Schatz Energy Research Center at Humboldt State University, California Energy Commission, the California Fuel Cell Partnership, University of California Riverside, and College of the Desert (plus many others!).

We believe hydrogen is the fuel of the 21st century, and are dedicated to advancing its commercialization. The implications are staggering. The changes in transportation alone will likely be the most significant since the turn of the last century!

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**Clean Cities**

**Sunline Services Group** (SSG), a separate joint powers authority, provides operational services to members and by generating revenues, helps support public transit.

**SunSweep**

The millennium started with a roar. This year has been one of the windiest on record, so the 11 CNG-powered regenerative air street sweepers operated overtime, cleaning over 59,000 road miles on four routes. New CNG-powered water and dumptrucks aided the effort. Annual air quality benefits include the reduction of NOx and harmful airborne PM 10 (fine particulate matter), and the elimination of tens of thousands of cubic yards of organic debris—most of which would be ground by traffic into PM 10. And because the street sweepers are also used for clean up after windstorms, over 6,000 cubic yards of sand were removed from the transportation system. That sand is used to rebuild habitat for the environmentally threatened fringe-toed lizard.

**Graffiti Removal**

Since SunLine performs maintenance at nearly 900 bus stops throughout the desert, it was a natural progression for SSG to start marketing the service. Now, when graffiti is discovered anywhere in the City of Palm Desert, or in unincorporated areas of Riverside County, SunLine removes it immediately. Services include power washing, paint matching and sandblasting and are available by contract to member entities.

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**SunBus Network**

SSG is a retailer of compressed natural gas (CNG) motor fuel. Public stations in Cathedral City, Desert Hot Springs, Indio, the Palm Springs International Airport, and Thousand Palms, are being operated in partnership with Pickens Fuel Corp. In addition, a 60-foot tanker truck with a mobile compressor delivers fuel to other locations, such as the United States Postal Service. With 190 CNG vehicles, it's the largest alternative fueled fleet in the desert.

**Sunline Regulatory Administration**

As the Coachella Valley regulator of the taxi industry, SRA is responsible for protecting the passengers of 165 taxicabs. It is also helping clear the air by leasing seven CNG-powered taxis to local operators. The vehicles are factory-equipped Ford Crown Victorias owned by SRA.

**CLEAN CITIES**

**Sunline** leads the Coachella Valley’s award-winning Clean Cities Program and provides the region’s local coordinator. Sponsored by the U.S. Department of Energy (DOE), Clean Cities promotes the objectives of the Clean Air Act and the use of alternate fuels. Since the valley earned its designation in 1996, over $25 million has been invested locally in alternate fuels and advanced transportation. The region has earned national awards for its public outreach efforts and for leveraging the most grant funds for alternate fuel projects.