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BERKELEY NATIONAL LABORATORY
Environmental Energy Technologies Division, Energy Analysis Dept., 1 Cyclotron Road, MS 90-2000, Berkeley, CA 94720

July 9, 2002

To: Chris Scruton (CEC)
From: Steve Wiel
Subject: Quarterly Progress Report for Second Quarter 2002
CC: Hashem Akbari, Paul Berdahl, Andre Desjarlais, Bill Miller, Ronnen Levinson

Please review this progress report in conjunction with the attached list of Tasks and Deliverables.

HIGHLIGHTS

- The project kick-off meeting was held in Sacramento on May 16, 2002.
- Akbari and Desjarlais attended the CRRC meeting at Las Vegas.
- The ORNL subcontract was processed in June 2002.

Tasks

1.1 Attend Kick Off MeetingOn May 16, 2002, we held our project kick-off meeting at the CEC office in Sacramento. The approved list of project tasks and schedules from this meeting is appended as Attachment 1 with % completion noted. The approved schedule of meetings is appended as Attachment 2. **This Task is completed.**

1.2 Describe Synergistic Projects
In an earlier communication with CEC, we provided a description of related projects at ORNL and LBNL. **This Task is completed.**

2.1 Establish the project advisory committee
An initial list of the PAC members had been prepared in February 2002. We updated the list with potential new candidates (Attachment 3). Many of the potential candidates were contacted and several have agreed to serve on the PAC. We have also contacted several of our potential industrial partners; all showed interest to participate in the project. A list of industrial partners is appended as Attachment 4. Akbari prepared several draft memos on behalf of our industrial partners detailing their commitments to the LBNL/ORNL project team and stating their understanding of commitments made to them by the LBNL/ORNL project team. An example of such a draft memo is appended as Attachment 5. The partners are reviewing the memos and are planning to finalize them in July and August.

2.2 Software standardization
(no activity)

2.3 PAC meetings

We prepared schedules for all PAC and CPR meetings (see Attachment 2).

2.4 Development of cool colored coatings
Berdahl and Levinson visited the BASF facilities. BASF has verbally agreed to lend a few necessary laboratory tools to LBNL.

2.4.1 Identify and Characterize Pigments with High Solar Reflectance
(no activity)

2.4.2 Develop a Computer Program for Optimal Design of Cool Coatings
(no activity)

2.4.3 Develop a Database of Cool-Colored Pigments
(no activity)

2.5 Development of prototype cool-colored roofing materials

2.5.1 Review of Roofing Materials Manufacturing Methods
This task is started by contacting our potential industrial partners and reviewing literature information.

2.5.2 Design Innovative Methods for Application of Cool Coatings to Roofing Materials
(no activity)

2.5.3 Accelerated Weathering Testing
(no activity)

2.6 Field-testing and product useful life testing

2.6.1 Building Energy-Use Measurements at California Demonstration Sites
Akbari contacted Habitat for Humanity (HfH) for potential monitoring sites.

2.6.2 Materials Testing at Weathering Farms in California
(no activity)

2.6.3 Steep-slope Assembly Testing at ORNL
(no activity)

2.6.4 Product Useful Life Testing
(no activity)

2.7 Technology transfer and market plan

2.7.1 Technology Transfer
(no activity)

2.7.2 Market Plan
(no activity)

2.7.3 Title 24 Code Revisions
Akbari attended a CEC workshop on May 30.

Management Issues

- The ORNL subcontract from LBNL was processed and is active. Funding was received by ORNL in late June, and effort can start in July 2002.

Attachment 1

Project Tasks and Schedules (*Approved on May 16, 2002*)

Task	Task Title and Deliverables	Plan Start Date	Actual Start Date	Plan Finish Date	Actual Finish Date	% Completion as of Jun 30, 2002
1.1	Attend Kick Off Meeting *Deliverables:* • Written documentation of meeting agreements and all pertinent information (**Completed**) • Initial schedule for the Project Advisory Committee meetings (**Completed**) • Initial schedule for the Critical Project Reviews (**Completed**)	5/16/02	5/16/02	6/1/02	6/10/02	100%
1.2	Describe Synergistic Projects *Deliverables:* • A list of relevant on-going projects at LBNL and ORNL (**Completed**)	5/1/02	2/1/02	5/1/02	5/1/02	100%
1.3	Identify Required Permits	N/A		N/A		
1.4	Obtain Required Permits	N/A		N/A		
1.5	Prepare Production Readiness Plan	N/A		N/A		
2.1	Establish the project advisory committee *Deliverables:* • Proposed Initial PAC Organization Membership List (**Completed**) • Final Initial PAC Organization Membership List • PAC Meeting Schedule (**Completed)** • Letters of Acceptance	6/1/02	5/17/02	9/1/02		60%
2.2	Software standardization *Deliverables:* • When applicable, all reports shall include additional file formats that will be necessary to transfer deliverables to the CEC • When applicable, all reports shall include lists of the computer platforms, operating systems and software required to review upcoming software deliverables	N/A		N/A		

Project Tasks and Schedules (contd.)

Task	Task Title and Deliverables	Plan Start Date	Actual Start Date	Plan Finish Date	Actual Finish Date	% Completiona s of Jun 30, 2002
2.3	PAC meetings *Deliverables:* • Draft PAC meeting agenda(s) with back-up materials for agenda itemsFinal PAC meeting agenda(s) with back-up materials for agenda itemsSchedule of Critical Project ReviewsDraft PAC Meeting Summaries • Final PAC Meeting Summaries	9/1/02		6/1/05		
2.4	Development of cool colored coatings					
2.4.1	Identify and Characterize Pigments with High Solar Reflectance *Deliverables:* • Pigment Characterization Data Report	6/1/02	6/1/02	12/1/04		< 2%
2.4.2	Develop a Computer Program for Optimal Design of Cool Coatings *Deliverables:* • Computer Program	11/1/03		12/1/04		
2.4.3	Develop a Database of Cool-Colored Pigments *Deliverables:* • Electronic-format Pigment Database	6/1/03		6/1/05		
2.5	Development of prototype cool-colored roofing materials					
2.5.1	Review of Roofing Materials Manufacturing Methods *Deliverables:* • Methods of Fabrication and Coloring Report	6/1/02	6/1/02	6/1/03		< 2%
2.5.2	Design Innovative Methods for Application of Cool Coatings to Roofing Materials *Deliverables:* • Summary Coating Report • Prototype Performance Report	6/1/02		12/1/04		
2.5.3	Accelerated Weathering Testing *Deliverables:* • Accelerated Weathering Testing Report	11/1/02		6/1/05		

Project Tasks and Schedules (contd.)

Task	Task Title	Plan Start Date	Actual Start Date	Plan Finish Date	Actual Finish Date	% Completion as of Jun 30, 2002
2.6	Field-testing and product useful life testing					
2.6.1	Building Energy-Use Measurements at California Demonstration Sites *Deliverables:* • Demonstration Site Test Plan • Test Site Report	6/1/02		10/1/05		
2.6.2	Materials Testing at Weathering Farms in California *Deliverables:* • Weathering Studies Report	6/1/02		10/1/05		
2.6.3	Steep-slope Assembly Testing at ORNL *Deliverables:* • Whole-Building Energy Model Validation Presentation at the Pacific Coast Builders ConferenceSteep Slope Assembly Test Report	6/1/02		10/1/05		
2.6.4	Product Useful Life Testing *Deliverables:* • Solar Reflectance Test Report	5/1/04		6/1/05		
2.7	Technology transfer and market plan					
2.7.1	Technology Transfer *Deliverables:* • Publication of results in industry magazines and refereed journal articles • Participation in buildings products exhibition, such as the PCBC • Brochure summarizing research results and characterizing the benefits of cool colored roofing materials	6/1/03		6/1/05		
2.7.2	Market Plan *Deliverables:* • Market Plan(s)	5/1/05		6/1/05		
2.7.3	Title 24 Code Revisions *Deliverables:* • Document coordination with Cool Roofs Rating Council in monthly progress reports • Title 24 Database	6/1/02	5/16/02	6/1/05		< 5%

Attachment 2

Schedules of Meetings

	Meeting	**Date**
1.	Project Kick-off Meeting (completed)	May 16, 2002
2.	Project Advisory Committee Meeting 1 (PAC1)	September 5, 2002
3.	Project Advisory Committee Meeting 2 (PAC2)	March 6, 2003
4.	Project Advisory Committee Meeting 3 (PAC3)	September 4, 2003
5.	Critical Path Review Meeting 1 (CPR1)	October 3, 2003 (or September 5, 2003)
6.	Project Advisory Committee Meeting 4 (PAC4)	March 4, 2004
7.	Project Advisory Committee Meeting 5 (PAC5)	September 2, 2004
8.	Critical Path Review Meeting 2 (CPR2)	October 7, 2004 (or September 3, 2004)
9.	Project Advisory Committee Meeting 6 (PAC6)	March 3, 2005
10.	Project Final Meeting	October 6, 2005

Attachment 3

Potential PAC Members

PAC MEMBER	SECTOR	PAC CONTACT	TEL	E-MAIL	PROJECT CONTACT	TEL	E-MAIL	COMMENTS
American Roof Tile Coating	Tile coating manufacturer				Akbari	510-486-4287	h_akbari@lbl.gov	
ASHRAE		Bruce Hunn	404-636-8400 X500	bhunn@ashrae.org	Akbari			5/23: Contacted and mailed a copy of prop. Interested, get back to me. 6/25: (ASHRAE), Bruce is worried that he may not have the time.
Asphalt Roofing Manufacturers Association		Russ Snyder	301-348-2014	rsnyder@kellencompany.com	Desjarlais	865-574-0022	yt7@ornl.gov	Tom Shallow (representing ARMA) contacted. He will inquire with the ARMA BOD if they are interested and will get back to us.
California Air Resources Board		Kim Horay-Rogalski David Mallory	916-327-2200 916-322-5911		Akbari	510-486-4287	h_akbari@lbl.gov	5/24: Talked to Mallory; will get back to me.
California Institute for Energy Efficiency		jim Cole	510-287-3320	jwcole@lbl.gov	Akbari	510-486-4287	h_akbari@lbl.gov	5/22,5/23: Agreed to serve on PAC
Cool Roofs Rating Council		Noah Horowitz	415-777-0220	nhorowitz@nrdc.org	Desjarlais/Akbari	865-574-0022	yt7@ornl.gov	5/22,5/23: Agreed to serve on PAC
DOE Building America		George James		george.james@ee.doe.gov				
DuroLast	Single-Ply Membrane	Paul Knox	800-248-0280	engineering@duro-last.com	Akbari	510-486-4287	h_akbari@lbl.gov	Paul Knox has left DuroLast!
EPA Air Pollution Control		Jack Colbourn	415-947-4109	colbourn.jack@epa.gov	Akbari	510-486-4287	h_akbari@lbl.gov	5/22: Agreed to serve on PAC
EPA Energy Star		Steven Ryan	202-564-1254	Ryan.Steven@epamail.epa.gov	Akbari	510-486-4287	h_akbari@lbl.gov	5/22: contacted Rachel; responded EPA is cutting back on Cool Roof. Cotanct Steve Ryan. 7/2: Called Ryan; agreed to serve on the PAC

Habitat for Humanity		Archie Mulligan, Executive Director	T916-456-9543 F916-456-5449	hfh@calweb.com	Akbari	510-486-4287	h_akbari@lbl.gov	6/18: Talked to Archie. Very cooperative and agreed to serve on the PAC. 5/24: Got a list of leader at HoH. Need to contact them.
MCA	Tile	Yoshihiro Suzuki	909-736-9590		Akbari	510-486-4287	h_akbari@lbl.gov	5/22: Contacted Yoshihiro. He likes to be an industrial partner
National Association of Home Builders								
Roof Tile Institute (Old name: National Concrete Tile Manufacturers Assn)	Concrete Tile Manufacturers	Rick Olson	541-741-7585		Desjarlais	865-574-0022	yt7@ornl.gov	Rick Olson of the Roof Tile Institute contacted; they want to participate in the PAC and maybe as a partner. Will try to identify contact person from manufacturer as partner.
National Roofing Contractors Association	Roofing Contractors	Mark Graham	847-299-9070	mgraham@nrca.net	Desjarlais	865-574-0022	yt7@ornl.gov	
RCMA	Coating Manufacturers	Joe Hobson		jhobson@kellencompany.com	Desjarlais	865-574-0022	yt7@ornl.gov	Joe Hobson of RCMA contacted. He will inquire with the RCMA BOD if they are interested and will get back to us.
Bay Area Air Quality Mgmt District	Public Interest	Mike Rothenberg	415-749-4668	mrothenberg@baaqmd.gov	Akbari	510-486-4287	h_akbari@lbl.gov	5/22: Mike agreed to serve on PAC, pending his boss's approval
South Coast Air Quality Mgmt District	Public Interest				Akbari	510-486-4287	h_akbari@lbl.gov	
SPRI	Single-Ply Manufacturers	Dave Roodvoets	614-890-6317	davelee@ix.netcom.com	Desjarlais	865-574-0022	yt7@ornl.gov	Dave Roodvoets of SPRI contacted. He will inquire with the SPRI BOD if they are interested and will get back to us.

Attachment 4

Potential Industrial Partners

INDUSTRY PARTNER	SECTOR	INDUSTRY CONTACT	TEL	E-MAIL	PROJECT CONTACT	TEL	E-MAIL	COMMENTS	Contact Logs
GAF	Shingle	Helene Pierce	973-628-3000	Hpierce@gaf.com	Akbari	510-486-4287	h_akbari@lbl.gov		Playing Tel Tag with Helene. Agreed to be a partner. A draft letter of understanding was mailed on June 6.
3M Minerals	Granule manufacturer	Uyen Tang, John Youngk, Peter Fleming	651-733-5074	PBFelming1@mmm.com	Akbari	510-486-4287	h_akbari@lbl.gov		5/22, 5/23: Confirmed interest to be a partner. Waiting for a draft letter of understanding from Hashem. A draft MOU was mailed on June 6.
BASF	Metal roofing	Robert Scichili	972-234-0180	scichir@basf.com	Desjarlais & Akbari	865-574-0022	desjarlaisa@ornl.gov	has new cool colors for metal roofing	5/22, 5/23: Confirmed interest to be a partner. Waiting for a draft letter of understanding from Hashem. A draft MOU was mailed on June 6.
Elk Manufacturing	Shingle	Lou Hahn	972-872-2293	lhahn@elkcorp.com	Desjarlais	865-574-0022	desjarlaisa@ornl.gov	Shingle manufacturer possibly interested in collaboration	
Ferro	Pigments	Kenneth Loye	216-750-7511	loyek@ferro.com	Desjarlais & Akbari	865-574-0022	desjarlaisa@ornl.gov	Manufactures IR Pigments	5/22, 5/23: Confirmed interest to be a partner. Waiting for a draft letter of understanding from Hashem. A draft MOU was mailed on June 6.
ISP Minerals	Granule manufacturer	Ingo Joedicke	301-714-1481	ijoedicke@ispcorp.com	Akbari	510-486-4287	h_akbari@lbl.gov		5/22, 5/23: Confirmed interest to be a partner. Waiting for a draft letter of understanding from Hashem. A draft MOU was mailed on June 6.
Shepherd Color Company	Pigments	Jeffrey Nixon	513-874-0714	jnixon@shepherdcolor.com	Desjarlais	865-574-0022	desjarlaisa@ornl.gov	Manufactures IR Pigments	Met with Jeff Nixon on June 11. Agreed to be an industrial partner.
MCA	Tile	Yoshihiro Suzuki	909-736-9590	ysuzuki@mca-tile.com	Akbari	510-486-4287	h_akbari@lbl.gov	Manufactures of Colored Clay Tiles	5/22, 5/23: Confirmed interest to be a partner. Waiting for a draft letter of understanding from Hashem. A draft MOU was mailed on June 6.

Attachment 5

Example of a Draft Letter on Industrial Partner Commitment

Company's Letter Head

<date>

Hashem Akbari
Heat Island Group
Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 90-2000
Berkeley, CA 94720

Subject: Participation of GAF in the Project to Develop Cool Roofing Materials

We applaud the leadership of the California Energy Commission in sponsoring a project to develop cool colored roofing materials. We are very excited about this project and would like to contribute to it as an industrial partner.

This project offers us an opportunity to expand our collaboration and bring new cool products to the market. We expect to collaborate on Project Tasks 2.1, 2.2, and 2.3 specified in the June 6, 2002 CEC/LBNL/ORNL document. The following will be the nature of collaboration under each task and sub-task (*task language:* GAF participation).

Task 2.1: Development of cool colored coatings

1. *Identify and characterize the optical properties of several standard and innovative pigmentation materials*: through our granule manufacturing partner, we will provide samples of pigments, binders, and paints used to coat roofing granules.
2. *Develop a computer model to maximize the solar reflectance of roofing materials for a choice of visible colors*: we will review the input and output of the computer program to ensure its applicability to granule coating.
3. *Create a database of characteristics of cool pigments*: we will review the attributes of the database and provide comments to ensure its applicability to granulate coating.

Task 2.2: Development of Prototype Cool-Colored Roofing Materials

1. *Compile information on roofing materials manufacturing methods*: we will provide non-proprietary information for manufacturing colored shingles. The information will assist LBNL and the granule manufacturers to develop innovative engineering methods for application of cool-colored coatings on shingles. We will review reports prepared by the project staff and provide comments. In some cases, we would like to co-author writing technical reports.
2. *Work with roofing manufacturers to design innovative production methods for cool-colored materials*: we will closely work with the project team to investigate innovative coating methods for shingles, apply them on roofing shingles, and have them measured and characterized at LBNL. Once a promising method has been identified, we will produce small quantities of roofing shingles for testing.
3. *Test the performance of materials in accelerated weather-testing facilities*: we understand that the objective of this effort is to ensure, prior to marketing, that the new materials retain their intended physical and optical characteristics. With that intention, we will

participate in multiple and rigorous product testing trials that may include production of enough quantities of shingles that allows us to do accelerated testing at our own facilities, at facilities of some of our customers that manufacture roofing shingles, and at other test sites in California. The information generated under this project will help the project team better understand the stability of shingles before marketing.

Task 2.3. Field testing of performance and product useful life testing

1. *Monitor building at California demonstration site to measure and document the energy improvement of cool-colored roof materials*: once we have products successfully tested at our laboratory and our accelerated testing facilities, we will produce enough roofing shingles covering up to five houses. We also supply the same quantity of standard-color roofing shingles. ORNL/LBNL will test the energy performance of the new roofing product. We will closely participate in reviewing the results of the monitoring project.
2. *Conduct material testing at weathering farms in California*: some of the materials produced in collaboration with our granule manufacturer partner under Task 2.3.1, will be shipped to California to be installed in weathering farms. We will closely review the results of the stability and degradation tests conducted at the weathering farms.
3. *Conduct thermal testing at the ORNL steep-slope assembly testing facilities (SSAT)*: In collaboration with our granule manufacturer partner, we will also ship test segments to ORNL to be tested at their SSAT. We will closely review the results of the tests at SSAT and provide input.
4. *Conduct accelerated product useful life testing*: we hope to obtain enough technical data to prove cool roofs last longer. In this task we will participate in the accelerated testing of standard and cool-colored shingles of the same color and measure physical, mechanical strength, and thermal characteristics of the paired products. Most of the accelerated testing will be performed at our facilities and those of our shingle manufacturer partner. LBNL and ORNL will conduct the scientific testing of the products.

Task 2.4. Technology transfer and market planning

We hope that this partnership will bring cool-colored shingles to market by the end of this project. Upon the completion of this project, we hope to be able to embark large-scale demonstrations in a few residential developments in California.

In addition to the above participation efforts, as an industrial partner to the project, we will attend the regular project meetings and the meetings of the Project Advisory Committee currently scheduled for every six months.

In this collaboration, we will assign a lead technical staff to the project. We anticipate that over the next three years, about xxx FTE (full-time-equivalent) person at our facilities will work on this project. Our total estimated in-kind contribution (staff, sample production, testing, etc.) to the project over the next three year will add up to about $xxx ($yyy/year).

We understand that most of the information provided by us to the project team will be non-proprietary. In cases where we will provide or receive proprietary information, we will participate in a non-disclosure agreement.

Once more, we are very excited about this project and we hope that soon all California buildings will soon have economical cool options for their roof.

Sincerely,

Company Representative