This report contains a summary, detailed minutes of the June 13, 2012 Pacific Energy Center Architectural Curriculum Advisory Panel meeting, and results from an associated post-meeting survey.
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Executive Summary

Findings:

*Integrated Design and Current Practice:* The Architectural Curriculum Advisory Panel found that architects have little opportunity to learn or practice integrated design and integrated design management. Integrated design trainings need to reach all members of the design team as well (Structural, Mechanical, Civil engineers, clients and the community etc.). Similarly, contractors are essential to the integrated design process, but the design, bid, build delivery method limits contractor input. Owners and developers need very convincing evidence to employ a fully integrated design/construction team, which is seen as an unfamiliar and potentially costly process.

*Current PEC Curriculum Offerings:* The Pacific Energy Center Architecture curriculum provides baseline technical and building science training. However, current PEC offerings do not sufficiently address process and management skills required for a robust integrated design, construction, and operations team. Neither do PEC trainings provide information on the financial benefits and cost savings possible with an integrated team.. Current architectural practitioners do not know how to readily “translate” the *status quo* into an integrated design process. Architects need clear trainings on how to transition current processes to an integrated model. All three categories, technical, cost, and management process need to be addressed jointly in the coursework in evidence based, data driven format.

*Certifications, Incentives and Mandates:* The Committee had mixed responses about certification and incentives for architectural education. All agree that incentives *could* move the market, especially if they better addressed owner concerns. Nevertheless, the group found that without a state mandate for architectural education the current division between architects who focus primarily on aesthetics and architects known for their technical/performance prowess will only grow. A mandate is the only way to assure design practitioners are gaining the knowledge necessary to implement the goals outlined in the *Long Term Strategic Plan* and, for that matter, baseline code compliance.

Recommendations:

1) Support the development of data driven, case study based integrated design courses combining, management, cost principles, and technical subject matter directed at architects and associated design and construction professionals. These case studies must be in-depth, strongly supported by *data*, and convincingly illustrate how a successful integrated design process leads to cost-effective higher building performance and a better environment for occupants.

2) Develop a path to a mandate including incentives. Incentives will encourage early adopters and the mandate will pick up late adopters.

3) Develop a path to engage architects, but also other engineering and construction professions, in integrated design education.
On June 13, 2012 PG&E’s Pacific Energy Center (PEC) assembled a group of energy efficiency, architecture, and training experts to advise in the establishment of “a multi-level architecture and integrated design curriculum that responds to the priorities laid out in the California Long Term Energy Efficiency Strategic Plan, as well as the California Workforce
This Advisory Panel met to brainstorm future course directions offered through the PEC, other California utilities, or outside partners. The panel discussed the need for, and possible impact of, programs certifying architects as 'low energy designers'. The panel advised that ‘mandates’, such as, building code updates, and new license renewal requirements would be the most effective in achieving energy efficiency educational goals in the design community. Additional areas, important to the building design community are their evolving needs for 3 to 5 years in the future, and how to get buy-in from the profession for energy efficiency and integrated design education.

The fundamental questions for the day were:

1. In the face of many years of California leadership in energy efficiency, increasingly stringent code progressions and new statewide zero net energy targets, how do you provide architects with the necessary skill set to keep up with the pace of change?
2. What specific topics most need to be addressed in educational programs if architects are to design buildings with high likelihood of delivering very low operational energy use?
3. Are there specific drivers that will increase the likelihood of architects participating in such programs?
4. Would forms of certification, for example an ‘energy performance architect’ accreditation or the addition of new requirements for licensure and licensure renewal, deliver improved building energy performance?
5. Are there issues and questions not raised by the meeting organizers that you would like to bring to our attention?

Several weeks after the advisory council meeting participants responded to a survey (see appendix 4).
ORGANIZATION OF THE WORKSHOP

The workshop was organized to encourage discussion, promote the flow of ideas, and create opportunities for participants to raise issues not previously anticipated by the organizers. Following introductions, the workshop opened with an introductory presentation by the organizers to provide background on California energy policy and goals. Two facilitated group exercises followed, focusing on what factors are most important in delivering high-performance, low-energy buildings across client groups. The exercises were based upon small group discussion, followed by a brief presentation, and then whole group discussion and recommendations. This format was modeled after architectural design team presentations.

The third exercise focused on identifying the underlying principles of an integrated design curriculum with specific training topic suggestions. Finally the PEC presented a draft integrated design curriculum proposing possible classes and learning tracks for feedback from the meeting participants. Each small group was asked to propose a specific integrated design curriculum course.

Summaries, final thoughts and potential future steps concluded the meeting.

The meeting facilitator was Richard C. Diamond. Mr. Diamond is a Staff Scientist and Deputy Group Leader of the Energy Performance of Buildings Group at Lawrence Berkeley National Laboratory and has facilitated a number of meetings for the California Public Utilities Commission on the Zero Net Energy Action Plan. The complete workshop agenda follows below.

This was a highly interactive event where many questions were asked and much discussion ensued. In the report that follows we provide a summary of each part of the workshop, conclusions drawn by the organizers, and next steps. To provide an accurate picture of the day, in each section we include comments from event participants that were captured by Resource/Refocus.
Workshop Agenda

9:00 am to 9:15 am:  Introductions

9:15 am to 10:15 am Introductory Presentation Providing Meeting Background
- Review of the Zero Net Energy Goals of the Long Term Energy Efficiency Strategic Plan
- Review of integrated design educational goals from Strategic Plan and review of recommendations for workforce education of professionals in the Needs Assessment.
- Brief review of requirements of Assembly Bill 32, the California Global Warming Solutions Act of 2006, which sets an economy-wide cap on California greenhouse gas emissions at 1990 levels by no later than 2020 an 11 percent reduction from current emissions levels.
- Summary of how energy is used in California and in California buildings.
- Short review of upcoming 2013 Title 24 requirements and how they compare to the current 2008 standards.

10:15 am to 10:30 am BEVERAGE BREAK

10:30 am to 12:00 pm Defining Design Team Skills/Three Scenarios
- Divide into two or three smaller groups and work through Exercises #1 and #2.
- Present and discuss group recommendations.

12:00 pm to 1:00 pm LUNCH

1:00 pm to 2:00 pm Principles and Needs of an Integrated Design Curriculum
- Small groups work through Exercise #3.
  o Define underlying principles that should be included & suggest specific topics
  o Discuss implications of group recommendations for development of individual classes and a multi-tiered curriculum.
- What is the place of voluntary certification and/or mandated training requirements? What would drive support for this type of certification among employers and/or building owners? What organizations might offer such a certification? How would this differ from existing continuing programs – AIA, GBCI, CEPE, CEA?

2:00 pm to 2:15 pm BREAK

2:15 pm to 3:30 pm Continuation of Exercise #3
- Present and discuss group recommendations.
- Specific course recommendations from groups
- Delivery of integrated design education

3:30 pm to 3:45 pm BREAK

3:45 pm to 4:45 pm Review of Draft Curriculum Developed by the Pacific Energy Center.
- Discuss the approach of the draft curriculum
  o Fundamentals track
  o Multiple advanced tracks on specific topics such as lighting, enclosure, HVAC approaches
- What should our curriculum development goals be for the next year and for the next three years?

4:45 pm to 5:00 pm Final Comments, Questions, Thoughts for the Future
INTRODUCTIONS AND LIST OF PARTICIPANTS

A list of PEC 2012 Advisory Panel Workshop participants and their affiliations follows below.

Practitioners

1. David Israel / BAR Architects
   Mr. Israel is a principal at an 85-person San Francisco based architectural, interior design, and planning firm involved in a range of nonresidential building types and housing of all types.

2. Bill Leddy/ Leddy Maytum Stacy Architects
   Mr. Leddy is principal at a mid-sized San Francisco based architecture firm known for community, educational, commercial and residential projects.

3. Nancy Malone / Siegel & Strain Architects
   Ms. Malone is a principal in mid-sized architecture firm based in Emeryville. The firm is known for community, educational, commercial and residential projects.

4. Kava Massih / Kava Massih Architects
   Mr. Massih is founder and Principal of Kava Massih Architects an architectural firm located in Berkeley, California. The firm has consciously developed a diverse project portfolio.

5. Rob Cocker / Perkins & Will
   Mr. Cocker is on the staff of the San Francisco office of Perkins & Will, an international architecture/engineering firm. The firm’s practice is focused on the civic/cultural, corporate/commercial, science/technology and higher education markets.

6. Paul Welschmeyer / Paul Welschmeyer Architects, Energy Consultants
   Mr. Welschmeyer is a sole practitioner architect & HERS Rater, as well as serving as American Institute of Architects California Council liaison to California Energy Commission.

7. Ed Dean / Studio M
   Mr. Dean has decades of experience as a principal at several large architecture firms, former professor at UC Berkeley, designer of a zero net energy library for Berkeley, CA, and consultant to California Energy Commission in the late 1970s/early 1980s.

8. Chris Duncan / Gelfand Partners
   Mr. Duncan is a principal and senior staff manager at Gelfand Partners. He serves on the Technical Committee of the Collaborative for High Performance Schools (CHPS).

Energy Policy Planning & Education

   Ms. Edminster is a recognized national expert on wood frame construction and green and very low energy home design. She is a principal author of the LEED for Homes Rating System.

    Dr. O’Bannon is Professor of Construction Management at California State University and Principal in the firm Richard Heath & Associates.

11. Kurt Cooknick / AIA/CC
    Mr. Cooknick, Assoc. AIA, is the Director of Regulation and Practice at American Institute of Architects California Council.
12. Steve Castellanos / Derivi Castellanos Architects / AIACC
   Mr. Castellanos is a former California State Architect, consultant to AIACC, and Principal in an
   architecture firm based in Stockton, CA

Regulatory Agencies

13. Craig Hoellwarth / California Energy Commission
   Mr. Hoellwarth is an energy specialist with the CEC and has long been involved in energy efficiency
   standards and policy

Utilities

14. Diane McLean / Southern California Edison
   Architect and Utility representative
15. Daniel Hamilton / Sacramento Municipal Utility District
   Utility representative
16. Bill Burke / PG&E, architect, PEC Architecture Programs Coordinator
   PG&E’s Pacific Energy Center & Utility Representative
17. Sam Jensen Augustine / PG&E, intern architect, Architecture Programs Coordinator
   PG&E’s Pacific Energy Center & Utility Representative
18. Dick Rome / PG&E, Energy Training Center-Stockton
   PG&E Energy Training Center – Stockton & Utility Representative
19. Milena Simeonova – PG&E, architect, Lighting Programs Coordinator
   PG&E’s Pacific Energy Center & Utility Representative
20. Robert Marcial – PG&E, Supervisor at PG&E’s Pacific Energy Center
   Mr. Marcial attended parts, but not all, of the workshop.

Facilitator

21. Rick Diamond / Lawrence Berkeley National Laboratory
   Dr. Diamond is a Staff Scientist and Deputy Group Leader of the Energy Performance of Buildings Group
   at Lawrence Berkeley National Laboratory.

Workshop Notes and Summary Report

22. Noelle Cole / Resource Refocus LLC, A strategic planning and consulting firm based in Berkeley,
    California.
23. Anna LaRue / Resource Refocus LLC, A strategic planning and consulting firm based in Berkeley,
    California.

Invited, unable to attend

1. Michael Nearman, California Building Standards Commission
2. Jordana Cammarata, California Public Utilities Commission
3. Lisa Paolo, California Public Utilities Commission
4. David Vasnaik, PG&E, Savings By Design program
5. Ray Nalangan, Sacramento Municipal Utility District
INTRODUCTORY PRESENTATION

Bill Burke and Sam Jensen Augustine provided background on energy efficiency policy and energy use and patterns in California. They outlined the major points affecting architects found in the California Long Term Energy Efficiency Strategic Plan (Long Term Plan), and the California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response (Needs Assessment)

The most important points of the presentation can be summarized as follows.

- Decoupling means California utilities achieve financial earnings from increased energy efficiency and thus actively promote it.
- The Long Term Plan includes zero net energy targets for residential buildings by 2020 and nonresidential buildings by 2030. Assembly Bill 32 also requires deep reductions in emissions of green-house gases.
- Building codes will become considerably more stringent. The 2013 Title 24 Nonresidential Energy Standards will be 25-30% more stringent than the 2008 Standards.
- California utilities need to implement an integrated design (integrated design) curriculum for design professionals between now and 2015. Architects are different from other specialty oriented industries and trades in their training needs because architectural work cuts across a broad base of skills.
- The California Public Utilities Commission (CPUC) is tracking progress. The training centers are looked to by the state to innovate in this area. (from Rick Diamond)
- The authors of the Needs Assessment found limited existence of industry recognized skill certifications in the relevant occupations and suggested consideration of a certificate program on energy efficiency for architects and/or energy training requirements for architectural licensure and license renewal.
- The CPUC Long Term Plan calls for Professional Boards to establish minimum guidelines for A/E and construction firms to require integrated design skills as a core competency among personnel in the 2016-2020 time period.

Rick Diamond, Bill Burke, and Sam Jensen Augustine asked:

- What is the “dream architect” in relation to the above? And how do we educate that architect?
- Is there a role for certification of architects and, if so, how might it work?

Participant responses centered on defining integrated design. The questions, responses from Rick Diamond, and comments can be summarized as follows.

- Q: Is integrated design really energy integrated design? A: There’s ambiguity here—it means integrated in the broadest sense.
- Q: So by supporting integrated design, energy gets saved? A: Yes, that will be the result of “designing intelligently.”
- Comment: Integrated design is a term for what large contractors are already doing.
- Comment: The different disciplines speak different languages and learning how to speak each other’s languages is very important.
- Comment: We need to figure out how to communicate this information to the client. We need to convince them that it’s not just best for the state, but also for them.

The presentation slides and a rough ‘transcript’ can be found in Appendix 1.
GROUP EXERCISES 1 & 2

PRELUDEx

Rick Diamond asked the groups to discuss factors that could drive a change to integrated design. Summaries follow below in the order in which groups presented:

Table 2: Over time societal values moved from “frugality” to the pursuit of excess, and now we are coming back to the idea of frugality and pushing down costs. Reducing waste as a core ethic is a potential driver.

Table 3: The ethical and professional obligation [of design professionals] to address global warming and energy/water consumption actually presents a creative opportunity. Design excellence increasingly means something different. In regards to code compliance: the bigger the code burden in some ways, the easier the job is for architects, as [they] just need to be creative in how to meet or beat it.

Table 4: There is a conflict between educating the client and managing costs. How do we pull the client along? Some clients don’t want to hear it. More education of clients is needed if they are to help drive this change.

Table 1: Social responsibility, frugality, and environment, like comments from those at the other tables. Another driver is human health.

Rick Diamond then discussed how integrated design needs to address more than just energy if it is to be valued and successful. He made the point that speaking of “non-energy benefits” is counterproductive. These are just benefits. People care about all of these other things as well as energy.

Paul Welshmeyer asked Rick Diamond why the ZNE requirement for residential buildings occurs ten years prior to that for nonresidential. Rick replied that the perception is that residential is easier to achieve and that there are fewer issues to work out. Paul made the point that ZNE has been defined by the CEC for homes and it’s a HERS score – so to him that discussion is over. Rick replied that the CEC needs to be clear for implementation, but the CPUC is not done- there are still issues being hashed out: time dependent valuation (TDV), embodied energy, etc. The standards could change. The CEC & CPUC are listening to each other.

THE EXERCISES

Exercises #1 and #2 lay out scenarios where design teams respond to a theoretical Request for Proposals (RFP). The scenarios represent a range of situations found in practice. The purpose of the exercises was:

1) to learn the integrated design and technical skills practitioners believe are needed in different contexts,
2) to discover whether architects currently have those skills,

3) how such skill trainings could best be provided.

Participants divided into four small groups to address each exercise and then each group made a presentation followed by discussion.

GROUP EXERCISE #1

You're asked to respond to a Request for Proposals for a new headquarters for the California Public Utilities Commission (CPUC). The commission wants an esthetically pleasing building that has good energy performance, isn’t extravagantly expensive, is durable, and creates a good interior environment for building inhabitants. The CPUC wants a building that exceeds 2007 ASHRAE 90.1 and 2008 Title 24 by 50%, and is designed to achieve LEED™ Platinum and to use as little as 25 kBTU\(^1\) per square foot per year of energy including a Data Center. The building should be a showcase of high-performance, low-energy design. It will demonstrate the integration of high performance design features and practices, showcase technology advances, and capture the public's imagination for renewable and energy efficient technologies. With the incorporation of on-site renewable energy, the building should be capable of operating at zero net energy over the course of a calendar year.

Here’s the process by which they plan to select the winning team:

Qualitative Merit Criteria for Best Value Selection (based on 100 points total) for a Performance-Based Design Build Process. Each factor and its assigned weight are provided below:

1. Demonstrates an approach for integrated safety and health into the design and construction of the project (15 Points Maximum)

2. Demonstrates an approach to obtaining energy goals, including LEED™ Platinum designation, the use of ENERGY STAR appliances at all applications when possible and to incorporate as little as 25 kBTU per square foot per year\(^1\) into the design solution, and achieve ZNE with incorporation of on-site renewable energy (15 Points Maximum)

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\(^1\)EUI, or *energy use intensity*, is a unit of measurement that describes a building’s energy use. EUI represents the energy consumed by a building relative to its size.\(^2\) A building’s EUI is calculated by taking the total energy consumed in one year (measured in kBTu) and dividing it by the total floorspace of the building. For example, if a 50,000-square-foot school consumed 7,500,000 kBTu of energy last year, its EUI would be 150. A similarly sized school that consumed 9,000,000 kBTu of energy last year would have a higher EUI (180) to reflect its higher energy use. Generally, a low EUI signifies good energy performance. Typical EUI's for existing buildings are shown in the table below. (from http://www.energystar.gov/index.cfm?fuseaction=buildingcontest.eui)
3. Demonstrates an approach for the design and construction for this project that meets the needs of the workforce of today and tomorrow (15 Points Maximum)

4. Demonstrates an approach to achieve a creative architectural image that is contextually appropriate with the site’s natural environment and the owner’s identity to showcase energy efficiency and renewable energy technology (15 Points Maximum)

5. Documents a design-build team structure indicating responsibility, accountability, communication, and collaboration. Documents partnership arrangements with proposed team members, as well as organizational approach to management of this project, including design-build team partnership arrangements, reporting relationships, and involvement of the executive management. (15 Points Maximum)

6. Demonstrates an approach to incorporate project needs specific to the region such as local codes, water laws, and local climate (10 Points Maximum)

7. Schedule (10 Points Maximum)

8. Demonstrates approach to collaborate with and incorporate ideas from diverse expert sources (5 Points Maximum)

QUESTIONS:

1. What skills do you as the architect need to bring to a team submitting a proposal to meet this design challenge?

2. How do you anticipate applying these skills during the design/construction process?

3. What trainings and/or training curriculum are needed to equip members of your firm with the skills needed to successfully participate in this process?

4. If you were to run a project design charrette in your own office for this project, briefly describe who you would invite and how you might organize it.

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Average EUI 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dormitory</td>
<td>151</td>
</tr>
<tr>
<td>Hospital</td>
<td>468</td>
</tr>
<tr>
<td>Hotel</td>
<td>228</td>
</tr>
<tr>
<td>K-12 School</td>
<td>169</td>
</tr>
<tr>
<td>Medical Office Building</td>
<td>134</td>
</tr>
<tr>
<td>Office Building</td>
<td>193</td>
</tr>
<tr>
<td>Retail Store</td>
<td>173</td>
</tr>
</tbody>
</table>

1. EUI values are presented in kBTU/ft²
Table 1 – Daniel Hamilton, Craig Hoellwarth, Ann Edminster, Chris Duncan, Paul Welschmeyer, Milena Simeonova

Table 2 – Steve Castellanos, Kava Massih, Diane McLean, Nancy Malone, Bill Burke

Table 3 – David Israel, Bill Leddy, Jim O’Bannon, Rob Clocker

Table 4 – Dick Rome, Ed Dean, Robert Marcial, Kurt Cooknick, Sam Jensen Augustine
Exercise 1 report out: Each team made a brief presentation showcasing their skills and approach to the potential client.

Table 2 (Nancy Malone speaking): Our team has a wonderful team of consultants. This team brings extraordinary expertise in the facilitating process and goal setting. Goal setting is the most important part of the process; goals will be revisited as the project moves on. Economics will be considered-- first cost analysis, as well as long term cost benefits of the project.

Overall feedback from group:

- Rob Clocker: Appreciated that they defined their process/approach.
- David Israel: Defining goals is the right place to start.
- Craig Hoellwarth: Signaling to the client that their needs will be addressed.
- Ann Edminster: Good skill in presentation-- not everyone is aware that’s even an issue
- Paul Welshmeyer: Cost effectiveness and 30% better is already the code, so this is a non-issue- why is it a talking point?
- Daniel Hamilton: Too much focus on big picture without details raised red flags for me. What expertise is missing on the team?
- David Israel: Discussion of team track record was missing.
- Milena Simeonova: I want to shake things up and not just improve on the status quo but want to focus on human well-being

Table 4 (Kurt Cooknick speaking): This team has experience with this type of project as a team, not just us as architects, but also with the contractors and subs, and works as a design build community, managing the expectations of the team and the clients all the way through so everyone knows where [they] are going. We have compared modeled results to post-occupancy evaluations. This team has a goal of life-long learning and a continuing education requirement. In the past the team has come in under budget and ahead of schedule – willing to tie fee to performance.

Overall feedback from group:

- Daniel Hamilton: Confidence level good, guarantee to be on schedule and under budget, will back up their results
- Bill Burke: I think they oversold it—didn’t believe it
- Steve Castellanos: Pitch too typical, generalized; no specifics
- Ann Edminster: They spoke to prior project experience, but not to prior experience in innovation
- Rob Clocker: I appreciated that the team said that they had experience working together before. Now people don’t want to hire an individual architect, they want to hire teams.

Table 1 (Ann Edminster speaking): This team has a deep understanding of energy issues. We don’t claim to be energy experts, but we do energy modeling within our firm - we know in concrete terms what it would mean to deliver a high performance building. We will be focusing on plug loads, which don’t show up in standard models but will dominate this project. Understand the need to integrate early and often with the team members – ongoing charettes. A project champion will be assigned to the project whose sole responsibility will be track the integrated design process and respond to the client’s needs.
Overall feedback from group:

- Ed Dean: Having in-house modeling convinced me that they worked together and had depth.
- Kurt Cooknick: Liked the idea of things that are often farmed out staying within the farm.
- Rob Clocker: Not sure there are visionaries on the panel. Very engineering focused/energy-centric.
- Milena Simeonova: Liked that the focus is on the process as organic rather than linear.
- Sam Jensen Augustine: They have a specific champion in charge of integration, someone with experience in energy, and that person could be the visionary.

Table 3 (Bill Leddy speaking): We have a stunning team of innovative designers and architects with a track record of high-performance buildings. This team focuses on doing the most with the least through creative design solutions. This is about building performance and how that affects your staff. The needs of the staff will be considered all along - identifying needs, a typical day in the life, and how this environment can help support the important work that they are doing. Designs will be fine-tuned with our amazing 5-D model – can identify cost relative to the amount of daylighting, and how it relates to the bottom line cost of the building. We want to create a deeply satisfying space.

Overall feedback from group:

- Self-evaluation from team: In the real world, making sure that there is funding for the early dollars that integrated design needs does not always happen and is not an easy sell.
- Rick Diamond: Use of language, using warm words, things that people can connect to
- David Israel: The language was about people, not the building.
- David Israel: The model would be adding time and cost or other parameters to the basic 3D Revit model that will start to tell you what will happen with different decisions.
- <Side conversation starts about modeling>

Rick Diamond: I’ve reserved some time later this afternoon to talk about the limitations of models…How many people [firms] would do modeling in-house? (most in the room indicated they would use consultants).

Summary from Exercise #1: Energy performance is one essential part of a set of client desires that can be broadly defined as “building performance”. Architects promote their ability to set goals, manage process, work together, and listen to the client ahead of their technical skills. Clients today hire teams, not architects. Architects must sell the whole design team’s skills not just their own. Specific skills regarding energy performance are important, but if they aren’t integrated and properly delivered the promised performance may not result. Energy performance tends to be introduced in the context of creating a good indoor environment – one that includes good daylighting, improves occupant performance, saves energy, and makes the whole building more valuable for an owner and makes occupants more productive. Architects and teams would like to be able to show post-occupancy performance of buildings delivered using different design processes. In-depth case studies based on data are very much needed and would help sway clients.
Conclusions: Architects are team managers, but are taught neither management skills nor how to work in teams as part of their education. Because integrated design approaches are relatively new, few architects have gained experience managing an integrated design team, and there are limited opportunities to gain that experience. Design professionals need integrated design management training.

Next Steps:

- Start to develop management trainings for architects and other members of the integrated design team.
- Determine current contracting processes and percentage of activity that follows traditional design, bid, build, vs. integrated design processes.
- Reach out to other sector strategy educational development teams to coordinate integrated design management trainings.
GROUP EXERCISE #2

Scenario One:
You’re approached by a respected commercial building developer regarding work on a four story office building. She wants an esthetically pleasing building that meets code, isn’t extravagantly expensive, is durable, and creates a pleasing interior environment for building occupants. Obviously, the building must comply with 2008 Title 24 Nonresidential Energy Standards. The process will be one of traditional design, bid, build. The engineering consultants will be professionals familiar with current good practice.

1. As the architect, are there particular skills you need to have to deliver a Title 24 compliant building?
2. How will energy performance be addressed over the course of the design/construction/commissioning process?
3. Are there skills members of your firm need to have, or need to gain, to successfully participate in this process?

Scenario Two:
The developer has dinner with Al Gore and comes back to you with a different set of performance requirements. She now wants an esthetically pleasing building that has good energy performance, isn’t extravagantly expensive, is durable, and creates a good interior environment for building occupants. She tells you the building should exceed 2008 Title 24 by 30%. The process will still be one of traditional design, bid, build. The engineering consultants will be professionals familiar with current good practice, but have not previously produced buildings with this level of energy performance.

1. What energy performance skills do you as the architect need to bring to a team submitting a proposal?
2. How do you anticipate applying these skills over the course of the design/construction/commissioning process? What would you need to feel confident you were on track to provide the requested level of energy performance?
3. What trainings and/or training curriculum would equip members of your firm with the skills needed to successfully participate in this process?
4. Would your approach to consultants be substantively different than it was in Scenario One?

For Exercise 2 – there was a slight rearrangement of seating to better balance team expertise

Table 1 – Daniel Hamilton, Ann Edminster, Chris Duncan, Paul Welschmeyer, David Israel
Table 2 – Steve Castellanos, Diane McLean, Nancy Malone, Bill Burke, Kurt Cooknick
Table 3 – Bill Leddy, Jim O’Bannon, Rob Clocker, Milena Simeonova, Craig Hoelwarth
Table 4 – Dick Rome, Ed Dean, Robert Marcial, Kava Massih, Sam Jensen Augustine
Exercise 2, Scenario 1 report out:

Table 4 (Ed Dean speaking) - Scenario 1: Since we are doing a conventional building, what we want to stress is that we will deliver the project you are looking for, but that this team will deliver a project with extra value at no extra cost to you while “future-proofing” the building against coming changes. The biggest cost of the building will be from the salaries of those who work in it. We’ll bring our energy efficiency expertise to enhance the occupant experience: natural light, ventilation- and can bring these principles into a conventional design without added cost, and you’ll also have a lower operational cost. We’ll do that with products that are standard – “the state of the shelf.” We can help you prepare for the future with PV-ready roofs, and can walk you through the process of finding a 3rd party provider for solar- lowers costs.

Overall Feedback from group:

- Paul Welshmeyer: The team didn’t just stay with the status quo, and as an owner I would recognize that I need to think about these things
- Bill Leddy: Didn’t make the client feel inadequate or behind the times and that they were really bringing the owner along without making them feel uncomfortable.
- Craig Hoellwarth: As a developer, hearing that it won’t cost more was attractive.

Rick Diamond to entire group: How did you feel about not having the contractor on board?

Sam Jensen Augustine (part of presentation group): We talked about it and thought- there’s no fee [to include them in integrated design]. How often can a team bring a contractor to an interview vs. mechanical or structural? For this project we probably couldn’t do that.

Table 3 (Rob Clocker speaking) - Scenario 1: We believe this building needs to make economic sense. Integrated design can help shave costs and so it should be part of the process. An early charrette process can benefit the project so we would like to take you through that process. The commissioning agent should also be brought on early as well and that will ultimately save cost. Also we can help you figure out who the market is for your building. As code changes for existing buildings, we can give you a sense of what’s coming and make sure you’re ready.

Overall feedback from group:

- Paul Welshmeyer: I’m only doing this [as a developer] because I have to. I don’t care about energy savings because the cost savings are not recouped by the developer.
- David Israel: Well, it is like designing an ugly building and a beautiful building - which do you think rents first? A pitch could be made that the long term value is real [in dollars].
- Daniel Hamilton: Glad you went back to the tenants –the benefits can be built back into lease rates – can link energy savings back to responsiveness to tenants

Rick Diamond to presenting group: Where did you feel shaky?

Rob Clocker (part of presentation group): The design-bid-build issue – without a contractor there, we could get into a lot of trouble designing this thing.
Summary from Exercise 2, Scenario 1: It's hard to do 'integrated design' when the design team isn't integrated! Current practice does not include a builder or contractor as part of the design team. In design, bid, build scenarios does not include a builder or contractor as part of the design team. "State of the shelf" means knowing what is currently available and practical to use. ‘Developer’ buildings are limited because everything is a financial calculation that may not align with other goals of the project or team. To the extent the team talks about performance with the developer or client, the question repeatedly comes back to HOW MUCH WILL THIS COST up front. While cost issues have to be addressed in every project, in developer projects the time frames for cost payback are typically short. Architects need compelling case studies backed up with good data on the across the board benefits of low-energy and integrated design in order to 'sell' it to clients. Clients don't want to pay for anything outside the industry standard unless they are convinced of the benefits. Telling them integrated design is better isn't enough. Everyone agreed that NOT HAVING A CONTRACTOR ON BOARD IS A PROBLEM!

(Conclusions and Next Steps follow the summary of Scenario 2 below.)

Exercise 2, Scenario 2 report out:

Table 2 (Diane McLean speaking) - Scenario 2: We’re excited that the client has decided to look at the energy usage and that they’d like the building 30% better than code. We’d like to bring the engineers on board early, and we would like to educate you on the integrated design process - to show you the added benefits and cost savings that it can bring. We’d also like to educate you about building orientation, glazing, the envelope and using passive strategies to improve the performance. We would bring in the Savings by Design team on for added help with the energy savings. A cost estimator will be brought on board early for short versus long term costing. There will be an ongoing evaluation of project goals throughout the process. We will model starting in schematic design to help inform the process all the way along. This will be “state of the shelf design” --not recommending anything radically new or different, but everything will be used well and carefully with a focus on quality and not on spending a lot of money for expensive specialty products.

Overall feedback from group:

- Ann Edminster: You told me as a client that you’re going to educate me, but I’m not sure I want to be told I’m being educated.
- Rick Diamond: We think so much of this is knowledge transmission, but it’s really communications skills that we need to transfer.
- David Israel: When the pitch is for developers everyone gets more timid about stating a vision or big ideals.
- Milena Simeonova: Thank you for inclusion of passive – we get so focused on saving energy through technology that we forget about passive.

Table 1 (Chris Duncan speaking) - Scenario 2: We want to frame our discussion around the feel of the interior of the building and your process and program considerations. We understand that the skin of the building has to be high performance. We will be modeling in the background. We hear that what you really want is energy savings. We don't have control over the contractor yet, but we
will make sure they do what is required otherwise we won’t get the 30% savings that you want. We will be the liaison between you and the contractor to make sure that the delivered building is what you want to live with long term.

**Overall feedback from group:**

- Milena Simeonova: Did not hear real vs. modeled - how is the performance assessed beyond the model for real people?
- David Israel (part of the presenting team): There are things you don’t get credit for in the models. It is more important to tie things back to the actual building and how the dollars get spent on things where energy use goes down but that are not necessarily reflected in the numbers [like natural ventilation].
- Rick Diamond poses question broadly to the group: Does the client really need to know about the limitations of the model?
- Paul Welshmeyer: Everyone talked more about “design” than energy even though the exercise was explicitly focused on energy efficiency. Even in the energy world design comes first– all of us in the room deliver design first, and heard design first even though it was last on the list of requirements.
- Craig Hoellwarth – if we don’t understand design, can’t deliver the energy efficiency.
- Paul Welshmeyer – An architect has to know a lot about design to deliver the energy efficiency.

**Summary from Exercise 2, Scenario 2:** Even when energy performance beyond code is requested, people still talk about other aspects of design; that's the nature of architecture. There are a host of issues to address. Design, bid, build, the current standard of the building procurement process, is a problematic process, and even more so when striving for integrated design. Design, bid, build makes it impossible to include the contractor in the integrated process. It seems design, bid, build is antithetical to the integrated design process. It's an unintegrated design process by design and in some ways it puts unnecessary or inappropriate responsibility on the architect. This suggests in developing a curriculum we consider differentiating between developer/commercial buildings and owner occupied, educational, community, and institutional buildings. Because of the focus on short term returns on investment in developer led building procurement, mandates may be needed to drive energy performance far beyond current code minimum. A second path would be to present developers with convincing data showing that high performance buildings made possible with integrated design result not simply in operational savings but produce a building that is a more valuable asset.

**Conclusions:** In a design, bid, build scenario the client, contractor, and community have major impact on the resulting building. It is essential to include contractors, client, and the community for effective integrated design. Currently there is rarely money in the design, bid, build scenario to include contractors. There are historic reasons driving use of the design, bid, build process that include minimizing cost and avoiding conflicts of interest. Both of these facts make the transition from a design, bid, build process to an integrated process difficult for many projects. Owners, who are rightly concerned about costs, want convincing, conclusive, well-documented evidence of the benefits and success of the integrated approach to design, construction, and operation of buildings.
before taking a perceived novel approach.

Next Steps:

- In order to transition from the historic process, research and develop case studies of projects that used an integrated design approach.
- Provide design teams and owners with data-based examples of the successes of integrated design along with lessons learned of pitfalls in the process and how to avoid them.
- Develop a case study on the integrated design process employed on the NREL zero net energy building as an alternate building procurement model.
- Identify appropriate organizations and individuals that can team together to develop data based case studies.
GROUP EXERCISE #3

PRELUDE

With the context set by the earlier exercises Rick Diamond explained that developing a curriculum entails thinking like a student as well as a teacher. In the morning, the group established needed skills. The next exercise establishes the potential ideal future curriculum.

Rick broke the exercise into three parts:

1) What are the foundational principles and technical skills found in an ‘ideal curriculum’?

2) Describe the contents of a “Fundamentals of Integrated Design” training class and make one or more specific recommendation for other classes.

3) How much time and commitment can working professionals make for integrated design training and/or certification? What are delivery paths for training and possible certification programs?

GROUP EXERCISE #3

Based upon the needs you’ve identified in exercises #1 and #2, what would an integrated design curriculum for architects look like?

If you were to be ‘certified’ as a low-energy building architect, would there be additional subjects you would expect to see included in the curriculum? If so, what would they be?

How many hours of course work would an architect be prepared to devote to an integrated design curriculum?

How many hours of course work would an architect be prepared to devote to certification? How might this change if certification carried with it specific benefits, for example access to utility incentive programs?

Here’s what the CPUC says it wants us to do:

The Strategic Plan Section 3.5 states: Integrated design brings together all relevant players at the start of a building project to comprehensively analyze and optimize energy strategies to deliver energy-efficient, high performance buildings and renovations, at little or no cost to the building owner. Integrated design can go beyond individual buildings and consider community-level energy and carbon impacts.

Questions the PEC would like answered:

1. How and what type of information can we provide that (1) gives architects the ability to control their design work by reducing reliance on outside consultants while (2) increasing the likelihood of improving the real world performance of their buildings in terms of energy efficiency, as well as moisture performance, durability, and client satisfaction?
If you have been part of an ‘integrated’ design project, describe how it was different from standard practice and what advice you would give to others seeking to replicate the process.

Table 1 – Daniel Hamilton, Craig Hoelwarth, Ann Edminster, Chris Duncan, Paul Welschmeyer, Steve Castellanos, Kurt Cooknick, Diane McLean, Nancy Malone, Bill Burke
Table 3 – David Israel, Bill Leddy, Jim O’Bannon, Rob Clocker
Table 4 – Dick Rome, Ed Dean, Kava Massih, Robert Marcial, Joey (PEC intern), Sam Jensen Augustine

The groups spent time discussing the questions and preparing to report to the groups. Additional information developed at each table is included in Appendix 2

Report out from exercise 3, part 1: Curriculum goals/principles

Table 3 (Jim O’Bannon speaking):
Table 3 Principles

We came up with 3 goals.

1. Determine what will cause the design community to embrace the integrated design process;
2. Develop competence needed to comply with new mandates
3. Determine how to assemble teams that will be needed to do this type of work. We need some sort of a carrot and stick - design excellence awards? Licensure requirement?

Table 3 Curriculum ideas

- We need to develop the competencies and the process management skills.
- What are the tools needed to make this happen: software, best practices, various "tracks" of specialties, promoting "whole systems thinking"
- How to market this [type of project to clients]? We need data to assist with marketing, and need to develop communication skills between groups;
- We talked about [developing] a whole building "smart meter" to evaluate how the building is actually performing
  - Rob Clocker (team member): Architects need rock-solid data on why green building is a good investment. 3rd party data is really needed.
  - David Israel (team member): When evaluating contractors, maybe give different points for different competencies. For architects, the core competencies would provide a common framework for language, and you would gain a knowledge and understanding of what is out there now in terms of standards and how to exceed it.
    - This could also be in the form of an intern development program (integrated design process), spending time shadowing each of the disciplines
    - The real value here [of such a program] is in the productivity in the building. Aggregating this data for use in the architecture field, having a resource for the data that is simple and concise and can be used as a tool would be valuable.

Table 4 (Sam Jensen Augustine and Ed Dean speaking):

Table 4 Principles

1. The curriculum should not define the process [of design] itself but should facilitate the process. We should be thinking in terms of the building "procurement" process and not just the design process and should somehow track the ways architects actually work [whether this is] a studio design charette process or integrated design teams.

2. <Ed Dean shows a diagram he drew to illustrate the phases of an ideal integrated design process.>
Unlike a traditional process, in an integrated design process much of the energy efficiency work (EE) happens in design development or earlier, in programming and schematic design. We don’t want to reinvent the wheel, but want to reinforce that the new stuff, the really important stuff, is new things at the beginning and the end of a project, when we need to initiate efforts to track and refine post-occupancy performance.

Table 4 Curriculum ideas

- Core competencies should be mandatory and short. Advanced/specialized topics can be more in depth and should be voluntary.

Comments:

Rick Diamond: [Ed’s diagram] is a good illustration of how integrated design does not mean that people are together all the time, but that there are these slices of time where there is collaborative effort.

Chris Duncan: I like that this scheme does not throw out what people already know.

Steve Castellanos: This brings up for me, what is the role of the profession versus the academy? What part of this would be/should be taught in the academy?

Table 2 (Nancy Malone and Steve Castellanos speaking):
Table 2 Principles

Principles that we thought were important to emphasize:

1. Decisions, especially regarding performance, should be evidence based
2. Work should be restorative (adding something to the environment)
3. Projects should be climate appropriate
4. Lifecycle analysis should be part of the project

Table 2 Curriculum ideas

- Core to the curriculum: process is so important
- Craft is very important; how buildings are made, not just from an aesthetic standpoint, but from a performance standpoint
- In terms of building performance, you should start with passive design strategies, then talk about modeling those strategies, and then talk about systems— in that order.
- Looking at actual buildings/projects in the real world should be part of the curriculum
- Knowledge of code is important and just knowing enough to meet it is different from understanding how to exceed it and use it in creative ways— that is competency.

Nancy Malone: Lastly, we talked about what it might mean to have some sort of professional certification based on performance that would be meaningful (would produce meaningful conclusions, i.e., high performing buildings). There could be a track for individuals and a track for firms.

Table 1 (Daniel Hamilton speaking):

Table 1 Principles

1. Focusing on a broad base of knowledge and understanding how buildings use energy—variables in systems and also building science;
2. Understanding the roles and responsibilities of each person on the team from early design to Cx, including legal and ethical responsibilities;
3. Understanding the process of integration;
4. There should be a communication/advocacy component

Table 1 Curriculum ideas

- Looking at unintentional waste in buildings as well as how there can be "no waste"
- Economics of energy savings— how to communicate to folks outside the profession and also related to the bottom line
- Why it matters? (State mandates, ethical, health & safety, etc.)
• Integrating engineers into the design process/finding common ground
• Integrated decision inflection points – when to gather data and why
• We want to promote the title “building performance architect” rather than "low energy" and to emphasize using language to communicate effectively. For instance, you don’t “promote” to a CFO, you “sell” to a CFO.

[General conversation ensued on who can/should ensure building performance]

Craig Hoellwarth: We’ve talked a lot, but who is taking responsibility for the building and how it performs? Maybe a "building performance architect" would take responsibility.

Paul Welshmeyer: Architects are liable - people don’t know that there is no such thing as a “certified energy consultant” in the state. For structural there is a certification, but who carries the liability for energy performance? By default, it’s probably the architect.

Dick Rome: Follow-through is a big deal, [but] if you design something and it gets installed wrong, that is not your fault.

Craig Hoellwarth: Someone needs to follow through to make sure it happens.

Bill Burke: The code is going there – there will be people in the process who have to sign off, saying they saw things installed and it was done properly.

Kurt Cooknick: You take it on faith that what you designed is what is going to be installed and that is not always what happens.

Bill Leddy: Architects cannot take responsibility for every occupant that walks through the door. Architects do not want to touch being liable [for energy performance] with a 10 foot pole.

David Israel: We do not and cannot guarantee performance.

Paul Welshmeyer: But can the professional delivery of [EE] buildings be equal to the structural delivery of engineers?

David Israel: We already do that – you want to understand what your client does enough to help with careful programming. Look at the shift in amount of space used, waste averted, etc.

Steve Castellanos: The more we design toward a certain type of performance we may have one point of view [on what a reasonable outcome is] but the public has another point of view -- they want results. The profession is going to have to address how that risk is managed.

Craig Hoellwarth: A benchmark for buildings is based on building end use, but we can’t control how the building is used. We are also moving toward asset ratings, not unlike cars.

Rick Diamond: The market will tell us soon whether asset rating or end use rating matters.

Summary from Exercise 3, Part 1: Architects need to cultivate knowledge of ‘core competencies’. Thus any integrated design curriculum needs to cover the ‘core’. More importantly, architects communicating and managing the building procurement process is part of this ‘core’, not just the design process. Along with technical training, ‘soft skill’ training in management is essential. An ‘integrated design team’ or an ‘integrated building procurement team’ could be considerably larger
than traditional design teams. Architects need training in how to manage such integrated design teams. Architects need in-depth case studies of the building procurement process with data attached. Architects need to be able to deliver facts as a basis for their client’s decisions. The curriculum should deliver core technical competences and management skills and examples of technically-competent, well-delivered buildings, with detailed information on the process, costs, and performance.

**Conclusions:** Core technical competencies must be incorporated into the integrated design management curriculum. An integrated design curriculum must be data and case study based. Data on cost effectiveness of changes to the process, from design, bid, build to integrated design, are essential if building owners are to make the shift from one building procurement model to the other. Additionally, advanced technical competencies developed through a multiple class series on a given topic should be a tertiary priority to core technical competencies combined with integrated design management training.

**Next Steps:**

- Identify existing curricula, if any, combining core technical skills with integrated design project management training.
- Identify sources of existing data showing the cost-effectiveness of integrated design process.
- Identify gaps in this data.
- Identify appropriate partners with whom to team to develop such case studies.

**GROUP EXERCISE #3, PART 2**

Rick Diamond asked each group to describe what a course on "Intro to Integrated Design for Design Professionals" would look like and to come up with at least one course they would like to see offered as part of a California initiative on integrated design training.

**Report out for Group Exercise 3, Part 2**

Table 1 – Daniel Hamilton, Craig Hoellwarth, Ann Edminster, Chris Duncan, Paul Welschmeyer, Steve Castellanos, Kurt Cooknick, Diane McLean, Nancy Malone, David Israel, Bill Leddy, Jim O’Bannon, Rob Clocker, Bill Burke, Dick Rome, Ed Dean, Kava Massih, Robert Marcial, Sam Jensen Augustine

Table 3 (Dave Israel and Jim O’Bannon speaking):

- Intro: Establish goals for an integrated design process. Be able to describe the process to the team and the client; know what you know and what you don’t, and where to find it.
Course essentials:
1. Define the process of integrated design, what it is and what it is not
2. How to build a team
3. How to gather the info you need
4. Leadership skills that are needed

Sample class titles: “How to Have the Conversation with the Client”, “To Charette or Not Charette”, “Lighting, Skin, and Integrated Solutions that Solve Multiple Objectives”, “Show Me the Money”

Table 1 (Ann Edminster speaking): (covering points of 2, 3 and 4 from this table’s response previous exercise)

- Intro: In a standard design process, common understanding is not achieved until close to project completion. So the "why" question is the way to start up front-- selling integrated design as a way to achieve high performance- then we would define the who-what-when.

Course essentials:
1. Cover quantitative goal setting and assessing the strengths that are already present on the team. Integrated design is addressing a larger skill set than is typically found within architecture alone.
2. Stretching beyond [the form] to look at what is happening within the building and addressing the occupants' uses and needs.
3. "Future proofing" for upcoming changes and over time changes.
4. The mechanics of integrated design: facilitation, resources, and tools to support integration. [including basic tools/questions like, “How do you schedule a meeting involving twenty different individuals?].
5. Using and understanding models

Table 4 (Kava Massih and Ed Dean speaking):

- Intro: We would take them through a case study and all the steps that architects go through every day but we would do it from an integrated design perspective.

Course essentials:
1. Start with program analysis and site analysis: transportation studies/shading studies/ solar geometry
2. Then look at the enclosure and all the things that go with it
3. End with the systems

So [to recap], take people through the steps that they already go through but from an integrated design standpoint---meaning all of this would be done upfront as part of the concept design phase.
Some of these steps and/or the modeling would be new and unfamiliar for most architects at this early phase of adoption of an integrated design process.

Table 2 (Nancy Malone and Steve Castellanos speaking):

- Intro: We would define What, Why, Who, How

Course essentials:
1. Integrate the training itself by adding end users, etc. Expand the concept so there are not just architects in the room.
2. The etiquette of teaming (communication skills)
3. Introduce the question of values, notion of commonality and goals. Perhaps establishing a charter and finding ways to build trust among team members.

Nancy Malone: Probably 5 years ago I convened a panel at West Coast Green on integrated design, and it was packed – but the audience wasn’t architects, it was everyone else on the team who wanted to make sure the design was done well.

Steve Castellanos: Because it was going to be a broader thing, we talked about some of the softer side of things, like values – maybe establishing a charter or a basis of design – we got a little warm and fuzzy, but it felt appropriate for an intro class.

Ann Edminster: What about the owner and the builder? Maybe we should move away from the term integrated to “integrated delivery” to include the builders into this process. The construction team often needs design input during the building process.

Summary from Exercise 3, Part 2:

Intro to Integrated Design for Design Professionals would describe the process. It would answer why integrated design is a way to achieve high performance. The course would present convincing data based arguments and examples for integrated design as an effective, and cost-effective, process to achieve a high performance building. It would teach how to share the process with the client and the rest of the team. The introductory class would also describe how to establish project goals and how to evaluate progress. Answering the "why" question is the way to start. Then you can define the what, who, how and when, perhaps by following a detailed case study of each of the steps involved. Intro to Integrated Design should describe the steps in a traditional process and then translate how to do those things from an integrated design perspective.

Conclusion: An introduction to integrated design should be more about process than technical knowledge. It should provide data-supported case studies showing how the process has been used to cost-effectively deliver a high performance building. It should explain the difference
between the current linear design process and an integrated design process using examples, delineation of the various steps, and a mock charrette.

Next Steps:

- Identify existing curricula that focus on integrated design management process and translating this process from the status quo in practice.
- Identify national and California experts on integrated design process.
- Identify appropriate core partner organizations with whom to develop and deliver an integrated design management process oriented curriculum
- Initiate schedule of discussions with core partners to deliver introductory course and future curriculum.
- Develop initial integrated design courses at the PEC that can serve as pilots for future partnerships.

GROUP EXERCISE #3, Part 3

Rick Diamond asked the advisory group to discuss one more thing – delivery of educational programs. A lively discussion followed, which we have tried to capture below.

Rick Diamond: Should these be voluntary classes, things that lead to certification, should it be charrettes, in-office trainings. How does this info go to scale?

Kurt Cooknick: How will we know if we are successful and on track [to get % of buildings to ZNE]? There are indicators that we are not making our goals. This is an indictment [against architects] - how was this arrived at?

Rick Diamond: CPUC is looking at the “how” right now. Not each piece was analyzed on the “how.” The CPUC itself does not really control any of the pieces of how this will happen - they can just convene the stakeholders. There was a plan written that came out of meetings like this from up and down the state. So how do we get this to scale?

Ann Edminster: One of the things that we have observed is that things that start out as voluntary eventually get adopted as code, and some of the fallout is not pretty, but it is certainly one pathway... Someone could develop a credentialing program for an "integrated design certified professional". People love gold stars.

David Israel: There is also the incentive thing- it still is very successful to offer incentives. Higher levels of rebates or incentives could work. And broadcast the information- here’s the benefit to you.

Rick Diamond: Does the PEC have case studies for integrated design on their website?

Robert Marcial: Not the website, but there are some in the lobby.
David Israel: I think people get a lot of value out of [case studies].

Bill Leddy: The overarching goal is carbon reduction – the biggest step is to achieve a broad-based tipping point among architecture professionals. How many people have designed a LEED platinum building only to learn that it is not performing well? There is a lot of danger to separating out integrated design to mean something other than what it should be- a holistic approach. LEED has become a brand name and revenue generator for USGBC and has lost meaning. It just gives people another way to differentiate and specialize- “oh, that’s what they do”.

Paul Welshmeyer: On the other hand a certification by the state will communicate that the professional can give the client a different level of care. The HERS certification for example has meat and potatoes on it (credibility); the Build It Green certification and other self-made certifications don’t hold that weight.

Bill Leddy: As a goal we want architects to make higher performance buildings and integrated design is one way to achieve that.

Chris Duncan: We don’t necessarily have the resources to do training in our office, so there needs to be some voluntary program that architects realize is an important next step. Until something is mandatory there doesn’t seem to be a lot of buy-in. There is such a glut of information out there…

Kava Massih: You have to start with kids in school. Once we are out there working, it is too late. We have already formed bad habits.

Rick Diamond: But we don’t want to write off current practitioners....

Steve Castellanos: AIA CC [AIA California Council] has set up an integrated design task group that is holding forums and trainings.

Rick Diamond: How do you make clients start demanding it?

David Israel: ADA requirements were a straight cost and pain to most clients - so they looked for people who knew how to design to it. This is no different. Once it is an obligation everyone will pursue the knowledge and clients will seek out those who do it best.

Kava Massih: If the idea is to have everyone do it this way, then you need to get to kids early in school or make it mandatory.

Sam Jensen Augustine: Requirements in 2013 require authorization for basis of design and it is not the architect that is authorized to sign, it is the PE. [Under what circumstances] do architects, who maintained a traditional role like basis of design, get to retain these rights? Maybe there is some sort of certification opportunity here…

**Summary from Exercise 3, Part 3:**
There was no clear agreement. Opinions differ significantly, although there were a few commonalities: Mandates work. If you require higher levels of performance via code, architects will be forced to learn how to do it. If you require training for licensure, professionals will have to take it. That Title 24 will become more stringent is a given, but knowledge of the code, and how to meet or exceed code minimums is not a given for many design professionals. What is unclear is the path by which to most quickly arrive at high levels of building design and actual performance. Financial incentives to owners and design teams can work. Starting with a voluntary program and eventually making it mandatory is another path. But a voluntary program might exacerbate existing divisions between architects focused on the visual look of the building and those responsible for code compliance and durability.

**Conclusion:** Without a mandate for training, some proportion of professionals will not stay current with code, let alone know how to outperform it. The standard of practice for architects needs to be raised. Similar to introducing CALGreen as a voluntary program and then incorporating it into code, a voluntary professional accreditation program on integrated design and building performance could eventually become the basis for a continuing education requirement for initial licensure and license renewal. Education is required to facilitate compliance (e.g. Utility Codes and Standards groups are working to improve compliance through building official education. Architects are only required to know the code insofar as the building official “catches” an architect’s oversight. There is no current requirement for continuing building code education for architects).

**Next steps:**

- Work to develop a path to a mandate for professional architectural education, possibly including certifications, incentives and outreach to architecture school. Identify the stakeholder organizations and points of contact.
- Develop possible curriculum models for use in a required educational program or guidelines for such a curriculum.
- Explore delivery methods for sharing the curriculum. Discuss with Codes and Standards how to improve code compliance by improving “the other side” of code compliance professionals.
PACIFIC ENERGY CENTER DRAFT INTEGRATED DESIGN CURRICULUM

Bill Burke presented the draft curriculum and asked for feedback from the participants.

Bill explained that the first four horizontal rows cover fundamental technical concepts needed by designers. The vertical paths below the black line represent in-depth sequential series of classes on specific technical topics such as electric lighting, energy modeling, and design of building enclosures for energy efficiency and moisture control.

Completion of classes in the horizontal rows at the top might serve as the basis for a 'performance architect' certification. Completion of classes in the vertical columns might serve as the basis for specialty certification in a given topic.

The discussion was as follows:

David Israel: I don’t like code classes and modeling classes as a separate track - they should be integrated into the relevant areas.

Ann Edminster: Everything identified falls under technical areas. And does not touch any of the areas 2-4 of what our group defined (process, facilitation, etc.)
Rick Diamond: The question is how do you get to integrated design from here?

Ed Dean: Is this really about competency? Shouldn’t we be relying on schools to do this?

Sam Jensen Augustine: I would flip that question. How much of this is being taught in schools?

Rick Diamond: The assumption here is that this is not the state of current competency.

Steve Castellanos: A lot of these things should be introduced during the training in the firm, and that calls upon us as a profession. A lot of the stuff that we do—education, certification—does not translate into any market benefit. Part of what should be thought about is how this translates into market value.

Jim O’Bannon: What are the objectives that we are trying to get out of this? Do the existing professionals have these competencies? If not, how do we reach them and then separately address the schools.

Craig Hoellwarth: How does this [curriculum] track with process? What do I need to know about energy and modeling during schematic design? What do I need to know about all of these disciplines at each different stage of design?

Paul Welshmeyer: It is probably easy to identify what we do and don’t know and how to get current, but this is really about how to practice.

Craig Hoellwarth: This is assuming that everyone is coming to PG&E. Any ideas on how to get the info to people where they are? Maybe taking it to AIA chapters?

Rick Diamond: What about e-learning, or a design competition around integrated practice?

Daniel Hamilton: You guys are all thinking about the big picture, which is great, but architects have limited time and limited resources and so we need to filter it down to a hierarchy and think about a prioritization.

Paul Welshmeyer: Who do you hire to fill this gap [in technical knowledge] if your office doesn’t do it?

Rob Clocker: We can hire [consultants]. I'm looking for a column [on the curriculum spreadsheet] that is on integrated design and that will walk me through the process. Where is the facilitation? Where is the data that I can take to clients?

Bill Leddy: How do you create the desire to learn this stuff? Many architects surveyed do not even think that sustainability is important. How do you avoid just preaching to the choir? The first step has to be to create the desire within the industry.

Bill Burke: Does T-24 or other legislation that requires documented levels of performance change people’s values?

Kava Massih: If people won’t do it for themselves, then they’ll be forced through codes.
Nancy Malone: Codes will force a lot of this on us, but in schools there is not a focus on this. A lot of schools teach object design without any other concerns—not even about how to design for people.

Kava Massih: You gotta put the sexy in it.

David Israel: [The PEC’s] charge is to help PG&E meet these mandates, and what I’m hearing is that we’d do better with less technical details. We need a fully integrated understanding - we don’t need massive detail but we do need the big picture [for executing integrated design].

[Aside: Diane McLean from SCE talks about experience with trying to work with professionals on integrated design and that it was hard to get anywhere. So what they did instead was to work with design students on interdisciplinary charrettes and Q&A with the different disciplines. Diane asks for input on how to take this to a different level and offer at a professional level.]

Summary of Responses to the Draft Curriculum:

The draft curriculum as presented focuses on a transfer of technical understanding and competency to architects and other members of the design team. It ignores project management, in particular the non-technical project management skills required for successful integrated design. Participants see a strong need for training on how to manage the integrated process. Advanced multi-session trainings focused on particular technical design issues, approaches, and technologies are less important, especially as few working designers feel they have the time to take them. A series on technical fundamentals is appropriate. However, technical training should always be tied back to how these issues fit in the integrated design process.

Conclusion: The draft integrated design curriculum needs major revision. Technical knowledge is needed. Technical training should focus on the basic physical principles needed to apply building science in design, product specification, construction detailing, and operations. At present, equal priority should be given to training on integrated design process and management skills useful in successfully guiding that process. This includes development of communication skills, and knowledge of communication processes and tools that can be repeated from project to project. It also means training in goal setting, client and team buy-in, metrics, and identification of points in the process where performance against those metrics must be checked before moving ahead.

Participants also see a need for in-depth case studies. Case studies should show how the integrated design process was used to successfully design a low-energy capable building that went on to deliver good performance in actual operation. These case studies must be in-depth, strongly supported by data, and convincingly illustrate how a successful integrated design process leads to cost-effective higher building performance, a better environment for occupants, and in some cases higher asset value for the building.

Next steps:

- Identify print & online resources that support skills development for the integrated design process.
• Identify existing integrated design process training programs.
• Identify leading integrated design practitioners and consultants both nationally and in California.
• Establish schedule of regular meetings with core partner organizations to further develop training strategy for technical issues and integrated design process and consider alternative delivery paths.
Appendix 1

MEETING NOTES FOR PEC CURRICULUM PLANNING 6/13/12 - INTRODUCTORY SESSION

/TRACKED LOOSELY TO AGENDA ITEMS IN BOXES/

**Introductions**

Bill: Intro Objectives:

As the policy framework changes, what information do architects need to control their design work?

How to support architects to increase the performance of buildings that get designed and not make them wholly dependent on consultants?

Does a certification model really work?

Do architects need to have a handle on energy modeling? Not necessarily, but they need to know how to talk about energy models and how to ask the right questions of their engineers and consultants. This is about how to have a better conversation.

Rick: So what is the “dream architect?” And how do we educate that architect?

Robert M.: The California Public Utilities Commission (CPUC) has asked the (education) track leaders to consider the demand for this kind of education and how to build it. PG&E does not necessarily want to get into the business of certification- PG&E can’t do everything- but where are the points of collaboration? What is going to drive the demand for/requirements for education for architects?

[Participant introductions]

| Review of the Zero Net Energy Goals of the Long Term Energy Efficiency Strategic Plan |
| Review of Integrated Design educational goals from Strategic Plan and review of recommendations for workforce education of professionals in the Needs Assessment. |
| Brief review of requirements of Assembly Bill 32 (PDF file), the California Global Warming Solutions Act of 2006, which sets an economy-wide cap on California greenhouse gas emissions at 1990 levels by no later than 2020 an 11 percent reduction from current emissions levels. |
| Summary of how energy is used in California and in California buildings. |
| Short review of upcoming 2013 Title 24 requirements and how they compare to the current 2008 standards. |

Bill: (Recap of the “California Experiment” article) - Policy has turned how the utilities make money on its head (decoupling), CA has energy efficiency (EE) and demand reduction targets. There are financial incentives for utilities if they reach or exceed the targets & penalties if targets are low-balled by utilities. Energy efficiency and demand reduction help utilities make money (they get
rewarded for overshooting goals). So in CA utilities genuinely want to save energy as it is in their best interest. This is enlightened public policy that has changed the framework in CA and is an example of using market forces for the good of the public.

Sam Jensen Augustine: CA has a long history of public policy aligning with social, economic benefits—CA has among the highest per unit energy costs in the USA but also some of the lowest overall energy bills. <Reviews the ZNE goals.> The CPUC and the CEC are still going through how we define exactly what ZNE means – but for our discussion, the amount of energy used over the course of the year is produced onsite during the course of the year.

Bill: The grid can be relied on for power but it is NOT a “giant storage battery” (the grid does not store energy).

[Sam Jensen Augustine goes through the ZNE and other “Big Bold” goals. Meeting slides are included in Appendix 4 of this report]

Sam Jensen Augustine: Basically, the Pacific Energy Center (PEC) needs to implement an integrated design (integrated design) curriculum. Architects are somewhat different in their training needs because of the broad base of skills- they need to be generalists in a sense and have an organizing principle. One of the supporting goals of the CPUC’s Big Bold goals is to promote integrated design knowledge to bring everyone along...more specifically the Energy Centers have received near-term direction (2009-2011) to implement an integrated curriculum. 2009-2011 is past and 2012-2015 is now.

Rick: The CPUC is tracking to see how progress is made. The training centers are being looked to by the state agencies to innovate in this area.

Ann Edminster: Has all the stuff in 2009-2011 already happened?

Sam Jensen Augustine: I don’t think it’s out of place for me to say no – what we want to investigate today is, what’s the carrot? Should there be a stick? How do we get people down this path?

Craig Hoellwarth: Is integrated design really energy integrated design?

Rick: There’s ambiguity here— it means integrated in the broadest sense.

Craig Hoellwarth: So by supporting integrated design, energy gets saved?

Rick: Yes, that will be the result of “designing intelligently.”

Robert: I was in discussion with [the CPUC] trying to get a better definition of [integrated design]. At PG&E, “integration” also includes renewable systems, demand response and integration of distributed generation technologies.

Paul Welshmeyer: integrated design is a term for what large contractors are already doing.

Diane: The different disciplines speak different languages and learning how to speak each other’s languages is very important.
Milena Simeonova: If we're looking for a common framework to unify the different disciplines it should be the human factor.

David Israel: We need to figure out how to communicate this to the client. We need to convince them that it’s not just best for the state, but also for them.

Bill: We want good looking buildings – we still want the architect to drive the design.

Sam Jensen Augustine: The traditional role of the architect is to be the client’s advocate, and we don’t want to necessarily change this

[Sam Jensen Augustine goes through the CA Workforce Education and Training Needs Assessment, AB 32, AB1103, and T-24 for 2013. Meeting slides are included in Appendix 4 of this report]

Sam Jensen Augustine: Architects may laugh at the ZNE targets, but it really is going to happen. Title 24 for 2013 is really going to happen.

Bill: It is already a lot more stringent (30%) than title 24 2008, and there is only one more code cycle between this one and 2020.

[As an example, Bill talks about what the new requirements mean for windows.]

Rob: But these are just the prescriptive recommendations and there’s still performance?

Bill: Yes.

Sam Jensen Augustine: New Buildings Institute did a study that looked at the characteristics of buildings that can get to Zero Net Energy. I’ll say it: all-glass buildings with current HVAC technology can’t do it.

[Sam Jensen Augustine explains the McKinsey cost curve.]

Rob: ZNE can have unintended consequences for high density. Why is the focus on energy and not carbon?

Rick: These issues are being looked at by the CPUC on the policy level, but this is still being worked out; However the California Energy Commission (CEC) is focused on the Title 24 cycles.

Bill: Most of the construction in CA is 4 stories or less. But the planning issues are central.
Appendix 2: Workshop Materials

All Appendix 2 materials prepared by Bill Burke and Sam Jensen Augustine

WORKSHOP INTENTION STATEMENT

The advisory panel will assist us in establishing a multi-level architecture and integrated design curriculum that responds to the priorities laid out in the California Long Term Energy Efficiency Strategic Plan (Strategic Plan) as well as the California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response. The advisory panel will consist of building science and energy efficiency experts, principals from California architecture firms, and individuals involved in education and training programs at California utilities.

Strategy 1-6 of the Strategic Plan calls for development of a multi-pronged approach to advance the practice of integrated design. The Strategic Plan Section 3.5 states:

Integrated design brings together all relevant players at the start of a building project to comprehensively analyze and optimize energy strategies to deliver energy-efficient, high performance buildings and renovations, at little or no cost to the building owner. Integrated design can go beyond individual buildings and consider community-level energy and carbon impacts.

Specific goals of the Strategic Plan for the 2012-2015 time period include:

- Promote widespread adoption of tools and resources that enable Integrated Design.
- Create market demand for Integrated Design as a key strategy to comply with a vastly enhanced Title 24.
- Leverage competition between A/E firms to ramp up their Integrated Design expertise. (similar to how LEED-AP has become de rigueur)
- Implement an educational curriculum promoting low-energy buildings through the practice of integrated design.

Our goal at PG&E’s Pacific Energy Center is to create an integrated design curriculum that supports existing continuing education programs and could eventually serve as a model for a ‘low energy building design’ certification program for architects and designers. We expect to work with and support existing education programs such as GBCI’s LEED Accredited Professional program and AIA’s Continuing Education System as a part of this effort. We also hope to open a discussion with the California Architect’s Board (CAB) regarding continuing education requirements in energy efficiency for license maintenance.
We want input because the integrated design curriculum, its implementation, and its goals are still in the formative stages.

PRE-WORKSHOP READING MATERIALS LIST

1. Executive Summary or short version of *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*

2. Executive Summary of the *Long Term Energy Efficiency Strategic Plan* + section 3 on integrated design education

3. Summary of how energy is used in buildings in California and North America, along with descriptions of the major end uses of energy for several different building types

4. Concise summary of changes coming in 2013 Title 24 Energy Standards
   a. Nonresidential Buildings:
      i. New requirements for design review at various phases plus commissioning and functional testing, signed off by a licensed professional engineer
      ii. Project energy efficiency goals must be spelled out as part of the Owner's Project Requirements
      iii. New requirement for written description of the Basis of Design (BOD), similar to current LEED-NC standard
      iv. Much more stringent requirements for u-factor and solar heat gain coefficient (SHGC) for windows and site built fenestration
   b. For residential and nonresidential buildings, significant new requirements for solar ready surfaces
   c. Discussion of ZNE (or some variant thereof) as the end goal of Title 24 changes coming in the next decade.
## PRE-WORKSHOP PROPOSED CURRICULUM MATRIX

### Proposed Architectural Curriculum - 16 April 2012

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*Pacific Energy Center 2012 Architectural Curriculum Advisory Panel Workshop Summary Report*
Appendix 3: presentation slides

All Appendix 3 materials prepared by Bill Burke and Sam Jensen Augustine

0 by 2020

By BrendelSignature at en.wikipedia
“These primary strategies will be supported by three enabling strategies:

1. Promote integrated design knowledge as the basis for commercial building design, construction, renovations and occupancy.

2. Support targeted research and development and promotion of emerging technologies.

3. Offer integrated program delivery of demand side management retrofit solutions.”
“Energy demand from the entire US buildings sector (everything from houses to light bulbs to office towers to retail stores) would not grow at all from 2008 to 2030 if we deployed energy efficiency measures costing less than the energy they displaced”

U.S. mid-range abatement curve – 2030

Source: McKinsey analysis
California Workforce Education and Training Needs Assessment
For Energy Efficiency, Distributed Generation, and Demand Response

DONALD VIAL CENTER ON EMPLOYMENT IN THE GREEN ECONOMY
Institute for Research on Labor and Employment
University of California, Berkeley
2011
1) IMPROVE WE&T PLANNING AND COORDINATION

2) DIRECT CONTRACTS

3) LICENSING

4) GREENING TRADITIONAL OCCUPATIONAL PROGRAMS
“[T]here does appear to be room for integrating energy efficiency topics into the professional licensure process similar to the way disability access coursework is now required of California architects. Similar continuing education courses on energy efficiency topics could be required of professional architects and engineers as part of their biannual licensing or as part of the CMAA construction manager certification process.”

California WE&T Needs Assessment
Assembly Bill 32 Calls for Reductions in CO2 Emissions to 1990 Levels
California Energy Performance Disclosure

In conformance with California Code of Regulations, Title 20, Article 9 (2010)

Portfolio Manager
Building Energy Rating

Energy Star
U.S. Environmental Protection Agency

Building Information

Building Name: Grass Valley Office Center
Building Owner: Joe B. Owner
Address: 1234 Rolling Hills Rd.
City: Grass Valley
Zip Code: 95945
Building ID Code: 001234
Building Type: OFFICE
Gross Floor Area: 60,900 sq. ft.

Energy Use Index

Actual: 125 kWh/ft²-yr
Weather Normalized: 130 kWh/ft²-yr

Energy Use Information

Annual Electricity Usage: 591,760 kWh
Annual Natural Gas Usage: 13,288 therms
Other Annual Energy Usage: None
Total Site Energy Usage: 3,347,912 Btu
Renewable Energy Production: None
Percent of Electricity from Renewables: 0%

The Energy Performance Ratings reported here were determined for this building based on
recorded energy consumption, building floor area and the following default or actual building
characteristics:

Default Building Data

Building Characteristic

- Weekly operating hours
- Number of occupants
- Number of computers
- Percent floor area cooled
- Percent floor area heated

Building Owner Verification

Date: ________________________  Signed: ________________________
ZNE Commercial Context

“California’s Title 24 should be broadened to address as many energy end uses as possible, especially plug loads; metering and data management; automated diagnostic systems; and sub-metering for tenant-occupied space.” – California Energy Efficiency Strategic Plan SECTION 3 – PAGE 33
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*Source: California End Use Survey, 2006*
Commercial Building Energy End Use

• Based on CEUS Data
• Allow budgeting based on typical energy usage
• Can be broken down by types and size
• Guide for low hanging fruit
• Available Nationally in CBECs

Source: CEUS
Title 24 Requirements

2005 & 2008 Nonresidential

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2013 Nonresidential

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Fenestration

- Window Prescriptive Requirements
- Area Weighted Performance Ratings

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-RSHGC: Relative Solar Heat Gain Coefficient, which takes into account overhang benefits

-VT: Visible Transmittance rating for overall daylight transmittance of product including frame,
-OR
-Use formula to adjust the glass VT

\[ VT = 0.53 \times VT_c \]
\[ VT_c = \text{Center of Glass VT} \]
## Proposed Architectural Curriculum - 11 June 2012

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### Energy Systems Design
- Energy Utilities Basics, Theory, Waste
- 3rd Year Basics
- Energy Analysis
- 3rd Year Basics
- Energy Calculation

### Energy Fundamentals
- Lighting Fundamentals
- Solar Geometry
- Heat Transfer 0
- Climate 0
- Psychology, Sensible & Latent
- Navigation, Struggle, and War

### Architectural Integrated Design
- Daylighting Basics
- Enclosure Design
- Glass Class
- 2.4 Basics
- Conventional HVC for Architects
- Setting Building Energy Targets
- Energy Modeling
- Conventional HVC for Architects
- Setting Building Energy Targets
- Energy Modeling
- Conventional HVC for Architects
- Setting Building Energy Targets
- Energy Modeling

### Specialization Tracks
- Lighting Track
- Enclosure Track
- Existing Building Track
- Energy Modeling for Architects
- HVC Track

### Perquisites from Energy Fundamentals
- Lighting Fundamentals
- Solar Geometry
- Heat Transfer
- Climate
- Psychology

### Perquisites from Architecture Core
- Daylighting Basics
- Enclosure Design
- Glass Class

### Integrated / Advanced Classes
- Controls
- Thermal Impacts of Framing
- Conventional HVAC
- Plug Loads and Occupants
- Enclosure Design Analysis Methods
- HVAC for Architects
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Per Capita Electricity Sales (not including self-generation) (kWh/person) (2006 to 2008 are forecast data)

United States

California

2005 Differences
= 5,300kWh/yr
= $165/capita

Per Capita Income in Constant 2000 S

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<th></th>
<th>1975</th>
<th>2005</th>
<th>% change</th>
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<tr>
<td>US GDP/capita</td>
<td>16,241</td>
<td>31,442</td>
<td>94%</td>
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<tr>
<td>Cal GSP/capita</td>
<td>18,760</td>
<td>33,536</td>
<td>79%</td>
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Annual generation from China's Three Gorges Dam compared to annual savings in 2020, from 20 years of sales of equipment subject to China's energy efficiency standards

3 Gorges Dam

Appliance Efficiency

*Other products include: clothes washer, TV, fans, stand-by power, electric water heater, electric cooktop, fluorescent lamp ballasts, rice cooker, microwave ovens, laser printers, fax, copiers, computer monitors, HID lamps and ballasts, motors, air compressors, transformers, servers, computers, double-capped fluorescents, heat pump water heater, rangehoods, ventilating fans, external power supply, vending machines, LED lamps, grid lighting, commercial AC chillers, water-cooled chillers, unitary AC.

Source: LBNL, China Energy End-Use Model, David Pidgley and Nina Zheng, 2010
New United States Refrigerator Use v. Time and Retail Prices

Source: David Goldstein, NRDC, SF
All Buildings Net Zero?

Federally Owned Buildings (Non-Residential)
Number of Stories
New does not always mean efficient

Top performing buildings use 3 to 4 times less energy per ft² than the worst performers.

Newer buildings are equally represented across all quartiles.

Based on a sample of 4,000 buildings nationwide.
• Source for following two Slides:
Appendix 4: Post Workshop Survey Results
Several weeks after the Advisory Group Workshop met, participants were asked to respond to a follow-up survey. The survey was administered via an online survey engine and collected 10 responses.

POST-WORKSHOP SURVEY RESULTS

The following section contains the results of a post-workshop survey. The survey was administered via an online survey engine and collected 10 responses. For each question the key points and themes that emerged across all responses have been condensed and presented up front. The condensed themes are followed by the full survey response text.

“I think over the next three years, developing ‘beginner’ tracks and ‘advanced’ tracks for low-energy design would be helpful so that younger architects could learn the basics while more experienced architects would not have to wade through so much repetition.” – quote from the Post-Workshop Survey

SURVEY QUESTIONS

1. How can continuing education programs best promote integrated design practices? What is the most crucial information that architects need to successfully implement and execute an integrated design process?
**QUESTION 1 KEY POINTS FROM RESPONDENTS**

- Integrated design needs to be better defined in terms of both a process AND a product. What is the end goal? How can the “building delivery” (integrated design) process be tailored to meet this goal?

- By weaving integrated design process principles throughout other offerings

- By promoting understanding of building science, current best practices, detailed construction plans for thermal envelope, T-24 modeling and Building Department field inspections

- By giving architects tools to navigate the process from team building and contracting, to collaborative decision making

- By focusing on design strategies and tools that can be used early on in the design process and that are appropriate to particular microclimates.

- By making integrated design classes a mandatory part of license renewal

- By providing incentives and promotions for architects who complete integrated design courses

**PEC Conclusion:** Responses confirm recommendations from the Advisory meeting that training on technical skills and design process are both required.

**QUESTION 1 FULL RESPONSES**

Respondent 1 (R-1): "Integrated design" means different things to different professionals - BIM, "Lean Project Delivery", etc.....The term needs to be better defined, or a new term developed, differentiating the goal from the means available to attain that goal. If the PEC - and the profession - can be clearer about what the goal is, the steps to attaining that goal will become clearer. The crucial information that architects need is that architecture isn't just about form or style or LEED checklists or EUI, it's about all of that (and more). In my mind, that's the "integrated design" we should aspire to. That's the "what".....everything else is the "how".

Respondent 2 (R-2): A. By including integrated design process offerings and by weaving integrated design process principles throughout other educational offerings. B. There are tangible benefits that they can sell to their clients and there are integrated design process practices they can implement without making a big fuss about it. It's mainly about being proactive on their part.
Respondent 3 (R-3): Understanding Building Science

Respondent 4 (R-4): Architects are now beginning to understand what integrated design is and what it means. What is needed now is a true "process" that works. This includes (and begins with) changes in the contractual agreements which allow and encourage an integrated process. Success also depends on integrated design process tools that will lead a team through necessary process steps and encourage collaborative decision-making.

Respondent 5 (R-5): 1. provide a well-structured educational program. 2. Current Building Science knowledge and Best Practice methods for delivering, thermal/EE modeling, thermal envelope construction plans and detailing tied to the t-24 modeling, and Building Department field inspections of all EE features of the building as required by the specific permit.

Respondent 6 (R-6): Working on an integrated basis requires team members committed to full and complete sharing of information in a positive collaborative method, and hopefully enhanced through the use of technology. AIA has fostered an integrated project delivery approach for several years and has developed guides, etc. Architects and the entire team need to participate in the development of project goals early in the process, and continually participate in guiding the project's adherence to those goals.

Respondent 7 (R-7): integrated design process gets to the heart of the design process, which evolves over time based on technological advances (such as Revit) and the changes in project delivery methods (such as more design-build). Still, low-energy building design requires addressing these particular design issues earlier in the process than the "current normal", even as it evolves toward a more integrated process. The key information and the focus of continuing education programs should be on appropriate design strategies for particular microclimates and building types and appropriate tools that can be effectively used in the early concept phases.

Respondent 8 (R-8): As we noted in the curriculum meeting, integrated design education programs should focus on process - how to build a team, how to run integrated design charettes, and techniques for running the whole process.

Respondent 9 (R-9): make it a mandatory course that has to be taken and passed to get license renewal.

Respondent 10 (R-10): Providing incentives for architects who participate. The incentives may be in the form of inservice credits, leads, cash rewards and/or listing in a published registry of those completing the cadre of courses.

2. Do you believe establishing a ‘low-energy building design’ certificate for architects & building designers would increase the number and measured performance of low-energy buildings? Would you be interested in such a certification for yourself? Why or why not?
QUESTION 2 KEY POINTS FROM RESPONDENTS:

Yes (4 responses)

- It would distinguish an “architect” from a “building performance architect”
- A post-licensure voluntary certificate should be an option
- Utilities could partner with AIA on such a certification

No (2 responses)

- There are too many different certifications already; there would be resistance to more
- Certification would promote artificial distinctions—everyone should be pursuing integrated design

Maybe (4 responses)

- If there is one, there should be some way to “grandfather” in experience (without having to take a bunch of classes)
- If there is one, it could not be “stand alone”. It would need to be combined with stricter codes and market-driven demand for EE buildings.

PEC Conclusion: Responses went in two directions. Some questioned usefulness of a 'certification', making the points that

- (1) industry leaders who have focused on energy efficiency would be unlikely to seek the certification.
- (2) it would further the split between 'designers', who focus on how a building looks, and 'technicians' who would then be asked to make things work. The point here being we need more, not less integration of design with performance.

Others made the point that there should be requirements for training in energy for licensure renewal. There currently exists a requirement for training on design for access, yet there are no requirements for knowledge of the California Building Energy Standards or design approaches to exceed the required minimum performance levels. Required training for all rather than certification for some was seen as the better path.

QUESTION 2 FULL RESPONSES

(R-1): No - there are too many certification programs already. This would only serve to increase the "Balkanization" of the design professions and is counterproductive to the ideal of "integrated design" - EVERY architect should be pursuing an integrated process and low-energy building design, not just anointed "experts".
(R-2): A. Possibly, if well-designed. B. Possibly, but doubtful. I'm a more likely teacher than student. I don't want to take classes to get a certificate, I want to get a certificate because I merit it ... i.e., if there's a way to grandfather based on experience, I might be interested but no way would I take a bunch of classes just to get the certificate.

(R-3): It certainly has the potential to make a difference.

(R-4): I believe that if there is any "certificate" program, it would be best to come from the AIA (utilities can partner with the AIACC on this), and that the training program would be under the title of "Integrated Design". This is more holistic (and "wholistic") and will include the training needed for "low-energy design".

(R-5): Yes, yes, and because there needs to be a distinction between an Architect and a Building Performance Architect.

(R-6): I would support a post licensure and voluntary certificate program. Architects operate in a number of environments with different practice models. AIA architects are required to participate in continuing education, with a required focus in sustainability. But as [with] many programs, the time spent on any area of focus does not result in a certification.

(R-7): My opinion: not by itself. Combined with stricter codes and a market-driven demand for such buildings, certification would round out a sense that this is accepted standard practice. There's a practical question of whether such certification could be practically layered on top of a LEED accreditation. (By the way, buildings are "certified" LEED and professionals are "accredited". Better to use the latter term: "LEBD-accredited professional". I just think that there would be resistance to yet another accreditation, especially in a related to LEED.

(R-8): I don't think that a certificate program would appreciably increase the number of low energy buildings. I'm mildly interested, primarily as another marketing item, however, the recognition might not become known by our client base for a while, so it might not be worth much from a marketing standpoint. From a technical standpoint, I'm already personally interested in low energy design, so a certificate program would likely not add much to my education.

(R-9): Yes and yes.

(R-10): To successfully implement/produce a project which exemplifies an integrated design architects must integrate renewable systems and demand response. All of which must be centered around the "human factor".

3. Do architects undervalue ‘free’ training? Is the same training valued more highly when you have to pay for it?

**QUESTION 3 KEY POINTS FROM RESPONDENTS:**
• Time concerns and quality of program matter more than cost

• “There is a difference between PG&E’s established customer base, and the uninitiated”

• Significant cost can be a barrier for some architects. However it can work well to bring the trainings to the firms or offer them to entire AIA chapters.

• Free is a good thing

• On the other hand, some people believe that they “get what they pay for”. Also, since time is at a premium, paying can serve as an extra incentive for someone to follow through and participate.

• Free may not be “enough” without other incentives

PEC Conclusion: The overall impression appears to be that architects don’t necessarily undervalue ‘free’ trainings. However, charging for a training could reduce ‘no show’ rates. Having prepaid for a training means architects are less likely to skip the training if work constraints arise than they are if a training is free.

Regardless of whether trainings are free or require a fee, additional models for ‘in office’ trainings should be considered.

QUESTION 3 FULL RESPONSES

(R-1): Possibly, but it’s important to have engaging speakers who make technical information interesting and useful.

(R-2): Not necessarily. PG&E's trainings are very well-reputed. In general, though -- like it or not -- people believe they get what they pay for. There’s a difference between PG&E’s established customer base (customers for ed. programs that is) and the uninitiated.

(R-3): I'm not certain what architects think about training.

(R-4): Absolutely, on both counts. At the same time, fewer architects can attend training when there is a (significant) cost. One thing that works well is to invite AIA Chapters or perhaps an entire office to training at once, either at the PEC or at their location -- in more of a partnership.

(R-5): It is not the cost of the education; it is a California Certification / License (ARB, CEC, CalCERTS) that is more important.

(R-6): I am not sure if free is the problem, or if is a matter of time, and indeed quality, of program. When architects are not working due to downturns, they have time but insufficient resources. When
they are working they may have resources but no time. Offering workplace sessions or online sessions may be a better option.

(R-7): The ADA-training licensure requirement is not free. There are various organizations that offer differently-priced online training sessions for this and I can assure you that architects look for the least expensive one. If it were free, it would be the selected option.

(R-8): Yes, in general, architects don't participate much in the free offerings because time is at such a premium. I don't think paid training is much more valued - but once signed up, might provide enough incentive for people to make sure to participate.

(R-9): No.

(R-10): Free training alone may not be enough unless it is completed with some type of incentive program.

4. As Title 24 mandates higher levels of energy performance and exceeding the code becomes increasingly more difficult, how would you structure incentives to architects to promote energy efficient design?

**QUESTION 4 KEY POINTS FROM RESPONDENTS:**

- The best way to achieve this agenda (high efficiency buildings) is to ramp up codes more quickly; Incentives are not as effective as code mandates
- Codes and market forces will push architects; The “incentive” is to get ahead of the competition and stay relevant
- Publish and market a list of architects based on criteria such as course completion, project completion etc.
- Contract structure should support and reflect the changes inherent in an integrated design process
- Programs that provide incentives to owners can help architects get buy-in from clients

**PEC Conclusion:** The general impression was that a mandate, not incentives for architects, will drive performance. Owners may respond to incentives and thus incentives have a role. However, once architects see energy performance as a market driver, they will feel a need to stay ahead of their competition.
**QUESTION 4 FULL RESPONSES**

(R-1): Programs like the national AIA COTE Top Ten awards, LEED, Living Building Challenge, etc. are key but they are still peripheral for many architects. The best way to mainstream this agenda is for the codes to ramp up more quickly, making deep energy efficiency required for all. Require it and architects, engineers and owners will find innovative ways to do it.

(R-2): Get relevant or go out of business?? I think it’s more a matter of marketing what’s available to help them meet the targets vs. incentivizing. The incentive is to get ahead of the competition, and that’s a marketing message. PG&E does a GREAT job of creating educational programs. It does a poor-to-mediocre job of promoting what they have on offer.

(R-3): <No Response>

(R-4): I believe the structure of contractual agreements must handle this issue. Business owners/leaders must be trained on the integrative design process so that they can be made aware of the benefits and structure contracts to support this process.

(R-5): Incentive programs are not as effective as code mandated requirements. Architects can help in promoting EE design, but the building owner is the one who must be made aware that their building must achieve a particular efficiency, and this public information message should be delivered to the building owners by the CEC, not the architectural profession.

(R-6): Code compliance is mandatory, so the use of regulation as a tool to reduce demand is important. Architects do say that they have problems with encouraging clients to take steps that may add to the cost of construction. Programs that provide incentives to owners, as well as continuing efforts such as Savings by Design should continue.

(R-7): It seems to me that if the codes become that strict, then we have achieved mandated energy-efficient design. I believe that this is very market-driven. When the clients explicitly add energy efficient design to their list of required experience and expertise when selecting an A/E team, the architects will be highly incentivized. Aside from cash awards, architects are most motivated by anything that moves them up in the list for a commission.

(R-8): I think incentives are not terribly effective. Mandates are much more effective.

(R-9): The voluntary approach has not worked. There is too much pressure to ignore it because of tight budgets etc. It has to be made mandatory for energy efficient design to work.

(R-10): Incentives could take one or more of the forms listed below: Develop, publish and market a selected list of architects based on criteria such as course completion, project completion, etc. Provide cash incentives such as those in "saving by design".
5. What should the PEC curriculum development goals be for the next year and for the next three years?

**QUESTION 5 KEY POINTS FROM RESPONDENTS:**

- Offer clear paths toward getting to net zero energy
- integrated design process Basics (including tools & resources and how to sell it to clients)
- Collaborate with statewide utilities, AIACC, public agencies and professional organizations to align with long-term goals
- Look at ways to require EE education for students and license renewal
- Focus on early-phase design now and potentially develop tailored approaches for different California microclimates
- Split courses into "beginner" and "advanced" tracks
- Keep meeting with advisory groups and interested parties to keep up momentum and circulate ideas
- Class ideas: Economics of energy savings; Philosophy of integrated design; Integrated decision making; Unintentional waste from buildings; Building a modeling system; Passive design; Code and regulatory compliance; Marketing the integrated building.

**PEC Conclusion**: Increase courses on process of integrated design. Combine management, economics, and building science. Advocate and work with other organizations for required education on California energy standards, energy-efficient design and 'zero-net' design.

**QUESTION 5 FULL RESPONSES**

(R-1): PEC is an excellent program - a huge resource for the profession and public. The "track" approach is a good start, allowing people to engage at the level they need. However I would caution against too many classes - fewer and better beats more. + Make the case for why ALL architects should be doing this - the "what". + Offer clear paths toward getting to net zero - the "how". Easy, right?
(R-2): Next year: integrated design process Basics (including "Why integrated design process") + integrated design process Tools & Resources + Selling integrated design process to Owners & Teams Next 3 years: integrated design process principles embedded in all course offerings + advanced integrated design process tools & resources

(R-3): To have all architects view the energy efficiency presentation; To add energy efficiency as a requirement in Architecture school.

(R-4): Collaborate with the statewide utilities and the AIACC to develop curriculum that will meet the needs of the architectural profession, as well as related professionals in the building industry, and which is in alignment with the CPUC Long Term Strategic Plan. Structure a curriculum that will be robust and at the same time flexible to changing needs.

(R-5): Make sure that this new EE program is required in order to receive an architectural license in California.

(R-6): Integrated design is a critical need and PEC should partner with owner, architect and contractor professional organizations to train and get the word out. AGC, AIA and BOMA all have some type of program on improving project design and delivery using an integrated approach.

(R-7): Next year: teach what you can about specific design strategies and tools for low energy design in the early design phases—what we know now. Next three years: develop materials and courses that focus on design strategies and tools for different microclimates in California and different building types. These do not exist now, but with some effort could be developed in the next couple of years.

(R-8): I think adding integrated design classes along with the already comprehensive technical classes would be valuable in the next year. I think over the next three years, developing "beginner" tracks and "advanced" tracks for low-energy design would be helpful so that younger architects could learn the basics, while more experienced architects would not have to wade through so much repetition.

(R-9): Keep meeting and invite interested parties to bring ideas. [There is] nothing like momentum and inertia to move things forward. The more specific and direct the curriculum is, the easier it will be for architects to apply it to their day to day professional activities. Quantifiable, measurable directives are best.

(R-10): The immediate goal should be the development/delivery of core curricula that addresses: Economics of energy savings; The philosophy of integrated design (mandates, ethics, the human factor); Integrated decision making. The next set of goals should include: Unintentional waste from buildings; Building a modeling system; Passive design; Code and regulatory compliance; Marketing the integrated building.

6. Do you have any follow-up comments on any issues raised at the curriculum meeting?
**QUESTION 6 KEY POINTS FROM RESPONDENTS:**

- Motivation/change is most likely to come to architects and clients alike through external (market, regulatory) forces

**QUESTION 6 FULL RESPONSES**

(R-1): < No Response>

(R-2): Great meeting -- loved it!

(R-3): Have pretty buildings but secondary to energy efficient buildings.

(R-4): I think it is important to speak to the intelligence of the design community, and introduce integrated design concepts in terms of "engaging together along a sustainable pathway -- integrating the conversation", rather than trying to say that the utilities are going to "teach" them integrated design principles (even though that is what is needed). I think that the required market transformation will come through an opening and expansion of a new mindset, not necessarily through techniques.

(R-5): No.

(R-6): Great meeting!!

(R-7): I think that there should be some thought given to how to motivate clients of different types based on their building procurement processes. Many (most) clients do not operate with a developer's mentality with regard to cost. What would motivate them to seek and prioritize low energy buildings? What are their perceived constraints? Can they get assistance in defining their selection process so that they get architects that really understand and can deliver a high performance, low-energy building?

(R-8): < No Response>

(R-9): I was shocked at the lack of interest by most architects and the general public based on some of the comments from the participants and their experiences in trying to promote energy efficient design. The urgency of the matter is not made clear to the general public and having some people deny the reality of global warming and the need to lower our energy consumption and for production of clean energy does not help matters. We need an educational blitz sustained for a long period to bring the public along. Then, the architects and the industry will be forced to design energy efficient buildings.

(R-10): Before launching an "Architectural integrated Design Curricula" it might be useful to develop a detailed plan which includes: A set of prerequisites - this might be online courses with test out options; A set of core courses that has four or five options/tracks; Advanced courses.