Critical-Path Steps for a Program that Delivers the "50% Energy Solution" 3/15/2017

Organizational Readiness

- ☐ **Success of a deep energy efficiency program is driven by attitudes as much as it is enabled by technology**. Most of this checklist centers on organizational factors and attitudes.
- ☐ **A key attitude is a willingness to challenge building systems design and operational practices** that have been entrenched and overly conservative for decades. Leadership must foster team trust that yields *breakthrough thinking*.
- ☐ **Ensure that facilities management (FM) staff, design and construction staff, and environmental health and safety (EH&S) staff are on the same page**. These groups need to "own" shared responsibility for getting energy projects done.
- ☐ **Leadership must reassure all stakeholders that *safety will not be compromised* for energy efficiency.** And facts, data, and rigorous analysis – rather than adherence to past "best practices" – will be the basis of ensuring safety.
- ☐ **Making buildings "smart" makes buildings safer for users.** Users of facilities are more assured about safety if building systems performance data – particularly air quality measurements – are made accessible to everyone. Transparency leads to insight, confidence, trust, and user support.
- ☐ **Communicate the view that borrowing experience and lessons learned from other programs is a sign of strength, not weakness.**

Goal Setting and Messaging

- ☐ **Develop shared understanding about why the 50% efficiency improvement goal is achievable and feasible:**
  - Prior to digital sensors and controls, building systems were designed for "worst case" loads, occupancies, hazards, and operating conditions. Energy waste was considered inevitable and tolerable.
  - Fan airspeed and pump flow-rate reductions yield *exponential* electrical energy reductions (the "cube rule").
- ☐ **Develop shared understanding for reasons *behind* the 50% goal**. This goal yields carbon reduction at *zero or negative cost*, whereas de-carbonizing source energy will entail a significant cost.
- ☐ **Establish periodic, quantitative progress reporting against annual goals**. Establishing this process conveys a genuine interest in achieving results.

- ☐ **Keep goal messaging simple, measurable, and understandable.** Set an overall percentage reduction for consumption, e.g., MBtu/SF or kWh/square foot/year. Set this goal for 5-7 years out, e.g., -X% by 2022-24, where X = 50% less the percent improvement previously accomplished.

Management and Leadership

- ☐ **Leader needs to be a visible, engaged champion of the energy retrofit program.** The leader cannot slip out of sight; rather, do a "checkup" using this list every 60-90 days.
- ☐ **Develop an understanding among campus leadership that a comprehensive energy efficiency program is an *investment* that pays off in terms of direct savings *and* addresses building systems deferred maintenance problems using, in effect, energy savings**. Moreover, this investment is low risk now that the types of energy retrofits applicable to campuses have been proven effective, savings targets have been consistently met, new ideas have been tweaked and optimized by early adopters, and deep energy efficiency is proving the most cost-effective and feasible way to effect a major reduction in GHG emissions.
- ☐ **Get campus leadership, staff, and stakeholders to embrace the scale and multi-year scope of this program.** In planning your program, expect to invest on energy efficiency retrofit projects an amount that approximates 40% of your energy budget over a seven-year period.
- ☐ **High-caliber implementation staff constitute a critical success factor.** Key roles include the Energy Manager charged with leading the program. A sizable program requires dedicated project delivery staff who can efficiently manage contracts, consultants, and contractors. Many organization structures and staffing models can be effective if enthusiastic, well-supported staff are empowered to take action.
- ☐ **Energy Manager needs to be responsible for evaluating the building inventory; prioritizing projects; and working with consultants, project managers, campus faculty and staff, and local utilities.** The Energy Manager needs to be empowered to make decisions and prioritize other professionals' work. The Energy Manager will determine the monitoring and verification (M&V) plan for each project. This critical position requires both technical and leadership skills, and is best supported by a team of engineering professionals with decades of design and operational experience who can trade off leadership roles and technical responsibilities as needed to deliver an array of interrelated projects.
- ☐ **Align responsibilities clearly for accountability and success.** The Energy Manager controls the funding for projects. Project managers write the contracts for engineering design consultants and bid contracts for implementation. The Energy Manager is essentially the "customer" and the trades/construction project managers are working for the Energy Manager. Clarity in these responsibilities is key to success.

Program Planning and Financial Planning

- ☐ **Provide "seed funding" to jump-start the program**. For a large research campus, this investment may approach a million dollars, but this investment will be more than recovered within a few years.
- ☐ **Build an energy project team** of engineers and design professionals who have both technical skills and managerial skills.
- ☐ **A successful program will need not only internal staff, but consultants who can evaluate, scope, and help plan the program**. This addresses the question, "where do we start?" Quickly evaluate building stock, collect as much data as readily available about buildings across campus, and crunch the data.
- ☐ **Use a simple project justification process**. For example, base funding approval on meeting a debt-coverage ratio (e.g., 1.15X) for the *entire program,* with no individual projects yielding <1.0X debt coverage. Do not require the Energy Manager to jump through numerous justification hoops.
- ☐ **Use a financing strategy that will enable a large-scale, multi-year, comprehensive program that can attain 50 percent energy reduction campus-wide.** A comprehensive program supports capital-intensive, longer-payback retrofits in combination with fast-payback retrofits. Do *not* give away the "low-hanging fruit" no matter how lucrative and expedient the temptation may appear. Comprehensive, whole-building energy retrofits create *synergies* that multiply savings, attaining or even exceeding 50 percent.
- ☐ **Pilot new project types initially before scaling-up campus-wide.** For example, select a relatively straightforward laboratory project (where digital controls and variable-air volume exist) as the initial "smart labs" project, learn from the pilot, and then deploy broadly. Do something similar for lighting retrofits.
- ☐ **Do lighting retrofits before HVAC retrofits**. Several reasons: HVAC loads will be reduced, lighting retrofits are simpler than HVAC retrofits, early savings will be realized, and lighting is part of every whole-building retrofit.
- ☐ **Take advantage of utility rebate programs or establish partnerships to create them.** Utility rate-payers have a vested interest in supporting energy efficiency, and incentive payments can enable projects that would otherwise not have been feasible.
- ☐ **Employ other campuses' proven practices** to incentivize and reward contractor performance. Also, import other campuses' best practices for managing project information and impacts on occupants of buildings undergoing energy retrofits.

Project Design Strategies

- ☐ **Apply sensors and software to deliver on this simple design goal that needs to be broadly understood:** a "smart" building system applies just enough energy, at just the right place, at just the right time.
- ☐ **Do comprehensive, integrated, whole-building energy retrofits** that attain ≥50 percent overall efficiency improvement.

- ☐ **Develop broad understanding that the energy management program does not merely enable the precision application of energy.** It also provides an essential "information layer" to verify and sustain performance.
- ☐ **Import proven project designs from other campuses**. This lowers risk, ensures success, and accelerates results.
- ☐ **Wherever feasible, design projects to achieve benefits beyond energy efficiency.** Building occupants are often unware of energy usage or savings, but they can become vocal champions if they perceive such improvements as higher quality lighting, quieter air-handling systems, or better temperature control.
- ☐ **New MEP consultants may be needed** to creatively challenge embedded, status-quo design practices.
- ☐ **Many projects will modify existing campus control systems.** Operations staff need to understand and buy into the "new normal." Otherwise, systems will revert to prior status-quo operating parameters.

Wendell C. Brase
University of California – Irvine