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SEIZING THE OPPORTUNITY (FOR CLIMATE, JOBS, AND EQUITY) IN BUILDING ENERGY EFFICIENCY

JOEL ROGERS

Abstract[*]

Retrofitting buildings to improve energy efficiency offers an excellent path to improving our natural and built environment. Existing buildings are grossly energy inefficient and are a major site of energy consumption and greenhouse gas emissions. Improved efficiency is not only the cheapest, most reliable, and climate-friendly way of meeting energy needs but it also saves money for utility customers while earning investors attractive returns. Finally, retrofitting requires extensive labor that can improve our economy, provide jobs to low-skilled workers, and enable training and advancement to more skilled work opportunities. President-elect Obama recognizes this potential in his proposals to use green technology training to build a clean technology workforce and to improve the efficiency of both new and existing buildings. However, the market does not

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currently include these opportunities because such efforts require coordination among multiple parties to overcome barriers such as upfront costs and risk aversion. This brief outlines a strategy, including specific policy proposals, to overcome these barriers and successfully transform our built environment to an energy efficient one.

Policy Recommendations

Federal policy should focus on developing organizations – government agencies, non-profits, coops – to administer projects that coordinate and provide benefits to utility companies, tenants or energy customers, banks, energy auditors, and certified contractors. One strategy to improve the management capacity of groups that can initiate and oversee these retrofitting projects is to offer them technical assistance. In addition, the federal policy can restructure incentives to 1) mandate energy efficiency; 2) reduce barriers to investment; 3) require full net-metering for customers; 4) developing markets for the "secondary" value of greater efficiency, such as emission trading markets; and 5) encourage greater cost transparency throughout the energy system. For these initiatives to be successful, the programs must both encourage deep participation throughout society and focus on equity issues such extending benefits to low-income households, providing not only more jobs but also higher quality jobs, and engaging communities.

Natural Constituencies

This policy framework creates opportunities for constituents across the wide range of groups that it seeks to coordinate. For example, energy customers will support reduced costs while banks can gain from new investment opportunities. The main constituency, however, would be the construction industry, contractors, and energy auditors that would provide the labor the retrofitting itself.

The most opposition to this strategy will arise from the mandates for energy efficiency that are included to promote deep participation in this new model. Tough builder standards and similar legislation could add project constraints and costs to contractors who seek to maintain flexibility and keep their costs low.

NOBODY SERIOUSLY DISPUTES the facts that: (1) buildings are the site of gigantic energy consumption and greenhouse gas (GHG) emissions in the U.S. and grossly inefficient in their energy use; (2) efficiency is the cheapest, most reliable, and climate-friendly way of meeting energy needs; (3) prudent investment in improving building energy efficiency can save utility customers (especially the poor) lots of money and earn investors an attractive return; (4) "retrofitting" buildings with current materials and technology to improve energy efficiency requires a lot of labor — ranging from entry-level to very skilled — which has to be done here.[1]

So you might think that building energy retrofits would be a killer app, of appeal to anyone concerned about climate, energy security, helping the poor, making money, or growing domestic employment. But it's not. Compared to the size of the opportunity — at its limit, covering all *300 billion square feet* of building space in America with cost-effective retrofit measures — the amount of retrofitting that goes on is tiny. This is so even in our cities, which account for most global warming and consume most of their energy in buildings.[2]

Why is this? And what is needed to get building retrofits done at scale? In what follows I assume a market test on financing — that loaned or invested capital for the work needs to generate a risk-adjusted market rate of return.[3] So another way of asking our question

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[1] On these different claims: (1) Buildings account for 40 percent of total U.S. energy consumption (70 percent of U.S. electricity consumption) and 43 percent of U.S. carbon emissions, a larger share than either transportation or industry; (2) Efficiency savings on the order of 20-30 percent are readily achievable by better insulation, lighting, and HVAC equipment and controls; more intensive efficiency measure applications can achieve savings on the order of 50-60 percent on a simple cost-effective basis (i.e., savings payback of more than full cost during lifetime); current consumption expenditures on building energy were about $350B in 2005 and should be about $400B this year, so the potential available savings should be somewhere north of $200 billion; (3) Efficiency costs approximately 3 cents per kWh of energy saved; measures are often one-time and low maintenance (e.g., insulation); the cleanest power plant is one not built; poor households devote a disproportionate share of income to home energy costs (often upwards of 10 percent) both because they have less income and tend to live in less efficient buildings and use less efficient appliances; common industry estimates show measures reaching 20-30 percent gains in efficiency paying for themselves in 3-5 years, and those reaching 50-60 percent improvements paying back in 8-10, implying internal rates of return of 10-33 percent; (4) Every $1M spent on retrofits generates about 10 person years of employment in direct installation of efficiency measures and another 3-4 person years in the production of relevant materials; buildings don't usually move.

[2] Globally, cities contain 50 percent of the world's population (by 2030, at least 60 percent), consume 75 percent of its energy, and account for 80 percent of its GHG emissions. As a share of local energy consumption by cities, buildings regularly account for more than 60 percent. In dense cities like NYC, they account more than 80 percent.

[3] This test may strike some as unduly demanding, but I think it's recommended on both practical and normative grounds. Practically, the prospect of entirely "free" capital (i.e., capital with no interest or repayment obligation) is vanishingly slim, especially in the amount needed for a big effort. Normatively, even less demanding capital should be spent wisely. A market test helps ensures that.

is this: Why doesn't the market for retrofits work, and how can we fix that?

Why The Market For Retrofits Doesn't Work

An old joke has it that an economist spots a $20 bill on the sidewalk but doesn't bother to pick it up because she knows it can't exist. In a world of complete competitive markets with only coordination problems standing in the way of increased wealth (problems that markets solve brilliantly), such unclaimed values aren't possible. In the real world, of course, markets are beset by "imperfections" (i.e., departures from the competitive market ideal) and "failures" (i.e., limits to that ideal in optimizing social welfare) that routinely miss values. The economist's failure to distinguish theory from reality is the joke here, and it's on her.

Retrofitting buildings for greater energy efficiency is something like that $20 bill. The opportunity is there and people don't pick it up. But this isn't because they're in the grip of a theory so strong that it makes facts disappear. It's because they don't even see the bill, or lack the strength to pick it up, or discover that they must run about the block several times before getting near it, only to have somebody else snatch it away from them. What's funny about that?

But so much for an overtaxed metaphor. The reason building energy retrofits aren't a killer app is that in the real world there are all sorts of barriers to realizing their value. Setting aside lack of interest or preference for other spending, among *tenants and owners* of buildings these barriers include:

1. Poor information (on costs, savings, people to do the work, etc.);
2. Lack of capital or access to capital (capital markets for building efficiency are not well developed, and only the Nobel committee gives a prize for banking on the poor[4]);
3. Split incentives (X pays the energy bills but Y owns the property);
4. Limited tenancy or ownership (why invest in efficiency if you're not around to get its benefits?);

Many things are desirable, but two seem most critical:

(1) For tenants/owners, much clearer incentives to take action, and radically lowered transactions costs in taking it. That would mean, ideally, no upfront capital costs, immediate and ongoing net savings, turnkey solutions on getting the work done properly, and no obligation beyond the period of their tenancy/ownership.

(2) For external investors, savings aggregation and reliable recapture of loaned capital. That would mean ways of pooling savings from diverse sources, and providing the individuals getting those savings compelling reason to pay back loaned capital.

[4] I refer to receipt of the 2006 Nobel Prize in Economics by Dr. Muhammad Yunus, whose Grameen Bank helped establish microcredit as a tool in economic development. Yunus' first (personal) loan of $27 was to 42 self-employed craftspeople. $6 billion in like loans after, Grameen's default rate is < 1 percent.

5. Costs of disruption (especially with many different people doing different parts of the work, who wants their life interrupted?);
6. General risk aversion and "social skepticism" (people are much more sensitive to losses than gains; that's especially so if gains require the cooperation of other people).

External *investors* in energy efficiency have some of these same problems but also those of:

7. Disaggregation (highly dispersed individual savings, each with negotiation costs on capture, rather than a single big opportunity);
8. Creditor default (we all know what that is).

Of course not all situations or people have these difficulties. Some many have none of them — say, an adventurous young homeowner in expected permanent residence, in good health and flush with money, whose best friends include many electricians and HVAC contractors. But most people have some of these problems, and poor people tend to have a lot of them.

How To Fix That

If that's why retrofits aren't being done anywhere near the scale we desire, how might we fix that? Many things are desirable, but two seem most critical:

(1) For tenants/owners, much clearer incentives to take action, and radically lowered transactions costs in taking it. That would mean, ideally, no upfront capital costs, immediate and ongoing net savings, turnkey solutions on getting the work done properly, and no obligation beyond the period of their tenancy/ownership.

(2) For external investors, savings aggregation and reliable recapture of loaned capital. That would mean ways of pooling savings from diverse sources, and providing the individuals getting those savings compelling reason to pay back loaned capital.

Are these things achievable in a reasonable model that might be applied in the real world? Yes they are. Here is a relatively simple model with six key players and four key contracts among them.

In rough order of appearance, the actors and their respective roles are:

1. A coordinating entity, here called **E2** (for "Energy Efficiency"), responsible for the project's administration. E2 would be the aggregator of customers/savings for the capital provider, the point of accountability for energy consumers, the manager of those actually doing the retrofit work. E2 could take any number of legal forms: a government entity or public-private partnership of some sort, a private for-profit or non-profit, a coop, etc.

2. A **utility** that regularly bills tenants/owners of properties for energy or other essential services and is willing to put a charge for E2 services on that bill and forward collected charges to E2. This could be a conventional energy utility or a water utility or provider of some other necessary service to the property. Nonpayment of the E2 charge would make the E2 program participant liable to discontinuance of that essential service (so, shutting off their heat or electricity or water).[5]

3. An **energy customer/E2 participant** willing to pay for the cost of efficiency measures on her utility bill if the annual repayment obligation is lower than their estimated energy savings[6] and if the payment obligation applies to her only during her tenancy/ownership (after which the unpaid obligation attaches to next tenant/owner or, in case of sale, is wrapped into the sale price).

4. A source of capital or **bank** that is willing to loan money to E2 for the work if it aggregates a large number of such customers/participants and acts as their intermediary. This bank could be an actual bank or group of banks, or a government, foundation, private investor, pension fund, or community savings pool, or any combination thereof. The loan itself could take many forms, and draw from different sorts of capital (public and private, taxed and not). In operation, it would ideally work at first as an open line of credit that E2 could draw down only as needed, and then as a revolving loan fund where income from participants is recycled out as capital for new work.

5. A certified and bonded energy **auditor** to recommend appropriate retrofit measures. Whatever the cost of capital, measures financed in the program would be restricted to those that have expected full saving payback well short of their expected life and imply payment charges well less than expected savings.[7]

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[5] I don't attend here to the many contingencies and variations in dealing with partial payment; state and municipal disconnection rules in case of non-payment; use of public or other guarantees against default; or the applicability of current utility ability to anticipate non-payment in rate proceedings (thus visiting them, as is done now, on all ratepayers), etc. These are among the many important details that need to be worked out, locally, in negotiation among the local parties and demands of local law.

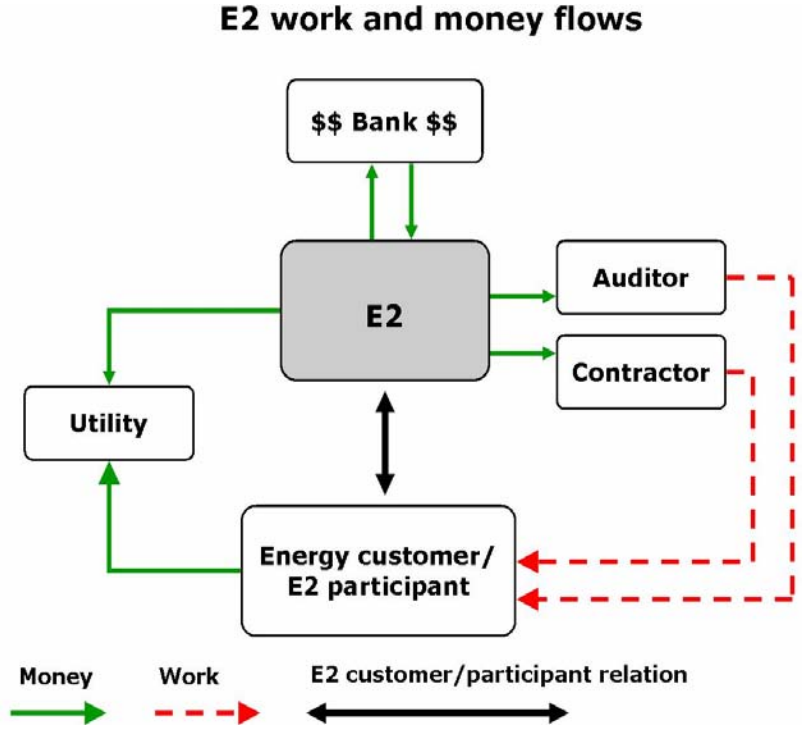
[6] Estimated savings are calculated based on the past verified average efficiency gains from the measures applied. We could alternatively measure before/after consumption directly, but getting to such direct measurement is presently difficult. Greater efficiency also raises a threat of moral hazard, with consumption potentially increasing because of its greater efficiency. Relying on verified past average efficiency gains seems like a fair, and certainly simpler, way to administer this.

[7] As a rule of thumb that gives some margin in meeting other terms, Paul Cillo and Harlan Lachman of the Energy Efficiency Institute and PAYS© recommend restricting measures to those that pass a "¾ - ¾" test requiring that (a) the term of payment for the measure not exceed 3/4^{ths} of its estimated useful life and (b) annually not exceed 3/4^{ths} of the measure's estimated annual savings.

6. A certified and bonded **contractor** to do the work.

The model would work like this (contracts numbered in bold). In expectation of adequate demand for E2 services and resulting individual savings, bank loans E2 money at interest for use as operating capital **(1)**. E2 identifies customers willing to pay for retrofit work on the above terms and contracts with an auditor **(2)** to determine the scope of appropriate measures at their property. Customer approves scope of work and assumes obligation to pay E2 via utility bill **(3)**. E2 contracts with contractor to do the work **(4)**.[8] Work is done and verified by E2. Repayment to E2 begins via the participant's utility bill.

In the figure below, the solid green lines represent the flow of money; the dotted red lines the flow of work; the two-sided black arrow the ongoing E2-customer/ participant relation.



[8] Here we propose separating the auditor, contractor, and financing roles to avoid the conflicts of interest and potential for opportunism intrinsic to most ESCOs (energy service companies). Along with seeking the highest return (which favors quick payback measures over the deepest energy-savings ones), ESCOs typically perform both the auditor and contracting functions, charge for use of their capital in the performance contracts they offer clients (but typically not on terms visible to clients), and produce or vend for a producer of the recommended efficiency equipment. With more experience, some of this separation of roles, especially the auditor/contractor ones, might be usefully reconsidered. Auditing has its own costs, and participants don't like disruption. Appropriately monitored, we can easily imagine combining the auditor and contractor functions, or running them in cooperation and more or less simultaneously. Also, note that these concerns about ESCOs are only that, and not a bar to working with them. ESCOs are obviously the repository of much skill in realizing efficiency savings, and this should be tapped into.

This model gets rid of most of the barriers noted above. It dramatically lowers risk and transactions costs for both recipients of services and capital providers. For tenant/owners, it requires no upfront capital, improves incentives by virtually guaranteeing immediate and ongoing net savings, and is indifferent to the length of their tenancy/ownership. For investors, it aggregates savings while providing justified confidence in repayment. To tenants/owners, the value proposition is: "If E2 fronts you the costs of achieving greater energy efficiency and guarantees measures that do that, are you willing to begin paying back those costs out of some of your savings while you're here?" For investors the proposition is: "If E2 organizes and aggregates a large pool of potential energy savers and guarantees you repayment from them out of their savings, are you willing to loan on that?" Both propositions are straightforward and attractive.

Here's what this would look like for an individual tenant/owner, say a homeowner. Assume the homeowner's pre-E2 average monthly energy costs are $200. She approves E2 retrofit measures that achieve a 25 percent increase in the home's energy efficiency, saving her $50 on energy consumption. Assume that the cost of the applied measures was $2000, using capital loaned at an 8 percent rate of interest on a 7-year amortization schedule, which implies monthly payments of $31.17.[9] Assume finally some modest administrative charges added by E2, here set for convenience in rounding at $3.83 (at a bit over 10 percent of flow, quite reasonable). The customer's utility bill would include a summary that might look like this:

Pre-E2 energy consumption	**$200**
Your consumption this month	**$150**
Your estimated E2 savings	**$ 50**
E2 service charge	**$ 35**
You owe this month	**$185**

Now $15 a month ($180 a year) may seem like too little to motivate anybody. But it's still found money from the standpoint of the customer, and after amortization would rise to $50 a month ($600 a year). And if energy costs rise, which seems very likely, the E2 deal will only look better. Say that costs double, so that our homeowner (absent E2 participation) would face charges of $400 rather than $200. Now the bill might look like this:

Estimated consumption without E2	**$400**
Your consumption this month	**$300**
Your estimated E2 savings	**$100**
E2 service charge	**$ 35**
You owe this month	**$335**

[9] Of course, different amounts of borrowed capital, interest payers, and amortization schedules are all possible. We chose a rough mid-point in the payback on typical retrofit measures, including those getting the deeper savings we are after, and a standard market rate of interest.

Here, doubled energy costs doubles the top line on the bill, from $200 to $400. But it also doubles the worth of savings, from $50 to $100 a month ($600 to $1200 a year). The homeowner still doesn't pocket all those savings during amortization. But since her repayment schedule has remained unchanged while energy costs have risen, she also sees a good deal more of them. Net savings during amortization have more than quadrupled, rising from $15 to $65 a month ($180 to $780 a year). These numbers are probably big enough to get almost anyone's attention.

There are ways to sweeten this deal further for E2 participants, and I'll explore some of these below. For the moment, however, let's take the model to be clear and attractive enough to ask about its implementation.

Getting To Scale

So how do we get to wide implementation of something like this model?

Most of its ingredient elements and antecedent conditions already exist. Along with countless examples of achieved savings from improved building energy efficiency and "shared savings" programs that utilities and ESCOs run with (typically larger) larger customers, we have examples of on-bill repayment schemes (via energy utility bills or property-taxes).[10] We have political demand for greater building efficiency, especially from mayors, and interest from private capital in financing projects with large aggregated savings.[11] We also, of course, have lots of energy customers worried about rising home energy bills, plenty of poor people looking for green pathways out of poverty, and general if diffuse public interest in doing something about climate change.

What are chiefly lacking are the E2-type entities to combine and harness these different elements and public interest into operational business plans. We lack some relevant *management/ organizing* capacity to run E2s — to persuade local civic leaders, recruit and service customers, negotiate with banks and utilities, target services at different points in building tenancy and ownership, monitor auditors and contractors, and otherwise handle administration on the terms indicated. There are also challenges/opportunities in realizing the *equity* promise of building retrofits, in improving

[10] New Hampshire, Hawaii, and Kansas now require at least some meter-based repayment of efficiency costs (see www.paysamerica.org), and Berkeley, CA now has a program to pay back investments in residential solar through property taxes (see www.cityofberkeley.info/sustainable).

[11] On interest from mayors, nearly 800 cities have joined the Climate Protection Agreement (see usmayors.org/climateprotection/) to achieve Kyoto GHG reductions. Virtually all make building efficiency a key part of reaching their goals. NYC's climate action plan (www.nyc.gov/html/planyc2030), for example, includes retrofitting some 900,000 buildings. On interest from private capital markets, basically all major banks are now scouting around in this area. The $5B they've committed to the Clinton Foundation's building retrofit effort with C40 cities (see www.clintonfoundation.org/) remains the most dramatic single example of interest, but it is hardly alone.

their support in *policy*, and in achieving *"deep participation"* in building efficiency projects, by which I mean the joint maximization of investor/tenant/owner involvement and the depth of available savings achieved.

Let's now consider these challenges/opportunities, and some of the work needed to meet/realize them. What follows is by no means intended to be exhaustive of the problems and promise, just a look at some of the work ahead.

Management/Organizing

E2 entities can again take different legal forms and organize their diverse corporate functions in different ways. But they will all need the capacity to develop business plans, handle money, negotiate deals, and navigate the complicated politics of what could soon be very large projects. This is considerable management/organizing capacity, beyond that of many of those with interests in building energy efficiency. We should be looking for potential allies in assembling that capacity (e.g., utilities, national or local ESCOs, progressive unions, community groups, etc.), and anticipate and encourage experimentation with different organizational models for finding the right combination of business competence and soul.[12]

We should also be prepared for some failures (the greatest source of learning), but work to avoid unnecessary failure by publicizing old mistakes or, more happily put, by widely sharing knowledge of what's been tried before and how it did. More generally, we should build learning routines for the new community of practice we hope to engender among E2-led efforts. That means an easily accessible (inevitably web-based) clearinghouse, displaying information on past efforts in building efficiency, emerging projects, current industry practice, major technology changes, etc., and supporting this new community's development of shared performance metrics, evaluation routines, program refinements in light of evaluation, benchmarking, and other ongoing information sharing.[13] Nobody with the ambitions assumed here knows precisely what they're doing here. We should admit our uncertainty, proceed as transparently as possible with the best available knowledge, and learn better how to learn together.

Especially since the field is moving so quickly, there will be need for more advanced sorts of technical assistance (TA) — in new financing possibilities, application of new technologies, new governance models, etc. — to the community of E2s Where this capacity exists it is scattered among multiple, often competing, and often for-profit

[12] Indeed, it would help immediately to have a list of alternatives that can be revised through future practice: different legal structures for these entities, different financing mechanisms at different points in their development, an inventory of the sorts of ongoing technical capacities they need, guides to assembling those capacities in different communities, estimates of costs of getting started, standards for outsourcing their necessary functions, etc.

[13] The beginnings of such a clearinghouse will soon be available at Green For All (www.greenforall.org).

organizations. There's need for thought on the design of some sort of cooperative (or, if you prefer, "open source," "peer production," "collective intelligence") model for its delivery — pulling from each TA provider what they are best at and combining it with contributions from others — at a cost that fledging E2s can afford.

Finally, we should explore whatever potential economies of scale and scope can be realized by direct program collaboration among members of the E2 community of practice. Among these are: (1) economies in joint training of their management/organizer leadership; a shared labor market, and recruitment to it, for the staff jobs they will have; peer-to-peer cross-site training; etc.; (2) economies in joint public education and advocacy work (e.g., on the benefits of building efficiency, the costs of present policy); in the use of shared technologies in community outreach (organizing the community of potential participants is obviously a major issue throughout); in pooled response to new opportunities (in policy, financing, etc.) or challenges; (3) economies in developing shared tools or research capacity for community assessment, targeting, business planning; (4) economies in the training needed for the actual work involved in projects (e.g., shared community college or other training curricula, assessment and screening tools for job candidates, routines on job placement and monitoring, training delivery modes); (5) economies in aggregating project finance on a multiple-site basis, to spread risk and further reduce capital costs. Not all of these will prove equally useful, and better opportunities will inevitably surface. The point is to keep an eye out for them all, and get the capacity to explore the promising ones.

If this field takes off, the costs of all these things — management/organizing capacity-building, learning infrastructure, advanced technical assistance, economies of scale and scope from more intense program coordination — can eventually be competed away or absorbed into general program administration. But the field is certainly not there yet. This suggests a natural role for private philanthropy[14] or public capital.[15] The bottom line is that to advance this model and get wide replication we need a few examples of doing this right and infrastructure for doing more of it, along the lines just described. And whatever the "market test" on actual performance we accept here, neither of these things is likely to come — at least, again, on the ambitious terms proposed here — from private markets. It requires risk-taking entrepreneurs for the public good, not just the private one.

Equity

[14] Especially since the field is new, it also presents an opportunity for philanthropy not just to help but to improve its own practice — with a cooperative initiative drawing money from multiple sources but sharing realistic expectations on the duration of support (conditioned on measurable progress on goals), eligibility criteria (including local matching requirements) that respect variation in local capital availability and philanthropic culture, metrics on progress, discipline in their enforcement, etc.

[15] If philanthropy does not step up to this, government should. Even in a model that relies heavily on private capital to pay for the work, it's entirely appropriate for public money be used to improve the efficiency of project administration and especially its ability to advance public interest goals.

To realize the equity promise of this work (i.e., its potential for poverty reduction and opportunity expansion for the poor and working class) we need capacity to recruit, train, and credential individuals seeking work in the building efficiency field (as regards training, in most cases, community college training as an energy auditor or HVAC technician is a good start); to place and retain them in institutions doing that work (companies, unions, others); and to assemble the additional social supports needed in both areas.

We have good models on all these elements from other industries, but again there's need to harvest past experience for lessons and to measure and diffuse good practices as applied to this one. We immediately need, for individual sites: plausible projections on new job demand from building efficiency projects; maps of their existing recruitment/training/placement/mentoring capacities; design of cost-effective ways of increasing that capacity; assessment of community college, employer, and other institutional interest in helping do this, and the terms of their help. Again and throughout, we should also be looking to realize economies of scale and scope and cross-site learning. To take some immediate examples: (1) there is no reason on earth why standardized detailed templates on all the tasks just mentioned should not be available to all; (2) no reason why job estimates done in one city are not shared with others; (3) no reason why those involved in different cities in the equity aspect of their respective programs should not be comparing notes.

The real equity goal is not employment *per se* — after all, as generations of civil rights leaders have pointed out, slavery was a full employment system — but employment in decently compensated jobs with real opportunities for advancement. Getting to decent compensation requires cementing alliances with unions, community organizations, high-road employers, and political leaders with interests in the same, and negotiating workable standards that they are all prepared to help enforce.

There are also governance issues around equity, specifically whether the chief responsibility for achieving it should lie with E2s or with some other organization. On the one hand, the issue is important enough to command attention at the center of project administration. The success of E2s depends on high participation and community support, and that support is unlikely without some real equity gains to that community.[16] On the other hand, there are natural tensions between satisfying these equity concerns and the market test that sustainable E2s must meet to survive. The latter will naturally incline E2s to select for service providers already prepared to do the

[16] Of course, one way to generate jobs for the community is to assign them tasks in project administration itself, as against the actual retrofit work. For example, community organizations could be paid to help recruit program participants. But we think this role, while important, should not come at the expense of getting to the "real" jobs in construction, plumbing, electrical work, etc., and assume that most community residents would agree.

work, potentially shortchanging the additional training and other services for those most in need. Mitigating those tensions is another natural role for government or philanthropic support, with such public-minded entities assuming some of those training and support services.

A different but related issue concerns tradeoffs between job quantity and job quality. The real equity goal is not employment *per se* — after all, as generations of civil rights leaders have pointed out, slavery was a full employment system — but employment in decently compensated jobs with real opportunities for advancement. Getting to decent compensation requires cementing alliances with unions, community organizations, high-road employers, and political leaders with interests in the same, and negotiating workable standards that they are all prepared to help enforce (e.g., prevailing wages and employer neutrality on organizing). But while such standards are now widely accepted in many public contracts, they are far from universal, and getting to that point will in many cases require a fight. Getting to career ladders will be even more complicated, since it will often require changes in the practices of the allies in that fight (e.g., unions and high-road employers). Again, there are useful lessons to draw from other industries in how community, business, and union support for both standards and career opportunities can be organized, even under sharply competitive conditions and community desperation for any employment. But even under more favorable conditions this is tough work, and a good deal more complicated than persuading someone to retrofit their house. We need to get ready to do it.

Policy

While our model can generally work under current law, there is every reason to improve the legal environment for building efficiency. That would among other things mean: (1) mandating efficiency investments (e.g., through tougher builder and appliance standards, or requirements to meet those standards at property point-of-sale or major rehab[17]); (2) removing barriers to those investments (e.g., by aligning the treatment of energy costs and building improvements under federal tax law, removing state and municipal land use laws that discourage dense development or transit-oriented development, internalizing the infrastructure costs of sprawl to the developers who lead it, getting full cost accounting on all new building construction, and life-cycle accounting on new infrastructure, removing barriers to value purchasing); (3) requiring full net-metering for customers (i.e., permitting customers to sell capacity to the grid as well as buy it, and to realize value from peak load reduction or other gains from efficiency of value to utilities) and the availability of utility billings systems to non-utility-led E2s, while

[17] Just one point here, to emphasize both the availability of proven efficiency practices and the slowness of their diffusion: it is now more than a *quarter century* since San Francisco enacted its Residential Energy Conservation Ordinance (RECO), which requires upgrades at point of building rehab or sale (see www.sfgov.org/site/uploadedfiles/dbi/Key_Information/19_ResidEnergyConsBk1107v5.pdf). But only a handful of cities have followed its example. Also, even the best law means nothing without enforcement, so resources for enforcement should be part of any proposed change.

compensating utilities for costs in increasing energy efficiency and not just the costs of new generation and distribution and sale; (4) developing markets for the "secondary" value of greater efficiency (e.g., emissions trading markets, efficiency trading markets, forward capacity markets[18]) and giving E2s the right to play in them; (5) encouraging greater cost transparency throughout the energy system, from real-time energy pricing for consumers to valuation of externalities (positive as well as negative) of different energy generation/efficiency measures.

These are all complicated issues, involving many legitimate differences on the precise elements of best design. Part of work ahead is to get closer to a sophisticated and consensus public interest view on them. But one thing is already clear. While all these changes are in the public interest, and many offer "win-win" opportunities for the public and the energy industry, there will also be a fair amount of industry resistance to many if not all such reforms. So in addition to figuring out more precisely what we want, we need to frame the issues in ways that are understandable and motivating for the public[19] and to organize the public to achieve reform despite opposition.[20]

Deep Participation

Finally, we need to find a workable means of maximizing *both* external investor and owner/tenant participation *and* the depth of energy savings achieved. High participation for very modest efficiency goals (skimming) will not do. Neither will deep energy savings for a tiny share of population. What we're after are high participation rates that leave as little unclaimed efficiency behind as possible.

The problem is that deep savings usually imply a longer payback period (i.e., a lower rate of return) for investors and greater disruption for existing tenants/owners. External

[18] Cap-and-trade systems on GHG emissions and raise-and-trade systems on energy efficiency work on the same general principles. A standard on permissible activity is set and then moved over time in the direction favored by policy, with permits awarded or auctioned to those engaging in the activity, and those on either side of the standard allowed to trade (buy and sell) these permits to reach universal compliance. In GHG emissions trading, where emissions are capped and lowered over time, those above the permissible level buy permits from those below it. In efficiency trading, where the standards are raised over time, those above the mandated level sell permits to those below it. As used here, a forward capacity market is a market for meeting expected future energy demand that values avoided new generation (i.e., efficiency) as highly as those of new generation capacity.

[19] A simple frame might be this: (1) consumers have a right to know the cost of their energy consumption in real time; (2) avoided generation costs should be valued at least as highly as new (dirty) ones.

[20] In building that public it will be important, as on other "environmental" issues, to emphasize the equity, productivity, and security gains from less energy consumption, not just the public health and climate ones. Energy consumption is heavily regressive and now hurts the working class as well as the poor, waste in production is lost value of no benefit to any business except the energy one, and the distortions of our foreign policy that follow from our energy dependence are perhaps too well known to require comment.

investors don't care about disruption but are concerned about liquidity and rates of return. For tenants/owners the interests are approximately opposite. They don't care about investor liquidity or return, and on our model they should be willing to accept long paybacks[21] — since amortization schedules can easily be adjusted to get them net savings throughout, and the remaining obligation goes elsewhere on vacancy or sale. But they do care very much about disruption.

High participation can help overcome both the investor and tenant/owner problems. With a big enough pool of participants, it's easier to adjust the mix of applied measures to get quicker buy-down of debt and an average payback that satisfies capital without sacrificing opportunities for deep savings. A large pool also permits targeting the application of measures to periods of low occupancy activity (e.g., during temporary vacancy, or already-scheduled rehab, or sale) while ensuring a steady flow of work.[22] Such targeting, which obviously avoids disruption, also allows greater cost-effective deep savings by reducing their cost.

But how do we get to high tenant/owner participation if direct energy cost savings aren't motivation enough? One way is to require it. Pass a law requiring that all buildings, within a given period or upon major rehabilitation or sale, meet a certain standard of energy efficiency — and then keep raising that standard. That's simple enough. All is needed is public will.

Another way is to elicit highly voluntary participation by further reducing its risks and increasing its return for key players. That means reducing external investors' risk of default or increasing their effective return (ideally to the point that they are willing to free up capital at lower nominal interest rates), and/or increasing the ability of tenants/owners to capture benefits in addition to lower energy costs. For external investors, risk can be reduced by using less demanding capital (e.g., public money or philanthropy) for credit enhancement, including guarantees on expected defaults. Return can be increased by awarding their investment favored tax treatment. For tenants/owners, we've already taken out all risk in our model. But return can be increased by tying participation to benefits other than energy cost savings. Participants might for example be given favored public service, financial credit, or tax treatment — from accelerated permitting of property development, to better credit ratings by financial institutions, to partial relief from local property taxes. They could be awarded value for the contribution their efficiency makes to peak load reduction or service reliability (something highly valued by utilities), or to the ends valued in the current or anticipated markets mentioned above (e.g., markets in GHG trading, efficiency, forward capacity), or to values in new markets

[21] I don't mean to overstate this. Especially among homeowners, despite the built-in assurances of the model, there is probably some limit to their tolerance for really long paybacks. But in truth we don't really know this either, and there's some obvious contrary evidence in the frequency of 30-year mortgages, so it's another place where more experience and evaluation are needed.

[22] Alternatively, if this is unduly restrictive, one could make the contract with tenants/owners two-staged, with immediate application of less disruptive measures and postponed (but obligated) application of more disruptive ones upon such periods of occupancy activity.

we can imagine to value the positive local externalities of building energy efficiency (e.g., its contribution to the health and productivity of their occupants[23]). And, looking beyond energy efficiency, the model described here can easily be wedded to almost any other way of producing value within buildings. One obvious way is to use buildings as a source of distributed energy generation, e.g., anything from solar panels to micro-CHP (combined heat and power, a.k.a. cogeneration). No doubt there are others.

In combination, such efforts could substantially improve the payback to tenants/owners. Consider a revised, and frankly fanciful version of our first homeowner example. This assumes the same basic numbers as in that first bill — with a $2,000 retrofit on a home with prior monthly energy costs of $200 a month, realizing a 25 percent increase in efficiency. But it also assumes cheaper financing: say at 5 percent instead of 8 percent, which would drive the monthly payments down to $28.27; modest gains in administrative efficiency (perhaps following from wide participation), so administration adds only $1.73 in additional costs (this particular figure, again, only for rounding). And it assumes homeowner participation in (1) GHG emissions markets, (2) forward capacity or other efficiency markets, (3) some local program that values the positive externalities just mentioned, and (4) sale of energy back to the grid — with $40 coming from each activity monthly. Then the bill might look like this:

Pre-E2 energy consumption	**$200**
Your consumption this month	**$150**
Estimated E2 energy savings	**$ 50**
This month's GHG credit	**($ 40)**
This month's negawatt credit	**($ 40)**
This month's local positive externality credit	**($ 40)**
This month's sale back to grid	**($ 40)**
E2 service charge	**$ 30**
You owe this month	**$ 20**

So now we're talking *serious* money savings: $180 a month ($2160 annually) during amortization, $210 a month ($2520 yearly) thereafter. Indeed, after amortization, the homeowner's energy bill effectively disappears. Instead of spending $2400 a year on this household necessity, she's *netting* $120 a year.

Beyond mandates and more material incentives, finally, there is moral persuasion and appeal to the public good. Defensive and battle-weary partisans of social progress often forget to make such "soft" arguments, even though it was precisely such arguments — for decency, regard for others, a concern for justice, a "blessed community" of equals,

[23] This is not a joke. Greater building energy efficiency makes buildings more comfortable and healthy for those within them. And less stressed and physically uncomfortable occupants, with fewer sick days and longer attention spans (among students, higher achievement scores!), are cumulatively much more productive. Gains to productivity here are widely estimated at 15 percent. Applied to a national economy of ≈ $15 trillion annual GDP, that represents a bit over $2 trillion in added value.

etc. — that first got them into their present line of work. They shouldn't be so bashful. As we strive to master the arcana of local landlord-tenant law, emerging energy markets, and new energy technologies; to get the individual material incentives right; to develop the market tested business model; to capture the greatest possible number of secondary benefits; etc. — we should not fail to make the social argument for building efficiency. Along with making economic sense, greater building efficiency is an obvious way to contribute to community health and shared prosperity, and to reduce the U.S. contribution to the global disaster of global warming, which will be visited most horribly on the world's poor and entirely innocent future generations. That improved building efficiency is a very small and mundane step toward healing our communities and planet also makes it no less worth taking. Indeed, small and mundane is sometimes good. It's called everyday life, which we should all be enjoying and making it possible for everyone forever to enjoy. Small and mundane also usually means that everyone can contribute, which is not a bad thing in building a democratic society.

Indeed, as improbable as it may now sound, doing our best to reduce the carbon imprint of the buildings we live and work in should be an ordinary civic expectation — as basic as obeying traffic lights, not driving drunk, or not blowing cigarette smoke in somebody's face — not an occasion for canonization. It just means avoiding unnecessary waste that's socially poisonous. That's pretty basic, isn't it?

But enough. Meeting and realizing the challenges and opportunities of *management/organizing, equity, policy,* and *deep participation* is the work ahead, and obviously there's a lot of it. The good news remains that the terrain on which this work will be moving forward has recently and fundamentally tilted in ways that favor its advance. There is both elite and popular demand for doing something about climate change, and emerging popular demand that the clean energy economy be more equitable than the dirty one. Building retrofits, with their associated cost-savings for the working class and poor and "green collar" job opportunities, are a natural way to meet both demands. This opportunity is especially evident in cities, with their density of inefficient buildings, poor people, generally progressive politics, and leadership on climate. And as just shown, there is in fact a plausible model for doing such building retrofits at scale — with most of its separate elements, if not their combination at scale, already proven — that can meet a market test on performance and attract private capital.

That is a nice point of departure.