E-SYSTEMS

Investing in Equity, Efficiency, and the Environment

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A Sustainable Development

Innovation Fund

for San Diego:

Concept Note

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I. BACKGROUND

This short note builds upon a number of discussions with key San Diego stakeholders in the private and public sectors, over several years, about the role of energy efficiency in the local economy. Long-term energy efficiency, emissions reductions, and finance remain of great interest both in California and nationally (see Annex 1 for an overview). This paper goes beyond these issues, and it discusses how energy efficiency might be used to also create a small strategic fund to help drive economic innovation in the San Diego region.

The idea of creating an innovation fund from a portion of energy and water savings, and the kinds of strategic "sustainable development" activities it might support was discussed first during a brain-storming session in January 2012 (see Annex 2). There is no shortage of good projects such an innovation fund might support. The key initial issues are rather what might be the size of such an innovation fund, given the current payment flows related to energy in San Diego, and how might the fund grow over time. At the end of the meeting, we agreed that a short analytical look at the fund idea would be prepared, then circulated among the group for comments, and then to consider any next steps.

This limited paper is meant to be only a quick scoping of the "supply side" of such an innovation fund. It reviews the scale of energy consumption and payment flows of San Diego's households and businesses, some assumptions about costs of retrofitting energy efficiency measures, how this might be rolled out over time, and what this suggests about capitalizing an innovation fund. A simple accounting spreadsheet pulls all this together. It can be used to look at various assumptions, scenarios, and how these affect results.

The focused paper does not attempt to go into the "demand side", the detailed implementation and management issues of how a fund might be actually managed. Many gaps remain but this preliminary work at least starts to frame the idea, it shows the innovation fund´s potential, and it discusses some constraints and next steps. If there is sufficient local interest, we would need to form a team to flesh out how it could be implemented.

The short note would have been impossible without the kind help of several expert reviewers. Scott Anders, Director, Energy Policy Initiatives Center (EPIC) at USD, and Andrew McAllister, now at the California Energy Commission (CEC), provided sources for many of the critical numbers and assumptions, and helped with an initial technical review. Peter MacCracken, Principal, Strategic Communications, and Duane Roth, CEO, CONNECT, offered helpful overall comments on an earlier draft. Simon Giles, ACCENTURE London provided a helpful independent overview. Rob Lichtman, Director, E-Systems, wrote the paper and is solely responsible for any errors and omissions, and the analysis and judgments expressed here.

II. SUMMARY

This paper suggests that ***a $10-30 M "Sustainable Development Innovation Fund" can be created while enabling the San Diego region to save over $240 M in energy expenditures, net after all financing payments, over five years.*** The numbers are driven by retrofit costs, rates of adoption, and the willingness to divert some savings to create the fund. The numbers are very rough, and important implementation and management details need fleshing out. But the idea's potential suggests it is worth developing further, by a local expert team. ***The flows involved are a fraction of the $9.8 Billion per year that San Diego's households and businesses currently spend on electricity and natural gas.***

The Sustainable Development Innovation (SDI) Fund idea would be part of a "grand bargain" between business and government who would push harder for energy efficiency, and consumers who would both share in the greater savings, (benefitting from the business-government push), and thus be willing give a small portion back to create the fund because it is good for the region.

Having such an innovation fund can help the San Diego region undertake a range of strategic projects that can create employment, reduce emissions, design better housing, and comply with state emissions regulations. The fund can help incubate projects important to the region's future by building local engineering and design capabilities in the "cleantech" growth sector. Completing a virtuous cycle, the fund could grow over time as savings and innovation increase. As government and private finance will continue to face revenue and credit constraints, having an agile ability to provide upfront, flexible innovation support is important. The SDI Fund could attract further investment, and be seen as a kind of "San Diego model".

A range of proven, fairly simple, existing technical solutions could be retrofitted to the regions dwellings and buildings to generate a 20% savings rate on energy use. However, we also assume conservatively that in total, only 10% of all current residential units and only 20% of business "floor space" participate in an ambitious, regional efficiency drive, over a ten year period. The innovation fund would be created by sharing a small portion of these savings, rolled out over several years.

The paper indicates orders of magnitude rather than a detailed projection. Even if the roll out rates are off by huge factors (e.g. only 2% of households and 10% of businesses participate), the idea still creates a reasonable start of an innovation fund scaled at + $10 M. Some of the paper's assumptions may be too conservative, understating overall savings and the fund's potential size.

This "developmental aspect" of energy savings payments should also be a part of any negotiations with private firms seeking to finance large scale energy efficiency programs. The gains from improved efficiency in energy and water use, used strategically, can be a tool for regional economic and social development.

This paper has a limited, narrow purpose: to take a quick, first cut look at the broad regional financial flows to see if the basic idea of funding an innovation fund as part of energy savings is viable. A number of important aspects remain unaddressed. These include critical implementation issues of how the overall financing and implementing process would be rolled out, both physically and institutionally, what might be realistic overhead, management, and marketing costs, and some tax and subsidy issues. The paper does not discuss how the innovation fund would be set up, where it would sit, or how it would be governed and managed. All these are important follow-on questions for a next phase of work.

Such work might be undertaken (and financed) as part of the new program being developed for the Center for Community Engagement, or some other arrangement via a third party research, consulting firm or university group, with foundation support. This paper will be more widely reviewed over the next months, and a follow-up brainstorm session convened to consider next steps. It will need a committed coalition of public and private interests to drive this forward.

III. DISCUSSION

Broadly, energy efficiency finance options include:

> utility partnerships; licensing, service, or waste fees; energy or carbon taxes; systems benefit funds; bonds; and options to capture the value created by avoided energy costs to create self-sustaining funds through revolving loan funds or other mechanisms. Additional [aspects] include leadership and management practices that have made the establishment and continuation of these funding mechanisms viable, such as champions, issue framing, dedicated staff, performance benchmarking, and measurement and verification.[1]

The Sustainable Development Innovation (SDI) Fund idea uses these ideas as part of a "grand bargain" between business and government who would push harder for energy efficiency, and consumers who would both share in the greater savings, (benefitting from the business-government push), and thus be willing give a small portion back to create the SDI Fund because it is good for the region.

The bargain should appeal to a range of local stakeholders, and stimulating innovation in growth sectors has been identified as a key need as part of the recent "regional visioning project". Local governments and utilities would help facilitate all this (including development payment and collection systems such as property tax or on-bill financing) because they can address key interests in reducing energy costs, reducing greenhouse gas emissions as required by state laws, developing new innovative policies, engineering and construction capabilities, and creating new mixed-income eco-design housing models and new jobs. By combining this with a deliberate, pro-region innovation policy and fund, overall public support and participation rates might increase. Creating a kind of one-stop shop or gateway can increase trust, promote broader more integrated solutions, and reduce costs for all.[2] Over time, this creates a virtuous cycle of more energy and water efficiency reducing costs and emissions, increasing the size of the innovation fund, increasing the pace and extent of local innovation which drives further efficiency and savings. This also helps make the financing process self-sustaining, in an era where government financing and private credit at all levels will remain under stress.

During the January 2012 brainstorm meeting, we discussed how developing such a SDI Fund could accomplish several objectives:

1. Based upon proven energy and water efficiency gains, create a respected, neutral platform/ forum to deal with resources issues in an integrated manner.
2. Establish strategic analytical base to link energy, water, waste, transport issues to long-term budgeting.
3. Promote several cutting edge eco-design, mixed-use, affordable housing developments, to accommodate projected population growth.
4. Solve real local problems and build platform for future.
5. Position San Diego to be a leading city on these issues – it has the climate, skills set, ability to innovate if we concentrate organizational, political and managerial leadership.

The SDI Fund would need an influential, diverse board and up-front support for soft planning and organizing costs. This would often be at the pre-feasibility phase, or which might require seed-funding

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[1] Eric Makres and Sarah Hayes *et al.*, the American Council for An Energy Efficient Economy (2012) "Keeping It In the Community: Sustainable Funding for Local Energy Efficiency Initiatives", Report E124, available from www.aceee.org . ACEEE's useful reviews pull together sources of current thinking and some case studies on many related energy issues. However, the case studies are more descriptive than analytical, a short-coming addressed later in this paper.

[2] On the trust and integration issues, see Christopher Russell and Rachel Young, "Understanding Industrial Investment Decision-Making", pp.24-25, report IE124, ACEEE (2012). On the overall direction of energy efficiency, see Dan York et. al. "Frontiers of Energy Efficiency: Next Generation Programs Reach for High Energy Savings", Report U131, ACEEE (2013).

to cover several years of development before receiving private or public funding. The Fund would operate transparently, with clear decision-making and funding rules.

Indicative Activities a Sustainable Innovation Fund Might Support

A portion of the fund might need to support costs to help expand the energy and water efficiency gains needed to expand the fund. This would be coordinated with other on-going state & federal programs, and it might include some additional marketing and communications activities, etc. But more importantly, the bulk of the SDI Fund would support a range of strategic activities, as shown in the examples below:

ELEMENT	COMMENT
Develop Integrated Regional Resource Strategy more tightly linked to local government budgeting	Work closely with City government & SANDAG, local finance, universities to develop practical tool to link financial, spatial, and environmental planning. Tool allows look at different growth –technology-policy scenarios and shows consequences for different stakeholders. Designed with national experts (US EPA modelers, McKinsey cost curves for energy and water systems), and is thoroughly integrated into city budgeting process. Extensive stakeholder discussions, workshops, to develop rolling "plan". Show how least cost solutions can be developed, reducing long term financial liabilities, need for increased taxes, while addressing economic, environmental and social challenges, particularly on the housing, urban sprawl, and water issues.
Promote Flagship Mixed Use / Smart Growth Property Developments	Help stimulate several flagship eco-design housing/mixed use property developments (one in the CBD e.g. new Gov. Center, one in a high population growth corridor. Helps create jobs, develop local engineering and design expertise, shows what is possible.[3] Help with workshops with developers, finance design competition, support preliminary engineering work, etc.
Strategic Innovation Projects	***Policy Reviews:*** green lease financing for energy and water efficiency; using property taxes to finance energy/water systems; building codes reviews; cooperation with SDG&E, etc.
	Technology Reviews: bring in expertise to show state of art eco-design building, e.g. NRDC office in LA, German "passivhaus" low energy designs, new biological wastewater treatment systems,; district, possibly ocean-based cooling systems etc. all offer large potential to decrease energy and water use.
	Smart Streets*:* work with single street or neighborhood to implement a range of measures via joint-management of systems and metering, decentralized waste-water treatment, smart metering & grids, in-fill eco-development and land purchase, smaller supermarkets, to test ideas at a neighborhood scale.
	Job Creation: Participate in new ESCOs, training programs, if appropriate (near commercial viability?) work with local algae-based biofuels firms to test small scale bio-reactors; work closely with new "cleantech" firms to apply ideas to strengthen the local economy and offer new options to reduce housing costs.
	Broker "deals" – be opportunistic as new options emerge.

[3] See Stockholm, Sweden for a powerful example: http://hammarbysjostad.se. This will be eclipsed by the more ambitious Royal Seaport development: www.stockholmroyalseaport.com Note how other leading cities use "sustainability" as key competitive advantage of living there: www.kk.dk/sitecore/content/Subsites/CityOfCopenhagen/SubsiteFrontpage.aspx www.rotterdam.nl/tekst_themes www.2030district.org/seattle www.portlandonline.com/bps/index.cfm?c=50531

A. Approach

Based on several discussions with staff at EPIC and CEC, a simple spreadsheet was developed to look at various savings, fees, and roll out scenarios that could affect the creation of an innovation fund. The model runs off a range of 2012 data on population, electricity and gas consumption and prices. All these projections, and the various SANDAG, California Energy Commission, SDG&E sources, are shown clearly in the spreadsheet model.[4] The model starts with the breakdown of how San Diego's households and businesses currently spend over $9.8 Billion per year on electricity and natural gas.

Deriving "unit" energy consumption data is a bit cumbersome, due to how the underlying data is collected or based. We have aggregate consumption data by sectors and fuel sources, but then must divide these by housing units (for households) and square footage of floor space, for businesses. This is partly also because we have energy retrofit cost data on those bases, respectively. Table 1 below shows these calculations.

Historical behavior observed across the USA shows that for a variety of reasons, only 15-20% of total potential users have been seen to actually capture potential energy efficiency savings and go through the full process of audits, finance, and installation.[5] This partly reflects the somewhat poor and uncertain financing and management of large energy efficiency program rollouts. While this surely can be improved, we use such conservative assumptions. Using 2012 data, we have assumed that of the 1.075 Million (M) residential units in San Diego, only 10% are reached within ten years, and similarly only 20% (as businesses typically adopt at a higher rate) of the 600 M square feet total of office, commercial, and retail space are retrofitted to achieve the projected 20% savings, within 10 years (Tables 2-3). The annual marginal roll out or adoption rate is simplistically assumed to be 1/10th of the 10 year totals, per year, for each category (Tables 2 and 4).

These various rates may be conservative. Roll out rates would actually vary over time following some normal "S" shaped growth curve: starting out slowly, ramping up following marketing and awareness promotion, and gradually slowing and plateauing out. For this reason, the model does not look beyond five years in terms of the growth of the innovation fund, though in practice, growth might continue.

Here, we have added a small retrofit charge to create revenue to capitalize the innovation fund over time. This charge is set at a level that allows households and businesses to still earn a net profit immediately, in the first year. We have assumed that households and businesses would be willing to finance a small additional fee, to be added to equipment and overhead costs that cover retrofits, to accelerate innovation in the San Diego region. Similar fees are added on to various retrofit costs by construction firms, and various energy efficiency aggregator firms. The fund creation charge would occur one time, up front.

It cannot be said strongly enough that there are a variety of ways to capitalize the SDI Fund. A number of other variations are possible (using a percentage of annual energy savings taken off utility bills, spread out over time, etc.). Other options might be more feasible politically and could be explored. However, the *level* of benefit sharing probably would not change the results shown in this paper.

We assume simplistically that a typical residential retrofit costs $10,000 to obtain 20% energy savings, based on observations from a range of programs. To this, we have added a $300 premium charge to help create the sustainable innovation fund. To keep this in perspective, the $300 fee, financed over 20 years at 6%, creates an annual payment of about $26. Similarly, we assume that business retrofits cost about $2.50 / ft^2, to which we have added a $0.20 / ft^2 premium charge to capitalize the fund. Both

[4] The complete Excel model is available as a download by clicking on the file shown in www.esysfound.org/area51

[5] Sarah Hayes *et al.*, (2011) "What Have We Learned From Energy Efficiency Financing Programs?", Report U115, American Center for an Energy Efficient Economy (Washington DC), available from www.aceee.org

users' costs are assumed to be financed using "property tax add-on" financing, with typical terms loans set at 6%, payable over 20 years.[6]

Businesses save more energy and a sharing of those savings vs. an upfront charge is perhaps more feasible than with households. These fee levels are set arbitrarily and can be varied; they have been set here to reflect a "bearable" small amount of costs per end-user, while still maintaining an immediate net positive savings rate for users. This is a judgment call and works out to 3% and 8% of total retrofit capital expenditure (capex), respectively. Both sectors were examined to preserve a kind of shared participation, so that businesses would not be solely responsible.

It is important to understand the structure of savings and financing charges used in the model, shown in Table 1 below. Given all other current model assumptions, we project that a typical single family house will have gross savings of about $980 per year in energy costs, increasing over time as prices rise. Net savings *after* financing charges (for all fees and equipment) reduces this to $84, or about 91% of those savings. This does not include additional related water savings or increases in home value, effects of better health, etc. but it does show how relatively "tight" household savings are vs. those for businesses.

As businesses consume more energy, their scope for saving more is greater. Given the model`s assumptions on a per square foot basis, gross savings are $1.53/ft^2, and all financing charges account are $0.24/ft^{2,}, or only 15% of gross energy savings. Both households and businesses still save money but household rates of return are about 9%, while business returns can exceed 50%, ignoring productivity and sales effects from better lighting. In passing, both these rates compare quite favorably (to put it mildly) to current rates obtained from savings accounts, government bond yields, or equity markets.

The method used here has the virtues of simplicity, and certainty. Again, it is not the only way. If for example, we set the small add-on charges to zero, a typical household would save net of financing about $110 per year (vs. the $84 that includes the charge). Typical business savings would go from $1.30/ft^2 to $1.32/ft^2. Reducing slightly how much of those savings would be passed on via utility bills could also be considered, as part of the "grand bargain" idea and with SDG&E cooperation. However, from the fund's perspective, this would increase uncertainty, and the household component would be smaller and more spread out over time. This would mean needing to increase the amount obtained from businesses to keep to the proposed schedule. But as the amounts involved are small, this might be quite feasible.

Given the annual participation assumptions used here (Table 2), households and businesses together would save about $17M / year without the proposed charges, and $16.5M / year with those charges, to capitalize the SDI Fund at the level and rate proposed. How that difference is obtained can be discussed. This simple model intends merely to highlight some of these issues.

Finally, we assume that the SDI Fund over time might only disperse 30% of any annual revenues as grants to support interesting, strategic projects. This ensures that an asset base remains for future work, and to allow a portion to cover marketing and small management costs.

B. Results (see next two pages)

1. A snapshot of the underlying spreadsheet with key assumptions and "roll out" rates, and
2. A summary chart showing:
   - Gross savings in regional energy payments,
   - Net savings after financing charges,
   - Growth of the innovation fund, and
   - Grant disbursements, over a five year period (limiting this to 30% of revenues).

[6] See Renewable Funding, Lawrence Berkeley National Laboratory, Clinton Climate Initiative. "Policy brief: Property assessed clean energy financing: Update on commercial programs." Mar. 2011, from http://eetd.lbl.gov/ea/ems/reports/pace-pb-032311.pdf, and California Center for Sustainable Energy (forthcoming 2013)

BASELINE CONSUMPTION

ELECTRICITY	Gwh	Price / kwh	Totals ($/YR)	Comments
Residential	7,792	0.1688	1,315,371,973	All quantities & rates taken off relavant worksheets here
Commercial	9,315	0.1562	1,455,373,125	
Manufacturing	1,536	0.1405	215,758,409	
TCU	1,938	0.1500	290,700,000	
TOTALS	20,581		***3,277,203,507***	

GAS	Mil Therms	Price / Therm		
Residential	5,214	0.76	3,963,701,691	All quantities & rates taken off relavant worksheets here
Commercial	1,989	0.42	843,060,310	
Industrial	3,190	0.56	1,799,906,560	
TOTALS			***6,606,668,562***	excludes mining

TOTAL ELECY & GAS EXP $/YR (excluding Mining) ***9,883,872,070***

ASSUMPTIONS

ASSUMPTIONS					
Hshld Penetration Rate	10%	Biz/ Com Penetration Rate	20%	Cumulative Penetration Rate % of 2012 Total	
Hshld Savings from EE	20%	Biz/ Com Savings from EE	20%		
Life of program (YRS)	10	Life of program (YRS)	10	Drives annual numbers of participating households and sq ft from biz/com	

		Innovation Fund			contribution as % of cost
Loan Interest Rate	6.0%				
Years for Repayment	20	Contribution Fee	Total Financed		
Avrg Cost Hld Retrofit	10,000	300	10,300	per unit	3.0%
Avrg Cost Bus Retrofit	2.50	0.20	2.70	per sq ft	8.0%

TABLE 1: IMPLICIT UNIT SPENDING / YEAR

	a	b	c	d	e (b + d)	INNOVATION FUND: One Time, One Year Payment			
	Total 2012 Spend/ Total Units	Value of Projected Gross Savings	CAPEX (with fee) Cost to save	Financed Payment / Yr	Net Savings Per Year	Contribution to Innovation Fund	Fund as % of PMT	Fund as % CAPEX	Fund as % of Gross Savings
Energy Spending per Household	4,911	982.15	10,300	($898.00)	84	300	33.4%	2.91%	30.5%
Energy Spending per ft2, Business & Commercial	7.67	1.53	2.70	($0.24)	1.3	0.20	85.0%	7.41%	13.0%

TABLE 2: PAYMENT FLOWS & INNOVATION FUND CREATION per Single Year

	a	b	c	d	e	f (c + e)	INNOVATION FUND: One Time, One Year Payment			
Sector	PER YEAR Participant Units	Current 2012 Spending / yr	Value of Projected Gross Savings	CAPEX (with fee) Cost to save	Financed Payment / Yr	Net Savings Per Year	Contribution to Innovation Fund	Fund as % of PMT	Fund as % CAPEX	Fund as % of Gross Savings
Households	10,750	52,790,737	10,558,147	110,725,000	(9,653,510)	904,637	3,225,000	33.4%	2.91%	30.5%
Business/Com ft2	12,000,000	92,095,968	18,419,194	32,400,000	(2,824,780)	15,594,414	2,400,000	85.0%	7.41%	13.0%
		144,886,705	**28,977,341**	**143,125,000**	**(12,478,290)**	**16,499,051**	**5,625,000**	45.1%	3.93%	19.4%

TABLE 3: PAYMENT FLOW AT YEAR 5

	a	b	c	d	e	f (c + e)	INNOVATION FUND: One Time Payment ; Status at YEAR 5			
TOTAL GAS & ELEC	Current 2012 Spending / yr	Spending as (f) of Pentra Rate x Prog Yrs	Value of Projected Gross Savings	CAPEX (with fee) Cost to save	Financed Payment / Yr	Net Savings Per Year	Contribution to Innovation Fund	Fund as % of PMT	Fund as % CAPEX	Fund as % of Gross Savings
Households	5,279,073,665	263,953,683	52,790,737	553,625,000	(48,267,550)	4,523,186	**16,125,000**	33.4%	2.91%	30.5%
Businesses	4,604,798,405	460,479,840	92,095,968	162,000,000	(14,123,898)	77,972,070	**12,000,000**	85.0%	7.41%	13.0%
(excl mining)	**9,883,872,070**	**724,433,524**	**144,886,705**	**715,625,000**	**(62,391,449)**	**82,495,256**	**28,125,000**	45.1%	3.93%	19.4%

TABLE 4: CUMULATIVE PARTICIPATION / NET SAVINGS to REGION (after financing) / FUND GROWTH

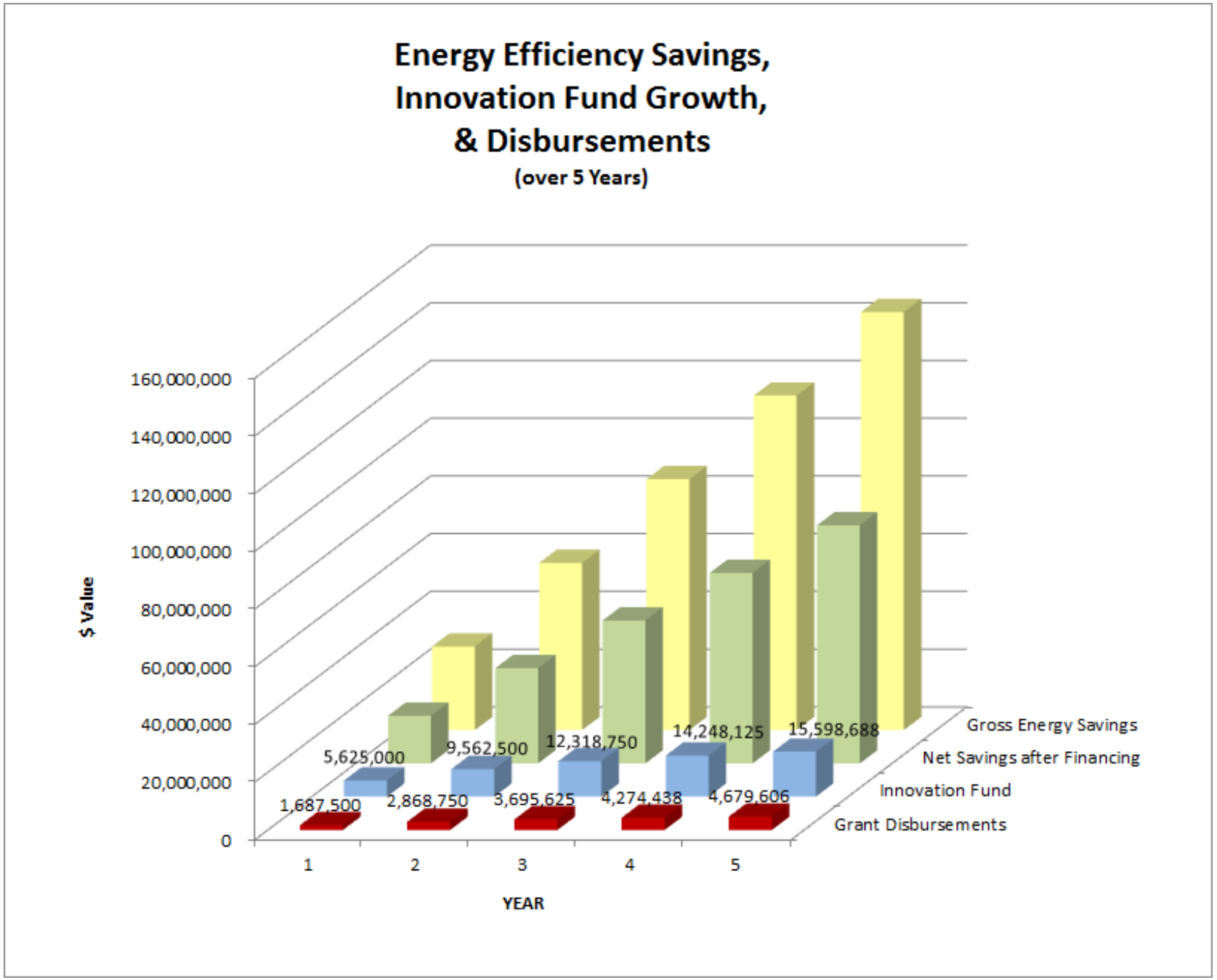
YEAR	1	2	3	4	5	5 YEARS TOTALS		
Cumulative Number of Households Participating	10,750	21,500	32,250	43,000	53,750	161,250		
Cumulative Bus/Com ft2	12,000,000	24,000,000	36,000,000	48,000,000	60,000,000	180,000,000		
Gross Savings in Energy Spending	28,977,341	57,954,682	86,932,023	115,909,364	144,886,705	434,660,114		
Net Savings (after financing charges) to Region($)	**16,499,051**	**32,998,102**	**49,497,154**	**65,996,205**	**82,495,256**	**247,485,768**		
Fund Growth (Carryover plus new revenue)	5,625,000	9,562,500	12,318,750	14,248,125	15,598,688			
Income Disbursed (set % ratio right)	1,687,500	2,868,750	3,695,625	4,274,438	4,679,606	**17,205,919**	Disbursement % of Revenue:	**30%**
Balance end of year	3,937,500	6,693,750	8,623,125	9,973,688	10,919,081			

NB:

No discounting, no inflatiion; no changes in energy prices; no taxes considerations; no subsidies; no inclusion of water system savings; no rolling in home improvement or increase on home value; no health, productivity, comfort issues

No mention of HOW funds collected, who manages the split of payments to suppliers vs fund: idea might be utilities would be net savers, get more with fund buy-in? No interest assumed earned on Fund balances

Need to confirm savings and costs in more detail, esp. on overhead side; Depending upon fund contribution rate, can exceed 1 yr payment; may need to be spread over 2 years, or delayed 1 year; needs linking with suppliers


Energy Efficiency Savings,
Innovation Fund Growth,
& Disbursements
(over 5 Years)
$ Value
160,000,000
140,000,000
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
0
1
2
3
4
5
YEAR
5,625,000
9,562,500
12,318,750
14,248,125
15,598,688
1,687,500
2,868,750
3,695,625
4,274,438
4,679,606
Gross Energy Savings
Net Savings after Financing
Innovation Fund
Grant Disbursements

C. Analytical Issues

1. Data

- Consumption and cost data is crude and not "fine grained".
- Model looks at only one year, does no discounting of future costs and benefits, and it ignores population, housing and business growth which will tend to understate fund potentials.
- Model does not incorporate any relative price changes either in fuels, or retrofit costs, over time.
- Fuel prices are in flux and are treated very simplistically here, e.g. we have ignored the 4 tiers of electricity pricing where large residential electricity users can pay more than double the average electricity price used here. Furthermore some efficiency gains may be tempered as they only affect variable consumption charges vs. fixed demand charges.

2. Assumptions

- **Retrofit costs** as reported are very crude, lumping together huge variation in household size, ownership, business sizes and nature, leases, etc. Not clear what if any "overheads, marketing, insurance etc. costs this includes).
- **The household retrofit benefits –costs is small, at the moment**. Over $900 in annual costs is spent to save about $85 net after repayments, per year. Even if the savings increase due to inflation or energy price increases, at this cost, the rate of return will remain under 10% (though compared to current savings rates this is a good deal). One can argue that a well-lit, well-insulated house or apartment will be more comfortable, will likely be healthier, and its increased resale value could easily exceed the retrofit investment. But in the current financial climate, better first-cut returns are desirable. But actually, we are seeing that people who do the upgrades are choosing the full, more expensive route to increase home values.
- **Thus, it is not clear the current household retrofit costs represent the "sweet spot".** The marginal cost curve might be more attractive at lower rate of energy savings – the 20% gain sought is to comply with AB32, S375 legislation, according to various state energy models. Given San Diego's dry mild climate, certain insulation and window modifications have less impact than in the northern parts of California. Furthermore, especially in the household sector, current legislation and financing skews interventions away from large scale air-conditioner, refrigerator, oven, washer-dryer replacement which might be a more cost-effective set of measures. The way the fund works here is simply a question of maximizing the number of people/businesses participating, so anything that increases this helps, even if this slightly compromises energy efficiency gains.
- **Fee rates are arbitrary and could be greatly refined** and revised. Not clear if they would be perceived as reasonable, if disparity between household fee rates and business fee rates is acceptable. The fees to create the fund are independent of any energy performance – they are simply a rate multiplied by the number of participating units in a given year.
- **Household roll out rate that average over 10,000 units per year** might be seen as optimistic. Business take up might alternatively be too conservative.

3. Sensitivity of Results

- **Interest Rates** – probably cannot vary much within the "Property Assessed Clean Energy (PACE) framework" so not so relevant. But under current cost assumptions, households save little at 7% interest rates.
- **Payment Period** – at 6% interest, household payments (based on the current 10K cost assumption) are very sensitive to term length, going negative (savings minus loan payments) if terms reduced to 15 years.

- **Participation Rates & Fees**: - needs more testing re: businesses acceptance.
- **IRRs** (calculated in full spreadsheet-but not included here) Currently, 58% for businesses, 9% for households over 20 years, with modest inflation.

D. Further Work

Beyond refining the data gaps and assumptions discussed above, and neglecting related water use and costs aspects, a number of important of "supply side" issues remain unaddressed. The paper does not discuss obviously critical implementation issues of how the overall financing and implementing (and collection) process would be rolled out, both physically and institutionally, and what might be realistic overhead, management, and critically, marketing costs. If there is one lesson from reviews of large scale energy efficiency program rollouts, it is that all the pieces need to be put in place and financed adequately so implementation is rapid, hassle free and accountable, and meets effectively all stakeholders´ needs. As noted, a serious roll-out program includes these elements:

- An independent, single point of contact for the client
- A free no-obligation energy efficiency assessment
- Clear, upfront communication of a project's cost/benefit analysis
- Instant rebates that range from 50%-70% of total project costs & up to 90% in some instances
- Low-cost equipment through negotiated volume pricing with qualified installation contractors
- Free start-to-finish project management and quality control
- Rebates paid directly to contractor to help defray client's out-of-pocket & transaction costs
- Referrals to other energy-efficiency programs as needed.[7]

How much all this would really cost in the San Diego context, and whether these costs are reflected adequately in our rough retrofit cost estimates needs further work, well beyond the limited intent of this paper. More discussions along these lines are needed with SDG&E staff involved in some related work underway in Chula Vista.

While there are a number of studies that survey work going on in California and the USA, these are mostly descriptive in nature, vs. hard evaluations of what works and what does not, from a tough business point of view. Hard data that cover all sources and uses of capital, true overhead accounting, observed rates of return, long-term monitoring and verification of results, and cash flow needs are difficult to find, or based upon only small/partial sample sizes. If a proper program is to be designed for San Diego, such questions will need to be answered, in a more rigorous fashion. [8]

On the "demand side", this narrow paper ignores how the innovation fund would be set up, where it would sit, how it would be governed and managed, rates of asset distribution, and how it might be best invested in building local capacity and helping jump start critical demonstration projects, etc. While these issues are deliberately ignored here (apart from Annex 2, p.15), they should be addressed in a next phase to further develop the idea and to build interest and support.

However this plays out, the idea can only go forward if it has the support of committed, influential leadership from a diverse group of San Diego business, government, and citizen's groups. The SDI Fund would need to be ring-fenced so its purpose is maintained. It needs a visible, transparent process of governance and project support from a respected, diverse board.

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[7] Building Energy Efficiency Studies (BEES) 2011, "Increasing Energy Efficiency in Existing Multifamily Buildings: An Overview of Challenges, Opportunities, and Policy Tools" available from www.cityofberkeley.info/bees p. 46.

[8] Examples include Lawrence Livermore Labs *et al,. op cit*,; Preservation Green Lab *et. al*. (2013) "The Energy Efficiency Potential of Small Buildings", available from www.PreservationNation.org/greenlab); Living Cities and Deutschebank Americas Foundation (2012), "The Benefits of Energy Efficiency in Multi-Family Affordable Housing", available from www.db.com/usa/content/en/ee_in_multifamily_underwriting.html; and Deutschebank Climate Change Advisors and the Rockefeller Foundation (2012), "United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models", available from www.rockefellerfoundation.org/news/publications/united-states-building-energy-efficiency

IV. CONCLUSIONS

- The overall idea shows promise after a quick look at some of the resource flows involved. The Idea of using an energy savings effort to also create an innovation fund that can fund strategic projects that create economic growth, develop new sets of local skills and capacity, and test new models of housing and employment is worth fleshing out in more detail. This supports the key need for San Diego to accelerate innovation in the "greentech/cleantech" space.

- Under conservative assumptions, a fraction of the $ 9.8 Billion paid currently for electricity and natural gas per year can easily support the creation of a $10-30 M sustainable innovation fund in San Diego, within 5 years. Key drivers of the numbers include retrofit costs, rates of participation, and the willingness to divert some savings to create the fund. With increases in participation rates and fee adjustments, the fund could conceivably grow larger at a faster pace. Once the fund is established and seen as stable, a portion might even be invested, which could increase its size several-fold over time.

- The creation of the Sustainable Innovation fund would be part of a "grand bargain" where leaders from businesses, governments, and citizen´s groups would agree to push much harder for greater energy efficiency to both increase the flow of savings, and to trigger related innovation. Citizens are then able to achieve greater savings, and are willing to share a small portion of this to create the fund.

- Energy efficiency gains is a resource that should be used wisely for the good of the region, and should form a pillar in any negotiations with private firms discussing related work with local governments. While private firm participation is very welcome as a way to test different models, such efforts might best be spread among several firms, at different scales and markets, and include a provision for the creation of the innovation fund.

- A number of important SDI Fund implementation and management issues are deliberately ignored in this narrow "supply side" paper. These issues, a clearer sense of stakeholder interests, and how those interests are addressed by the SDI Fund, all need fleshing out.

- A respected small team could be formed to develop this further, in consultation with EPIC, CCSE, local business groups, SDG&E, several local citizen's groups, SANDAG, the City of San Diego and several innovative energy firms, possibly as part of the new Center for Community Engagement`s work plan, possibly as a stand-alone entity funded by grant support. The only way the idea can work is if it is driven by a respected, diverse, committed local team.

V. NEXT STEPS

A series of next steps are proposed below:

1. Organize 2013 Stakeholder Brainstorm session to discuss a more detailed follow-up implementation study.
2. Review by TSDF/Center for Community Engagement – make development stream as part of the Vision, help finance further development? Consider forming a "Scoping" development team.
3. Discuss with Local/National Foundations, State Government in Sacramento, CEC, SDG&E, US DOE, US HUD/EPA Sustainable Communities to see if development support can be obtained.

ANNEX 1: OVERVIEW OF ENERGY EFFICIENCY ISSUES

For those somewhat unfamiliar with energy efficiency issues and thinking, some brief excerpts of recent useful California work is included here.[9] Common barriers to increasing energy efficiency in existing buildings include:

- ***Misaligned incentives*** between property owner and tenant. When units are individually metered, the building owner has no direct financial incentive to make investments in in-unit energy upgrades. When a building is master-metered, tenants have no direct financial incentive to conserve energy.

- ***High initial costs***. Many property owners do not have access to the upfront capital needed to invest in energy upgrades.

- ***High transaction costs***. Property owners often feel overwhelmed by the process of identifying relevant upgrade opportunities and matching incentive programs.

- ***Uncertain return on investment*** . A range of variables affect the actual energy and money savings realized from a property owner's investment in energy efficiency. Many property owners lack access to technical assistance services that can help them to identify cost effective energy efficiency strategies and to calculate the payback.

- ***Limited knowledge and motivation***. Property and owners and tenants often have limited knowledge of the potential benefits and process of making energy improvements, and limited motivation for engaging in this work.

While government and utility efforts to reduce energy use in existing multifamily buildings remain relatively limited compared to resources aimed at the single-family residential and commercial sectors, there are a growing number of government agencies and utilities across the country that are leveraging ratepayer dollars, one-time stimulus funds, and other resources with private sector investment to remove barriers to energy efficiency in existing multifamily buildings. The ultimate goal is sustained transformation in how the market functions, so that energy efficiency is business-as-usual amongst multifamily property owners, property managers, and tenants.

A fundamental takeaway from interviews with policy makers and …property owners and managers that informed the study for this report is that achieving market transformation requires policy mechanisms that enable property owners to realize an economic return on investments in energy efficiency. Put another way, unless energy-related capital investments result in increased revenues or increased property value/equity, there is limited economic rationale for a multifamily building owner to make such an investment. Increased revenues can come in several forms:

- Increased building sale valuation
- Cost savings due to reduced energy use
- Less tenant turnover and associated transaction costs and interruptions in rent payments
- Higher rents

.. A range of policy mechanisms local and state governments and utilities are employing to achieve market transformation in existing multifamily buildings include:

[9] From BEES (2011), Executive Summary, *op cit*.

- Mandatory improvement and disclosure requirements designed to capture a baseline level of energy savings across a community's existing multifamily building stock and to make energy efficiency an explicit component of a building or unit's value.

- Rebates to lower cost of energy upgrades and to help property owners go beyond the minimum.

- Financing programs to minimize the upfront cost of energy upgrades and amortize costs over time.

- Tax-based incentives to encourage private investment in energy efficiency.

- Strategies that help calculate benefits and align incentives for the affordable multifamily housing sector, with potential relevance to rent controlled housing.

- Tools for removing the split incentive barrier by increasing the capacity of property owners to make energy improvements and recoup their costs in a manner that enables appropriate, equitable sharing of costs and benefits between owners and tenants.

- Streamlined technical assistance designed to minimize property owners' transaction costs associated with identifying upgrade opportunities and matching incentives and financing.

- Workforce development tailored to the existing multifamily building context.

- Marketing, outreach, and education programs used to connect multifamily stakeholders with the services available to them and to encourage the behavior changes necessary to achieve increased energy efficiency.