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Greening Grants: Minimizing Energy and Environmental Impacts of Federally-Funded Research

May 29, 2015

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Consequences from Missing Connections between Sustainability and Federal Research Funding

Kathy Ramirez-Aguilar

U.S. DEPARTMENT OF ENERGY

Consequences from Missing Connections between Sustainability & Federal Research Funding

Kathryn A. Ramirez-Aguilar, Ph.D.
Green Labs Program Manager
University of Colorado Boulder

CU-Boulder Green Labs Program

An important focus-
engaging & collaborating with scientists on:

Energy Conservation

Water Conservation

Material Waste Reduction

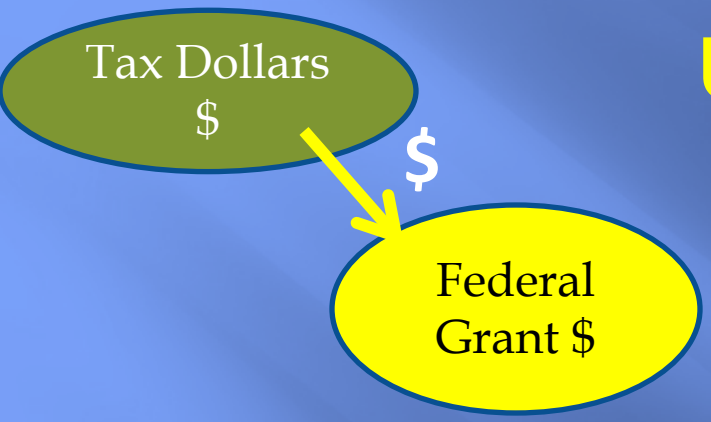
Hazardous Waste Reduction

Efforts with scientists are based on good will.

There is a lot of good will to be had

Many scientists care about the environmental footprint of their research, which also often benefits efficient use of research funding.

Funding of Research on University Campuses



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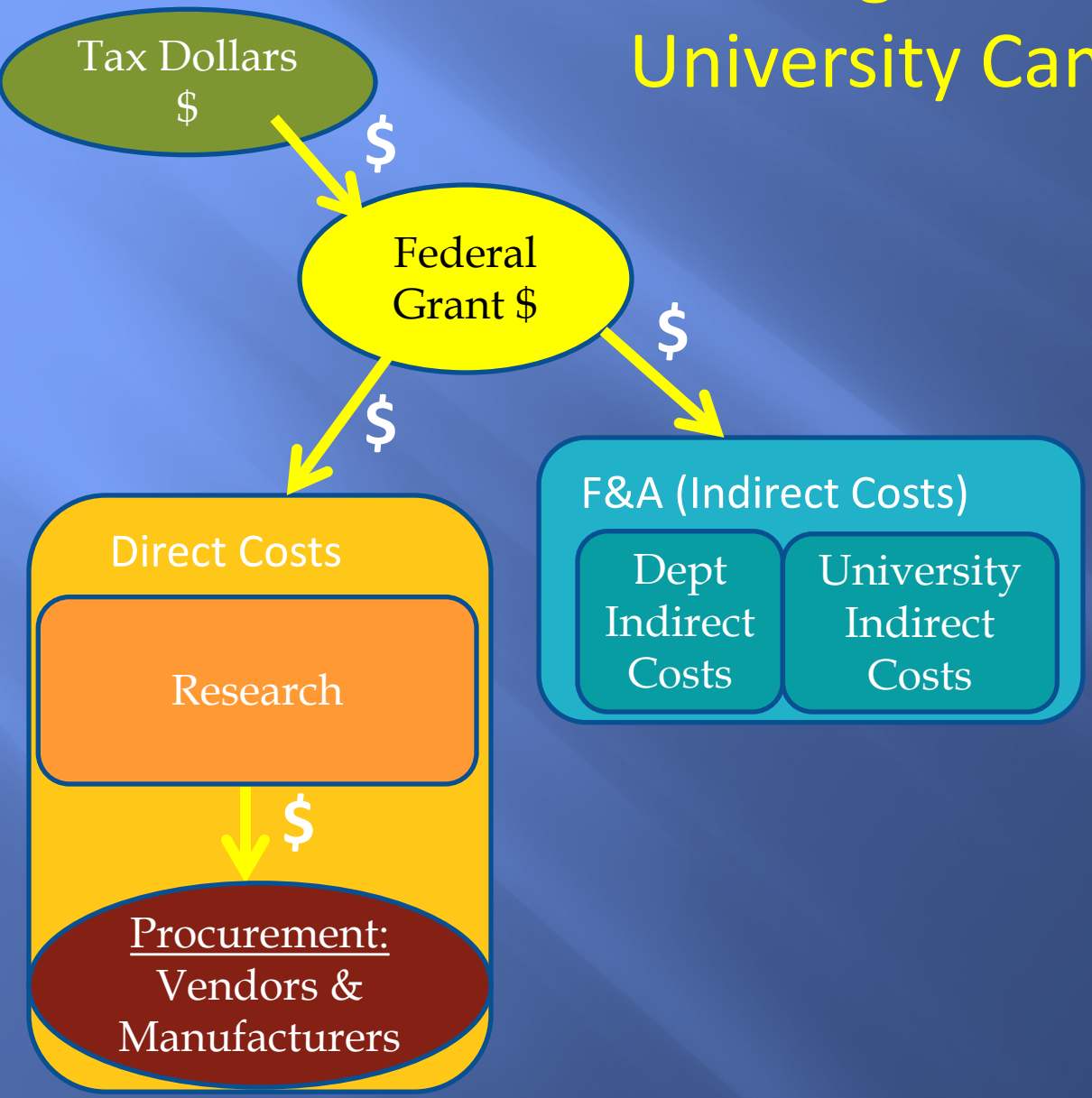

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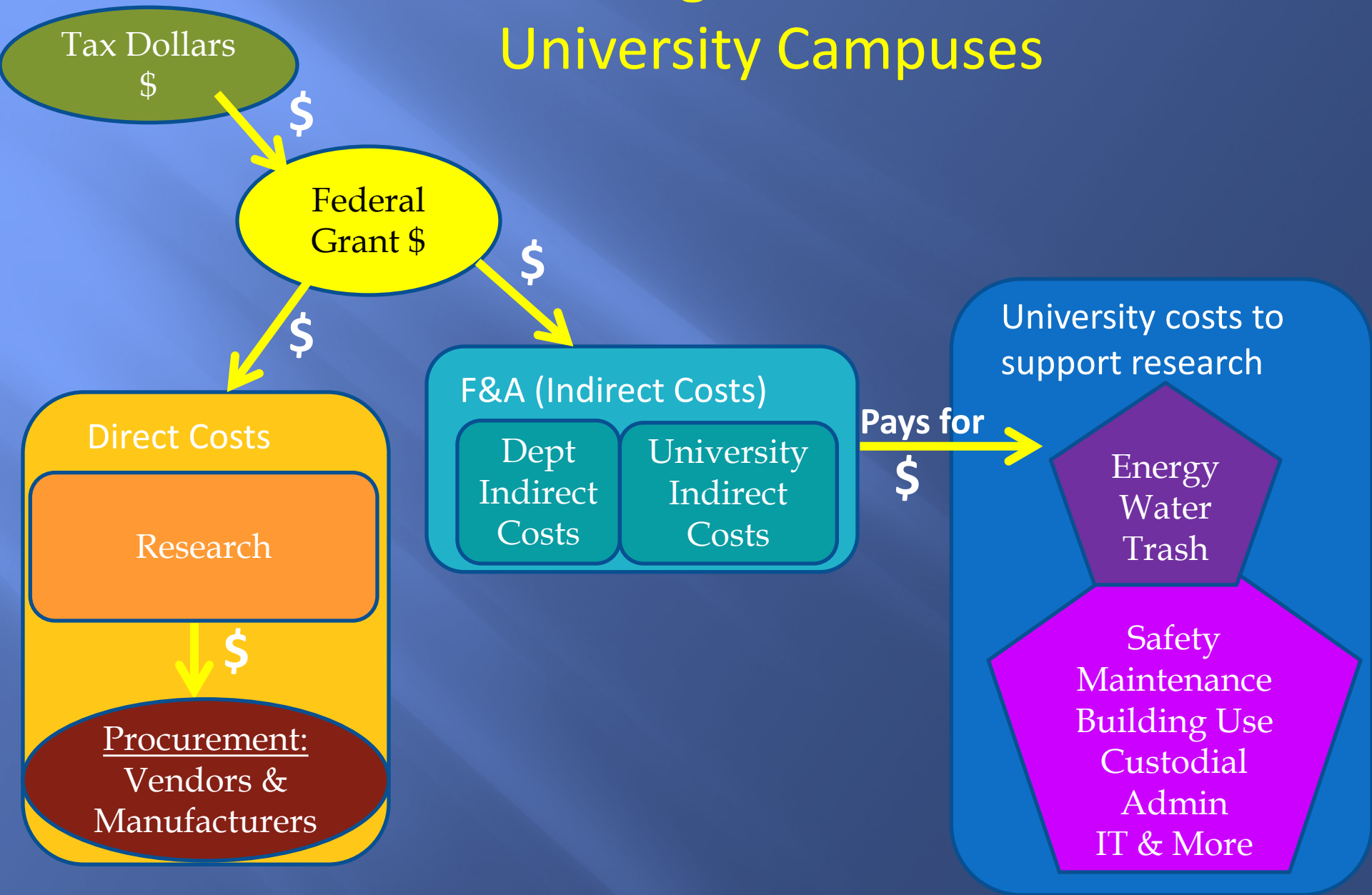
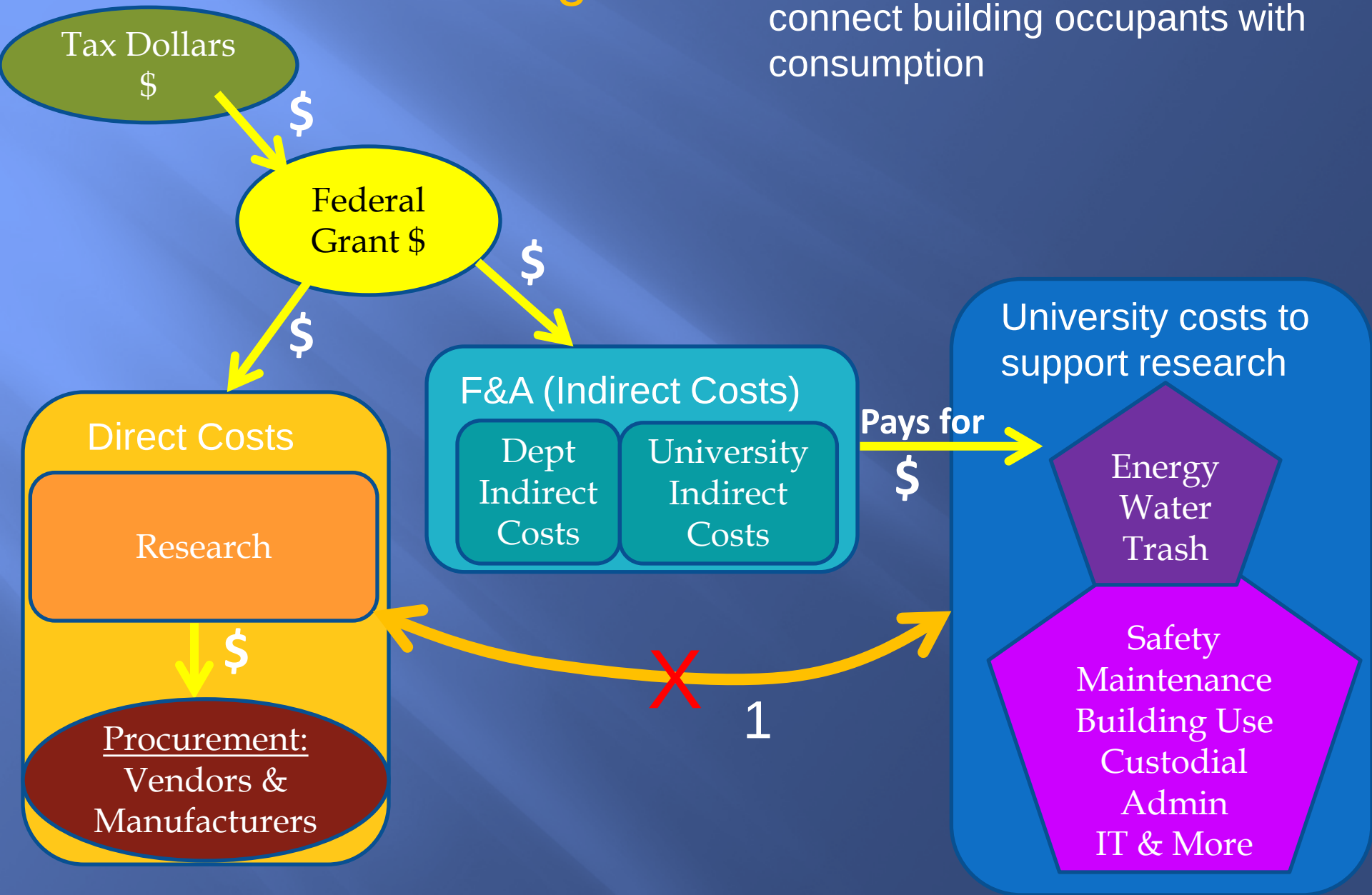


Missing Sustainability Connections in Univ. Research Funding:

1. Universities generally do not connect building occupants with consumption



Missing Sustainability Connections in Univ. Research Funding:

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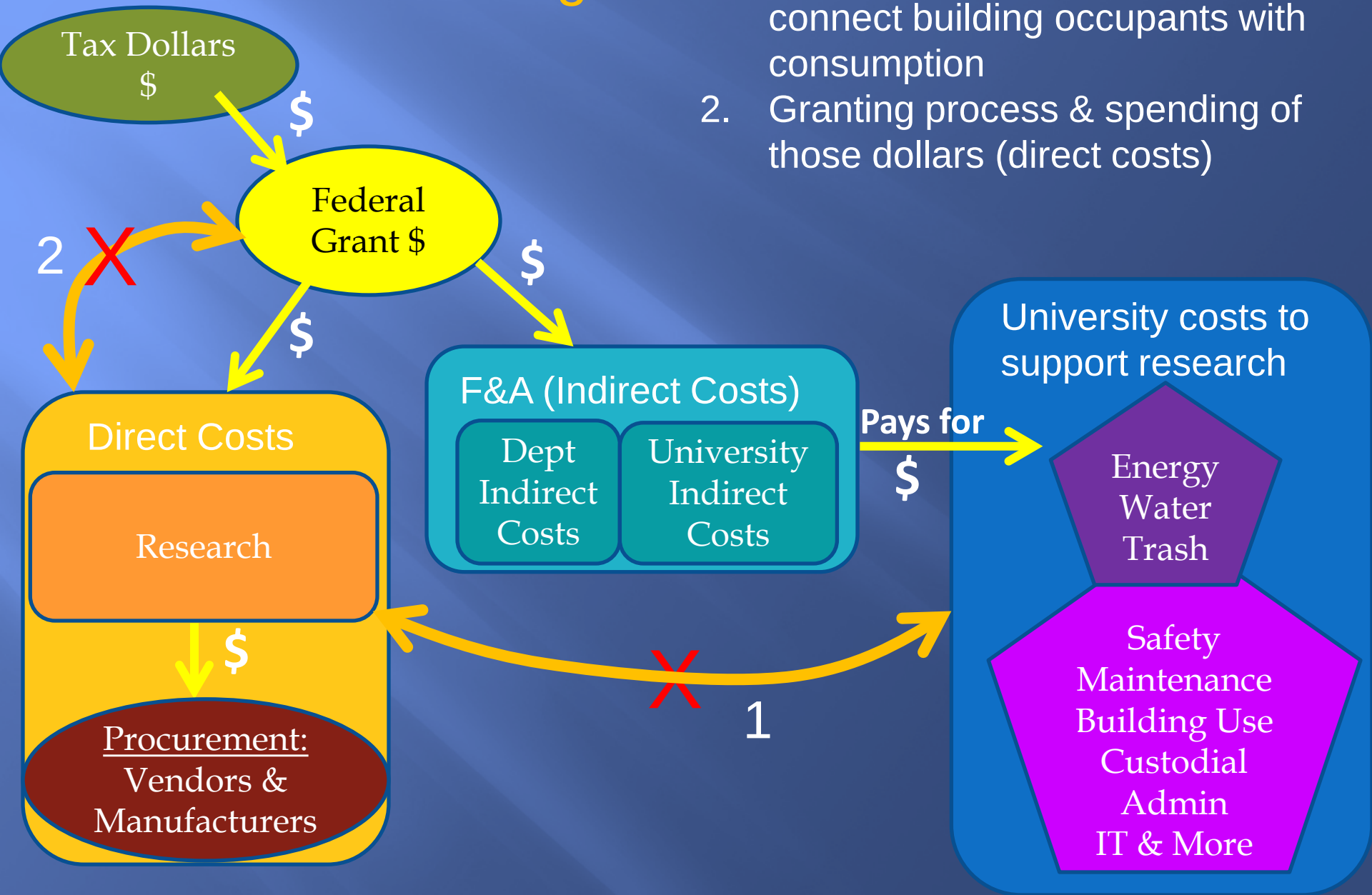
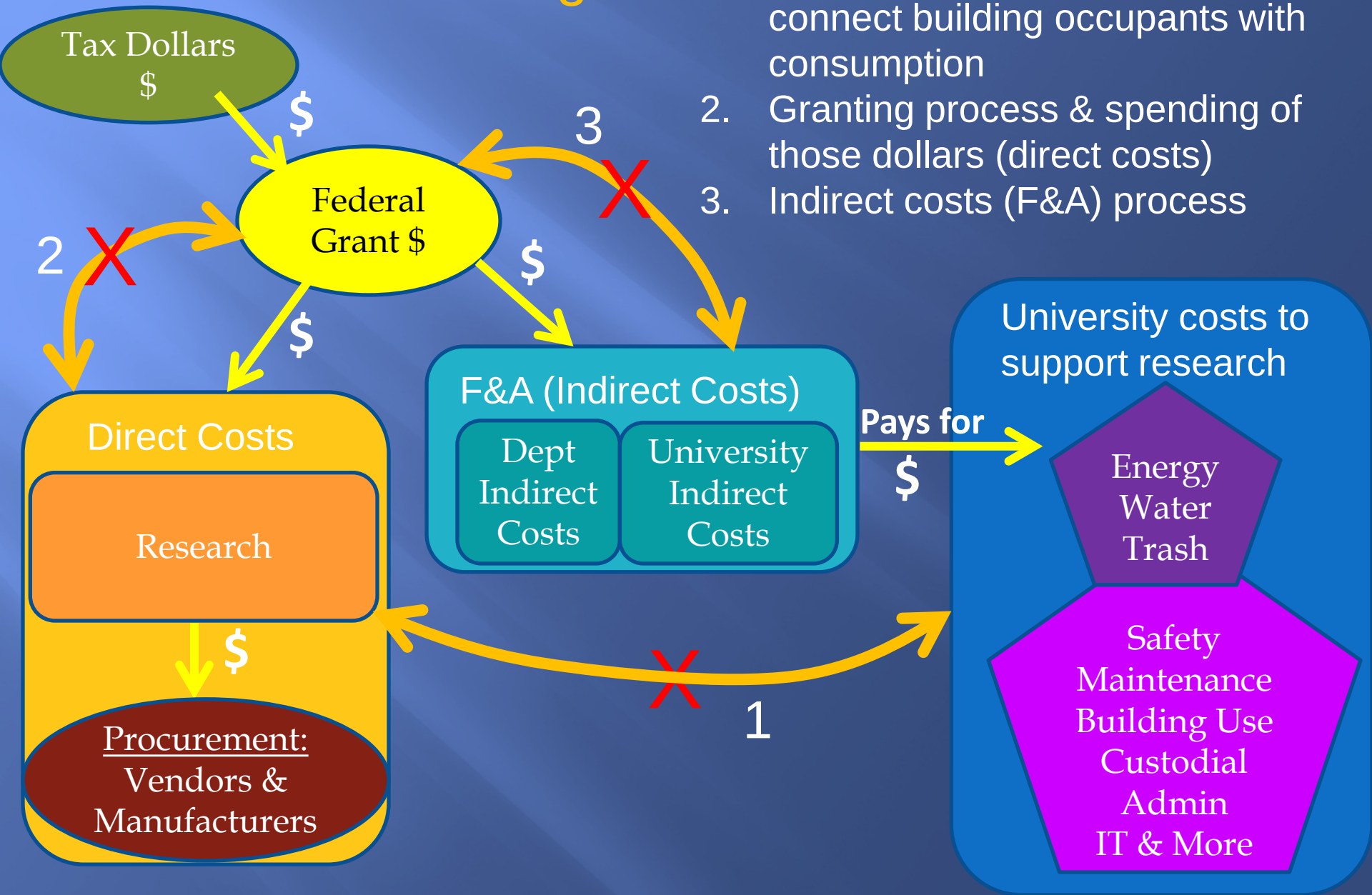
2. Granting process & spending of those dollars (direct costs)

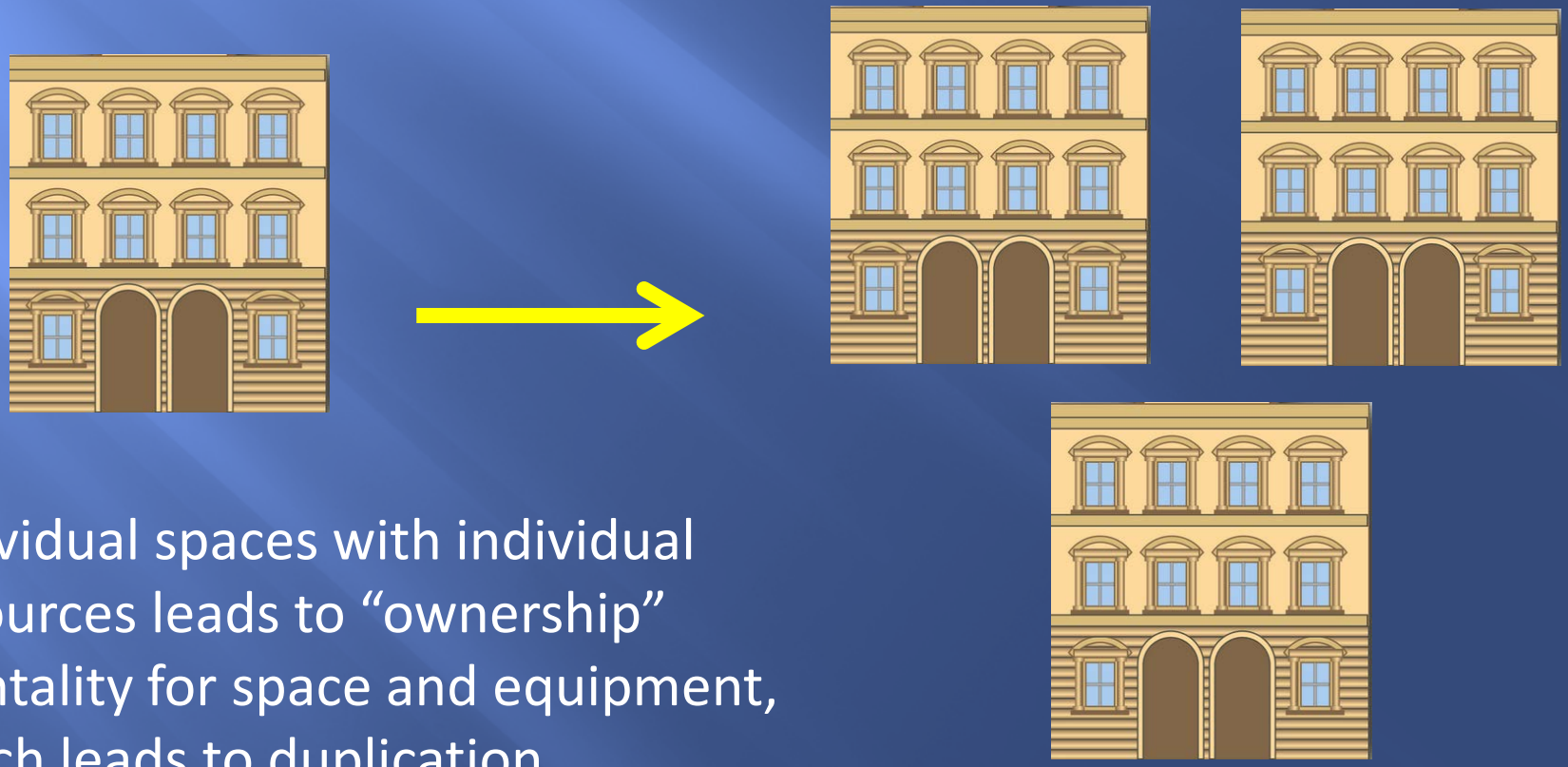


Missing Sustainability Connections in Univ. Research Funding:

1. Universities generally do not connect building occupants with consumption
2. Granting process & spending of those dollars (direct costs)
3. Indirect costs (F&A) process



Inefficient Use of Lab Space and Fume Hood Resources



Individual spaces with individual resources leads to “ownership” mentality for space and equipment, which leads to duplication

Duplication of Equipment

Lack of awareness of what equipment resources exist on campus

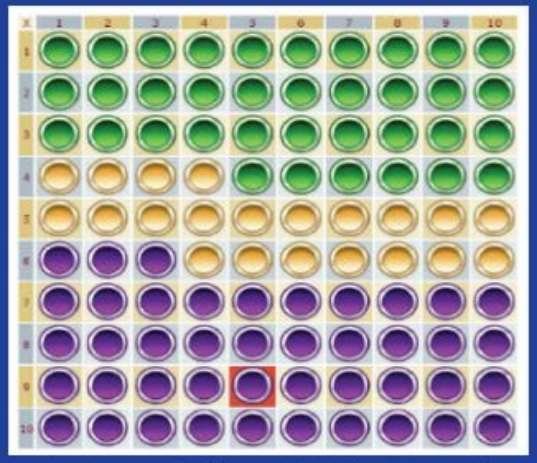
Equipment & Processes that Consume More Energy/Water than Necessary

Inefficient Sample Storage Leading to More Ultra Low Temp Freezers

Do you know what is in your lab freezer?

By inventorying:
Save MONEY, ENERGY and TIME!!!

Ultra Low Temperature Freezer



Inventorying Software Graphic Example

Ongoing training of scientists to do the same…

EFFICIENCY & RESOURCE USE NOT GENERALLY INCLUDED IN:

- Research decisions
- Purchasing decisions
- Requests for space & fume hoods

Less Money for Research

Funding to support entire research system

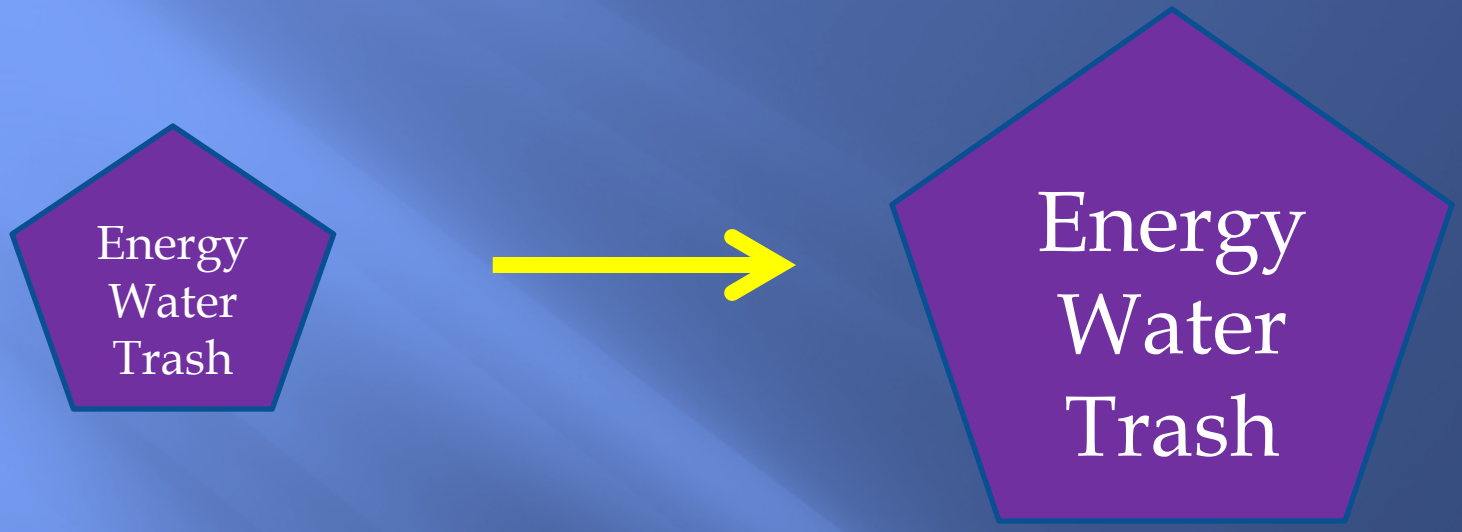
Less Money for Research

Funding to support entire research system

Less Money for Research

Funding to support entire research system

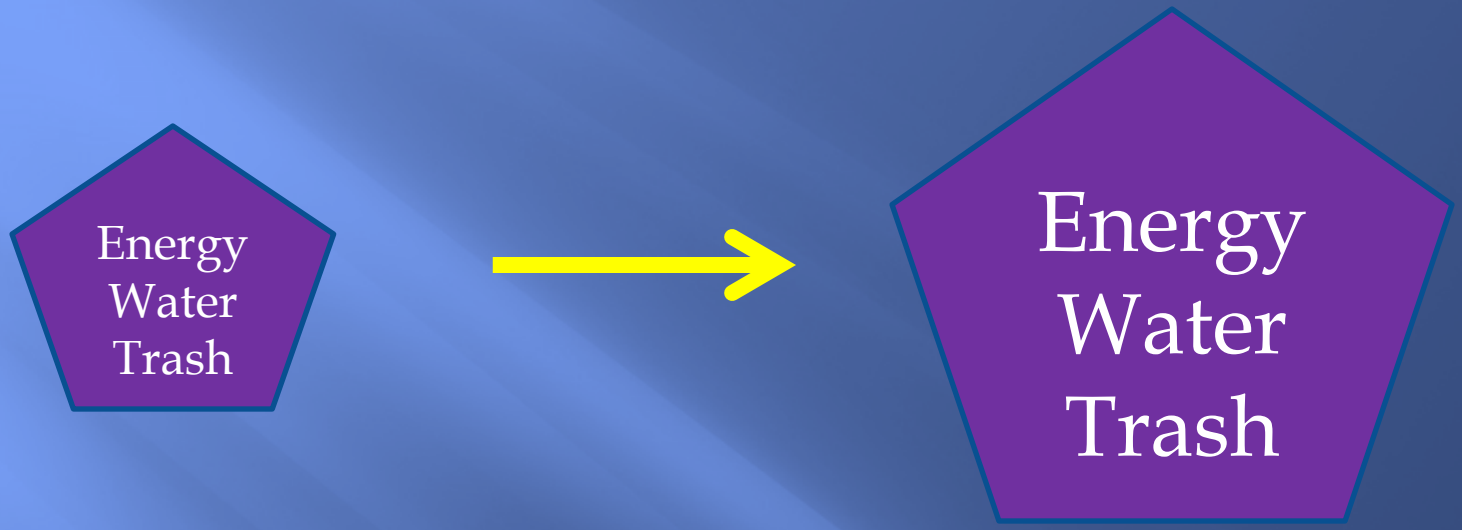
Greater Indirect Costs for Research



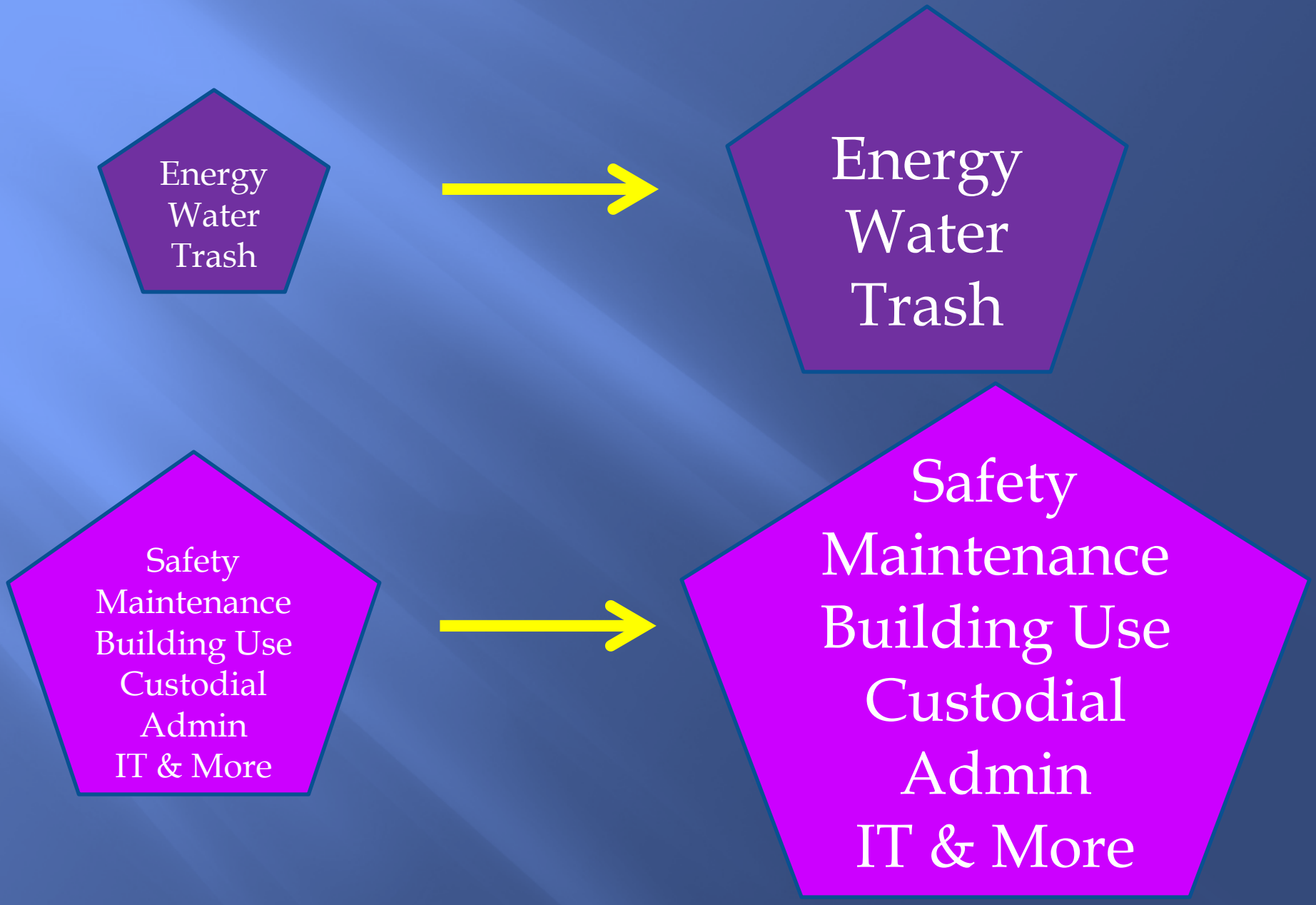
Univ. Research Labs	SqFt Portion	Energy Portion
CU-Boulder ('10-'11)	20%	43%
Stanford	20%	50%
UC-Davis	33%	~75%

Resources: Shannon Horn, CU-Boulder Facility Management Engineering; Susan Vargas, Stanford Energy Manager, Allen Doyle, UC-Davis Office of Sustainability

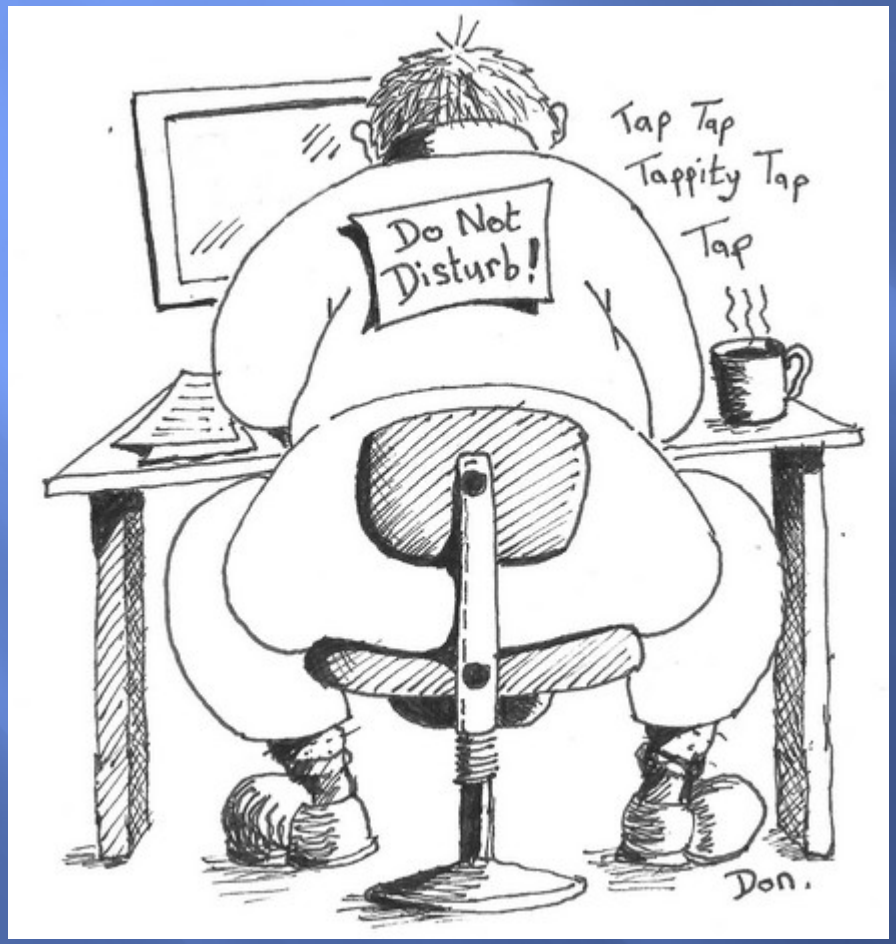
Greater Indirect Costs for Research

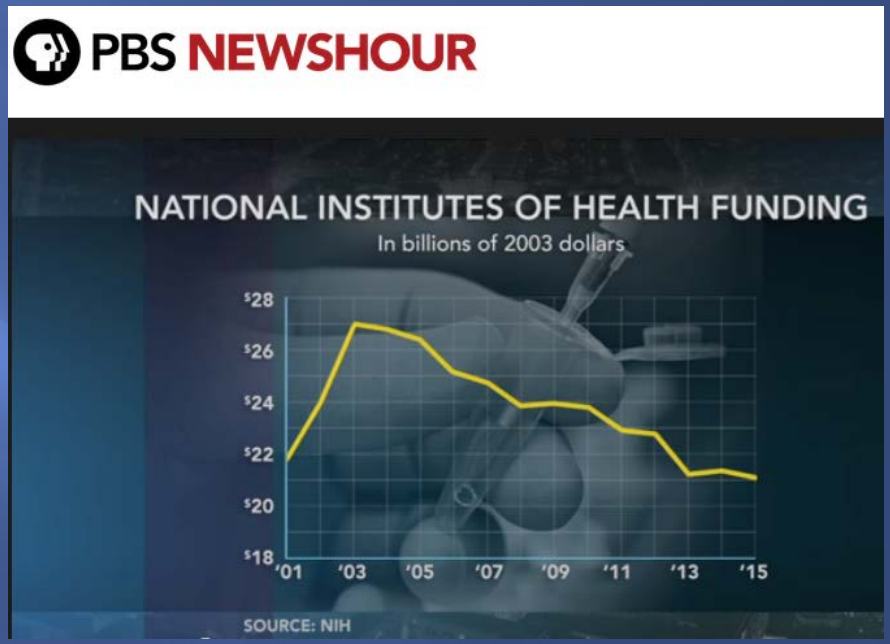


Greater Indirect Costs for Research



Scientists spending more and more time writing grants





NIH request for more funding

PBS NEWSHOUR

Will declining funding stunt scientific discovery in the US?

May 17, 2015 at 10:30 AM ET

Greening Grants is about:

- Reducing the environmental footprint of research
- Effective, efficient use of federal research grant dollars
- Enhancing value from tax-payer dollars
- More money for actual research

Are there connections to grant funding that can encourage:

1. Equipment sharing & avoiding duplication
2. Utilization of managed, shared lab equipment facilities
3. Use of campus lab space and fume hood that fits present researcher needs
4. Selection of lab equipment and processes that energy/water efficient
5. Chemical & freezer sample management & centralized freezer storage

Purpose of this meeting today…

- Raise awareness
- Share some initial actions by federal agencies and universities
- Discussion about ways to connect sustainability to federal funding
- Can it be done without increasing administrative burden?

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Initiatives in the UK to Connect Efficiency to Research Funding

Peter James

Supporting World Class Science

Peter James, Director

(Previously Professor of Environmental Management, University of Bradford)

www.effectivelab.org.uk

GOLD SPONSORS:

PLATINUM SPONSORS:

SUPPORTORS:

Lab energy, environmental impacts

- Many are evident and can be tackled directly
  - air quality, chemicals, freezer good practice, fume hood sashes, local equipment sharing, recycling & waste, transport, water etc.
- Many key ones are indirect and not obvious to users:
  - Provision and use of space
  - The ventilation systems behind the fume hood
  - Strategic provision and overall use of equipment
  - Staff productivity and lab procedures/workflows

UK Science Funding

- Direct state support for universities/specialist institutes
  - core based on students & research/teaching ranking
  - specific, generally for science buildings & infrastructure
  - Higher Education Funding Council for England (HEFCE)
- Tuition/postgrad fees (with some extra public support)
- Research Councils – ‘hands off’ competitive bidding
- Foundations, especially Wellcome as a funder/operator
- Targeted public funding – environment, health etc.
- Contract research

UK Drivers for Lab Resource Efficiency

- Funding pressures: more from less
  - 2010 Wakeham Review of Research Councils – URL
  - 2011 & 2015 Diamond Reviews of HE – URL and URL
- Carbon/energy demands
  - Demanding energy and other requirements
  - Collective HE target of 43% CO2 cut 2005-2020 URL
- High and rising costs
  - electricity 20c per kWh or more
  - land $600,000 per acre (over 2x NYC, 7x Denver)

Mechanisms (All Non Environmental)

- Research Councils URL
  - 2011-15 target of c $600m savings (3-5% pa)
  - Linking overhead cost recovery to efficiency levels
  - Part funding equipment to encourage sharing
  - Other measures (guidance, procurement etc.)
- HEFCE: Transparent Approach to Costing (TRAC) URL
  - Full economic costing of all research projects
  - Avoidance of cross subsidy
  - Random audits

Research Councils – Efficiency Rating

- All research organisations placed in 5 Efficiency Groups, based on:
  - absolute level of indirect costs
  - improvement over the previous year
- A varying ‘penalty’ deduction from indirect cost figures
  - 0-6% in year 1 to 0-18% in year 3+
- Initially only applied to non facilities element of indirect costs
- URL

Research Councils – Equipment Costs

- Full economic costing: Example URL
- Only part funding of most equipment
  - under $15,000 treated as direct costs, typically an automatic RC contribution of c 80%
  - $15,000 to $170,000 standard justification, up to 50%
  - over $170,000 science/business case, up to 100%
- Encouraging equipment sharing HE consortia
  - standard inventories

Research Councils – Next Steps?

- More benchmarking
  - equipment performance and use, space utilization
- More focus on facilities efficiency as well as equipment
- Lab/dept efficiency assessment
  - LabRats type Green Lab assessments as a foundation?
- Internal sharing of smaller equipment items & chemicals
- Common standards for more data exchange
- Recommended norms and guidance
- Procurement agreements and bulk purchasing

Some Other Points

- Salix Finance provides perpetual loans for ‘revolving green funds’ as per Harvard model URL
- University of Cambridge has a proxy energy devolution scheme with annual consumption targets for Schools and rewards/fines for good/bad performance URL
- National Union of Students has incorporated the S-Lab Environmental Assessment Framework into its popular ‘Green Impact’ audit scheme URL

Conclusions

- Much ‘hidden’ environmental improvement potential
  - best addressed without too much of a ‘green’ hat?
- Align with good science + organizational agendas
  - ‘Win win’ actions, Good Laboratory Practice
- Capture ‘hidden’ knowledge e.g. maintenance, technical
- Align carrots and sticks with control and motivation
- Think holistically about equipment: not just databases
- Target big change as well as routine processes

Questions and Discussion

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Break

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Initial Actions by US Federal Agencies

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Addition of Laboratory to the Sustainable Facility Tool & Inclusion of Biomedical Equipment and Supplies Category to the Green Procurement Compilation

Michael Bloom

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Sustainable Facilities Tool

- Visit www.SFTool.gov

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Guide for the Selection and Purchase of Energy Efficient Equipment for Research Laboratories and Healthcare Facilities

Alamelu Ramesh

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Integration of Sustainability Principles in Grant Development, Review & Award Criteria

Bill Hemmington

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Connecting Sustainability to Indirect Cost Recovery (ICR) and Grant Terms & Conditions for Energy Efficient Lighting

Kristen Taddonio

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Uniform Guidance CFRs Requiring Equipment Sharing and Avoiding Acquisition of Duplicative Items

Gil Tran

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Initial Actions by Universities

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Energy Management: Engaging and Financially Connecting with Electricity Use

Kevin Ng

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Energy Management: Engaging and Financially Connecting Occupants with Electricity Use

Better Buildings Summit
May 29, 2015

Kevin Ng
Assistant Energy Manager, PE, CEM
Office of Sustainability and Energy

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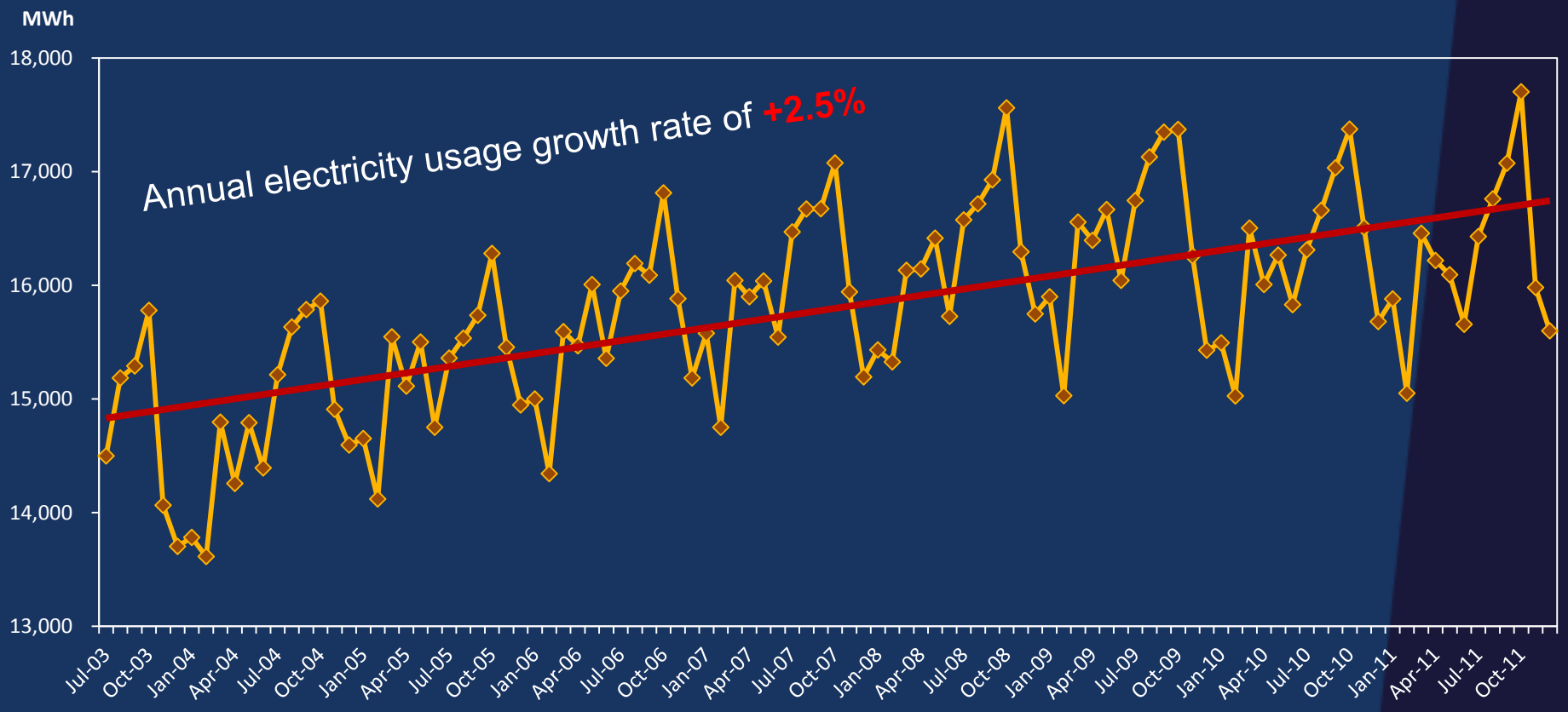
The Big Picture



In 10 years, compounds to +28%

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Status quo

- Management of energy usage and costs reside centrally

- The need for culture change:

  - Increased utilization of existing spaces
  - Addition of new buildings
  - Persistence of retrofit and rcx savings
  - Preservation of building systems

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Energy Management Initiative

- Established in 2010 through Operational Excellence
- Complements existing campus operations and goals
- Consists of four components:
  - Energy Incentive Program
  - Energy Office
  - Energy Use Policy
  - Outreach

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Why Occupants?

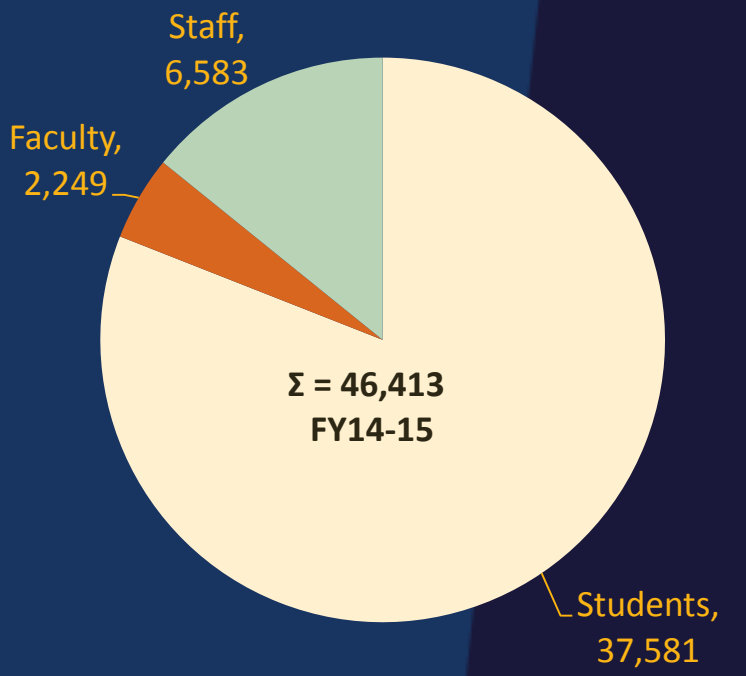
- Do your occupants of your academic buildings know how much it costs to operate their building each month?

- By the numbers:

  81% students, 14% staff, 5% faculty

  of which 0.1% are technical staff

- Growing evidence on occupant energy savings



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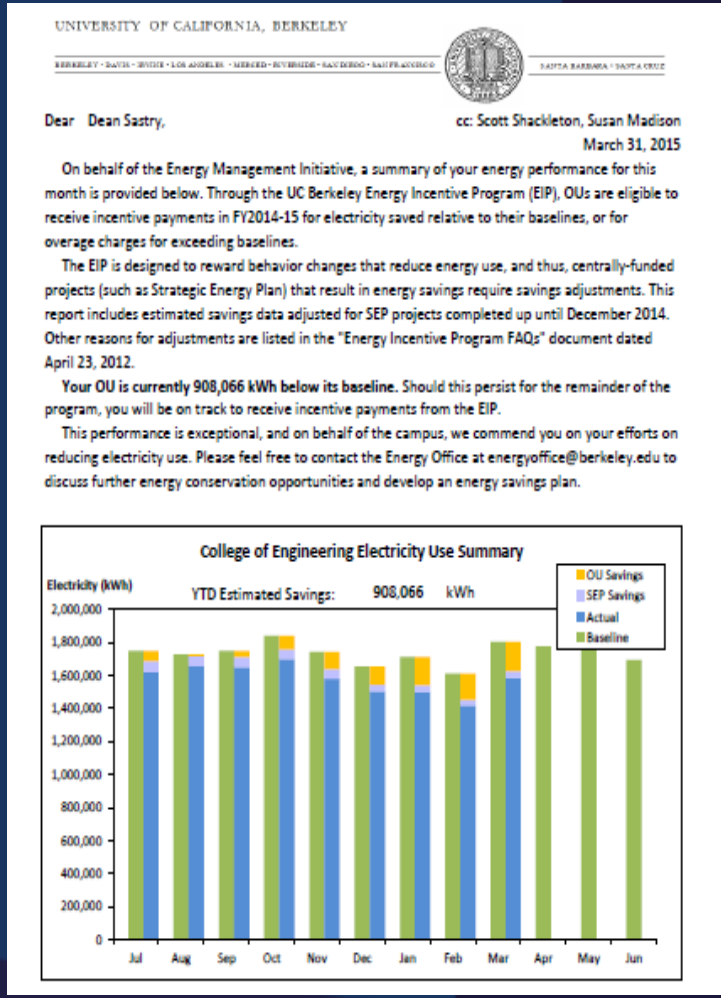
Incentive Program

- Only focuses on electricity use:
  - Controllability
  - Metering system reliability
- Program rules:
  - Square footage apportionment
  - Roll up by Operating Units
  - Availability of energy data
  - Steering Committee



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BERKELEY · DAVIS · IRVINE · LOS ANGELES · MERCED · RIVERSIDE · SACRAMENTO · SAN FRANCISCO · SANTA BARBARA · SANTA CRUZ

Dear Dean Sastry,

cc: Scott Shackleton, Susan Madison

March 31, 2015

On behalf of the Energy Management Initiative, a summary of your energy performance for this month is provided below. Through the UC Berkeley Energy Incentive Program (EIP), OUs are eligible to receive incentive payments in FY2014-15 for electricity saved relative to their baselines, or for overage charges for exceeding baselines.

The EIP is designed to reward behavior changes that reduce energy use, and thus, centrally-funded projects (such as Strategic Energy Plan) that result in energy savings require savings adjustments. This report includes estimated savings data adjusted for SEP projects completed up until December 2014. Other reasons for adjustments are listed in the "Energy Incentive Program FAQs" document dated April 23, 2012.

Your OU is currently 908,066 kWh below its baseline. Should this persist for the remainder of the program, you will be on track to receive incentive payments from the EIP.

This performance is exceptional, and on behalf of the campus, we commend you on your efforts on reducing electricity use. Please feel free to contact the Energy Office at energyoffice@berkeley.edu to discuss further energy conservation opportunities and develop an energy savings plan.

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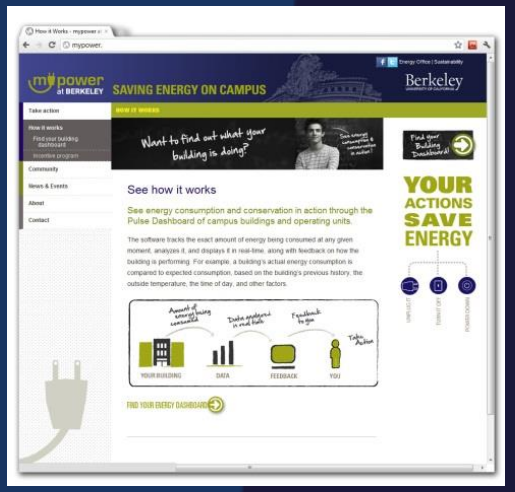
Outreach - marketing

- myPower outreach and marketing campaign to influence individual behavior change
  - Voluntary Power Agents

- Energy competitions in academic buildings and dorms

- Energy presence in main campus
  - Storefront for walk-ins
  - Energy tools and tips to spur individual action



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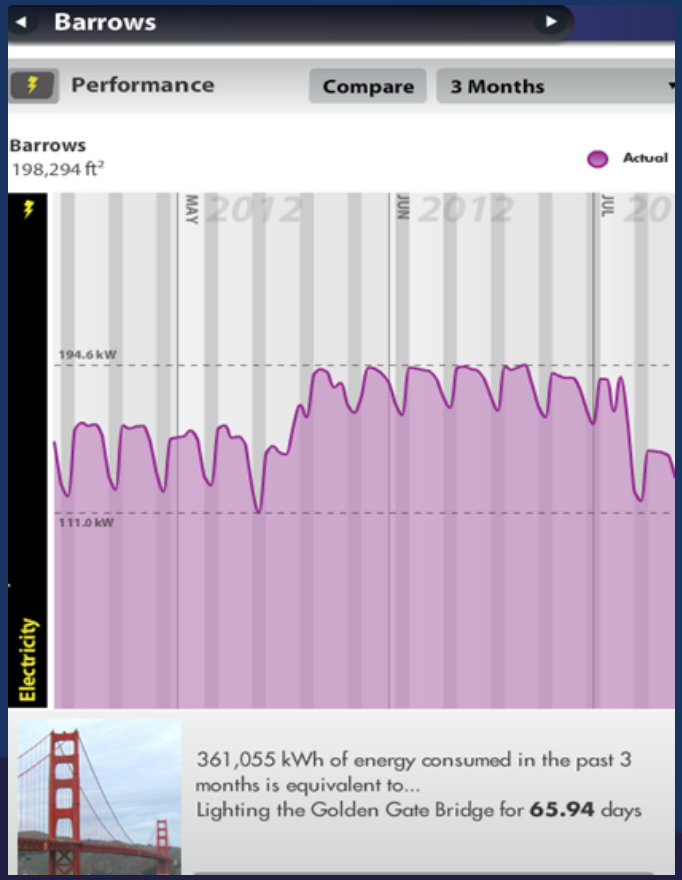
Outreach - technical

- Energy dashboards



- Building surveys

SAVING ENERGY *On Campus*

myPower at BERKELEY

UC Police Department Office
1 Sproul Hall
October, 2013

Building Contact: Dispatcher, Michael Erazo
merazo@berkeley.edu
myPower Team: Matthew Cook
Patrick Murray
Erin Fenley – fenley@berkeley.edu

Background

The UC Police Department office is located in the basement of Sproul Hall. The building, built in 1941, houses many important campus administrative offices: Financial Aid, Admissions, Registrar, and Visitor Services. The UCPD office received Green Department Certification from the UC Berkeley Office of Sustainability in 2009.

The office houses approximately 160 employees. However, due to the responsibilities of the UCPD, much of the office's operations and technology are active all 24 hours of the day.

Michael Erazo has been very active in promoting sustainable behavior in the UCPD office. As a volunteer Power Agent, Erazo helped to organize an office power load survey with the myPower team in Fall of 2012. Additionally, he has been vocal in encouraging other employees to be more cognizant of their energy use. Erazo contacted the myPower team to analyze the energy complications arising from the basement location of the office.

Lighting

The basement location of the UCPD office creates issues with lighting. Windows are limited in the office, and when there are aboveground windows, they are often impeded by bushes or the blinds are closed for privacy reasons. This severely limits the amount of natural light entering the office, creating a large need for overhead lighting.

Many of the rooms and offices possess task lights, however there are still rooms that have overhead lighting when task lighting would suffice. Additionally, some rooms are lit at all times, even when unoccupied. Many of the task lights still use incandescent lightbulbs, but Mr. Erazo indicated that the office is slowly transitioning to more efficient CFLs and LED lighting.

The 24 hour demands of the UCPD require that some lights remain on at all times, but lighting in the office after hours is reduced. Outside of the offices, many of the lights in Sproul Hall are left on after business hours.

Recommendations

- ☐ Open blinds to utilize natural light when not dealing with sensitive information
- ☐ Identify the locations of light switches in different rooms
- ☐ Look into methods to change to LED lighting without changing fixtures
- ☐ Encourage employees to replace incandescent lightbulbs with more efficient CFLs
- ☐ Contact building manager to look into:
  - Installing more efficient hallway lights
  - Utilizing "night mode" lighting after hours

Thermal Comfort

The basement location of the office also creates many issues with the temperature inside the office. Due to the antiquated ventilation systems, the temperature inside the office is generally very warm and uncomfortable. Additionally, UCPD employees are required to wear thick uniforms which add to the discomfort.

The windows are rarely opened in place of air conditioning due to the obstructions blocking the windows outside. For

Find more energy saving information at *myPower.berkeley.edu*

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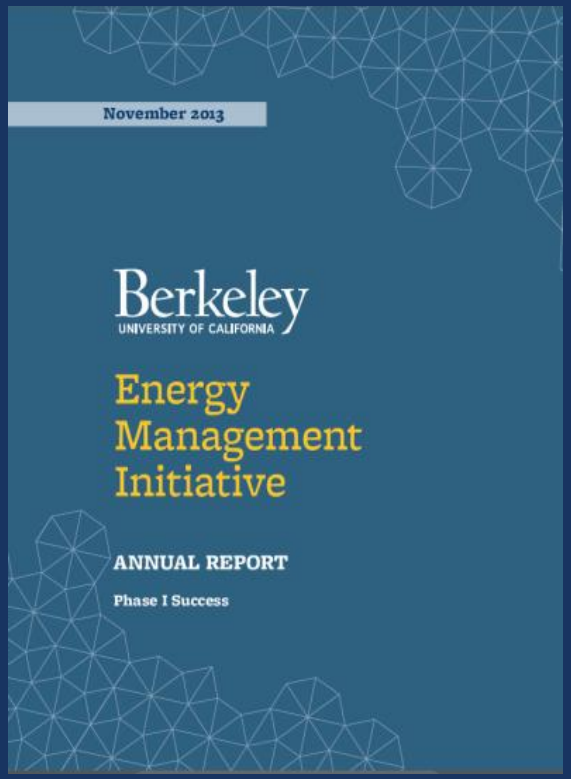
Outreach - research

Organization	Research Interest	Application
Center for the Built Environment	• Occupant thermal comfort • HVAC controls sequences	• Personal comfort systems at Doe Library and Stanley Hall • HVAC setpoint and deadband reset in Stanley Hall
LoCAL	• Occupant-controlled heating and cooling • Energy dashboards	• Application deployed in Sutardja Dai Hall • sMAP viewer in over 50 buildings
College of Engineering / Architecture / PG&E	• Building systems energy use and rcx • Automated fault detection for HVAC	• Energy audit and analysis of HVAC, lighting and window shades in Energy Biosciences Building • Pilot application in pneumatic control system
CITRIS	• Best in class HVAC control sequences	• Pilot project in Sutardja Dai Hall airside systems
TGIF	• Implement projects to help meet teaching and sustainability goals	• Smart plugs installation at Carleton and South Hall • LED retrofit for microscopes in Valley Life Addition
Lawrence Berkeley National Labs	• Rapid efficiency feedback for building managers • Whole building measurement and verification (various) • Backpack-mounted building energy modeling	• Deployed in over 60 campus buildings • Evaluate accuracy of forecast by whole building energy algorithm • Pilot data collection and verification in Mulford Hall
Pacific Northwest National Labs	• Re-tuning of building systems for efficiency using simple tool	• Re-tuning training and assessment of Soda Hall and Hertz Hall

Results



mypower.berkeley.edu/sites/default/files/EMIAnnualReport13.pdf

- EMI saved $4.4M in two years
- Incentive program monies returned to campus:

  Year 1 = $874,000 (*8,740,207 kWh*)

  $20,000 overage

  Year 2 = $995,000 (*9,956,443 kWh)*

  +13%
- Active, ongoing, relationships for continuous improvements

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kevin.ng@berkeley.edu

Additional Resources

- EMI Annual Report FY13
- EMI Annual Report FY14
- Incentive Program Background
- Department Energy Surveys
- Case Studies of Partnership and Technical Outreach Success
- Energy Dashboards for comparing buildings, reviewing previous competitions, and checking target and actual performance

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Efficiency in the Research Environment: Publicizing Shared Instrumentation and Open Access Facilities

Amorette Getty

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Efficiency in the Research Environment: Publicizing Shared Instrumentation and Open Access Facilities

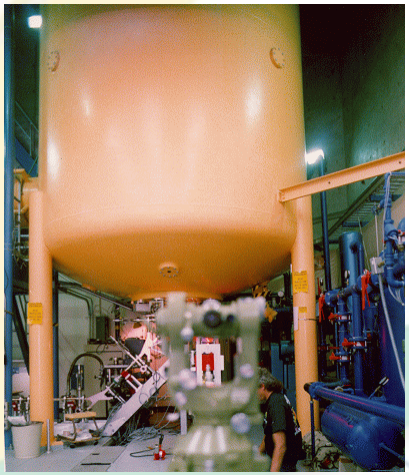
Amorette Getty, PhD

May 29, 2015

Research Instrumentation

National Science Foundation – Major Research Instrumentation Grants:

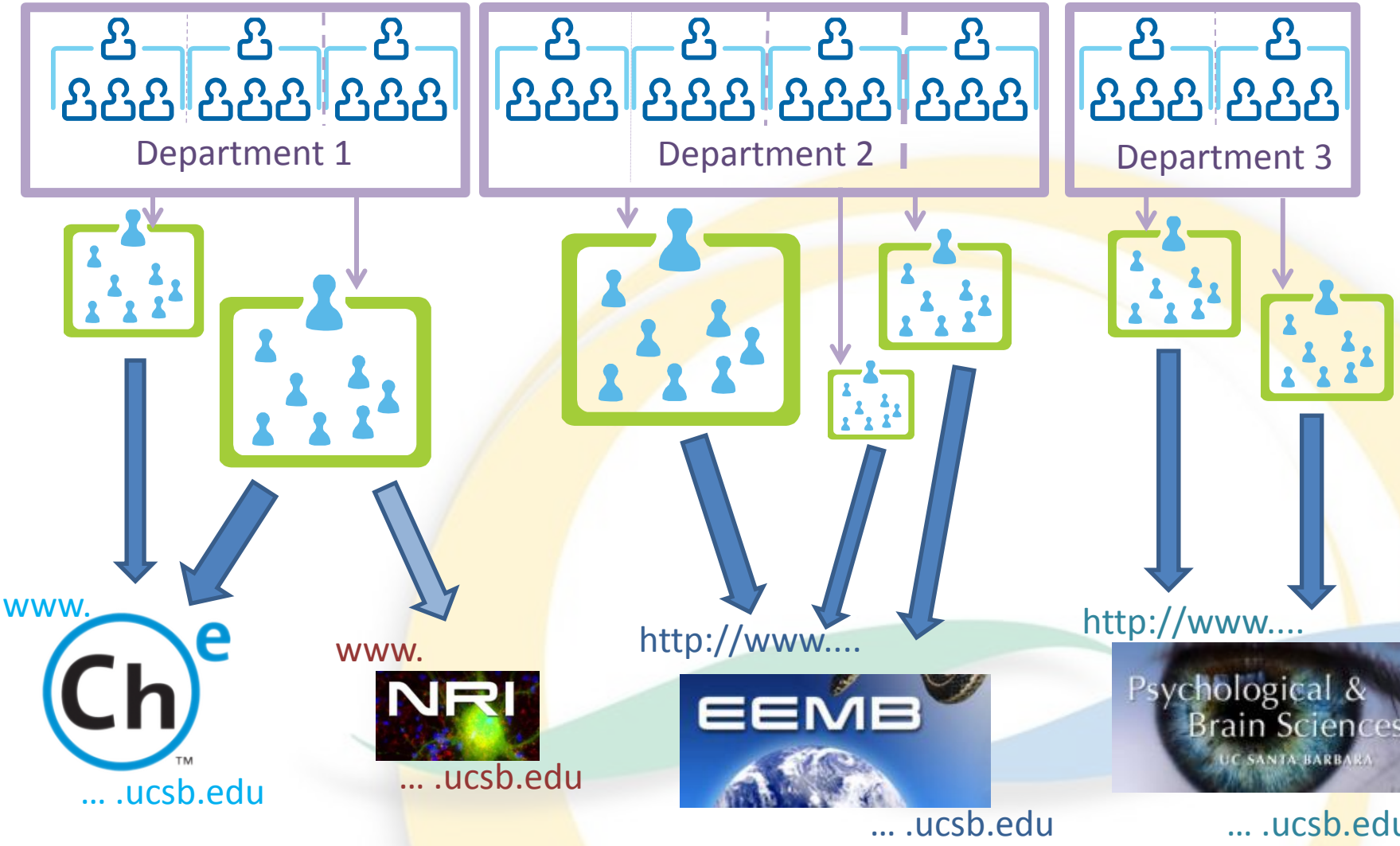
- $90 Million Total
- 175 awards of $100k - $4 million each



Sustainability: Efficient Use of Resources

- Energy (plug load, increased ventilation req't)
- Water (cooling, process)
- Material Waste (sample prep waste; haz mat; house utilities)
- Minimize redundant instruments
- Frequency of use (how many hours/day?)
- Availability and access (# users, types of users)
- Knowledge of existence (who knows about it?)

Research Networking Status Quo



www.sharedinstrumentation.ucsb.edu

shared INSTRUMENTATION

Search this site...

Home | About | Instruments | Instrument types | Core Facilities | External Users | Add/update your instruments

STATISTICS

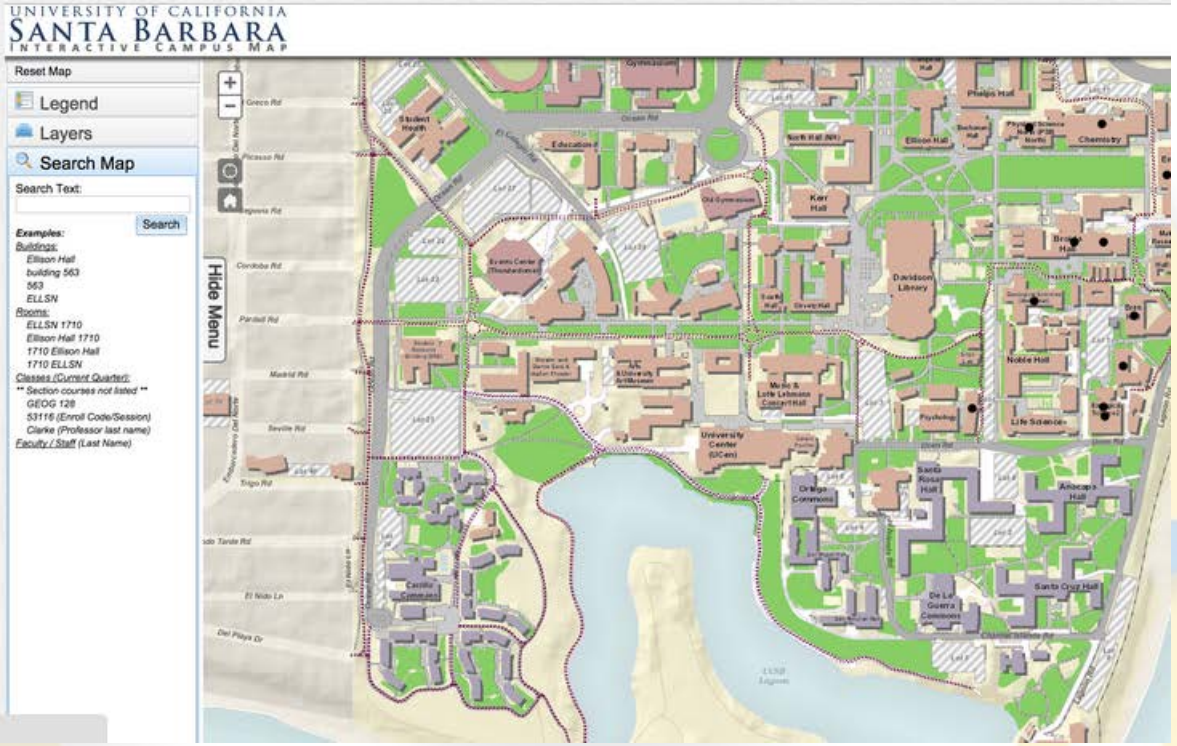
45 FACILITIES

291 INSTRUMENTS

RECENTLY ADDED INSTRUMENTS

- Desktop Sequencing System
- Siemens MAGNETOM MRI

UCSB FACILITIES NETWORK



link.map.geog.ucsb.edu/j8

Collaborative Effort

- UCSB's Office of Research
  - Motive: Advertise instruments purchased on Shared Instrumentation Grants
  - Provide Funding for WebDev and Intern labor
  - Responsible for ongoing maintenance.
- MRL's MRFN Office
  - Provided base website code based on MRFN.org
- UCSB Sustainability Intern Office
  - Project management and database population
  - Publicity to other universities and national groups
  - Promote to labs as a big-picture sustainability measure

Single-Discipline Solutions

- www.MRFN.org 

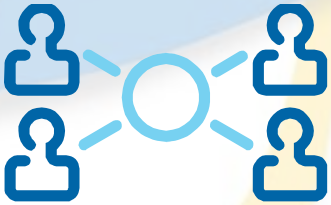
- “Shared Experimental Facilities” a core requirement for NSF Materials Science and Engineering Centers (MRSECs)
- 27 of 30 MRSECs are members of the Materials Research Facilities Network to share information about their facilities and experts

Visions of the Future




- More Instruments:
  - All PIs on campus with Shared Instrumentation grants
  - Sustainability Certification - Additional Points awarded to labs listing instruments.
  - Highlight in grant funding requests

- Growth Beyond UCSB
  - Multiple UC Campuses?
  - Form interlinked Shared Research Facilities Networks with compatible protocols.



Thank you! Questions?

sharedinstrumentation.ucsb.edu

sustainability.ucsb.edu/labrats

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Better Buildings
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Facilities Management Funding to Incentivize Purchases of Energy & Water Efficient Equipment by Labs

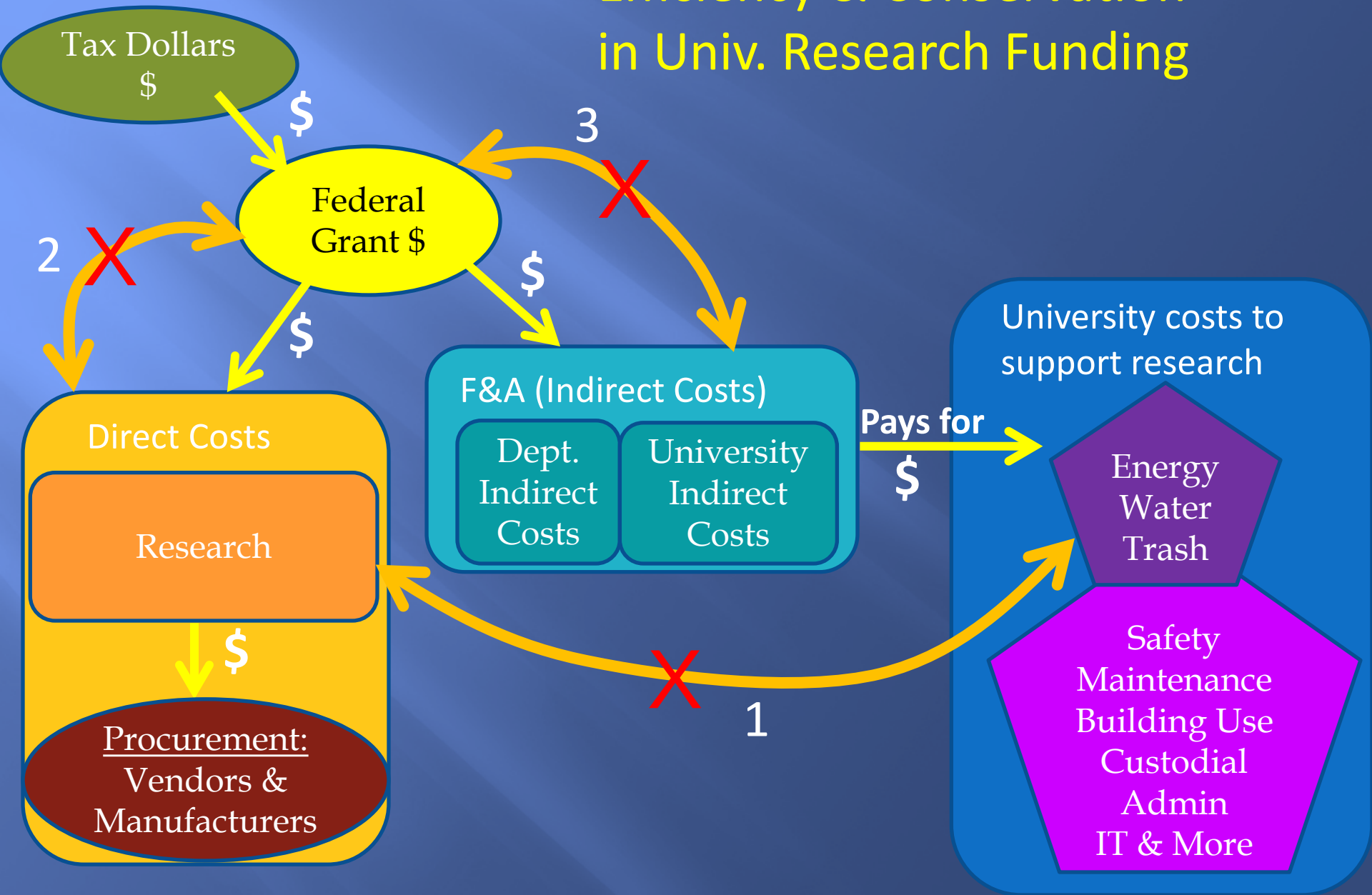
Kathy Ramirez-Aguilar

U.S. DEPARTMENT OF ENERGY

Facilities Management Funding to Incentivize Purchases of Energy & Water Efficient Equipment by Labs

Kathryn A. Ramirez-Aguilar, Ph.D.
Green Labs Program Manager
University of Colorado Boulder

Missing Requests for Efficiency & Conservation in Univ. Research Funding



Facilities Management Funding for Efficient Lab Equipment Purchases

Up to 5 yrs of energy or water savings:

- Equipment replacements
- New equipment

Consolidate from 2 ULT freezers to 1 efficient ULT freezer

44.6
kWh/day

10.5
kWh/day

76% reduction in electricity
$6600 incentive = 6.5 yrs of electricity savings

Low Temp Environmental Chamber: 5.5ºC and Lighting

33.2 kWh/day

11.2 kWh/day

66% reduction in electricity

$3252 incentive= 5 yrs electricity savings

Break

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Open Discussion About Ways to Further Connect Sustainability to Federally Supported Research

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Wrap-Up & Next Steps

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