Better Buildings®
U.S. DEPARTMENT OF ENERGY

# Bringing Efficiency to Research (BETR) Grants

**May 16, 2017**

2 to 3:15 p.m.

U.S. DEPARTMENT OF ENERGY

# Panelists

- Daniel Robinson, US DOE
- Kathy Ramirez-Aguilar, CU-Boulder
- Phil Wirdzek, International Institute for Sustainable Laboratories ($I^2SL$) - Moderator

Daniel Robinson

US DOE

U.S. DEPARTMENT OF
ENERGY

Kathy Ramirez-Aguilar

CU-Boulder

U.S. DEPARTMENT OF ENERGY

# BETR Grants:
## Bringing Efficiency to Research Grants

**Kathy Ramirez-Aguilar, Ph.D.**
**Chair, I²SL University Alliance Group**
**Green Labs Program Manager, CU-Boulder**
**kramirez@colorado.edu**

Greening Federal Grants

Previous Name

=

Bringing Efficiency to Research Grants (BETR Grants)

Current Name

**Presentation Outline:**

- How research is funded on US university campuses
- Why scientists are facing such tough competition for federal funding
- Where do inefficiencies exist and the consequences
- What can you do at your university or federal agency

## Bringing Efficiency to Research Grants (BETR Grants) is about connecting efficiency with federal research funding

Efficient use of resources:

- Maximize effective use of federal research funding
- Minimize the environmental footprint of research

I²SL International Institute for Sustainable Laboratories®

FEMP Federal Energy Management Program

Better Buildings U.S. DEPARTMENT OF ENERGY

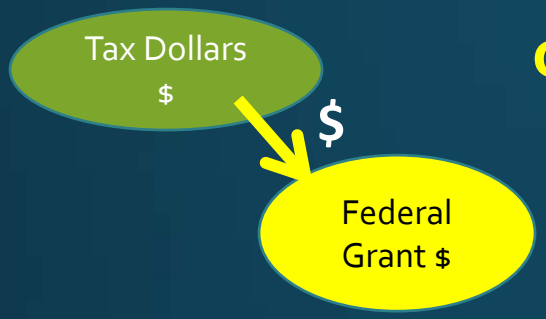
# How is research funded on US university campuses?

# Majority of US University Research Is Funded by Federal Government

% research funding from federal govt.

CU–Boulder (FY14) = 80%
Univ. of Michigan (FY14) = 57%
Dartmouth (~FY14) = 86%
Stanford (~FY14) = 80%
Univ. of Florida (FY14) = 66%
Northwestern Univ. (FY14) = 73%
Univ. of Chicago (FY13) = 74%
Iowa State (FY15) = 53%
Penn State (FY14) = 62%
Rutgers Univ. (FY14) = 53%
UC-Davis (FY14) = 53%
UC-Irvine (FY15) = 66%
UC-Santa Barbara (FY15) = 78%
Univ. of Kansas (FY14) = 80%
Univ. of Minnesota (FY15) = 61%
Univ. of Oregon (FY15) = 90%
Univ. of Washington (FY15) = 80%
Princeton (FY14) = 72%
Univ. of Rochester (FY15) = 75%
Univ. of Wash.- St. Louis (FY15) = 75%

# Federal Funding of Research on University Campuses



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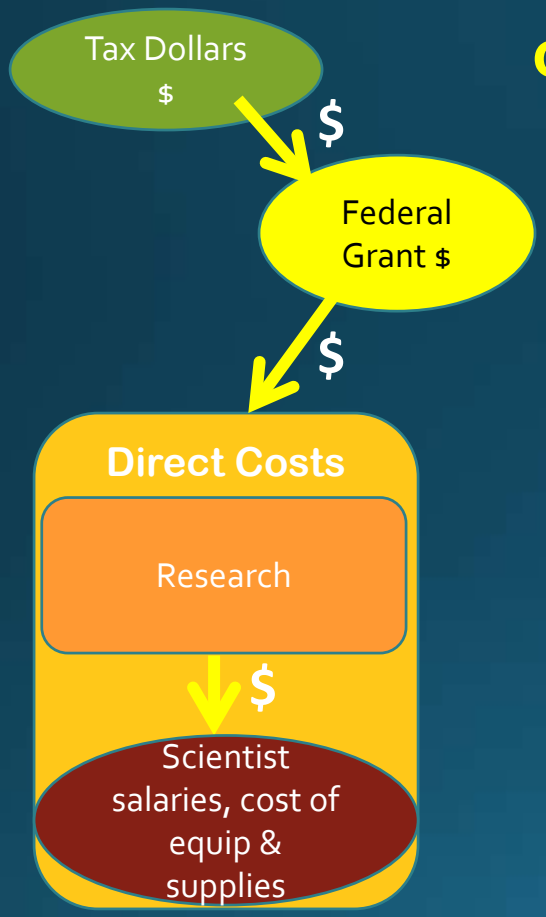

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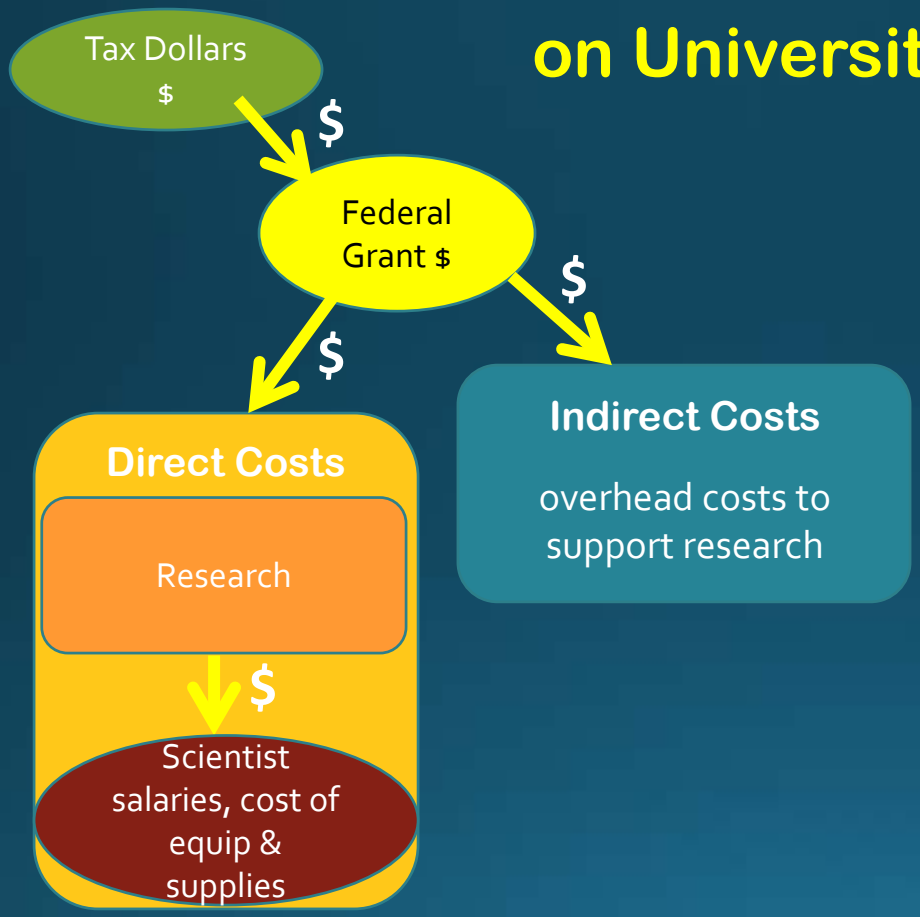

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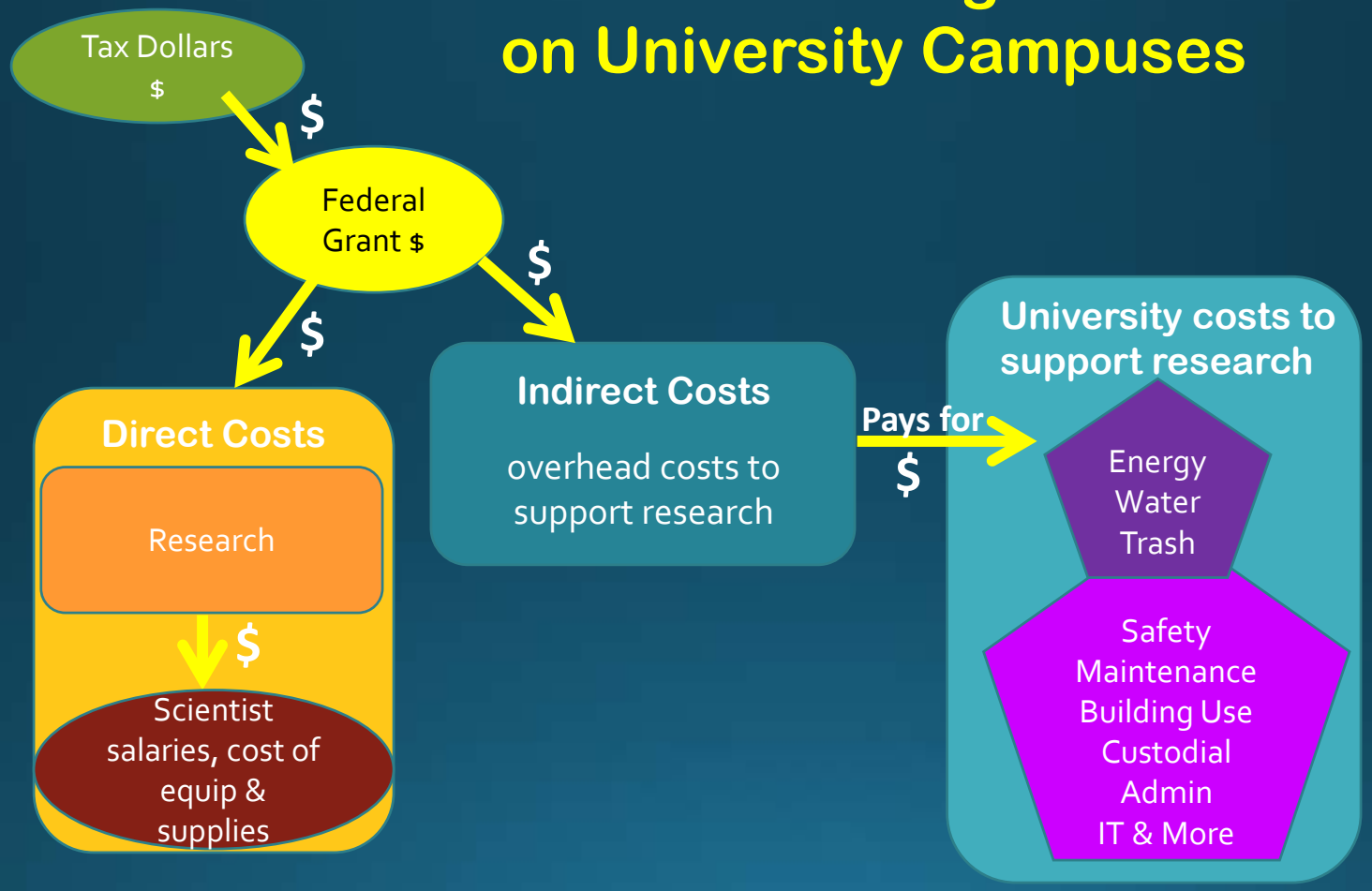
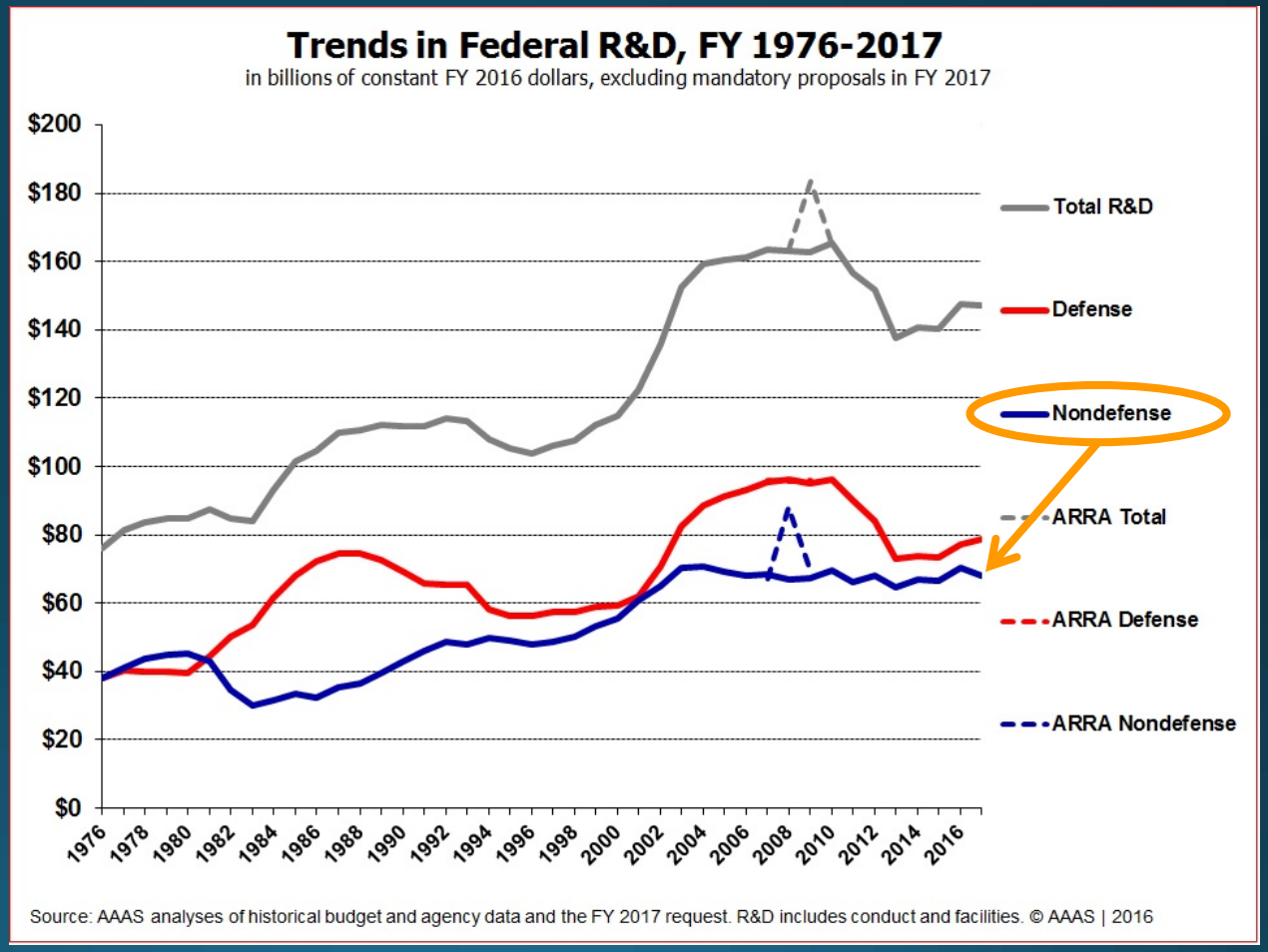


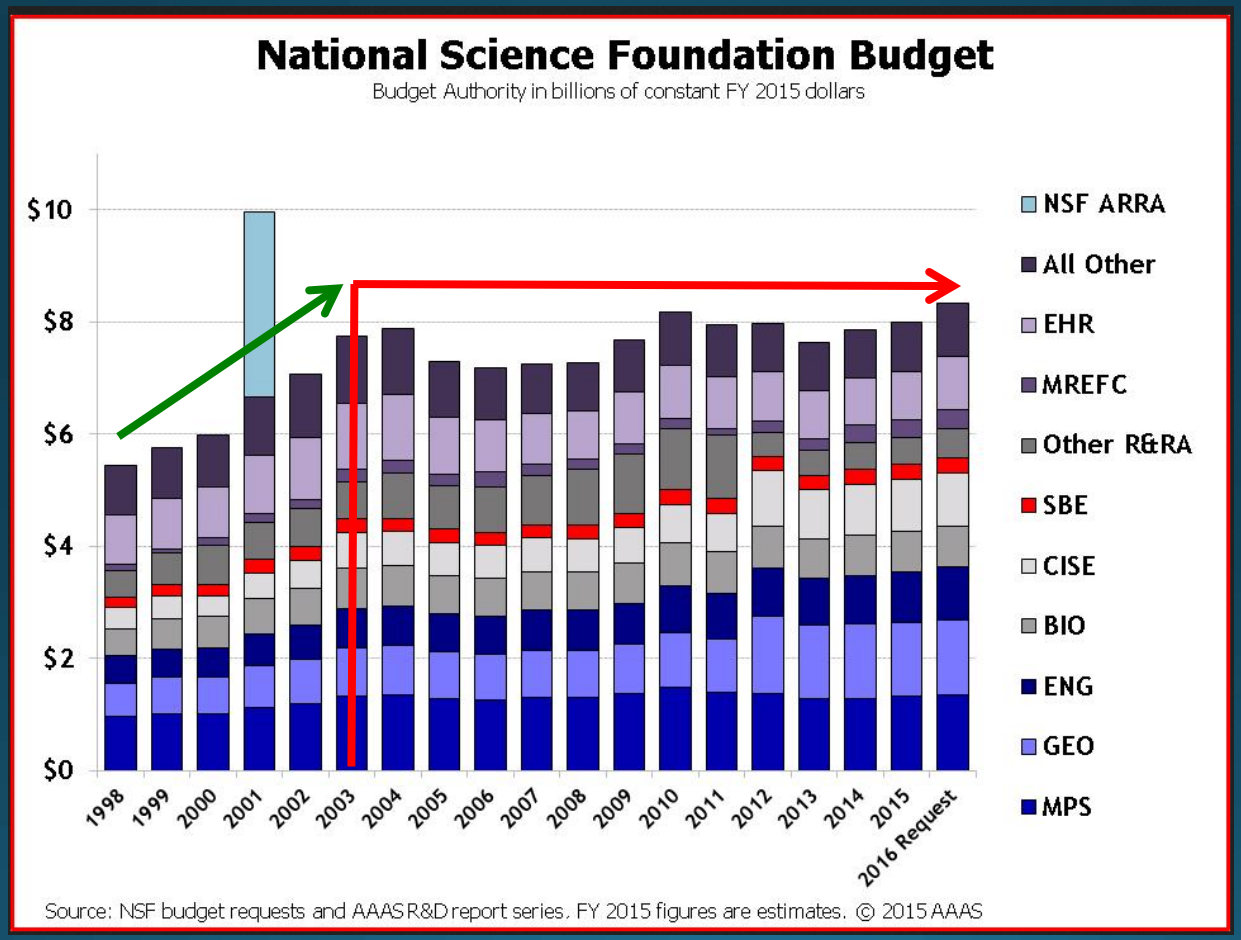
# Why are university scientists facing tough competition for federal funding?

# Non-defense R&D funding plateaued in 2003




ARRA = American Recovery and Reinvestment Act

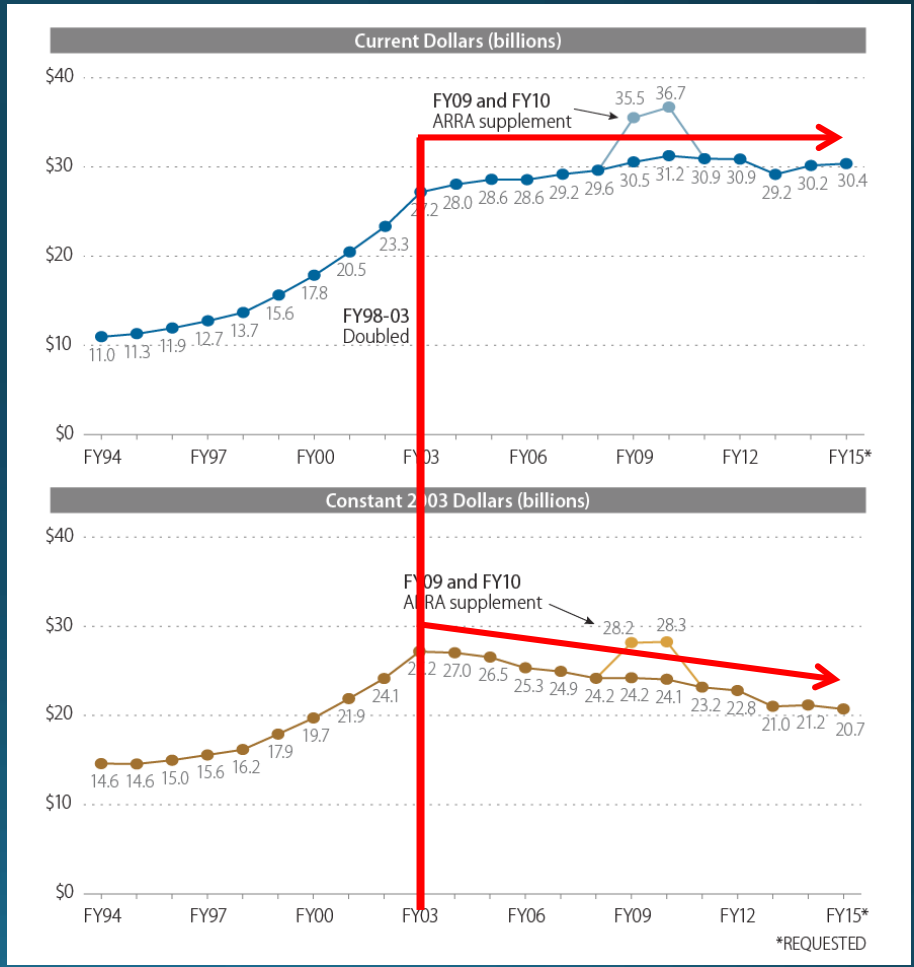
# Historical Trends in NSF Budget



# With inflation, buying power of federal funding has decreased

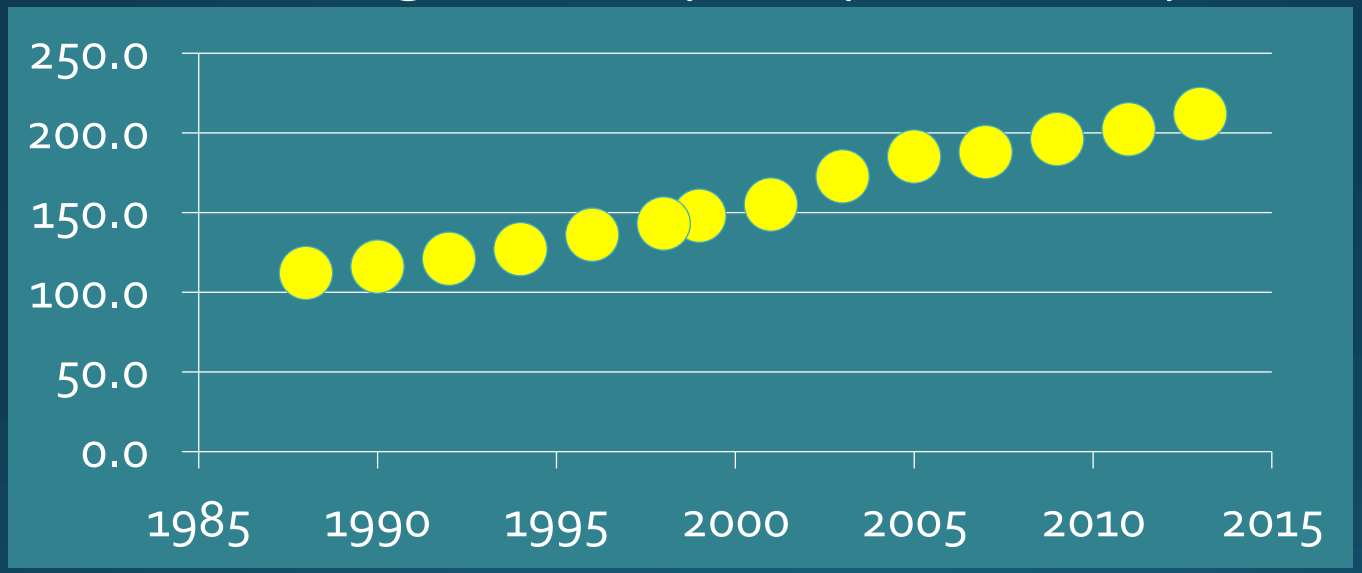
20-25% loss in purchasing power since 2003 even though budgeted amounts have stayed around $30 billion.

NIH Appropriations, FY1994-FY2014 request




Source: Brief History of NIH Funding: Fact Sheet, Judith A. Johnson March 7, 2014

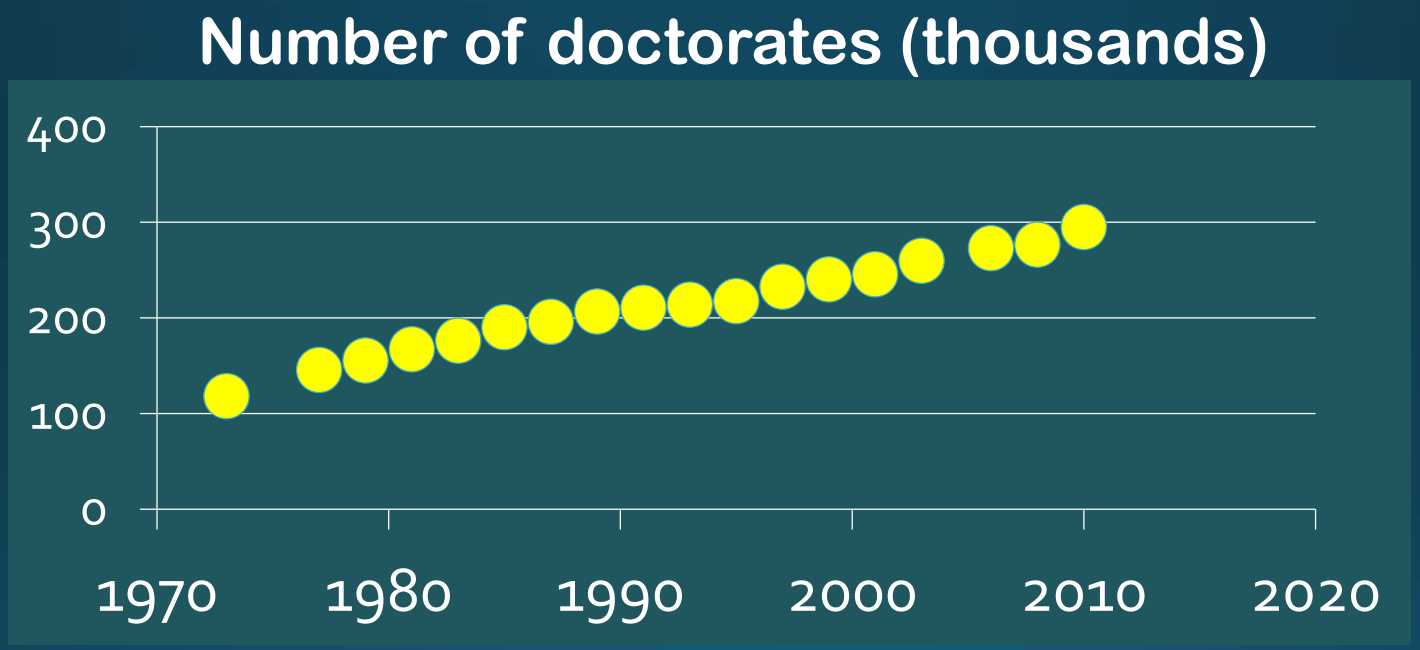
# Increasing US university research sq.ft.




Source: http://www.nsf.gov/statistics/2015/nsf15316/

**89% growth between 1988 & 2013**

# Growth of doctorates (science, engineering, health) employed in US academia




Source: http://www.nsf.gov/statistics/seind14/content/chapter-5/at05-15.pdf

**50% growth between 1987 & 2010**

# Scientists facing rising competition for federal funding

Small or lack of increases in federal research funding

+

More university scientists competing for federal funding

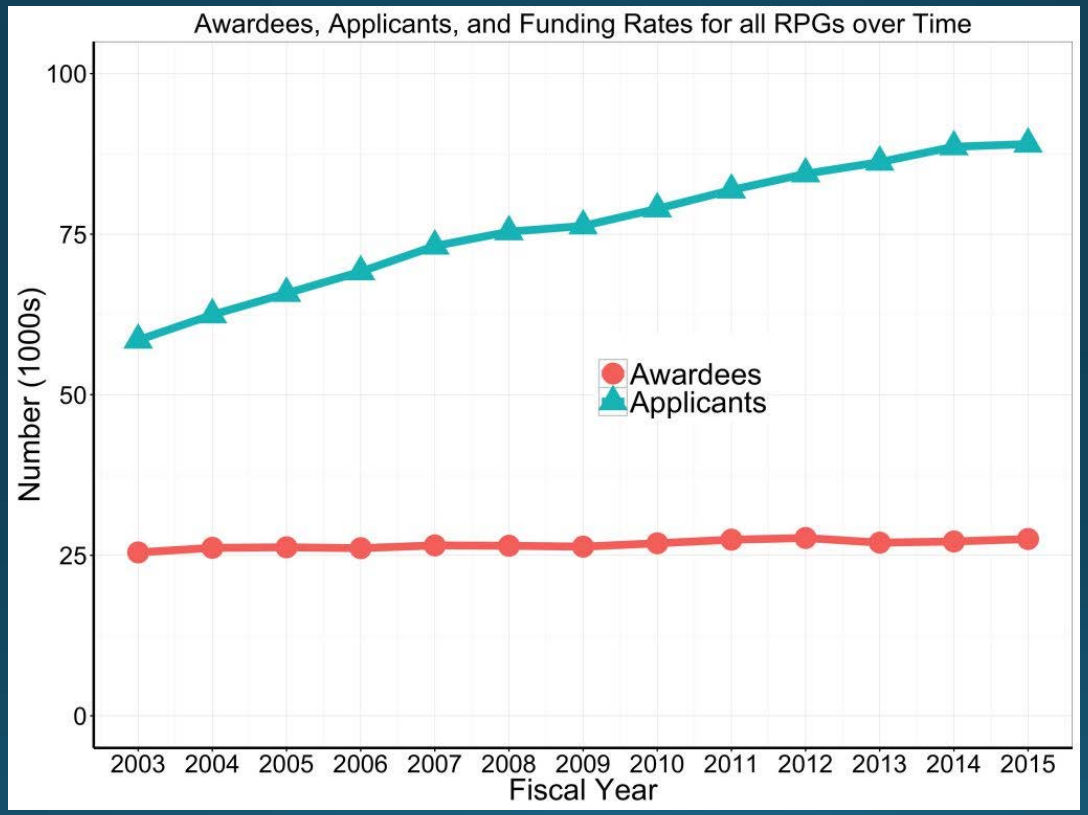
+

Inflation decreasing buying power of federal funding

=

Rising competitio n for federal funding

# Competition for Funding Keeps Rising

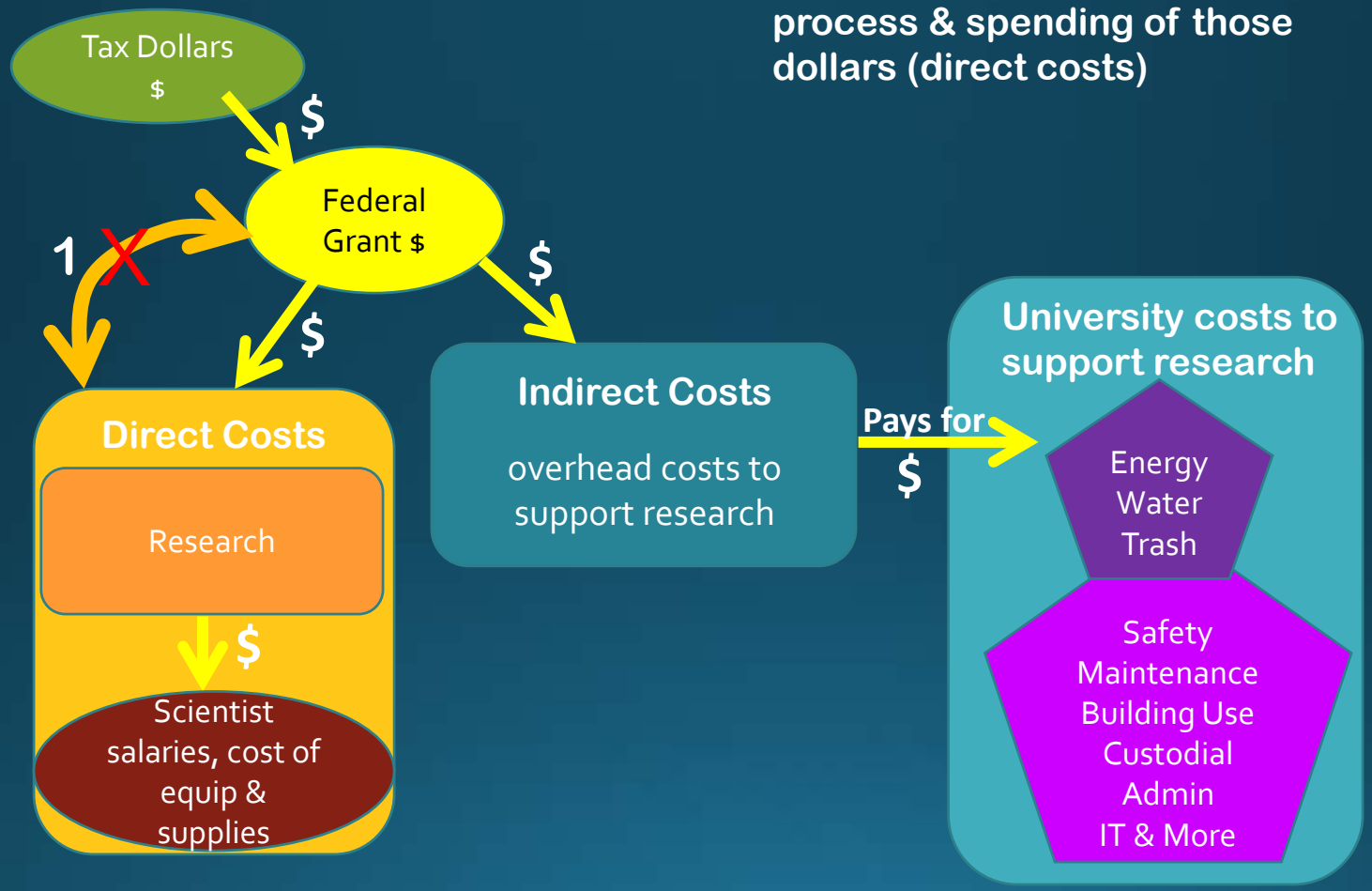



Source: Michael Lauer, Director of OER, NIH
https://nexus.od.nih.gov/all/2016/05/31/how-many-researchers/

Where do inefficiencies exist in the present system and what are the consequences?

# Missing Efficiency Connection in Federal Funding of Research at Universities

1. Federal grant application process & spending of those dollars (direct costs)



## During the grant application process and spending of those dollars, there are missed opportunities for federal granting agencies to ask or encourage scientists to:

1. Select lab equipment and processes that are energy/water/material efficient where possible and that use green chemicals

2. Share equipment and make use of existing equipment resources already on campus

3. Use campus lab space and fume hoods efficiently & effectively to fit present researcher needs rather than historical needs

4. Encourage computer resource, software, & data sharing

# Individualized space with individualized resources leads to duplication

Floor centrifuge

# Lack of awareness of what equipment resources exist on campus

Scanning electron microscope

# Uniform Guidance Code of Federal Regulations (CFR) requiring equipment sharing & avoiding duplication

## 2 CFR 200.313 c2

"must also make equipment available for use on other projects or programs currently or previously supported by the Federal Government, provided that such use will not interfere with the work on the projects or program for which it was originally acquired.": http://www.ecfr.gov/cgi-bin/text-idx?SID=597cf895a4e1859ccf447c54c795d4b3&node=se2.1.200_1313&rgn=div8

## 2 CFR 200.318 d

"must avoid acquisition of unnecessary or duplicative items" : http://www.ecfr.gov/cgi-bin/text-idx?node=2:1.1.2.2.1.4.31&rgn=div7

**Problem:** Lack of awareness of what equipment resources exist on campus and where to find them

**Solution:** Shared Instrument Website

http://www.colorado.edu/sharedinstrumentation/

*Many thanks to UC-Santa Barbara for sharing platform with CU-Boulder.*

# Managed, shared equipment in shared spaces benefits science and scientists

- Saves funding
- Saves time
- Places maintenance & training on manager
- Attracts talent & promote collaboration
- Benefits space & equipment utilization
- Managers provide expertise
- Compliance with CFRs
- In line with campus sustainability goals

Biosafety Cabinet (BSC)

# Biochemistry Cell Culture Facility

Full-time director

16 laboratories with 70 active users

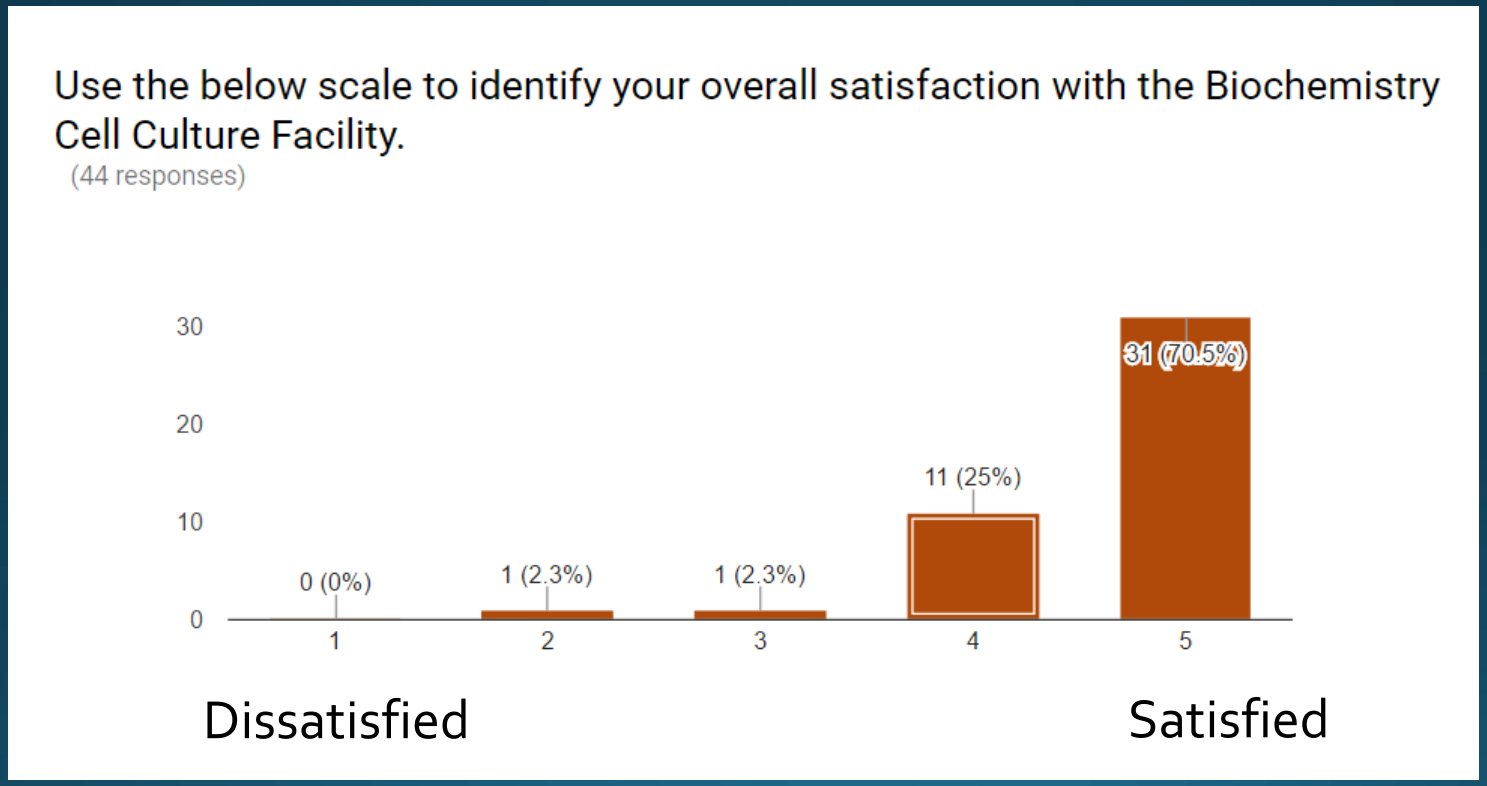
- 4 departments/institutes
- 13 labs use facility every day
- 11 labs have multiple users every day

BSL-1 & BSL-2

Shared BSCs, incubators, freezers, & more

Began 25 years ago with 4 labs and has grown and grown.

# Users Like the Biochemistry Cell Culture Facility



# Case Study: Biochemistry Cell Culture Facility

Shared Cell Culture Facility

Serving 16 labs
1554 $ft^2$

VS.

16 separate cell culture spaces
2220 $ft^2$

# Case Study: Summary of Savings for Shared Cell Culture Facility - DRAFT FIGURES

## Ongoing Savings - university

| | |
|---|---|
| Energy | ~$8000/yr |
| Maintenance | $58,000/yr |
| TOTAL: | ~$66,000/yr |

## Ongoing Savings - scientists

| | |
|---|---|
| Labor | ~$128,000/yr |
| Supplies | ~$67,000/yr |
| TOTAL: | ~$195,000/yr |

## Upfront Savings (renovation)

| | |
|---|---|
| Equipment | ~$288,000 |
| Construction | ~$238,000 |
| TOTAL: | ~$526,000 |

## Upfront Savings (new construction)

| | |
|---|---|
| Equipment | ~$288,000 |
| Construction | ~$699,000 |
| TOTAL: | ~$987,000 |

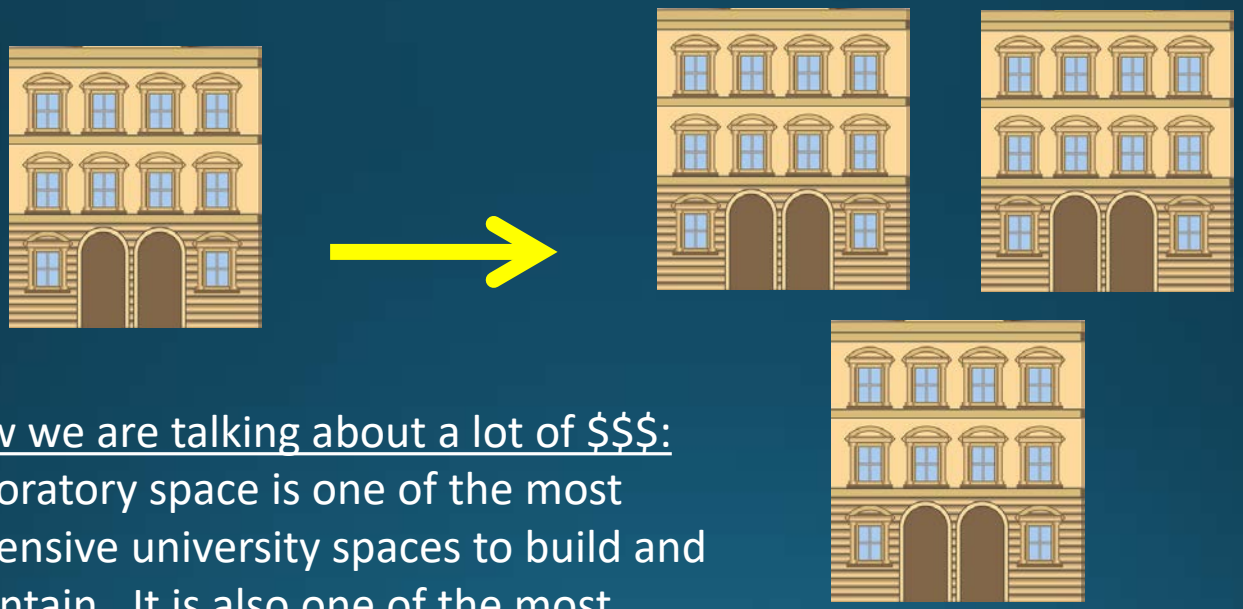
# Lab research can change directions

Equipment that a lab needs now, may not be needed later.

Understandably, a lab may not want to let equipment go because they may need it in the future.

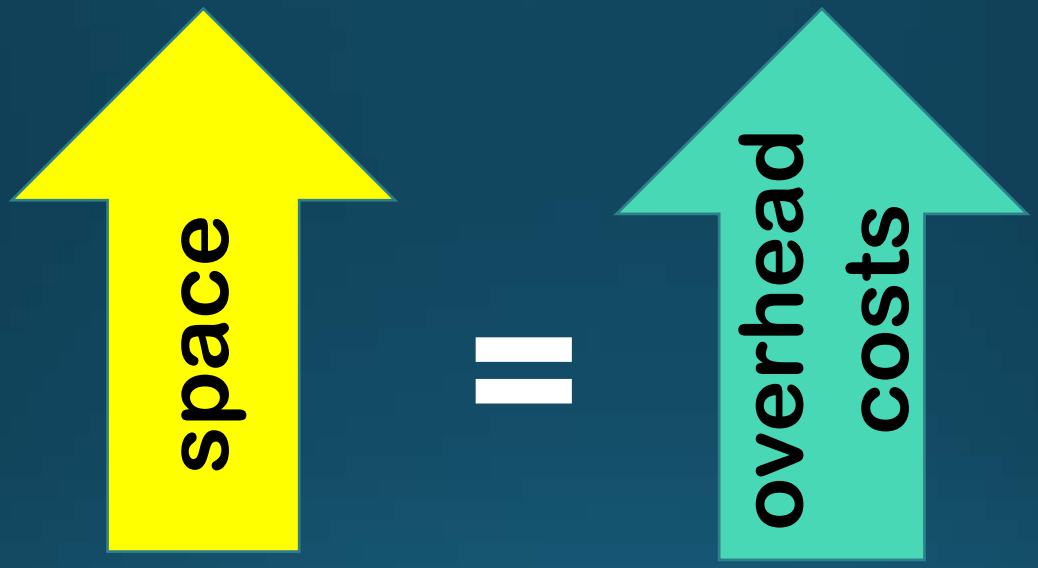
# As a result, it is not uncommon to find unused or underutilized equipment in labs

# Individualized resources leads to not only inefficient use of equipment resources, but importantly, space resources



<u>Now we are talking about a lot of $$$:</u>
Laboratory space is one of the most expensive university spaces to build and maintain. It is also one of the most energy intensive spaces on campus.

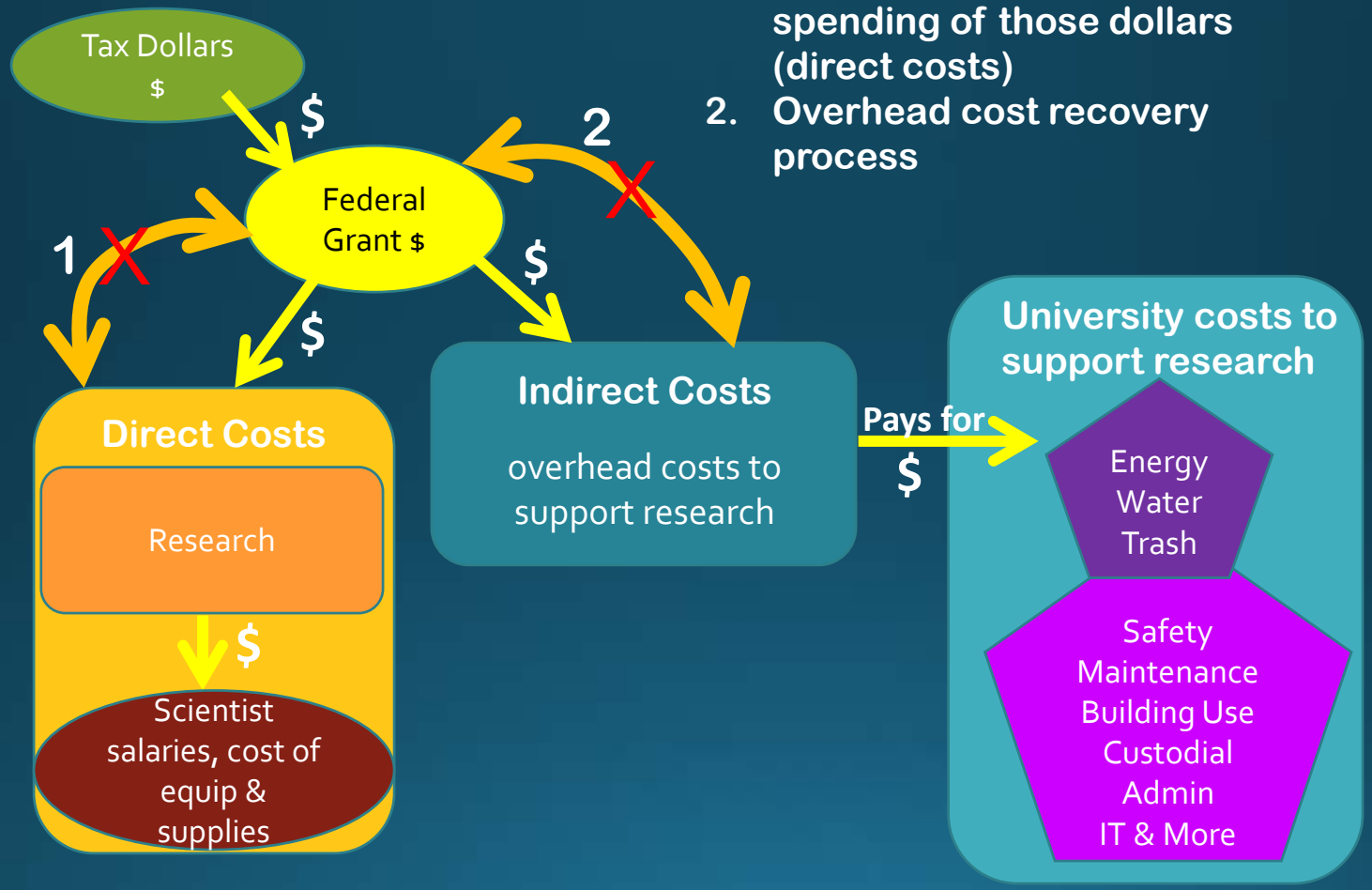
The more space, the greater the overhead costs to support research




Costly to the federal government and universities

# Missing Efficiency Connections in Federal Funding of Research at Universities

1. Federal granting process & spending of those dollars (direct costs)
2. Overhead cost recovery process



# Various names for overhead costs

Facilities & Administrative (F&A) costs = Indirect Costs (IDC) = Indirect Cost Recovery (ICR)

The slides that follow describe this process for universities that receive more than $10 million in federal funding for direct costs. Below $10 million there is a simplified process.

# How is an overhead rate calculated & applied?

## How is the Facilities & Administrative (F&A) rate calculated?

$$\text{F\&A Rate} = \frac{\text{F\&A expenses supporting research}}{\text{modified total direct costs}} \times 100$$

## How is the rate applied?

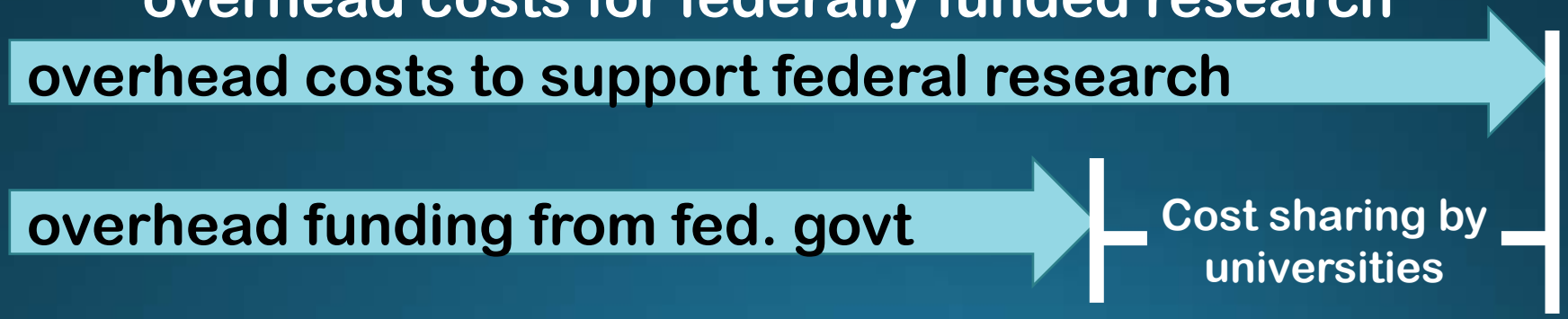
- Example rate = 54%
- Example grant of $1,000,000
- Ideally, university could expect to receive $540,000 for overhead costs (this is in addition to the $1,000,000 the scientist has been awarded)
- But effective rate is lower since there are items that cannot be included (a typical effective rate is around 30%)

# Federal funding to universities for overhead costs is significant

*Nature 19 Nov. 2014* "Indirect costs: Keeping the lights on" http://www.nature.com/news/indirect-costs-keeping-the-lights-on-1.16376:

- 2013: $5.7 billion of NIH's $22.5 billion went for indirect costs

**but universities report insufficient federal funding to cover overhead costs for federally funded research**

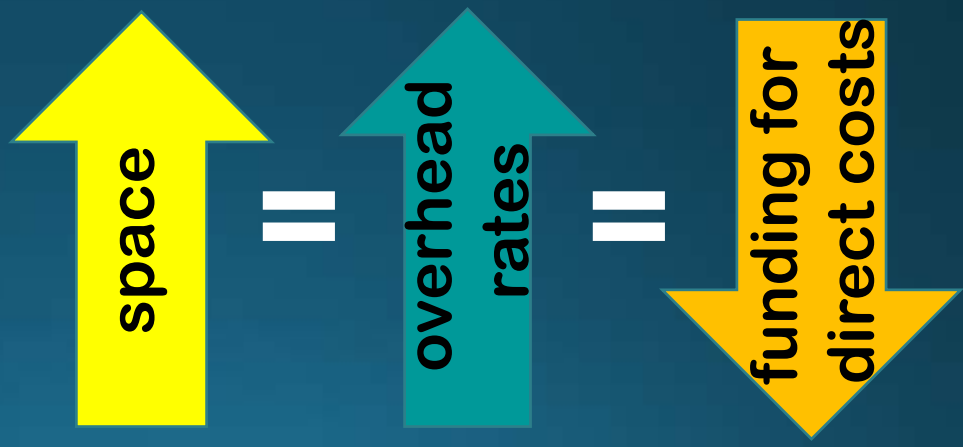


# Space is an important factor in the overhead rate calculation (F&A rate) for research universities

Two general components of overhead costs:

1. Administrative costs (capped at 26% since 1991)
2. Facilities costs (not capped)
   - Building and equipment depreciation
   - Operations & maintenance of facilities
   - Other (library, interest on facility debt)

Facilities costs calculation greatly depends on space assigned to federal funded research:



# Federal process for funding overhead costs misses opportunities to ask for efficiency

## Lacks requests for:

- Efficient use of lab space assigned for federal research
- Energy efficiency and water efficiency in buildings included in overhead rate calculation

## Universities could:

- Add actions for efficiency to their overhead cost recovery rate (F&A) application, setting the precedence and being seen as a leader before federal government starts asking for the information.

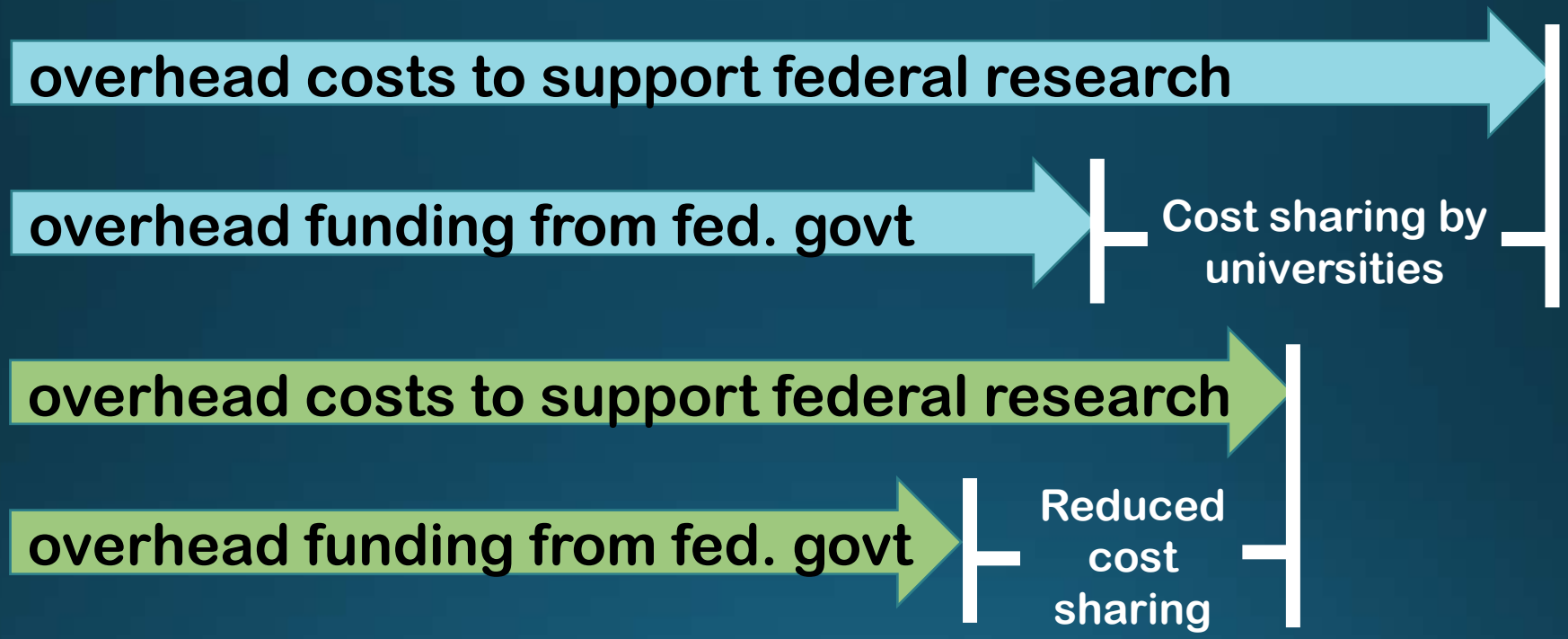
# Need for raised awareness with scientists on how overhead rate is calculated

Science community has concerns about overhead (F&A) rate, but are not aware of how is it calculated and how their decisions affect it.

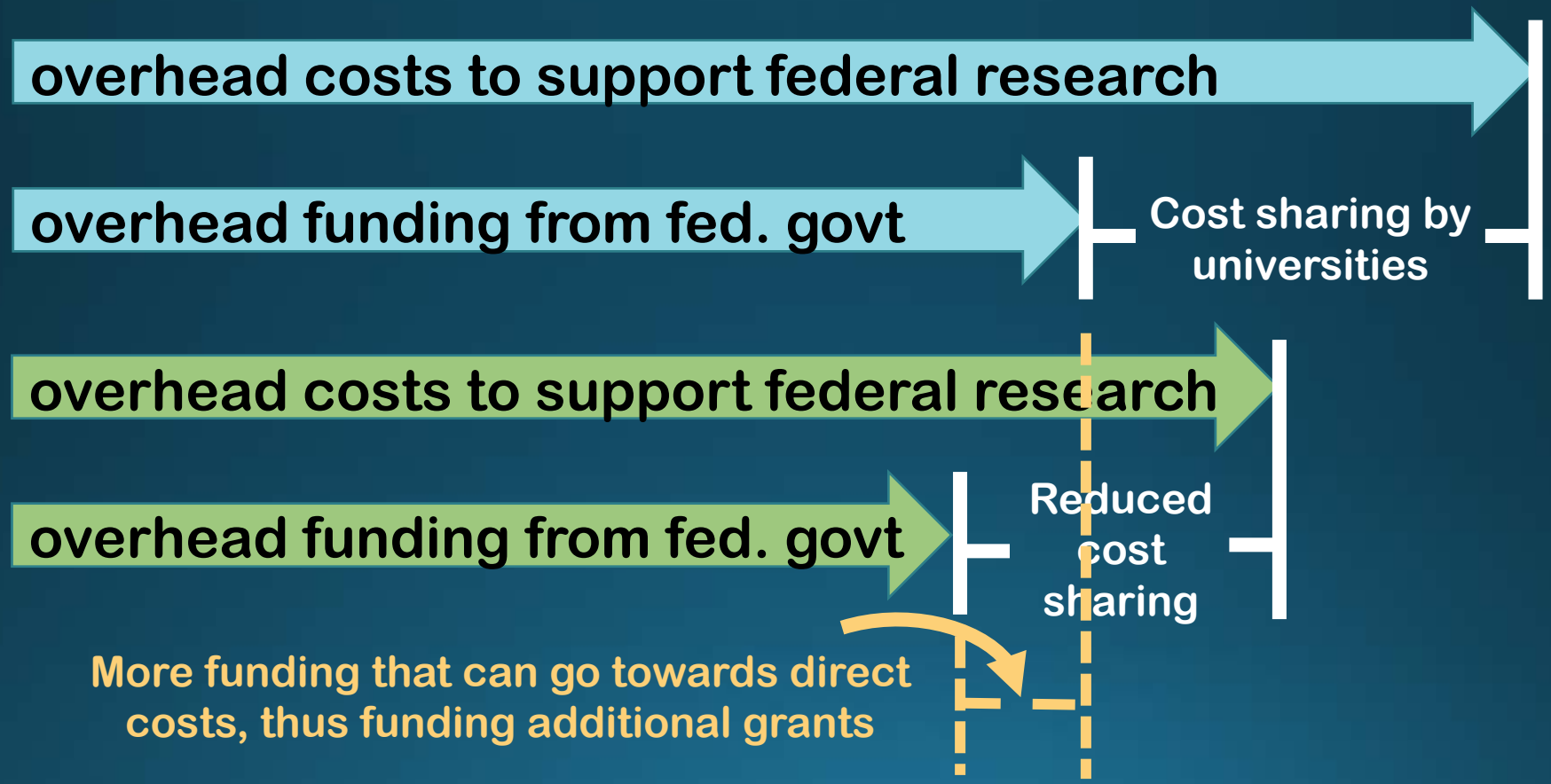
Items that lead to a higher rates:

- Inefficient space connected with federal funding
- Construction of new research buildings
  - Interest on facility debt
  - Building depreciation
- More energy consumption than necessary

## What if scientists/univ. were more efficient, lessening overhead costs… could this reduce cost sharing burden?



## What if scientists/univ. were more efficient, lessening overhead costs… could it provide more $ for direct costs?



**Inefficiencies mean a greater environmental footprint for research than necessary**

# Inefficiencies mean that scientists have to spend more and more time writing grants

Less time doing research

+

Focusing on projects that are likely to get funding

# BETR Grants would improve both of these issues

## BETR Grants: Are there connections to federal funding that can greatly improve?:

Equipment Sharing

Space Efficiency

Selection of Energy/Water/Material Efficient Processes & Equipment

IT resource sharing

# BETR Grants is a win-win. It is in everyone's best interest.

1. Scientist → more money for research & easier access to equipment resources
2. Tax-payer & government → better use of federal dollars
3. University → benefit sustainability commitments & financial savings since federal overhead $$ do not cover all costs
4. Environment → reduced research footprint

# What can you do at your university or federal agency?

# Federal Agencies Could:

1. Raise awareness about CFRs

2. Encourage efficiency in connection with federal dollars
   - Selection of energy/water efficient processes/equipment
   - Sharing of equipment resources
   - Efficient space utilization

3. Incorporate voluntary sections in grant and F&A rate applications where actions for efficiency could be included

# Universities Could:

1. Form a partnership of campus stakeholders (scientists, research administrators, EHS, Facilities, campus leadership) to :
   - Create a Green Labs Program on campus
   - Enhance shared equipment and core facilities for more than just the very expensive equipment
   - Develop efforts leading to more efficient use of existing research space rather than expanding campus footprints with new construction
   - Incentivize energy/water efficiency
   - Promote BETR Grants

# Visit new BETR Grants website: www.i2sl.org/betrgrants

- Website is resource on how to include efficiency in grant proposals
- UC Santa Barbara - already taking action
- NSF "Broader Impacts" section could include how efficiency in labs contributes to broader campus sustainability goals
- Feedback received – it's a good idea!
- Early adopters will be seen as leaders

# QUESTIONS?

## Contact Information:

**Kathy Ramirez-Aguilar, Ph.D.**
**Chair, I²SL University Alliance Group**
**Green Labs Program Manager, CU-Boulder**
**kramirez@colorado.edu**

# Thank You

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