

# EPA Technical Workshop on Energy Efficient Servers and Datacenters

## Study Overview

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Santa Clara Convention Center

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# Study team



- Responsible for leading technical and research tasks in support of the study
- **LBNL**
  - Eric Masanet (Task coordinator)
  - Rich Brown
  - Bruce Nordman
  - Dale Sartor
- **Alliance to Save Energy**
  - Joe Loper
  - Jeff Harris
- **Stanford**
  - Jon Koomey
- **U.S. EPA**
  - Kim Crossman
  - Bruce Hedman (EEA)
- **UC Berkeley**
  - Arman Shehabi
  - John Stanley

- 1) Summary of work plan and interpretations of study requirements
- 2) Vision for the final report to Congress
- 3) Purpose and goals of working group sessions

# Background



- **Purpose of Study:** To inform the U.S. Congress of the impacts of energy use by U.S. servers and data centers and the opportunities for Federal policies and research to reduce this energy use through improved energy efficiency
- **Deadline for submission to Congress:** June 7<sup>th</sup>, 2007
- To meet these goals in the allotted time:
  - The study must rely on currently available information
  - The work plan must be focused on the required tasks
  - The analyses must be focused on supporting the final policy recommendations
  - The analyses must be at a high level
  - The study will make recommendations for future work

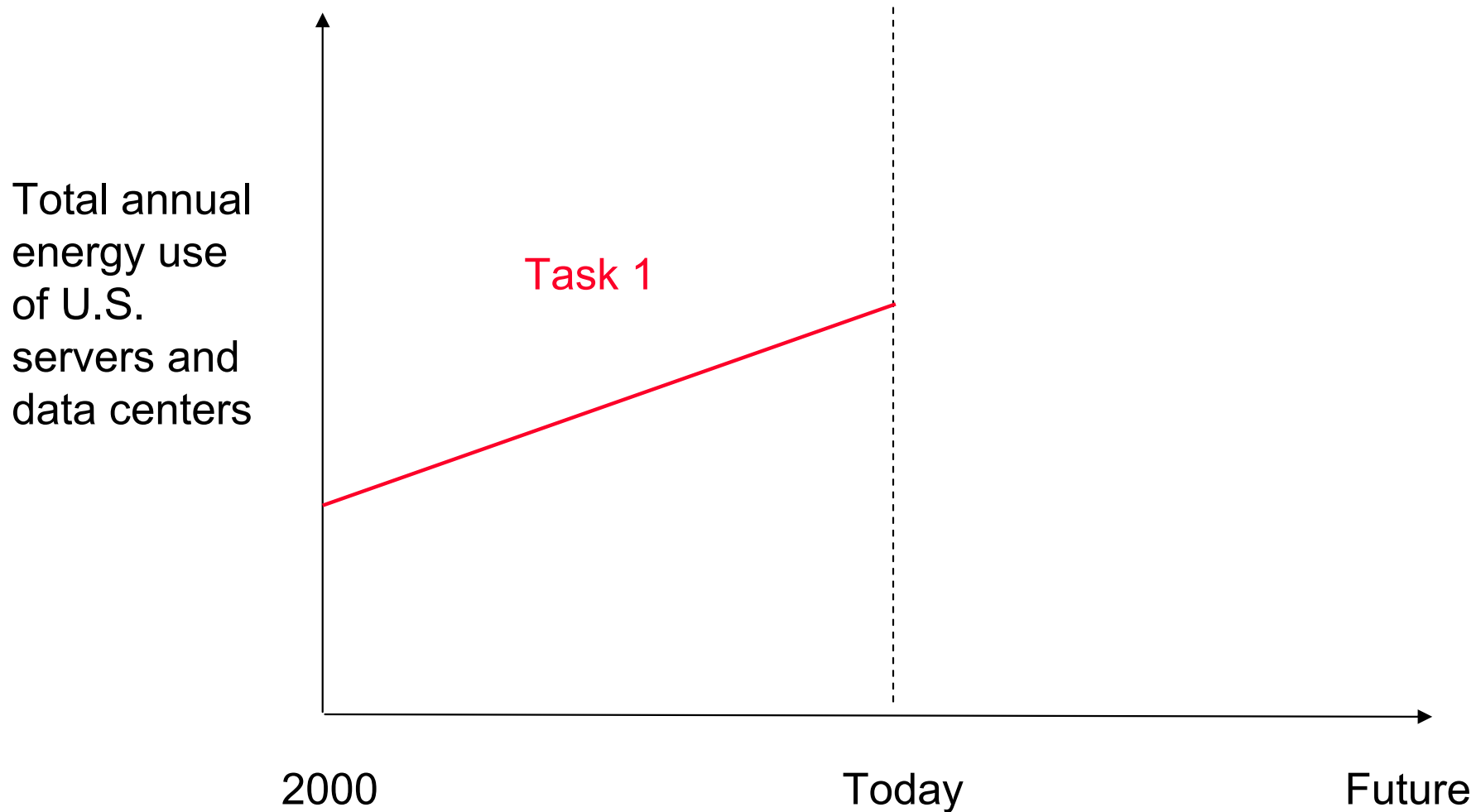
# Task 1



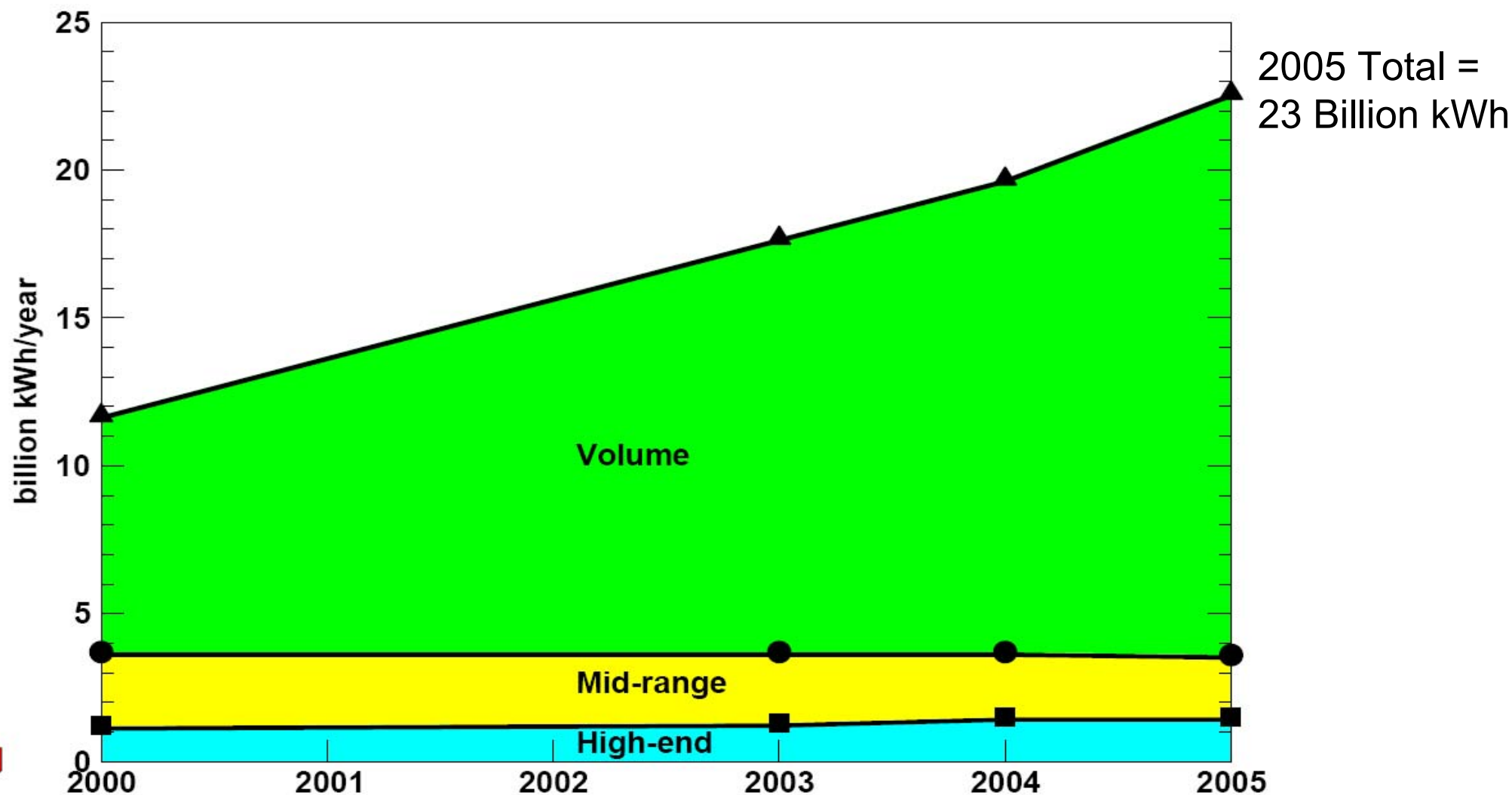
## Approach:

- Derive estimates of growth trends utilizing existing data sources
- Utilize method employed in Jon Koomey study for estimates of nationwide server energy use
- Derive estimates for the energy use of storage devices
- Derive estimates for the energy use of network equipment
- Determine factors for extrapolating these estimate to data centers
- Determine split of Federal vs. non-Federal

# The vision for Task 1



# Koomey study key results



2005 Total =  
23 Billion kWh

# Task 2

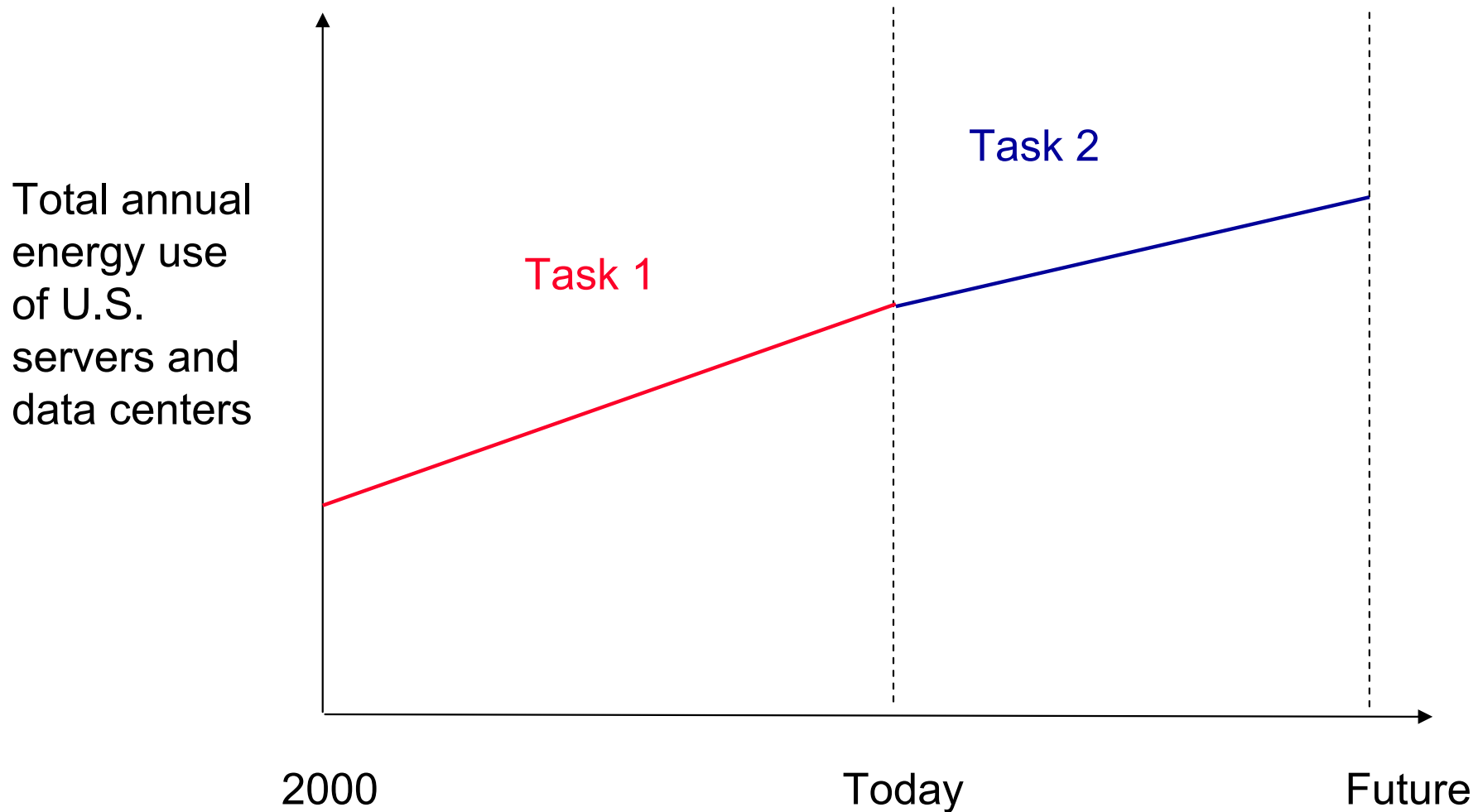


## Approach:

- Estimate trends in energy efficiency for servers and IT equipment
- Perform rough quantitative evaluation of base case (business as usual) energy use of servers and data centers over the next 5 years.
- Utilize representative equipment and data center configurations to estimate energy use. Technical inputs will be drawn from interviews with key industry staff and analysts.



# The vision for Task 2



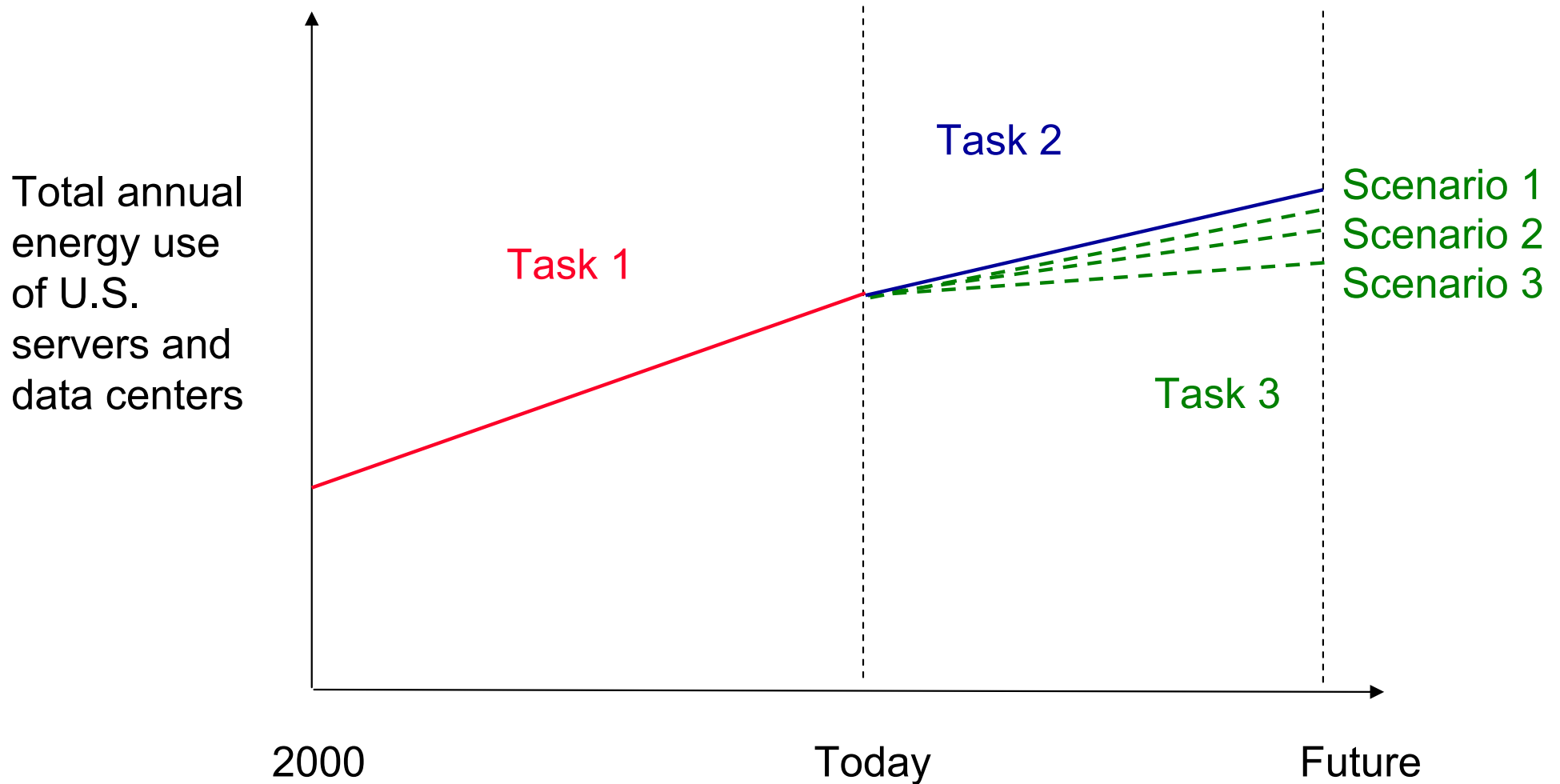
# Task 3



## Approach:

- Estimate potential energy savings compared to the base case identified in Task 2.
- Look at 2-3 plausible efficiency scenarios (minimal, moderate, maximum technology) to project savings if more efficient data centers and servers are deployed.
- Energy savings reported nationally and allocated to:
  - Federal and private sectors
  - IT equipment efficiency and infrastructure efficiency

# The vision for Task 3



# Task 4



## Approach:

- Translate energy savings from Task 3 into peak load savings, and estimate avoided generation capacity using integrated forecasting model (National Energy Modeling System).
- Qualitative discussion of transmission and distribution benefits from peak load savings. (Grid impacts are very time- and location-dependent)

# Task 5



## Approach:

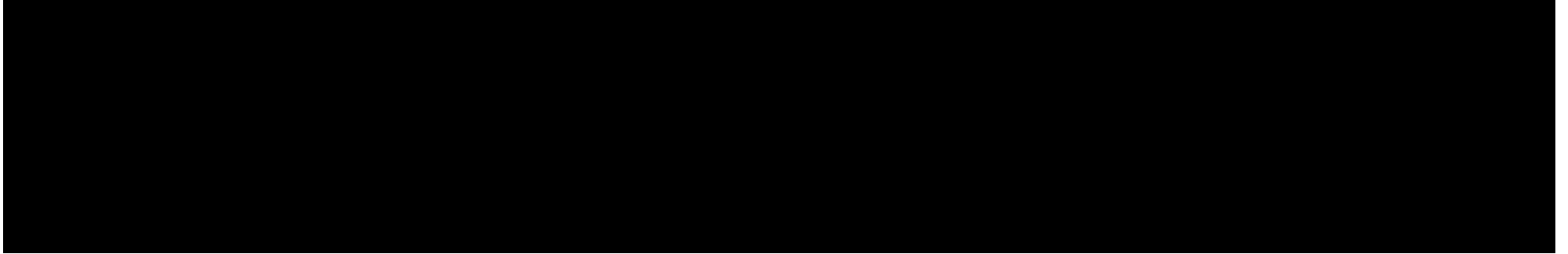
- Perform a qualitative analysis that considers additional negative or positive impacts of identified energy efficiency strategies, based on interviews with key industry staff and analysts.

# Task 6



## **Approach:**

- Task lead is U.S. EPA Combined Heat and Power Partnership
- Perform a qualitative analysis of distributed generation and combined heat and power applied to data centers.



## **Approach:**

- Perform a qualitative review of the range of incentives and policies based on existing data sources.
- Focus on Federal policies (such as tax credits and ENERGY STAR), but include a broad overview of non-Federal incentives and voluntary policies (e.g., a few utility programs, such as PG&E's incentive program).



## **Approach:**

- Provide a qualitative description of recommended Federal incentives and voluntary programs coordinated at the Federal level (e.g. ENERGY STAR).
- Secondary recommendations to address non-Federal incentives and programs.
- Include key RD&D needs that are best addressed by the Federal government



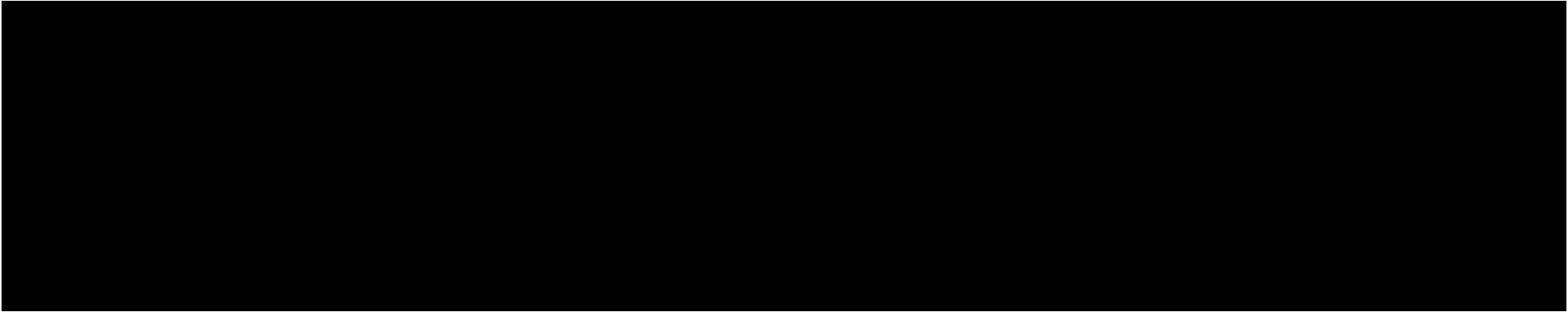
# Vision for Task 8 recommendations



## Preliminary categories for incentives and voluntary programs:

- **Financial incentives**
  - e.g., utility rebates, Federal tax deductions/credits
- **Education and training**
  - e.g., datacenter operator certification
- **Industry voluntary standards**
  - e.g., energy performance metrics, test procedures, IEEE standards
- **Endorsement labeling**
  - e.g., ENERGY STAR
- **Government procurement**
  - e.g., EPA Act 2005 purchasing requirements
- **Government operation**
  - e.g., mandatory benchmarking of Federal datacenters, pilot program implementation in Federal facilities
- **Research, development, and demonstrations (RD&D)**
- **Information**
  - Technical guidance, awareness campaigns, publication of benchmark data, etc.

# Task 9



## **Approach:**

- Hold one stakeholder workshop in Silicon Valley including breakout working group meetings, with broad representation from industry, utilities, government, and energy efficiency advocacy groups
- Convene teleconference to present final study conclusions to interested stakeholders
- Post results (including drafts) on web site for comment.

# Vision for the final report



- A summary report will be issued for each study task
- A 10-15 page executive summary will be created based on the key findings and policy recommendations identified in the task reports
- The final report will consist of:
  - The executive summary
  - The task reports included as technical appendices

# Study timeline



Project Phase	Date(s)	Task/Milestone
<b>1) Outreach</b>	Today February 16	Technical workshop with key stakeholders at the Santa Clara Convention Center.
<b>2) Draft Report Development</b>	February 19 – March 30	Information gathering, assessment, and drafting of task reports
	April 2	Draft task reports completed and posted on project website for review
<b>3) Final Report Development</b>	April 2-13	Stakeholder comment period for task reports
	April 16 - 30	Revision of task reports where feasible, drafting of executive summary
	Around May 1	Teleconference to present draft report (finalized task reports, draft executive summary) to stakeholders and to solicit comments on executive summary
	May 2-11	Final revisions
<b>4) Agency Review</b>	May 11	Final task reports and executive summary completed and submitted to EPA
<b>5) Submission to Congress</b>	June 7	Report submitted by EPA to Congress

Questions on study scope, approach, and timeline?

# Working group overview



## Purpose:

- Presentation of relevant study objectives and proposed work plan
- Solicitation of working group input on proposed work plan
- Discussion of preliminary data assumptions and identified information gaps
- Definition of process and sources to address information gaps
  - Volunteers are requested to please fill out follow up forms
- Summary of key working group outcomes and next steps

## Organization:

- Facilitator: serves as neutral moderator to keep agenda moving
- Technical lead(s): leads and technical discussions
- Note taker: records key working group decisions and outcomes

## Ground rules:

- No selling, stay at high level, allow everyone to participate
- We assume that all data received are public and citable

# Working group topics



## **Working Group 1: IT Equipment**

**Facilitator:** Klaus Lange, HP/SPEC

**Technical leads:** Eric Masanet, Bruce Nordman, LBNL

**Note taker:** Michael Armbrust, UC Berkeley

## **Working Group 2: Power and Cooling Infrastructure**

**Facilitator:** Bill Tschudi, LBNL

**Technical leads:** Dale Sartor, LBNL

**Note taker:** Arman Shehabi, UC Berkeley

## **Working Group 3: Integrated Design, Operation, and Management Issues**

**Facilitator:** John Hengeveld, Intel

**Technical leads:** Jon Koomey, Stanford

**Note taker:** Peter Bodik, UC Berkeley

## **Working Group 4: Incentives and Voluntary Programs**

**Facilitator:** Jay Taylor, Dell

**Technical leads:** Rich Brown, LBNL

**Note taker:** John Stanley, UC Berkeley

# Working group logistics



- 10:30**                      **Attendees Break into Working Group Sessions**
- 10:30 – 12:00**                      ***Morning Session*** – Each group will be presented with a task summary and work plan for discussion. Attendees begin outlining information gaps.
- 12:00**                      ***Working Lunch*** – Attendees pick up lunch in the main discussion room and return to working groups to continue focused discussions.
- 12:15 – 1:45**                      ***Afternoon Session*** – Each group will define process and available resources to address information gaps in the study, to be reported back to the larger group.
- 1:45**                      **Break**
- 2:00**                      **Plenary Summary of Working Group Sessions**
- 3:00**                      **Plenary Discussion of Results & Information Sharing Between Groups**