ANALYSIS OF CANCER RISKS IN POPULATIONS NEAR NUCLEAR FACILITIES IN THE UNITED STATES

Presentation to the French Nuclear Safety Authority
June 9, 2015
Paris

Ourania Kosti
Senior Program Officer
Nuclear and Radiation Studies Board

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

NATIONAL ACADEMIES ORGANIZATION

The National Academies

- National Academy of Sciences (NAS)
- National Academy of Engineering (NAE)
- Institute of Medicine (IOM)
- National Research Council (NRC)

Congressionally chartered (1863)

Private & nonprofit

"Advisors to the Nation on Science, Engineering, and Medicine"

STUDY REQUEST

U.S. Nuclear Regulatory Commission (USNRC) approached the Academies to update the 1990 National Cancer Institute study which:

- Compared rates of cancer deaths in counties with a nuclear facility to those without
- Had no data on radiation exposures
- Included only facilities that were operational as of 1982

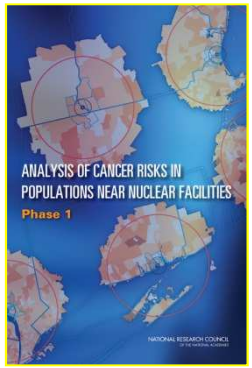
The Academies agreed to carry out a two-phase study

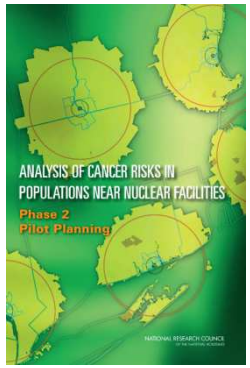
- Phase 1: Scoping study to identify scientifically sound approaches for carrying out the cancer risk assessment
- Phase 2: Cancer risk assessment informed by Phase 1 results

STUDY PHASING

	Phase 1	Phase 2		
		Pilot Study (7 facilities)		Nationwide Study
Steps		Planning	Execution	To be determined (TBD)
Purpose	Identify study approaches	Plan for pilot	Assess feasibility of nationwide study	Estimate risks
Study Period	Sept. 2010-May 2012	Sept. 2013-Dec. 2014	TBD	TBD
Duration	20 months	16 months	~30 months	>>30 months

yes





PHASE 1 COMMITTEE MEMBERSHIP

John E. Burris, Chair, Burroughs Wellcome Fund

John C. Bailar, III, University of Chicago (retired)

Harold L. Beck, Environmental Measurements Laboratory (retired)

Andre Bouville, National Cancer Institute (retired)

Phaedra S. Corso, University of Georgia

Patricia J. Culligan, Columbia University

Paul M. DeLuca, Jr., University of Wisconsin

Raymond A. Guilmette, Lovelace Respiratory Research Institute

George M. Hornberger, Vanderbilt Institute for Energy and Environment

Margaret Karagas, Dartmouth University

Roger E. Kasperson, Clark University (retired)

James E. Klaunig, Indiana University

Timothy Mousseau, University of South Carolina

Sharon B. Murphy, University of Texas Health Science Center (retired)

Roy E. Shore, Radiation Effects Research Foundation

Daniel O. Stram, University of Southern California

Margot Tirmarche, Institute of Radiation Protection and Nuclear Safety

Lance Waller, Emory University

Gayle E. Woloschak, Northwestern University

Jeffrey J. Wong, California Environmental Protection Agency

PHASE 2 PILOT PLANNING COMMITTEE MEMBERSHIP

Jonathan M. Samet (IOM), University of Southern California

Harold L. Beck, Independent Consultant

Steven M. Becker, Old Dominion University

Andre Bouville, National Cancer Institute (retired)

Jean D. Brender, Texas A&M Health Science Center

Christie R. Eheman, Centers for Disease Control and Prevention

R. William Field, University of Iowa

Daniel O. Stram, University of Southern California (USC)

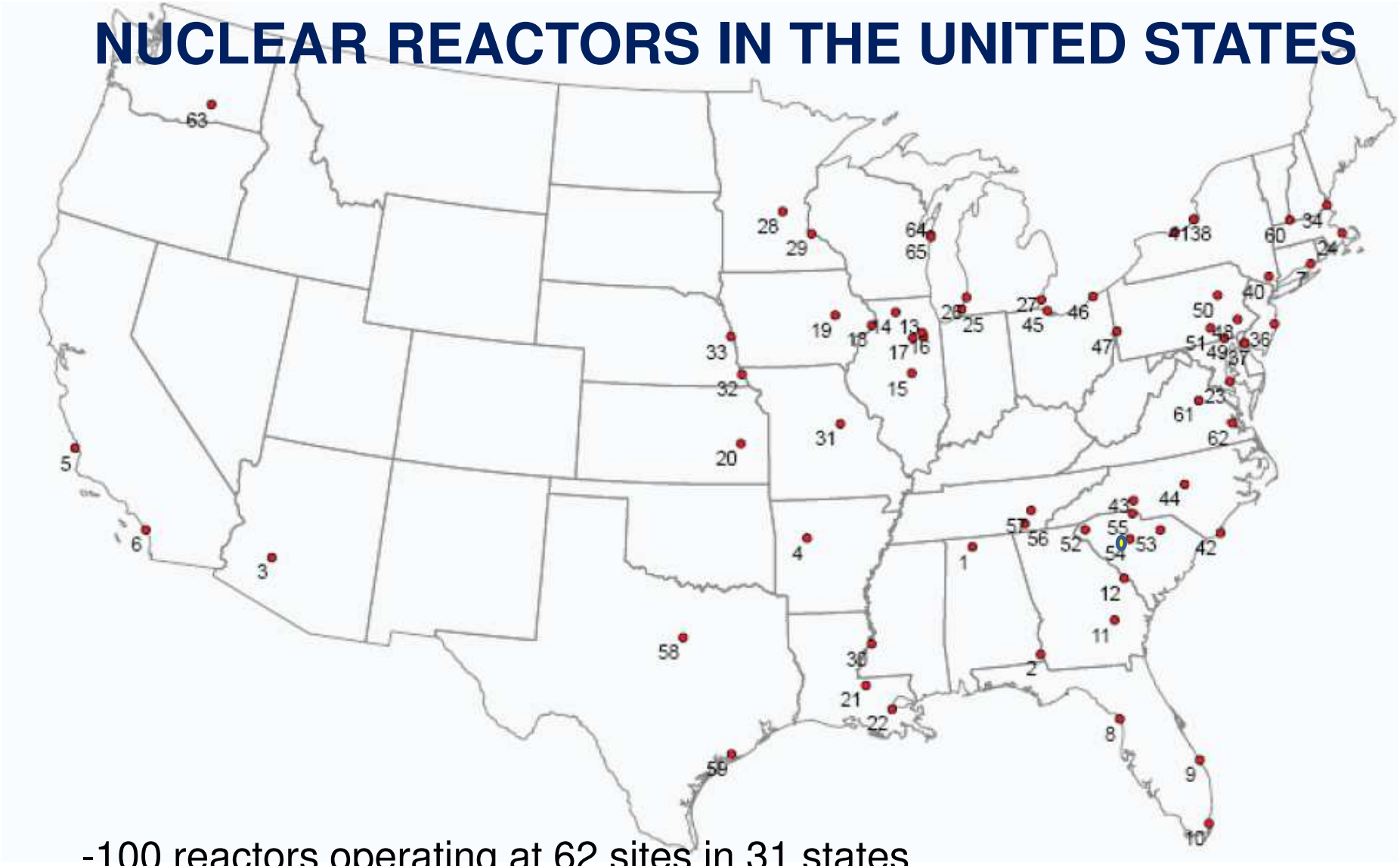
Margot Tirmarche, Nuclear Safety Authority of France

Jonathan C. Wakefield, University of Washington

STUDY SPONSOR

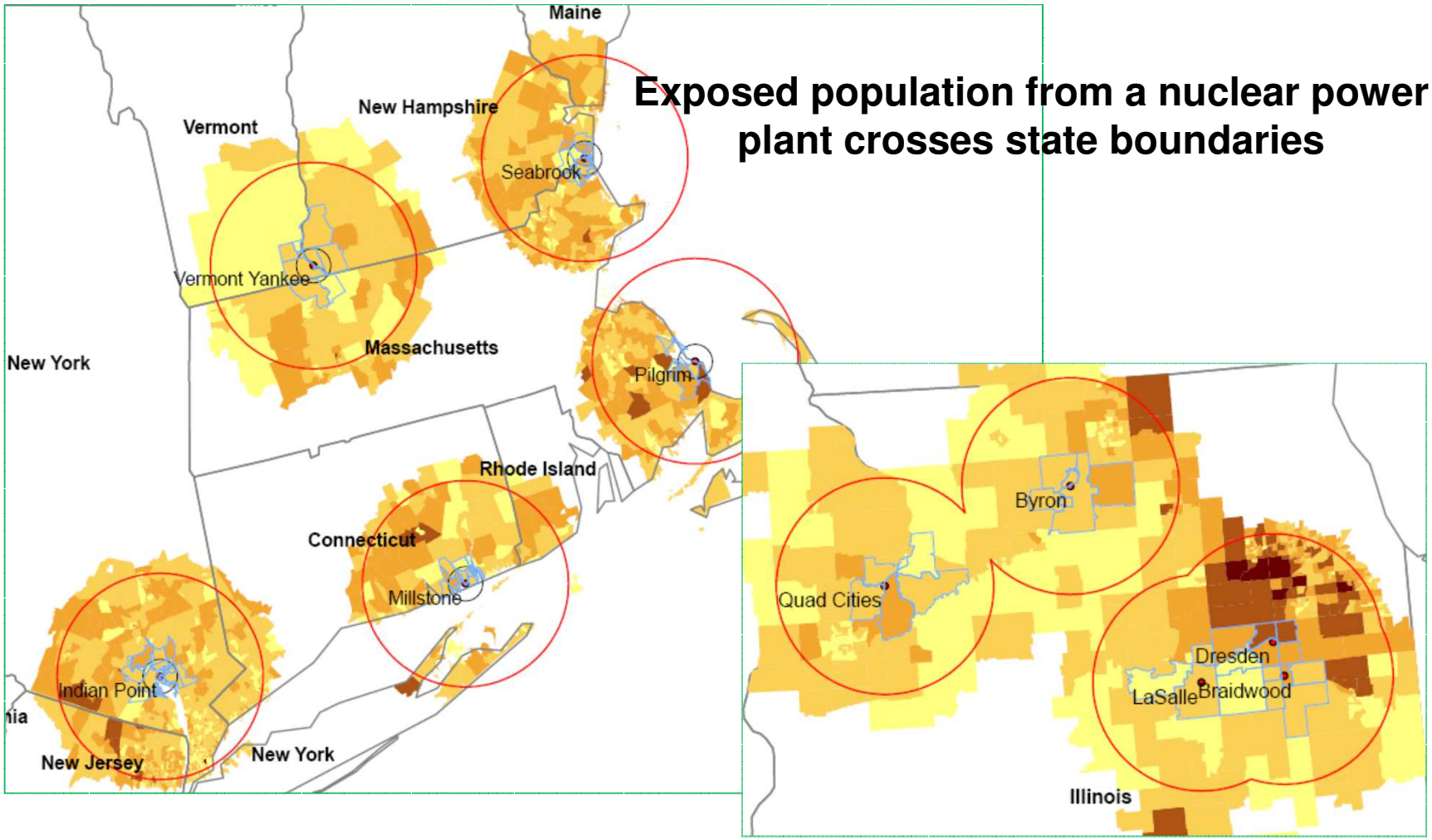
- Study requested by the U.S. Nuclear Regulatory Commission (USNRC)
  - A “small” independent federal agency
    - ~ $1 billion annual budget (90% through fees billed to licensees)
    - ~4,000 full-time equivalent staff
  - Created by the Energy Reorganization Act of 1974
  - Responsible for regulating civilian activities related to the production and use of nuclear materials, including nuclear power plants and fuel cycle facilities

NUCLEAR REACTORS IN THE UNITED STATES



-100 reactors operating at 62 sites in 31 states

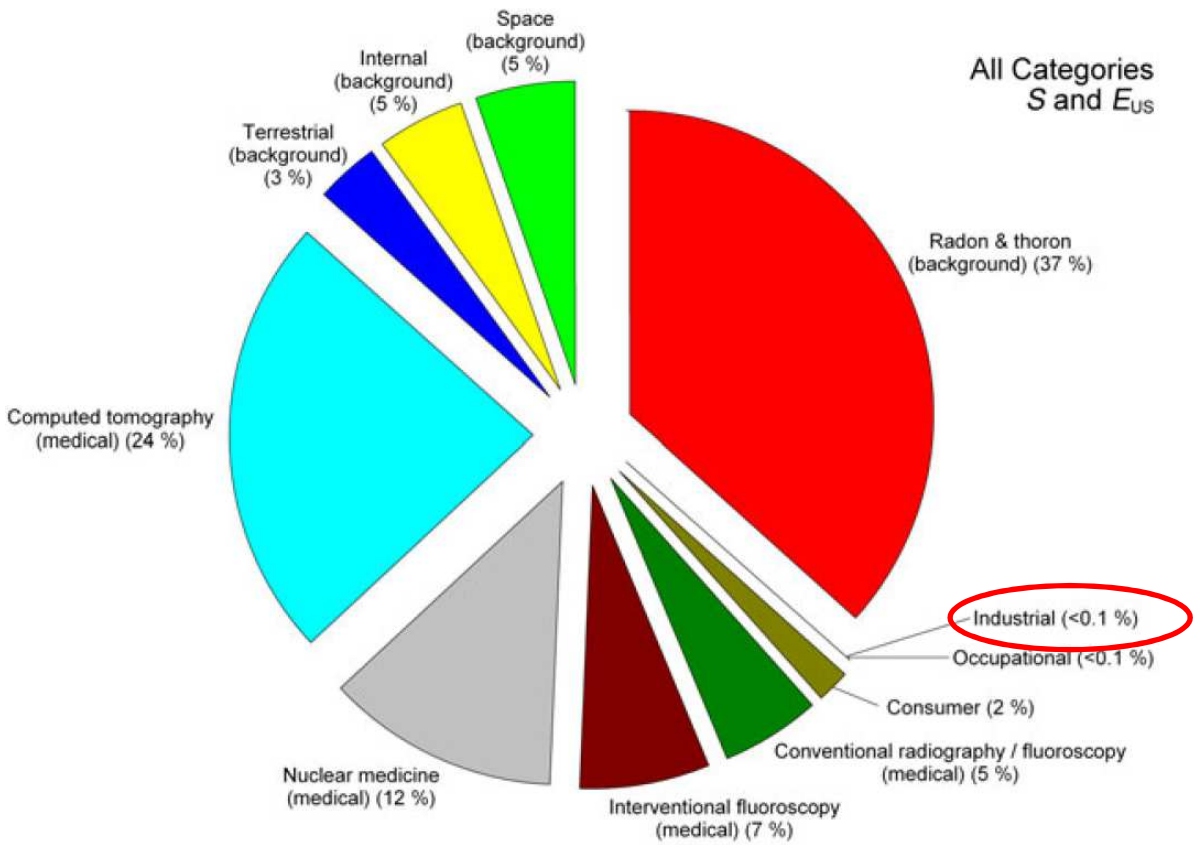
-Approximately 1 million people live within 8 km of operating nuclear power plants in 2010; over 45 million people live within 50 km.

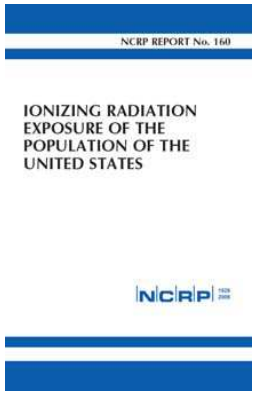


Exposed population from a nuclear power plant crosses state boundaries

Population overlap among nuclear power plants

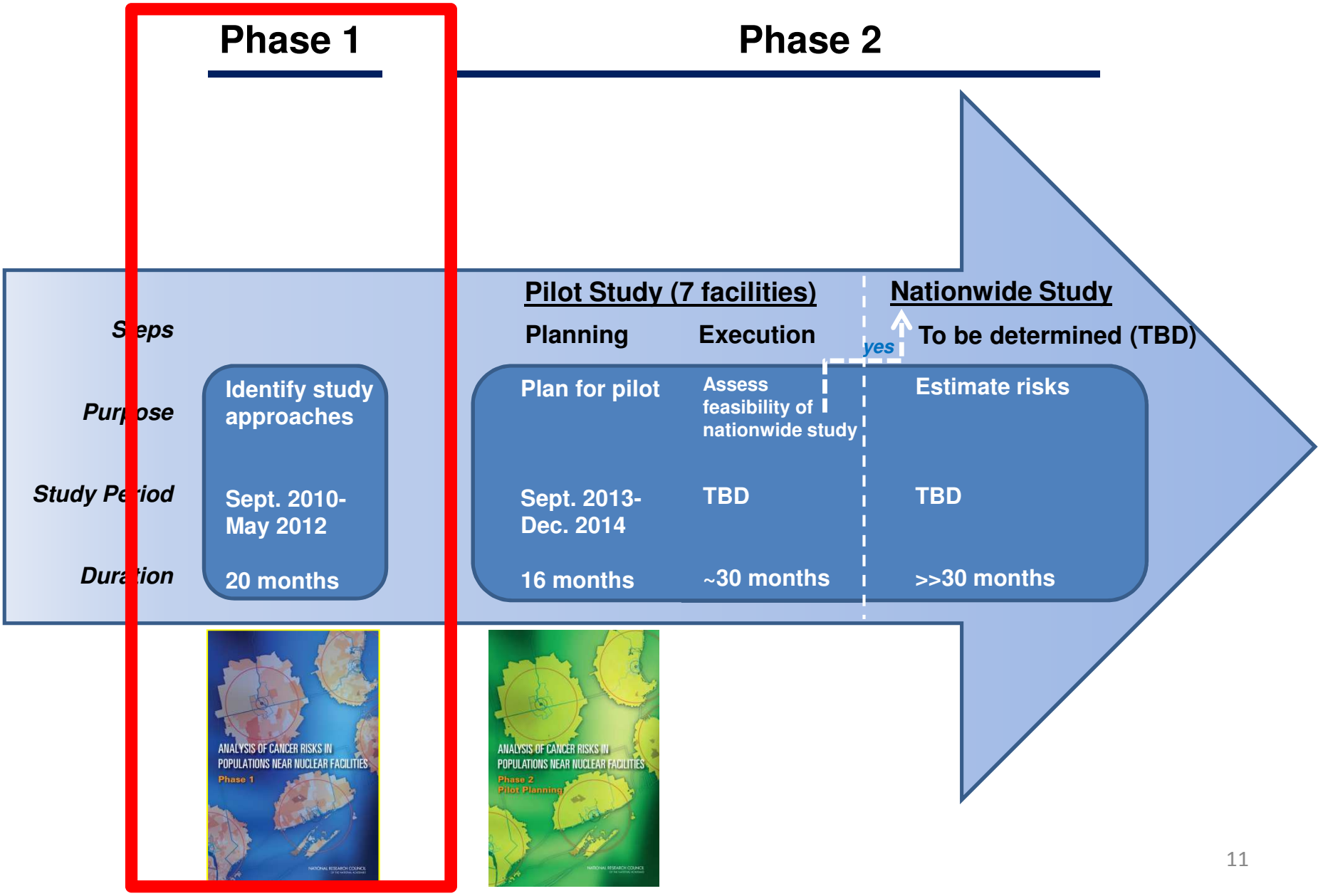
RADIATION EXPOSURE *OF THE U.S. POPULATION*





- On average, a person living in the United States receives 6.2 mSv total effective dose annually
- On average, 3 mSV comes from background radiation and 3 mSv from medical diagnostic procedures (1 CT scan is on average 8 mSv)
- The U.S. Environmental Protection Agency estimates exposure of populations near nuclear facilities <0.01 mSv

STUDY PHASING: Phase 1



KEY MESSAGES FROM PHASE 1

- Several challenges for carrying out the epidemiologic studies.
- Several approaches possible.
- Effluent releases suitable for dosimetry.
- Two study designs recommended.
- **Feasibility** pilot study needed.
- Stakeholder engagement important.

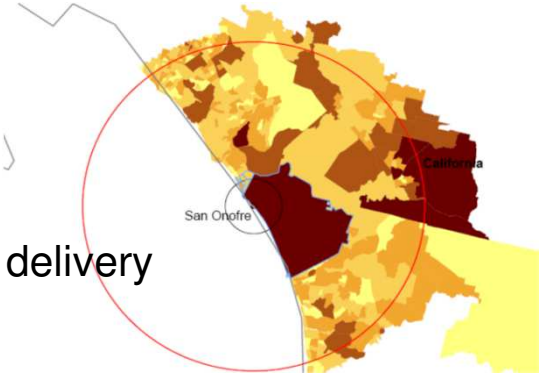
ABOUT THE PILOT STUDY DESIGNS

1. A *population-level,* or *ecologic,* study of cancer incidence and mortality in populations living in census tracts within ~50 km (30 miles) of the nuclear facilities.

- All cancer types
- All ages
- All years of operation (as early as 1957)
- Exposure based on geographic centroid of census tract where diagnosed or died

2. A *linkage-based case-control* study of children younger than 15 years of age born within ~50 km (30 miles) of the nuclear facilities.

- Pediatric cancers
- In utero – 15 years old
- About 1995 - today
- Exposure based on address where the mother lived at time of delivery



ABOUT THE PILOT SITES

Dresden, Illinois
Millstone, Connecticut
Oyster Creek, New Jersey
Haddam Neck , Connecticut
Big Rock Point, Michigan
San Onofre, California
Nuclear Fuel Services, Tennessee

ABOUT THE PILOT: PROCEDURE

- NAS will contract with appropriate individuals/organizations to carry out the pilot.
- NAS and a NAS advisory committee will oversee the work.
- NAS and its contractors will make use of existing health information and data from the facilities.
  - -no interviews
  - -no new measurements

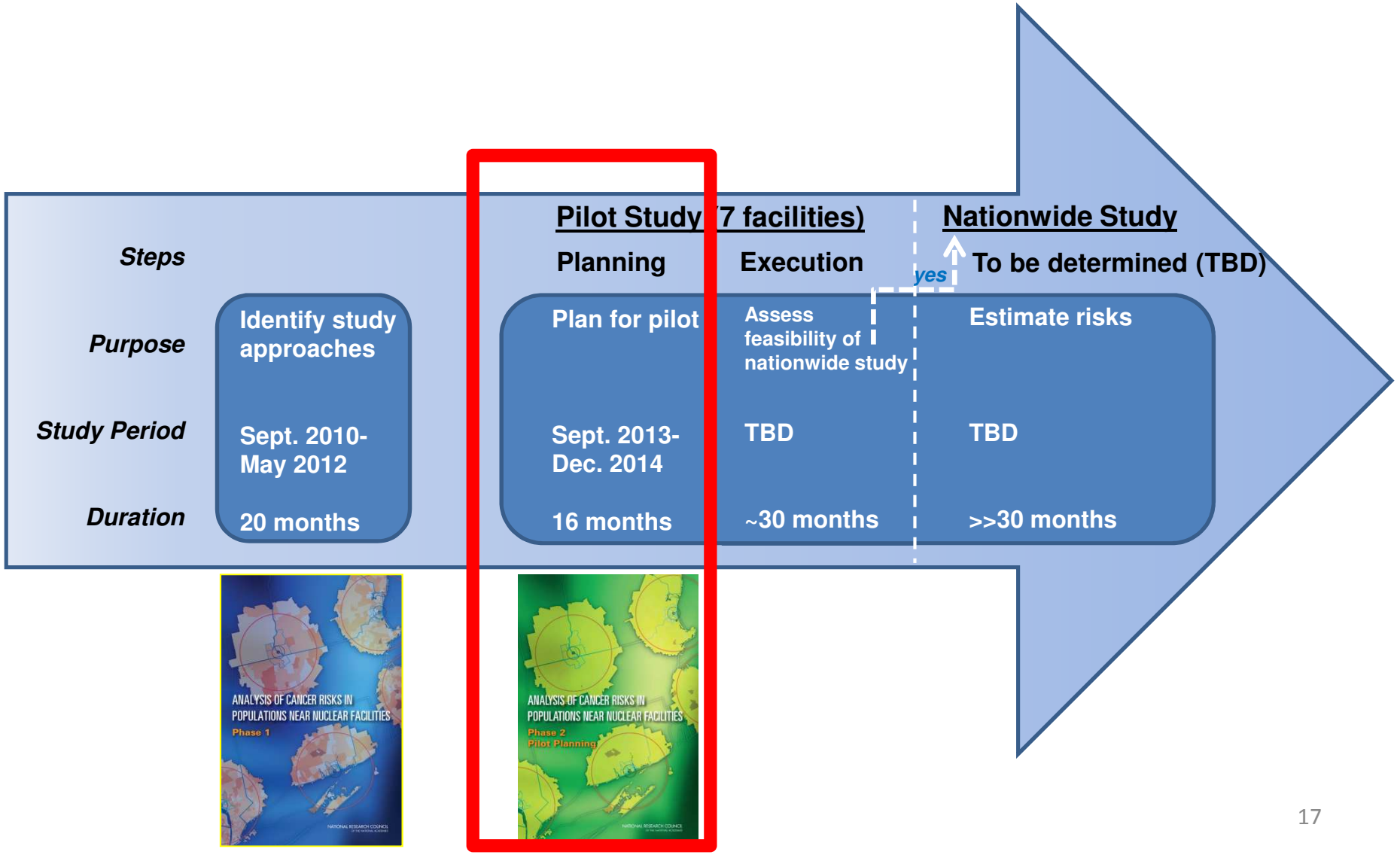
NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION
Office of Public Affairs Telephone: 301/415-8200
Washington, D.C. 20555-0001
E-mail: opa.resource@nrc.gov Site: www.nrc.gov
Blog: http://public-blog.nrc-gateway.gov

No. 12-117 October 23, 2012

NRC SPONSORING NATIONAL ACADEMY OF SCIENCES EFFORT TO CARRY OUT PILOT OF CANCER RISK STUDY

STUDY PHASING: Phase 2 Pilot Planning



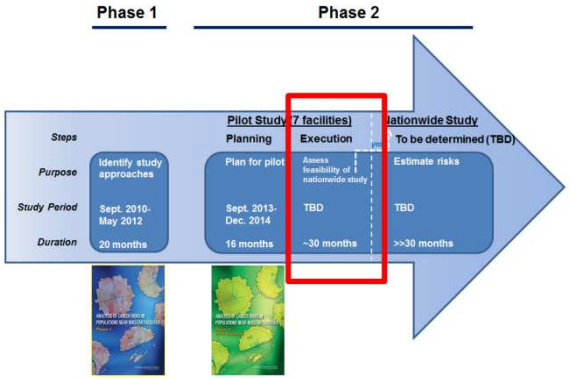
KEY MESSAGES FROM PHASE 2 PILOT PLANNING

- Need for transparency and ongoing communication with stakeholders.
- Need for comprehensive discussion of assumptions and uncertainties.
- Need for independent validation of dosimetry data.
- **Need caution with presenting risk estimates from the pilot study, if such a decision is made.**
- **Feasibility of ecologic study may be compromised.**
- The ecologic study should not have as detailed dosimetry as the case-control study.

THE COMMITTEE EMPHASIZES THAT:

It is possible that even if feasible, the nationwide study will have low statistical power to detect any excess cancer risks in populations near nuclear facilities, if they exist. In that case the recommendation to proceed with the nationwide study will require weighing the potential for false positive associations together with the value of communicating with the public that the best information available, even if limited, is being used to answer its questions about cancer risks near nuclear facilities.

CURRENT STATUS



- Per USNRC's request NAS submitted a proposal for the pilot execution step to USNRC in January 2015.
- The total estimated cost for the pilot execution is ~ $8 million in 39 months. The estimated cost was informed by cost estimates provided by:

➢ Responders to a request for information.
➢ State cancer registries and vital statistics offices.
➢ Geocoding experts.

- **USNRC's decision to fund the pilot is pending.**

QUESTIONS, COMMENTS, OR SUGGESTIONS?

Please contact:

Ourania (Rania) Kosti, study director
okosti@nas.edu

Phone: 202-334-3066
Website: http://dels.nas.edu/global/nrsb/CancerRisk

If you would like to be added on the study listserv and receive updates, send us an email at **crs@nas.edu**