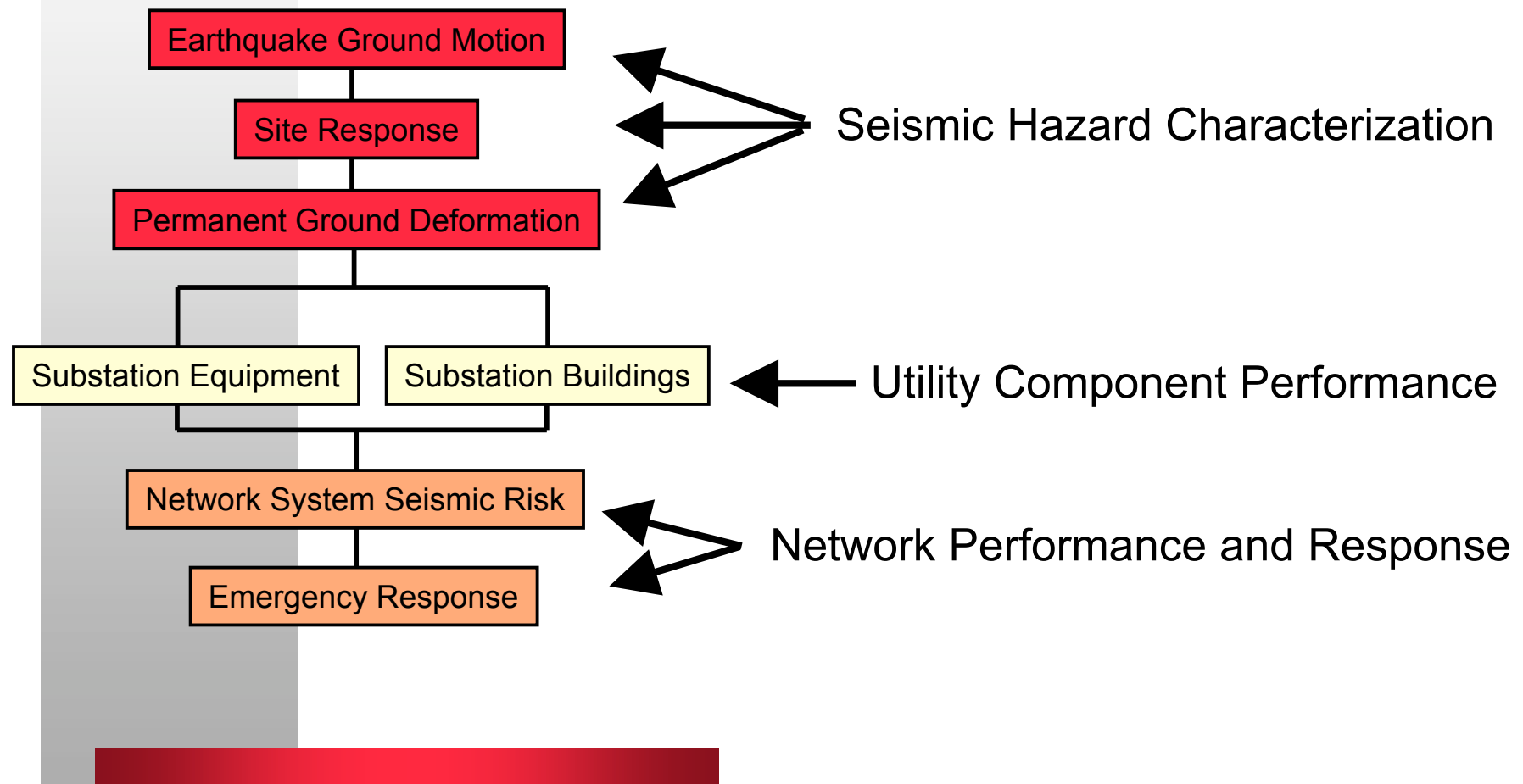


New Hazard Assessment Product: Next Generation of Attenuation Model (NGA)

Brian Chiou

Division of Research and Innovation
California Department of Transportation

PEER-Lifelines Program Research Plan



What is NGA Program?

- **NGA program is a series of closely coordinated research projects**
- **Topic areas 1 (earthquake ground motion) and 2 (site response)**

NGA Program Goals

- **To develop a new suite of predictive relationships of earthquake ground motion that**
 - **Merge views of experienced attenuation model developers with current research results from earth science and engineering communities**
 - **Satisfy needs of current and emerging practice in earthquake engineering**

Partners of NGA Program

- **Pacific Earthquake Engineering Research Center (PEER)**
- **Southern California Earthquake Center (SCEC)**
- **U.S. Geological Survey (USGS)**

NGA Program

- **Program coordinator: Maury Power**
- **People involved in the planning of NGA program**
 - **Cliff Roblee**
 - **Mike Riemer**
 - **Norm Abrahamson**
 - **Brian Chiou**

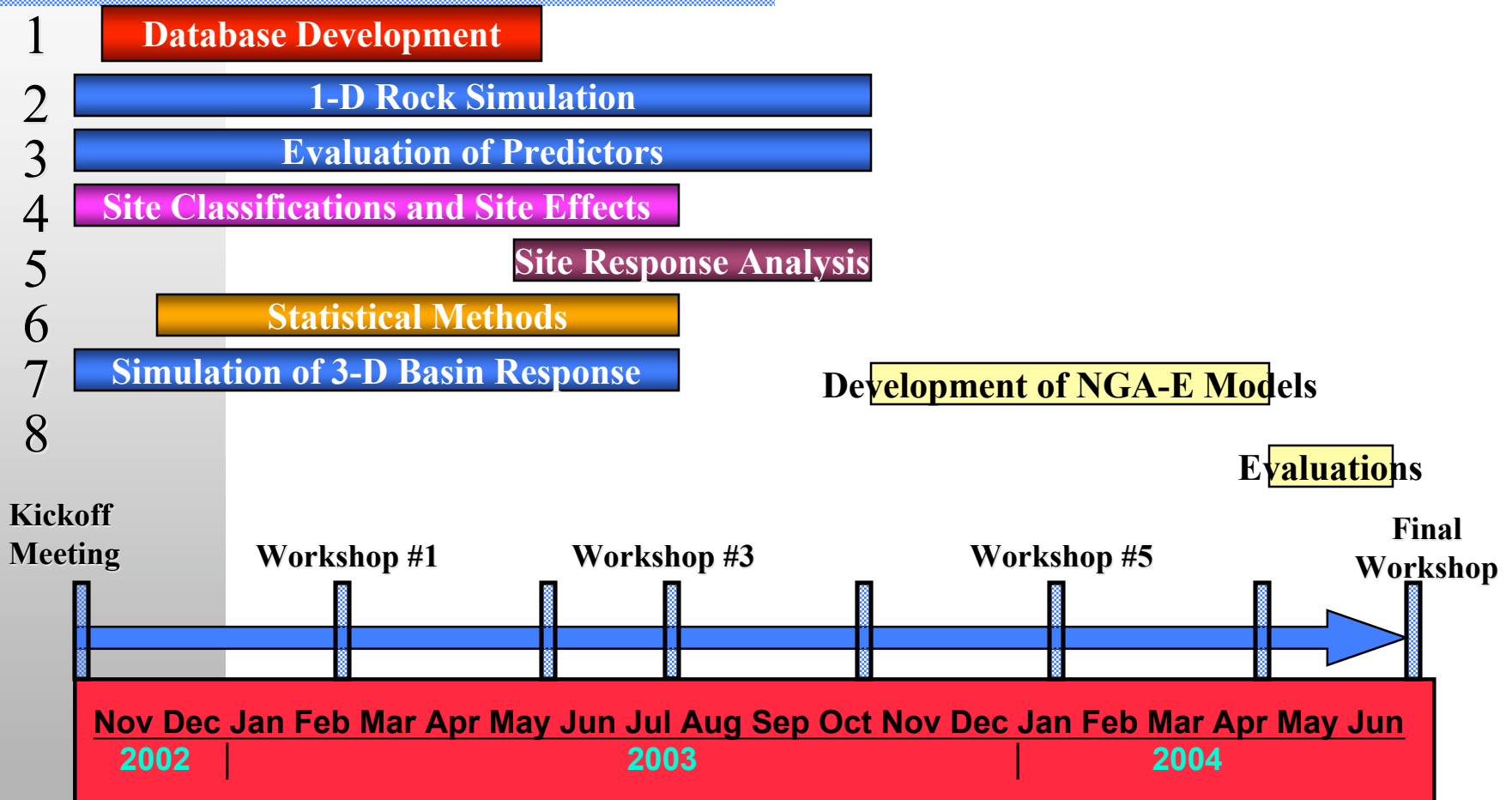
Final Product (Integration of Individual Research)

- **Attenuation models for spectral acceleration (5% Damped), PGA, PGV, and PGD**
 - **Horizontal components (fault normal, fault parallel, and average components)**
 - **Shallow crustal earthquakes in CA**
 - **Magnitude range: M5 - M8.5**
 - **Distance range: 0 - 200 km**
 - **Period range: 0.0 (PGA) - 10 seconds**

Final Product

- **Five developer teams**
 - **Abrahamson and Silva**
 - **Boore**
 - **Campbell and Bozorgnia**
 - **Idriss**
 - **Chiou and Youngs**

NGA Tasks and Proposed Schedule



Workshop Participants

- **Developers and researchers**
- **Stakeholders (Kickoff meeting and workshop #1)**
 - Caltrans
 - PG&E
 - Bay Area Rapid Transit (BART)
 - East Bay Municipal Utility District (EBMUD)
 - Southern California Edison
 - California Department of Water Resources
 - Division of Safety of Dams (DSOD)
 - Federal Energy Regulatory Commission (FERC)
 - U.S. Bureau of Reclamation

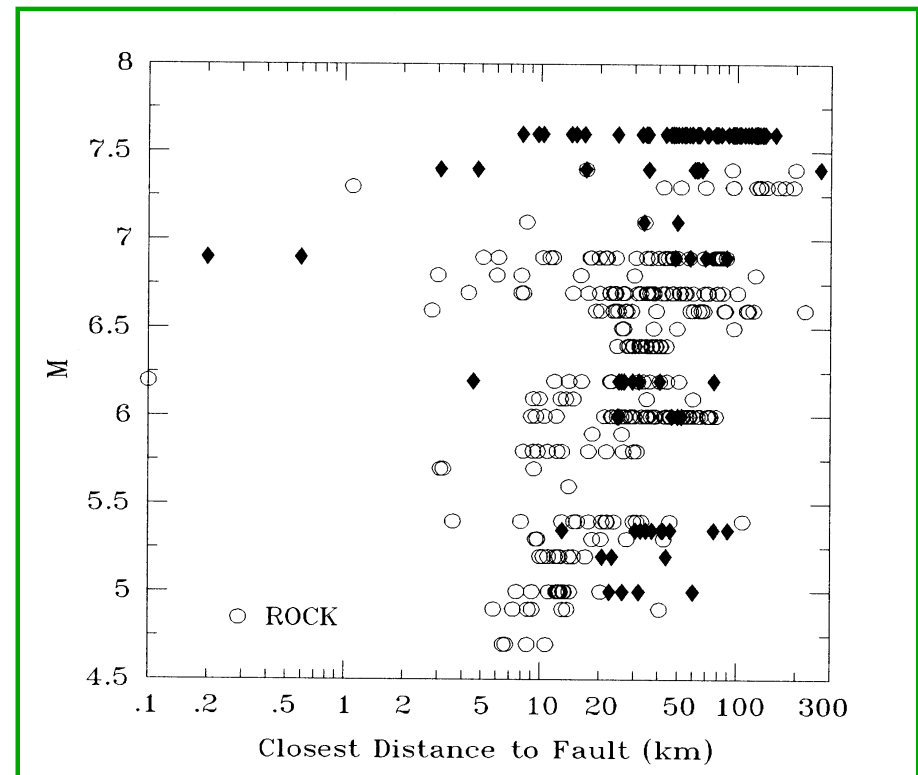
Database Development

- **Enhanced strong-motion data set**
- **Recent earthquakes and metadata**
- **Current, consistent, and verified**
- **Available to all developers and researchers**

Simulation of Rock Motion

- **Extrapolation beyond data**
- **Use of numerical simulations to guide the extrapolation**

Rock



Source and Path Effects

- **Distance and magnitude scaling**
- **Footwall/hanging wall**
- **Style of faulting**
- **Directivity**

- **Buried vs. surface faulting**
- **Static stress drop (ruptured area) and other (dynamic) stress parameters**
- **Other fault properties**
- **3-D basin**

Site Classification and Site Effects

- **To provide an improved basis for decisions by developers to**
 - **Define site classes**
 - **Account for site effects**

Statistical Analysis

- **Measurement error of predictor**
- **Missing values in predictor variable**
- **Correlation in residuals**
 - **Between neighboring frequencies**
 - **Between neighboring recording sites (spatial correlation)**

Working Groups

- **Develop and evaluate research results to aid NGA developers**
- **6 working groups**

Working Groups

2/18/03

WG#1 Record Processing		WG#2 Validation of Ground Motion Database	WG #3 Validation of 1-D Rock Motion Simulations	WG #4 Source / Path Effects	WG #5 Site Classification & Site Effects	WG #6 Statistical Modeling of Data
Scope Item (1)	Scope Item (2)					
<u>M. Power.</u>	<u>R. Graves</u>		<u>S. Day</u>	<u>J. Anderson</u>	<u>R. Borchardt</u>	<u>B. Youngs</u>
N. Abrahamson	N. Abrahamson	N. Abrahamson	N. Abrahamson	N. Abrahamson	N. Abrahamson	N. Abrahamson
D. Boore [1]	R. Archuleta	D. Boore/C. Stevens	B. Chiou	J. Boatwright	D. Boore	D. Brillinger
B. Chiou [1]	D. Boore	Y. Bozorgnia	J. Boatwright	B. Chiou	J. Bray	B. Chiou
B. Iwan [2]	T. Shakal	K. Campbell	R. Harris	S. Day	B. Chiou	
B. Nigbor		I.M. Idriss		B. Foxall	N. Field	
T. Shakal [2]		W. Silva		R. Harris	I.M. Idriss	
		B. Youngs/B. Chiou		M. Peterson	M. Power	
				W. Silva	C. Roblee	
				P. Somerville	W. Silva	
				P. Spudich	J. Stewart	

Legend:

- Underlined individuals are proposed working group chairs

[1] Representing COSMOS and NGA

[2] Representing COSMOS

Working Group Members

- **PEER**
- **SCEC**
- **USGS**
- **CGS/CSMIP**
- **LLNL**

Status of NGA Program

- **Workshop #1 in February**
 - Database development
 - Source/path effects
- **Working group meetings in March**
- **Workshop #2 in May**

END