Energy/Facilities Connection Conference

Mike Weedall
Vice President, Energy Efficiency
Bonneville Power Administration
May 13, 2011

Presentation Outline

- BPA Overview
- PNW Energy Efficiency Achievements 1978-2009
- Northwest Power and Conservation Council's 6th Power Plan Targets and Action Items
- BPA's Energy Efficiency Action Plan
- Demand Response and Smart Grid

Context and Background

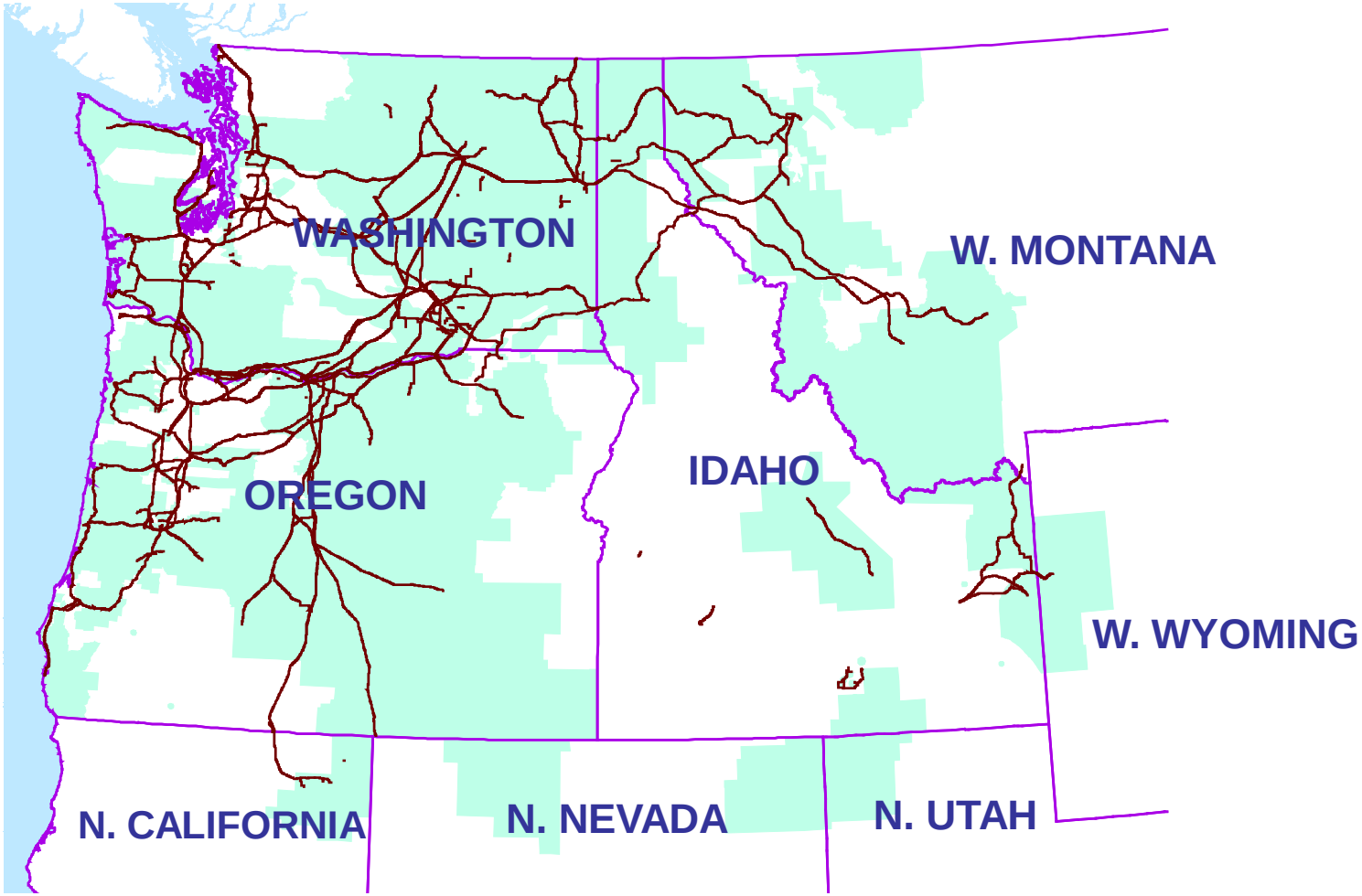
BPA Headquarters, Portland, Oregon

BPA Overview

- Federal agency (DOE) responsible for marketing and distributing electricity from 31 Federal hydro projects dams, one non-federal nuclear plant and over 2,500 MW's of wind in the PNW
- Supplies about 40 percent of the electricity in the PNW

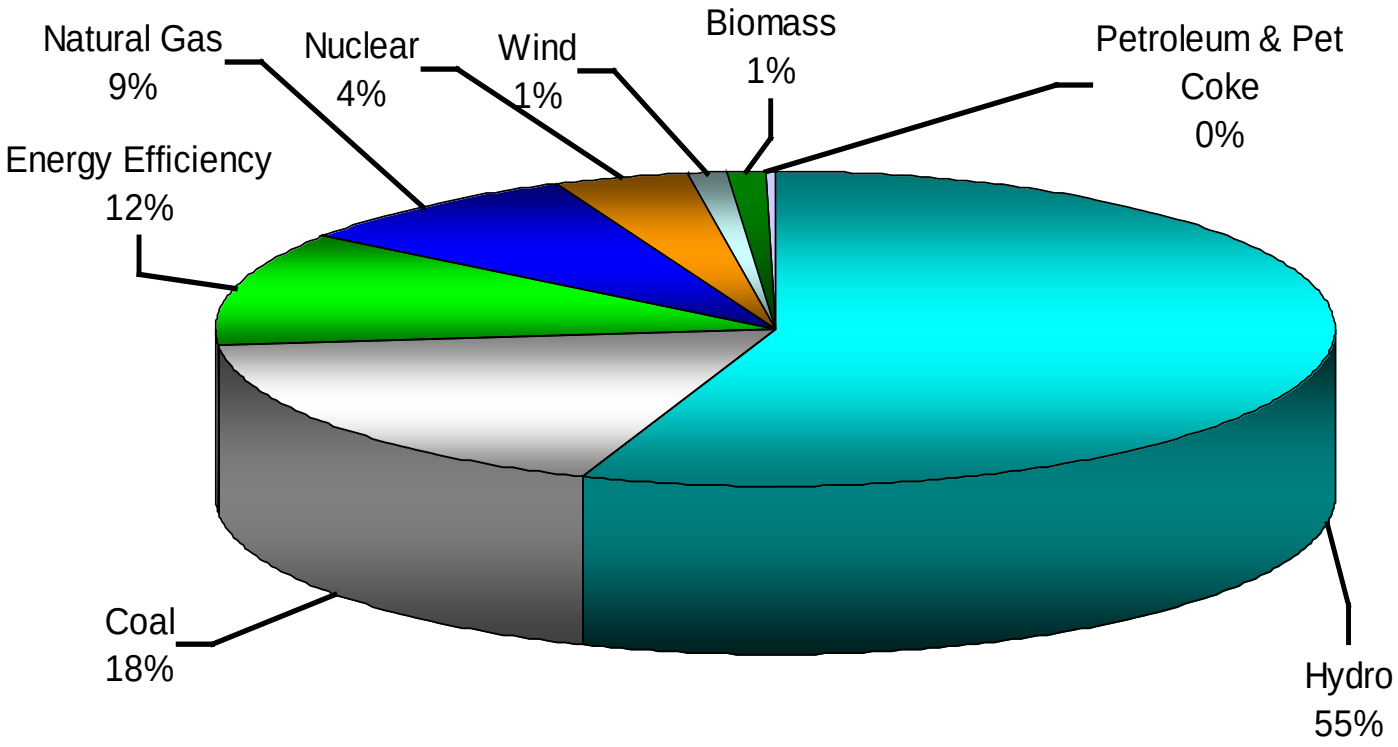
- Serves 140 customers (PUDs, Munis, REA Coops, DSIs)
- Owns, operates and maintains over 15,000 circuit miles of high voltage transmission lines *(representing about 80 percent of the PNW's capacity)* and 150 substations
- Total operating revenues average $3.5 billion annually

BPA Service Territory



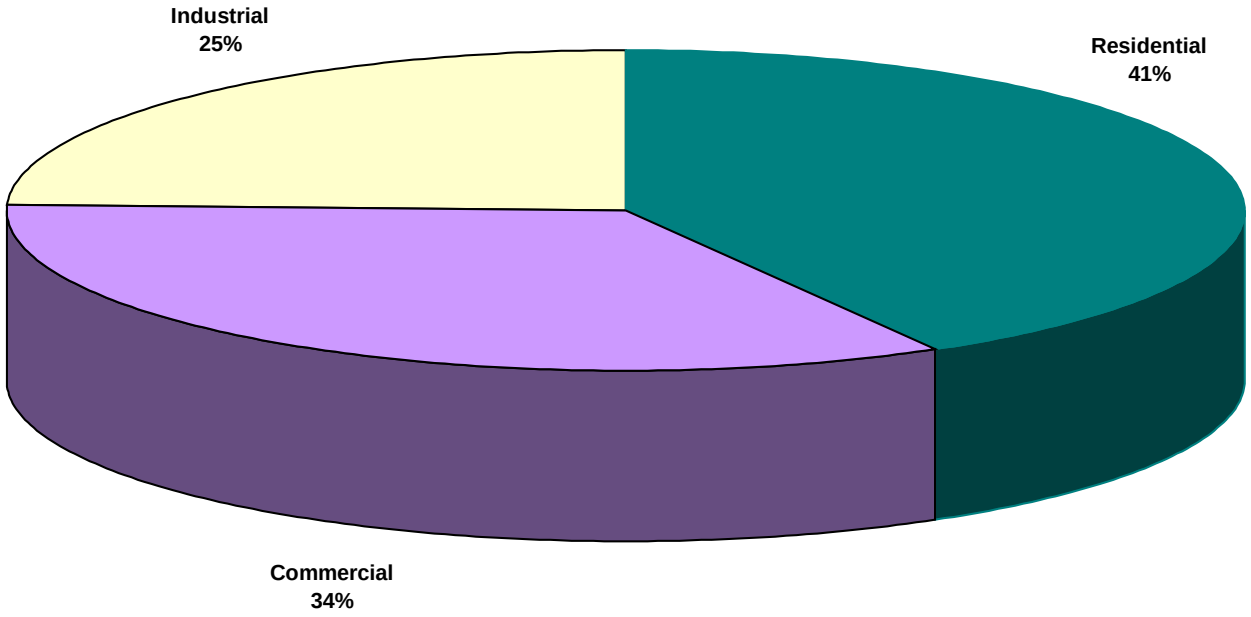
Source of Electricity Supply in PNW

Energy efficiency is the PNW's third-largest resource



Source: NW Power and Conservation Council

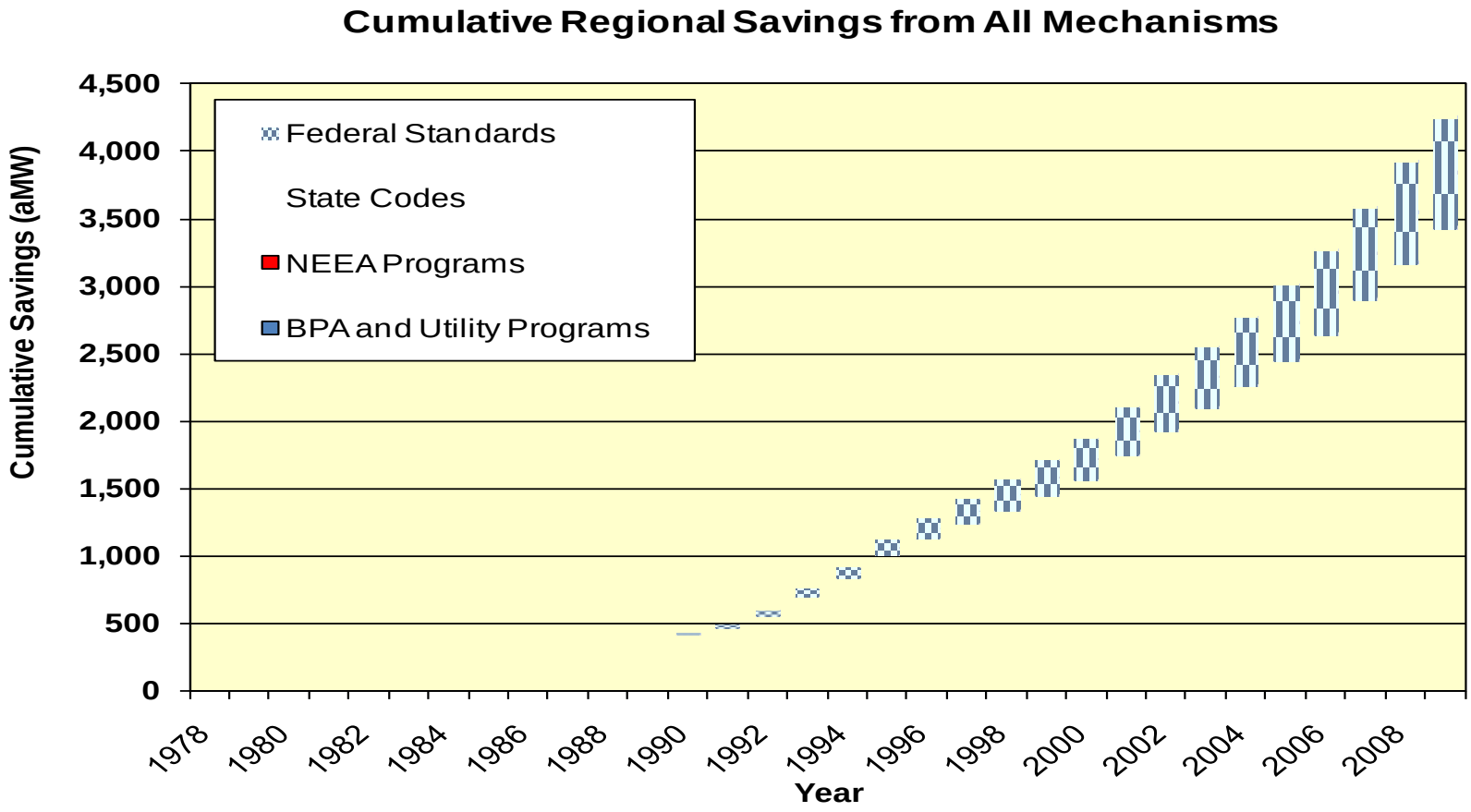
PNW Electricity Consumption



Source: Energy Information Administration

PNW Energy Efficiency Achievements 1978 - 2009

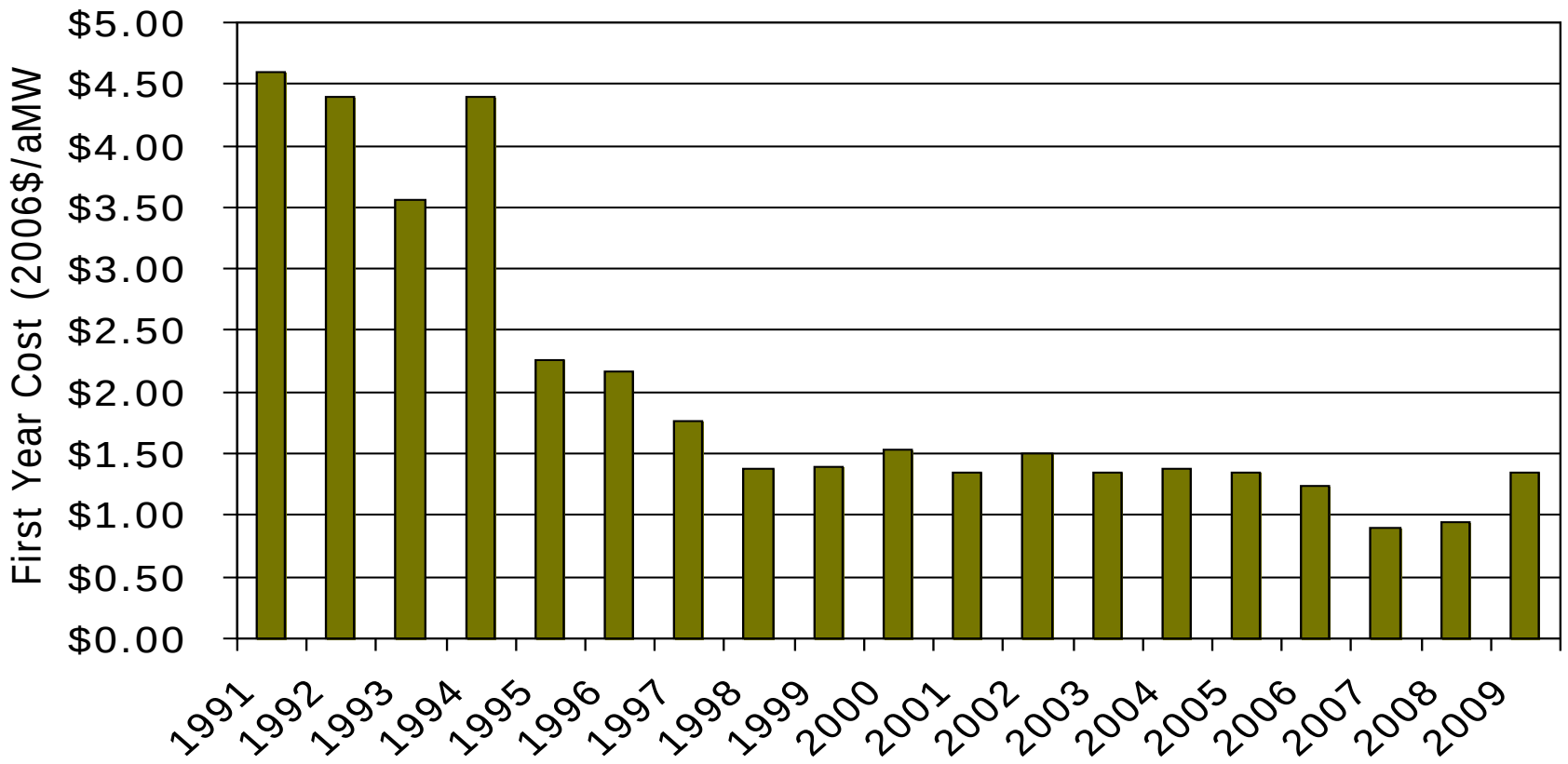
PNW Energy Efficiency Achievements 1978 - 2009



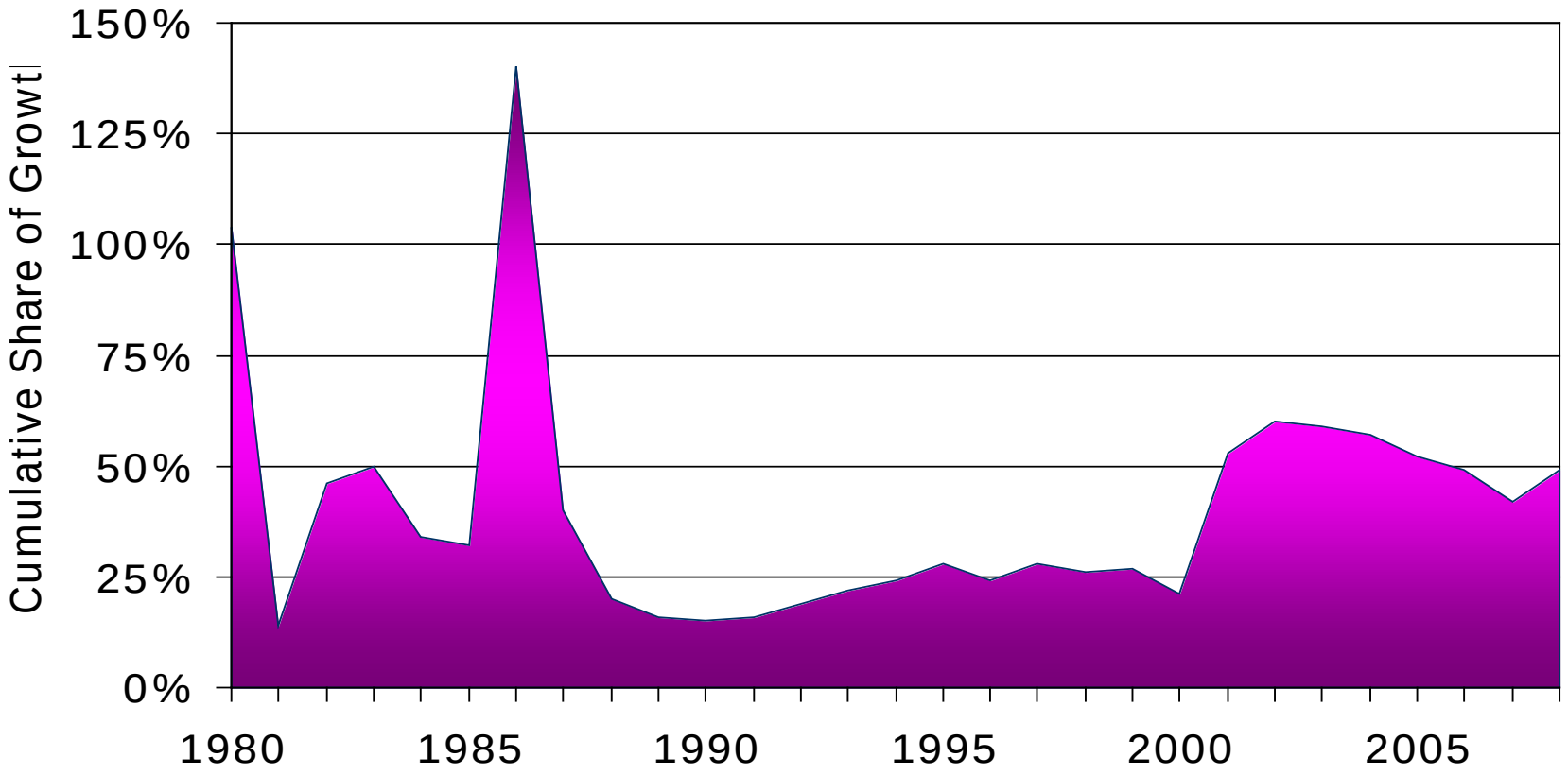
Since 1978 Utility & BPA Programs, Energy Codes & Federal Efficiency Standards Have Produced *4300* aMW of Savings.

Source: NW Power and Conservation Council

Utility Cost of Conservation Continues to Decrease



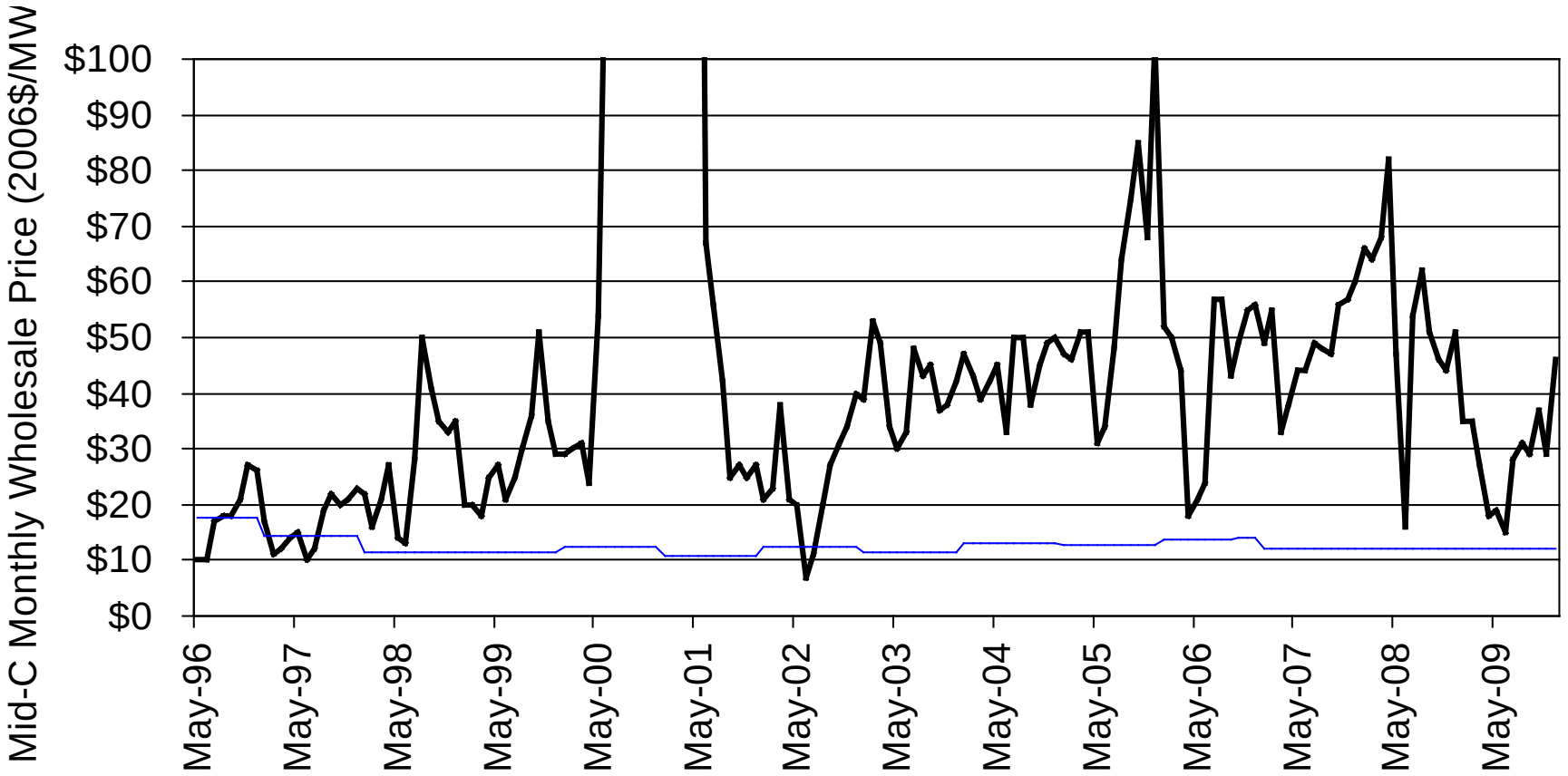
Since 1980 Energy Efficiency Resources Met Half of PNW Load Growth



Source: NW Power and Conservation Council

Let's Be Clear:

Utility Acquired Energy Efficiency Has Been A BARGAIN!

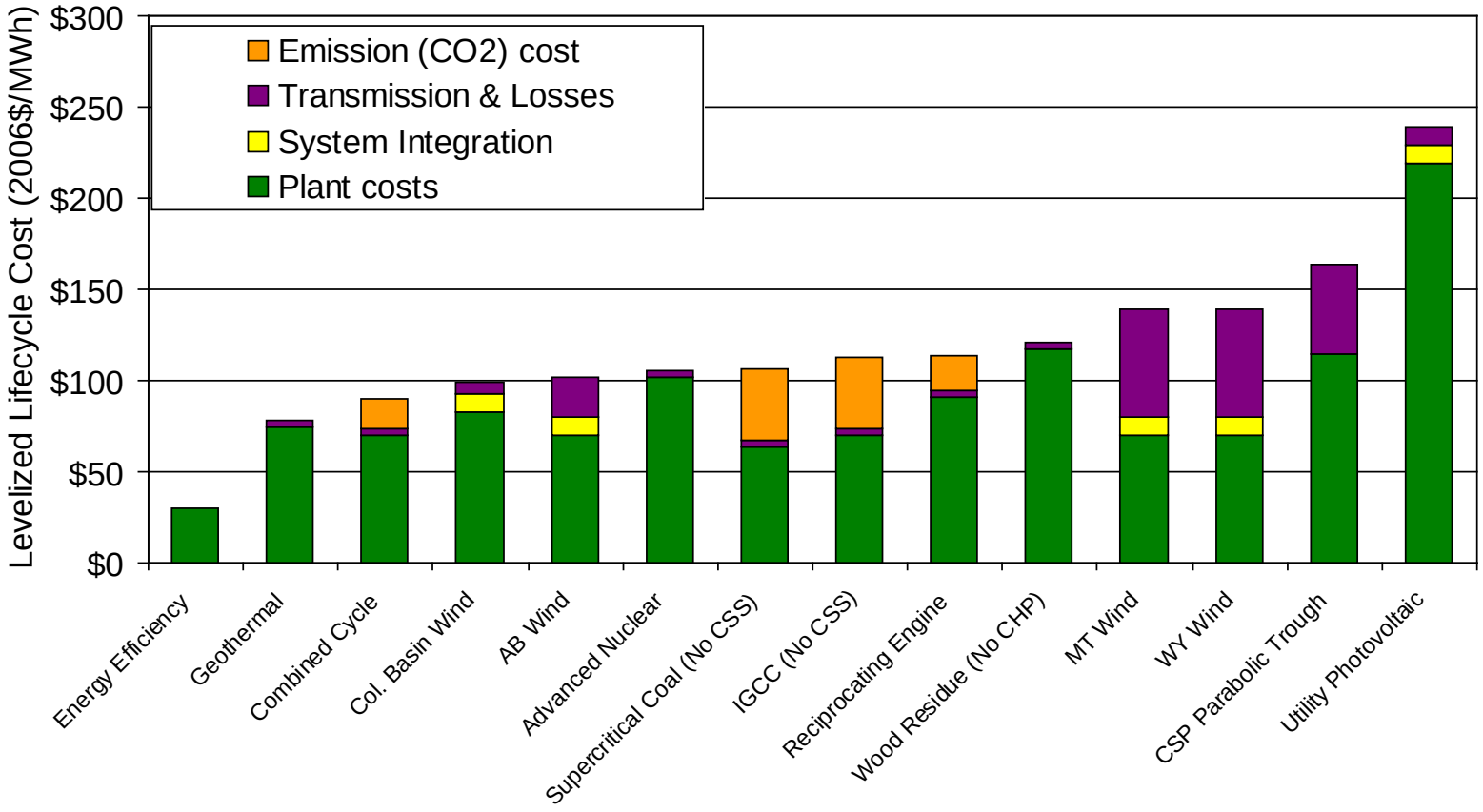


4,300 aMW is equivalent to:

- It's more than enough electricity to serve the ***entire state of Idaho*** and ***all of Western Montana***.
- It saved the region's consumers nearly ***$1.7 billion*** in 2009.
- It lowered 2009 PNW carbon emissions by an estimated ***15 million*** tons.

Source: NW Power and Conservation Council

Energy Efficiency is Still the Cheapest Option

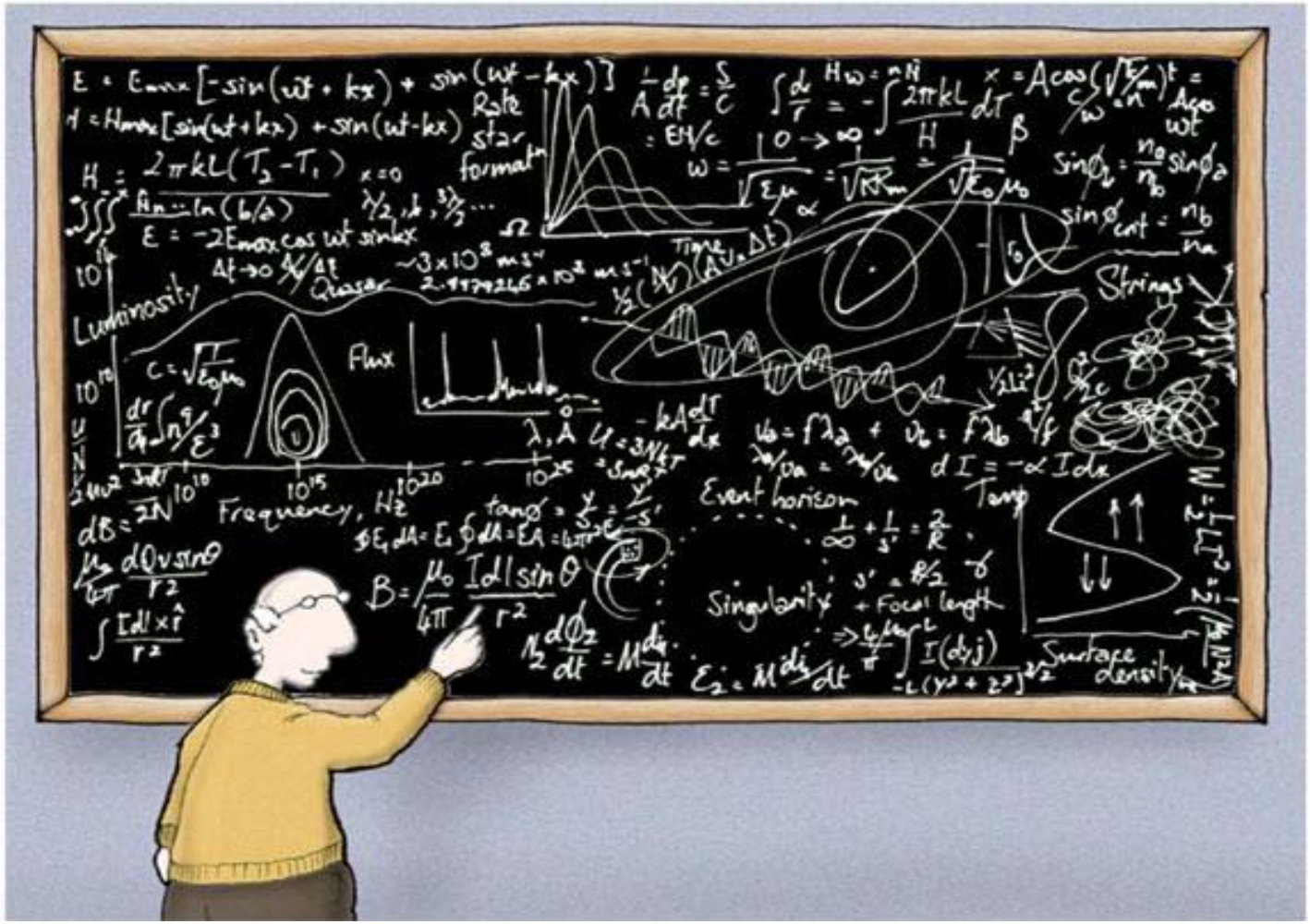


Assumptions :
Efficiency Cost = Average Cost of All Conservation in Draft 6th Power Plan Under $100 MWh
Transmission cost & losses to point of LSE wholesale delivery
2020 service - no federal investment or production tax credits
Baseload operation (CC - 85%CF, Nuclear 87.5% CF, SCPC 85%)
Medium NG and coal price forecast (6th Plan draft)
6th Plan draft mean value CO2 cost (escalating, $8 in 2012 to $47 in 2029).

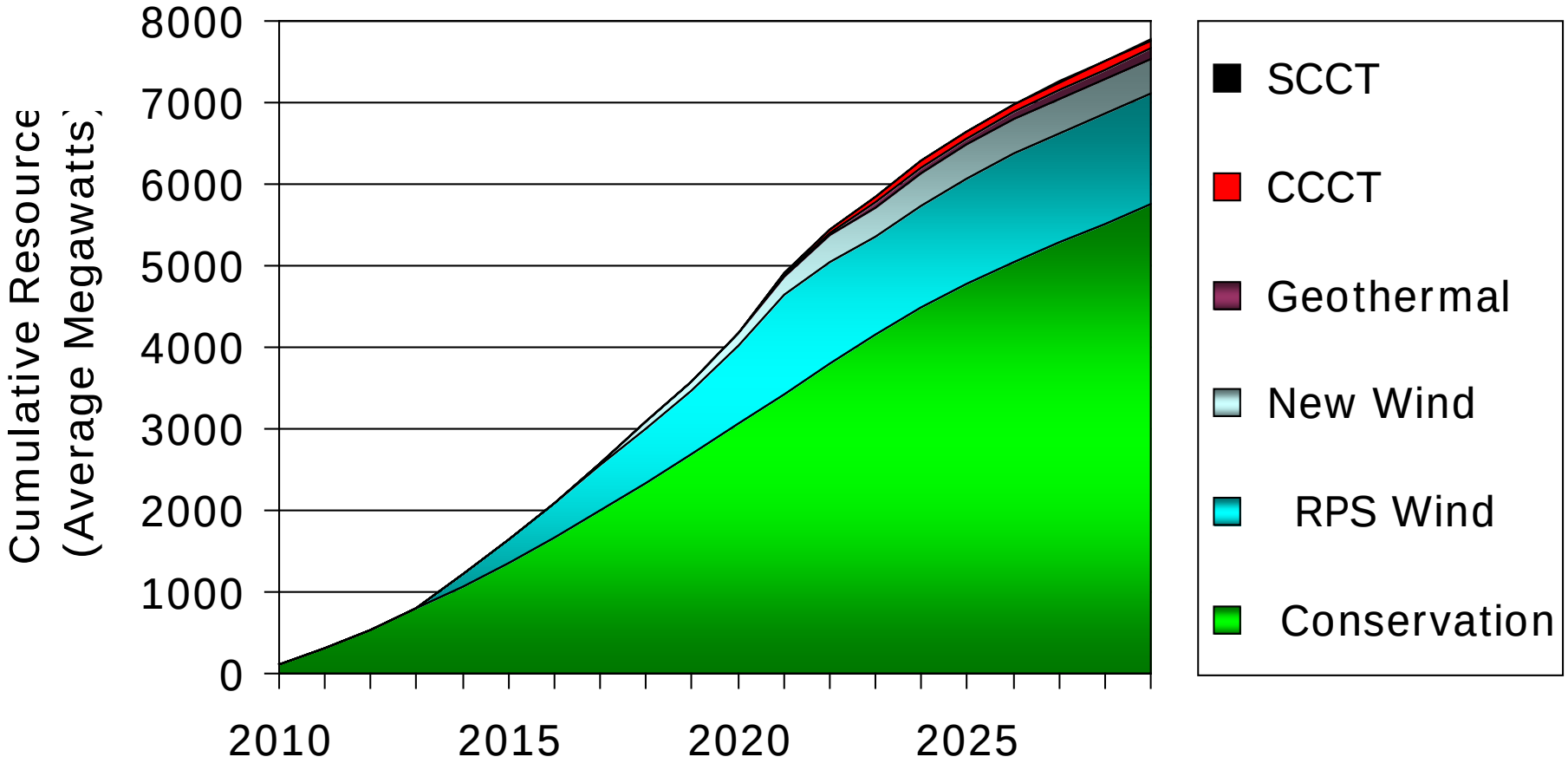
There's Still "Mass Quantities"

6th Plan Technically Achievable Conservation Potential by Sector

How Much More Efficiency Should We Develop?

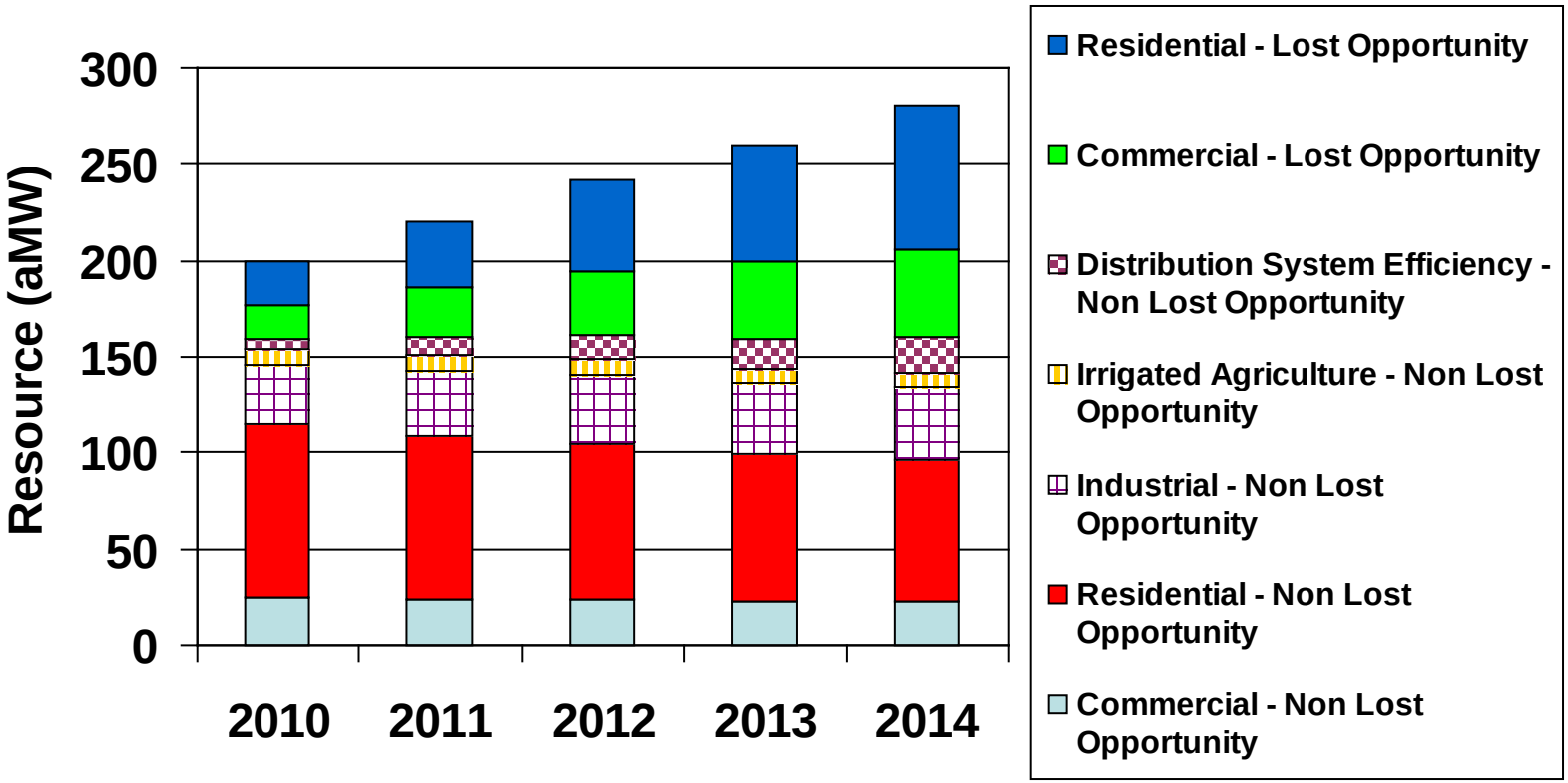


6th Plan Resource Portfolio*



*Expected Value Build Out. Actual build out schedule depends on future conditions

6th Power Plan Energy Efficiency Targets 2010-2014 = 1200 aMW



Energy Efficiency Targets

Public Power's share of the regional energy efficiency target is 504 aMW from 2010 - 2014.

Summary of Savings Targets (aMW, 2010-2014)

Sector	Total Target	Non-Programmatic Savings			Market Transformation		Target Adjusted for Non-Programmatic and Market Transformation	Program Target, Adjusted for Achievability
		Market Induced	Codes & Standards	ARRA Funding	NEEA - New Programs	NEEA - Existing Programs		
Residential	275	26	8	4	18	17	202	**132**
Commercial	90	12	1	9	14	6	48	**100**
Industrial	93	-	-	-	12	7	74	**74**
Agriculture	20	-	-	-	-	-	20	**20**
Federal	-	-	-	-	-	-	-	**25**
Distribution Efficiency	26	-	-	-	-	-	26	**20**
Total	***504***	**38**	**9**	**13**	**43**	**30**	***371***	***371***
% of Target	**100%**	**7.5%**	**1.7%**	**2.6%**	**8.6%**	**6.0%**	**73.6%**	**73.6%**

How will BPA meet these targets?

BPA provides an array of energy efficiency services and support:

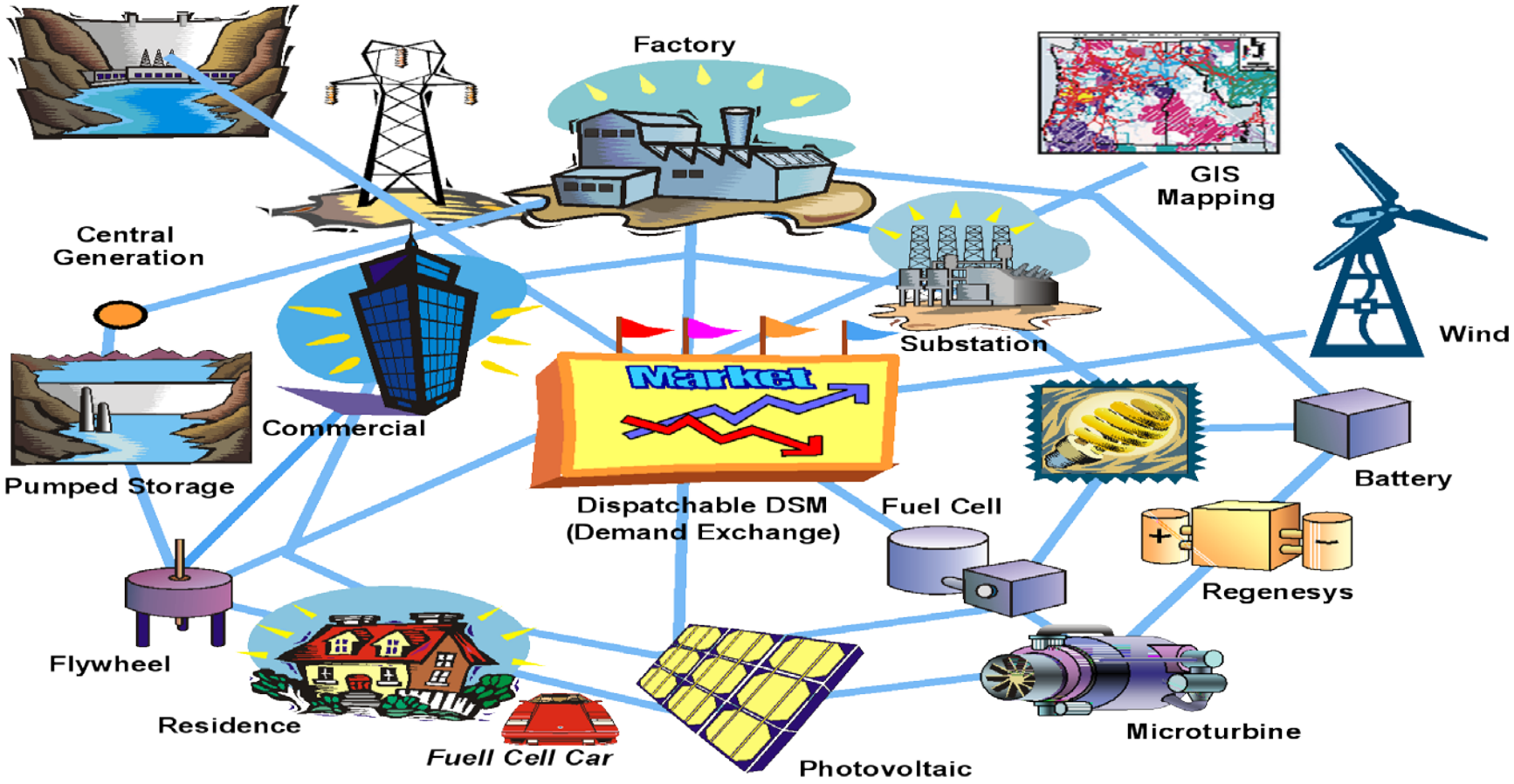
- Infrastructure
  - Policy
  - Regional capabilities
  - Outreach and engagement
  - Technical Support
- Acquisition
  - Incentive funding
  - Program design, support, and implementation
- Innovation
  - Demonstrations
  - Pilots

- BPA works through its public utility customers and regional partners to achieve energy savings

BPA's Continued Leadership

- The Energy Efficiency Emerging Technologies (E3T) team leads BPA's efforts to research new, viable energy efficiency technologies and provide verifiable data to support measure deployment.
- BPA is working with customer utilities to launch Demand Response pilots in the region.
- BPA supporting PNNL in Smart Grid Demonstration linking eleven utilities into test of integrating their systems.

BPA's Energy Web



Pacific Northwest Demonstration Project

What:

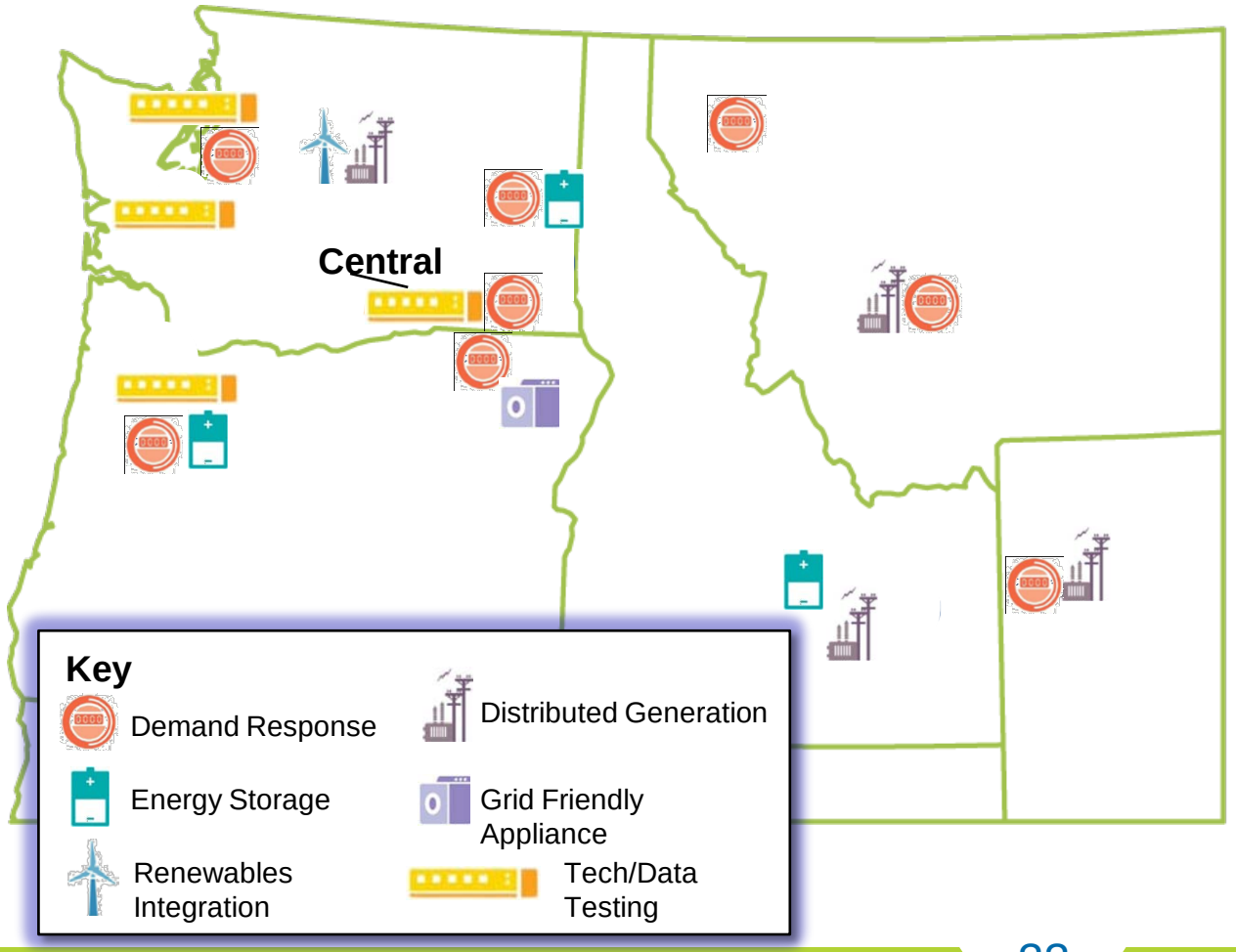
- $178M, ($89M private, $89M ARRA-funded), 5-year demonstration
- 50,000 metered customers in 5 states

Why:

- Quantify costs and benefits
- Develop communications protocol
- Develop standards
- Facilitate integration of wind and other renewables

Who:

Led by Battelle and partners including BPA, 11 utilities, 2 universities, and 5 vendors



PNW Smart Grid Demonstration: Goals and Objectives

Goals:

- Provide **two-way communication** between distributed generation, storage, and demand assets and the existing grid infrastructure
- Validate new smart grid technologies and inform business cases. **Quantify smart grid costs and benefits**
- Advance **interoperability standards** and **cyber security** approaches for transactive control
- Integrate rapidly expanding portfolio of **renewable resources**

Objectives:

- Manage peak demand
- Facilitate integration of wind and other renewables
- Address constrained resources
- Select economical resources
- Improve system efficiency
- Improve system reliability
  - Load Management
  - Conservation Voltage Reduction
  - Distributed Generation

Exploring Technologies at the Utility Level

Utilities: Summary of Scope of Work	Back-up Generation	Battery / Storage	Demand Response	Distributed Generation	Distrib Auto/Mgmt	PHEV / EV	End-user Portals	Diagnostics	AMI	
Avista Utilities	■	■	■		■		■	■	Itron	Includes microgrid, creating of educational opportunity at WSU, and a test of a full range of DR measures
Benton PUD		■		■	■				Sensus	Explore interoperability and install a web-based interface for improved data management
City of Ellensburg				■						Test renewable (solar, wind) technologies, evaluate incentives for investing in comm. renewable energy park, involving CWU.
Flathead Electric Coop.			■				■		Aclara	An evaluation of four levels of residential smart grid technologies in Libby and near Kallispell
Idaho Falls Power	■	■	■	■	■	■	■	■	tbd	Includes microgrid and solar sites at local public schools
Lower Valley Energy	■	■	■	■	■		■		Aclara / L&G	Includes optimization of resources, reliablity improvements in extreme weather locations at sites in Western Wyoming
Milton-Freewater City Light & Power			■		■				Aclara	Includes outage reporting, voltage and frequency stability; dlc for electric heat, hot water heater, cycling of a/c and city water pump
NorthWestern Energy			■		■		■		Itron	Also, data management. Includes state capitol buildings complex in Helena and remote rural areas near Phillipsburg
Peninsula Light Company			■		■					Improve reliability and defer construction of underwater cable service to island using direct load control and CVR
Portland General Electric		■	■	■	■	■			Sensus	Realize dynamically reconfigurable feeders with intentional islanding and improve integration of intermittent resources
UW / Seattle City Light	■		■	■	■	■	■		tbd	A utility/university collaboration to create a "smart microgrid" with campus facilities mgt, administrators, faculty and students

Project will Test an Extensive Set of Assets

- The project is anticipated to deploy over 90,000 assets across 68 asset system types across the 11 subprojects.

Demonstration Asset Category		Quantity	Notes
Responsive Assets	Backup Generation	6	4 from Avista and 2 from UW.
	Battery Storage	49	49 battery units.
	Distributed Generation	559	559 units--e.g. Ellensburg is installing 540 75-W solar panels; counted as 540 units, not as 1 solar system.
	Demand Response	7,648	Includes programmable thermostats, direct load control devices, smart appliances, and other customer devices.
	Distribution Automation	17,833	Sum of DA devices
	Plug-in Hybrid Vehicles	tbd	IFP will have some PHEV charging points, but number not quantified yet
	All Responsive Assets	**26,095**	
Enabling Assets	End user portals	13,694	Avista and UW noted here.
	Diagnostics	pending	
	AMI	56,283	
	All Enabling Assets	**69,977**	

The Demonstration will create a "system of systems," and tie together the sub-project assets….

Demand Response: Drivers in the PNW

- **Peak demand** is expected to continue to grow at an average rate of 1.7% annually.
- Load growth, wind integration and fish operations are testing the **capacity** of the Federal Columbia River Power System.
- The **costs of building and permitting new resources** is increasing.
- Legislation, including I-937, renewable portfolio standards, and cap-and-trade are **limiting the types of new resources** that utilities can acquire.
- The Northwest Power and Conservation Council's Sixth Power Plan calls for research of Demand Response (DR) through **pilot projects** and **technology demonstrations**
- The Northwest Energy Efficiency Taskforce has asked BPA to take a role in the Region to **expand DR potential and share learnings** (Action 9, October 2009 report).
- Response to new BPA **demand charge** (economic signal)

"…achievable technical potential for demand response in the region is around 5% of peak load over the 20-year plan horizon. The plan assumes 1,500 to 1,700 megawatts of load reductions in the winter and summer, respectively…. "

Sixth Northwest Power Plan, Chapter 5

Northwest Power and Conservation Council

BPA Sponsored Demand Response Residential Pilot Projects

Orcas Power & Light Cooperative	• Aclara AMI Technology • Water heater / thermostat control devices • Home area network capabilities • Real time communication through internet to study customer behavior
City of Port Angeles	• Water heating DR controls • In-home displays with home area network capabilities • Thermal storage devices for home heating
Mason County PUD #3	• Network configured for a Renewable Demand Response signal • Enhanced hot water heater control system to store renewable energy (wind)
Emerald PUD	• Cooper AMI Technology • Water heater control devices • Heat pump control devices • Programmable thermostat devices
Kootenai Electric	• Hot water heaters and thermostats • Aclara Technology • Testing of consumer acceptance and response
Central Electric	• Hot water heaters with Intermatic programmable timers • Addressing peak demand periods (e.g. morning)

2 new c & I pilots kicking off in FY11

Energy Efficiency

GAZING INTO THE CRYSTAL BALL

National energy efficiency drivers

Reduce your carbon footprint

- Climate change awareness growing with state mandates/actions underway and national initiative expected.
- Challenges to new thermal power plant construction makes EE more attractive.
- Emerging technologies will dramatically increase usage of electricity.

Regional energy efficiency drivers

- Tiered rates in Regional Dialogue will send clear signal of the value of EE.
- Development of state renewable and energy efficiency standards will act as additional leverage for BPA.
- Expected demands on federal hydro system will result in capacity issues.
- Aging BPA workforce will affect our customers.

BPA energy efficiency drivers

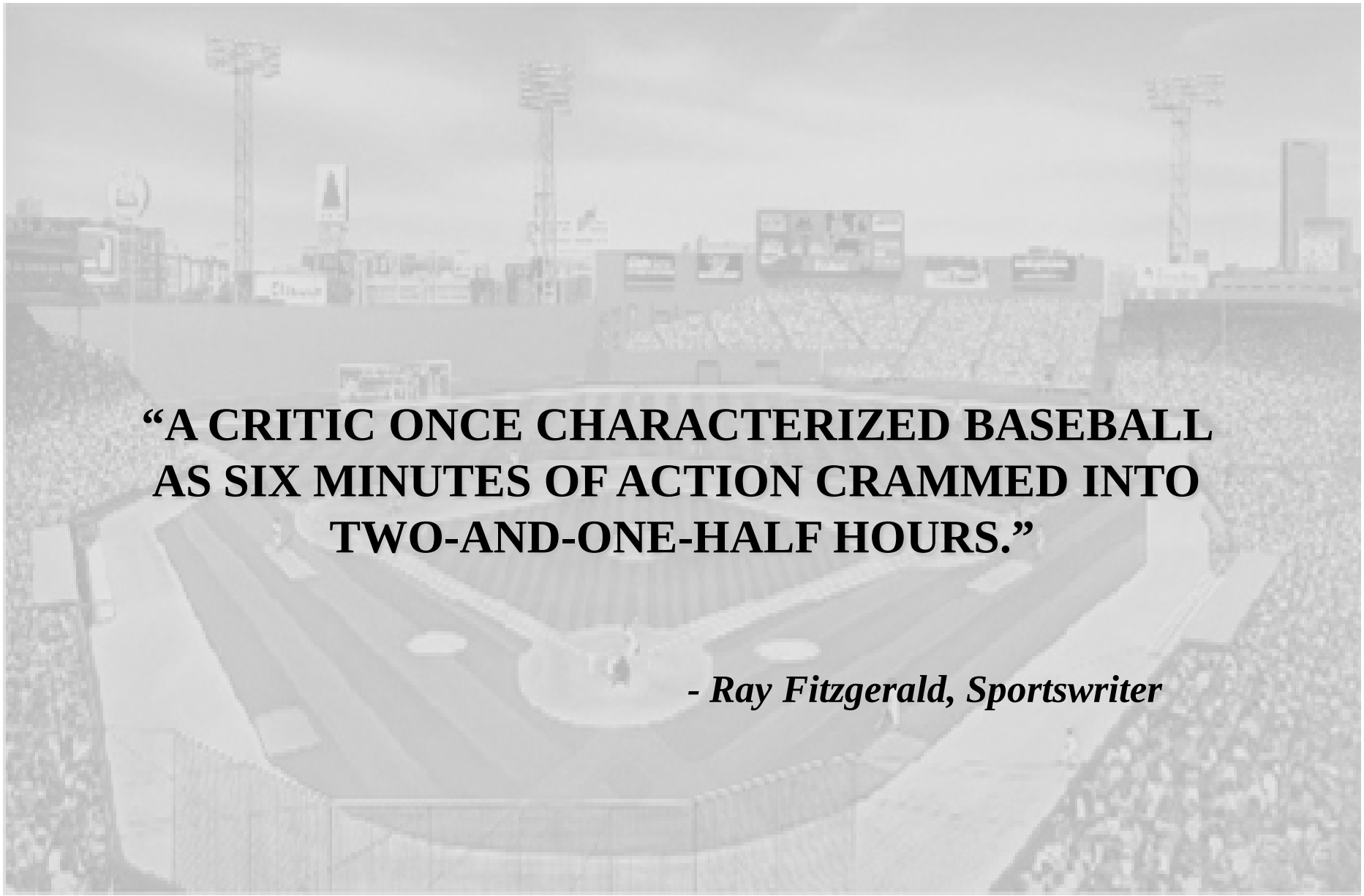
- Staffing and succession planning with more retirements in BPA's Energy Efficiency department.
- Benefits of regional coordinated efforts to plan and implement energy efficiency programs and standards will be even more valuable in the future.
- Trade allies are key to selling and delivering energy efficiency in the region, and BPA must build capability to tap and manage this resource.

How will all this affect BPA energy efficiency programs?

- BPA and others in the region will continue to do more EE, not less.
- More need/opportunity to jointly pursue EE with others in region.
- Must develop more capacity and peak management programs.
- Role for market transformation to become even more important.
- Expand marketing of BPA's energy efficiency programs.

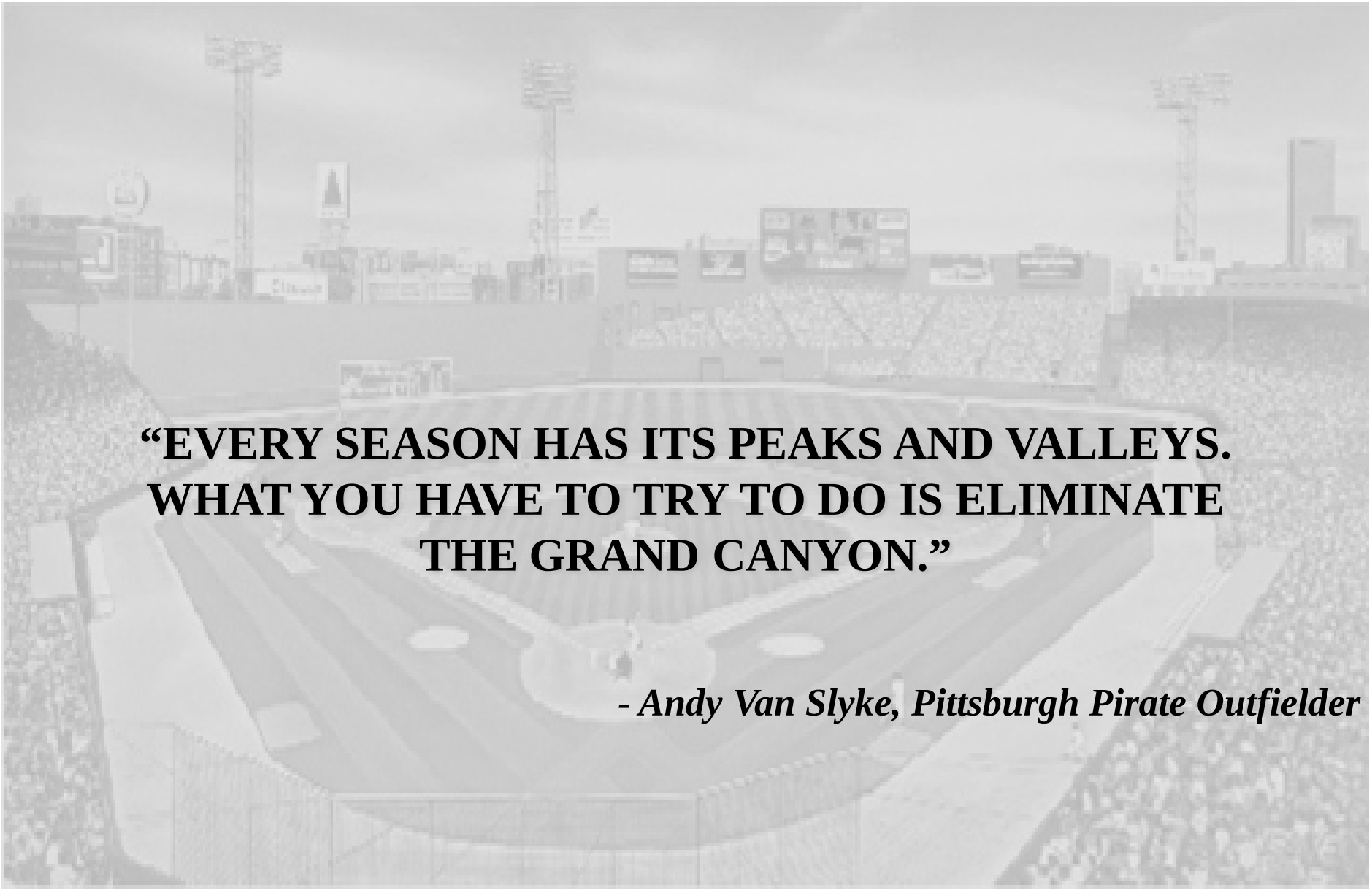
How will all this affect BPA energy efficiency programs? (cont.)

- The march of technology continues, and Energy Efficiency will benefit from new tools:
  - Smart meters, smart chips, high speed communication devices, etc., will allow utilities the ability to control and shape energy consumption of end-users with minimal disruption.
- Plug loads will continue to be an issue in the residential sector.
  - Phantom power consumption must be addressed through codes and standards work.
- Plug-in hybrids will be available, both adding to electric demand and possibly serving as a resource to feed power back into the grid during an emergency.



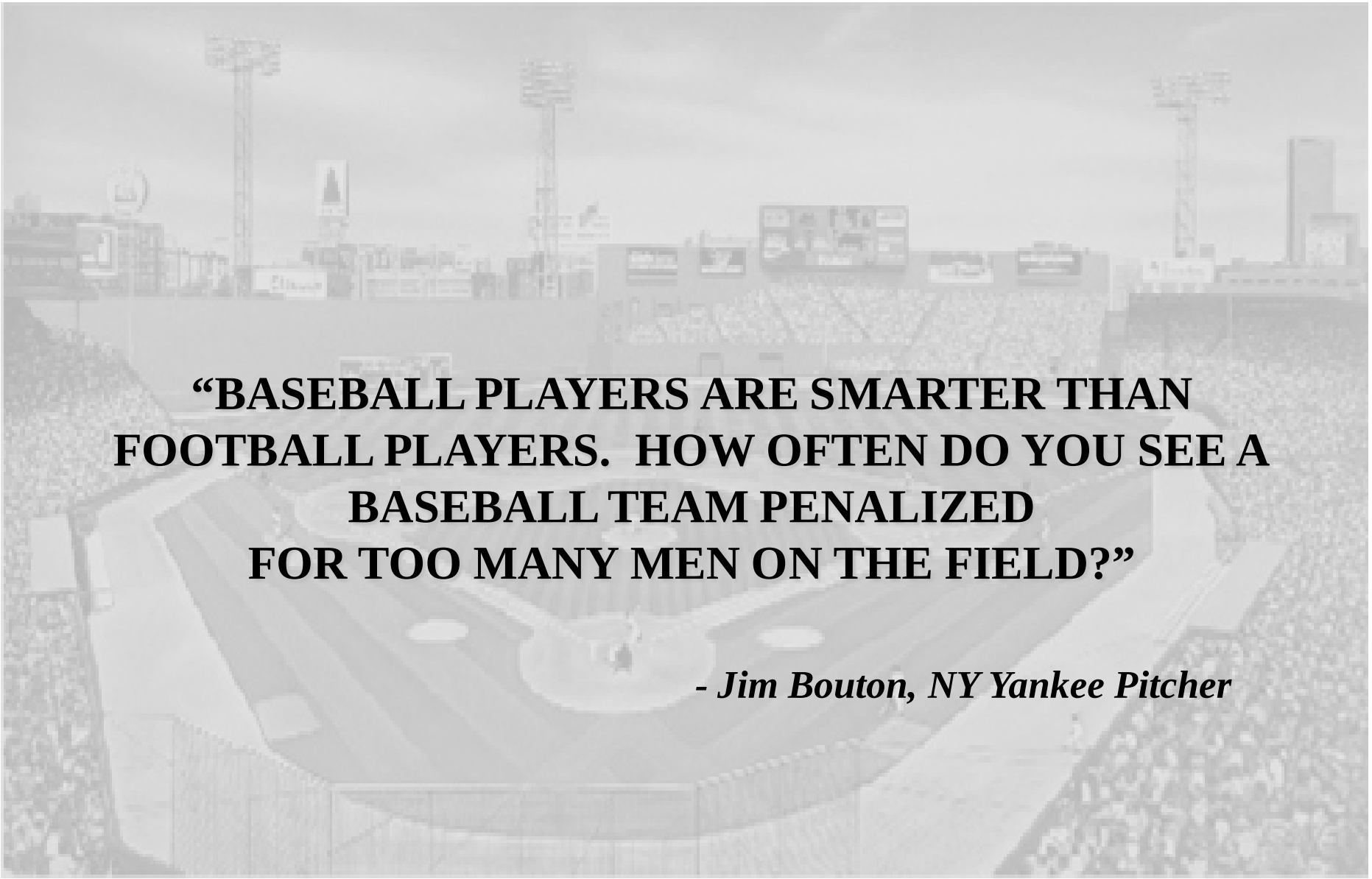
“A CRITIC ONCE CHARACTERIZED BASEBALL AS SIX MINUTES OF ACTION CRAMMED INTO TWO-AND-ONE-HALF HOURS.”

- Ray Fitzgerald, Sportswriter



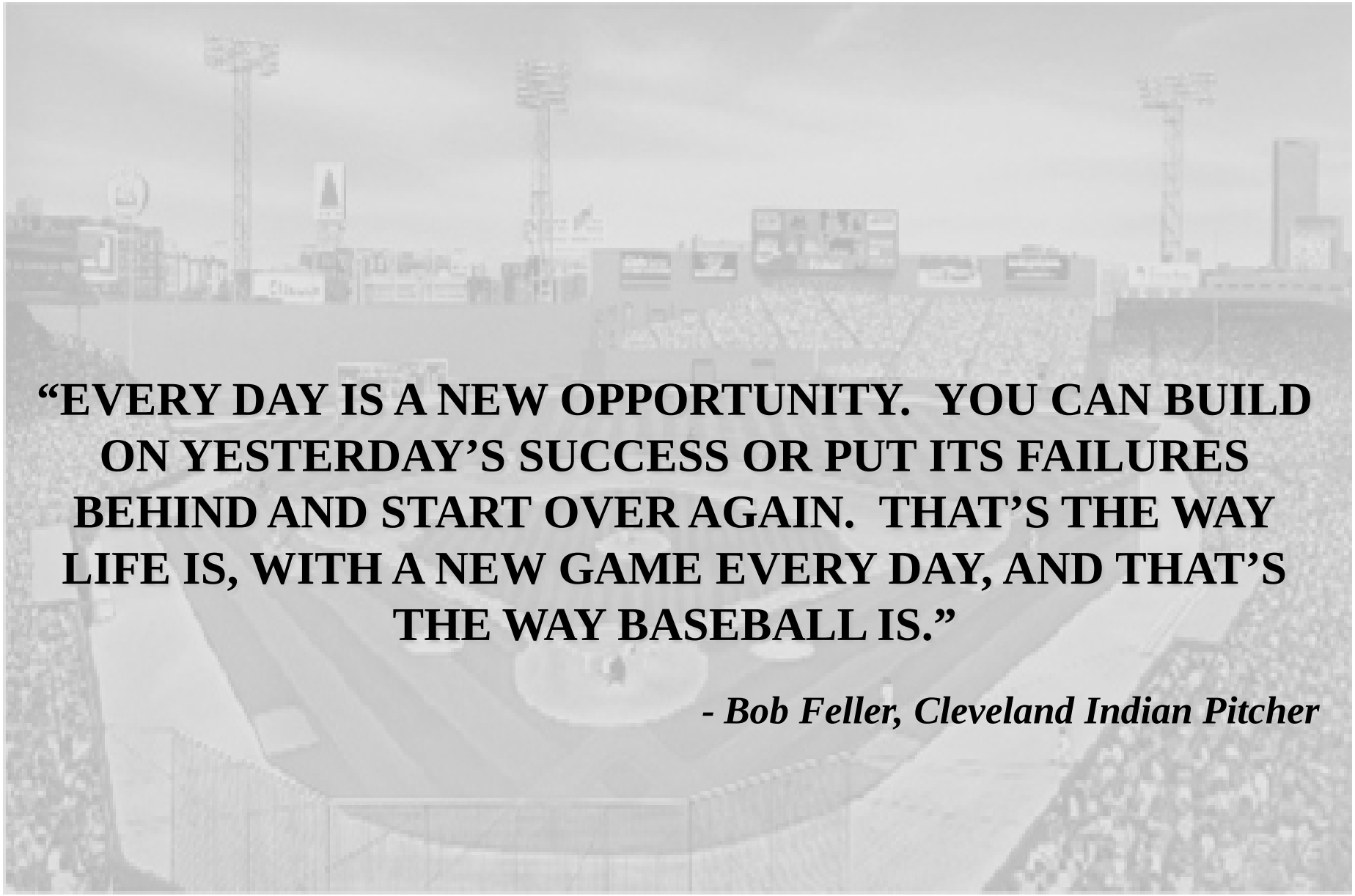
“EVERY SEASON HAS ITS PEAKS AND VALLEYS. WHAT YOU HAVE TO TRY TO DO IS ELIMINATE THE GRAND CANYON.”

- Andy Van Slyke, Pittsburgh Pirate Outfielder



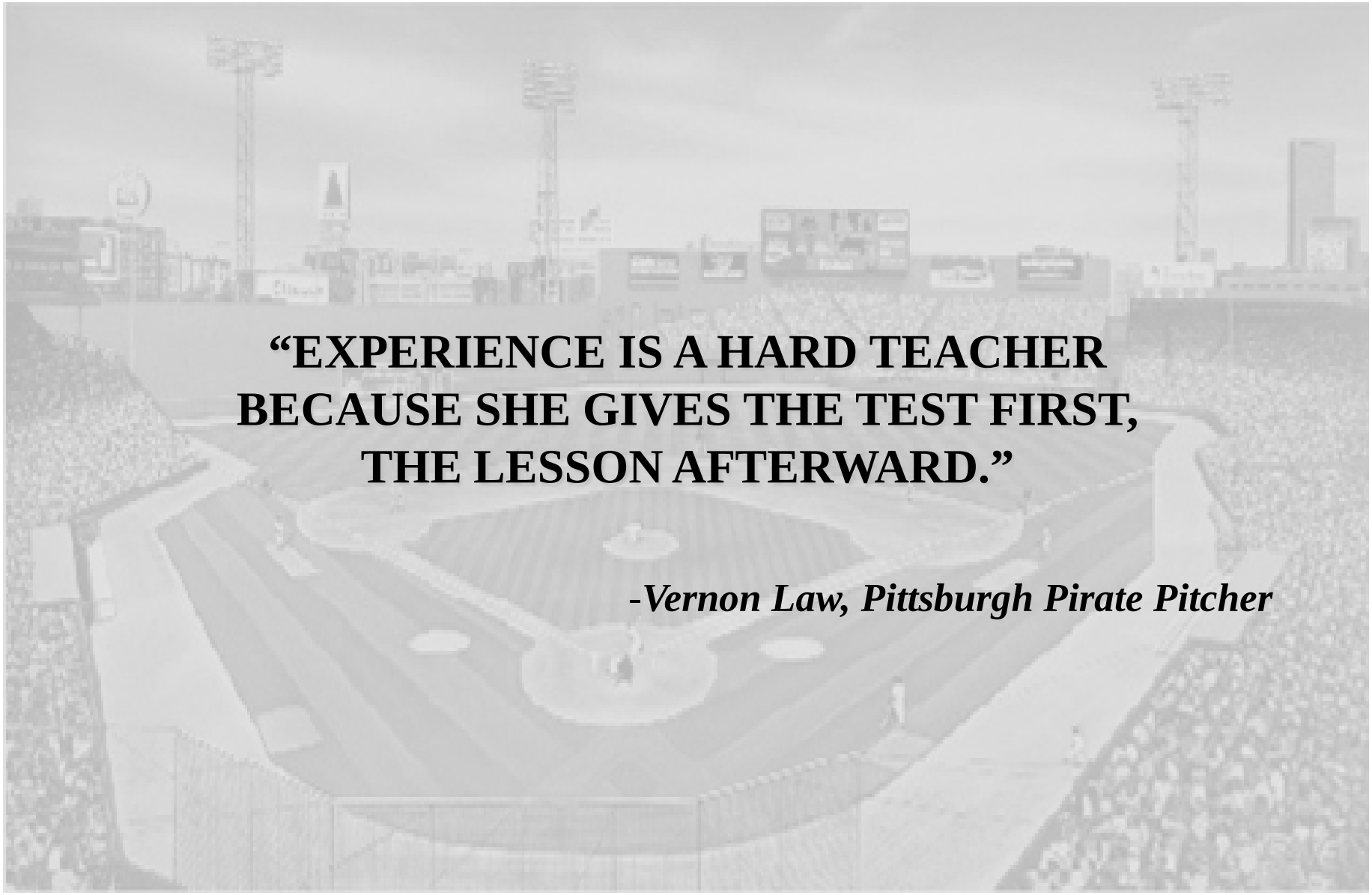
“BASEBALL PLAYERS ARE SMARTER THAN FOOTBALL PLAYERS. HOW OFTEN DO YOU SEE A BASEBALL TEAM PENALIZED FOR TOO MANY MEN ON THE FIELD?”

- Jim Bouton, NY Yankee Pitcher



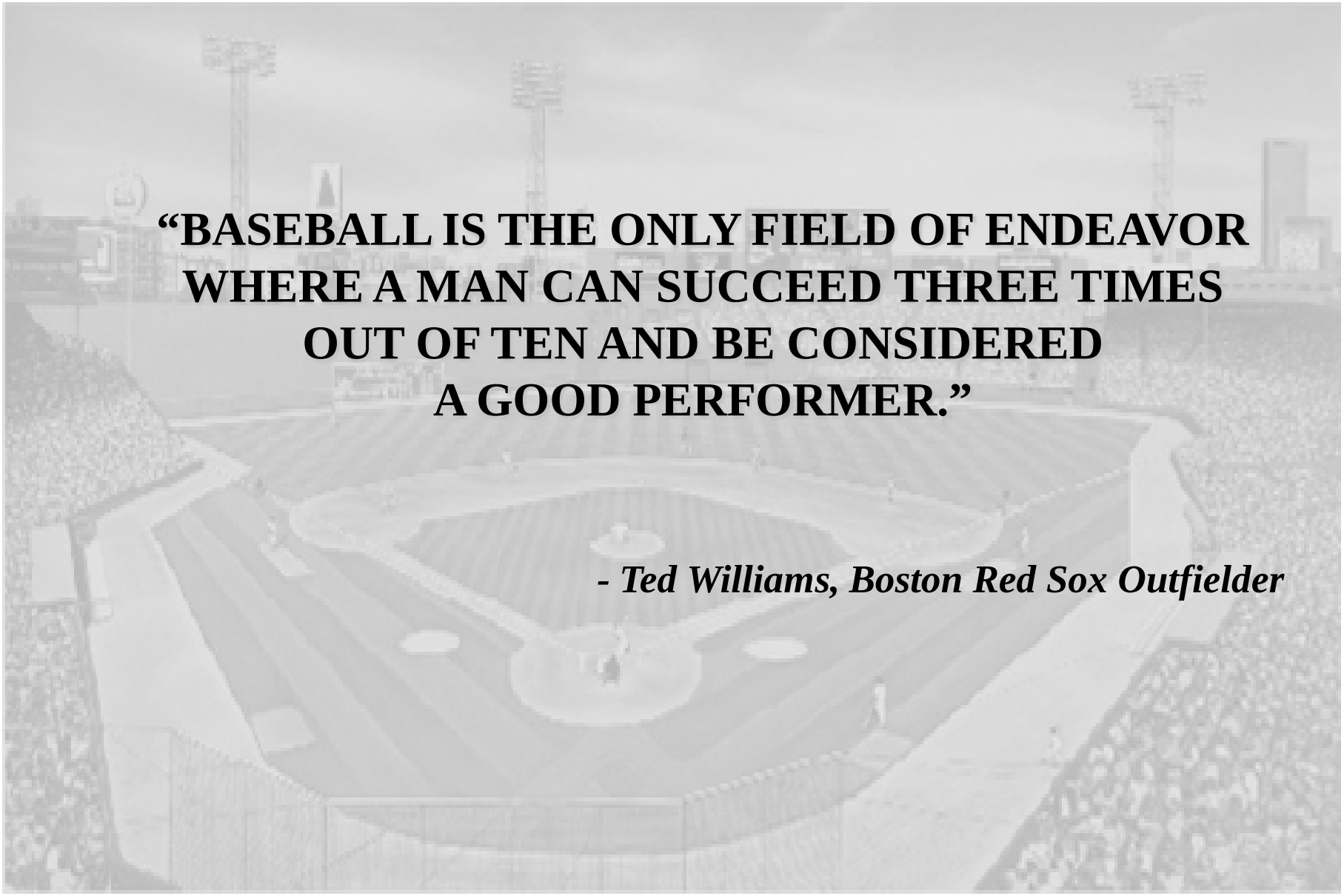
“EVERY DAY IS A NEW OPPORTUNITY. YOU CAN BUILD ON YESTERDAY’S SUCCESS OR PUT ITS FAILURES BEHIND AND START OVER AGAIN. THAT’S THE WAY LIFE IS, WITH A NEW GAME EVERY DAY, AND THAT’S THE WAY BASEBALL IS.”

- Bob Feller, Cleveland Indian Pitcher



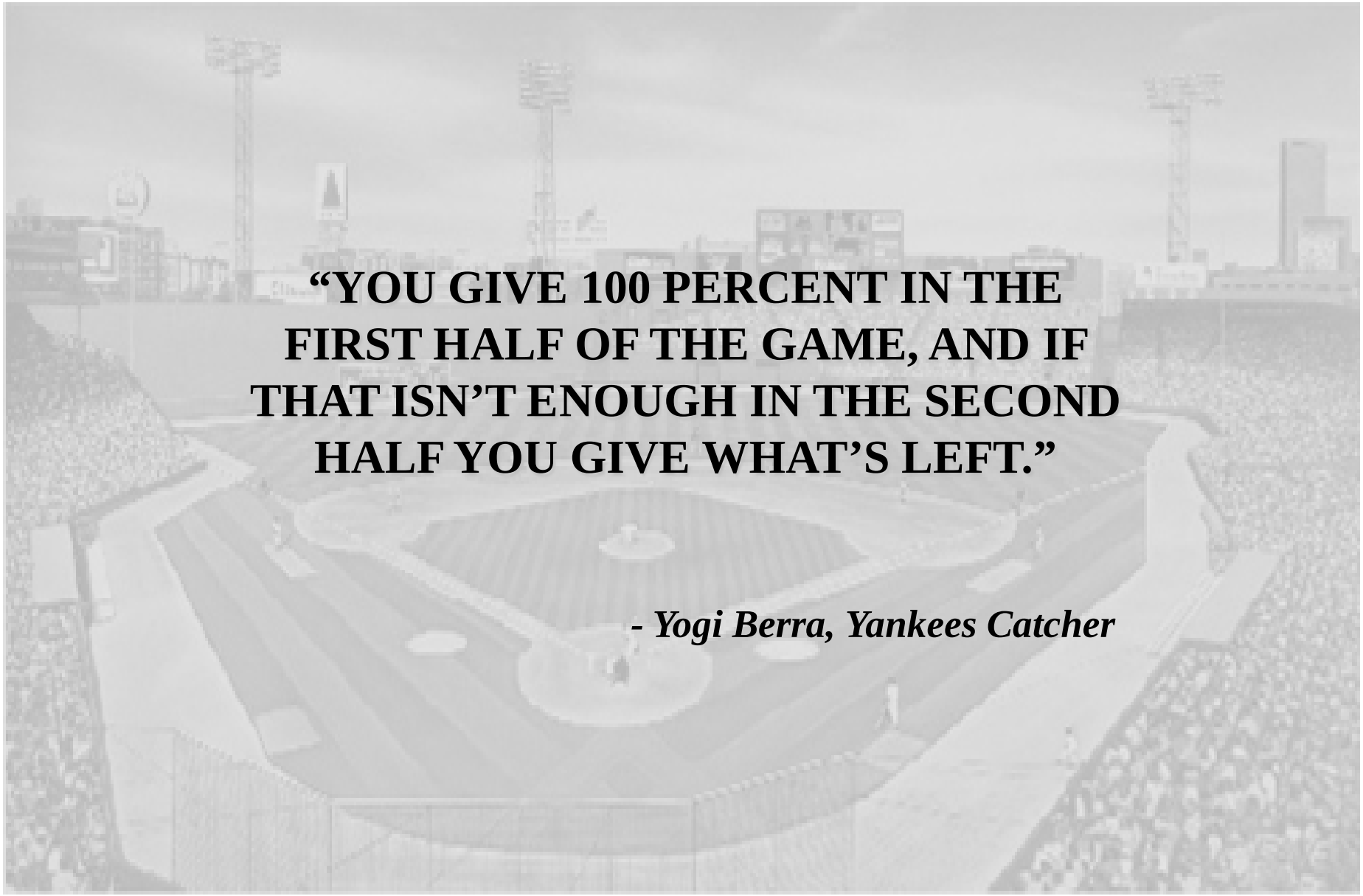
“EXPERIENCE IS A HARD TEACHER BECAUSE SHE GIVES THE TEST FIRST, THE LESSON AFTERWARD.”

-Vernon Law, Pittsburgh Pirate Pitcher



“BASEBALL IS THE ONLY FIELD OF ENDEAVOR WHERE A MAN CAN SUCCEED THREE TIMES OUT OF TEN AND BE CONSIDERED A GOOD PERFORMER.”

- Ted Williams, Boston Red Sox Outfielder

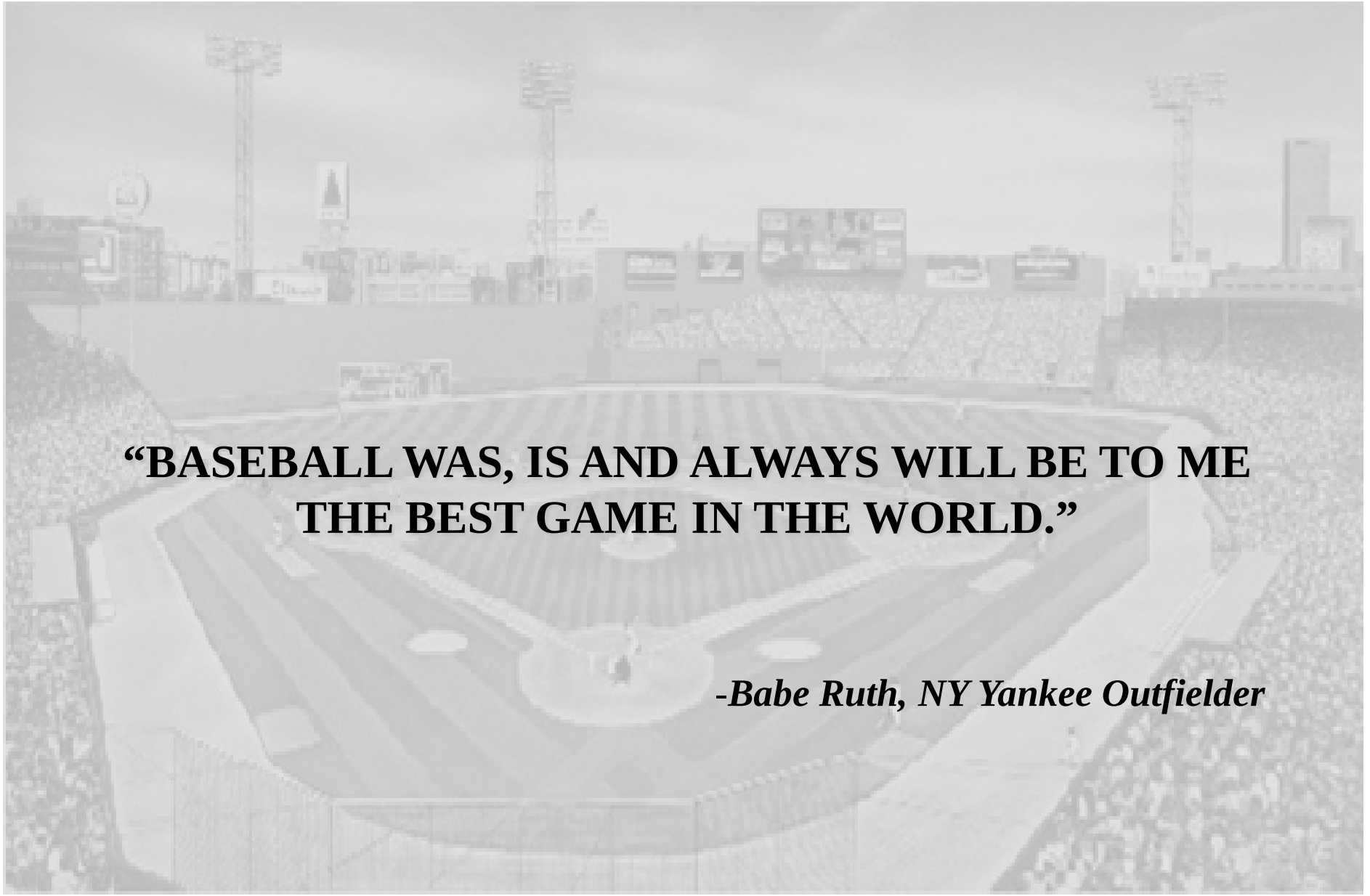


“YOU GIVE 100 PERCENT IN THE FIRST HALF OF THE GAME, AND IF THAT ISN’T ENOUGH IN THE SECOND HALF YOU GIVE WHAT’S LEFT.”

- Yogi Berra, Yankees Catcher

“WHEN I WAS A SMALL BOY IN KANSAS, A FRIEND OF MINE AND I WENT FISHING…I TOLD HIM I WANTED TO BE A REAL MAJOR LEAGUE BASEBALL PLAYER, A GENUINE PROFESSIONAL LIKE HONUS WAGNER. MY FRIEND SAID THAT HE’D LIKE TO BE PRESIDENT OF THE UNITED STATES. NEITHER OF US GOT OUR WISH.”

-Dwight D. Eisenhower
34th President of the United States



“BASEBALL WAS, IS AND ALWAYS WILL BE TO ME THE BEST GAME IN THE WORLD.”

-Babe Ruth, NY Yankee Outfielder

Questions?