



2003

National Weatherization Training Conference



**A SUMMARY OF FINDINGS FROM
THE RECENT LITERATURE ON THE
WEATHERIZATION ASSISTANCE
PROGRAM'S NON-ENERGY BENEFITS**

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LITERATURE REVIEW RECENTLY COMPLETED BY ORNL STAFF

- Updated estimates of Non-Energy Benefits from 1993 national evaluation
- Placed all Non-Energy Benefits in appropriate categories
- Identified range of values and selected point estimate for each benefit
- Annual benefits converted to Net Present Value in 2001 dollars
 - (3.2% discount rate, 20 year measure lifetime)

METHODS FOR SELECTING POINT ESTIMATES

- Tried to find all available literature
- Constructed distributions of all (credible) reported dollar values
- Chose best point estimate
 - Used expert judgment
 - Usually most of the values were clustered in one part of the range

**NATIONAL POINT ESTIMATE IS
CONSERVATIVE BECAUSE DID NOT
INCLUDE A NUMBER OF
KNOWN BENEFITS**

- Known benefits with no reported dollar values
 - Improved health and safety from dealing with CO problems
 - Reduced collection costs for utility
 - Full fuel life cycle benefits to the environment
 - Fuel extraction (e.g., coal)
 - Fuel processing
 - Transportation
 - Disposal

**NATIONAL POINT ESTIMATE IS
CONSERVATIVE BECAUSE DID NOT
INCLUDE A NUMBER OF POSSIBLE
BENEFITS THAT ARE HARD TO VALUE**

- Improved comfort
- Decreased noise
- Lead paint education
- Increased social equity
- Increased community pride

MAJOR CATEGORIES OF NON-ENERGY BENEFITS

- Ratepayer Benefits
 - Payment-Related
 - Service Provision
- Household Benefits
 - Affordable Housing
 - Safety, Health, and Comfort
- Societal Benefits
 - Environmental
 - Social
 - Economic

RATEPAYER BENEFITS: PAYMENT-RELATED

- Avoided rate subsidies
- Lower bad debt write-off
- Reduced carrying cost on arrearages (1993)
- Fewer notices and customer calls
- Fewer shut-offs and reconnections
- Reduced collection costs

RANGE OF BENEFITS AND POINT ESTIMATES FOR PAYMENT-RELATED RATEPAYER BENEFITS

Nonenergy Benefit	Range of Benefits (in 2001 \$ per Participating Household: Net Present Value)	Point Estimate of Benefits (in 2001 per Participating Household: Net Present Value)
Rate subsidies avoided	6-70	21
Lower bad debt write-off	15-3462	89
Reduced carrying cost on arrearages	4-110	57

RANGE OF BENEFITS AND POINT ESTIMATES FOR PAYMENT-RELATED RATEPAYER BENEFITS (CONT.)

Nonenergy Benefit	Range of Benefits (in 2001 \$ per Participating Household: Net Present Value)	Point Estimate of Benefits (in 2001\$ per Participating Household: Net Present Value)
Fewer notices and customer calls	0-23	6
Fewer shut-offs and reconnections for delinquency	2-15	8
Reduced collection costs	Not Available	Not Available

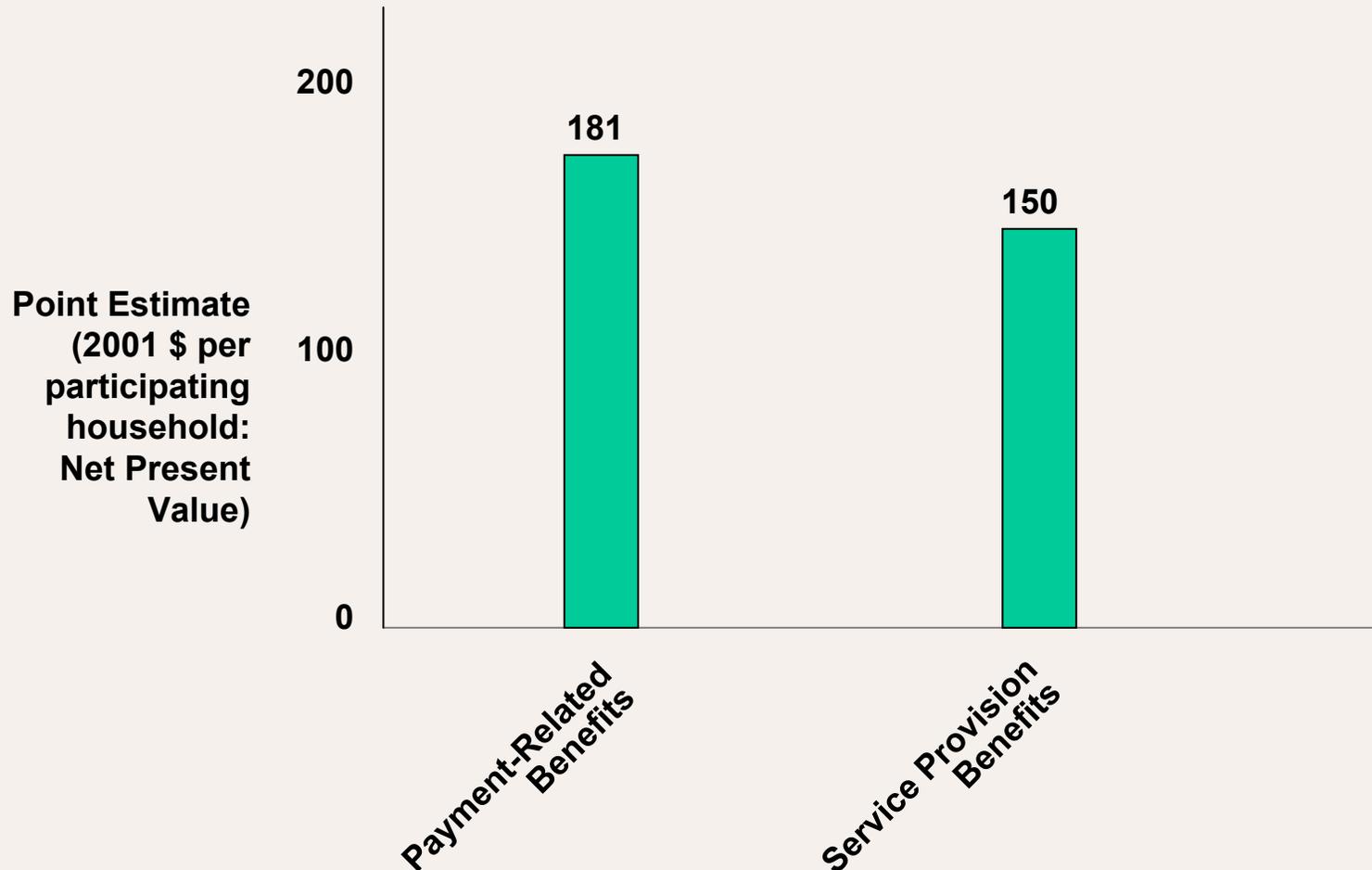
RATEPAYER BENEFITS: SERVICE PROVISION

- Fewer emergency gas service calls
- Transmission and Distribution loss reduction
- Insurance savings

RANGE OF BENEFITS AND POINT ESTIMATES FOR SERVICE PROVISION BENEFITS

Nonenergy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
Fewer emergency gas service calls	39 - 201	101
T&D loss reduction	33-80	48
Insurance savings	0-2	1

AVERAGE LIFETIME MONETARY VALUE OF RATEPAYER BENEFITS, BY TYPE



HOUSEHOLD BENEFITS: AFFORDABLE HOUSING

- Water and sewer savings
- Property value benefits
- Avoided shut-offs and reconnections
- Reduced mobility
- Reduced transaction costs

RANGE OF BENEFITS AND POINT ESTIMATES FOR AFFORDABLE HOUSING BENEFITS

Nonenergy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
Water and sewer savings	62-1607	271
Property value benefits*	0-5413	180
Avoided shut-offs and reconnections	0-52	17
Reduced mobility	0-1460	278
Reduced transaction costs	0-131	37

*Occurs one time only in year weatherization is performed

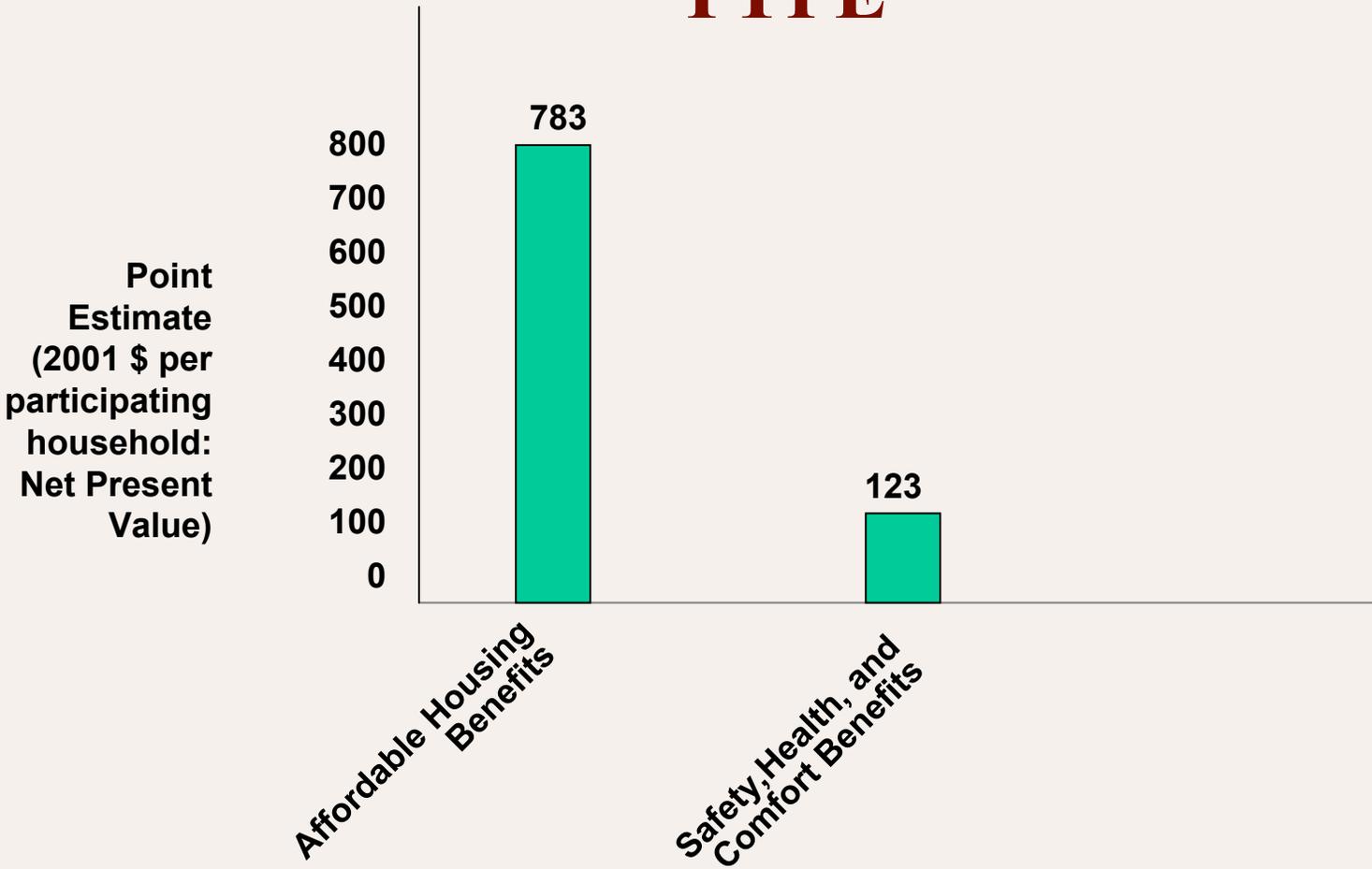
HOUSEHOLD BENEFITS: SAFETY, HEALTH, AND COMFORT

- Fewer fires
- Fewer illnesses
- Improved comfort and related factors

RANGE OF BENEFITS AND POINT ESTIMATES FOR SAFETY, HEALTH, AND COMFORT BENEFITS

Nonenergy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
Fewer fires	0-555	68
Fewer illnesses	0-2191	55
Improved comfort and related factors	Not Available	Not Available

AVERAGE LIFETIME MONETARY VALUE OF HOUSEHOLD BENEFITS, BY TYPE



SOCIETAL BENEFITS: ENVIRONMENTAL

- Air Emissions
 - Carbon
 - Sulfur oxides
 - Nitrogen oxides
 - Carbon monoxide
 - Methane
 - Particulate matter
- Heavy metals
- Fish impingement
- Waste water and sewage

RANGE OF BENEFITS AND POINT ESTIMATES FOR ENVIRONMENTAL BENEFITS

Nonenergy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
<i>Air Emissions - Natural Gas</i>		
Carbon (CO ₂)	40 - 32,189	102
Sulfur Oxides (SO _x)	.02 - 6015	23
Nitrogen Oxides (NO _x)	.02 - 2254	48
Carbon Monoxide (CO)	.21 - 758	46
Methane (CH ₄)	.07 - 269	92
Particulate Matter (PM)	.01 - 6983	9
Subtotal	40 - 49,176	320

RANGE OF BENEFITS AND POINT ESTIMATES FOR ENVIRONMENTAL BENEFITS (Continued)

Nonenergy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
<i>Air Emissions - Electricity</i>		
Carbon (CO ₂)	167 - 97,857	305
Sulfur Oxides (SO _x)	31 - 40,872	92
Nitrogen Oxides (NO _x)	11 - 17,290	523
Carbon Monoxide (CO)	36 - 81	39
Methane (CH ₄)	.68 - 1.15	.91
Particulate Matter (PM)	.27 - 704	14
Subtotal	246 - 156,805	974

*Uses natural gas emissions for air emissions

RANGE OF BENEFITS AND POINT ESTIMATES FOR ENVIRONMENTAL BENEFITS (Continued)

Nonenergy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
<i>Other Benefits</i>		
Heavy Metals	1.39 - 17,205	380
Fish Impingement	23.44 - 23.44	23.44
Waste Water and Sewage	3.36 - 657	146
Subtotal	28 - 17,885	549
Total*	68 - 67,061	869

*Uses natural gas emissions for air emissions

SOCIETAL BENEFITS: SOCIAL

- Avoided unemployment benefits

RANGE OF BENEFITS AND POINT ESTIMATES FOR SOCIAL BENEFITS

None energy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
Avoided Unemployment Benefits*	0 - 183	117

*Occurs one time only in year weatherization is performed

SOCIETAL BENEFITS: ECONOMIC

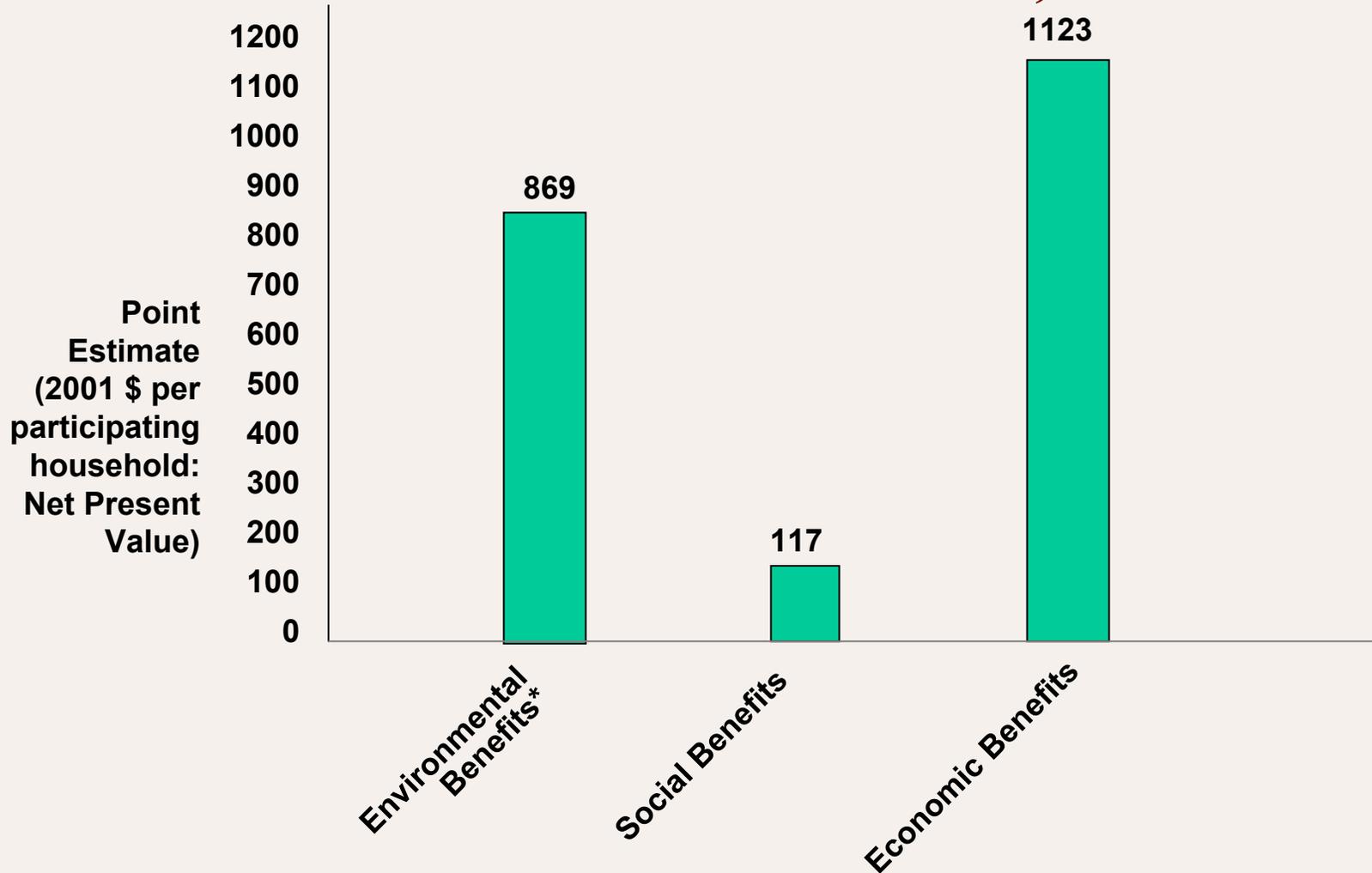
- Direct and indirect employment
- Lost rental
- National security

RANGE OF BENEFITS AND POINT ESTIMATES FOR ECONOMIC BENEFITS

Nonenergy Benefit	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
Direct and Indirect Employment*	115 - 4354	801
Lost Rental	0 - 2.19	1.14
National Security	75 - 3286	321
Total	190 - 7642	1123

* Occurs one time only in year weatherization is performed

AVERAGE LIFETIME MONETARY VALUE OF SOCIETAL BENEFITS, BY TYPE



*Using natural gas estimates for air emissions

RANGE OF BENEFITS AND POINT ESTIMATES FOR ALL NON-ENERGY BENEFITS

Nonenergy Benefit Category/Subcategory	Range of Benefits (in 2001 \$ per participating household: Net Present Value)	Point Estimate of Benefits (in 2001 \$ per participating household: Net Present Value)
Ratepayer Benefits		
Payment-Related Benefits	27-3680	181
Service Provision Benefits	72-283	150
Total for this Category	99-3963	331
Household Benefits		
Affordable Housing Benefits	62-8663	783
Safety, Health, and Comfort Benefits	0-2746	123
Total for this Category	62-11,409	906
Societal Benefits		
Environmental Benefits	68-67,061	869
Social Benefits	0-183	117
Economic Benefits	190-7642	1123
Total for this Category	258-74,886	2109
Total for All Benefit Categories	419-90,258	3346

ECONOMIC, ENVIRONMENTAL AND AFFORDABLE HOUSING BENEFITS HAD THREE HIGHEST POINT ESTIMATES IN ORNL ANALYSIS

- Economic benefits = \$1123
 - Employment highest component (\$801)
- Environmental benefits = \$869
 - Used natural gas, electricity would be higher
- Affordable housing benefits = \$783
 - Highest components are reduced mobility, water and sewer savings and increased property values

UNCERTAINTY RELATED TO POTENTIAL VALUE OF BENEFITS

- Air emissions highest uncertainty and highest potential value (possibly more than \$100,000 for electricity)
 - Value is highly uncertain because
 - depends on many factors
 - methods are used that produce very different results
- Less uncertainty and lower values for household (\$906) and utility rate payer (\$331) benefits than for societal benefits (\$2109)

CONCLUSIONS

- Total point estimate for all Non-Energy Benefits is \$3346
- This estimate is substantially higher than figure from 1993 national evaluation
- Difference between the two estimates is largely because new study quantified much broader array of Non-Energy Benefits. Where same benefits were estimated results were similar in the two studies.
- New point estimate for Non-Energy Benefits is slightly greater than the value of energy savings and much greater than weatherization costs