

RECYCLING & INTEGRATED PLANNING:

Steps for the Most Cost-Effective GHG Reduction Strategies

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MANY SOLID WASTE MANAGEMENT OPTIONS FOR COMMUNITIES

- Incentives
- Programs/services
 - City / private
- Policies/legislation
- Infrastructure/facilities
 - City / private



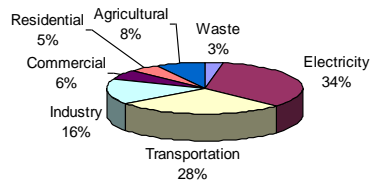
COMMUNITIES HAVE MULTIPLE GOALS & DRIVERS ...

- Extending landfill life; address overuse
 - Cheaper, more nimble than new infrastructure
- Improving efficiency of diversion
- Citizen demand / Politics
- Goals / diversion / mandates (tons)
- Total Cost and Cost efficiency
- Environmental impacts (GHG, toxicity, resources), jobs, other goals

Scores of potential choices... How to select...?

US GREENHOUSE GAS EMISSIONS SOURCES - CONVENTIONAL

Electricity, building energy use responsible for about 1/3 of GHG emissions



Source: USEPA, 2005

PERSPECTIVE: PROGRAMS MODELED

- Solid waste:
 1. Pay-as-you-throw (PAYT)
 2. Residential curbside recycling (CS Recy.)
 3. Yard waste (composting not AD)
- Calculation approach (tons → GHG; costs...)

(Base case, normalized)



ENERGY ALTERNATIVES ANALYZED



Residential Weatherization (Res EE)

Programs, generation, including renewables...

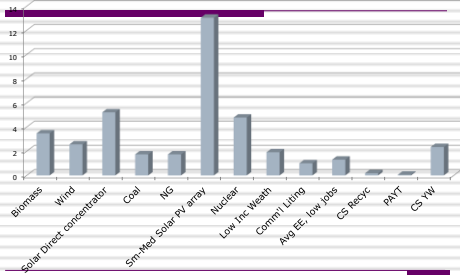
Commercial Lighting (Com EE)

Wind

Solar



Relative Cost per MTCO2e



Relative to Com'l Lighting=1

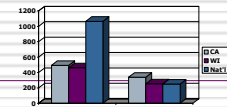


RELATIVE JOB IMPACTS

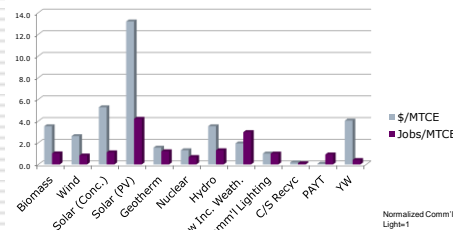


JOB CREATION ALSO DIFFERENTIATES PROGRAMS

- Direct install, broad programs create more jobs
- Fewer jobs from appliance programs
 - No installation
 - Equipment not all made in US or the relevant state
- Recession...



RELATIVE COST, JOBS PER MTCE FOR RECYCLING & ENERGY



Source: Phase 1 draft figures, Skumatz Economic Research Associates, Inc. (SERA) Superior, CO. All rights reserved. May be used with permission of author.



OTHER CONSIDERATIONS / POLICY GOALS

- Cost
- Environmental
- Jobs
- Perspective / Authority
- Speed
- Retention
- NEBs
- Other



OTHER PROGRAM CONSIDERATIONS

- Authority to implement
 - Perspectives – city / county vs. utility
 - Cities / counties may also consider recycling, transportation, other strategies
 - Conducted similar analysis of recycling programs

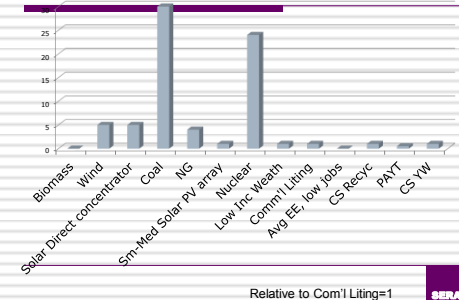
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OTHER POLICY CONSIDERATIONS

- Speed & coverage
 - Affected by budgets, potential
 - Some programs fast ... some ramp-up
 - Relatively large size per commercial installation helps speed MTCE achievements
 - Cost, training, verification, etc. of weatherization programs can slow ramp up
 - Ramp-up comparisons; budget staging

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TIME TO RAMP UP TO DELIVERY MTCE - RELATIVE



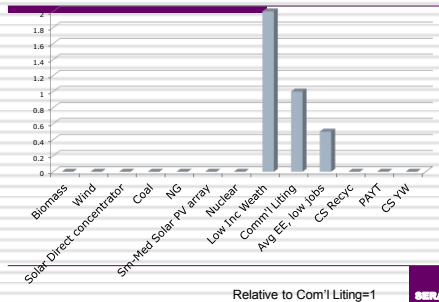
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OTHER POLICY CONSIDERATIONS

- Indirect benefits
 - Significant value - multiples of direct impacts
 - Societal (mostly enviro & jobs, but...)
 - Utility
 - Participant – maximize full value given budget...?
- Out of pocket costs / funding (different perspectives)
- Reliability, many others...

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PARTICIPANT EFFECTIVE AS A RATIO OF DIRECT EFFECTS



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OTHER PROGRAM CONSIDERATIONS

- Retention
 - Reflected in EULs / lifetimes
 - Lower for CFL programs; higher for weatherization / retrofit
 - Consider consistently in cost computations
 - Values for behavioral as potential part of portfolio not well demonstrated...

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PROGRAM / PORTFOLIO SELECTION

- Integrated planning in MTCE terms
- Multi-objectives
 - Beyond kWh, kW, B/C
 - Craft portfolios beyond technical, economic, etc...

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MULTI-ATTRIBUTE PRIORITY ASSIGNMENTS

	Weights (1)	Wgts (2)	Wgts (3)
Three weighting scenarios			
Cost/MTCE	100%	40%	60%
1 / jobs	0%	30%	15%
Speed	0%	30%	15%
Authority	0%	0%	0%
Other	0%	0%	10%

Retention, NEB, funding, other...

Costs per kWh, cost per MTCE, and many other criteria

Source: Phase 1 project figures, Skumatz Economic Research Associates, Inc. (SERA) Superior, CO.

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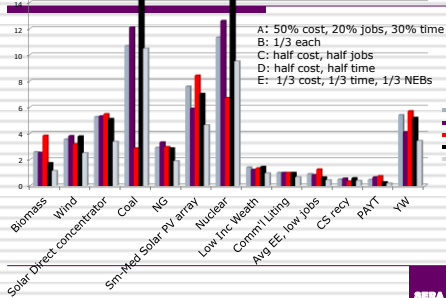
MULTI-ATTRIBUTE PRIORITY ASSIGNMENTS

Low score is best	Unit1	Unit2	Est1	Est2	Lamp	CFL	Com1	Com2	Com3	ComExp
Rank Weights 1 (all cost)	8	6	3	5	1	2	10	4	7	8
Rank Weights 2 (40% cost, 30% jobs, 30% speed)	9	4	5	2	7	1	10	3	5	8
Rank Weights 3 (60% cost, 15% jobs, 15% speed, 10% other)	9	6	3	5	3	1	10	2	7	8

Source: Phase 1 project figures, Skumatz Economic Research Associates, Inc. (SERA) Superior, CO.

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SCORES UNDER DIFFERENT WEIGHTS



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INTEGRATED PLANNING FOR MTCE OBJECTIVE

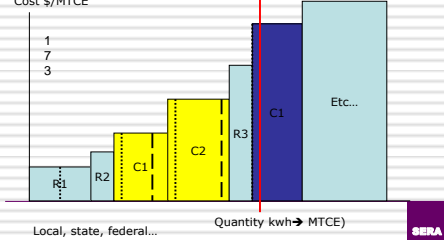
SUPPLY CURVES

- Total (previous), cumulative
- Annual (EE smaller, SW exhaust faster)
- Delivery supply curve...

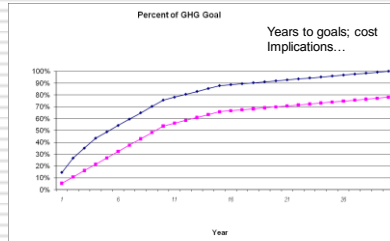
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DEVELOPING PORTFOLIO – MULTI-ATTRIBUTE

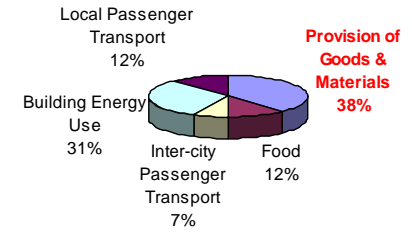
Rankings →	2	3	4	5	6	Dotted line 1 year
Under weights	1	5	3	2	4	Dashed line 10 year
Cost \$/MTCE	1	3	2	5	6	



MAPPING PATH TO GHG GOAL INCLUDING DIFFERENT PROGRAMS (YEARS & PROGRESS)



US GREENHOUSE GAS EMISSIONS (REVISED)



Source: USEPA (Prelim); from Allaway (ORDEQ)

WHAT WORKS? PROGRAM AND COST ANALYSIS

Tradeoffs and cost-effectiveness within Solid Waste Options...

EFFICIENT, EFFECTIVE PROGRAM OPTIONS / "WINNERS"

	High Diversion Impact	Strong Cost Savings
Pay As You Throw (PAYT); incentives	√	C/E
Every Other Week (EOW) Recy, YW, Gbg	√	√
Single Stream, fewer streams; containers	√	√
Education	?	?
Mandates and Bans	√	√

Others as well: analyzed containers, sign-ups, charge structures, same day, Curbside, landfill costs, etc.

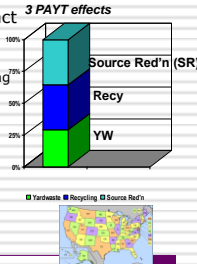
Source: Skumatz Economic Research Associates, Inc. analysis

PAY-AS-YOU-THROW / RECYCLE & \$AVE



PAYT - EFFECTIVE AND COST-EFFECTIVE

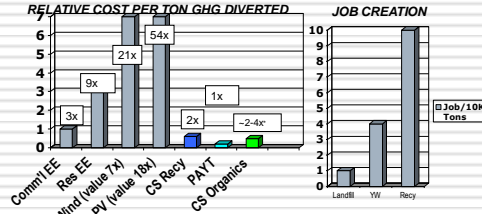
- Effectiveness – biggest impact
 - Includes waste prevention
 - More C/E than alternatives
 - One of top 3 drivers from leading US states
- Strengths & Weaknesses
 - Political will
 - Ordinance vs. Contract
 - Why Cities, Haulers should favor PAYT
 - BMPs – recycling, size, containerization, incentive



Source for graphs and figures: Skumatz Economic Research Associates, Inc. Source for top 3 drivers: Skumatz & Freeman / SERA, "Colorado Roadmap Report, 2008."

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CHEAPER PER MTCE AND STRONG JOB CREATION IMPACTS



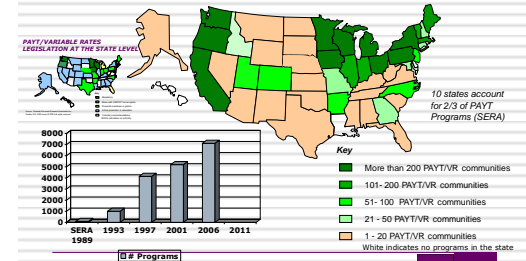
Results show key MSW programs cheaper to reduce CO2 than EE. PV, Wind high cost per MTCE.

Source: Skumatz Economic Research Associates, Inc. SERA, Superior, CO. All rights reserved. Draft. Used with permission of author. Source for Job Creation - Institute for Local Self-Reliance website.

*Organics figures Vary based on model

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PAY-AS-YOU-THROW (PAYT)/ VARIABLE RATES COMMUNITIES

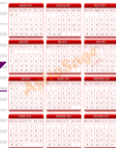


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EFFICIENCIES: ALTERING COLLECTION FREQUENCY

- It's all about the stops!
- Every other week (EOW) recycling
 - Lose some recycling
 - Significant savings – ~half the stops/labor/equipment
 - Carts, education
- EOW – Add Yard Waste or YW+Food
 - Alternate Recy / Organics – nearly "free" (only tip change)
 - Lose percentage points – GAIN whole new stream! & already separate!
- EOW trash
 - Optional vs. system wide; multiple examples; optimize STOPS
 - Tailor collections to need (YW weekly? EOW Trash?)



Source: Skumatz Economic Research Associates, Inc. analysis

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EFFICIENCIES: SINGLE STREAM RECYCLING & LARGE CARTS

- Strong quantitative impacts from fewer streams & large containers
 - IF processing infrastructure available
 - Higher recycling
 - (participation, convenience, diversion)
 - Significant cost savings (autom)
 - MF and Commercial Benefits
 - Glass issue...
- Progress in recycling collection must stay parallel with trash collection
- 96 gallon containers are a huge source of the impact (even without SS)!



Source: Skumatz Economic Research Associates, Inc. analysis

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WHERE DOES EDUCATION FALL?

- Comp plans & stakeholder meetings always recommend / agree on education...
 - No one has to DO or CHANGE anything...
- Impacts rarely measured
 - SERA study / gathered data on 130 campaigns
 - Same kind of statistical analysis
 - Comparison to SERA research on CBSM



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WHAT WORKS? PROGRAM & COST ANALYSIS

Source: SERA 1996-2005
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MAKING EDUCATION & OUTREACH MORE EFFECTIVE

- Don't focus on traditional outreach.
- Self-efficacy
- Market indirect benefits
- Social marketing ROI (CBSM)



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WHERE IS THE "BIG BANG" FOR THE BUCK?

- Mandates & Bans

Spend the capital where there's impact...



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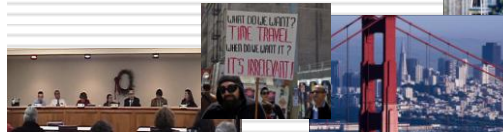
WHAT WORKS? PROGRAM AND COST ANALYSIS

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EFFICIENCIES: MANDATES / BANS

- Mandatory Pay, Mandatory SSO, Bans
 - Similar; in place in the most successful cities
 - Recycling, organics
- Residential & Commercial programs
- Enforcement key to success
 - Where, who, penalties – many options
- Barriers? Political will.



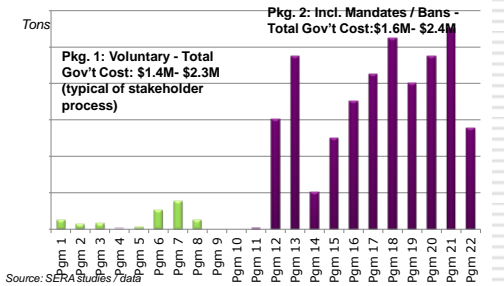
BANS, MANDATES – SETTING THE STAGE

- Processing capacity (chicken / egg)
- Space for recycling
- Enforcement capacity
- Technical assistance & education

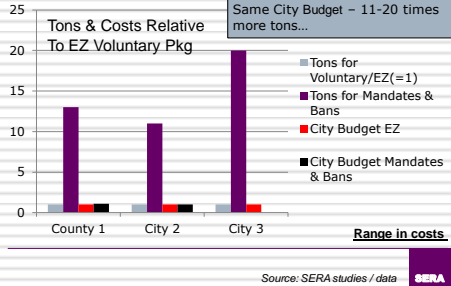
- Overall –
 - economics and
 - politics



RECENT SERA STUDY - IMPACT COMPARISON



COMPARISON - EASY (EZ) VS. MANDATES / BANS



OTHER

- Certainly other options, streams, etc. (C&D), but...



DECISION-MAKER DILEMMA



Political will?

High impacts, mandates, big changes, low \$

Low impact, voluntary / incentives / encourage, don't rock the boat

MAKING SENSE OF THIS? WHAT DO THE NUMBERS SAY?

- Quantitative guidance - large opportunity to increase diversion **efficiently!**
 - Consider BEFORE new infrastructure (\$) (demand side)
 - Options -incentives, EOW, SS/containers, Education, mandates, new streams
- To reach highest levels of diversion - if goals are important - might have to act aggressively...
 - Pussyfooting won't do it...spend political capital where it will make a difference...



THANK YOU!!

Questions?

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