Choice architecture in a new domain: applying defaults to an infrastructure-planning tool.

Tripp Shealy, Ph.D. Candidate
Glenn Department of Civil Engineer
Clemson University

The infrastructure we build today locks in energy use for many decades ahead.

Let's focus on engineers decisions, not consumers, to reduce energy!

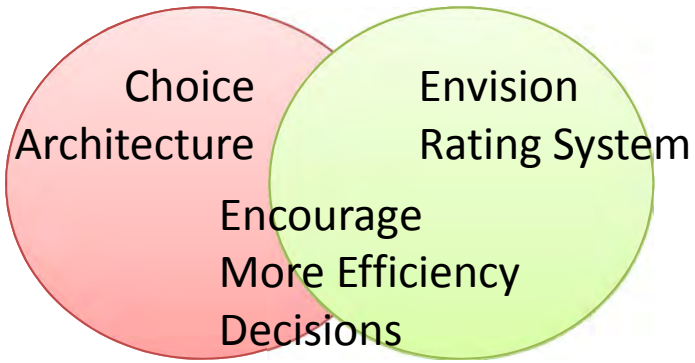
Roads, bridges, and buildings often have a service life over 50 years.

Lots of opportunities to help engineers make more informed decisions and reduce energy consumption.

- Rating Systems
- Building Codes
- Energy Modeling Software

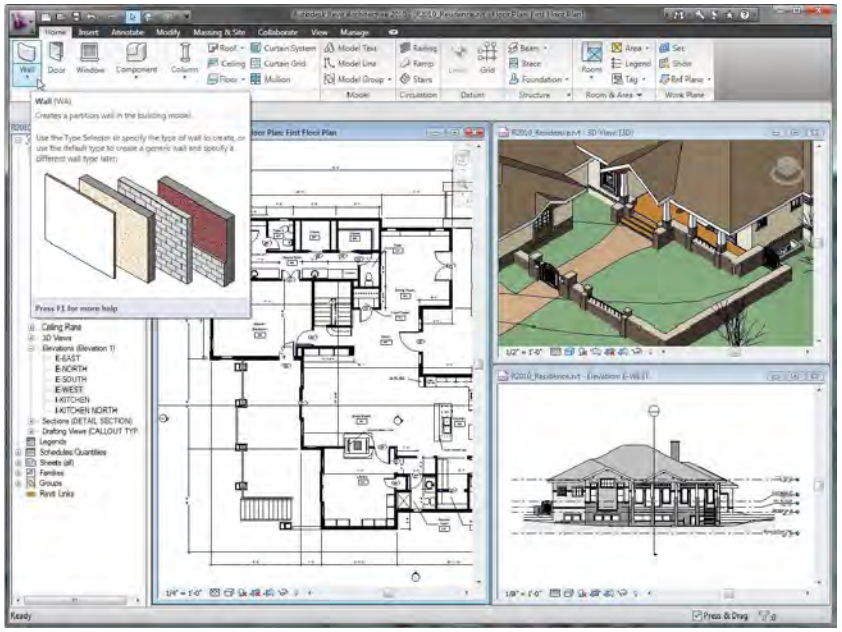
I hypothesize choice architecture can help engineers chose more sustainable options.

1. Choice architecture
2. Application to an engineering decision tool
3. Empirical study with students and professional engineers



Choice architecture is how the information is presented and how this influences the decision.

Just as a building architect influences the use of a space, a choice architect influences how options are perceived.



A choice is not being made, only the environment is being changed.

Envision is similar to LEED except only infrastructure.

Preliminary Design Process:

Berkeley, California:
Envision is used to prioritize backlogged projects. Projects with highest potential points move up.

San Antonio, Texas:
Envision used as judging criteria during design competition for Port Development.

Reston, Virginia:
Envision is used by stakeholders to approve or reject design proposals.

QUALITY OF LIFE 13 Credits | LEADERSHIP 10 Credits | RESOURCE ALLOCATION 14 Credits | NATURAL WORLD 15 Credits | CLIMATE AND RISK 8 Credits

QL1.3 DEVELOP LOCAL SKILLS AND CAPABILITIES

Environmental Neutral

LEVELS OF ACHIEVEMENT

IMPROVED (1 points)	ENHANCED (2 points)	SUPERIOR (5 points)	CONSERVING (12 points)	RESTORATIVE (15 points)
Hire Locally	Disadvantaged groups	Specific skills outreach	Local capacity development	Long-term competitiveness

Levels of Achievement	*Standard*	*Endowed*
Industry Norm	★ *0 points*	*(-12)*
Improved	*1*	*(-11)*
Enhanced	*2*	*(-10)*
Superior	*5*	*(-7)*
Conserving	*12*	★ *12 points*
Restorative	*15*	*(+3)*

★ Starting point *and new reference point*

Small changes in choice architecture (how we design options) can have a big impact on outcomes.

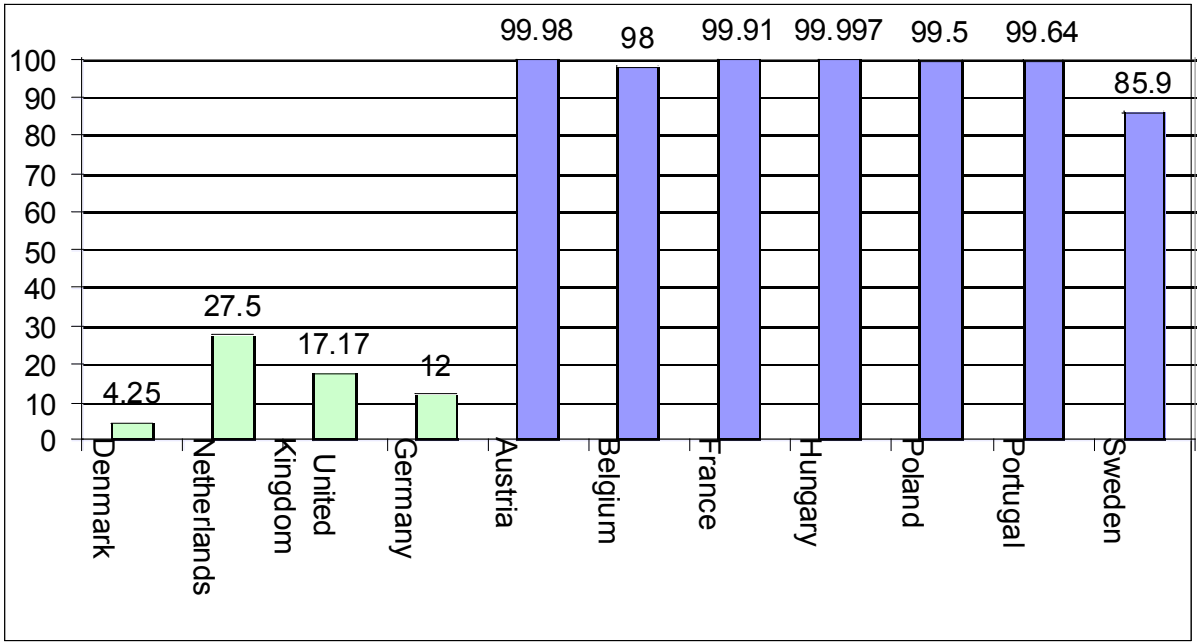
1. Setting a Default: Organ donors (Johnson and Goldstein, 2003)

Opt-in

15% donor rate

Opt-out

93% donor rate

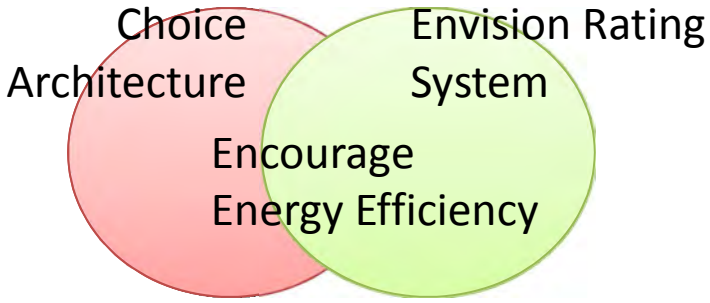


Small changes in choice architecture (how we design options) can have a big impact on outcomes.

2. Endowment Effect

- Chinese worker productivity and bonuses (Hossain and List, 2009).
- Student grades (Smith and Smith, 2009).

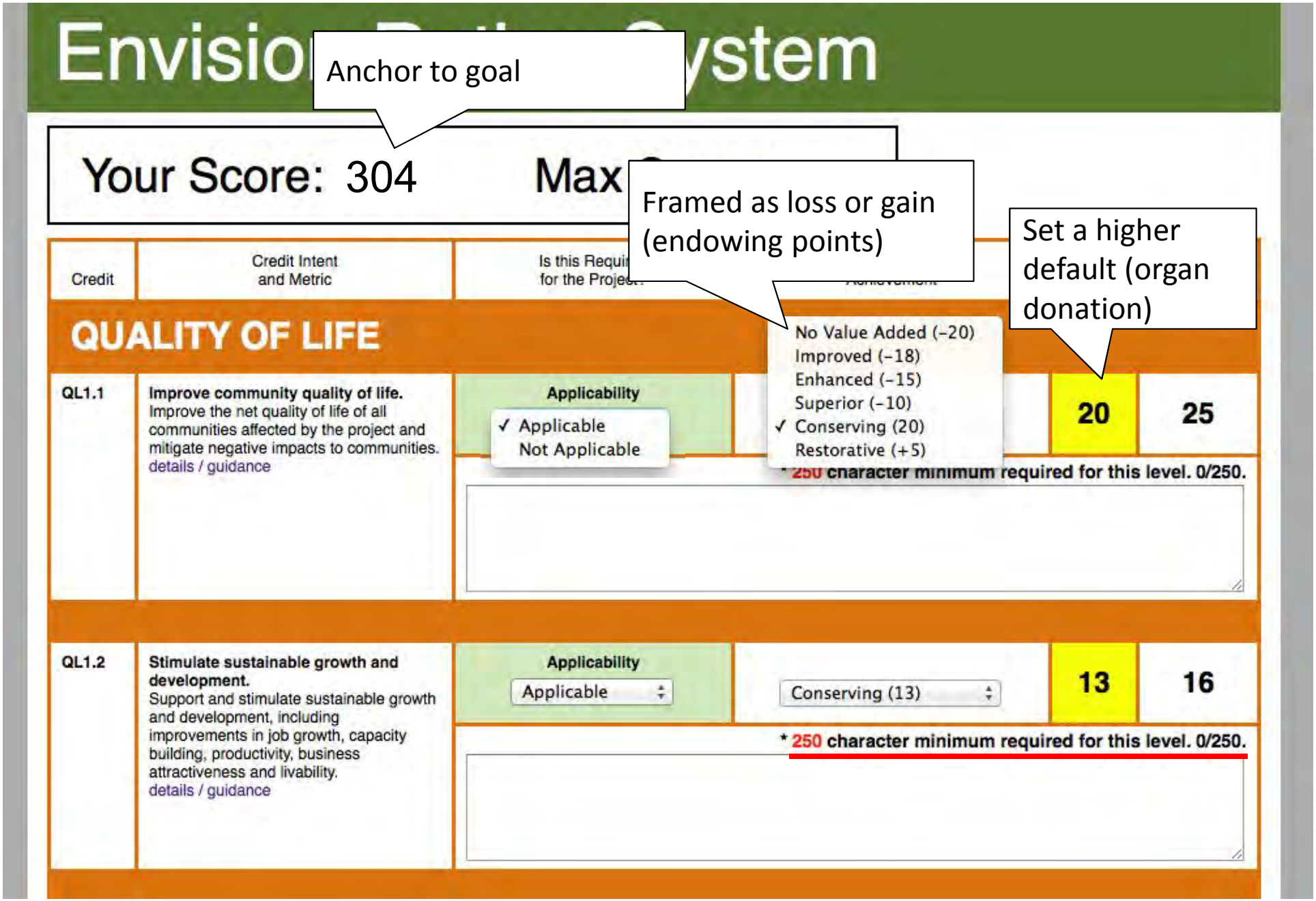
1. Defaults (organ donation)
2. Endowment Effect (Chinese factory)



Envision Rating System

Your Score: 0 **Max Score: 384**

Credit	Credit Intent and Metric	Is this Required for the Project?	Level of Achievement	Score	Possible Points
QUALITY OF LIFE					
QL1.1	**Improve community quality of life.** Improve the net quality of life of all communities affected by the project and mitigate negative impacts to communities. details / guidance	**Applicability** ✓ Applicable / Not Applicable	✓ No Value Added (0) / Improved (2) / Enhanced (5) / Superior (10) / Conserving (20) / Restorative (25)	0	25
					…um requirement met.
QL1.2	**Stimulate sustainable growth and development.** Support and stimulate sustainable growth and development, including improvements in job growth, capacity building, productivity, business attractiveness and livability. details / guidance	**Applicability** Applicable	No Value Added (0)	0	16
					* 0 character minimum requirement met.

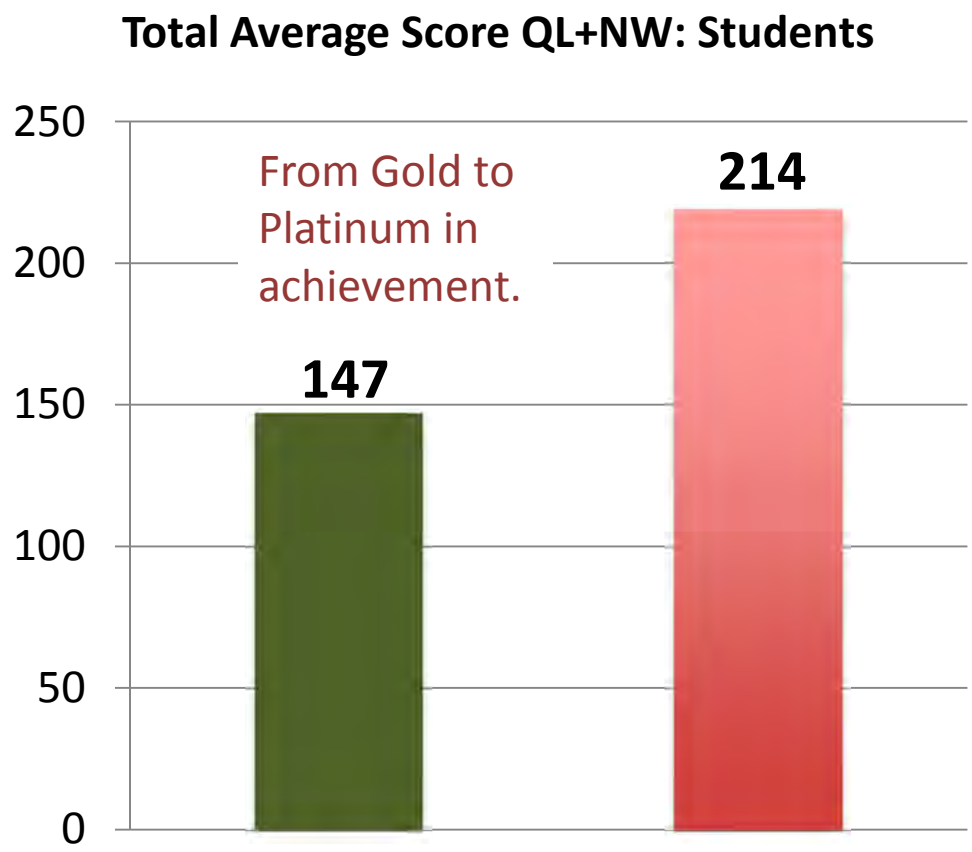

Envisio ystem
Anchor to goal
Your Score: 304
Max
Framed as loss or gain (endowing points)
Set a higher default (organ donation)
Credit
Credit Intent and Metric
Is this Requi for the Projec
QUALITY OF LIFE
No Value Added (-20)
Improved (-18)
Enhanced (-15)
Superior (-10)
✓ Conserving (20)
Restorative (+5)
QL1.1
Improve community quality of life.
Improve the net quality of life of all communities affected by the project and mitigate negative impacts to communities.
details / guidance
Applicability
✓ Applicable
Not Applicable
20
25
* 250 character minimum required for this level. 0/250.
QL1.2
Stimulate sustainable growth and development.
Support and stimulate sustainable growth and development, including improvements in job growth, capacity building, productivity, business attractiveness and livability.
details / guidance
Applicability
Applicable
Conserving (13)
13
16
* 250 character minimum required for this level. 0/250.

Students were randomized to receive Envision version and given 26 questions from Quality of Life and Natural World.

Case Study: Rural Alabama town redevelopment project.

- Plan includes “complete streets.”
- Upgrade to cultural resources.
- Supports local character of Main Street.

Endowed student group scored significantly higher, a 20% increase in sustainability achievement.

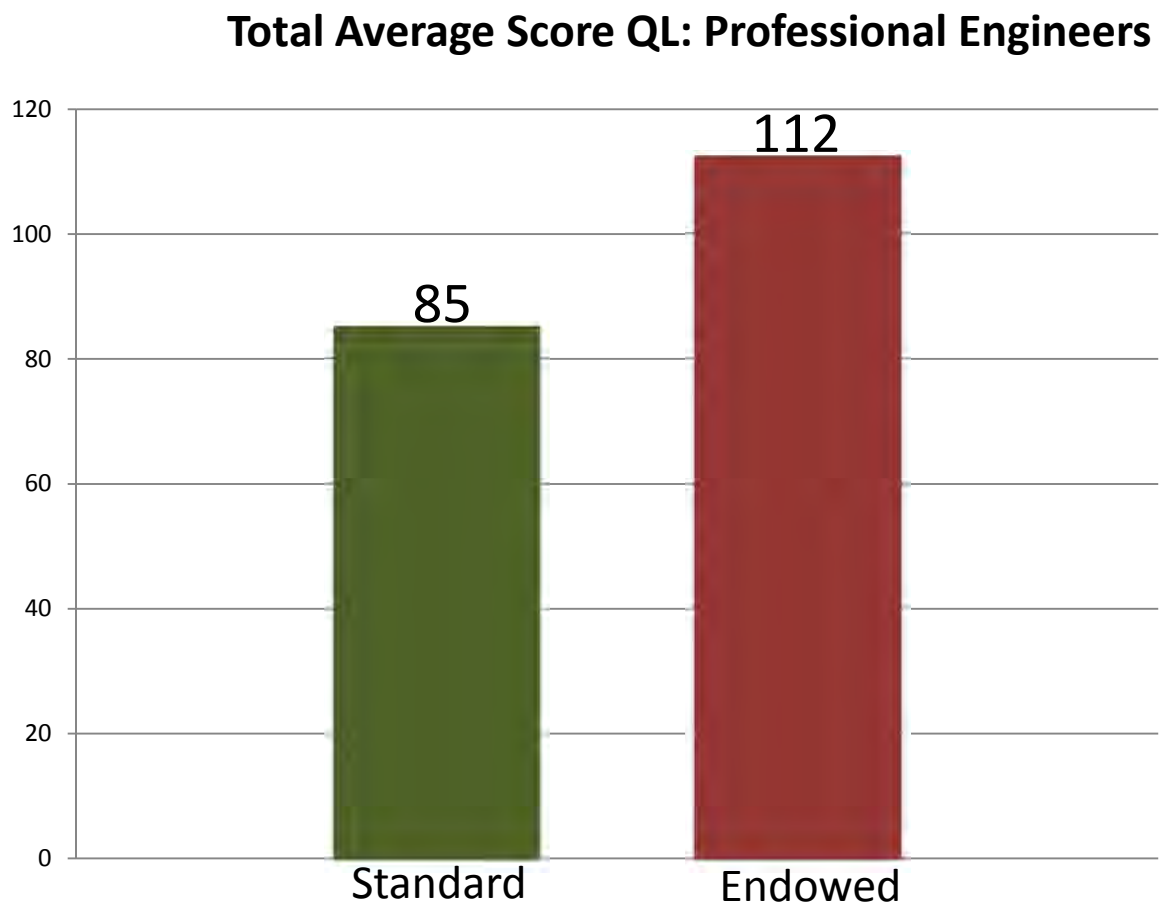


	Standard	Endowed
n	*25*	*16*
SD	*65*	*66*
p	*0.00164*	

Small shift in choice environment had a big impact on decision making.

65 professional engineers used the same case study, assigned Envision points to project details.

Endowed professional group scored significantly higher, a 24% increase in sustainability achievement.



	Standard	Endowed
n	*32*	*33*
SD	*40*	*42*
p	*0.005*	

- Limitation: This was only a planning session to teach about Envision.
- This may not change the project outcome but starting with a higher goal can only help.
- We saw no change in motivation in groups.

Small changes in engineering decision frameworks can help set higher energy efficiency goals.

Levels of Achievement	*Standard*	*Endowed*
Industry Norm	★ *0 points*	*(-12)*
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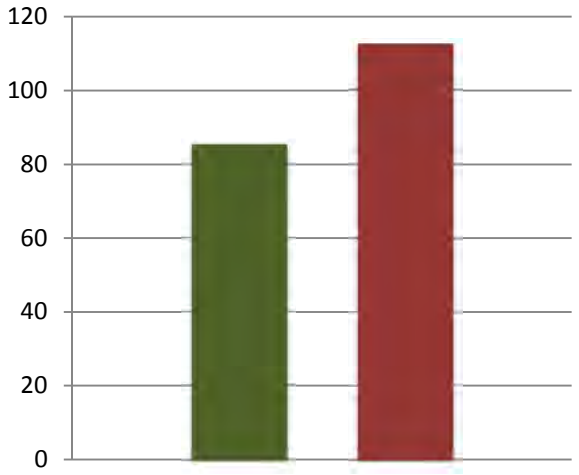

We can create big energy reductions by focusing on engineering decisions. What other engineering tools could we apply this?