Tree Shade for Energy Savings

Proposed New Program to SAG
December 15, 2015

ELEVATE ENERGY
Smarter energy use for all

Metropolitan Mayors Caucus

Program Idea

- Plant trees for strategic energy savings
- Target single family homes with yards
- Energy benefits from trees
  - Direct Shading to reduce cooling
  - Evaporative cooling/ heat island impacts
  - Winter wind reduction/air infiltration in winter
- Distribute small, hardy trees
- Educate about tree planting and care
- Realize savings long term

Background – Trees as EE measure

- EE measure for the building exterior
- Trees must be strategically placed
  - Can have negative impacts (winter shading)
- Trees grow over time
  - Benefits begin in 5-10 years
  - Continue for 40+ years
- Multiple co-benefits
- Utilities now use tree planting programs

Background - Science

- US Forest Service has studied and modeled ‘ecosystem services’ from trees
  - Chicago Urban Forest Climate Project (1993)
    - 3 trees shading west wall reduce energy for:
      - Cooling by 7%
      - Peak cooling by 6%
  - Midwest Community Tree Guide (2005)*
    - Recommends trees as cost-effective strategy
    - Other regional tree guides produced

Background - Science

- US Forest Service
  - Carbon Dioxide Reduction Through Urban Forestry (1999)
    - Detailed modeling specific for many variables
  - Refining **models** for 2 decades
    - UFORE
    - i-Tree current model*
      - Complex involving multiple environmental benefits
      - Suite of tools to maximize management of trees for benefits

*more later

Background – Existing Utility Programs

- Alliant Energy (Iowa)
  - 62,000 trees since 2001
- Trico Electric (Tuscon)
- Idaho Power
  - 4000 trees, 5 million kWh saved over next 20 years
- Baltimore Gas & Electric
  - 21,000 trees, 34 MWh and 1.4 million therms (lifetime savings)

Background – Existing Utility Programs part of Portfolio

- Sacramento Municipal Utility District
  - Contracts with Lawrence Berkeley National Lab & US Forest Service for verification
  - Report savings in portfolio standards
- City of Roseville, CA
  - Navigant's EMV report showed acceptable results
  - Annual savings at tree maturity is 170 kWh

Background – Energy Saving Trees Program

Welcome! *(Step 1 of 4)*

Welcome to Energy-Saving Trees, a free service to plant trees on your property. Get started by entering your address below:

Street address
754 Aztec,

City, State
carol stream, il

ZIP code
60108

Utility company
ComEd

Promotion
Fall 2015- mailed to you
2-3 ft , bare root

Start

Save up to 20% on your summer energy bills by planting trees.

Complete the fields on the left to get started.

About Energy-Saving Trees

Energy-Saving Trees is a research-based tool intended to help homeowners and utility companies save energy and money by strategically planting trees.

Find out more

Utility partners

Utility companies across the country are becoming partners with the Arbor Day Foundation to help reduce energy use through strategic tree planting.

pepco ONCOR BGE An Exelon Company

Learn more

Program Duration

- Must consider life-cycle benefits
- Negligible benefits for 5-10 years
- Trees expected to live 40+ years
- Models use 20 and 40 year time frames
- Plan for 3 year pilot project

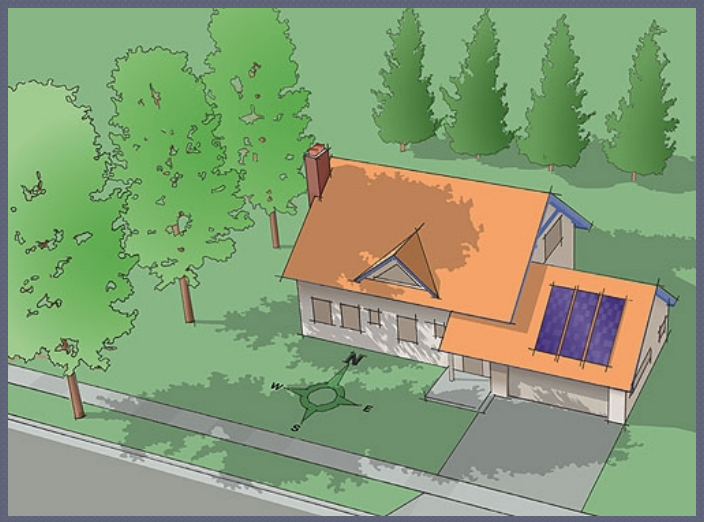
Budget

- $250,000
  - Design new program
  - Non-profit and municipal partnerships
  - Deliver 2000 new trees

  - Locally grown, hardy trees
  - Easy to transport & store
  - $40 – 140

Eligible Measures

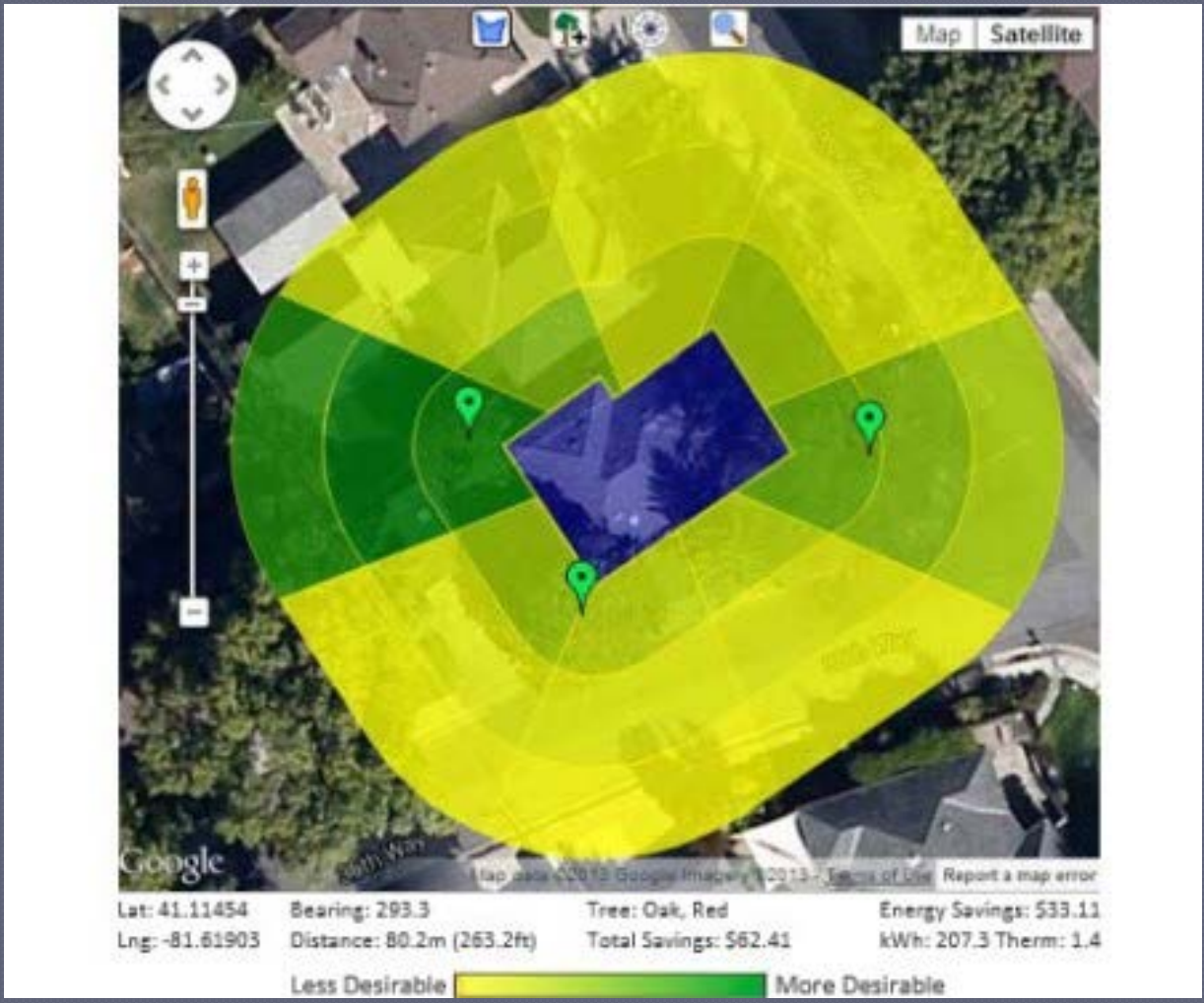
- Provide tree(s) to eligible homeowners
- Homeowner plants trees
- Municipalities and non-profits assist



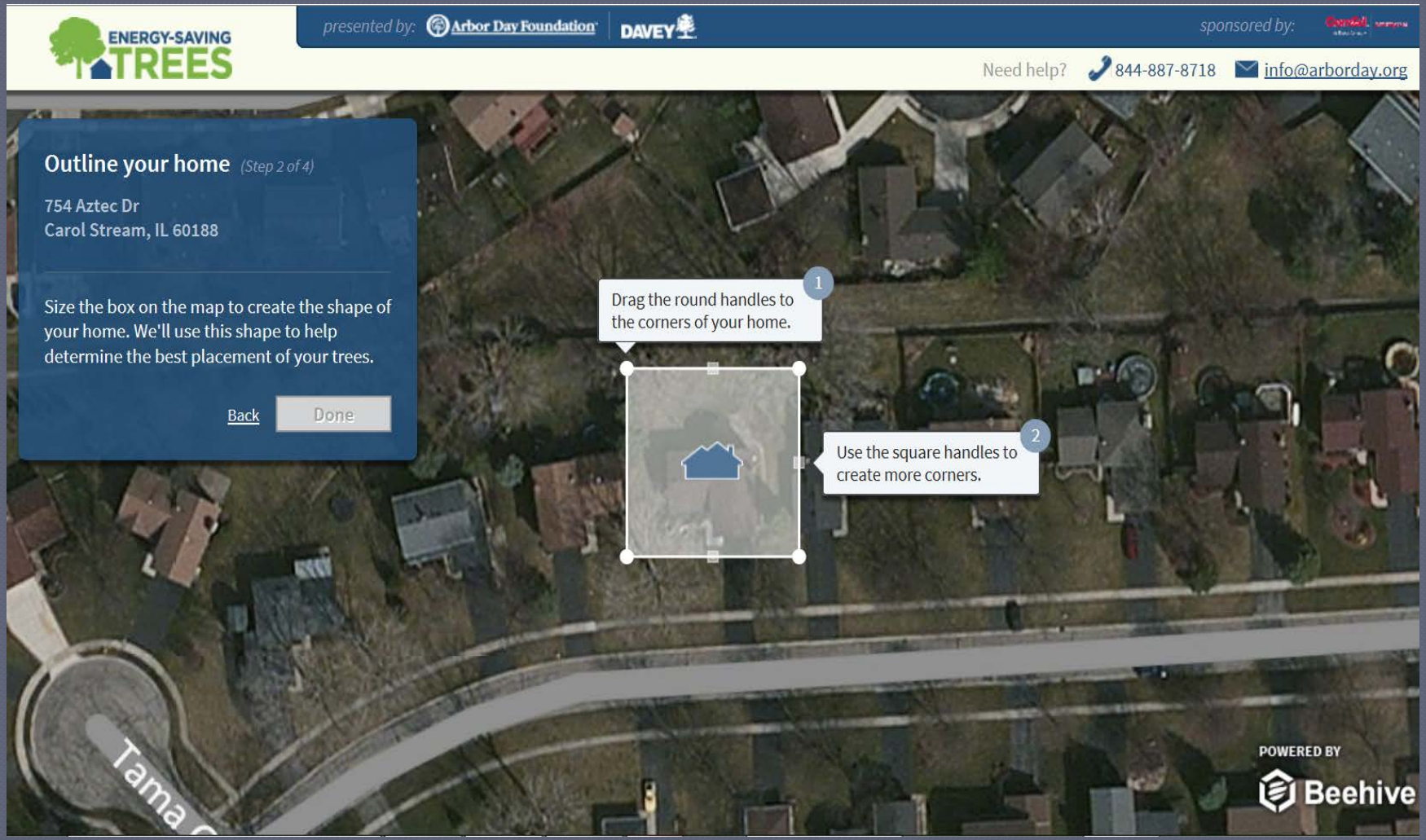
Delivery, Collaboration, Tracking

- Collaborators
  - Municipalities
  - Conservation & environmental groups
- Qualify homes with models & map tools
- Recommend planting location & tree species
- Trees distributed by local government agency
- Verification by 3rd party
  - Trees are thriving

i-Tree Design Tool



Target – suburban & exurban



Marketing Strategy

- Utilities
- Municipalities
  - High losses of trees due to emerald ash borer infestations
  - Serious tree deficit on public and private lands
  - Naperville has proven Arbor Day tree sale
  - 140 IL municipalities are ‘Tree City USA’ and hold official Arbor Day event

Estimated Annual Savings – Per Tree

Assumption - hackberry tree, 5 m from wall, 30% mortality
Source – USFS Midwest Community Tree Guide

		Yr 5	Yr 10	Yr 15	Yr 20	Yr 25	Yr 30	Yr 35	Yr 40	40 yr ave
Cooling	(kWh)									
Yard Tree:	west	74	188	254	301	323	333	334	333	268
Yard Tree :	south	30	84	140	191	233	263	283	292	189
Yard Tree:	east	47	124	181	224	250	267	275	280	206
Public Tree		26	64	103	137	161	184	201	212	136
Heating	(kBtu)									
Yard:	west	938	1987	2778	3400	3796	4028	4136	4105	3146
Yard:	south	498	885	1464	2032	2555	2955	3227	3336	2119
Yard:	east	871	1858	2663	3310	3742	4002	4131	4107	3085
Public		1041	2235	3096	3756	4149	4357	4434	4373	3430

Estimated Program Savings - Cumulative

		Year 5	Year 10	Year 15	Year 20	Year 25	Year 30	Year 35	Year 40	40 year ave
Cooling	(kWh)									
Yard Tree:	west	111,000	282,000	381,000	451,500	484,500	499,500	501,000	499,500	402,000
Heating	(kBtu)									
Yard:	west	1,407,000	2,980,500	4,167,000	5,100,000	5,694,000	6,042,000	6,204,000	6,157,500	4,719,000
Cumulative savings 5-40 yrs	(kWh)		555,000	1,965,000	3,870,000	6,127,500	8,550,000	11,047,500	13,552,500	
Cumulative savings 5-40 yrs	(kBtu)		7,035,000	21,937,500	42,772,500	68,272,500	96,742,500	126,952,500	157,972,500	

Cost of Program $250,000 budget for first 3 years; 1,500 living trees at year 5	(per kWh)	$ 0.48

Project Development

- Evaluating models
  - Optimize Energy Savings
    - Cooling
    - Peak Cooling
    - Avoid winter shade penalty
- Evaluate role of existing utility programs

Champions

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