



ENERGY STAR®

Automatic Commercial Ice Makers

V 2.0 Draft 2

Stakeholder Webinar

September 21, 2011
Washington D.C.

Purpose of Revision



- Version 1.1 has been in place since 2008
- Current market penetration is 42%; opportunity for additional energy savings
- Expand scope to flake and nugget continuous type ice makers
- Update test standard references (currently referencing AHRI 810-2006)
- Adopt the DOE Test Procedure upon final ruling.

- DOE is also expanding scope to address flakes and nuggets (continuous type)
- Referencing the ASHRAE/AHRI test method but will publish a test method by Winter 2011
 - ENERGY STAR will reference the same test method (CFR and not ASHRAE/AHRI)
- Normalize energy use for continuous type based on ice hardness
 - ENERGY STAR will harmonize once final
- Clarify test method for RCU designed to connect to compressor racks
 - ENERGY STAR will harmonize once final
- EPA will harmonize with DOE definitions once final
- Issues with the test procedure (water hardness, etc.) are being investigated through the NOPR process.

Data Set and Methodology



- Data set combines
 - Non-ENERGY STAR models listed in the AHRI Certified Product Directory
 - Models on ENERGY STAR QP list
 - Flake and nugget models provided by manufacturers
 - Ice Hardness data received after Draft 1 for continuous products.

Draft 2 Product Categories



- EPA continues proposing to preserve the IMH, RCU, and SCU categories
 - Systems cannot be easily interchanged based on application, installation needs, the facility, and space.
- EPA has changed the product groupings to two overall categories: Batch-Type and Continuous-Type

Sampling and Rounding



- Sampling
 - EPA has added the basic model definition and the sampling requirements defined under 10 CFR section 429.45 to harmonize with DOE sampling methods.
- Significant Digits and Rounding:
 - All calculations shall be carried out with directly measured (unrounded) values.
 - Unless otherwise specified, compliance with specification limits shall be evaluated using directly measured or calculated values without any benefit from rounding.
 - Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to 0.1 for energy consumption rate and potable water.

Excluded Products



- EPA continues proposing to exclude **RCU w/ remote compressor** until a workable test method is developed to account for total energy use.
- EPA proposes excluding **water dispensing ice makers** unless more dispensing energy use data is provided across manufacturers.
- EPA proposes to exclude **water-cooled ice makers** due to high water consumption and importance of installation, but may consider closed loop water recovery designs in the next revision.

Changes in Draft 2: Continuous-Type



- EPA has combined flake and nugget systems into one Continuous-Type Ice Maker category
- EPA is proposing to incorporate AHRI definitions for flake and nugget machines once final for informational purposes only
 - a) Flake: typically used for cooling food, commercial and industrial process cooling, and special medical and scientific cooling applications.
 - b) Nugget: typically used for cooling water and beverage drinks, and for a chewable ice with a softer consistency than cube ice.

Changes in Draft 2: Continuous-Type



- Normalized energy values by ice hardness
 - EPA received enough ice hardness data to create a robust ice hardness data set and to propose new level lines based on this revised approach
 - EPA started the level lines by curve fitting a power curve in each IMH, RCU, and SCU category due to larger data sets from combining flakes and nuggets
 - Minor adjustments were made to proposed levels to assure representation across all size classes

Ice Hardness Adjustment Factor

- Ice Hardness Adjustment Factor equation provided by the DOE TP NOPR as “Ice Quality Adjustment Factor” (using “hardness” as a more accurate term)

Ice Hardness Adjustment Factor =
$$\left[\frac{144 \text{ Btu/lb} + 38 \text{ Btu/lb}}{\left(\frac{144 \text{ Btu/lb}}{\text{calorimeter constant}} \right) + 38 \text{ Btu/lb}} \right]$$

- EPA proposes to list both adjusted and non-adjusted energy values for consumer information on ENERGY STAR website.
- EPA has no batch hardness data to evaluate normalizing batch-type systems.

Changes in Draft 2: Continuous-Type



- Proposing new Potable Water Use levels
 - Accommodates measurement tolerances, the inherent water use to make ice, and purge features

Draft 2 Continuous-Type Levels



Type	Energy Consumption Rates (kWh/100 lbs ice)	Potable Water Use (Gal/100 lbs ice)
IMH	$\leq 18.74 * H^{-0.164} - 0.40$	≤ 15.0
RCU	$\leq 6.00 * H^{-0.162} + 3.50$	≤ 15.0
SCU	$\leq 59.45 * H^{-0.349} - 0.10$	≤ 15.0

H= harvest rate for system under evaluation

Draft 2 RCU Continuous-Type Issue



- By combining flakes and nuggets into one type, normalizing the data for ice hardness, and segmenting into the 3 ice machine categories, it creates a small data set for some RCU nugget and flake categories
- Balancing consumer choice vs differentiating the market

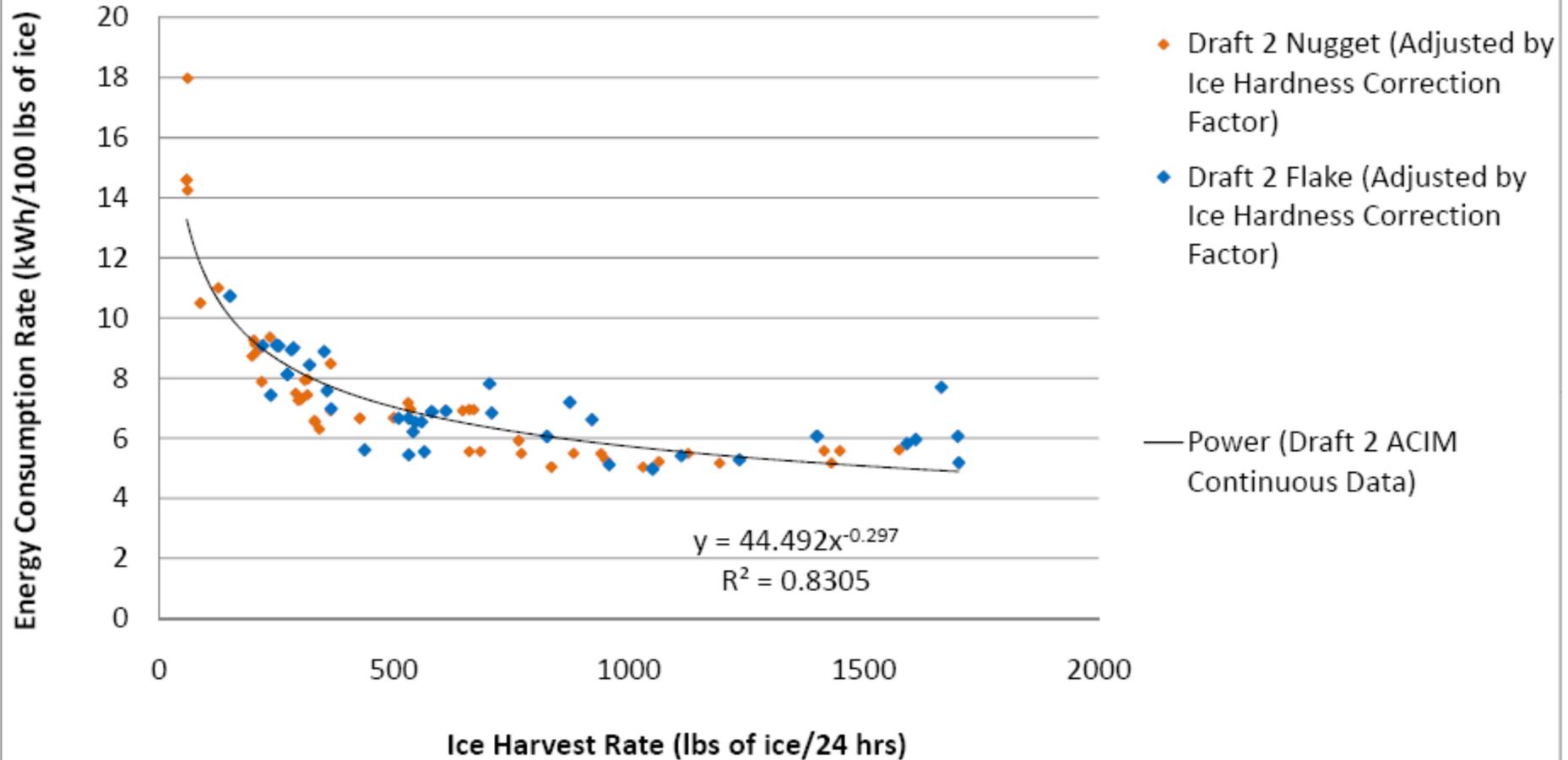
Draft 2 Continuous-Type Statistics



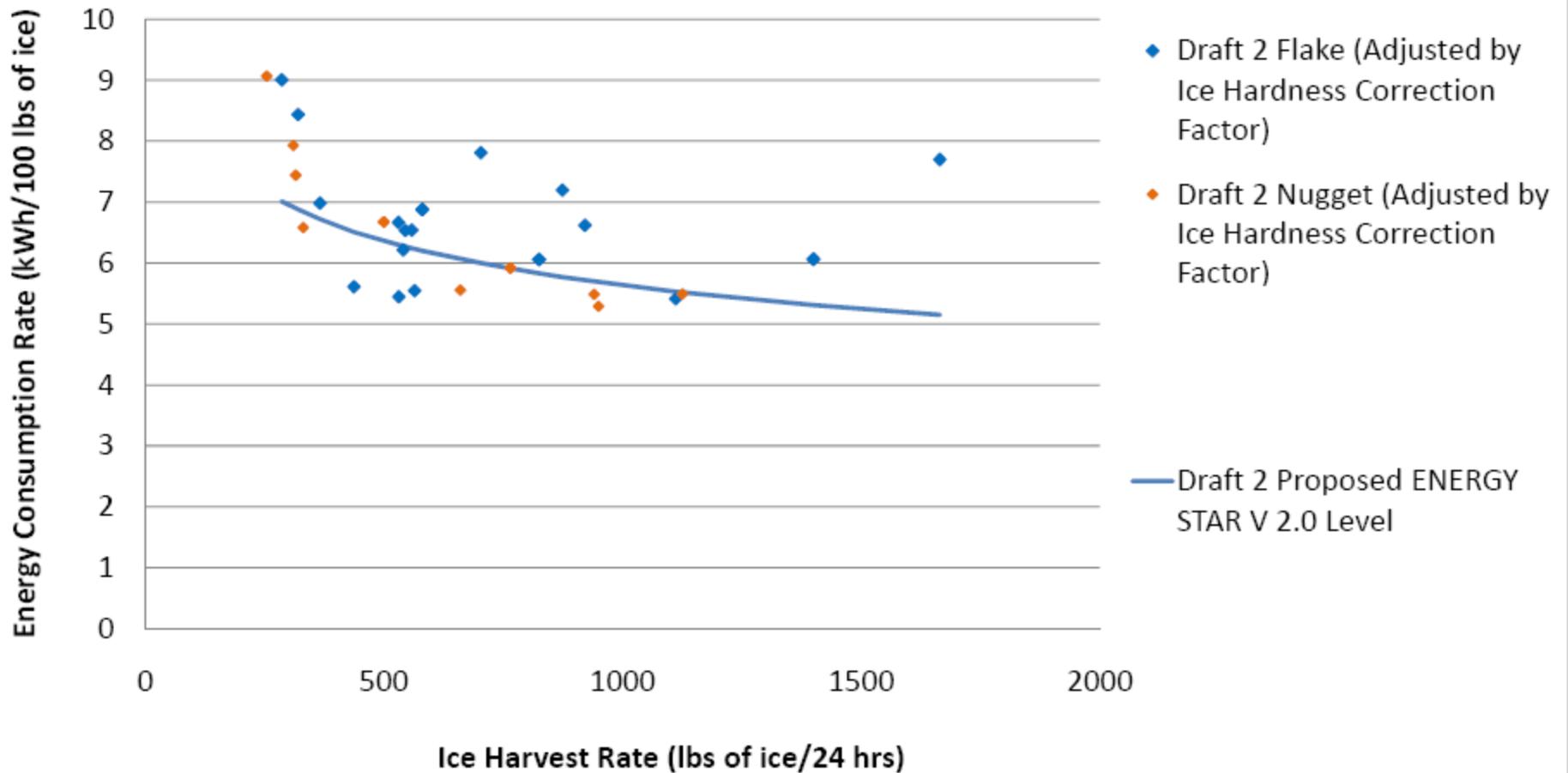
ENERGY STAR V 2.0 Levels	Harvest Rate lb ice/24 Hours	Potable Water Use	Energy Use Qual %	Potable Water Use Qual %	ENERGY STAR Qual %	ENERGY STAR Qual %	# of Qual Models	Number of Manuf Represented	Total Manuf
IMH	Nugget	15	40%	100%	40%	28%	9/32	3	3
	Flake		23%	100%	23%			3	4
RCU	Nugget	15	54%	100%	54%	54%	13/24	3	4
	Flake		50%	100%	50%			3	3
SCU	Nugget	15	39%	100%	39%	34%	16/35	2	3
	Flake		25%	100%	25%			2	3

While higher qualification rates than typical, the proposed levels provide some choices among all capacity categories

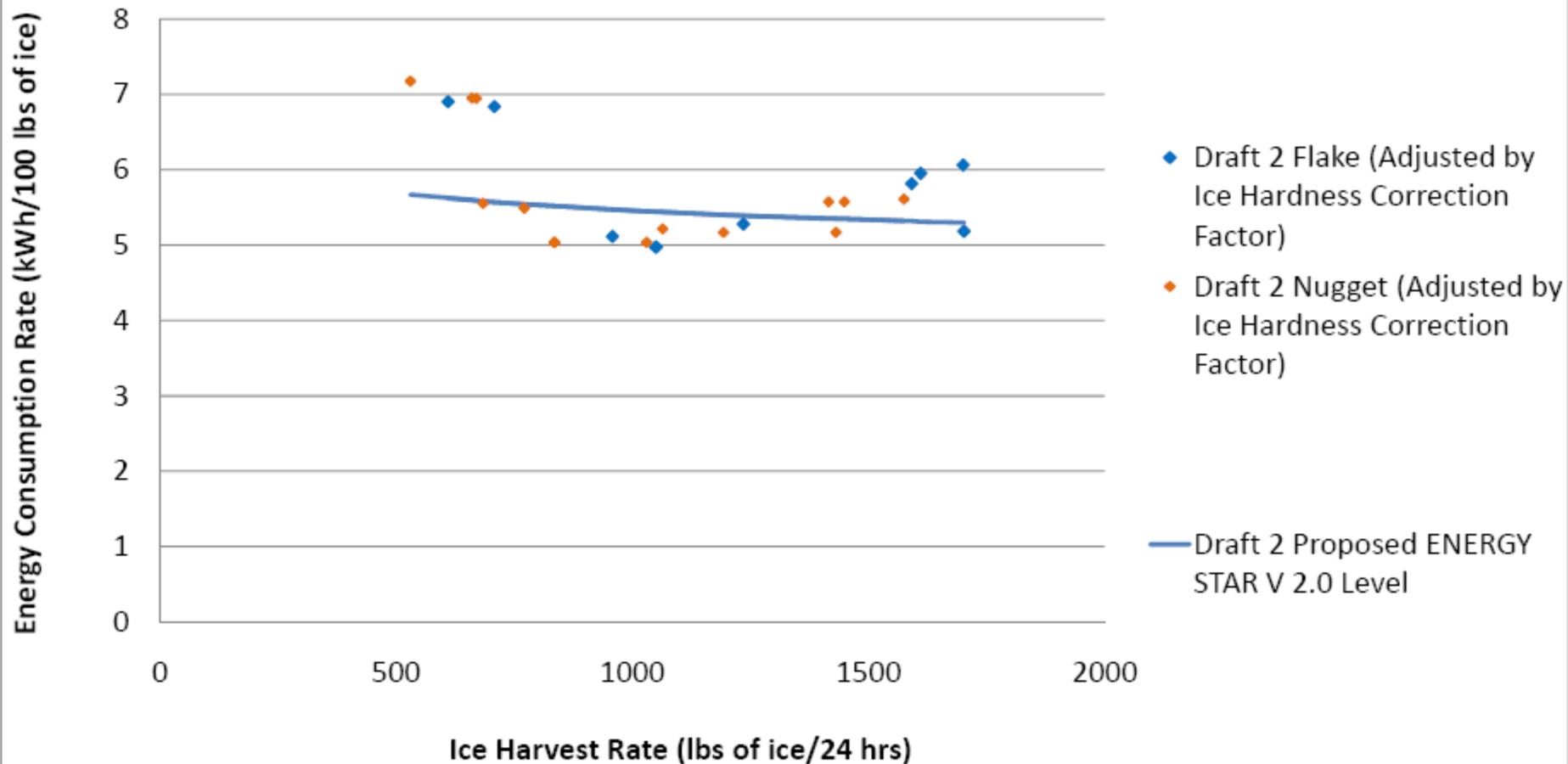
**Draft 2 -All Continuous Type
Air-Cooled Automatic Commercial Ice Maker
Adjusted Energy Consumption Rate vs Ice Harvest Rate**



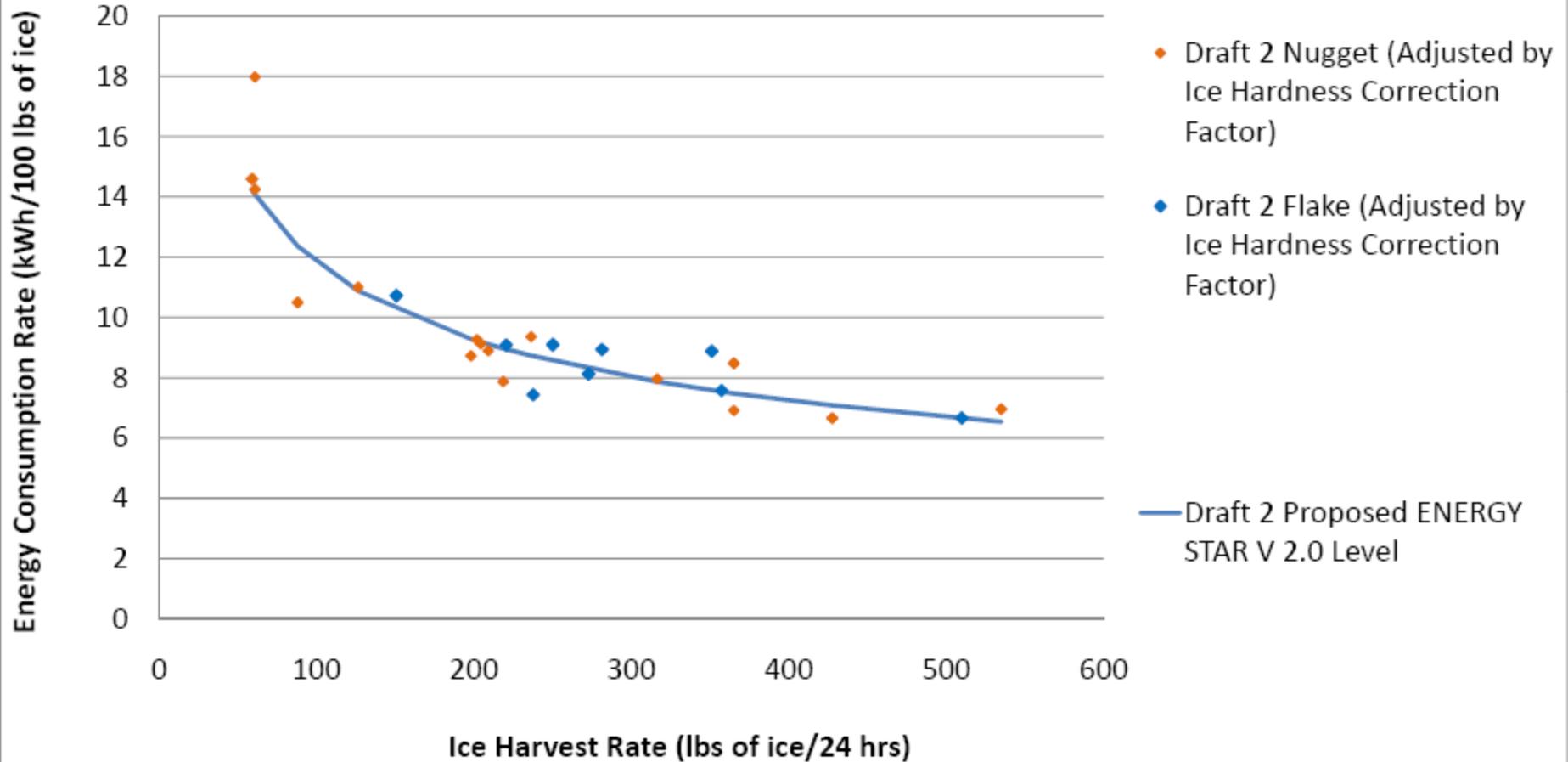
**Draft 2 - IMH Continuous Type
Air-Cooled Automatic Commercial Ice Maker
Adjusted Energy Consumption Rate vs Ice Harvest Rate**



**Draft 2 - RCU Continuous Type
Air-Cooled Automatic Commercial Ice Maker
Adjusted Energy Consumption Rate vs Ice Harvest Rate**



**Draft 2 - SCU Continuous Type
Air-Cooled Automatic Commercial Ice Maker
Adjusted Energy Consumption Rate vs Ice Harvest Rate**

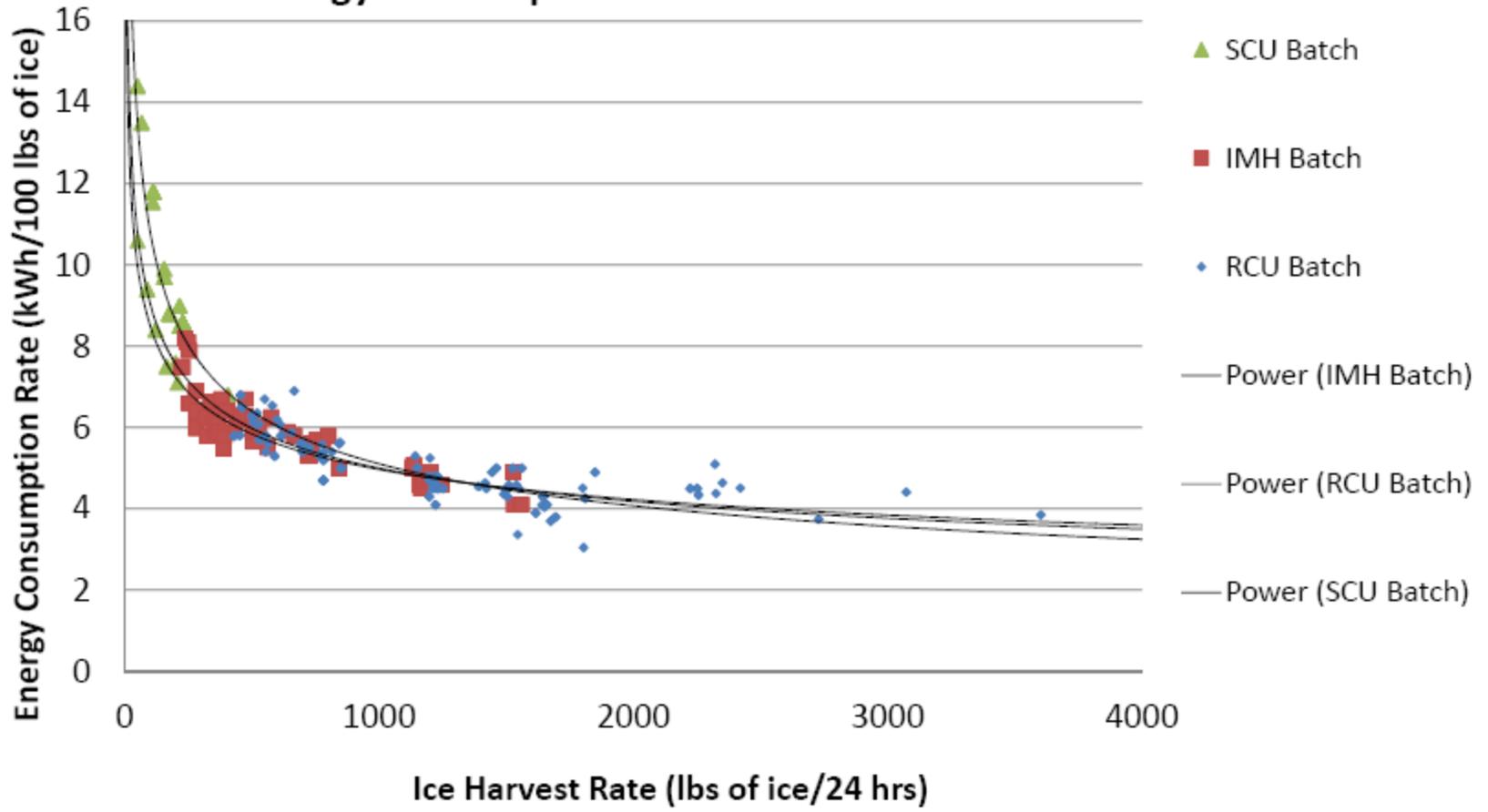


Changes in Draft 2 - Batch



- Started level lines by curve fitting a power curve in each IMH, RCU, and SCU category to match the methodology used for Continuous-types
- For potable water use, no discernable trend with potable water vs capacity, so EPA continues proposing Draft 1 levels
- Minor adjustments to proposed levels to assure representation across all size classes

All Batch Types
Air-Cooled Automatic Commercial Ice Maker
Energy Consumption Rate vs Ice Harvest Rate



Draft 2 Batch-Type Levels



	Version 1.1			Draft 2 Version 2.0 Proposed	
Equipment Type	Harvest Rate, H (lbs ice/day)	Energy Use Limit (kWh/100 lbs ice)	Potable Water Use Limit (gal/100 lbs ice)	Energy Use Limit (kWh/100 lbs ice)	Potable Water Use Limit (gal/100 lbs ice)
IMH	< 450	$9.23 - 0.0077H$	≤ 25	$\leq 24.94 * H^{-0.234} - 0.15$	≤ 20.0
	≥ 450	$6.20 - 0.0010H$	≤ 25		
RCU (without remote compressor)	< 1000	$8.05 - 0.0035H$	≤ 25	$\leq 29.67 * H^{-0.258} - 0.14$	≤ 20.0
	≥ 1000	4.64	≤ 25		
RCU (with remote compressor)	< 934	$8.05 - 0.0035H$	≤ 25		
	≥ 934	4.82	≤ 25		
SCU	< 175	$16.7 - 0.0436H$	≤ 35	$\leq 48.66 * H^{-0.326} + 0.08$	≤ 25.0
	≥ 175	9.11	≤ 35		

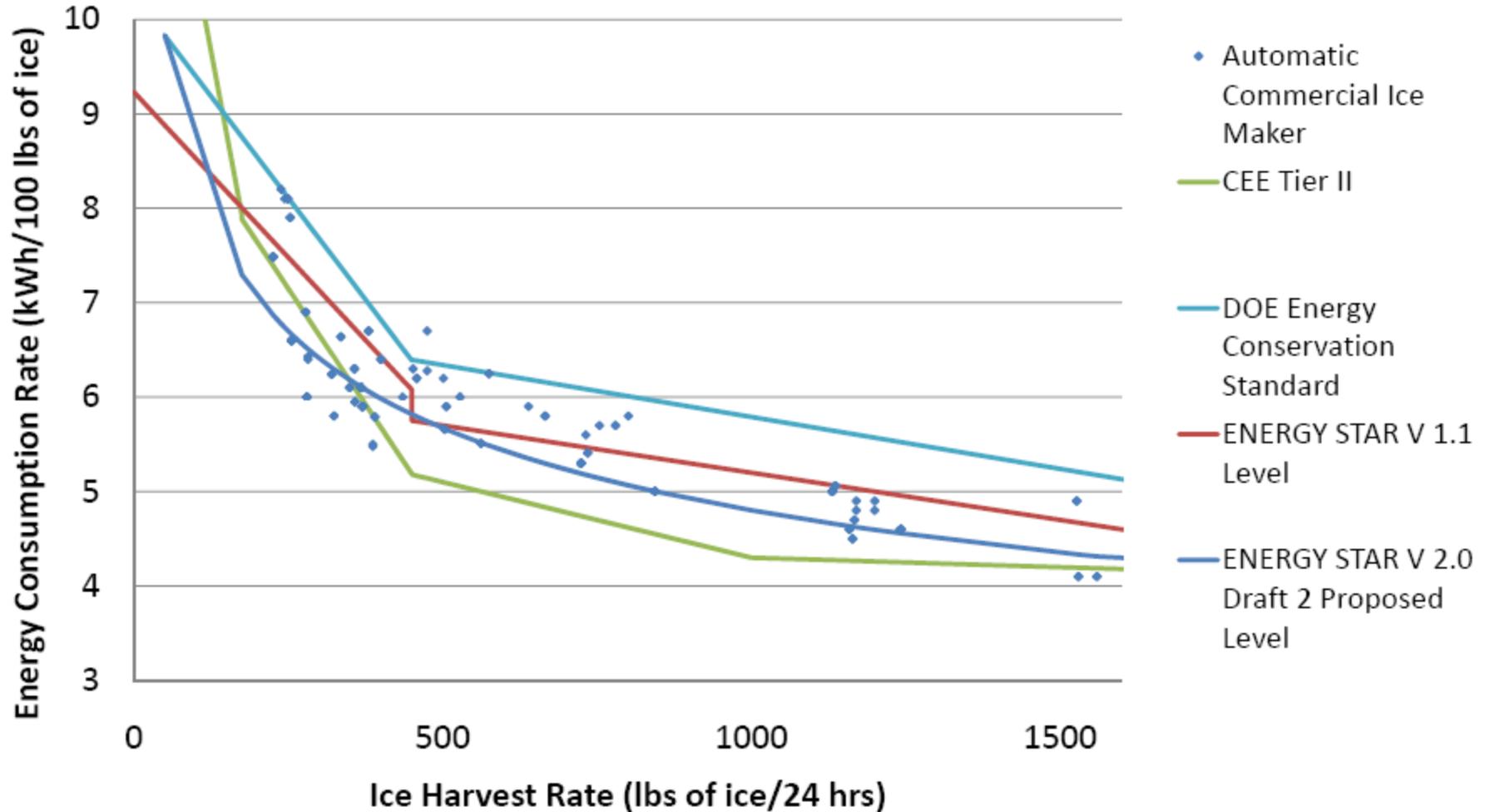
H= harvest rate for system under evaluation

Air cooled Batch - Cubed

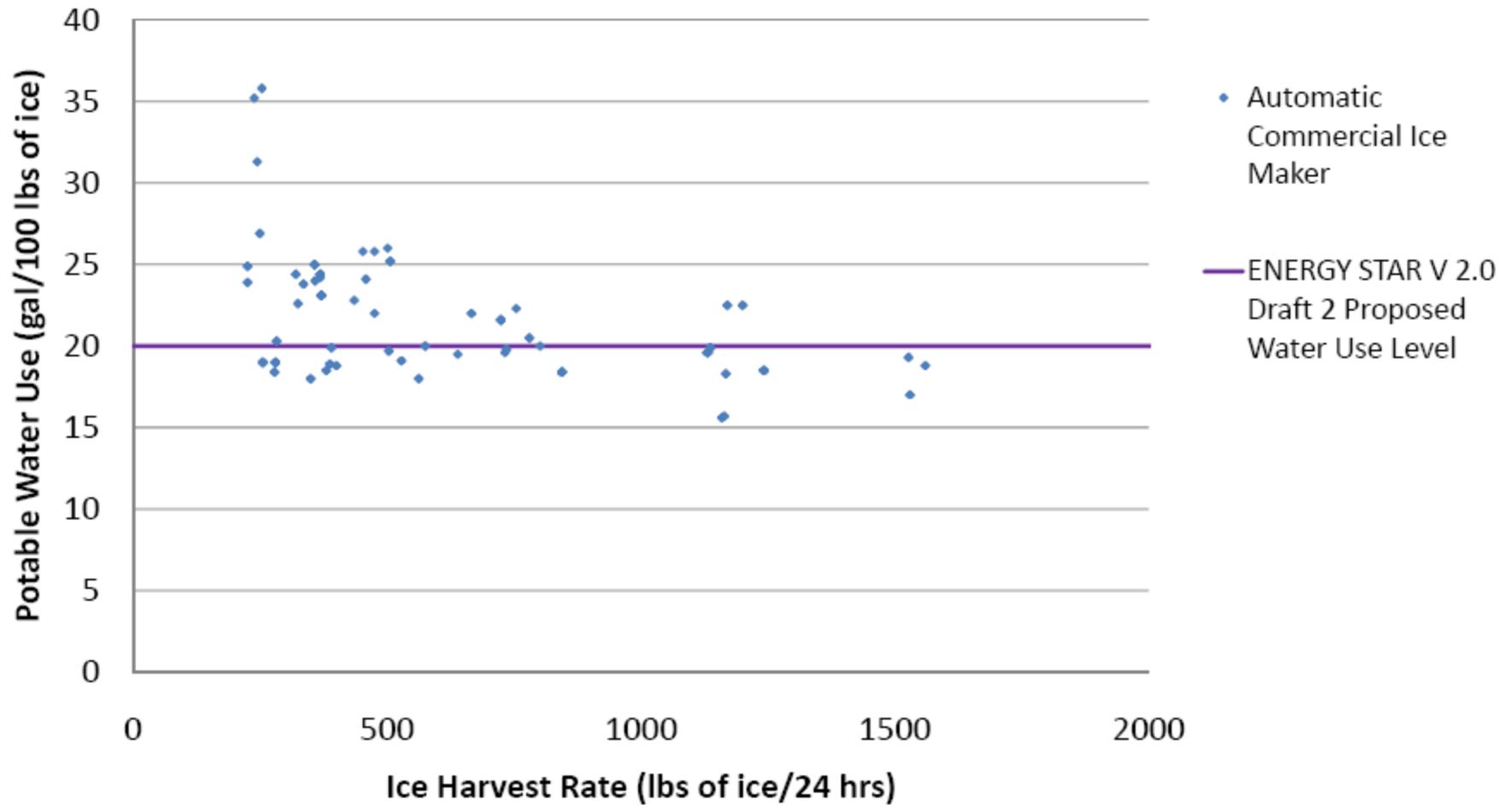


ENERGY STAR V 2.0 Levels	Potable Water Use	Energy Use qual %	Potable Water Use Qual %	ENERGY STAR Qual %	Number of units qualifying	Number of Manuf	Total Manuf
IMH	20	43%	55 %	27%	36/131	3	5
RCU	20	31%	67 %	25%	43/173	6	6
SCU	25	45%	45%	33%	15/47	2	6

Draft 2 - IMH Batch Type
Air-Cooled Automatic Commercial Ice Maker
Energy Consumption Rate vs Ice Harvest Rate



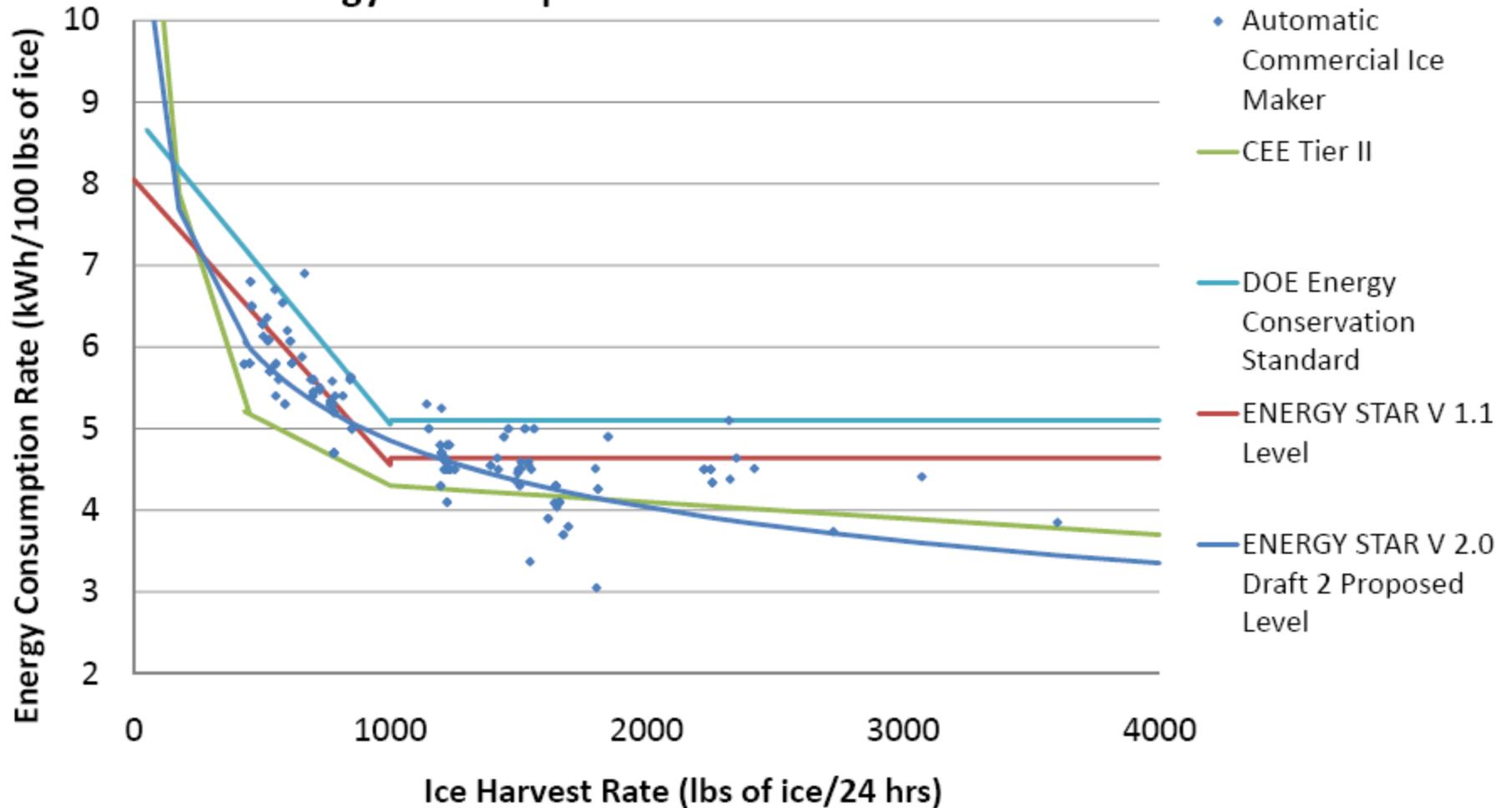
Draft 2 - IMH Batch Type
Air-Cooled Automatic Commercial Ice Maker
Potable Water Use vs Ice Harvest Rate



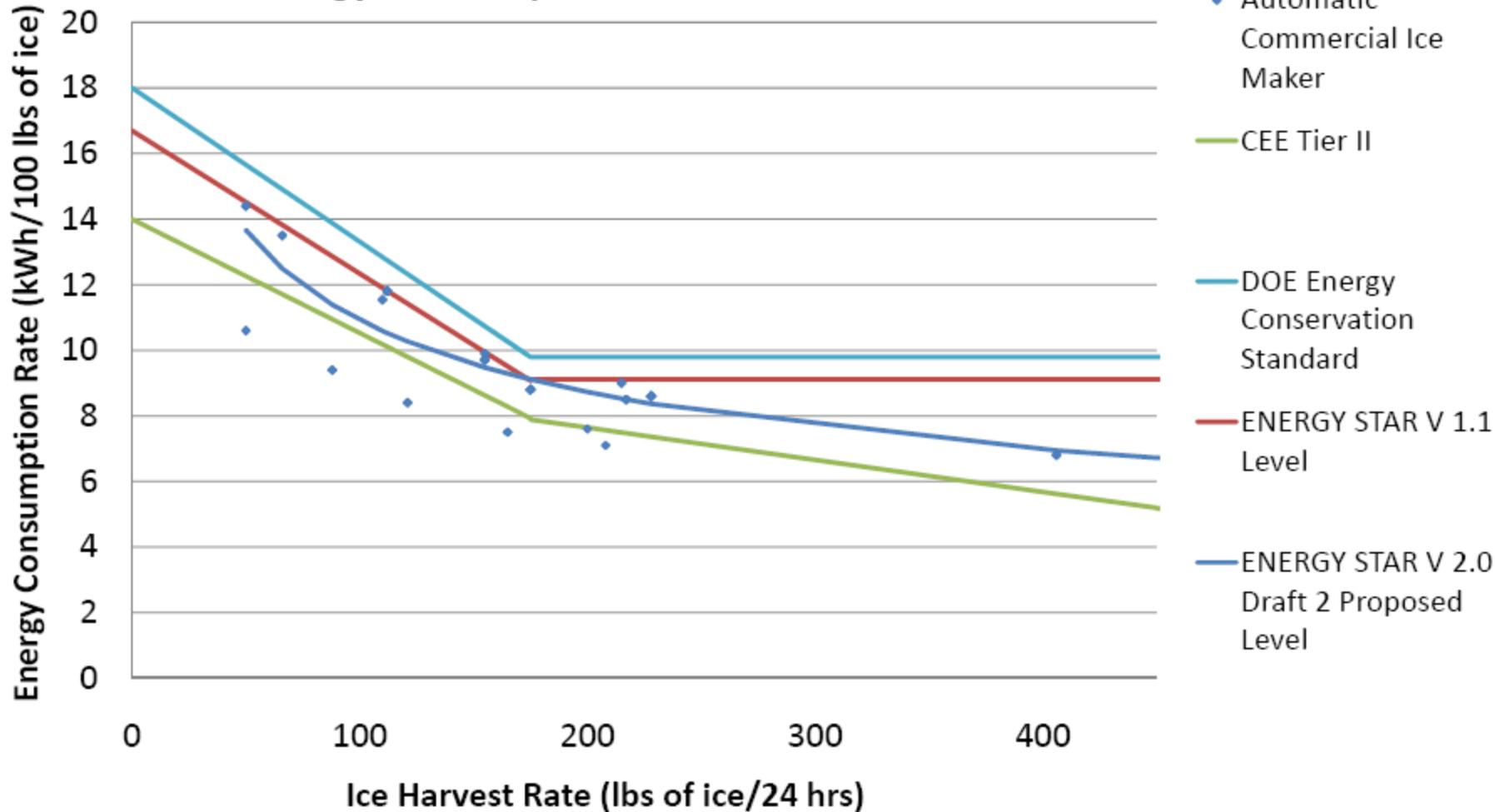
Draft 2 - RCU Batch Type

Air-Cooled Automatic Commercial Ice Maker

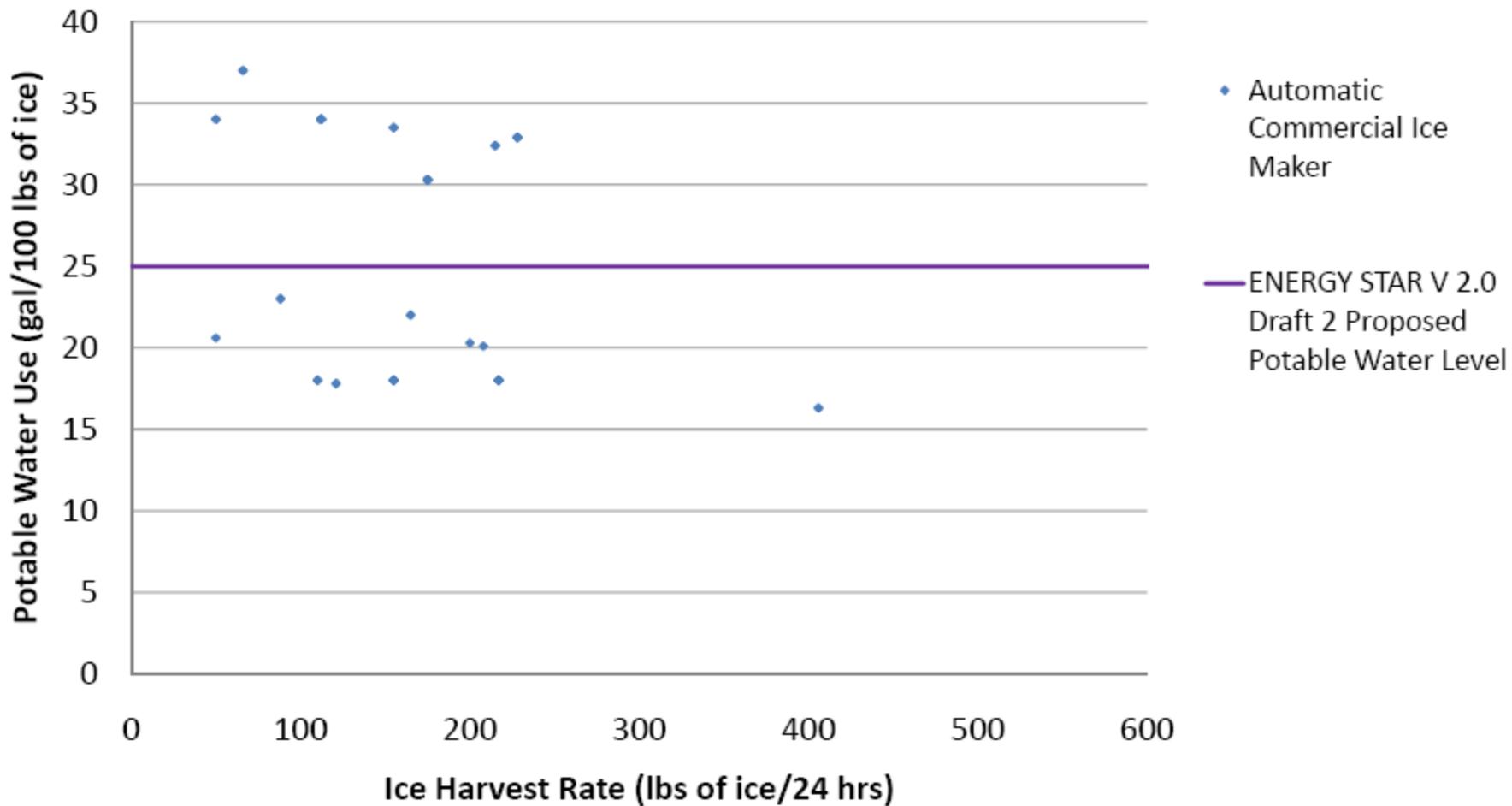
Energy Consumption Rate vs Ice Harvest Rate



Draft 2 - SCU Batch Type Air-Cooled Automatic Commercial Ice Maker Energy Consumption Rate vs Ice Harvest Rate



Draft 2 - SCU Batch Type
Air-Cooled Automatic Commercial Ice Maker
Potable Water Use vs Ice Harvest Rate



Timeline



- March 30, 2011 – Launch
- May 17, 2011 – Draft 1
 - May 23 – stakeholder meeting at NRA
- August 5, 2011 – Draft 2
 - Comments due August 26
 - Webinar – Sept 21
- October 2011 – Draft 3 ?
- November 2011 – Draft Final
 - Winter of 2011- DOE Test Procedure final
- September 2012 – Effective

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For related documents please visit:
www.energystar.gov/revisedspecs