



ENERGY STAR Commercial Dishwashers

Version 3.0 Draft 2

Tanja Crk, EPA
Dan Baldewicz, ICF
Rachel Selbert, ICF

October 22, 2019
HAPPY ENERGY STAR DAY!



Call in Number

PGI Call-in:

1-877-423-6338

797501#



Agenda

- Welcome, Introductions
- Definition and Scope Changes
- Proposed Requirements
 - Notes on Dataset
 - Water Consumption
 - Washing Energy
- Energy Recovery Credit
- Data Collection for Future Revisions
- Comment Deadline



Heater Definitions

- Booster Heater (clarified)
- Storage
- Circulating water heater
- Instantaneous water heater
 - Tank type
 - Watertube type
- Added per stakeholder feedback
- Definitions from NSF 170-2015



Heat Recovery Machine Definition

Equipment with heat recovery equipment

- Technology Neutral.
- Options include: vapor, exhaust, drain, heat pump, other

To claim heat recovery credit:

- High temp:
 - ≥ 40 °F preheat capacity AND/OR,
 - Drainwater tempering avoidance (≤ 140 °F) AND/OR,
 - Ventless (Type II hood not needed).
- Low temp:
 - ≥ 40 °F preheat capacity



Scope Changes

- Removed Pot Pan Utensil Low Temp, High Temp Only
- Removed Flight Type Low Temp, High Temp Only
- Proposed in Version 3 Draft 1
- Lack of certified models and no product data



Dataset Updates

- Confidential wash data obtained from multiple stakeholders.
- **Multiple manufacturers** represented in additional data
 - Includes both Energy Recovery and conventional machines.
- Booster heater idle energy data received



Water Consumption

- V3D1 Comments:
 - Potential Rinseability Issues
 - Multiple stakeholders
- Reverted to Version 2.0 levels for all product types

Machine Type	Low Temp Water Consumption* *	High Temp Water Consumption**
Under Counter	≤ 1.19 GPR	≤ 0.86 GPR
Stationary Single Tank Door	≤ 1.18 GPR	≤ 0.89 GPR
Single Tank Conveyor	≤ 0.79 GPR	≤ 0.70 GPR
Multiple Tank Conveyor	≤ 0.54 GPR	≤ 0.54 GPR
Pot, Pan, and Utensil (PPU)	N/A	≤ 0.58 GPSF
Single Tank Flight Type	N/A	GPH ≤ 2.975x + 55.00
Multiple Tank Flight Type	N/A	GPH ≤ 4.96x + 17.00



Washing Energy

- Minor adjustments to High Temp Single Tank Conveyor
- New dataset confirmed V3D1 washing energy limits for other product types
- New Pot Pan Utensil Limit:
 - Terms of sq.ft./rack
 - Per stakeholder feedback
- **Energy Recovery Credit** applies to wash limit

Machine Type	Low Temp Washing Energy	High Temp Washing Energy
Under Counter	≤ 0.15 kWh/rack	≤ 0.35 kWh/rack
Stationary Single Tank Door	≤ 0.15 kWh/rack	≤ 0.35 kWh/rack
Single Tank Conveyor	≤ 0.16 kWh/rack	≤ 0.36 kWh/rack (was 0.34)
Multiple Tank Conveyor	≤ 0.22 kWh/rack	≤ 0.36 kWh/rack
Pot, Pan, and Utensil (PPU)	N/A	$\leq 0.55 + 0.05 \times$ SFrack
Single Tank Flight Type	N/A	Reported
Multiple Tank Flight Type	N/A	Reported



Energy Recovery Credit

$$V \text{ [gal/rack]} \times 0.097 \text{ [kWh/gal]} \leq E_{\text{Credit_max; MachineType}}$$

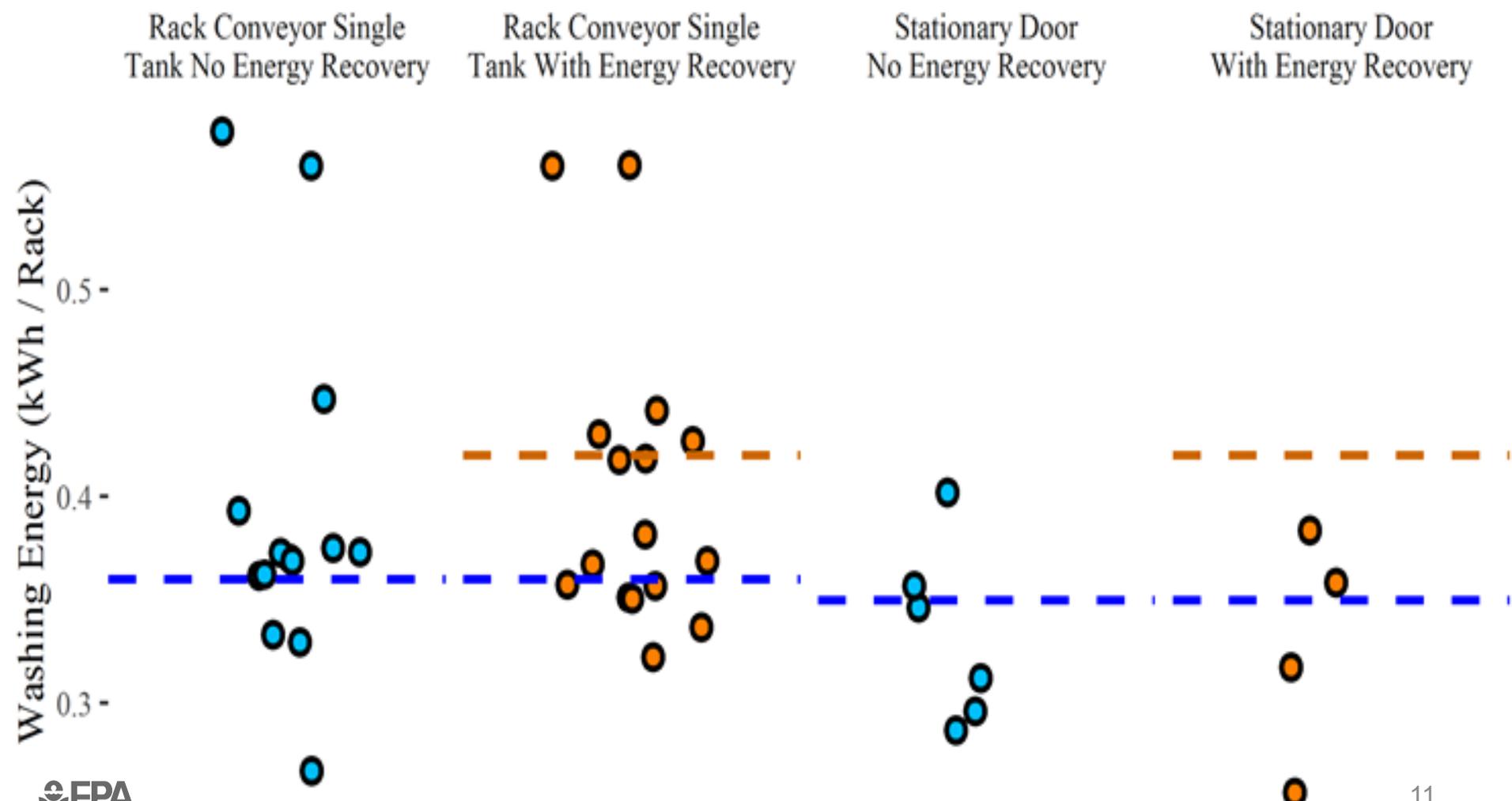
- Requires at least ONE Energy Recovery feature:
 - 40 °F Preheat, ≤ 140 Drainwater, Ventless
- ASTM test must be performed at 70 °F ± 3 °F
- Credit based on:
 - 40 °F water preheat
 - Median water use
 - Stakeholder feedback

Energy Recovery Credit Max, $E_{\text{Credit_max}}$	
Machine Type	Credit Value (kWh/rack)
Under Counter	0.07
Stationary Single Tank Door	0.07
Pot, Pan, and Utensil (PPU)	0.07 (kWh/Rack)
Single Tank Conveyor	0.06
Multiple Tank Conveyor	0.04



Washing Energy by Product Type

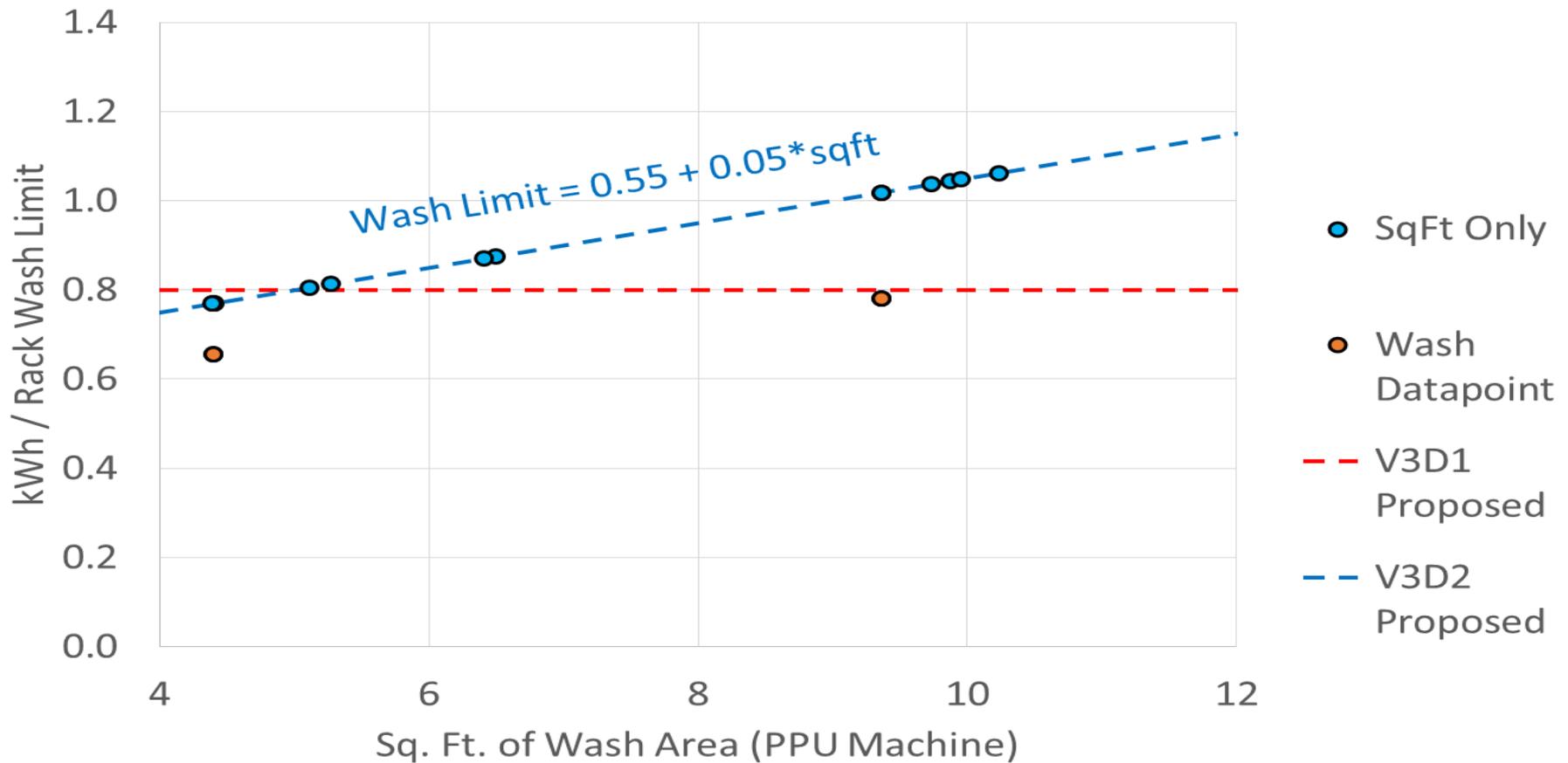
Blue Line: V3D2 Wash Limit. Orange Line: Max ER Credit





Pot Pan Utensil, High Temp – Wash Requirement

V3D2 Proposed Wash Requirement, PPU





Idle Energy Rate

- Proposed V3D1 Flight Type idle requirement dropped
 - Stakeholder comments that Flight machines have low idle hours
- No changes to other idle requirements

Machine Type	Low Temp Idle Energy Rate*	High Temp Idle Energy Rate*
Under Counter	≤ 0.25 kW	≤ 0.30 kW
Stationary Single Tank Door	≤ 0.30 kW	≤ 0.55 kW
Single Tank Conveyor	≤ 0.85 kW	≤ 1.20 kW
Multiple Tank Conveyor	≤ 1.00 kW	≤ 1.85 kW
Pot, Pan, and Utensil (PPU)	N/A	≤ 0.90 kW
Single Tank Flight Type	N/A	Reported
Multiple Tank Flight Type	N/A	Reported



Future Data Collection, ASTM: F1696 / F1920

- Primary Domestic Hot Water Energy
 - Information on hot water heater use (bldg. water heater)
 - Replaces the energy recovery credit in a future revision
 - Water Inlet Temperature (at test)
- Door Closed Idle Energy Rate, Energy Saver Mode
 - Evaluate whether to incorporate into program
- Booster Heater Idle Energy Rate
 - Incorporate the booster heater into ENERGY STAR idle performance criteria
 - Currently excluded from most idle measurement points (inseparable booster heaters rare in practice).



Additional Considerations for Future Revisions

- Test Procedure Updates:
 - NSF 3, rinseability test procedure
 - NSF 3, sanitization / water use updates
 - Updates to ASTM F1696 and F1920
- Additional Product Characteristics (QPX):
 - Dump and Fill Machine
 - (Flight Type) Single / Dual Rinse
 - Energy Recovery Information
 - Yes/No, Types of Energy Recovery used



Draft 2 Specification Comment Deadline

- Send written feedback to CommercialDishwashers@energystar.gov
- **Please include any supporting data for additions or revisions to proposed requirements and/or adders with your written Draft 2 specification feedback.**

Comment Deadline

Thursday, November 7, 2019



Contact Information

Specification:

Tanja Crk, EPA

Tanja.Crk@epa.gov

202-566-1037

Dan Baldewicz, ICF

Dan.Baldewicz@icf.com

518-452-6426

Rachel Selbert, ICF

Rachel.Selbert@icf.com

202-791-8879

Brian Ward, ICF

Brian.Ward@icf.com

224-622-4068



ASTM F26 Meeting – Oct. 29-30, 2019

- Brian Ward (ICF) attending in person
- Tanja Crk & Brian Krausz (EPA) calling in

Duty Cycles Discussion (CFS Savings Calculator)

- Assumptions from ~2009. Still representative of the market?

	Annual days of operation	Average daily hours of operation	Racks washed per day	Typical wash time (min)	Time spent in wash mode per day (hrs)	Time spent in idle mode per day (hrs)
Machine Type (Low Temp)						
Under Counter	365	18	75	2	2.5	15.5
Stationary Single Tank Door	365	18	280	1.5	7	11
Single Tank Conveyor	365	18	400	0.3	2	16
Multiple Tank Conveyor	365	18	600	0.3	3	15
Machine Type (HighTemp)						
Under Counter	365	18	75	2	2.5	15.5
Stationary Single Tank Door	365	18	280	1.5	7	11
Pot, Pan, and Utensil	365	18	200	3	10	8
Single Tank Conveyor	365	18	400	0.3	2	16
Multiple Tank Conveyor	365	18	600	0.2	2	16
Single Tank Flight Type	365	18	N/A			2
Multiple Tank Flight Type	365	18	N/A			2