- **Data of Market Penetration**
  The basis of adjusting the current scope due to the % market penetration of ENERGY STAR devices is not based on complete and accurate sales of all devices in the US. No unit shipment from any non-ENERGY STAR partners of combination ovens were collected for the Data Summary Report.
  The U.S. ENERGY STAR Shipment Data lists the volume of the subcategories of other products, e.g. Audio/Video Products, Boilers, Ceiling Fans, CAC/ASHP, Clothes Dryers, Clothes Washers, Computers, Displays, Furnaces, Lamps, Luminaires, Telephony, Televisions, Water heaters. The Product Category for Commercial Ovens has three (3) subcategories and should be listed as other product categories with sub-categories.

- **Convection Mode Cooking-Energy Efficiency %**
  The target for combination ovens is still higher than the target for convection ovens (78% vs. 76%). A Convection Oven is quite like a Combination Oven. It is even more specialized to that single operation mode and has even more parts that could influence the efficiency negatively (holes in the cabinet for de-/ humidification; thermal bridge from injection/steam generator). But the limits for Combination Ovens are more demanding. Since the test method is the same, we feel the limits should be the same as well.
  For example, A customer will decide on a convection oven instead of a combination oven because the convection oven is certificated by ENERGY-STAR. He expects lower energy consumption. This is not true in all cases because of the different limits. The ENERGY-STAR certification should make it easier for customers to choose a unit with their requirements.

- **Cooking-Energy Efficiency, % half- to full size**
  As the criteria for Convections ovens are divided into full- and half-size limits, we suggest the adaption of this differentiation also for combination ovens. As you can see in the results of the ENERGY STAR Version 3.0 Commercial Ovens Draft 2 Data Packet (pan capacity>6), half-size electric appliances have an average Cooking-Energy Efficiency of 77,4%, full-size appliances have an average of 80,3%.

- **Cooking-Energy Efficiency, different pans capacity**
  As you can see in the results of the ENERGY STAR Version 3.0 Commercial Ovens Draft 2 Data Packet, Cooking-Energy Efficiency in convection mode strongly depends on the pan capacity. In particular, the fraction of “small” ovens (< 10 pans) compliant is significantly lower concerning “bigger” ovens (>= 10 pans). The proposed new thresholds, especially for electrics ovens, will increase this discrepancy, further lowering the percentage of compliant small ovens (from 60% to only 26%!) while leaving very high the percentage of compliant ovens of bigger size (from 91% to 79%!).
  These limits should be dependent on pan capacity and should remain unchanged for < 10 pans.
  (Note: in the “Listed” ovens from the *CA TRM baseline* were not considered)

Fuel type	Number of pans	Mode	Current Threshold	Listed	Compliant	Ratio	Proposed Threshold	Compliant	Ratio
Electric	<10	Convection	76%	35	21	60%	78%	9	26%
Electric	<= pans < 20	Convection	76%	40	36	90%	78%	31	78%
Electric	pans>=20	Convection	76%	34	31	91%	78%	27	79%
Gas	<10	Convection	56%	12	10	83%	57%	7	58%
Gas	<= pans < 20	Convection	56%	38	26	68%	57%	21	55%
Gas	pans>=20	Convection	56%	29	28	97%	57%	26	90%

- **Water Consumption Rate: All Combination Ovens**
  We agree that water consumption gets more important and should be a criteria for testing. But the proposed value expressed in “water consumption per pan and hour (gal/hr/pan)” should be adapted. With this value an efficient oven with a high production rate is disadvantaged. For example, this affects two ovens with the same energy-efficiency but different production

capacities. An oven, which can cook faster is disadvantaged to an oven which needs a long time to perform the test. If both used the same amount of energy and had the same water consumption during the test period, the faster oven could miss the criteria. The value water consumption per pan and hour could be useful for planers of a building.
We propose that the value should be changed to “water consumption per pan”. This value shows directly the needed amount of water for cooking a certain amount of potato.

- **Cooking-Energy Efficiency, % for ovens with roll-in racks**
  Ovens with a removable trolly may have a disadvantage to ovens with a fixed rack. The heating of the mass of the trolly isn’t considered in the calculation in the ASTM standard. But the heating up of this mass from ambient temperature to cavity temperature influences the efficiency in a non-negligible way. See the following calculation as example:
  <u>*ASTM convection mode efficiency test with potatoes*</u>

Weight of a trolly (part in cabinet)	*22,5*	*kg*
c_stainless_steel	*0,46*	*kJ/kgK*
dT trolly	*157*	*K*
Q_trolly	*1630*	*kJ*

The amount of energy for heating up one tray of russet potatoes (including assumed evaporation of steam) is around 1835 kJ. As you can see the influence of heating up the trolly (1630kJ) is almost comparable for heating up one more tray of potatoes.
We propose to consider the influence of the trolly in the calculation of the standard or in the target limits for the EnergyStar.

Since the referenced test method of the EPA Version 3.0 is the ASTM F2861-20 standard, the group is asking for clarification on the following points at the upcoming ASTM meetings December 7th-8th, 2021. This could result in an update to this standard.

- 10.7.8 Is the temperature setting 350°F or the settings from test 10.2.6? Maybe a clearer definition can be made.
- 11.9.2 The final temperature of the pans is more likely higher than defined in the formula. The final temperature for the pan ($Tf_{p,c}$) is defined as the final temperature of the potatoes, but an end temperature like the cabinet temperature is more likely.

$$E_{pan,c} = W_{pan,c} \times Cp_{pan} \times \Delta T_{pan,c} \qquad (10)$$

where:

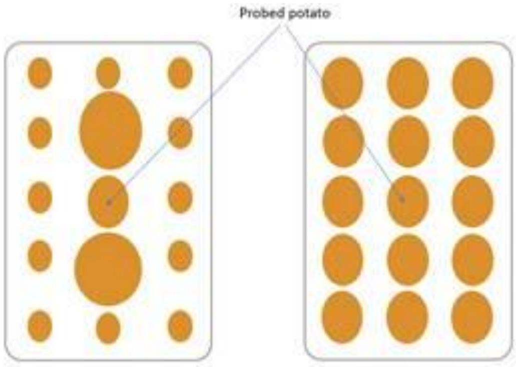
$W_{pan,c}$ = weight of shallow steam pan(s) used in convection mode test, lb,
Cp_{pan} = specific heat of stainless-steel, Btu/lb°F,
= 0.11 Btu/lb°F (see 2.4), and
$\Delta T_{pan,c}$ = useful temperature rise in shallow steam pan(s), °F,
= $Tf_{p,c} - Ti_{p,c}$
$Tf_{p,c}$ = average temperature of all of the russet potatoes at the end of the convection mode cooking test, °F,
$Ti_{p,c}$ = average temperature of all of the russet potatoes at the beginning of the convection mode cooking test, °F,

- 11.9.2 The evaporated water from the potato is not only been heated up (convection mode) to the evaporation temperature, it will be heated up to the chamber temperature of 350°F. The steam should be calculated up to 350°F. (additional term $E_{vap,p,\Delta T}$)

$E_{potato,c}$ = energy into the potatoes, Btu (kJ), and
= $E_{sens,p} + E_{vap,p}$

- Potato-Weights

In the standard there are various definitions of the potato weights and their ranges. In chapter 7.2 the range for red potatoes is defined by ±0.02lb which mean ±9g. In Chapter 7.3. the range for russet potatoes is also 0.02lb but calculated in grams ±91g. Which is correct one? In Chapter 10.7.5 the weight of the probed russet potato is defined by 0.5±0.06lb (instead of 0.48±0.02lb in 7.3) – Why is there are a difference in the mean value and a higher tolerance? Also, the word “average” in the definitions of 7.2 and 7.3 is not clear. Does this mean, that single potatoes can be out of the range? If potatoes out of this range are allowed a used case could be like this:



- 6.9. A Definition of the thermocouple wire with a maximum diameter (outside) for a 24GA wire → Recommendation change to a requirement? Definition of thermocouples appreciated.
- The testing situation for appliances with trollies is not considering the heat gained by the trolly during the cooking process → Adaption of efficiency values at EPA or considering in the calculation of the standard (see explanation above)
- 6.3. Appliances with a depth of more than 1,05m cannot meet this requirement. Would it make more sense to define a range for the distance between unit and hood instance of a distance between floor and hood?
- 9.8. How is the dynamic water pressure measured? In physics is defined:
  Pressure total = pressure dynamic + pressure static
  Which pressure should be measured in the standard?
- Conversion of units of the temperature. There might be a mistake in chapter 10.7.7. Most of the time 75 ± 5°F is converted to 24 ± 2,8°C. In this case it is **21** ± 2,8°C.
- 10.3.5 Which Temperature is the leading one (external or the internal appliance)? A temperature setting point of the unit should be higher than the target value of the temperature. Otherwise a unit with a bad temperature control (heating elements switch off to late) reaches the value much faster.
- Target temperature of potatoes. Why is there a range for the target temperature of the red potatoes and a fixed value for the russet potatoes (10.6.12 vs. 10.7.11)
- 10.6.11 After one test run in steam mode you have to go back to chapter 10.6.7 for the next runs. In Chapter 10.6.8 the oven hast to be stabilized then for one further hour before starting the second run. This is not required in convection mode 10.7.12. There you start with 10.7.4 with the next run. A stabilization period is just required for the first test run in 10.7.8. Why it is not the same in steam mode?

We recommend setting the preheating time for the first run to 1.5 h and for the second and third run to 1 h.