



February 14, 2018

*Department of Environmental Quality  
NC Electronics Management Program*



# *NC Electronics Management Program*

SL 2010-67 (SB 887) with stakeholder process

- Landfill Ban
- Manufacturer responsibility law:
  - computer and TV manufacturers
  - retailers
  - local governments
- Helped expand private and public infrastructure to manage collection and recycling of covered devices



# *Context Behind Creation of Session Law 2010-67*

While considering Senate Bill 887 the General Assembly Found:

- Electronic equipment contains both valuable resources and constituents that can introduce toxic materials into landfills
  - Valuable constituents: aluminum, steel, copper, plastic, and precious metals such as gold, palladium, platinum, and silver
  - Toxic constituents: lead, mercury, beryllium, cadmium, brominated flame retardants and a variety of batteries which also contain heavy metals
- Computer equipment and televisions represent an emerging, increasing and complex part the municipal waste stream
- North Carolina citizens want and need access to convenient options for managing end-of-life electronics equipment
- Recycling of computer equipment and televisions will recover valuable materials, divert toxic constituents from landfills, create jobs and expand the tax base of the state



# *GS 130A-309.09D Landfill Bans*



- Yard trash
- White goods
- Aluminum cans
- Whole scrap tires
- Lead-acid batteries
- Alcoholic Beverage Containers
- Motor vehicle oil filters
- Plastic Bottles (except motor oil or pesticide)
- Wooden pallets (except to C&D landfills).
- Oyster shells
- **Discarded computer equipment**
- **Discarded televisions**

# *Electronic Materials*

Electronic equipment contains constituents that can introduce toxic materials into soil, air and water but also valuable resources which can be harvested to build industry

- Toxic: lead, mercury, beryllium, cadmium, brominated flame retardants and a variety of batteries which also contain heavy metals
- Valuable: precious metals: gold, platinum, silver, palladium, and recyclables: aluminum, steel, copper, plastic, rare earth

Recycling of computer equipment and televisions recovers valuable materials, diverts toxic constituents from landfills, creates jobs and expands the tax base of the state





# *Cathode Ray Tube (CRT)*

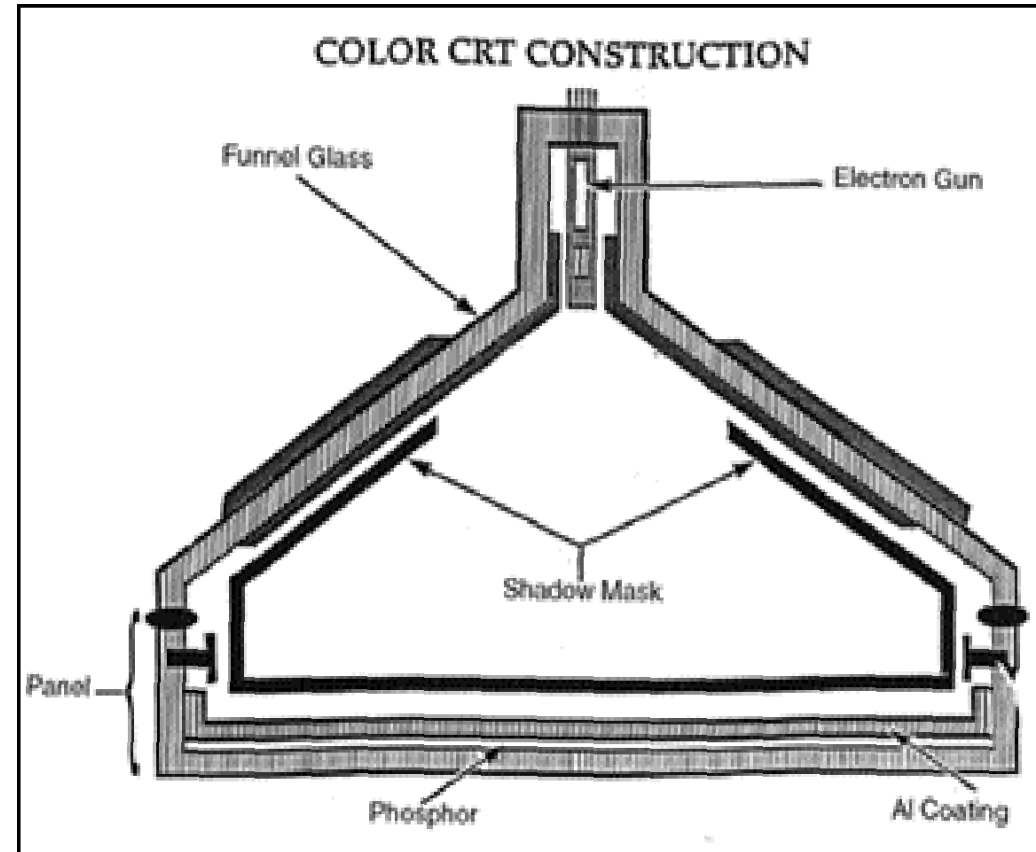
**FUNNEL - 22%-28% lead oxide**

**NECK - 30% lead oxide**

**PANEL GLASS - (screen) 2/3 of the CRT's mass. 0-4% lead oxide**

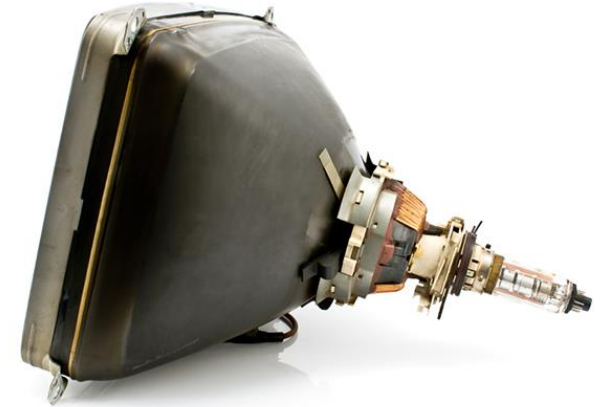
**SOLDER (or Frit) - 70-85% lead**

**YOKE - copper wire around neck**



# Televisions and Monitors

- Cathode Ray Tube (CRT)



- Flat Panel Display (FPD)
  - CCFL Back Light
  - LED Back Light



LCD-TV mit  
LED Backlight



LCD-TV mit  
CCFL Backlight

## *Critical Nuance on CRT Disposal*

- Commercially generated CRTs are subject to hazardous waste management regulations – would affect CRTs from private businesses.
  - Businesses would need to demonstrate CRTs are non-hazardous before they can be disposed in MSW landfills
  - Rescinding state disposal ban on televisions would not exempt businesses from this regulation
  - If businesses recycle their CRTs, they are not subject to hazardous waste management determination and rules
- Example: Local University has some CRT televisions to discard
  - To dispose of them in a landfill, the University would need to prove CRTs are not hazardous waste
  - If the University uses a recycling option, no additional requirements apply
    - Recycling options available through county programs and through established private recycling infrastructure in NC

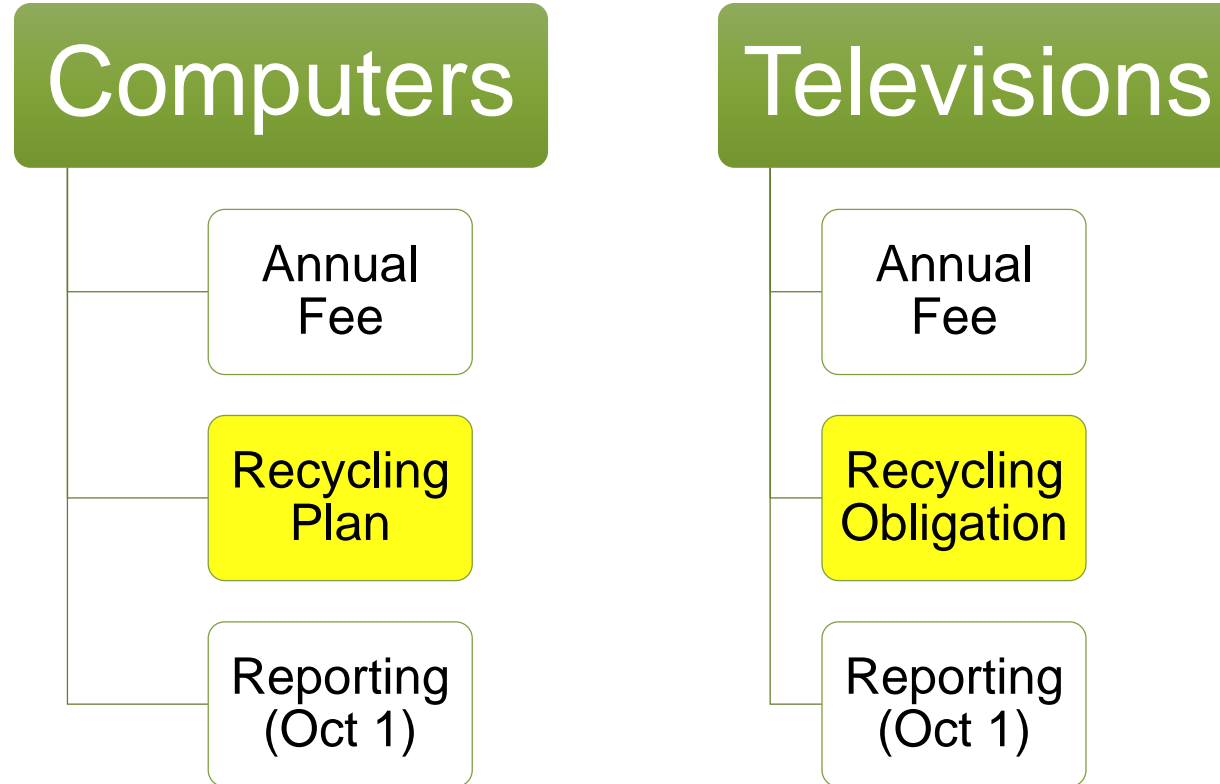


# *Electronics Compliance*

- Stockpiles have been found in past years (2013) but DEQ is not aware of current stockpiles of electronics where compliance action is being taken.
- Some of the stockpiles in previous years were created by **non-certified** recyclers and before state registration system was in place.
- Solid Waste and hazardous waste field staff have not been observing the same number of local government or business stockpiles of electronics compared to previous years.



# *NC Electronics Program: Manufacturer Responsibilities*



# *Computer Equipment Manufacturer Requirements*

- Computer Equipment Manufacturers -Free take-back program to “Consumers”
  - occupant of single or multifamily residence, or non-profit organization with less than 10 employees
- Recycling plans
- Registration, Annual fees
  - Level 1 = \$15,000
  - Level 2 = \$10,000 initial, \$7,500 annual
  - Level 3 = \$10,000 initial, \$2,500 annual



# *Television Manufacturer Requirements*

- TV registration, annual fee \$2,500
- Must “recycle or arrange for the recycling” of their market share TV manufacturer “market share” measured using sales data from Electronics Recycling Coordination Clearinghouse (ERCC)
- DEQ sets total annual target for TV recycling
  - 21,000,000 lbs. for FY 2015-16 (10,500 Tons)
  - 28,000,000 lbs. for FY 2016-17 (14,000 Tons)
  - 28,000,000 lbs. for FY 2017-18 (14,000 Tons)

# *Retailers*

A retailer that sells or offers for sale new computer equipment or televisions must:

- determine that all new covered devices are labeled
- review the NC DEQ web site to confirm that the manufacturer of a new covered device is on our list
- Retailers assist DEQ with manufacturer outreach





# *Local Government*



- Funding is available to support electronics collection programs. To be eligible:
  - Establish separate budget account for funds
  - Contract must be with certified 'R2' or 'e-Steward' recycler
  - Annual Report

## *Benefits of Recycling Electronics*

- Returns commodities and products to the general economy
  - Energy efficient feedstocks for manufacturers worldwide
- Part of overall effort to reduce long-term dependence on solid waste disposal and landfills
- Diverts hazardous materials from solid waste landfills – lead, mercury
- Helps grow the state's recycling economy
  - NC home to major electronics processors with substantial investments in plant and equipment
- Meets citizen demand for alternatives to disposal



North Carolinians have access to electronics recycling. Counties without access can use computer mailback.

NO

\* Citizens in three counties without access can use computer mailback services required by law



# *Access to Electronics Recycling*

North Carolina is unique among Southeastern states in citizens having comprehensive access to electronics recycling services



# *North Carolina Electronics Recycling Economy*

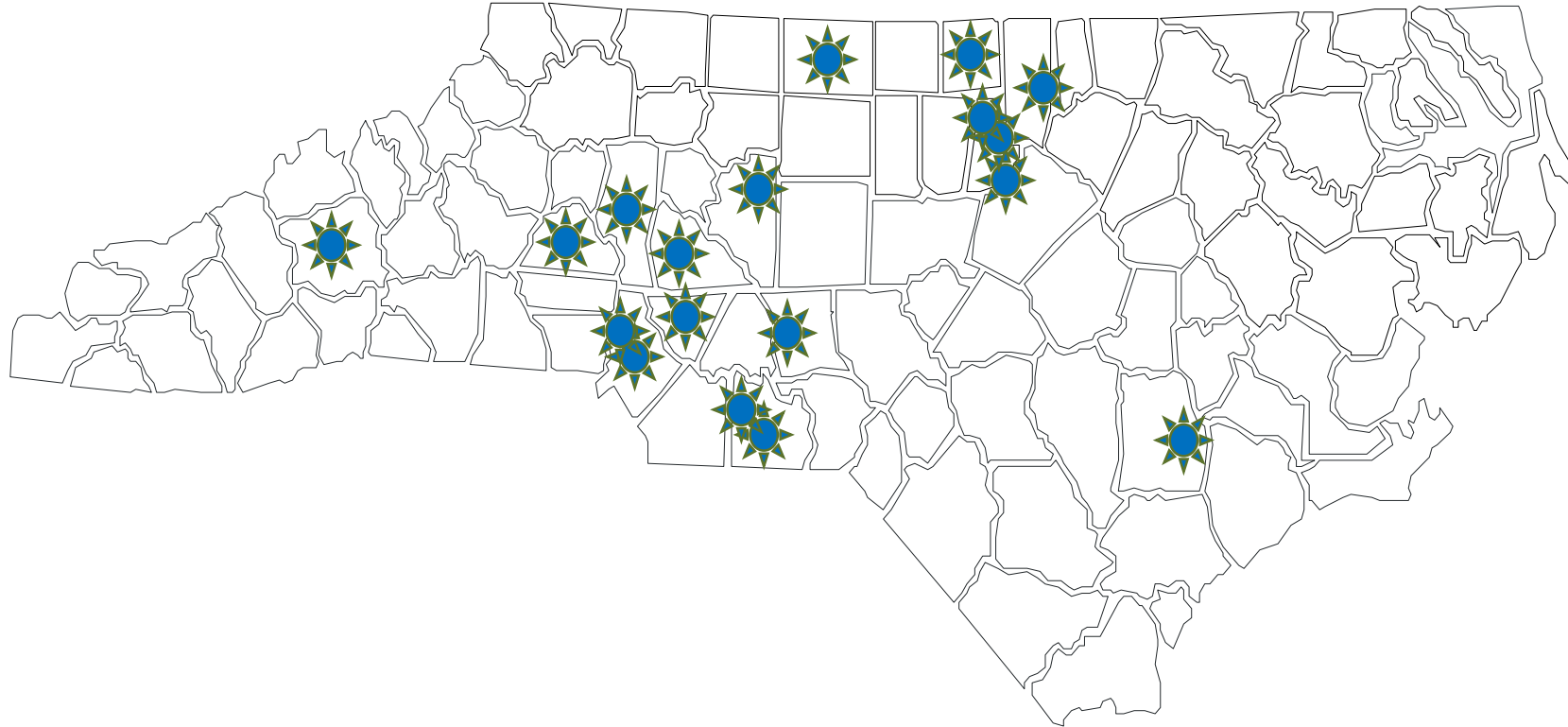
- NC electronics system has created substantial private sector electronics recycling industry
- 19 R2 Certified Recyclers in NC
- 4 e-Steward Certified Recyclers
  - All 4 hold both certifications
- 49 NC Registrations with DEQ since 2015



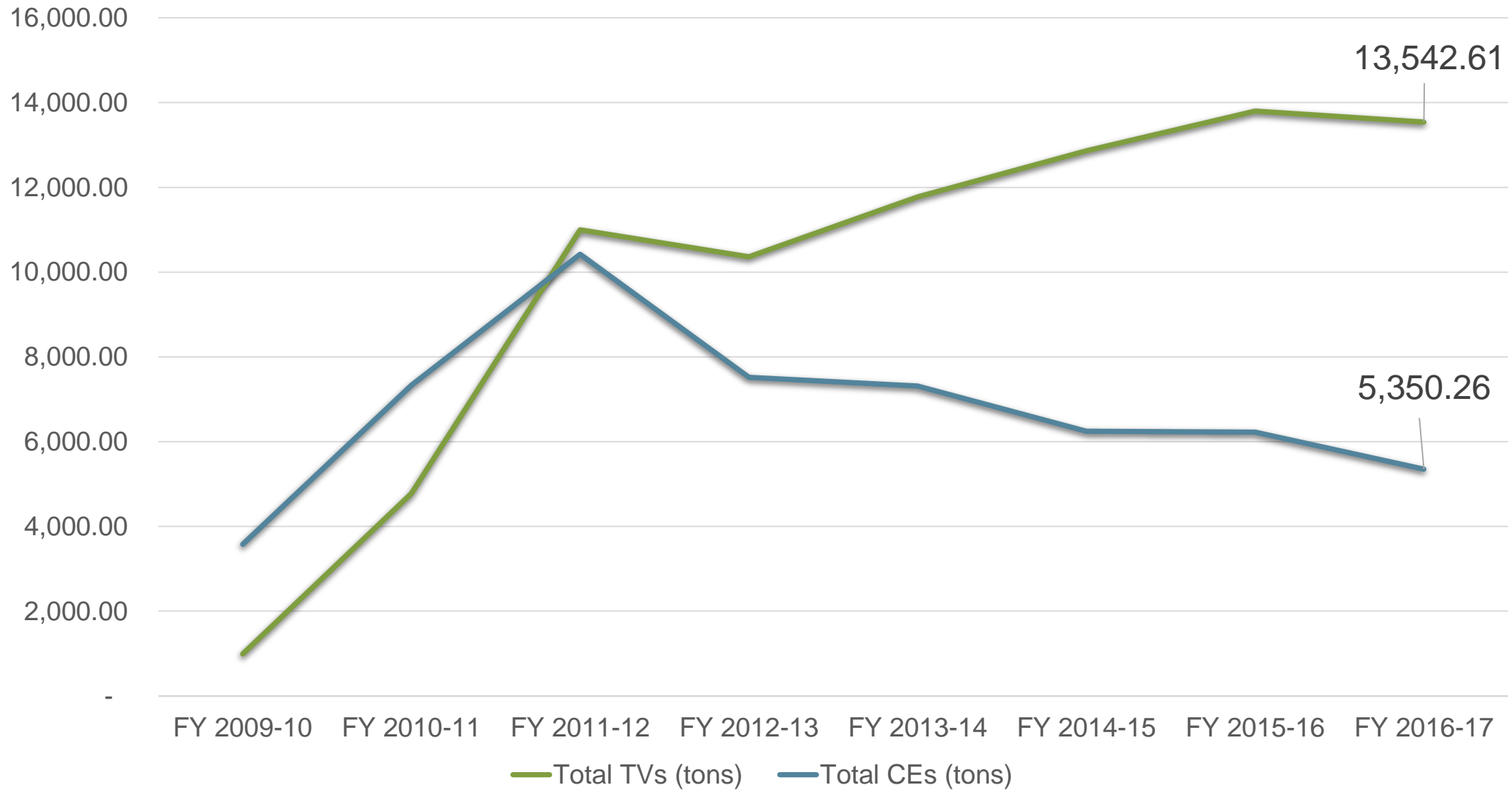


# *Certified Electronics Recyclers in NC*

- Private investment in plant and equipment exceeding **\$55,000,000**
- Large presence in rural areas across NC, including Anson, Iredell, Catawba, Granville, Stanly, Rowan, and Rockingham Counties



## *Recycling of Electronics in NC*



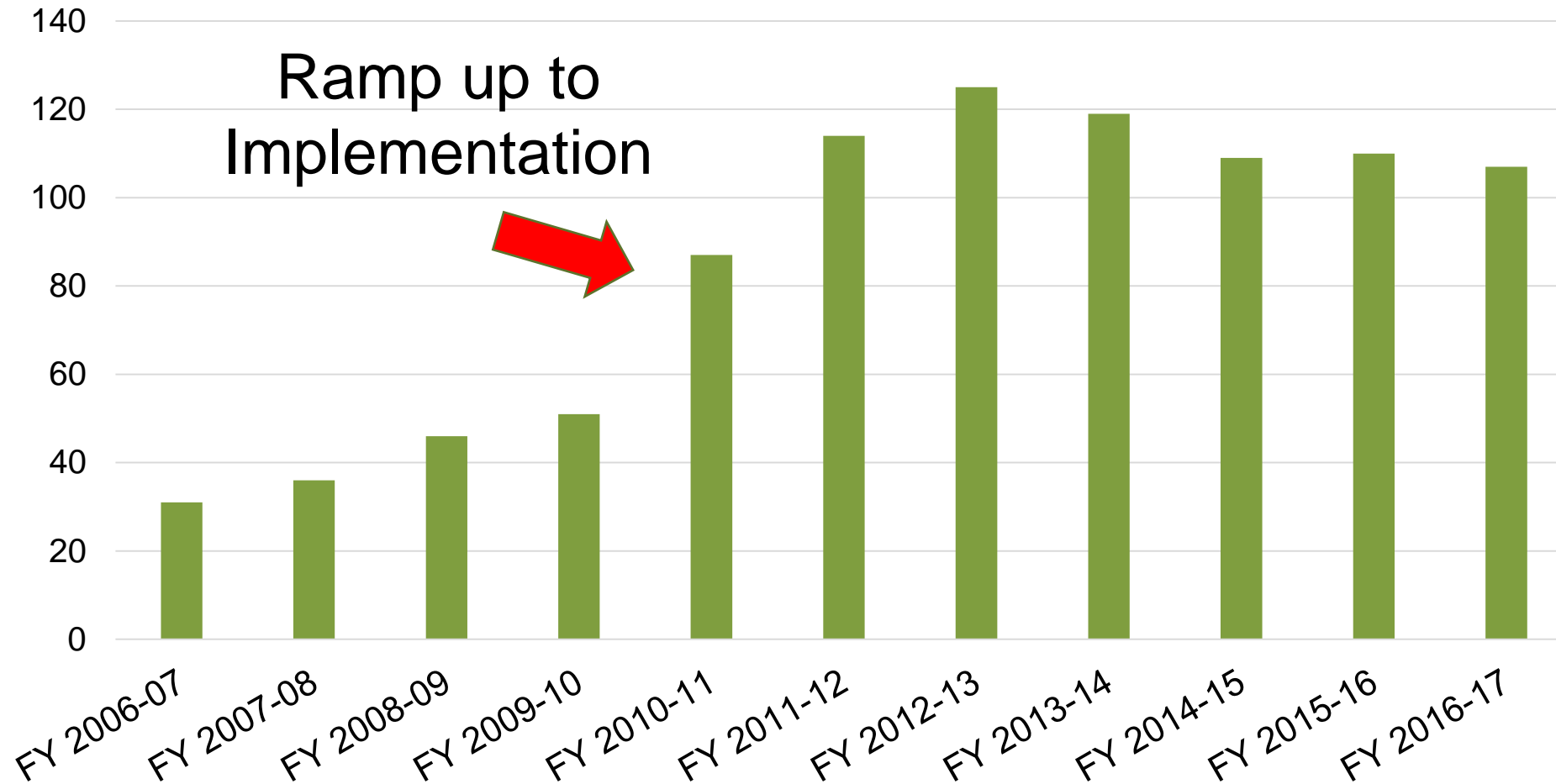
Overall Recycling of Electronics in NC	FY 2010- 11	FY 2011- 12	FY 2012- 13	FY 2013- 14	FY 2014- 15	FY 2015- 16	FY 2016- 17
Manufacturer Televisions	1,754	2,733	1,624	2,460	2,834	1,743	2,086
Manufacturer Computer Equipment	2,896	3,996	2,099	1,843	1,193	1,598	694
Local Government Televisions	3,019	8,265	8,739	9,315	10,026	12,058	11,138
Local Government Other Electronics	4,432	6,424	5,420	5,471	5,051	4,624	4,657
TOTAL (tons)	12,102	21,417	17,882	19,090	19,104	20,022	18,893
Total Pounds Per Capita	2.5	4.4	3.7	3.9	3.8	4.0	3.8

Portion collected by  
local government  
programs

- 84% of TVs
- 87% of Computer  
Equipment/Other  
Electronics



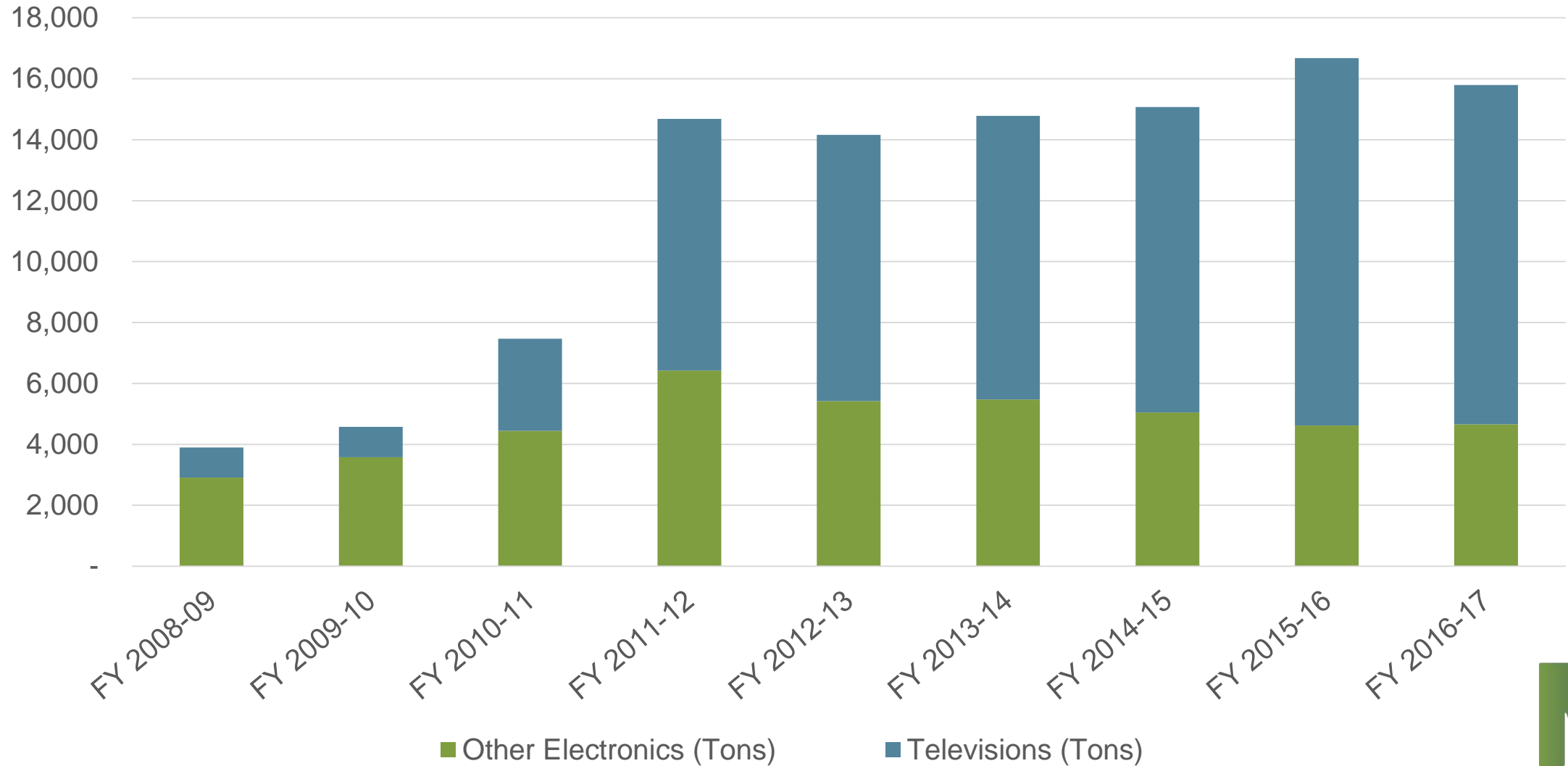
# *Local Gov't Electronics Recycling Programs in NC*



# Communities reporting electronics recycling tonnage  
FY 2016-17: 109 Programs (92 county, 17 municipal)



# *Tons of Electronics Recycling Collected by NC local governments*



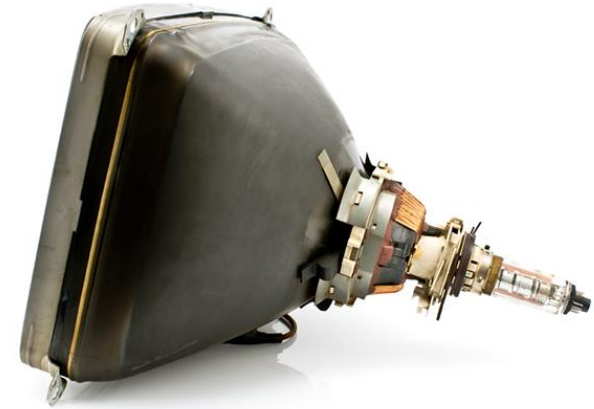


## *Changing Nature of Materials Handled by Local Gov't Collection System*

	FY 2009- 10	FY 2010- 11	FY 2011- 12	FY 2012- 13	FY 2013- 14	FY 2014- 15	FY 2015- 16	FY 2016- 17
TVs	22%	41%	56%	62%	63%	66%	72%	71%
Other Elect.	78%	60%	44%	38%	37%	34%	28%	29%

# *Changes in TV Technology*

- Three Main Generations of TVs
  - CRTs
    - Dominant technology for many years with sales essentially ending in 2010
    - Bulk of TVs collected so far have been CRTs – an unknown quantity remains
    - Main material of concern: lead in panel and funnel glass
  - LCDs
    - First generation of Flat Panel Display (FPD) televisions – approximately 174 million LCD TVs were sold between 2001 and 2014
    - Picture is backlit by small fluorescent lamps
    - Main material of concern: mercury in the fluorescent lamps
  - LEDs
    - Newest mainstream FPD TV technology, now dominating sales
    - Contain neither lead nor mercury, but still require dismantling in recycling process



## *CRT Glass Downstream Markets*

- CRT glass processing and end-use capacity exists in North America and globally
- Net cost to process glass for recycling, though cost of glass recycling has declined in the recent past
- No barrier to moving CRT glass to responsible end-use besides cost

### CRT Glass Demand:

- Lead Smelters
- Ceramic Tiles
- Industrial Glass Uses:
  - Fiberglass
  - Other ceramics
  - Lighting
- Daily cover for lined-landfills



Glass tiles for residential use made from CRT glass

## *Ensuring NC Materials Are Handled Properly*

- Requirements in law that television manufacturers ensure environmentally sound recycling of televisions
- Local governments provided guidance since law's inception on choosing responsible recyclers
- State contract has 6 vetted contractors available for local programs to use as markets
- Recyclers register with State to allow tracking companies involved in electronics recycling
- State active participant in strengthening R2 certification program



## Televisions Recycled by Local Governments In North Carolina

Fiscal Year	CRT TVs Percentage	Flat Panel TVs Percentage
2014-15 <sup>1</sup>	93.2%	6.8%
2015-16 <sup>1</sup>	93.0%	7.0%
2016-17 <sup>2</sup>	89.5%	10.5%

Expect to see continued gradual decline in  
proportion of CRT Televisions

<sup>1</sup> – results from NC DEQ Survey as reported to General Assembly in May 2017

<sup>2</sup> – results from limited community data available to NC DEQ





## *Estimates of Household TV Ownership in NC*

	2005	2010	2015	2020 (projected based on trend)
Total TV Ownership in NC (units) <sup>1</sup>	9,229,098	10,683,223	11,497,770	12,841,884
CRT Portion	88%	68%	48%	28%
FPD Portion	12%	32%	52%	72%

Average Life Span (U.S. EPA):

- CRT TV = 13.5 years
- FPD TV = 9 years



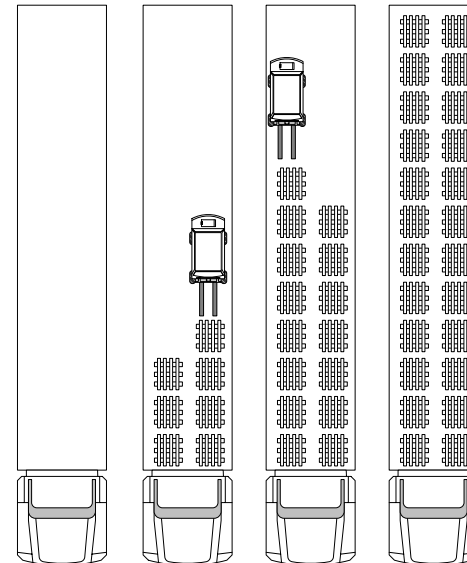
# *NC Program Cost for Local Governments as determined by 2016 DEQ study*

- Average Cost Per Pound Managed = \$0.25
- Average Cost Per Capita = \$0.75
- Rates experienced by communities vary based on program attributes

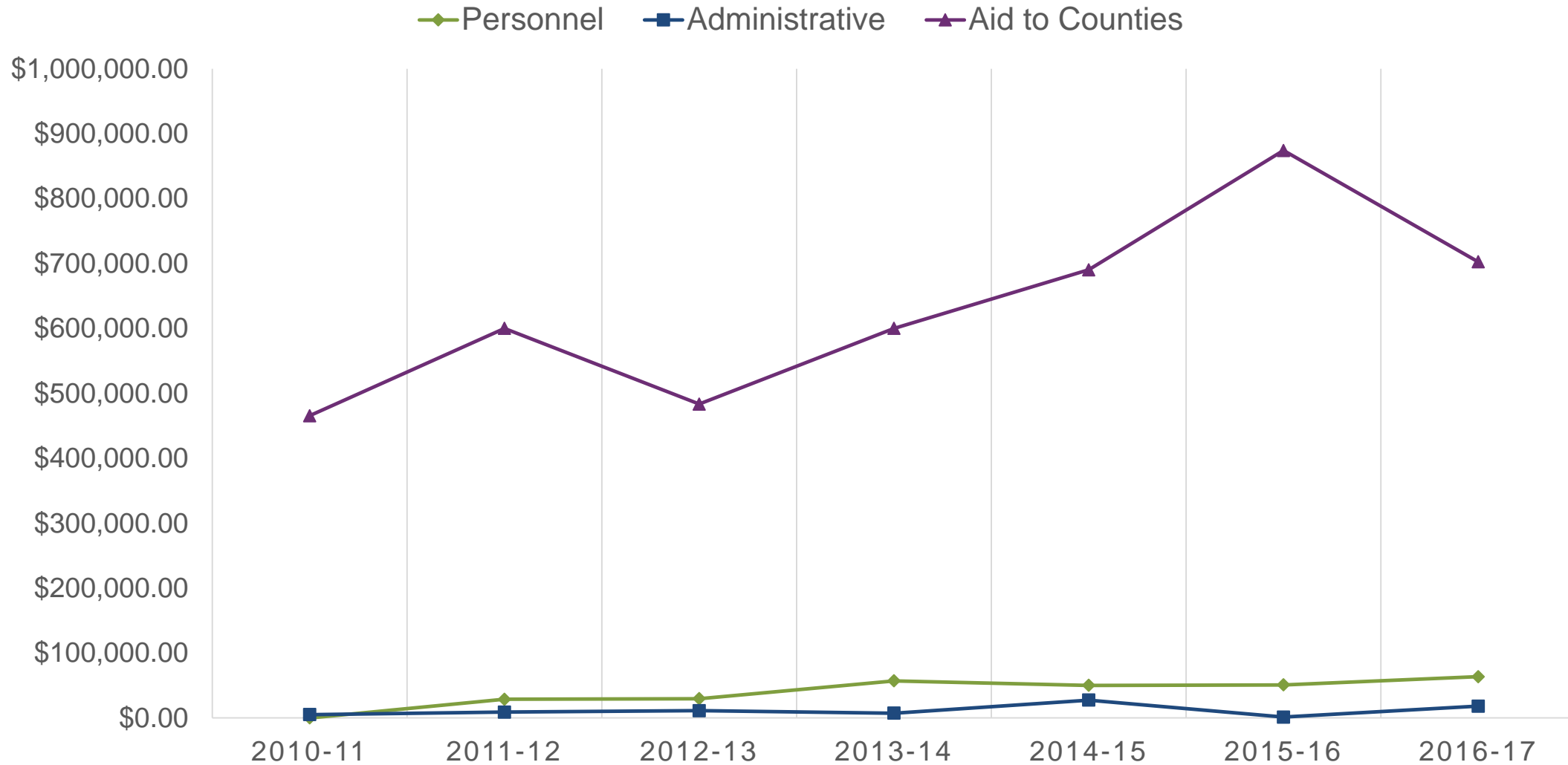


# *Techniques for Cost-Effective Local Programs*

- Work with recycler supported by manufacturer quota
- Handle materials efficiently
  - Avoid double handling – containerize/palletize materials on the go
  - Maximize weight on a truck
  - Get tips from electronics vendor on sorting and packing
  - Collect and pack to prevent breakage
- Discourage scavenging
- Open collection program to higher value materials
  - Commercial and institutional materials
  - Cell phones



# *ELECTRONICS MANAGEMENT FUND EXPENDITURES*



# *State Funding to Eligible Local Government Programs*

Year	Amount	# Eligible Governments	\$ per capita
2011	\$465,500	64	\$0.072
2012	\$600,000	72	\$0.077
2013	\$483,391	82	\$0.055
2014	\$600,000	88	\$0.066
2015	\$690,175	88	\$0.077
2016	\$873,930	82	\$0.096
2017	\$702,500	91	\$0.074
2018	\$700,000	72	\$0.080



## *Manufacturer Level II vs Local Government Recovery – Imbalance in the System*

- Computer Manufacturers can register at Level II in exchange for operating drop-off sites in the 10 largest cities.
  - Increasing number of manufacturers use Level II, but collect very few tons (less than 1% of what local governments collect)
  - Level II represents very high cost recovery for the system ~ \$5,000/ton
  - Urban drop-off sites not accessible to rural citizens
- Eliminating Level II and Level III Registration would provide ***additional \$225,000 for local programs each year***





# *How TV Manufacturers Support System*

## **TV Manufacturers**

- Given Market share % by NC DEQ
- Meets their obligation by paying for TV recycling by electronics recyclers



## **Electronics Recyclers**

- Receive quota orders from Manufacturers
- Source materials from local governments and others to meet quota
- Are paid for processing by manufacturers



## **Local Programs**

- Send materials to recyclers, who should have quota to fill

## **Example:**

- Manufacturer X sells 10% of all TVs
- Total TV Tonnage: 14,000 tons
- 10% = 1,400 tons
- Manufacturer fulfills responsibility by paying Recycler to process 1,400 tons

## *Issues in TV Manufacturers Support*

- Total reported manufacturer tons falling short of true total tons collected – almost 20% gap in FY 2016-17
- Some Manufacturers not sourcing quota from Recyclers who directly receive Local Program material
  - As much as 4,000 tons in FY16-17
- Some Manufacturers give quota to Recyclers who receive little direct material from Local Programs
  - One vendor received 6,500 tons of quota in FY 16-17 but recycled just 840 tons from local programs
- Electronics Recyclers receiving quota payments for less than true cost of processing – some as ***low as 4 cents/pound***





## *Options for Strengthening Program*

- Eliminate computer manufacturer registration levels to remove inefficient part of the system and increase funding to local programs.
- Establish mechanisms to make sure TV manufacturer quota is directly connected to County-collected TVs and to encourage that quota payments are in line with actual processing costs.
- Continue to assist communities in adopting best management practices.

*Questions?*

