



Energy Consumption of Refrigerators in Ghana - Outcome of Household Surveys

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Background

- Robust growth in electricity demand
 - driven by the residential sector
- Electricity shortages
 - caused by erratic rainfall and an over-reliance on variable hydropower
- 60% of homes connected to electricity grid
- Lighting is most common electric device in homes
- Refrigerators & freezers - domestic appliances use most electricity in the residential sector
- Fans also provide substantial load
- Motors create large loads in commercial / industrial sectors



Project Objectives

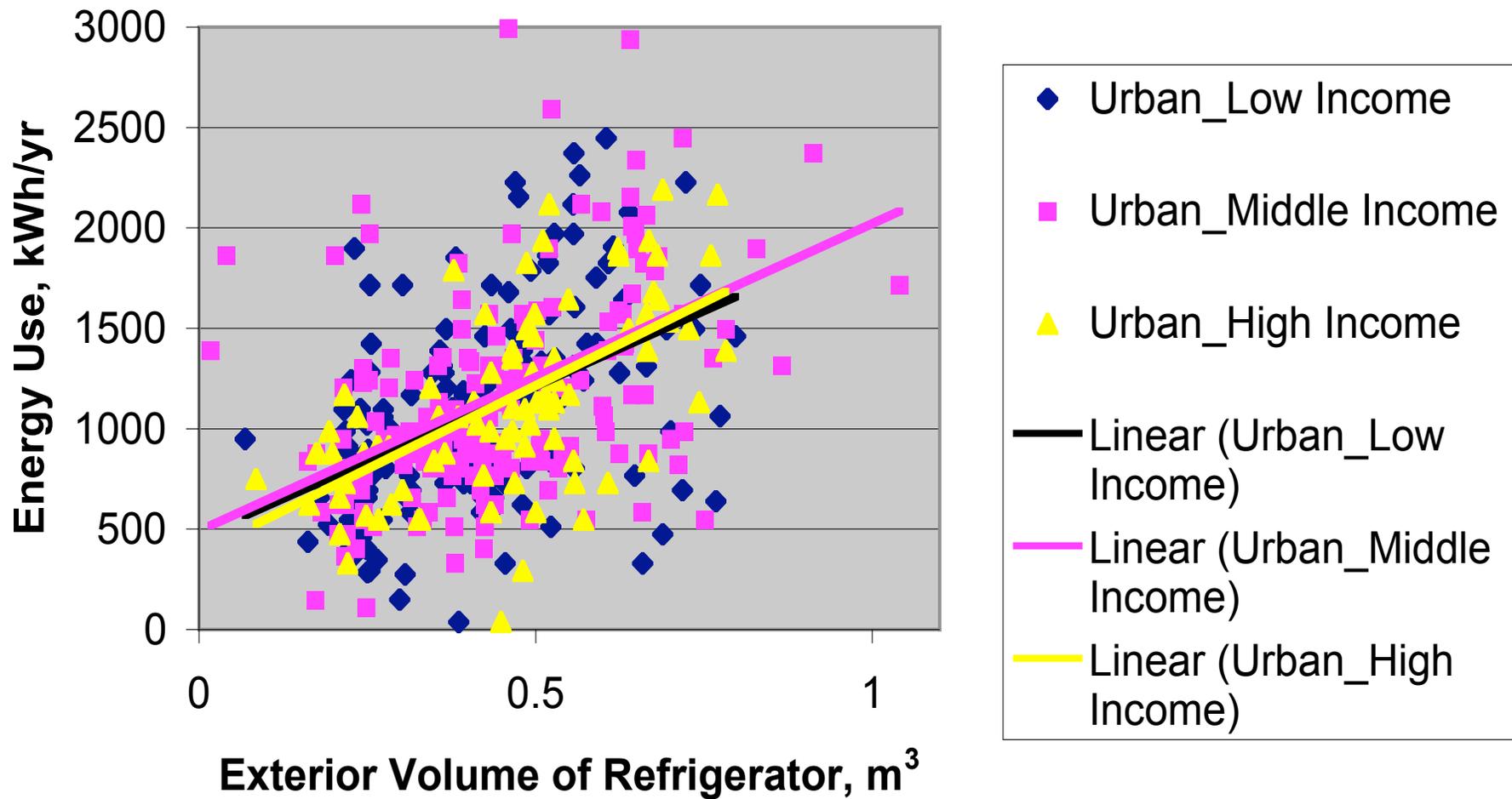
- To progressively generate large scale electricity savings and reduce GHG emissions from the electricity generation—
 - by limiting the electricity demand from refrigerators / refrigerator/freezers
- Introduce mandatory energy efficiency standards, labels, and incentive programs for refrigerators / refrigerator/freezers
- Use of standards and labels as main tool for transforming refrigerators / refrigerator/freezers market towards more energy efficient products
- Use of incentive programs to push the boundary for high efficiency products which will enable efficiency to continually improve over time



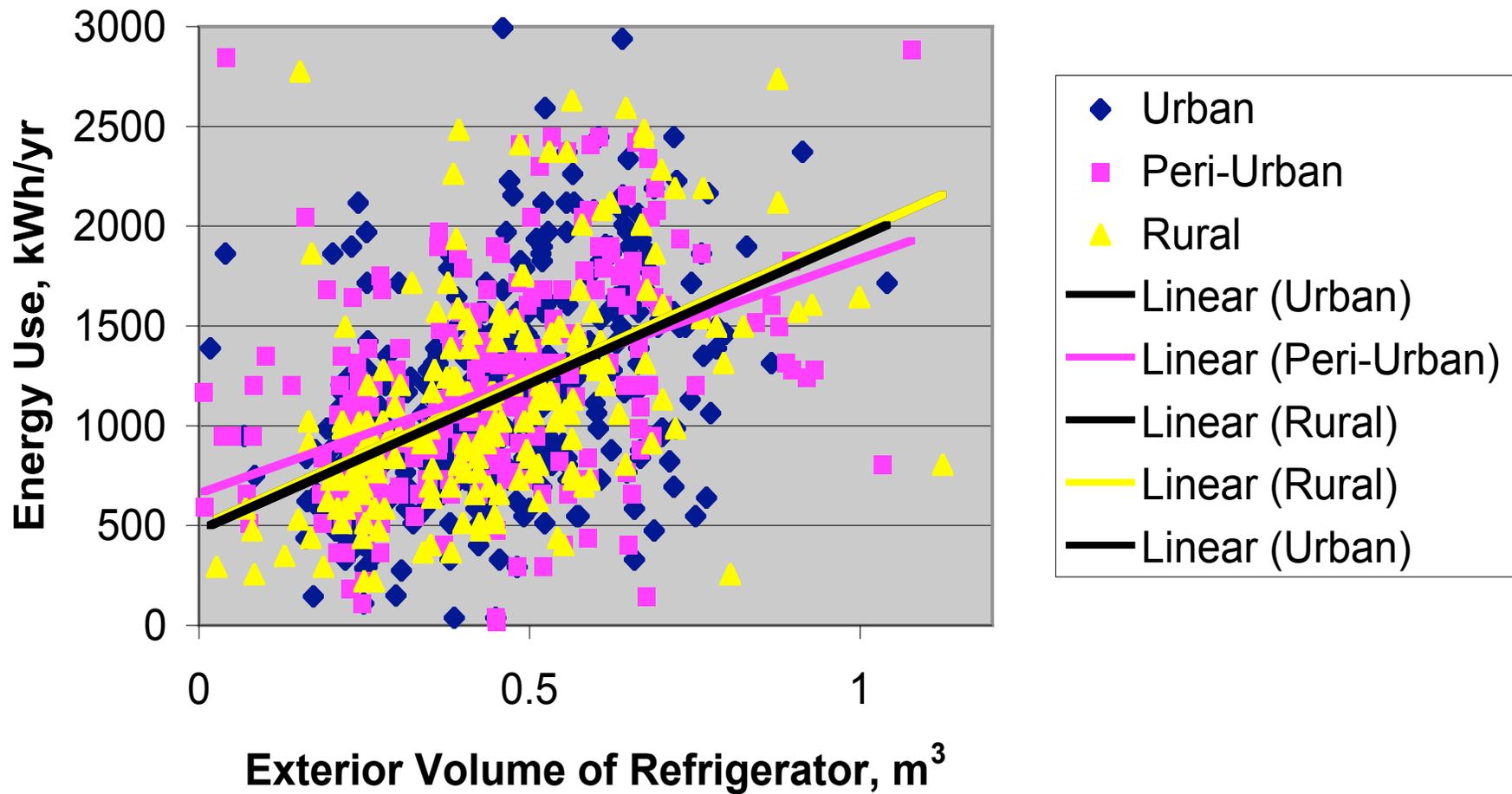
Some Survey Observations

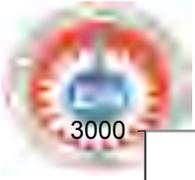
- 90% of households own at least one refrigerator and one fan
- Domestic refrigerators and freezers account for 25% - 50% of total residential electricity consumption
- average consumption is more than 1000 kWh/year/unit
 - over twice energy use for such equipment in developed countries
- Use of such refrigerators / refrigerator/freezers cause substantial energy waste
- Contributes to emission of greenhouse gases emission
 - as electricity generation is heavily reliant on fossil fuel for new supplies

Energy Use of Refrigerators in Urban Households

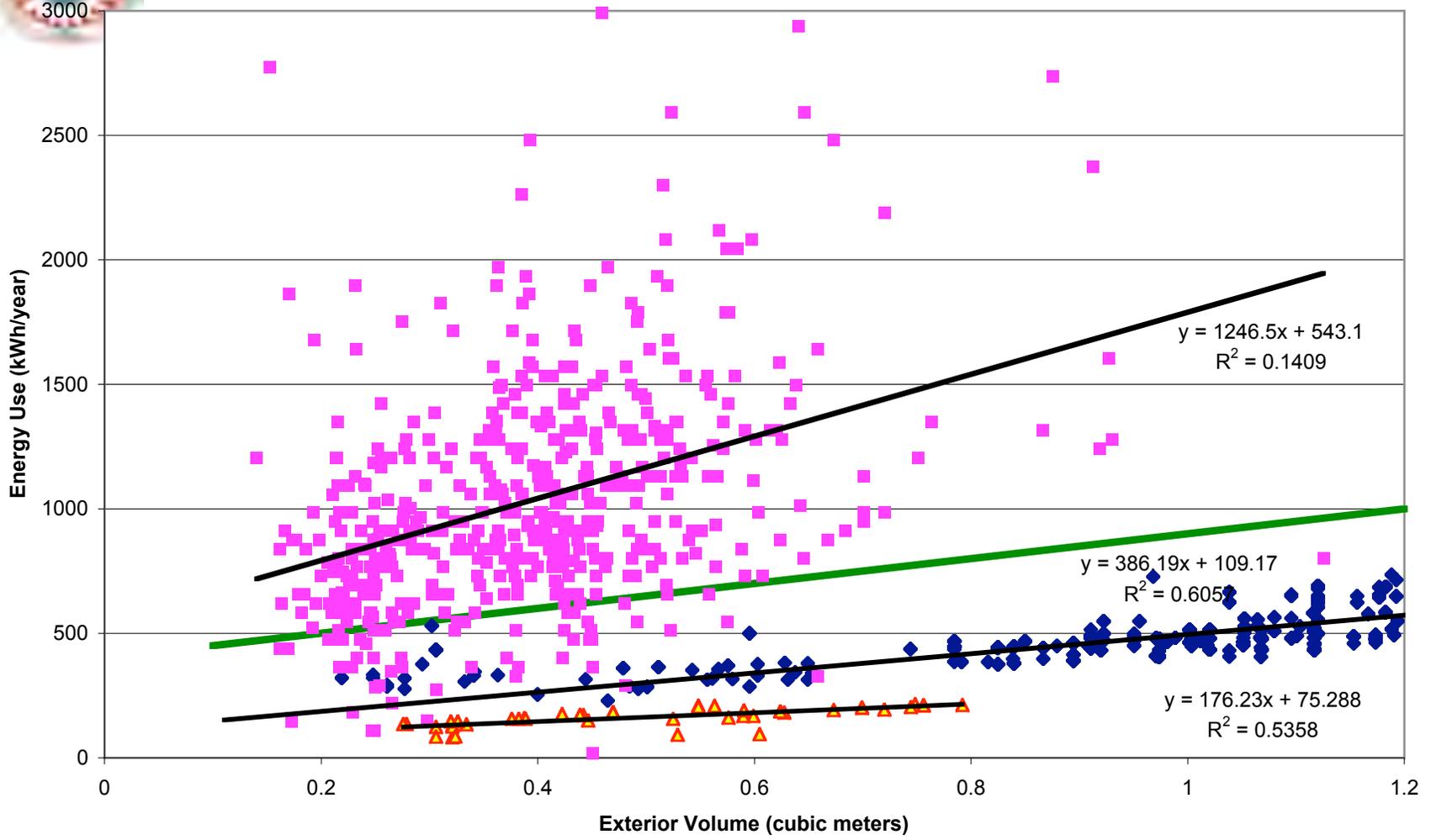


Energy Use of Refrigerators in Urban, Peri-Urban & Rural Households



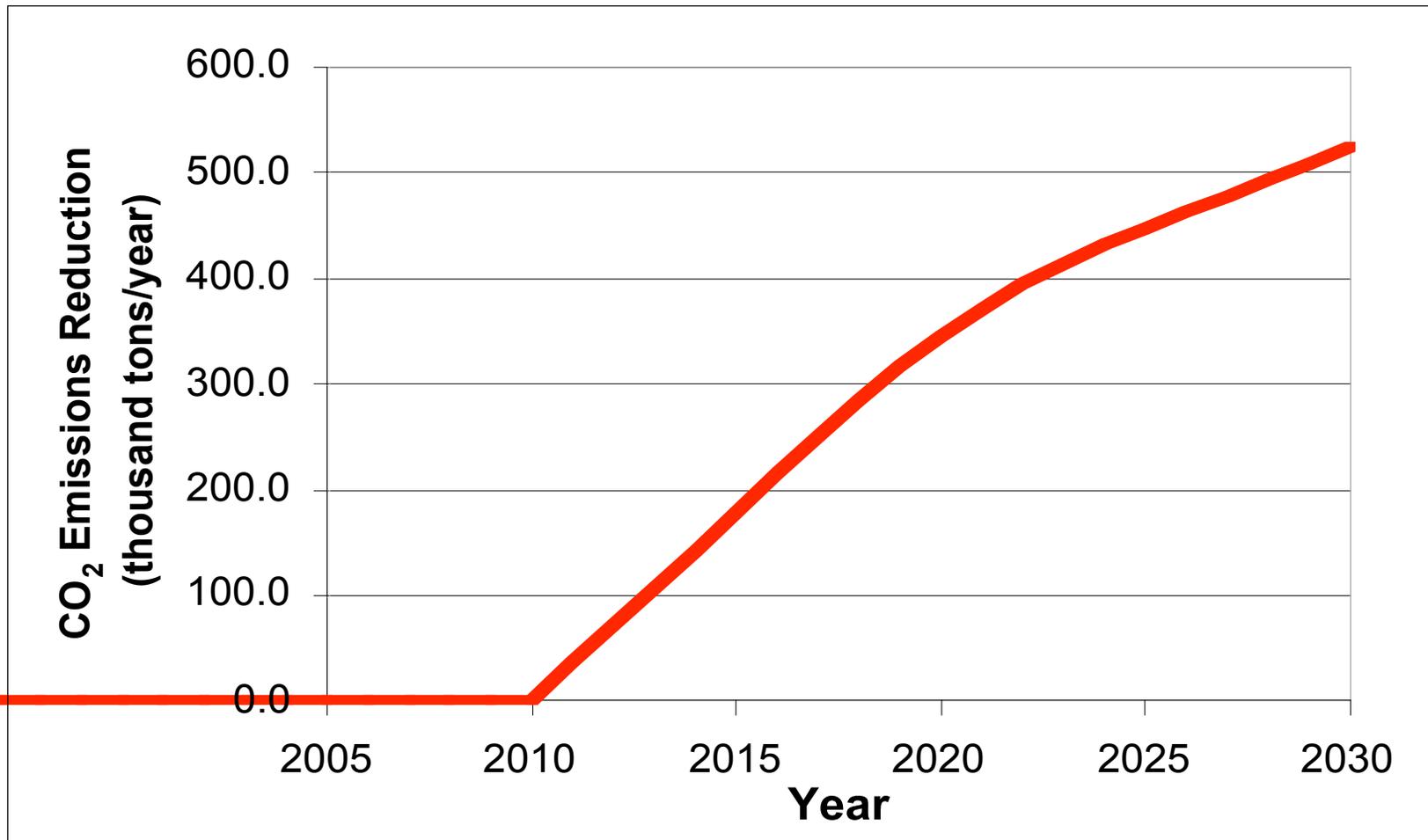


Comparative Energy Use



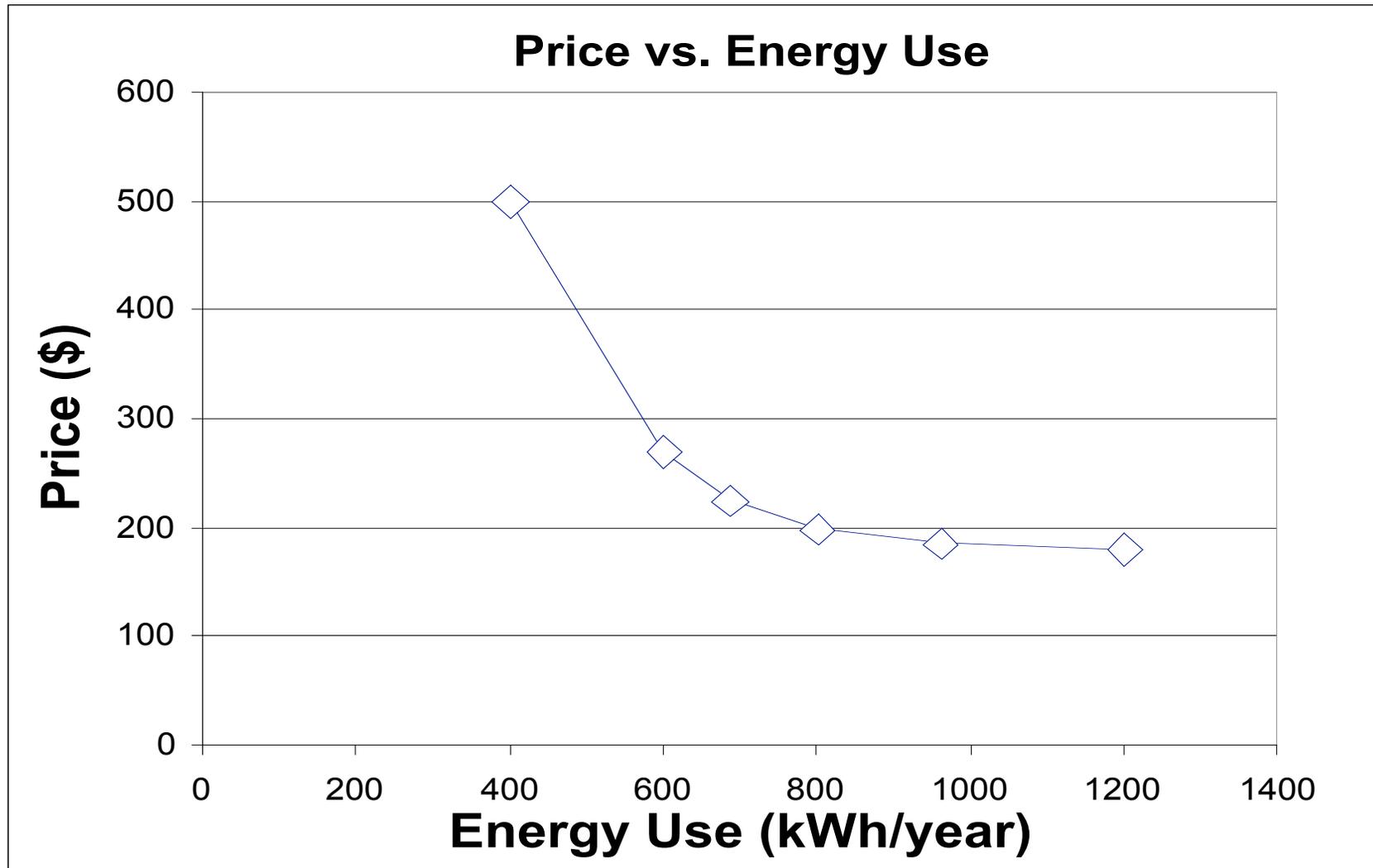


Projected CO₂ emission reduction from MEPS



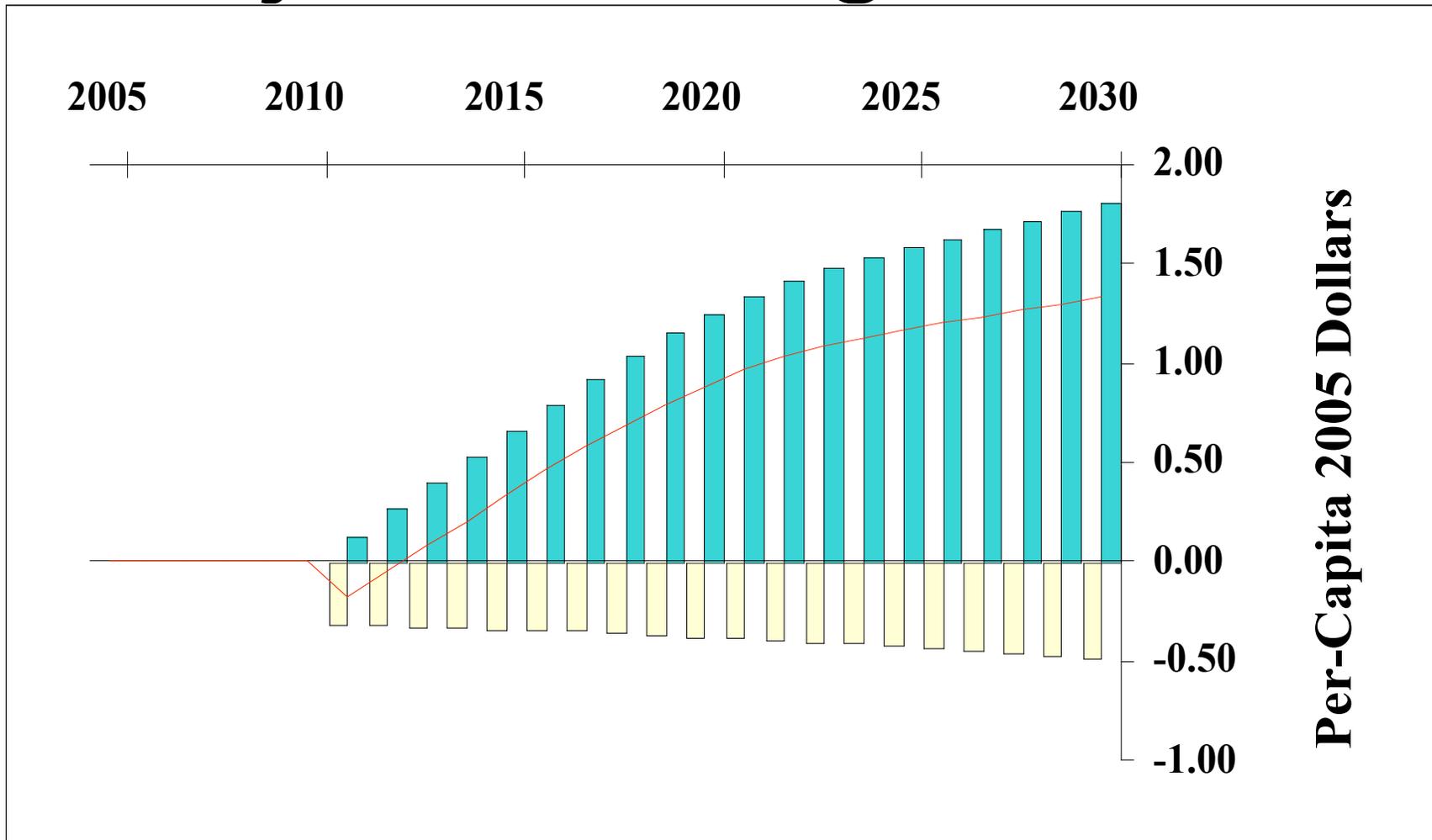


Refrigerator Price and Energy Use





Projected savings from MEPS





Regulatory elements of Ghana refrigerator/freezer energy efficiency standard

- **Application of Regulation**
- **Requirement to comply with Regulation**
- **Minimum performance requirements**
- **Information on package and labeling requirements for refrigerators and refrigerator-freezers**
- **Offences in relation to removal of label**
- **Powers of an inspector**
- **Petition against detention or seizure**
- **Forfeiture of and fines for refrigerators and refrigerator-freezers**
- **Offences and penalties**
- **Offence by corporate bodies**
- **Civil actions; jurisdiction**
- **Interpretation**



Coverage and scope

- Regulations apply to refrigerators, refrigerator-freezers and freezers manufactured in Ghana, imported for use in Ghana, sold or offered for sale in Ghana.
- **Exemption**
- refrigerators and refrigerator-freezers sold by individual persons who used it in at least one continuous year
- where individuals have sold less than two refrigerators or refrigerator freezers in the previous year



Minimum performance requirements

- maintain a temperature
 - $< 10^{\circ}\text{C}$ in fresh food compartment
 - $< -5^{\circ}\text{C}$ degrees in freezer compartment
- **Maximum Energy Consumption**
- **Refrigerators / Refrigerator-Freezers** - $500 \text{ kWh/yr} + 400 \text{ kWh/yr} \times \text{exterior cubic volume}$
- **Freezers** - $650 \text{ kWh/yr} + 500 \text{ kWh/yr} \times \text{exterior cubic volume}$



Information on package and labeling requirements

- the manufacturer's name or trade mark
- the manufacturer's model identifier
- the energy star rating of the model
- the food & freezer compartment volumes
- Energy Consumption Rating (ECR), kWh/yr
- the type of refrigerant



Proposed Rating for Refrigerators and Refrigerator-Freezers in Ghana

Appliance	Annual Energy Consumption, kWh/year				
	***** 5-Star	**** 4-Star	*** 3-Star	** 2-Star	* 1-Star
Refrigerators and Refrigerator/Freezers	<250	250 – 300	300 – 350	350-400	400 – 500
Freezers	<300	300-350	350-400	400 – 500	500 – 650



Inspections - Powers of an inspector

- To ascertain whether appliances comply with Regulations
- **An inspector may at any reasonable time**
- enter any place he/she believes that refrigerators or refrigerator-freezers are being manufactured, imported, offered for sale
- examine or test refrigerators or refrigerator-freezers
- seize any refrigerators or refrigerator-freezers which
 - contravene any provision of the Regulations or
 - improperly labeled or labeled in such a way as to be deceptive, misleading or false



Penalties and enforcement

- A refrigerator or refrigerator-freezer that does not conform to the Regulations is liable for seizure, forfeiture or fine
- Energy Commission shall set the appropriate level for fines and dispose of any forfeited refrigerators or refrigerator-freezers in a manner it may determine
- Revenue raised from non-compliance appliance fines shall be allocated for efficient appliance regulation and program education implementation and enforcement activities in a manner determined by the Commission



Follow-up Activities

- Public education and awareness campaigns
- Experimenting with refrigerator rehabilitation and redesign
- Developing curriculum and educational programs
- Institutional and human resource capacity building
- Pilot scheme on 100 households supplied with efficient refrigerators and refrigerator-freezers



Public education

- Dissemination of brochures and radio interviews
- Awareness workshops for policy makers
- Household Energy Conservation Clubs in educational institutions



Awareness Workshops for Decision Makers

- Aim of workshops - to equip decision makers with the knowledge to make informed decisions in support towards programs/investments aimed at improving refrigerator energy efficiency in the Ghana
- Target Groups
 - members of Parliamentary Select Committee on Energy
 - top officials of Ministry of Energy and Energy Commission



Household Energy Conservation Clubs in Educational Institutions

- Household Energy Conservation Clubs – HECCs
- to be launched in secondary schools
- to organize fora to sensitize students on the opportunities to improve refrigerator efficiency
- students will impart the knowledge to their parents and others



Schools and curriculum development

- Development of curriculum regarding energy efficiency and energy use in high schools - as part of science education
 - to enhance education and awareness around refrigerator energy use and efficiency
 - to collect data and information at the grassroots level
 - to motivate both students and teachers
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- Strategy - use of simple electricity meters - for educational home energy audits
 - to teach students on the connection between science, physics, energy and concrete economic savings in the household



Potential Benefits of Enforcement of Energy Efficiency Standards

- Environmental benefits of reduced carbon emissions and CFC leakage
- Economic benefits of decreasing the cost of modern energy services supply
- Poverty reduction benefits of decreasing the electricity bill of poor households with refrigerators and refrigerator-freezers



Conclusion

- The Ghana Standard has a wider scope than most other refrigerators/freezers standards
- it covers both new and used products
- to be enforced and many distribution points including: import, manufacture, warehousing, and sale
- Ghana MEPS accepts a very simple local test procedure along with the results of test procedure results (with adjustment) from other countries
- Ghana also accepts as MEPS compliant refrigerators/freezers from other countries that have reasonable stringent efficiency standards
- Ghana MEPS implementation will be supplemented by an education and enforcement program that will help assure long-term compliance with the regulation
- 95% of countries in Africa have yet to implement MEPS for refrigerators
- Ghana's experience in this matter can be an example, education, motivation, and inspiration for other countries to carry out similarly beneficial energy efficiency policies



Thank you for listening